WestConnex

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New M5

Environmental Impact Statement

Technical working paper: Noise and vibration



Appendix J

November 2015

WestConnex

WestConnex The New M5

Technical Working Paper: Noise and Vibration

Client: Roads and Maritime Services

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1.0 Introduction

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the New M5 (the project), which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road, and St Peters. The project would also include an interchange at St Peters and connections to the existing road network.

Approval is being sought under Part 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The project is declared to be State significant infrastructure (SSI) under section 115U(2) of the EP&A Act by reason of the operation of clause 14 and Schedule 3 of the State Environmental Planning Policy (State and Regional Development) 2011. Accordingly, the project is subject to assessment under Part 5.1 of the EP&A Act and requires the approval of the Minister for Planning. An environmental impact statement (EIS) is therefore also required.

Roads and Maritime is seeking the project to be declared by the Minister for Planning as State significant infrastructure and critical State significant infrastructure under sections 115U(4) and 115V of the EP&A Act.

On 11 August 2015, the Commonwealth Minister for the Environment determined that the project has the potential to significantly impact on a matter of national environmental significance and is therefore a 'controlled action'. This means that approval of the project will be required from the Commonwealth Minister for the Environment in addition to environmental and planning approvals required under State legislation.

Under the Bilateral Agreement relating to environmental assessment (February 2015) between the Commonwealth Government and the NSW Government, this EIS has been adopted for the purpose of meeting the assessment requirements of both the Commonwealth EPBC Act and the NSW EP&A Act.

This technical report provides a noise and vibration impact assessment of the project and has been prepared to support the EIS.

The acoustic terminology used in this report is explained in the glossary of terms and abbreviations in **Appendix A**.

1.1 Overview of WestConnex

WestConnex is a 33 kilometre motorway that is intended to link Sydney's west with the airport and the Port Botany precinct. The component projects of the WestConnex program of works are:

- M4 Widening – Pitt Street, Parramatta to Homebush Bay Drive, Homebush (planning approval granted on 21 December 2014 and under construction)
- M4 East – Homebush Bay Drive, Homebush to Parramatta Road and City West Link (Wattle Street) at Haberfield (planning application lodged and subject to planning approval)
- New M5 – (the subject of this EIS)
- King Georges Road Interchange Upgrade (planning approval granted on 3 March 2015 and under construction)
- M4-M5 Link – Haberfield to St Peters (undergoing concept development and subject to planning approval)
- Sydney Gateway (is the subject of further investigations by the NSW Government and would be subject to separate planning approval).

Separate planning applications have or will be lodged for each component project. Each project will be assessed separately, but the impact of each project will also be considered in the context of the wider WestConnex program of works.

A proposed Southern extension from Arncliffe to Kogarah is currently being investigated by the NSW Government, and would connect the New M5 to the southern and bayside suburbs of Sydney, and the proposed F6 motorway.

The WestConnex Delivery Authority (WDA) was established by the NSW Government to manage the delivery of the WestConnex series of projects for Roads and Maritime on behalf of the State. The WDA was a public subsidiary corporation of the Roads and Maritime. Following the achievement of early milestones for the WestConnex program of works, the NSW Government took the opportunity to evolve this early governance model.

On 1 October 2015 the transfer of the project delivery functions of WDA to Sydney Motorway Corporation (SMC) was finalised, forming a single decision-making entity to finance and deliver the WestConnex program of works. SMC is a private corporation, the shareholders of which are the Minister for Roads, Maritime and Freight and the Treasurer, with a majority independent board of nine directors.

Roads and Maritime is the Government client agency for the WestConnex program of works. In that capacity Roads and Maritime will enter into contractual arrangements with SMC subsidiary entities which will design, build, own and operate the motorway on behalf of Roads and Maritime. Roads and Maritime and SMC are working together to manage the planning approval process for the project. However, for the purpose of the planning application for the project, Roads and Maritime is the proponent.

1.2 Project overview

Key components of the project would include:

- Twin motorway tunnels between the existing M5 East Motorway (between King Georges Road and Bexley Road) and St Peters. The western portals along the M5 East Motorway would be located east of King Georges Road, and the eastern portals at St Peters would be located in the vicinity of the Princes Highway and Canal Road. Each tunnel would be about nine kilometres in length and would be configured as follows:
    - Between the western portals and Arncliffe, the tunnels would be built to be three lanes but marked for two lanes as part of the project. Any change from two lanes to three lanes would be subject to future environmental assessment and approval
    - Between the Arncliffe and St Peters, the tunnels would be built to be five lanes but marked for two lanes as part of the project. Any change from two lanes to any of three, four or five lanes would be subject to future environmental assessment and approval
- Tunnel stubs to allow for a potential future connection to the future M4-M5 Link and a potential future connection to southern Sydney
- Surface road widening works along the M5 East Motorway between east of King Georges Road and the new tunnel portals
- A new road interchange at St Peters, which would initially provide road connections from the main alignment tunnels to Campbell Road and Euston Road, St Peters
- Two new road bridges across Alexandra Canal which would connect St Peters interchange with Gardeners Road and Bourke Road, Mascot
- Closure and remediation of the Alexandria Landfill site, to enable the construction and operation of the new St Peters interchange
- Works to enhance and upgrade local roads near the St Peters interchange
- Ancillary infrastructure and operational facilities for electronic tolling, signage (including electronic signage), ventilation structures and systems, fire and life safety systems, and emergency evacuation and smoke extraction infrastructure
- A motorway control centre that would include operation and maintenance facilities
- New service utilities and modifications to existing service utilities
- Temporary construction facilities and temporary works to facilitate the construction of the project
- Infrastructure to introduce tolling on the existing M5 East Motorway
- Surface road upgrade works within the corridor of M5 East Motorway.

Construction activities associated with the project would generally include:

- Commencement of enabling and temporary works, including construction power, water supply, ancillary site establishment, demolition works, property and utility adjustments and public transport modifications (if required)
- Construction of the road tunnels, interchanges, intersections and roadside infrastructure
- Haulage of spoil generated during tunnelling and excavation activities
- Fitout of the road tunnels and support infrastructure, including ventilation and emergency response systems
- Construction and fitout of the motorway control centre and ancillary operations buildings
- Upgrades to surface roads and construction of bridges
- Implementation of environmental management and pollution control facilities for the project.

Subject to the project obtaining planning approval, construction of the project is anticipated to commence in 2016 and is expected to take around three years to complete.

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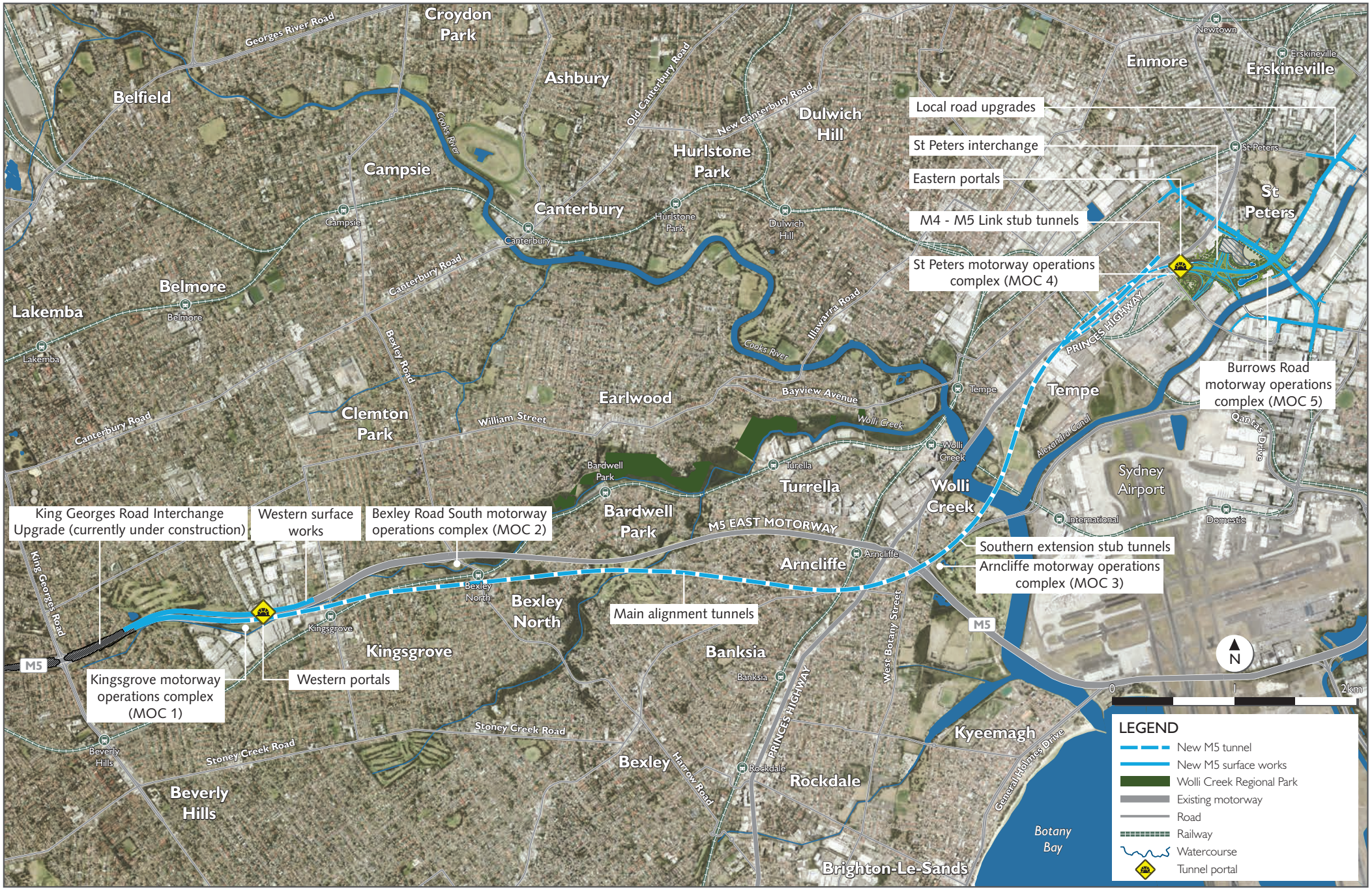


Figure 1 The project

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The M5 Motorway corridor (the M5 East Motorway and the M5 South West Motorway) is the main passenger, commercial and freight corridor between Port Botany, Sydney Airport and south-west Sydney. Traffic demands on the M5 East Motorway currently exceed the design capacity of the roadway, and as a result, present a significant bottleneck to the M5 Motorway corridor with motorists experiencing heavy congestion and unreliable journey times. The project is needed to provide additional capacity along the M5 Motorway corridor, and would allow for a more robust and reliable transport network.

1.3 Project location

The project would be located within the Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay local government areas. The project corridor is located from about five to twenty kilometres to the south and south-west of the central business district of Sydney. The project would traverse the suburbs of Beverly Hills, Kingsgrove, Bexley North, Earlwood, Bardwell Park, Bardwell Valley, Arncliffe, Wolli Creek, Tempe, Sydenham, St Peters, Alexandria and Mascot.

1.4 Secretary's Environmental Assessment Requirements

The Secretary's environmental assessment requirements (SEARs), for the project were issued on 5 March 2015, and re-issued with revisions on 26 August 2015. The SEARs have informed the preparation of this technical working paper.

The SEARs relevant to the assessment of potential noise and vibration impacts of the project are listed below in **Table 1**.

Table 1 Secretary's environmental assessment requirements – Noise and vibration key issues

Secretary's Environmental Assessment Requirements	Where addressed in this report
Key Issue - Noise and vibration including, but not limited to:	
- an assessment of the noise impacts of the project during operation, consistent with the *Road Noise Policy* (EPA, 2011) and *NSW Industrial Noise Policy* (EPA, 2000). The assessment must address: • the redistribution of traffic, • impacts to receivers (dwellings, child care centres, educational establishments, hospitals, motels, nursing homes, or places of worship), • sleep disturbance, and • the characteristics of noise (eg low frequency noise)	Operational road traffic noise: **Section 6.1** Fixed facility noise: **Section 6.2**
- an assessment of construction noise and vibration impacts, consistent with *the Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and *Assessing Vibration: a technical guideline* (DEC, 2006). The assessment must address: • the nature of construction activities (including transport, tonal or impulsive noise generating works and the removal of operational noise barriers, as relevant), • the intensity and duration of noise and vibration impacts (both air and ground borne noise) • the nature, sensitivity and impact to receivers, • the need to balance timely conclusion of noise and vibration generating works with periods and receiver respite and other factors that may influence the timing and during of construction activities (such as traffic management), • an indication of potential for works outside standard construction hours, including predicted levels, exceedances and a number of potentially affected receivers, justification for the activity in terms of the ICNG; and	**Chapter 5.0**
- cumulative assessment of potential construction noise and vibration impacts due to other developments in the vicinity, including future stages of WestConnex.	**Section 5.2**

This technical report presents the assessment of the potential construction and operational noise and vibration impacts as a result of the project, and the identification of feasible and reasonable noise and vibration mitigation measures. The assessment, as presented within this technical working paper, will inform the design of feasible and reasonable mitigation measures.

The scope of the construction noise and vibration assessment is as follows:

- Utilisation of background noise measurements to establish the construction noise management levels (NMLs) in accordance with the *Interim Construction Noise Guideline* (DECC, 2009)
- Identification of noise sensitive catchment areas likely to be affected by construction noise and vibration.
- Calculation of noise and vibration levels likely to be associated with the construction works at sensitive receivers and the evaluation of the extent of resulting impacts. This would include ground-borne noise and vibration associated with tunnelling activities
- Consideration of the impacts that may result from the proposed construction and mitigation measures to reduce adverse impacts where appropriate. These measures would be developed and implemented through the construction environmental management plans.

The scope of the operational road traffic noise assessment on sensitive receivers and noise from operational or 'fixed' facilities, is as follows:

- Identification of project specific operational noise criteria for road traffic noise in accordance with the *Road Noise Policy* (RNP) (DECCW, 2011) and the *Noise Criteria Guideline* (NCG) (Roads and Maritime, 2015)
- Identification of receivers along the alignment that are potentially sensitive to noise and vibration
- Modelling of road traffic noise levels with existing (2015) road traffic volumes, to provide a baseline for the assessment of future noise levels
- Validation of the existing road traffic noise model with site noise measurements and road traffic surveys.
- Modelling of road traffic noise levels for both the 'build' (with project) and the 'no build' (without project) scenarios for the year of opening (2021) and 10 years after opening (2031)
- Identification of appropriate operational noise criteria for fixed facilities in accordance with the *NSW Industrial Noise Policy* (INP) (EPA, 2000)
- Modelling of environmental noise emission from operational facilities or 'fixed' facilities
- Identification of feasible and reasonable noise mitigation measures where the operational noise criteria are exceeded
- For recommended operational mitigation, the feasible and reasonable mitigation measures would be investigated further and confirmed during detailed design, and in consultation with the affected community and landowners.

This technical report considers the following legislation, guidelines, policies and / or standards to inform the impact assessment of the project:

- *NSW Protection of the Environment Operations Act 1997* (POEO Act 1997)
- *NSW Road Noise Policy* (RNP) (DECCW, 2011)
- *Noise Criteria Guideline* (NCG) (Roads and Maritime, 2015)
- *Noise Mitigation Guideline* (NMG) (Roads and Maritime, 2015)
- *Environmental Noise Management Manual (ENMM)* (RTA, 2001)
- *NSW Industrial Noise Policy* (INP) (EPA, 2000)
- *NSW Industrial Noise Policy Application Notes* (EPA, 2013)
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- *Assessing vibration: a technical guideline* (AVATG) (DEC, 2006)
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990)

- DIN Standard 4150: Part 3 1999 - *Structural Vibration in Buildings – Effects on Structures*
- British Standard 7385: Part 2 1993 - *Evaluation and Measurement of Vibration in Buildings*
- Australian Standard 1055: Part 1 1997 - *Acoustics – Description and measurement of environmental noise, Part 1: General procedures*
- Australian Standard 2187 Part 2 2006 - *Explosives – Storage and Use Part 2: Use of Explosives*
- International Standard 14837 Part 1 2005 - *Mechanical vibration - Ground-borne noise and vibration arising from rail systems – Part 1: General guidance*

1.5 Structure of this report

The report is structured as follows:

- **Chapter 1 – Introduction.** This chapter introduces the project and the proponent, and describes the project area
- **Chapter 2 – The project.** The chapter provides a description of the project during construction and operation as relevant to this impact assessment
- **Chapter 3 – Existing ambient environment.** This chapter provides a description of the existing noise environment within the study area
- **Chapter 4 – Assessment criteria.** This chapter summarises the assessment criteria that applies to this assessment
- **Chapter 5 – Construction noise and vibration assessment.** The chapter provides the results of the construction noise and vibration impact assessment
- **Chapter 6 – Operational noise assessment.** This chapter provides the results of the construction noise impact assessment for road traffic noise and operational facilities
- **Chapter 7 – Construction noise and vibration mitigation.** The chapter outlines the recommended mitigation and management measures for potential construction noise and vibration impacts.
- **Chapter 8 – Operational noise mitigation.** The chapter outlines the recommended mitigation and management measures for potential operational noise, subject to detailed design
- **Chapter 9 – Noise and vibration impact summaries**. This chapter provides a summary by noise catchment areas for the impact assessment as detailed in Chapter 5 and Chapter 6.
- **Chapter 10 – Conclusion.** This chapter presents the conclusion to the report.

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2.0 The project

A detailed project description is provided in Chapter 5 and Chapter 6 of the EIS for the project. A brief overview is provided below, relevant to this assessment.

2.1 Operation

Western surface works and Kingsgrove Road surface works

The western surface works would connect the New M5 and the existing M5 East Motorway to the M5 South West Motorway through works within and around the King Georges Road interchange.

The key road infrastructure works that occur as part of the western surface works would include:

- Construction of four new lanes (two eastbound and two westbound) to connect the M5 South West Motorway and the King Georges Road interchange with the New M5 main alignment tunnels
- Realignment of the M5 East Motorway surface roads between the King Georges Road interchange and the M5 East Motorway tunnel portals. The M5 East Motorway surface roads would be resurfaced, delineated from the New M5 and provided with new signage
- Construction of two new bypass lanes comprising eastbound and westbound ramps to bypass the New M5 and provide a connection between the King Georges Road interchange and the M5 East Motorway
- Construction of a permanent noise barrier along the northern project boundary. The noise barrier would extend from around the King Georges Road interchange to the M5 East Motorway eastbound tunnel portal
- Construction of a permanent noise barrier along the southern project boundary. The noise barrier would extend from around the King Georges Road interchange to the M5 East Motorway westbound tunnel portal
- Extension of the Kindilan underpass within Beverly Grove Park to accommodate the project
- Realignment of and improvements to the shared pedestrian and cyclist path that runs through Beverly Grove Park, parallel to, and north of, the M5 East Motorway
- Cuttings and embankments for surface road works
- Installation of tolling infrastructure for the New M5 and M5 East Motorways
- Landscaping and rehabilitation works
- Extension of two existing box culverts at Kooemba Road
- New operational drainage infrastructure to connect existing stormwater infrastructure to a concrete channel at Kirrang Street.

The western surface works area would also contain the Kingsgrove motorway operations complex (MOC1), which would include ancillary operational infrastructure including the Kingsgrove ventilation facility, deluge tanks, the main alignment tunnels emergency response system, a maintenance facility and a workshop, offices, storage and car parking.

Main alignment tunnels

The project has been designed to connect to the existing road network at two locations:

- The King Georges Road interchange, the M5 East Motorway and M5 South West Motorway via the western portals
- The St Peters interchange and local surface road network via the eastern portals.

Tunnel stubs would also be included to potentially provide a connection to

- The future Southern extension via stub tunnels at the southern extension caverns near the Kogarah Golf Course
- The future M4-M5 Link via stub tunnels at the St Peters caverns near the St Peters interchange.

Tunnel portals

The New M5 western tunnel portals would be located at Kingsgrove and would connect to the western surface works.

The western tunnel portals would be staggered, with the eastbound portal meeting the surface around 90 metres further west than the westbound tunnel portal. The eastern tunnel portals would connect to the surface at the St Peters interchange, about 70 metres east of Canal Road.

The eastern tunnel portals would connect to the surface at the St Peters interchange and would be about 70 metres east of Canal Road. The eastern tunnel portals would be staggered by about 10 metres.

Dive and cut and cover structures would be constructed at the western and eastern tunnel portals to create entry and exit ramps which would join surface roads with the New M5 main alignment tunnels. On and off-ramps would vary in size and shape in response to local conditions and would require a number of cuttings and embankments.

The main alignment tunnels at the western and eastern tunnel portals would be line marked for two lanes with the provision to be widened in the future to three and five lanes (respectively), subject to additional assessment and approval.

St Peters interchange

The St Peters interchange in its ultimate configuration (ie in the event the entire WestConnex program of works is completed) would connect the New M5, the future M4-M5 Link and the future Sydney Gateway with:

- Euston Road at the intersection of Campbell Road
- Gardeners Road at the intersection with Kent Road via a new bridge over the Alexandra Canal
- Sydney Airport and Port Botany via the future Sydney Gateway.

The St Peters interchange, in its ultimate configuration (ie in the event the entire WestConnex program of works is completed), would be a multi-level interchange and would include seven bridges.

The St Peters interchange would be constructed as part of the project. Construction of the St Peters interchange would include:

- The closure of the Alexandria Landfill site
- Construction of roads and embankments within the St Peters interchange site
- Construction of operational ancillary infrastructure associated with the New M5
- Connection of the New M5 with the local road network at the intersection of Euston Road with Campbell Road, and with Gardeners Road via a new bridge over the Alexandra Canal
- Landscaping and revegetation works within the interchange site.

Construction of the St Peters interchange would allow for two additional future stages to provide connections between the St Peters interchange and the:

- Future M4-M5 Link and the
- Future Sydney Gateway.

The additional possible future stages of works would provide the ultimate connectivity through the interchange between the New M5, the future M4-M5 Link, the future Sydney Gateway and the local road network. These stages would be subject to future environmental assessment and approval.

The construction of all roads within the St Peters interchange site would be delivered as part of this project. The road construction works within the Alexandria Landfill site, would include landforming and construction of embankments as part of the Alexandria Landfill closure plan. All roads that form part of St Peters interchange would be constructed as part of the initial stage with the aim of minimising potential disruptions to the operation of the New M5 and local road connections during construction of the additional future stages of the WestConnex program of works.

Local road upgrades

Local roads around the St Peters interchange and the intersection of Campbell Road and Euston Road would be upgraded to ensure safe and efficient connections with the New M5, and to cater for additional traffic demands. Local road upgrades would include:

- Upgrade and widening of Euston Road, from the upgraded Campbell Road / Euston Road intersection to the intersection with Maddox Street to the north of Sydney Park
- Upgrade, widening and extension of Bedwin Road / Campbell Street / Campbell Road from the railway bridge near Camdenville Park to a new intersection with Bourke Road, Mascot
- Upgrade and widening of Bourke Road / Bourke Street, Mascot between Church Street and the Campbell Road extension
- Widening of Gardeners Road
- Other minor local road changes (such as tie-in works)
- New and upgraded bridges and structures
- Access arrangements for heavy vehicles
- Provision of pedestrian and cycle infrastructure
- Changes to bus infrastructure.

Local road upgrades would include modifications to existing intersections, construction of new intersections, localised tie-in works on connecting streets, cutting and embankment works and works to impacted utilities and drainage.

Motorway operations complexes

The project would require permanent operational ancillary infrastructure including:

- Operational management control systems and incident and emergency response infrastructure
- Tunnel ventilation systems and facilities
- Drainage and water treatment facilities
- Noise attenuation measures
- Utilities
- Roadside furniture and lighting.

Most operational ancillary infrastructure would be established in five main motorway operations complexes:

- The Kingsgrove motorway operations complex (MOC1) – located to the south of the western project portals and the existing M5 East Motorway, on land previously occupied by the Kingsgrove South construction compound (C3)
- The Bexley Road South motorway operations complex (MOC2) – located to the south of the M5 East Motorway western portals, adjacent to Bexley Road, on land previously occupied by the Bexley Road South construction compound (C5)
- The Arncliffe motorway operations complex (MOC3) – located near the south western corner of the Kogarah Golf Course site, on land previously occupied by the Arncliffe construction compound (C7)
- The St Peters motorway operations complex (MOC4) – located near the western corner of the St Peters interchange, adjacent to the Prince Highway / Canal Road intersection, on land previously occupied by the Canal Road construction compound (C8)
- The Burrows Road motorway operations complex (MOC5) – located at the corner of Burrows Road and Campbell Road, St Peters on land previously occupied by the Burrows Road construction compound (C11).

Noise attenuation measures, utilities, roadside furniture and lighting would be provided as required along the project corridor.

Operational ancillary infrastructure that would be located within each motorway operations complex is summarised in **Table 2**. Infrastructure required for the ongoing management of the Alexandria Landfill, would also be operational, including landfill gas, leachate and other environmental control measures.

Further detail of the ventilation facilities, motorway control centre and maintenance facility is provided in the following sections.

Table 2 Summary of motorway operations complexes and operational ancillary infrastructure

Operational ancillary facilities	Motorway operations complex				
	Kingsgrove (MOC1)	Bexley Road South(MOC2)	Arncliffe (MOC3)	St Peters (MOC4)	Burrows Road (MOC5)
Ventilation facility	✓		✓	✓	
Emergency smoke extraction facility		✓	✓		
Deluge water tanks	✓				
Car parking	✓	✓	✓	✓	✓
Substation / power supply	✓	✓	✓	✓	
Emergency response system	✓				
Maintenance facility	✓				
Workshop / offices	✓				
Storage	✓				
Water treatment plant / infrastructure			✓		
Motorway control centre					✓

Ventilation system

The project's ventilation system would include:

- An in-tunnel air quality monitoring system, linked to the motorway control centre at the Burrows Road motorway operations complex (MOC5). This monitoring system would be used to monitor in-tunnel air quality so that a series of proactive and reactive air quality management measures can be implemented as required to ensure that acceptable in-tunnel air quality is maintained
- Jet fans installed in the ceiling of the project tunnels to assist movement of tunnel air caused by the piston effect
- Three ventilation facilities, including axial fans and ventilation outlets, at the Kingsgrove motorway operations complex (MOC1), the Arncliffe motorway operations complex (MOC3) and the St Peters motorway operations complex (MOC4)
- Two emergency smoke extraction facilities, including axial fans and emergency smoke extraction outlets, at the Bexley Road South motorway operations complex (MOC2) and as part of the Arncliffe ventilation facility at the Arncliffe motorway operations complex (MOC3).

Key components of the tunnel ventilation systems are summarised in **Table 3**. Further detail on the ventilation system can be found in Section 5.8 of the EIS.

Table 3 Key components of the project's ventilation system

Ventilation system component	Description
Jet fans	- Mounted in pairs or triples, with each separated by about 90 metres - About 129 jet fans would be installed as part of the project. Of these around 54 would be installed in the eastbound main alignment tunnel and around 75 would be installed in the westbound main alignment tunnel. The final number of jet fans would be determined during detailed design - Jet fans would be operated to maintain acceptable in-tunnel air quality.
Emergency smoke extraction facilities / air injection inlets	- Two emergency smoke extraction outlets would be provided at: • Bexley Road South motorway operations complex (MOC2) • As part of the Arncliffe ventilation facility at the Arncliffe motorway operations complex (MOC3) - Each emergency smoke extraction outlet would include axial fans to allow for the extraction of smoke or the introduction of fresh air from outside the project tunnels - Bexley Road South motorway operations complex (MOC2) would serve a dual function as an air injection inlet for the project. Another air injection inlet would be provided within the Arncliffe motorway operations complex (MOC3)
Ventilation facilities	- Three ventilation facilities would be provided: • Kingsgrove ventilation facility, located in the Kingsgrove motorway operations complex (MOC1) • Arncliffe ventilation facility, located in the Arncliffe motorway operations complex (MOC3) • St Peters ventilation facility, located in the St Peters motorway operations complex (MOC4). - The ventilation facilities include ventilation outlets which have been designed to: • Minimise energy consumption by extracting tunnel air using axial fans and outlets located as close to the tunnel alignment as practical and feasible • Have an exhaust flow rate of around 800-1000 cubic metres per second at the Kingsgrove ventilation facility and 800-1000 cubic metres per second at the St Peters interchange ventilation facility • Discharge at about 30 metres above ground level at the Kingsgrove motorway operations complex, at about 30 metres above ground level at Arncliffe and about 20 metres above ground level at the St Peters ventilation facilities, in line with the Australian Government's Civil Aviation Safety Authority requirements.

Motorway control centre

A WestConnex motorway control centre would be provided within the Burrows Road motorway operations complex (MOC5).

The motorway control centre would be the central building for all communications and control of the project's operational management control systems. The motorway control centre would be staffed 24 hours a day, seven days a week, and would require around 26 full time equivalent staff.

The motorway control centre would include a video wall and operating interfaces for all monitoring and control systems, an incident control facility, training and incident response room, air conditioning, power supply systems and workforce facilities (ie amenities).

Maintenance facilities

The Kingsgrove motorway operations complex (MOC1) would include a maintenance facility to support maintenance of the New M5 during operation.

The maintenance facility would require a workforce of up to about 10 workers and would include a workshop, storage for spare parts and equipment, parking for up to around 15 vehicles, a second storage area for bulky equipment and spare parts and an office building including kitchen facilities and amenities.

Motorway tolling infrastructure

Tolling points would be installed for the New M5 and M5 East Motorways. Each tolling point would have a gantry and associated shelter. Tolling points would be installed at the following locations:

- On the mainline carriageway of the M5 East and New M5 Motorways, east of the King Georges Road interchange
- On the on-and off-ramps of the King Georges Road interchange for the M5 East Motorway
- On the on-and off-ramps of the Kingsgrove Road interchange for the M5 East Motorway
- On the on-and off ramps of Bexley Road interchange for the M5 East Motorway
- At the eastern portal, at the St Peters interchange, for the New M5 Motorway.

2.2 Construction activities

Construction of the project would involve the following activities:

- Establishment of construction compounds
- Construction traffic works
- The use of temporary construction compounds to facilitate construction
- Tunnelling activities, including tunnel excavation, civil finishing works and fit-out
- Other bulk earthworks for construction of cut and cover structures, surface road works and the closure of the Alexandria Landfill
- Closure of the Alexandria Landfill, including bulk earthworks, landfill capping, leachate and groundwater management systems and a gas collection and management system
- Construction of permanent operational infrastructure, including a maintenance facility, ventilation and emergency smoke extraction/ air injection facilities, substations, operational water treatment plan and a New M5 motorway control centre
- Construction of new and upgrades/ modifications to existing bridges
- Construction of new, and modifications to existing drainage and water management infrastructure
- Road pavement works (surface and tunnel)
- Finishing works.

Construction activities required for the project can be grouped into six distinct areas:

- Underground tunnelling and tunnel construction activities
- The western surface works, including:
    - Construction of the M5 East Motorway integration works
    - Construction activities associated with the Kingsgrove North construction compound (C1), the Kingsgrove South construction compound (C2) and the Commercial Road construction compound (C3)
    - Construction of the Kingsgrove motorway operations complex (MOC1)
- The Kingsgrove Road surface works, including the installation of tolling infrastructure on the M5 East Motorway
- The Bexley Road surface works, including:
- Construction activities associated with the Bexley Road North construction compound (C4), the Bexley Road South construction compound (C5) and the Bexley Road East construction compound (C6)
- Construction of the Bexley Road South motorway operations complex (MOC2)

- The Arncliffe surface works, including:
  - Construction activities associated with the Arncliffe construction compound (C7)
  - Construction of the Arncliffe motorway operations complex (MOC3)
- The St Peters interchange and local road upgrade surface works, including:
  - Landfill closure works.
  - Construction of the St Peters interchange
  - Construction activities associated with the Canal Road construction compound (C8), the Campbell Road construction compound (C9), the Landfill Closure construction compound (C10), the Burrows Road construction compound (C11), the Campbell Road bridge construction compound (C12), the Gardeners Road bridge construction compound (C13) and the Sydney Park construction compound (C14)
  - Construction of the St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)
  - Construction of local road upgrade works, and associated works (eg the Camdenville Park basin works)

The majority of the construction is located underground within the main alignment tunnels, within the on and off-ramps or at the St Peters interchange.

Tunnel excavations would be carried out with roadheaders. A roadheader is a machine which comprises a boom-mounted rotating cutter head on track-mounted frames and a loader device (usually on a conveyor).

Rock breaking and controlled blasting would be used in some areas of the tunnel excavation to improve the efficiency of excavation activities and shorten the overall excavation program. Areas that are likely to require controlled blasting would be confirmed during detailed design and refined where necessary in response to geological conditions experienced during construction. It is anticipated that controlled blasting would be suitable for cross passage and bench excavations throughout the project.

Surface works would be required to support tunnelling activities, and to construct the interchanges, tunnel portals, the M5 East Motorway integration works, local road upgrades and motorway operations complexes. Construction compounds would also be required to support construction activities. These are described further in this section.

An overview of the construction activities associated with the project is provided in **Table 4**. An overview of construction compounds is provided in **Table 5** and shown in **Figure 2**. A construction program is provided in **Table 7**. Detailed descriptions of each construction activity can be found in Chapter 6 of the environmental impact statement for the project.

Table 4 Overview of construction works

Component	Typical activities
Construction set-up and preparatory works	
Establishment of construction compounds	- Demolition of existing buildings - Establishment of construction compound fencing and hoardings - Vegetation clearance - Installation of sediment and erosion control measures - Installation of site offices and crib rooms - Construction of hardstands - Construction of access roads, site entry and exit points and security - Set up of spoil sheds and support equipment as required - Set up of construction monitoring equipment - Construction traffic works, including - Relocation of utilities.

Component	Typical activities
Alexandria Landfill closure	
Landfill Closure works	- Construction of access roads, site entry and exit points and enabling works - Foundation preparatory works - Bulk earthworks (St Peters interchange cut to fill) - Bulk earthworks (imported fill and engineered fill) - Cut foundation treatment - Capping installation - Establishment of leachate collection, treatment pumping station - Construction and establishment of groundwater seepage cut-off wall - Landscaping.
Tunnel construction and fit out	
Tunnel construction	- Construction of shafts and / or declines - Installation and operation of roadheaders - Spoil stockpiling and removal - Controlled blasting of the bench and cross passages - Controlled blasting and / or rockbreaking of the main alignment tunnels and cross passages - Installation of shotcrete lining - Installation of waterproof membrane, where required - Installation of final lining and architectural treatments - Construction of the concrete floor - Installation of drainage and utility infrastructure - Final finishes and line marking.
Portal construction	- Construction of the cut and cover structures - Bulk excavation with the cut and cover and the dive structure - Spoil stockpiling and removal - Installation of the drainage and utility infrastructure - Installation of road base, lighting, new jersey barriers - Final asphalting layer installed - Sign installation and construction of the toll gantries - Linemarking, traffic switches to tie in with existing road network landscaping and noise walls.
Mechanical and electrical systems.	- Installation of fire and life safety systems, tunnel ventilation facilities, operational tunnel lighting, signage, power reticulation through the tunnel, communication systems, and control and operational management control systems and infrastructure - Commissioning of mechanical and electrical systems, including emergency procedures.
Surface works – roads	
Local road upgrades	- Removal of existing road pavements, as required - Installation of the drainage and utility infrastructure - Installation of road base, lighting, kerb and guttering, verges, medians, and new jersey barriers - Earthworks and excavation, including Camdenville Park basin works - Spoil stockpiling and removal - Installation of final asphalting layer - Sign installation and street lighting - Line-marking, traffic switches to tie in with existing road network landscaping.
Construction of St Peters interchange	- Bulk excavation and material disposal - Foundation works to pavements including piling - Structural and flexible pavement construction to St Peters interchange - Construction of the St Peters interchange bridges - Construction of the shared path ramps and bridge over Campbell Road - Construction of bridges over Alexandra Canal - Construction of retaining walls and landscaping.

Component	Typical activities
Surface works – operational infrastructure	
Construction of tolling facilities	- Construction of toll gantries - Construction of technical shelters - Installation of communications and power - Commissioning of toll operations.
Construction of operational facilities	- Construction of ventilation system facilities, including emergency smoke extraction facilities - Construction of the motorway control centre and backup facility - Construction of permanent access roads to operational facilities - Construction of drainage and water treatment facilities, including water treatment plant - Construction of motorway operations complexes - Establishment of noise barriers - Installation of roadside furniture and lighting.
Commissioning and demobilisation	
Testing and commissioning	- Testing of plant and equipment - Commissioning of the project.
Finishing work and demobilisation	- Removal of construction facilities - Landscaping - Rehabilitation of affected areas - Post-construction condition surveys - Removal of construction environmental controls - Removal of construction ancillary facility related traffic signage.

Table 5 Summary of temporary construction compounds

Construction compound	Compound purpose		Compound activities							
	Civil and surface works	Tunnelling support	Site offices	Staff amenities	Parking	Laydown area	Spoil management	Workshop and maintenance	Tunnelling launch and support	Construction water treatment plant
Kingsgrove North (C1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kingsgrove South (C2)	✓		✓	✓	✓	✓	✓	✓		
Commercial Road (C3)		✓	✓	✓	✓	✓	✓	✓	✓	✓
Bexley Road North (C4)		✓		✓		✓	✓	✓	✓	
Bexley Road South (C5)		✓		✓	✓	✓	✓	✓	✓	✓
Bexley Road East (C6)		✓	✓	✓	✓	✓				
Arncliffe (C7)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canal Road (C8)		✓	✓	✓	✓	✓	✓	✓	✓	✓
Campbell Road (C9)	✓		✓	✓	✓	✓	✓			
Landfill Closure (C10)	✓		✓	✓	✓	✓	✓			
Burrows Road (C11)	✓		✓		✓	✓	✓			
Campbell Road bridge (C12)	✓			✓	✓	✓				
Gardeners Road bridge (C13)	✓		✓	✓	✓	✓	✓			
Sydney Park (C14)	✓			✓		✓				

Note 1: The Bexley Road East construction compound would only be providing support facilities to the tunnelling compounds (such as car parking and office use)

Table 6 Indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Establishment of construction compounds																
Landfill closure works																
Construction of western surface works																
Tunnel construction																
Construction of St Peters interchange																
Portal construction																
Construction of local road upgrades																
Construction of permanent operational facilities*																
Mechanical and electrical fit-out																
Establishment of tolling facilities																

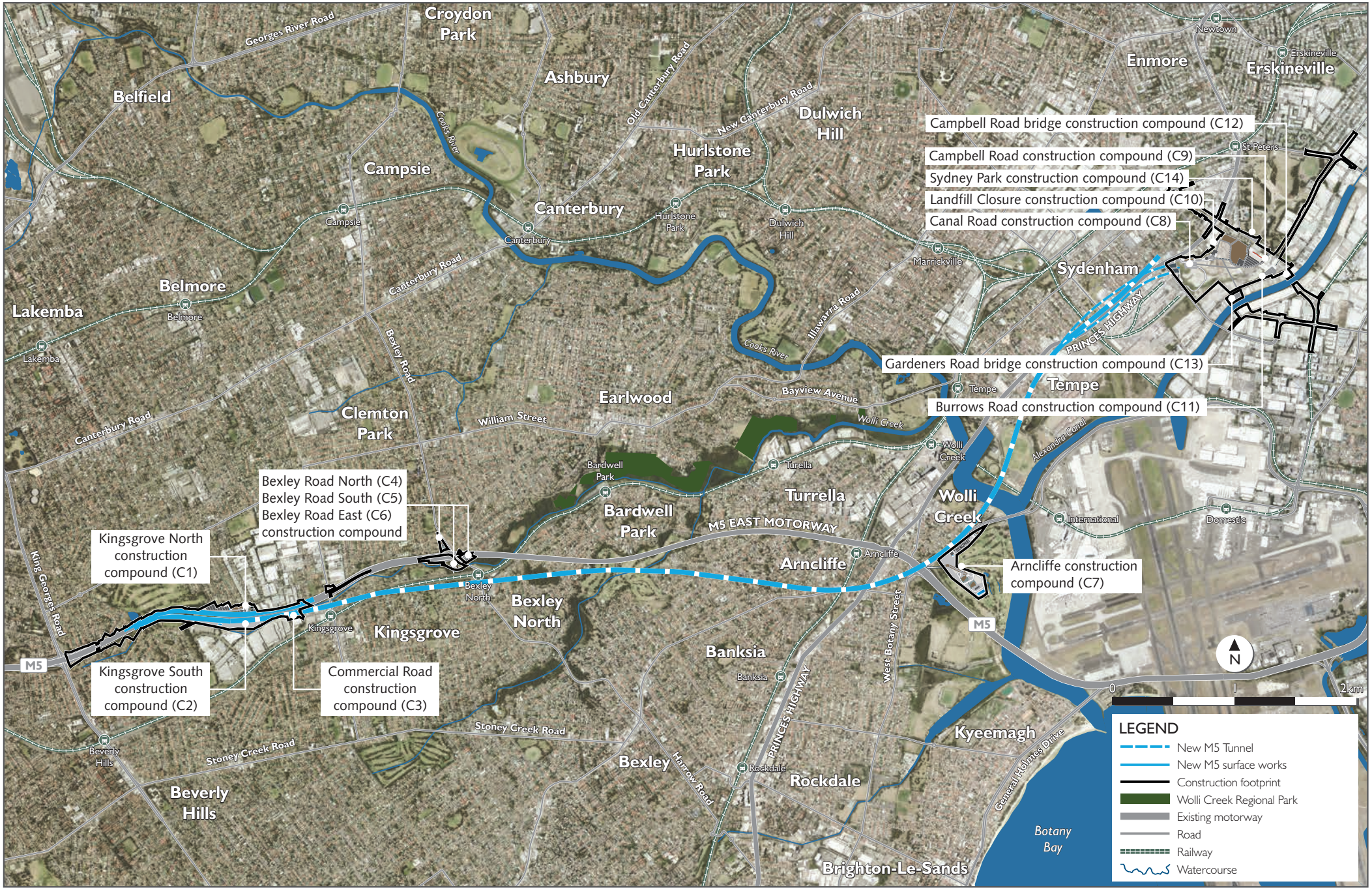


Figure 2 Overview of construction compounds

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2.2.1 Construction hours

Construction activities required for the project would be managed in six broad categories:

- Tunnelling and tunnelling support activities, including spoil handling and haulage, and underground construction and fit-out works. These activities would be carried out up to 24 hours per day and seven days per week
- Out of hours construction activities that cannot be conducted during standard construction hours for safety or operational reasons. These activities would include some M5 East Motorway integration works and local road upgrade works
- Most other construction activities, which would be carried out within standard construction hours
- Blasting and rock breaking, which would be conducted with reduced construction hours and subject to provision of respite periods
- Minor or ancillary activities that would not generate a noise impact above acceptable levels, or are otherwise authorised by an Environment Protection Licence under the *Protection of the Environment Operations Act 1997*
- Activities that are required to be conducted under direction from a relevant authority (such as Police) or are required to prevent an imminent loss of life or environmental damage.

In accordance with the *Interim Construction Noise Guidelines* (DECC, 2009), the majority of surface construction would be carried out between the following standard construction hours:

- 7:00am to 6:00pm Monday to Friday
- 8:00am to 1:00pm Saturdays

There would generally be no aboveground construction works on Sundays or public holidays, with the exception of those activities required to be undertaken outside of standard construction hours.

A summary of construction hours for these categories of construction activities is provided in **Table 7**, with further details provided in Section 6.7 of the EIS.

Table 7 Construction hours

Activity	Construction hours	Comments or exception
Tunnelling, tunnelling support and underground construction activities		
Tunnelling excavation	24 hours per day, seven days a week.	- The main alignment tunnels, tunnel stubs, ventilation extraction tunnels and all underground excavations would be carried out continuously. - Activities that support tunnelling works would occur 24 hours per day, seven days a week.
Spoil handling and haulage	Up to 24 hours per day, seven days per week.	- Spoil haulage would be limited and managed during peak hours and special events - Vehicle movements would be limited and managed during evening and night-time in residential areas or close to identified sensitive receivers - Vehicle movements outside of standard construction hours would occur at the following construction compounds: • Kingsgrove North construction compound (C1) and Kingsgrove South construction compound (C2) (via the underpass): via left-in, left-out access from the M5 East Motorway or via Garema Circuit, Wirega Avenue, Moorefields Road, Kingsgrove Road and King Georges Road[1] • Commercial Road construction compound (C3): via access from Commercial Road, Kingsgrove Road and the M5 East Motorway • Bexley Road North construction compound (C4): via Bexley Road, Canterbury Road and King Georges Road and the M5 East Motorway • Bexley Road South construction compound (C5): via Bexley Road, Kingsgrove Road, Stoney Creek Road, Forest Road and the M5 East Motorway • Bexley Road East construction compound (C6): via Wolli Avenue, Frost Street, Douglas Street, Stoney Creek Road, Bexley Road, Forest Road and the M5 East Motorway [2] • Arncliffe construction compound (C7): via Marsh Street Princes Highway, Wickham Street, West Botany Street and the M5 East Motorway • Canal Road construction compound (C8): via Canal Road and the Princes Highway. - Spoil would be moved during the day, outside of peak periods where practical, feasible and reasonable management strategies would be investigated to minimise the volumes of heavy vehicle movements at night
Underground construction and tunnel fit-out	Up to 24 hours per day, seven days per week.	- Deliveries for underground construction would be subject to the same management measures as spoil haulage.

Activity	Construction hours	Comments or exception
Out of hours activities for safety and operational reasons		
Out of hours activities for safety and operational reasons	At any time, subject to individual requirements.	- Construction activities would only be conducted outside standard construction hours for safety or operational reasons, including design and quality considerations and to avoid traffic interruptions - Specific management measures would be developed for each relevant activity or group of activities to manage potential impacts on sensitive receivers - The construction activities would include • Surface works at western surface works, Arncliffe construction compound and the St Peters interchange sites • Local road upgrade works • Bridge construction • Delivery of precast units & other materials • Services searches • Road maintenance works • Traffic control and switches • Line-marking • Service relocations and adjustments.
Surface construction activities (not specified elsewhere)		
Most surface construction activities	Daytime construction hours: - 7 am to 6 pm on weekdays. - 8 am to 1 pm on Saturdays. - No works on Sundays or public holidays.	- Western surface works - Construction traffic movements - Excavation and spoil removal from construction shafts and declines at the surface - Local road upgrades - Bridge construction - Surface works at the western surface works, Kingsgrove surface works, Bexley surface works, Arncliffe construction compound and the St Peters interchange. Some of these activities would also occur outside standard daytime construction hours as detailed in this table.
Blasting and rock breaking		
Blasting	Between 9:00am and 5:00pm, Mondays to Fridays and 9:00 am to 1:00pm on Saturdays	- Blasting would occur up to six days per week (Monday to Saturday). Blasts would be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the EPA through consultation on the Construction Noise and Vibration Management Plan.
Rock breaking (with potential for impulsive or tonal noise impact at a sensitive receiver)	Between 8:00am and 6:00pm Monday to Friday and 8:00am to 1:00pm Saturdays, with respite periods.	- Respite periods would be scheduled to minimise the frequency and duration of extended rock breaking activities with potential for impulsive or tonal noise emissions.
Minor or ancillary activities		
Minor activities	At any time	- Minor activities would include activities that do not lead to an exceedance of the applicable noise management level at an affected receiver.

Activity	Construction hours	Comments or exception
Activities authorised by an environment protection licence	As specified in the environment protection licence.	- Construction activities would be managed as required by the Environment Protection Licence.
Emergency or directed activities		
Emergency or directed activities	At any time	- Activities would be carried out as directed by a relevant authority - Activities would be carried out if required to prevent an imminent loss of life or environmental damage.

Note 1: Heavy vehicle movements from C1 outside of standard construction hours would only occur via access and egress directly to and from the M5 East Motorway. There would be times when direct access to the M5 East Motorway would be blocked due to construction works within the site and access would then be required via Garema Circuit

Note 2: Only light vehicles would travel via Wolli Avenue, Frost Street, Douglas Street, Stoney Creek Road, Bexley Road and Forest Road

Table 8 Construction work hours at construction compounds

Construction compound	Type of construction activity	Construction work hours
Kingsgrove North (C1)	Tunnelling	24 hours a day, seven days a week
	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Kingsgrove south (C2)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Commercial Road (C3)	Tunnelling	24 hours a day, seven days a week
Bexley Road North (C4)	Tunnelling	24 hours a day, seven days a week
Bexley Road South (C5)	Tunnelling	24 hours a day, seven days a week
Bexley Road East (C6)	Tunnelling	24 hours a day, seven days a week
Arncliffe (C7)	Tunnelling	24 hours a day, seven days a week
Canal Road (C8)	Tunnelling	24 hours a day, seven days a week
	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Campbell Road (C9)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Landfill Closure (C10)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Burrows Road (C11)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Campbell Road bridge (C12)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Gardeners Road bridge (C13)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays
Sydney Park (C14)	Civil construction[1]	7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays

Note 1: Some works outside of standard construction hours may be required

Works outside of standard construction hours

While the majority of the surface construction work would be constructed during standard construction hours, some construction activities would need to be undertaken at night for reasons including:

- Public and construction worker safety,
- Design and quality considerations,
- To minimise the length of construction and the duration of any associated amenity impacts on the local community
- To avoid significant traffic interruptions along the M5 East Motorway and the surrounding arterial and local road network.

Night works would generally commence after the evening traffic peak period when traffic volumes have reduced.

Works undertaken outside of standard hours are expected to be subject to relevant conditions of an environment protection licence issued under the *Protection of the Environment Operations Act 1997*. Environment protection licence conditions would potentially include measures relating to community notifications and procedures for recording and addressing complaints. Additional information regarding licences and approvals that may be required for construction of the project is provided in Chapter 2 of the EIS.

Some out-of-hours surface works would be required to minimise impacts on the efficiency of the road network, and to minimise safety impacts to the construction workforce and members of the public. Subject to permits and approvals from the Traffic Management Centre and/ or Roads and Maritime (where relevant), surface works to be undertaken outside of standard construction hours would generally include:

- Traffic switching of the M5 East carriageways, providing access tie-ins between the completed permanent works associated with the project and the M5 East Motorway, including asphalting, line marking and the installation of barriers
- Traffic switching along local roads to newly constructed pavement, including asphalting, line marking and the installation of traffic barriers and signals
- Demolition of infrastructure along the M5 East Motorway to accommodate construction of the project including concrete barriers, noise barriers and vegetation
- Installation of signage and tolling infrastructure in close proximity to traffic
- Relocation of services at locations close to traffic, and service cutovers
- Delivery of oversize items to construction ancillary facilities
- Crane lifts which require lane closures, or where the works are restricted by the operation of Sydney Airport and / or road travel restrictions.

Tunnelling works (including fitout works but excluding blasting) would be undertaken 24 hours a day, seven days a week to minimise the overall length of construction and the duration of any associated amenity impacts on the local community.

All activities that support tunnelling would also be required to be undertaken 24 hours a day, seven days a week. Handling of spoil at the surface would be required as stockpiling large amounts of spoil within the main alignment tunnels would not be feasible. Spoil is therefore required to be transported from the main alignment tunnels to stockpiles on the surface (within sheds), prior to haulage from the site.

Stockpiling spoil on the surface with no spoil haulage outside of standard construction hours would result in additional heavy vehicle movements during standard construction hours, which would have an adverse impact on the road network, particularly during the AM and PM peak periods. Spoil haulage outside of standard construction hours would be from:

- Kingsgrove North (C1) construction compound
- Commercial Road (C3) construction compound
- Bexley Road North (C4) construction compound
- Bexley Road South (C5) construction compound
- Arncliffe (C7) construction compound
- Canal Road (C8) construction compound.

Concrete and shotcrete deliveries for shotcrete to these construction compounds would also be required 24 hours a day, seven days a week, as the excavated tunnel would be progressively supported behind the roadheader by applying shotcrete to the excavated tunnel walls. The alternative would be a concrete batch plant at each construction compound that provides tunnelling support, which would have adverse noise impacts at sensitive receivers.

Spoil haulage from these construction compounds would be limited to the regional and State road network.

Some additional activities at construction compounds across the project would be required to support out-of-hours works. Where possible, these activities would be kept to a minimum with only those required to support the works to be used.

Night time and weekend work would also be required for some construction activities associated with construction of the bridges over Alexandra Canal, works associated with the upgrades to local roads and for the western surface works, including:

- Road tie-in works, temporary diversions and traffic switches – Completing these construction works at night when traffic flows are low would minimise disruptions to traffic and minimise any potential safety conflict between construction personnel and traffic.
- Pavement works and linemarking – These works would require lane closures and, in some cases, total closure of roads in order to safely carry out the works. This means that pavement works cannot be undertaken during periods of high traffic volumes and would need to occur during evening and night-time periods. Carrying out these works at night would minimise disruptions to traffic flows along the M5 Motorway corridor and local roads, as the works would involve multiple traffic switched within a short period of time before traffic is allowed to use the completed sections of pavement.

Other works that are proposed to be undertaken outside of standard daytime construction hours without any further approval (assuming this is consistent with the instrument of approval) would include any of the following circumstances:

- Works which are expected to comply with the relevant Noise Management Level at the nearest sensitive receiver
- The delivery of materials as required by the Police, Roads and Maritime Services and/ or other authorities for safety reasons
- Where it is required to avoid the loss of lives, property and / or to prevent environmental harm in an emergency
- Where agreement is reached with affected receivers.

Where work is required outside of standard construction hours, measures would be implemented to minimise noise and other types of disturbance to residents and sensitive receivers.

The construction noise assessment for the project (AECOM, 2015) was undertaken in accordance with the *Interim Construction Noise Guideline* and feasible and reasonable noise management measures have been identified as part of this assessment.

Noise management measures would be further refined during the detailed design phase of the project in consultation with the NSW Environment Protection Authority. Further, the Environment Protection Licence for the project would provide for appropriate management of construction noise impacts.

Construction noise attenuation

Temporary noise barriers would be installed along the boundaries of construction compounds that face sensitive receivers and acoustic sheds would be constructed around tunnel shafts and associated stockpile sites where out of hours spoil removal would occur.

A summary of temporary construction noise attenuation structures to be implemented as part of the project is provided in **Table 9**. Further detail regarding construction noise mitigation and management is provided in **Chapter 7.0**.

Table 9 Temporary construction noise attenuation structures

Construction compound	Temporary noise attenuation
Kingsgrove North (C1)	- Two and a half metre high noise barrier along northern and eastern boundaries of the facility - Acoustic shed surrounding shaft and associated spoil stockpile.
Kingsgrove South (C2)	- No temporary noise attenuation proposed.
Commercial Road (C3)	- Non-acoustic shed surrounding tunnel shaft and associated spoil stockpile.
Bexley Road North (C4)	- Four and a half metre high noise barrier along entire boundary of facility - Acoustic shed surrounding tunnel shaft and associated spoil stockpile.
Bexley Road South (C5)	- Four and a half metre high noise barrier along almost all boundaries of the facility - Acoustic shed surrounding tunnel shaft and associated spoil stockpile.
Bexley Road East (C6)	- Four and a half metre high noise barrier along northern and eastern boundaries of the facility.
Arncliffe (C7)	- Three metre high noise barrier along the northern, western and southern boundaries of the facility - Non-acoustic sheds surrounding tunnel shaft and associated spoil stockpile.
Canal Road (C8)	- Two and a half metre high noise barrier along the Canal Road and Princes Highway boundaries of the facility.
Campbell Road (C9)	- Two and a half metre high noise barrier along Campbell Road adjacent to the hardstand and laydown area - Two and a half metre high noise barrier along part of the western boundary of the facility.
Landfill Closure (C10)	- No temporary noise attenuation proposed.
Burrows Road (C11)	- No temporary noise attenuation proposed.
Campbell Road bridge (C12)	- No temporary noise attenuation proposed.
Gardeners Road bridge (C13)	- No temporary noise attenuation proposed
Sydney Park (C14)	- No temporary noise attenuation proposed

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3.0 Existing ambient noise environment

3.1 Overview

The project would traverse the suburbs of Beverly Hills, Kingsgrove, Bexley North, Earlwood, Bardwell Park, Bardwell Valley, Arncliffe, Wolli Creek, Tempe, Sydenham, St Peters, Alexandria and Mascot.

The study areas includes a mixture of urban and suburban noise and vibration sensitive receivers (such as, residential properties, educational establishments, hospitals and recreational areas), commercial and industrial properties, as well as major motorways, roads and railway lines.

For the purposes of this assessment, the study area has been divided as follows:

- M5 East Motorway study area, which encompasses areas adjacent to the existing M5 East Motorway and M5 South West Motorway from west of Kingsgrove Road interchange to Bexley Road interchange.
- Arncliffe study area, which encompasses Kogarah Golf Course and surrounds.
- St Peters and surrounds study area, which encompasses St Peters and surrounding areas that would be impacted by the St Peters interchange and local road upgrades.

3.2 Existing noise environment

3.2.1 M5 East Motorway

The noise environment is dominated by the existing M5 East Motorway and M5 South West Motorway throughout this area. Sub-arterial roads that contribute to the noise environment include Bexley Road, Kingsgrove Road and King Georges Road. To the south of the M5 East Motorway, sensitive receivers are also affected by the Bankstown railway line. Other contributing noise sources include local roads and industry.

Noise at receivers located further away from the motorway and sub-arteria roads would be exposed to local traffic noise and general suburban noise sources.

3.2.2 Arncliffe

The noise environment is dominated by heavy traffic flows on Marsh Street, West Botany Street, Princes Highway and the M5 East Motorway. The M5 East Motorway portals are also located within close proximity to sensitive receivers. The airport is located to the east of this area. Aircraft noise is a key source of noise for receivers within this area.

3.2.3 St Peters and surrounds

The noise environment throughout St Peters and surrounds is considered to be urban. Significant noise sources include major roads such as the Princes Highway, Canal Road and Gardeners Road. Receivers located on local roads such as Campbell Road and Campbell Street would also be subject to noise from those roads. Other key noise sources include industry, aircraft movements and railway movements on the Bankstown railway line to the north of the project.

3.3 Noise sensitive receivers

Noise sensitive receivers were identified by aerial photography and characterisation of all buildings within the project area was undertaken through a ground-truthing exercise. This exercise, in conjunction with cadastral information, was used to determine the classification of residential, commercial, industrial, educational, recreational and other uses (sheds and the like) buildings. Properties that would be acquired and demolished as part of the project were not considered.

Noise catchment areas (NCA) have been determined for the construction and fixed facility operational noise and vibration assessment and all 30 NCAs are identified in Appendix C.

3.3.1 M5 East Motorway

The majority of the receivers surrounding the existing M5 East Motorway are suburban residential, with two large groupings of industrial estates to the north and south of the M5 East Motorway, to the west of Kingsgrove Road. Commercial receivers increase in number towards Bexley town centre.

Residential receivers comprise single and double storey individual houses. Several parks are scattered throughout the area. Canterbury Golf Course is situated adjacent to the M5 East Motorway, at the western end of this area. Noise sensitive receivers other than residential receivers are listed in **Table 10**.

Table 10 Other sensitive receivers within close proximity to the M5 East Motorway

Receiver	Receiver type
Junee Reserve	Active recreation area
Clemton Park	Active recreation area
Kingsgrove North High School	School
Kingsgrove World of Learning	Childcare centre
Forrester Reserve	Active recreation area
Kingsbury Reserve	Active recreation area
McCallums Hill Public School	School
Anglican Church Sydney Diocese	Place of worship
Kingsrove Christian Brethren Assembly	Place of worship
Beverly Grove Park	Active recreation area
Barfa Bear Child Care Centre	Childcare centre
Coolabah Street Tennis Courts	Active recreation area
Moorefields Masonic Village	Aged care
Canterbury Municipal Golf Course	Active recreation area
John K Stewart Park	Active recreation area
Regina Coeli Catholic Primary School	School/ place of worship
Catholic Church	Place of worship
Footsteps Early Learning Centre	Childcare centre
Footstep Early Learning Centre OOSH School Care	Childcare centre
Baptist Union of New South Wales	Place of worship
Eloura Street Reserve	Active recreation area
Hurstville City Council Family Day Care Scheme	Community centre
Beverly Hills Park	Active recreation area
Tallawalla Street Reserve	Active recreation area
Kingsgrove Early Childhood Health Centre	Community centre
Anglican Church Sydney Diocese	Place of worship
Kingsgrove Uniting Church	Place of worship
St Ursula	School
Kookaburra Reserve	Active recreation area
Catholic Church	Place of worship
Kids Oasis Childcare Centre	Childcare centre
Douglas Street Park	Active recreation area
Braeside Crescent Park	Active recreation area
Nairn Gardens	Active recreation area
Whitbread Park	Active recreation area
Illoura Park	Active recreation area
Clemton Park Public School	School

Receiver	Receiver type
Beaumont Reserve	Active recreation area
Clemton Park St Marks Anglican Church	Place of worship
Kingsgrove Bexley North Community Centre	Community centre
Kingsgrove Avenue Reserve	Active recreation area
Presbyterian Church of Eastern Australia	Place of worship
Gilchrist Park North	Active recreation area
Shaw Street Reserve	Active recreation area

3.3.2 Arncliffe

Sensitive receivers within this area are predominantly residential in nature and lie along West Botany Street and the north western side of Marsh Street. These receivers generally comprise single and double storey individual houses. Kogarah Golf Course is located to the east of the Marsh Street and M5 East Motorway interchange.

3.3.3 St Peters and surrounds

Surrounding land uses include the residential neighbourhoods of St Peters, Tempe, Erskineville, Sydenham and Newtown as well as general residential and industrial areas of Alexandria to the east. Residential receivers within these neighbourhoods are generally single and double storey terraces, with multi-storey receivers along Sydney Park Road, adjacent to Sydney Park. Adjacent land uses to the Alexandra Canal are predominantly industrial and commercial. Receivers along the Princes Highway are a mix of residential and commercial. Noise sensitive receivers other than residential receivers are listed in **Table 11**.

Table 11 Other sensitive receivers in St Peters and surrounds

Receiver	Receiver type
Sydney Park Childcare Centre	Community centre
Camdenville Public School Preschool	School
Tom Foster Community Centre	Community centre
Camdenville Park	Active recreation area
Simpson Park	Active recreation area
Rowswell Playground	Active recreation area
St Peters Public School	School
St Peters Church of England	Place of worship
Sydney Park	Active recreation area
St Peters Sydenham Library	Community centre
Francis Playground	Active recreation area
Sydenham Green	Active recreation area
Marrickville SES	Commercial
Nancy Bird-Walton Reserve	Active recreation area
Active Kids Mascot	Childcare centre
Building Blocks Early Child School Learning	Childcare centre

3.4 Ambient noise monitoring

Ambient noise monitoring was undertaken at 27 locations throughout the study areas generally within four noise monitoring periods:

- The first set of monitoring was completed in May/June 2014 (as part of the King Georges Road Interchange Upgrade project)
- The second set was completed in December 2014
- The third set was completed in March 2015
- The fourth set was completed in June 2015.

In addition, logging was repeated at two locations during July/August/September 2015 due to earlier equipment failures. Concurrent traffic counts were undertaken during the third monitoring period. This data has been used to validate the operational noise model. Results from the monitoring periods have been used to establish construction noise management levels and operational noise criteria for fixed facilities.

The locations for the noise logging were chosen through examination of aerial photography and site inspections. Attended noise measurements were also undertaken to determine the nature of the local noise environment and confirm road traffic was the controlling noise source (for the validation of the operational noise model).

The background noise logging locations and the traffic counter locations are illustrated in Appendix C. The noise logging results are provided graphically in Appendix D. The background noise logging locations were selected as generally representative of the noise sensitive receivers likely to be most affected by the works and consequently facilitate a worst case noise assessment.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1 per cent, 10 per cent and 90 per cent of the sample period respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level. The L_{Aeq} is the energy averaged noise level over a defined period.

The results of the noise monitoring have been processed in accordance with the procedures contained in the *NSW Road Noise Policy* and the *NSW Industrial Noise Policy*. Weather data recorded during the noise monitoring survey periods was obtained from the Bureau of Meteorology weather station, located at Canterbury. The Sydney Airport wind data was appreciably affected by wind, which was not considered to be characteristic of the St Peters area. On this basis, Canterbury weather data was used when considering the logger data. Periods which were affected by noise from extraneous wind and rain were omitted from the results.

Details of each noise logging location (NL) and the noise monitoring equipment are provided in **Table 12** below. As the study area includes receivers up to 600 metres from the alignment of surface roads, noise loggers have been located at varying distances from the existing road alignments. This allows the accuracy of the model to be confirmed over the extent of the project.

Table 12 Noise logging locations

No.	Address	Purpose				Measurement period
		Construction	Operational road noise	Maximum noise	Fixed facility	
NL01	400 Sydney Park Road, Alexandria	✓	✓		✓	05 – 19 December 2014
NL02	108 Campbell Street, St Peters	✓	✓	✓	✓	31 August – 10 September 2015
NL03	18 Campbell Street, St Peters	✓	✓			05 – 21 December 2014
NL04	506-518 Gardeners Road, Alexandria	✓	✓		✓	05 – 19 December 2014
NL05	187-211 Princes Highway, St	✓	✓		✓	05 – 19 December 2014

No.	Address	Purpose				Measurement period
		Construction	Operational road noise	Maximum noise	Fixed facility	
	Peters					
NL06	7 Bellevue Street, Tempe	✓			✓	05 – 19 December 2014
NL07	227-231 Bexley Road, Kingsgrove	✓	✓		✓	16 – 31 March 2015
NL08	10 Beaumont Street, Kingsgrove	✓	✓			16 – 31 March 2015
NL09	11 Flat Rock Road, Kingsgrove	✓	✓		✓	16 – 31 March 2015
NL10	59 Aringya Street, Kingsgrove	✓				16 – 31 March 2015
NL11	South of M5, Kingsgrove		✓			16 – 31 March 2015
NL12	82 Rosebank Avenue, Kingsgrove	✓	✓		✓	16 – 31 March 2015
NL13	North of M5, Kingsgrove		✓			16 – 31 March 2015
NL14	97 Tallawalla Street, Beverly Hills	✓	✓	✓	✓	16 – 31 March 2015
NL15	South of M5, Kingsgrove		✓			16 – 31 March 2015
NL16	36 Allambee Crescent, Beverly Hills	✓				22 May – 2 June 2014
NL17	25 Kirrang Street, Beverly Hills	✓				22 May – 2 June 2014
NL18	19 Elouera Street, Beverly Hills	✓				22 May – 2 June 2014
NL19	24A Railway Road, Sydenham	✓				28 July – 6 August 2015
NL20	20 Marsh Street, Arncliffe	✓			✓	12 – 20 June 2015
NL21	6 Eve Street, Arncliffe	✓			✓	17 – 25 June 2015
NL22	25 Firmstone Garden, Arncliffe	✓			✓	12 – 24 June 2015
NL23	92 Wolli Avenue, Earlwood	✓			✓	12 – 20 June 2015
NL24	61 Shaw Street, Bexley North	✓			✓	12 - 25 June 2015
NL25[1]	311 King Georges Road, Beverly Hills	✓				22 May – 2 June 2014
NL26	15 Rosetta Lane, Beverly Hills	✓				22 May – 2 June 2014
NL27	6 Grove Avenue, Narwee	✓				22 May – 2 June 2014

Note 1: Monitoring location near to building facade.

3.5 Unattended background noise monitoring results

The background noise monitoring results are provided in **Table 13**. These noise levels were used to define the appropriate construction noise management levels, consistent with the *Interim Construction Noise Guideline*. They were also used to define the applicable noise criteria for fixed ancillary facilities such as the ventilation and tunnel support facilities, in accordance with the *Industrial Noise Policy*.

The assessment background levels (ABL) were established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each assessment period of interest. The background noise level or rating background levels (RBL) representing the day, evening and night-time assessment periods were based on the median of individual ABLs determined over the entire monitoring duration.

Table 11 also presents the ambient L_{Aeq} levels at each monitoring location. The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

The noise levels presented in **Table 13** indicate that the noise environment at the measurement locations are typical of suburban/urban noise environments located alongside major transport corridors, where day time and evening background levels are high due to heavy and continuous traffic flows. The night time background levels tend to decrease as a result of reduced traffic flows.

Table 13 Ambient noise measurements

Noise logging location	Rating background level, dB(A)			Ambient L_{Aeq} noise level, dB(A)		
	Day (7am to 6pm) $L_{A90,15\ minute}$	Evening (6pm to 10pm) $L_{A90,15\ minute}$	Night (10pm to 7am) $L_{A90,15\ minute}$	Day (7am to 6pm) $L_{Aeq,15\ hour}$	Evening (6pm to 10pm) $L_{Aeq,4\ hour}$	Night (10pm to 7am) $L_{Aeq,9\ hour}$
NL01	57	51	40	67	63	62
NL02	50	46	39	68	65	63
NL03	54	45	40	68	65	61
NL04	58	52	42	69	67	63
NL05	52	50	44	64	65	57
NL06	58	56	49	71	69	64
NL07	54	54	40	63	63	59
NL08	49	46	41	55	52	51
NL09	48	49[1]	43	54	54	51
NL10	Equipment failure[3]	Equipment failure[3]	Equipment failure[3]	Equipment failure[3]	Equipment failure[3]	Equipment failure[3]
NL11	68	67	49	73	72	70
NL12	45	47[1]	43	54	53	50
NL13	67	67	51	72	72	69
NL14	50	50	42	56	54	52
NL15	67	64	49	73	71	69
NL16	47	46	40	57	53	52
NL17	49	49	42	54	53	51
NL18	50	49	40	55	54	51
NL19	60	54	43	74	73	69

Noise logging location	Rating background level, dB(A)			Ambient L_{Aeq} noise level, dB(A)		
	Day (7am to 6pm) $L_{A90,15\ minute}$	Evening (6pm to 10pm) $L_{A90,15\ minute}$	Night (10pm to 7am) $L_{A90,15\ minute}$	Day (7am to 6pm) $L_{Aeq,15\ hour}$	Evening (6pm to 10pm) $L_{Aeq,4\ hour}$	Night (10pm to 7am) $L_{Aeq,9\ hour}$
NL20	55	56[1]	45	61	62	59
NL21	49	48	42	54	55	50
NL22	47	48[1]	39	55	54	50
NL23	51	51	43	57	56	53
NL24	47	49[1]	41	63	62	58
NL25[2]	60	58	46	72	70	69
NL26	53	52	44	58	56	54
NL27	52	51	39	58	56	53

Note 1: Application notes to the Industrial Noise Policy indicate that the community generally expects a greater control of noise during the evening and night as compared to the day time. Therefore the evening is set to no more than that for the daytime and the night-time to no more than the evening.

Note 2: Monitoring location near to building facade. Measured L_{Aeq} noise levels considered to represent façade reflected noise levels which are up to 2.5 dB(A) higher than the equivalent free-field condition.

Note 3: Noise levels at location NL09 were deemed to be representative of those at location NL10, and were therefore adopted.

3.6 Operational road noise monitoring results

Provided in Table 14 are the average noise levels measured at each noise monitoring location for locations affected by road traffic noise. Only monitoring locations NL01 through to NL15 are included as these locations are appropriate to use for validation of the road traffic noise model.

The measured noise levels have been compared to the predicted noise levels from the validation noise model. Good correlation between these measured noise levels and the predicted noise levels in the validation model provides confidence that the future road traffic noise levels can be accurately predicted for the operational noise assessment. Further information on the noise modelling and validation of noise model outputs is provided in Section 6.1.3.

Table 14 Operational road noise monitoring results

Noise logging location	Ambient road traffic noise level dB(A)	
	Day (7 am – 10 pm) ($L_{Aeq, (15\ hour)}$)	Night (10 pm – 7am) ($L_{Aeq, (9\ hour)}$)
NL01	66	62
NL02	68	64
NL03	67	62
NL04	68	64
NL05	64	58
NL06	70	64
NL07	63	59
NL08	54	50
NL09	54	51
NL10	Equipment failure[1]	Equipment failure[1]
NL11	73	70
NL12	54	51
NL13	72	69
NL14	56	52
NL15	72	69

Note 1: Sufficient road traffic noise levels were provided by measurements at other locations to adequately validate the road traffic noise model.

4.0 Assessment criteria

4.1 Construction noise

The risk of adverse impact of construction noise on a community is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

The *Interim Construction Noise Guideline* is a NSW Government document that sets out ways to deal with the impacts of construction noise on residences and other sensitive land uses. It presents assessment approaches tailored to the scale of the construction project and identifies practices to minimise noise impacts. The *Interim Construction Noise Guideline* recommends that a quantitative assessment is carried out for all *major construction proposals that are typically subject to the environmental impact assessment processes*. A quantitative assessment, based on the likely construction scenarios, has been carried out for the project.

Predicted noise levels at nearby noise sensitive receivers (eg residences, schools, hospitals, places of worship, passive and active recreation areas) are compared to the levels provided in the *Interim Construction Noise Guideline*. Where an exceedance of the management levels is predicted the *Interim Construction Noise Guideline* advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details.

Where construction noise levels reach 75 dB(A) residential receivers can be considered as 'highly noise affected' and the proponent should, in consultation with the community, consider restricting hours to provide respite periods.

The *Interim Construction Noise Guideline* defines what is considered to be feasible and reasonable as follows:

- Feasible - A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.
- Reasonable - Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.

Work that is proposed outside of standard working hours, as defined in the *Interim Construction Noise Guideline*, generally requires strong justification.

Noise management levels for residential receivers are derived using the information in **Table 15**.

Table 15 Construction noise management levels - Residential receivers from the Interim Construction Noise Guideline

Time of day	Management level $L_{Aeq\ (15\ min)}$[1]	How to apply
Recommended standard hours: - Monday to Friday 7am to 6pm - Saturday 8am to 1pm - No work on Sundays or public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. • If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see Section 7.2.2 of the *Interim Construction Noise Guideline*.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.

4.1.1 Noise catchment areas

The study area has been divided into 30 distinct noise catchment areas (NCA). The noise environment at each of the sensitive receivers within a noise catchment area is considered to have a similar noise environment to the unattended monitoring location within that NCA. As such each of these sensitive receivers is assigned the same background noise level and noise management level. The location of each NCA is provided graphically in Appendix C. Table 16 provides details of the construction noise management levels and the number of residential receivers identified within each NCA.

Table 16 Noise catchment areas and construction noise management levels

NCA	Representative logger	Number of residential receivers	Period	Rating background level[1] (RBL)	Construction noise management levels (NML) [2,3]
NCA01	NL01	203	Day	57	67
			Evening	51	56
			Night	40	45
NCA02	NL02	335	Day	50	60
			Evening	46	51
			Night	39	44
NCA03	NL02	174	Day	50	60
			Evening	46	51
			Night	39	44
NCA04	NL01	26	Day	57	67
			Evening	51	56
			Night	40	45
NCA05	NL01	0	Day	57	67
			Evening	51	56
			Night	40	45
NCA06	NL02	516	Day	50	60
			Evening	46	51
			Night	39	44
NCA07	NL05	59	Day	52	62
			Evening	50	55
			Night	44	49
NCA08	NL03	24	Day	54	64
			Evening	45	50
			Night	40	45
NCA09	NL19	269	Day	60	70
			Evening	54	59
			Night	43	48

NCA	Representative logger	Number of residential receivers	Period	Rating background level[1] (RBL)	Construction noise management levels (NML) [2,3]
NCA10	NL06	42	Day	58	68
			Evening	56	61
			Night	49	54
NCA11	NL04	32	Day	58	68
			Evening	52	57
			Night	42	47
NCA12	NL20	108	Day	55	65
			Evening	55[1]	60
			Night	45	50
NCA13	NL21	65	Day	49	59
			Evening	48	53
			Night	42	47
NCA14	NL22	85	Day	47	57
			Evening	47[1]	52
			Night	39	44
NCA15	NL23	413	Day	51	61
			Evening	51	56
			Night	43	48
NCA16	NL07	104	Day	54	64
			Evening	54	59
			Night	40	45
NCA17	NL09	410	Day	48	58
			Evening	48[1]	53
			Night	43	48
NCA18	NL09	305	Day	48	58
			Evening	48[1]	53
			Night	43	48
NCA19	NL12	492	Day	45	55
			Evening	45[1]	50
			Night	43	48

NCA	Representative logger	Number of residential receivers	Period	Rating background level[1] (RBL)	Construction noise management levels (NML) [2,3]
NCA20	NL18	553	Day	50	60
			Evening	49	54
			Night	40	45
NCA21	NL16	420	Day	47	57
			Evening	46	51
			Night	40	45
NCA22	NL16	218	Day	47	57
			Evening	46	51
			Night	40	45
NCA23	NL17	728	Day	49	59
			Evening	49	54
			Night	42	47
NCA24	NL14	259	Day	50	60
			Evening	50	55
			Night	42	47
NCA25	NL24	237	Day	47	57
			Evening	47[1]	52
			Night	41	46
NCA26	NL24	675	Day	47	57
			Evening	47[1]	52
			Night	41	46
NCA27	NL25	88	Day	60	70
			Evening	58	63
			Night	46	51
NCA28	NL27	708	Day	52	62
			Evening	51	56
			Night	39	44

NCA	Representative logger	Number of residential receivers	Period	Rating background level[1] (RBL)	Construction noise management levels (NML) [2,3]
NCA29	NL24	449	Day	47	57
			Evening	47[1]	52
			Night	41	46
NCA30	NL26	222	Day	53	63
			Evening	52	57
			Night	44	49

Note 1: Application notes to the Industrial Noise Policy indicate that the community generally expects a greater control of noise during the evening and night as compared to the day time. Therefore the rating background level for the evening is set to no more than that for the daytime and the night-time to no more than the evening.

Note 2: Day noise management levels = RBL + 10 dB(A)

Note 3: Evening / night noise management levels = RBL + 5 dB(A)

4.1.2 Non-residential criteria

Noise management levels recommended by the *Interim Construction Noise Guideline* for other sensitive land uses, such as schools, hospitals or places of worship are shown in **Table 17**. Noise management levels for commercial and industrial premises are provided in **Table 18**.

Table 17 Construction noise management levels – Sensitive land uses other than residential

Land use	Construction noise management level, $L_{Aeq\ (15\ min)}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended “maximum” internal levels in AS2107 for specific uses.

Table 18 Construction noise management levels – Commercial and industrial land uses

Land use	Construction noise management level, $L_{aeq\ (15min)}$ (applies when properties are in use)
Industrial premises	External noise level 75 dB(A)
Offices, retail outlets	External noise level 70 dB(A)

4.1.3 Sleep disturbance (construction)

The *Interim Construction Noise Guideline* requires a sleep disturbance assessment to be undertaken where construction works are planned to extend over more than two consecutive nights. The *Interim Construction Noise Guideline* makes reference to the EPA's *NSW Environment Criteria for Road Traffic Noise* (ECRTN), now superseded by the NSW *Road Noise Road Noise Policy*, for assessment of sleep disturbance. The *Road Noise Policy* references the recommendations in the Environmental Criteria for Road Traffic Noise as providing the most appropriate assessment guidance.

The guidance provided in the *NSW Road Noise Policy* for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10pm to 7am), the $L_{A1(1\ min)}$ noise level outside a bedroom window should not exceed the $L_{A90\ (15\ minute)}$ background noise level by more than 15 dB(A). The EPA considers it appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The *Road Noise Policy* contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, 'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'. Therefore, given that an open window provides around 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Table 19 presents the sleep disturbance screening and sleep disturbance awakening reaction criteria.

Table 19 Construction noise sleep disturbance criteria

NCA	Rating background level (RBL), dB(A)	Sleep disturbance screening $L_{A1(1min)}$ criteria, dB(A)	Sleep disturbance awakening reaction $L_{A1(1min)}$ criteria, dB(A)
NCA01	40	55	65
NCA02	39	54	65
NCA03	39	54	65
NCA04	40	55	65
NCA05	44	59	65
NCA06	39	54	65
NCA07	44	59	65
NCA08	41	56	65
NCA09	43	58	65
NCA10	49	64	65
NCA11	42	57	65
NCA12	45	60	65
NCA13	42	57	65
NCA14	39	54	65
NCA15	43	58	65
NCA16	40	55	65
NCA17	43	58	65
NCA18	43	58	65
NCA19	43	58	65

NCA	Rating background level (RBL), dB(A)	Sleep disturbance screening $L_{A1(1min)}$ criteria, dB(A)	Sleep disturbance awakening reaction $L_{A1(1min)}$ criteria, dB(A)
NCA20	40	55	65
NCA21	40	55	65
NCA22	40	55	65
NCA23	42	57	65
NCA24	42	57	65
NCA25	41	56	65
NCA26	41	56	65
NCA27	46	61	65
NCA28	39	54	65
NCA29	41	56	65
NCA30	44	59	65

4.1.4 Construction road traffic noise

Noise from construction traffic on public roads is not covered by the *Interim Construction Noise Guideline*. However the *Interim Construction Noise Guidelines* does refer to the ECRTN, now superseded by the NSW *Road Noise Policy*, for the assessment of noise arising from construction traffic on public roads.

In assessing feasible and reasonable mitigation measures under the *NSW Road Noise Policy*, an increase of up to 2 dB(A) represents a minor impact that is considered barely perceptible to the average person.

Therefore, the noise goal applied to traffic movements on public roads generated during the construction phase of the project is an increase in existing road traffic noise levels of no more than 2 dB(A).

4.2 Construction vibration criteria

The relevant standards / guidelines for the assessment of construction vibration are summarised in **Table 20**.

Table 20 Standards / guidelines used for assessing construction vibration

Item	Standard / guideline
Structural damage	German Standard DIN 4150 – Part 3 – *Structural Vibration in Buildings – Effects on Structures* (DIN 4150)
Human comfort (tactile vibration) [1]	*Assessing Vibration: A Technical Guideline* (AVATG) [1]
Human comfort (regenerated noise)	*Interim Construction Noise Guideline* (ICNG)

Note 1: This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities for example, a tunnel boring machine.
- Impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with a duration of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities.
- Intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

4.2.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration.

DIN 4150 provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in **Table 21**. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 21 DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	Vibration velocity in mm/s			
		At foundation at a frequency of:			Vibration at the horizontal plane of the highest floor
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8

4.2.2 Human comfort

Humans are sensitive to vibration such that they can detect vibration levels well below those required to cause any risk of damage to a building or its contents. Criteria to avoid annoyance are therefore more stringent than those to prevent structural damage.

4.2.2.1 Intermittent vibration

The assessment of intermittent vibration outlined in *Assessing Vibration: A Technical Guideline* (DEC, 2006) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the day time and night time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in **Table 22**. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 22 Preferred and maximum vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Day time		Night time	
	Preferred	Max	Preferred	Max
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	0.8	1.6	0.8	1.6

4.2.2.2 Continuous and impulsive vibration

Acceptable levels of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. *Assessing Vibration: A Technical Guideline* provides the preferred values for continuous and impulsive vibration. These are presented in **Table 23**.

There is low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values in **Table 23**. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short duration. Vibration levels above those indicated in **Table 23** may be dealt with through negotiation with the regulator of the affected community. The following axes are defined in relation to the human body:

- x – back to chest.
- y – right side to left side.
- z – foot to head.

Table 23 Preferred and maximum peak particle velocity for continuous and impulsive vibration acceleration (mm/s)

Location	Assessment period	Preferred	Maximum	
		z axis x and y axes	z axis	x and y axes
Continuous vibration				
Critical areas[1]	When in use	0.14	0.28	
Residences[2]	Day Night	0.28 0.20	0.56 0.40	
Offices, schools, educational institutions and places of worship	When in use	0.56	1.1	
Workshops	When in use	1.1	2.2	
Impulsive vibration				
Critical areas	When in use	0.14	0.28	
Residences[2]	Day Night	8.6 2.8	17.0 5.6	
Offices, schools, educational institutions and places of worship	When in use	18.0	36.0	
Workshops	When in use	18.0	36.0	

Note 1: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria.

Note 2: Criteria for residences are lower than schools as people expect to be able to relax/sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.

4.3 Ground-borne noise

Vibration generated by activities such as tunnelling may enter buildings via the ground. This causes the floors, walls and ceilings to vibrate and to radiate noise. This noise is commonly referred to as structure or ground-borne noise or regenerated noise. Ground-borne noise is typically low frequency and if audible, is perceived as a 'rumble'.

In general, ground-borne noise level values are relevant only where they are higher than the airborne noise. Regenerated noise levels would typically be masked by airborne noise associated with construction activities associated with traffic and/or surface road construction activities.

The amount of ground-borne noise experienced by receivers located close to tunnelling activities is influenced by a number of factors including:

- The tunnel construction technique.
- The depth of tunnelling work.
- Geological ground conditions.
- The timing and duration of construction activities.

The ground-borne noise management levels as outlined in the *Interim Construction Noise Guideline* were adopted for this project and are presented in **Table 24**. The ground-borne noise management levels are applicable during the evening and night-time periods only, as the objective is to protect the amenity and sleep of people when they are at home.

Table 24 Recommended ground–borne noise goals for construction activities

Time	Ground-borne noise goals
Evening (6pm to 10pm)	40 dB(A) $L_{Aeq\ (15\ min)}$
Night-time (10pm to 7am)	35 dB(A) $L_{Aeq\ (15\ min)}$

4.4 Blasting

Construction blasting can result in two adverse environmental effects – airblast and ground vibration. The airblast and ground vibration produced may cause human discomfort and may have the potential to cause damage to structures, architectural elements and services.

Two guidelines have been considered as part of this assessment:

- Australian and New Zealand Environment Council (ANZEC) Guidelines – *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.
- Australian Standard 2187.2-2006 Explosives - Storage and Use Part 2: Use of Explosives – Appendix J.

The ANZEC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* has been adopted by the Environment Protection Authority as comfort criteria to minimise annoyance and discomfort to persons at noise sensitive sites (eg residences, hospitals, schools etc.) as a result of blasting. The guidelines are not intended to provide structural damage criteria. However they do provide a conservative approach to the assessment of potential impacts on structures as minimising human annoyance and comfort would inherently minimise structural damage.

AS 2187.2 recommends ground vibration limits which are consistent with the ANZEC guidelines but provides more detail with respect to criteria for human comfort and structural damage. This includes consideration of different types of structures such as more sensitive masonry and plasterboard buildings and less sensitive reinforced concrete buildings. AS 2187.2-2006 notes that damage (even of a cosmetic nature) has not been found to occur at airblast levels below 133 dB (linear peak).

4.4.1 Blasting criteria

In relation to airblast overpressure, the following criteria have been adopted:

- Less than or equal to 115 dB (linear) peak for 95 per cent of total blasts over 12 months.
- Less than 120 dB (linear) peak for any blasts.

For the purposes of this project, the AS 2187.2 ground vibration criteria have been considered and are summarised in **Table 25**. AS 2187.2 recommends that if the prescribed limits in **Table 25** cannot be achieved, an agreement may be reached with the landowner permitting higher levels.

The blast vibration criteria identified in the ANZEC are considered conservative and were originally developed to protect communities exposed to long-term blasting operations such as mining sites. For projects such as this, with a shorter duration of blasting of two months or less, a higher vibration criterion may be reasonable.

For this project, the location of the blast moves along the alignment such that any one receiver is affected for short period of time. Table J4.5(A) in Appendix H of AS2187.2 presents vibration limits designed to safeguard human comfort in relation to blasting that have been used by some authorities, as it defines clearer vibration limits which are dependent on the specific duration of the project. Based on the limitations of the ANZEC guideline and further guidance in AS2187.2, a human comfort vibration limit of 10 millimetres per second (peak particle velocity) for blasting operations lasing less than 12 months has been adopted for this project.

Table 25 Blasting ground vibration criteria summary

Category	Human comfort	Structural damage[1]
Sensitive structures (eg residential, theatres, schools etc.)	5 mm/s for 95% blasts per year 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply[2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Occupied non-sensitive structures of reinforced concrete or steel construction (eg factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply*
Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (eg factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Unoccupied non-sensitive structures of reinforced concrete or steel construction (eg factories and commercial premises)	N/A	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply*
Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction	N/A	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Services structures, such as pipelines, powerlines and cables	N/A	Limit to be determined by structural design methodology. Special consideration may be required for high pressure gas pipelines.

Note 1: The values above are less stringent than those in DIN4150 (Table 21). This is because DIN4150 considers resonance in buildings from continuous vibration. Due to the short duration of blasting events the propensity for resonance within buildings is minimal, giving rise to higher criteria.

Note 2: The blast vibration criteria identified in the ANZEC are considered conservative and were originally developed to protect communities exposed to long-term blasting operations such as mining sites. For projects such as this, with a shorter duration of blasting of 2 months or less, a higher vibration criterion may be reasonable. For this project, the location of the blast moves along the alignment such that any one receiver is affected for short period of time. Table J4.5(A) in Appendix H of AS2187 presents vibration limits designed to safeguard human comfort in relation to blasting that have been used by some authorities, as it defines clearer vibration limits which are dependent on the specific duration of the project. Based on the limitations of the ANZEC guideline and further guidance in AS2187, a human comfort vibration limit of 10 mm/s (peak particle velocity) for blasting operations lasing less than 12 months has been adopted for this project.

The measurement of vibration should be taken at any point on 'noise sensitive sites' which is at least the longest dimension of the foundation of a building or structure away from such buildings or structure.

These requirements do not cover high rise buildings, buildings with long span floors, specialist structures such as reservoirs, dams and hospitals, or buildings housing scientific equipment sensitive to vibration. These require special considerations, which may necessitate taking additional measurements on the structure itself. Particular attention should be given to the response of suspended floors.

4.4.2 Recommended hours and frequency of blasting activities

The ANZEC guidelines recommend that:

- Blasting should generally only be permitted during the hours of 9 am – 5 pm Monday to Saturday. Blasting should not take place on Sundays or public holidays
- Blasting should generally take place no more than once per day.

The recommended restrictions on times and frequency of blasting do not apply to those premises where the effects of the blasting are not perceived at noise sensitive sites. In addition it should be noted that the recommendation of blasting taking place no more than once per day is taken to mean no one sensitive receiver should not be affected by blasting more than once per day.

However, it is noted that for this project, blasting would occur 9am – 5pm Monday to Friday and 9am to 1pm Saturday. No blasting would occur on Sundays or public holidays.

4.5 Operational assessment criteria

4.5.1 Operational road traffic noise criteria

Noise criteria are assigned to sensitive receivers using the Roads and Maritime's *Noise Criteria Guideline*. The *Noise Criteria Guideline* provides guidance on how to apply the *NSW Road Noise Policy*.

The *NSW Road Noise Policy* requires the consideration of two scenarios, the 'No Build' option (without the project) and the' Build' option (with the project). The No Build option represents the scenario if the project was not to proceed. The Build option represents the scenario if the project was to proceed. Each of these scenarios must be considered at two points in time, the year of opening and the design year, typically ten years after opening. For this project, the year 2021 has been assessed as the year of opening, and 2031 for the design year.

The project assessment area extends to where noise levels are dominated by other roads that are not being assessed as part of this project as defined in the *Noise Criteria Guideline*. This is up to a maximum distance of 600 metres from the project works for urban areas. Residential receivers may be assigned new, redeveloped, transition zone or relative increase criteria depending on how the project would influence noise levels. For each façade of the residential receiver the most stringent applicable criteria will be used in the assessment.

Criteria are based on the road development type which is affecting the residential receiver. In some instances residential receivers may be exposed to noise from both new and redeveloped roads. Where this occurs, the proportion of noise from each road is used to establish transition zone criteria. Transitions zones are not applicable to this project.

A further check is made to prevent large increases in noise level using the relative increase criteria.

In terms of operational road noise, this project mainly impacts two distinct areas, the area surrounding Kingsgrove (also known as the western surface works) and St Peters. The future alignment of the project at Kingsgrove would fall within the existing road reserve, hence the sensitive receivers are subject to the redeveloped road noise criteria.

The future alignment at St Peters would significantly change the traffic flows on the project roads, changing the functional class of the roads. Campbell Street and Campbell Road both connect Princes Highway to local roads, resulting in both roads currently being considered as collector roads. In the future, the project would result in these roads becoming sub-arterial roads. As a result of this change in functional road class, sensitive receivers adjacent to these roads are subject to the new road noise criteria. Other receivers throughout the project area are also subject to existing noise from major arterial roads, hence the eligibility of these receivers is considered in their highly urban context, in accordance with the *Noise Criteria Guideline*. The project study area is presented in Appendix F.

Table 26 Road traffic noise assessment criteria for residential land use

Road category	Type of project/land use	Assessment criteria dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Freeway/ arterial/sub-arterial	Existing residences affected by noise from new freeways/arterial/sub-arterial road corridors	$L_{Aeq, (15\ hour)}$ 55 (external)	$L_{Aeq, (9\ hour)}$ 50 (external)
	Existing residences affected by noise from redevelopment of existing freeways/arterial/sub-arterial roads Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments Existing residences affected by noise from existing freeway/arterial/sub-arterial roads where no redevelopment is taking place	$L_{Aeq, (15\ hour)}$ 60 (external)	$L_{Aeq, (9\ hour)}$ 55 (external)
	Existing residences affected by both new roads and the redevelopment of existing freeway/arterial/sub-arterial roads in a Transition Zone[1]	Between $L_{Aeq, (15\ hour)}$ 55-60 (external)	Between $L_{Aeq, (9\ hour)}$ 50-55 (external)
	Existing residences affected by increases in traffic noise of 12dB(A) or more from new freeway/arterial/sub-arterial roads[3]	Between $L_{Aeq, (15\ hour)}$ 42-55 (external)	Between $L_{Aeq, (15\ hour)}$ 42-50 (external)

Note 1: The criteria assigned to a façade depend on the proportion of noise coming from the existing road. Please see Roads and Maritime's' Noise Criteria Guideline for further information.

Note 3: The criteria at each façade are determined from the existing traffic noise level plus 12 dB(A).

The criteria for other sensitive receivers are presented in **Table 27**.

Table 27 Road traffic noise assessment criteria for non-residential land use

Existing sensitive land use	Assessment criteria		Additional considerations
	Day (7am – 10pm)	Night (10pm – 7am)	
1. School classrooms	$L_{Aeq, (1\ hour)}$ 40 (internal)	-	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000)
2. Hospital wards	$L_{Aeq, (1\ hour)}$ 35 (internal)	$L_{Aeq, (1\ hour)}$ 35 (internal)	

Existing sensitive land use	Assessment criteria Day (7am – 10pm)	Night (10pm – 7am)	Additional considerations
3. Places of worship	$L_{Aeq, (1\ hour)}$ 40 (internal)	$L_{Aeq, (1\ hour)}$ 40 (internal)	The criteria are internal, ie the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see row 5 Open space (passive use) of this table) may be applied.
4. Open space (active use)	$L_{Aeq, (15\ hour)}$ 60	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, eg playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, eg school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
5. Open space (passive use)	$L_{Aeq, (15\ hour)}$ 55	-	
8. Child care facilities	Sleeping rooms $L_{Aeq, (1\ hour)}$ 35 Indoor play areas $L_{Aeq, (1\ hour)}$ 40 (internal) Outdoor play areas $L_{Aeq, (1\ hour)}$ 55 (external)		Multi-purpose spaces, eg shared indoor play/sleeping rooms should meet the lower of the respective criteria. Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.
9. Aged care facilities	-	-	Residential land use noise assessment criteria should be applied to these facilities.

For other sensitive receivers such as schools, places of worship and childcare facilities, the *Noise Criteria Guideline* criteria are based on internal noise levels. A minimum outside-to-inside attenuation of 10 dB(A), on the basis of open windows for natural ventilation, has been assumed to allow for an external noise assessment at the other sensitive receivers. However, as details are not currently available to allow the building-specific façade noise reduction to be identified it is recommended that this should be investigated further at detailed design.

The noise model predicts noise levels for $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ periods for day and night-time respectively. It has been found that for most sensitive receivers with one hour noise criteria, the $L_{Aeq(15hour)}$ noise level is consistent with the $L_{Aeq(1hour)}$ noise level due to the hours of usage. This is discussed further in **Section 6.1.9**.

4.5.2 Guidance for the evaluation of feasible and reasonable noise mitigation measures

Where the *Noise Criteria Guideline* criteria are exceeded, the Roads and Maritime's *Noise Mitigation Guideline* provides further discussion of situations where provision of additional controls, such as noise barriers, architectural treatments and quieter pavements, would be considered 'feasible and reasonable'. It should be acknowledged that these considerations apply only if it can be demonstrated that all 'feasible and reasonable' traffic management and other road design opportunities for reduction traffic noise have been exhausted.

The *Noise Mitigation Guideline* provides guidance on managing and controlling road traffic generated noise and describes the principles to be applied when reviewing noise mitigation. The *Noise Mitigation Guideline* recognises that the criteria recommended by the *Noise Criteria Guideline* are not always practicable and that is it not always feasible and/or reasonable to expect that they should be achieved.

The *Noise Mitigation Guideline* notes that the most effective way of minimising noise from vehicles and traffic is to control vehicle noise at the source. Where source measures are not practical, or do not provide sufficient noise reduction, additional methods are required to reduce levels to within acceptable margins. Such additional methods may include the use of noise barriers and/or consideration for architectural treatment of residences.

The *Noise Mitigation Guideline* provides three triggers where a receiver may qualify for consideration of noise mitigation (beyond the adoption of road design and traffic management measures). These are:

- The predicted 'Build' noise level exceeds the *Noise Criteria Guideline* controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the' Build' minus the 'No Build') is greater than 2.0 dB(A); or
- The predicted 'Build' noise level is 5 dB(A) or more above the criteria (exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project; or
- The noise level contribution from the road project is acute (daytime $L_{Aeq(15hour)}$ 65 dB(A) or higher, or night time $L_{Aeq(9hour)}$ 60 dB(A) or higher) then it qualifies for consideration of noise mitigation even if noise levels are dominated by another road.

In this assessment, the total noise at all receivers considered is controlled by the project. Therefore it is only necessary to consider the first two triggers.

The eligibility of receivers for consideration of additional noise mitigation is determined before the benefit of additional noise mitigation (quieter pavement and noise barriers) is included. The requirement for the project is to provide feasible and reasonable additional mitigation for these eligible receivers to meet the *Noise Criteria Guideline* controlling criterion. If the *Noise Criteria Guideline* criterion cannot be satisfied with quieter pavement and noise barriers, then the receiver is eligible for consideration of at-property treatment.

4.5.3 Maximum noise levels

Maximum noise levels generated by road traffic noise have the potential to cause disturbance to sleep. Although noise goals are not provided in the *NSW Road Noise Policy*, the *NSW Road Noise Policy* includes a review of internal sleep arousal research. The *NSW Road Noise Policy* concludes that there appears to be insufficient evidence to set new indicators for potential sleep disturbance due to road traffic noise. Nevertheless, Roads and Maritime recognises the potential impacts and requires an assessment of maximum noise levels be made where impacts may occur during the night.

Guidance for assessing maximum noise levels are provided in Practice Note iii of the *Environmental Noise Management Manual*. The maximum noise assessment should be used as a tool to help prioritise and rank mitigation strategies, but should not be used as a decisive criterion in itself and should not be used to aid in designing the degree of mitigation required.

The assessment considers the following:

- Calculation of maximum noise levels
- The extent to which the maximum noise levels for individual vehicle pass-bys exceed the L_{Aeq} noise level for each hour of the night (ie L_{Amax} noise levels greater than 65 dB(A) where $L_{Amax} - L_{Aeq(1hour)} \geq 15$ dB(A))
- The number of times the maximum noise levels for individual vehicle pass-bys exceed the L_{Aeq} noise level for each hour of the night.

4.5.4 Operational fixed facilities noise criteria

The *Industrial Noise Policy* sets out guidelines for the assessment and control of industrial noise. The *Industrial Noise Policy* applies to all noise emissions from the permanent operational ancillary facilities (or 'fixed' facilities) for the project.

The assessment procedure for industrial noise sources has two components:

- Controlling intrusive noise impacts in the short term for residences
- Maintaining noise level amenity for particular land uses including residences.

4.5.4.1 Intrusive noise impacts

The *Industrial Noise Policy* states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noise sources are generally considered to be acceptable if the equivalent continuous (energy-averaged) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is termed the intrusiveness criterion.

The RBL is the background noise level to be used for assessment purposes and is determined by the methods given in the *Industrial Noise Policy*. Adjustments are to be applied to the level of noise received at the assessment point where the noise source contains "annoying characteristics" (as described in the *Industrial Noise Policy*) such as tonality or impulsiveness.

The NCAs potentially affected by the operation of the motorway operations complexes, ventilation facilities and tunnel support facilities, and the RBLs for the relevant NCA, are presented in **Table 28**.

Table 28 Logged RBL noise levels

Facility	Location	Rating background level, dB(A)		
		Day[1]	Evening[2]	Night[3]
Kingsgrove motorway operations complex (MOC1) and western portals	NCA18	48	49	43
	NCA19	45	45	43
	NCA24	50	50	42
	NCA25	47	47	41
Bexley Road South motorway operations complex (MOC2)	NCA15	51	51	43
	NCA16	54	54	40
	NCA17	48	48	43
	NCA26	47	47	41
Arncliffe motorway operations complex (MOC3)	NCA12	55	55	45
	NCA13	49	48	42
	NCA14	47	47	39

Facility	Location	Rating background level, dB(A)		
		Day[1]	Evening[2]	Night[3]
St Peters motorway operations complex (MOC4) and eastern portals	NCA06	50	46	39
	NCA07	52	50	44
	NCA10	58	56	49
Burrows Road motorway operations complex (MOC5)	NCA04	57	51	40
	NCA05	57	51	40
	NCA11	58	52	42

Note 1: Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.

Note 2: Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays.

Note 3: Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

4.5.4.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in the *Industrial Noise Policy*. That is, the ambient noise level should not exceed the level appropriate for the particular locality and land use. This is termed the amenity criterion.

The recommended *Industrial Noise Policy* amenity criteria for residential receivers in urban and suburban areas, and for other non-residential receivers, are listed in **Table 29**.

Table 29 Recommended L_{Aeq} noise levels

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level , dB(A)	
			Acceptable	Recommended maximum
Residence	Suburban	Day[1]	55	60
		Evening[2]	45	50
		Night[3]	40	45
	Urban	Day[1]	60	65
		Evening[2]	50	55
		Night[3]	45	50
School classroom — internal	All	Noisiest 1-hour period	35	40
Hospital ward — internal — external	 All All	 Noisiest 1-hour period Noisiest 1-hour period	 35 50	 40 55
Place of worship — internal	All	When in use	40	45
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50	55

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level , dB(A)	
			Acceptable	Recommended maximum
Active recreation area (eg school playground, golf course)	All	When in use	55	60
Commercial	All	When in use	65	70
Industrial	All	When in use	70	75

Note 1: Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.

Note 2: Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays.

Note 3: Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

In accordance with the *Industrial Noise Policy* where the existing noise level from industrial noise sources is close to the acceptable noise level, the noise level from any new sources must be controlled to preserve the amenity of an area. In addition where the level of traffic noise is high enough to make noise from an industrial source effectively inaudible, the acceptable noise level becomes the $L_{Aeq, period(traffic)}$ minus 10 dB(A).

4.5.5 Resultant environmental noise criteria

A summary of the intrusive and amenity criteria for the fixed operational noise facilities is given in **Table 30**. These criteria must be applied at the most affected boundary or 30 metres from the residential building. The more stringent background noise levels have been used to determine the criteria, resulting in a conservative assessment.

Table 30 Summary of environmental noise criteria

Facility	Location	$L_{Aeq(15\ min)}$ Intrusiveness criterion, dB(A)	L_{Aeq} Amenity criterion, dB(A)	Project specific noise criteria dB(A)
Daytime				
Kingsgrove motorway operations complex (MOC1)	NCA18	53	55	53
	NCA19	50	55	50
	NCA24	55	55	55
	NCA25	52	55	52
Bexley Road South motorway operations complex (MOC2)	NCA15	56	55	55
	NCA16	59	55	55
	NCA17	53	55	53
	NCA26	52	55	52
Arncliffe motorway operations complex (MOC3)	NCA12	60	60	60
	NCA13	54	60	54
	NCA14	52	60	52
St Peters motorway operations complex (MOC4)	NCA06	55	60	55
	NCA07	57	60	57
	NCA10	63	58[1]	58
Burrows Road motorway operations complex (MOC5)	NCA04	62	60	60
	NCA05	62	60	60
	NCA11	63	59[1]	59
Evening				
Kingsgrove (MOC1)	NCA18	54	45	45
	NCA19	50	45	45
	NCA24	55	45	45
	NCA25	52	45	45

Facility	Location	$L_{Aeq(15\ min)}$ Intrusiveness criterion, dB(A)	L_{Aeq} Amenity criterion, dB(A)	Project specific noise criteria dB(A)
Bexley Road South (MOC2)	NCA15	56	45	45
	NCA16	59	45	45
	NCA17	53	45	45
	NCA26	52	45	45
Arncliffe (MOC3)	NCA12	60	50	50
	NCA13	53	50	50
	NCA14	52	50	50
St Peters (MOC4)	NCA06	51	45[1]	45
	NCA07	55	53[1]	53
	NCA10	61	57[1]	57
Burrows Road (MOC5)	NCA04	56	51[1]	51
	NCA05	56	51[1]	51
	NCA11	57	55[1]	55
Night				
Kingsgrove (MOC1)	NCA18	48	38[1]	38
	NCA19	48	40	40
	NCA24	47	40	40
	NCA25	46	40	40
Bexley Road South (MOC2)	NCA15	48	40	40
	NCA16	45	40	40
	NCA17	48	40	40
	NCA26	46	40	40
Arncliffe (MOC3)	NCA12	50	45	45
	NCA13	47	45	45
	NCA14	44	45	44
St Peters (MOC4)	NCA06	44	51[1]	44
	NCA07	49	45[1]	45
	NCA10	54	52[1]	52
Burrows Road (MOC5)	NCA04	45	50[1]	45
	NCA05	45	50[1]	45
	NCA11	47	51[1]	47

Note 1: Based on site observations and logging results amenity criterion has been adjusted in accordance with the Industrial Noise Policy due to existing industrial noise contributions.

4.5.5.1 Tonality and Industrial Noise Policy modifying factors

As per the *Industrial Noise Policy*, penalties to the overall predicted noise levels at receiver locations apply if it is found that they possess annoying characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low frequency content. In accordance with the SEARs, consideration was given to the application of penalties to account for annoying characteristics in the noise modelling. The assessment was completed in accordance with Chapter 4 of the *Industrial Noise Policy*. Further discussion is provided in **Section 6.2**.

4.5.5.2 Sleep disturbance (fixed facility operational noise)

Application notes to the *Industrial Noise Policy* were updated in June 2013 and present discussion on sleep disturbance and its objective assessment. To minimise the risk of sleep disturbance as a result of industrial type operations during the night-time period, the *Industrial Noise Policy* application notes reference the *Road Noise Policy*.

The guidance provided in the *NSW Road Noise Policy* for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10pm to 7am), the $L_{A1(1\ minute)}$ noise level outside a bedroom window should not exceed the $L_{A90\ (15\ minute)}$ background noise level by more than 15 dB(A). The EPA considers it appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The *NSW Road Noise Policy* contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, *'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'*. Therefore, given that an open window provides around 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

A summary of the sleep disturbance screening and awakening reaction criteria for the fixed operational noise facilities is given in **Table 31**.

Table 31 Summary of sleep disturbance noise criteria

Facility	Location	Sleep disturbance screening $L_{A1(1\ min)}$ criteria, dB(A)	Sleep disturbance awakening reaction $L_{A1(1\ min)}$ criteria, dB(A)
Kingsgrove (MOC1)	NCA18	58	65
	NCA19	58	65
	NCA24	57	65
	NCA25	56	65
Bexley Road South (MOC2)	NCA15	58	65
	NCA16	55	65
	NCA17	58	65
	NCA26	56	65
Arncliffe (MOC3)	NCA12	60	65
	NCA13	57	65
	NCA14	54	65
St Peters (MOC4)	NCA06	54	65
	NCA07	59	65
	NCA10	64	65
Burrows Road (MOC5)	NCA04	55	65
	NCA05	55	65
	NCA11	57	65

5.0 Construction noise and vibration assessment

Construction activities required for the project can be grouped into six distinct areas:

- Underground tunnelling and tunnel construction activities
- The western surface works, including:
    - Construction of the M5 East Motorway integration works
    - Construction activities associated with the Kingsgrove construction compound (C1, C2)
    - Construction activities associated with the Commercial Road construction compound (C3)
    - Construction of the Kingsgrove motorway operations complex (MOC1)
- The Kingsgrove Road surface works associated with the erection of tolling infrastructure at Kingsgrove Road
- The Bexley Road compound and infrastructure works, including:
    - Construction activities associated with the Bexley Road North construction compound (C4), Bexley Road South construction compound (C5) and Bexley Road East construction compound (C6)
    - Construction of the Bexley Road South motorway operations complex (MOC2)
- The Arncliffe surface works, including:
    - Construction activities associated with the Arncliffe construction compound (C7)
    - Construction of the Arncliffe motorway operations complex (MOC3)
- The St Peters interchange and local road upgrade surface works, including:
    - Construction of the St Peters interchange
    - Construction activities associated with Canal Road construction compound (C8), Campbell Road construction compound (C9), the Landfill Closure construction compound (C10), the Burrows Road construction compound (C11), the Campbell Road bridge construction compound (C12), Gardeners Road bridge construction compound (C13) and the Sydney Park construction compound (C14)
    - Construction of the St Peters motorway operations complex (MOC4) and the Burrows Road motorway operations complex (MOC5)
    - Construction of local road upgrade works and bridgeworks.

An overview of the construction footprint and construction compounds is provided in Appendix B.

Details of construction activities and construction hours is provided in Section 2.2 of this technical working paper. Further detail can be found in Chapter 6 of the EIS.

Assessed construction activities and whether the works would be undertaken during the daytime, evening and night-time periods are presented in **Table 32** and **Table 33**. The noisiest activities have been considered as part of this assessment.

The construction noise and vibration assessment has been separated into surface and tunnelling works. They are further categorised into the following:

- Surface works
    - Site establishment
    - Construction compound and car park generation operations
    - Construction of portals (cut and cover tunnel)
    - M5 East Motorway road widening and alignment
    - Construction of St Peters interchange
    - Construction of ventilation facilities
    - Local road works including construction of Campbell Road and Gardeners Road bridges
    - General utility installation and relocation
    - Camdenville Park basin works.

- Tunnelling works
    - Site establishment
    - Construction compound and car park generation operations
    - Tunnelling support establishment
    - Tunnelling support site work.

Table 32 Assessed construction work stages – Construction compounds

Locality	Stage	Activity	Construction compounds [1]													
			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Surface works	Site establishment	Power generator[2]	DEN	DEN	DEN	-	-	-	-	DEN	-	DEN	-	-	-	-
		Instalment of environmental controls	D	D	D	-	-	-	-	D	-	D	-	-	-	-
		Demolition of existing structures	D	D	D	-	-	-	-	D	-	D	-	-	-	-
		Crushing and screening	D	D	D	-	-	-	-	D	-	D	-	-	-	-
		Vegetation clearing	D	D	D	-	-	-	-	D	-	D	-	-	-	-
		Establishment of construction facilities	D	D	D	-	-	-	-	D	-	D	-	-	-	-
		Road and intersection modifications and installation of traffic controls	D	D	D	-	-	-	-	D	-		-	-	-	-
	Construction compound and car park generation operations	General worksite and car parking	DEN	DEN	DEN	-	-	-	-	DEN	-	DEN	-	-	-	-
		Workshop; Deliveries; Maintenance Storage[3]	DEN	DEN	DEN	-	-	-	-	DEN	-	DEN	-	-	-	-
	Construction of portals (cut and cover tunnel)	Piling; excavation of decline	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Earthworks	DE	DE	-	-	-	-	-	DE	-	-	-	-	-	-
		Road tie-in works	DE	DE	-	-	-	-	-	DE	-	-	-	-	-	-
	M5 East Motorway road widening and realignment	Earthworks	DE	DE	-	-	-	-	-	-	-	-	-	-	-	-
		Road tie-in works	DE	DE	-	-	-	-	-	-	-	-	-	-	-	-
	Construction of St Peters interchange	Piling; ground improvement	-	-	-	-	-	-	-	-	D	D	-	-	D	-
		Earthworks	-	-	-	-	-	-	-	-	DE	DE	-	-	DE	-
		Road tie-in works	-	-	-	-	-	-	-	-	DEN	DEN	-	-	DEN	-
	Construction of ventilation facilities	General worksite and car parking	-	DE	-	-	DE	-	DE	DE	-	-	-	-	-	-
		Workshop and deliveries	-	D	-	-	D	-	D	D	-	-	-	-	-	-

Locality	Stage	Activity	Construction compounds [1]													
			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
		Construction of ventilation facilities	-	D	-	-	D	-	D	D	-	-	-	-	-	-
	Local road works including construction of the Campbell Road bridge	Demolition of existing structures	-	-	-	-	-	-	-	-	D	-	D	D	D	D
		Earthworks	-	-	-	-	-	-	-	-	D	-	D	D	D	D
		Road tie-in works	-	-	-	-	-	-	-	-	DEN	-	DEN	DEN	DEN	-
		Kerbing and drainage	-	-	-	-	-	-	-	-	DEN	-	DEN	DEN	DEN	-
		Pedestrian and cyclist bridges at Campbell Road	-	-	-	-	-	-	-	-	DEN	-	-	-	-	DEN
		Campbell Road bridge	-	-	-	-	-	-	-	-	-	-	-	DE	DE	-
	General utility installation and relocation	Service installation and relocation	DEN	DEN	DEN	-	-	-	-	DEN	DEN	DEN	DEN	DEN	DEN	DEN
Tunnelling works	Site establishment	Power generator	D	D	D	-	-	-	D	D	-	-	-	-	-	-
		Instalment of environmental controls	D	D	D	D	D	D	D	D	-	-	-	-	-	-
		Demolition of existing structures	D	D	D				D	D	-	-	-	-	-	-
		Vegetation clearing	D	D	-	D	D	D	D	-	-	-	-	-	-	-
		Establishment of construction facilities	D	D	D	D	D	D	D	D	-	-	-	-	-	-
		Road and intersection modifications and installation of traffic controls	D	D	D	D	D	D	D	D	-	-	-	-	-	-
	Construction compound and car park generation operations	General worksite and car parking	DEN	DEN	DEN	-	-	DEN	DEN	DEN	-	DEN	-	-	-	-
		Maintenance storage; Workshop deliveries[3]	DEN	DEN	DEN	-	-	DEN	DEN	DEN	-	DEN	-	-	-	-
	Tunnelling support establishment	Piling; excavation of decline	DEN	DEN	DEN	DEN	DEN	-	DEN	DEN	-	-	-	-	-	-
		Decline excavation and construction[4]	DEN	DEN	DEN	DEN	DEN	-	DEN	DEN	-	-	-	-	-	-

Locality	Stage	Activity	Construction compounds [1]													
			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
	Tunnelling support site	Tunnelling and support	DEN	DEN	DEN	DEN	DEN	-	DEN	DEN	-	-	-	-	-	-
		Spoil handling	DEN	DEN	DEN	DEN	DEN	-	DEN	DEN	-	-	-	-	-	-
		Tunnel lining[5]	DEN	DEN	DEN	DEN	DEN	-	DEN	DEN	-	-	-	-	-	-

Note 1: The letters D, E and N denote the time periods (Day Evening and Night) in which the works would occur. Definitions of these time periods are described in Section 1.6.3

Note 2: Generators may be required during the night-time to run security lighting for the site

Note 3: Only deliveries for oversized vehicles and equipment would be undertaken outside of standard construction hours.

Note 4: Excavation for the emergency smoke extraction facilities and the ventilation facilities has been included in the tunnel decline excavation and construction of portals scenarios

Note 5: This includes concrete and shotcrete deliveries for tunnel construction support.

Table 33 Assessed construction work stages –Bridges, roads, portals and buildings

Locality	Stage	Activity	Bridges		Basin works	Roads			Portal				Buildings	Tolling infrastructure
			Large[2]	Small[2]	Camdenville Park	Local	St Peters interchange	Western	Western		Eastern		Demolition	Tolling infrastructure
Surface works	Site establishment	Power generator	-	-		-	-	-	-	-	-	-	-	-
		Instalment of environmental controls	-	-		-	-	-	-	-	-	-	-	-
		Demolition of existing structures	-	-		-	-	-	-	-	-	-	-	-
		Crushing and screening	-	-		-	-	-	-	-	-	-	-	-
		Vegetation clearing	-	-		-	-	-	-	-	-	-	-	-
		Establishment of construction facilities	-	-		-	-	-	-	-	-	-	-	-
		Road and intersection modifications and installation of traffic controls	-	-		-	-	-	-	-	-	-	-	-
	Construction compound and car park generation operations	General worksite and car parking	-	-		-	-	-	-	-	-	-	-	-
		Workshop; Deliveries; Maintenance storage	-	-		-	-	-	-	-	-	-	-	-

Locality	Stage	Activity	Bridges		Basin works	Roads			Portal				Buildings	Tolling infrastructure
			Large[2]	Small[2]	Camdenville Park	Local	St Peters interchange	Western	Western		Eastern		Demolition	Tolling infrastructure
	Construction of portals (cut and cover tunnel)	Piling; excavation of decline	-	-		-	-	-	DE	DE	DE	DE	-	-
		Earthworks	-	-		-	-	-	-	-	-	-	-	-
		Road tie-in works	-	-		-	-	-	-	-	-	-	-	-
	M5 East Motorway road widening and realignment	Earthworks	-	-		-	-	DE	-	-	-	-	-	-
		Road tie-in works	-	-		-	-	DE	-	-	-	-	-	-
	Construction of St Peters interchange	Piling; ground improvement	-	-		-	D	-	-	-	-	-	-	-
		Earthworks	-	-		-	DE	-	-	-	-	-	-	-
		Road tie-in works	-	-		-	DEN	-	-	-	-	-	-	-
	Construction of ventilation facilities	General worksite and car parking	-	-		-	-	-	-	-	-	-	-	-
		Workshop and deliveries	-	-		-	-	-	-	-	-	-	-	-
		Construction of ventilation facilities	-	-		-	-	-	-	-	-	-	-	-
	Local road works including construction of the Campbell	Demolition of existing structures	-	-		-	-	-	-	-	-	-	D	D
		Earthworks	-	-		D	-	-	-	-	-	-	-	-

Locality	Stage	Activity	Bridges		Basin works	Roads			Portal				Buildings	Tolling infrastructure
			Large[2]	Small[2]	Camdenville Park	Local	St Peters interchange	Western	Western		Eastern		Demolition	Tolling infrastructure
	Road Bridge	Road tie-in works	-	-		DEN	-	-	-	-	-	-	-	-
		Kerbing and drainage	-	-		DEN	-	-	-	-	-	-	-	-
		Pedestrian bridges to Campbell Road	-	DEN		-	-	-	-	-	-	-	-	-
		Campbell Road bridge	DE			-	-	-	-	-	-	-	-	-
	Camdenville Park basin works	Earthworks			D									
	General utility installation and relocation	Service installation and relocation	-	-		-	-	-	-	-	-	-	-	-
	Construction of toll infrastructure	Site establishment	-	-		-	-	-	-	-	-	-	-	DEN
		Road works	-	-		-	-	-	-	-	-	-	-	DEN
		Construction of toll gantries	-	-		-	-	-	-	-	-	-	-	DEN
Tunnelling works	Site establishment	Power generator	-	-		-	-	-	-	-	-	-	-	-
		Instalment of environmental controls	-	-		-	-	-	-	-	-	-	-	-
		Demolition of existing structures	-	-		-	-	-	-	-	-	-	-	-

Locality	Stage	Activity	Bridges		Basin works	Roads			Portal				Buildings	Tolling infrastructure
			Large[2]	Small[2]	Camdenville Park	Local	St Peters interchange	Western	Western		Eastern		Demolition	Tolling infrastructure
		Vegetation clearing	-	-		-	-	-	-	-	-	-	-	-
		Establishment of construction facilities	-	-		-	-	-	-	-	-	-	-	-
		Road and intersection modifications and installation of traffic controls	-	-		-	-	-	-	-	-	-	-	-
	Construction compound and car park generation operations	General worksite and car parking	-	-		-	-	-	-	-	-	-	-	-
		Maintenance storage; Workshop deliveries	-	-		-	-	-	-	-	-	-	-	-
	Tunnelling support establishment	Piling; excavation of decline	-	-		-	-	-	-	-	-	-	-	-
		Decline excavation and construction	-	-		-	-	-	-	-	-	-	-	-
	Tunnelling support site	Tunnelling and support	-	-		-	-	-	-	-	-	-	-	-
		Spoil handling	-	-		-	-	-	-	-	-	-	-	-

Locality	Stage	Activity	Bridges		Basin works	Roads			Portal				Buildings	Tolling infrastructure
			Large[2]	Small[2]	Camdenville Park	Local	St Peters interchange	Western	Western		Eastern		Demolition	Tolling infrastructure
		Tunnel lining	-	-		-	-	-	-	-	-	-	-	-

Note 1: The letters D, E and N denote the time periods (Day Evening and Night) in which the works would occur. Definitions of these time periods are described in Section 1.6.3

Note 2: Large bridges are Campbell Road bridge and Gardeners Road bridge. The small bridge represents the pedestrian and cyclist bridge at Campbell Road.

Table 34 and **Table 35** present the sound power levels of the proposed construction equipment for the described works above. These sound power levels are typical values taken from data provided in the *Australian Standard AS2436-2010*, *Guide to noise control on construction, demolition and maintenance sites and the UK Department for Environment*, Food and Rural Affairs (DEFRA) noise database and assume equipment is modern and in good working order. Based on experience of other projects, L_{A1} sound power levels are typically up to 8 dB(A) above L_{Aeq} sound power levels. The range and types of equipment used may be subject to change and would be confirmed during the detailed design phase.

Table 34 Sound power levels for proposed construction equipment and scenarios for surface works

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
Site establishment	Power generation	Generator	91[2]	91
	Instalment of environmental controls	Excavator (35T)	103	105
		Franna crane (20T)	93	
		Small truck (<20T)	98[1]	
	Demolition of existing structures (No rock hammering)	Excavator (35T)	103	106
		Truck and dog	102[1]	
	Demolition of existing structures (Rock hammering only)	Excavator with rock hammer (30T)	126[6]	126
	Crushing and screening	Norberg Lototrack LT100R Crushing and Grinding Mobile Plant	117	118
		Front end loader	108	
		Excavator (35T)	103	
		Truck and dog	102[1]	
	Vegetation clearing	Excavator (35T)	103	120
		Tub grinder/mulcher	120	
		Small truck (<20T)	98[1]	
	Establishment of construction facilities	Excavator (35T)	103	105
		Franna crane (20T)	93	
		Small truck (<20T)	98[1]	
	Road and intersection modifications and installation of traffic controls	Truck (20T)	102[1]	106
		Scissor lift	100	
		Franna crane (20T)	93	
		Line marking truck	102[1]	
Construction compound and car park generation operations (C1-C11)	General worksite and car parking	Light vehicle	90	92
		Water treatment plant pumps	87[2]	
	Workshop; Deliveries; Maintenance storage	Road truck (deliveries to site)	102[1]	107
		Compressor	60[2]	
		Workshop Hand Tools	94	
		Franna crane (20T)	93	
		Water cart (15kL)	104	
		Light vehicle	90	
		Water treatment plant pumps	97[2]	

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
Construction of portals (cut and cover tunnel)	Piling; excavation of decline	Bored piling rig	110	116
		Concrete pump	106	
		Excavator (35T)	103	
		Jack hammer (20kg)	113[6]	
		Concrete agitator	105	
		Compressor	70	
	Earthworks	Excavator (35T)	103	121
		Pneumatic hammer	120[6]	
		Bulldozer D7	109	
		Truck and dog	102[1]	
		Shotcrete rig (diesel)	106	
		Concrete agitator	105	
	Road tie-in works	Paver	104	121
		Daymaker lighting tower (900 kg)	77	
		Franna crane (20T)	93	
		Road truck	102[1]	
		Road profiler (17T)	110	
		Asphalt truck and sprayer	102[1]	
		Roller (12T)	109	
		Concrete saw	120[6]	
		Line marking truck	102[1]	
		Water cart (15kL)	104	
M5 East Motorway road widening and realignment	Earthworks	Excavator (35T)	103	127
		Excavator with rock hammer (45T)	126[6,7]	
		Drilling machine (diesel)	107	
		Pneumatic hammer	120[6]	
		Bulldozer D7	109	
		Truck and dog	102[1]	
		Shotcrete rig (diesel)	106	
		Concrete agitator	105	
	Road tie-in works	Paver	104	121
		Daymaker lighting tower (900kg)	77	
		Franna crane (20T)	93	
		Road truck	102[1]	
		Road profiler (17T)	110	
		Asphalt truck and sprayer	102[1]	
		Roller (12T)	109	
		Concrete saw	120[6]	
		Line marking truck	102[1]	
		Water cart (15kL)	104	

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
Construction of St Peters interchange	Piling; ground improvement	Bored piling rig	110	111
		Franna crane (20T)	93	
		Excavator (35T)	103	
	Earthworks (No rock hammering)	Excavator (35T)	103	115
		Road truck	102[1]	
		Roller (12T)	109	
		Water cart (15kL)	104	
		Grader (25T)	109	
		Truck and dog	102[1]	
		Concrete pump	106	
		Concrete agitator	105	
	Earthworks (Rock hammering only)	Excavator with rock hammer (45T)	126[6]	126
	Road tie-in works	Paver	104	121
		Daymaker lighting tower (900kg)	77	
		Franna crane (20T)	93	
		Road truck	102[1]	
		Road profiler (17T)	110	
		Asphalt truck and sprayer	102[1]	
		Roller (12T)	109	
		Concrete saw	120[6]	
		Line marking truck	102[1]	
		Water cart (15kL)	104	
Construction of ventilation facilities	General worksite and car parking	Light vehicle	90	98
		Water treatment plant pumps	97	
	Workshop and deliveries	Road truck	102[1]	107
		Compressor	70	
		Workshop hand tools	94	
		Franna crane (20T)	93	
		Water cart (15kL)	104	
	Construction of ventilation facilities	Crane – wheeled (100T)	100	125
		Saw cutting reo	124[6]	
		Saw cutting formwork	109[6]	
		Concrete pump	106	
		Concrete vibrator	97	
		Concrete grinding machine	117	

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
Local road works including construction of the Campbell Road bridge	Demolition of existing structures (No rock hammering)	Excavator (35T)	103	106
		Truck and dog	102[1]	
	Demolition of existing structures (Rock hammering only)	Excavator with rock hammer (30T)	126[6]	126
	Earthworks (No rock hammering)	Excavator (35T)	103	122
		Pneumatic hammer	120[6,7]	
		Concrete saw	115[3,6]	
		Grader (25T)	109	
		Roller (12T)	109[7]	
		Road profiler (17T)	110[7]	
		Truck and dog	102[1]	
		Shotcrete rig (diesel)	106[7]	
		Concrete agitator	105[7]	
	Earthworks (Rock hammering only)	Excavator with rock hammer (30T)	126[6,7]	126
	Road tie-in works	Paver	104	113
		Road truck	102[1]	
		Bobcat	104	
		Daymaker lighting tower (900kg)	77	
		Asphalt truck and sprayer (12T)	102[1]	
		Roller (12T)	109[7]	
		Water cart (15kL)	104	
		Line marking truck	102[1]	
	Kerbing and drainage	Concrete saw	115[3,6]	116
		Line marking truck	102[1,7]	
		Hiab truck (12T)	98[1]	
		Concrete agitator	105	
	Pedestrian bridges to Campbell Road	Excavator (45T)	105	119
		Concrete saw	115[3,6]	
		Mobile crane (250T)	106	
		Franna crane (20T)	93	
		Piling rig (Driven)	116[7]	
		Concrete pump	106	
	Campbell Road bridge	Excavator (45T)	105	119
		Concrete saw	115[3,6]	
		Piling rig (Driven)	116[7]	
		Mobile crane	106	
		Franna crane	93	
		Concrete pump	106	

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
General utility installation and relocation	Service installation and relocation	Excavator (20T)	103	121
		Pneumatic hammer	120[6]	
		Concrete saw	115[3,6]	
		Truck and dog (20T)	102[1]	
Construction of toll infrastructure	Site establishment	Material delivery truck	102	106
		Light vehicle	90	
		Small truck	98	
		Hiab truck	102	
	Road works	Paver	104	122
		Asphalt truck and sprayer	102	
		Bobcat	104	
		Compressor	70	
		Concrete Truck	106	
		Concrete Vibrator	97	
		Generator	70	
		Pump	97	
		Road profiler	110	
		Concrete saw	120[6]	
		Excavator with bucket	105	
		Truck	102	
		Vibratory roller	112	
		Front end loader	108	
	Toll gantry construction	Crane - wheeled	106	108
		Material and delivery trucks	102	
		Hand tools	98	
		Light vehicle	90	
Basin works	Camdenville Park basin works	Excavator (35T)	103	113
		Excavator (20T)	103	
		Dump truck	102	
		Vibratory roller	112	
		Diesel pump	97	

Note 1: Sound power levels are time-weighted

Note 2: Equipment assume to be located in a shed, with an insertion loss of 10 dB(A)

Note 3: Equipment assumed to be located behind a noise screen during works, with an insertion loss of 5 dB(A)

Note 4: Equipment assumed to be located underground during works, with an insertion loss of 10 dB(A)

Note 5: Equipment assumed to be attenuated with a minimum insertion loss of 20 dB(A)

Note 6: Includes a penalty of 5 dB(A) has been added to this sound power level in the assessment to account for 'annoying' characteristics in accordance with the Interim Construction Noise Guideline

Note 7: Equipment would only be used for road surface works, and not works occurring within construction compounds

Table 35 Sound power levels for proposed construction equipment and scenarios for tunnelling works

Activity	Scenario	Equipment	SWL, dB(A)	SWL, dB(A)
			Per plant	Total
Site establishment	Power generation	Generator	91[2]	91
	Instalment of environmental controls	Excavator (35T)	103	105
		Franna crane (20T)	93	
		Small truck (<20T)	98[1]	
	Demolition of existing structures (No rock hammering)	Excavator (35T)	103	106
		Truck and dog	102[1]	
	Demolition of existing structures (Rock hammering only)	Excavator with rock hammer (20T)	126[6]	126
	Vegetation clearing	Excavator (35T)	103	120
		Tub grinder/mulcher	120	
		Small truck (<20T)	98[1]	
	Establishment of construction facilities	Excavator (35T)	103	105
		Franna crane (20T)	93	
		Small truck (<20T)	98[1]	
	Road and intersection modifications and installation of traffic controls	Truck (20T)	102[1]	106
		Scissor lift	100	
		Franna crane (20T)	93	
		Line marking truck	102[1]	
Construction compound and car park generation operations	General worksite and car parking	Light vehicle	90	92
		Water treatment plant pumps	87[2]	
	Workshop; Deliveries; Maintenance storage	Road truck (deliveries to site)	102[1]	107
		Compressor	60[2]	
		Workshop Hand Tools	84[2]	
		Franna crane (20T)	93	
		Water cart (15kL)	104	
		Light vehicle	90	
		Water treatment plant pumps	87[2]	

Activity	Scenario	Equipment	SWL, dB(A) Per plant	SWL, dB(A) Total
Tunnelling support establishment	Piling; excavation of decline	Bored piling rig	110	113
		Concrete pump	106	
		Excavator (35T)	103	
		Concrete agitator	105	
	Decline excavation and construction (No rock hammering)	Concrete agitator	105	121
		Excavator (35T)	103	
		Drilling machine (diesel)	107	
		Pneumatic Hammer	120[6]	
		Truck and dog	102[1]	
		Shotcrete rig (diesel)	106	
	Decline excavation and construction (Rock hammering only)	Excavator with rock hammer (35T)	126[6]	126
Tunnelling support site	Tunnelling and support	Road header	101[4]	104
		Dust scrubber	100[4]	
		Ventilation fan	90[5]	
	Spoil handling	Moxie (spoil out of tunnel) (38T)	110	113
		Truck and dog	102[1]	
		Front end loader (in spoil loading shed)	108[7]	
	Tunnel lining	Concrete pump	106	109
		Compressor	60[2]	
		Concrete truck	106[1]	
		Pneumatic vibrator	97	

Note 1: Sound power levels are time-weighted.

Note 2: Equipment assume to be located in a shed, with an insertion loss of 10 dB(A)

Note 3: Equipment assumed to be located behind a noise screen during works, with an insertion loss of 5 dB(A)

Note 4: Equipment assumed to be located underground during works, with an insertion loss of 10 dB(A)

Note 5: Equipment assumed to be attenuated with a minimum insertion loss of 20 dB(A)

Note 6: A penalty of 5 dB(A) has been added to this sound power level in the assessment to account for 'annoying' characteristics in accordance with the Interim Construction Noise Guideline

Note 7: For Bexley (C4, C5) and Arncliffe (C7) construction compounds: standard and out-of-hours works equipment would operate in an acoustic shed, with an insertion loss of 25 dB(A). For Canal Road (C8) and Campbell Road (C9) construction compounds: standard work hours and out-of-work hours equipment would operate externally, and are therefore afforded no additional attenuation. For Kingsgrove North (C1): standard hour works equipment would work outside, and out-of-hours work equipment would be located in an acoustic shed with an insertion loss of 25 dB(A)

5.1 Construction noise modelling and prediction

Noise levels due to the construction activities have been predicted at nearby residences using SoundPLAN noise modelling software v7.3. The modelling used the CONCAWE algorithm and includes ground topography, buildings and structures and representative construction noise sources as detailed in **Table 34** and **Table 35**. Free field point receivers at 1.5 metres high were assumed.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures would also vary as the construction equipment moves around the site. Neutral weather conditions were assumed for all construction scenarios.

Existing barriers that would not be impacted by construction activities have been assumed to remain in place during construction. Barriers which are impacted by construction activities have been removed. To present a reasonable 'worst case' scenario temporary barriers have not been included in the assessment for construction activities along the western and eastern surface works. Noise barriers and hoarding around the perimeter of ancillary construction compounds are detailed in **Table 9**. The proposed noise barriers and hoarding range from 2.5 to 4.5 metres in height and are used where residences are located adjacent to the construction compound.

Acoustic sheds and non-acoustic sheds have been included at the compounds providing tunnel launch access and support sites. The locations and types of sheds have been detailed in **Table 9**. All tunnelling operations and loading of trucks with tunnel spoil would be completed within the sheds. However, the sheds would not be in place for the sinking of the shafts and excavation of the declines. The first phase of the building construction scenario would be representative of the shaft sinking activities prior to the establishment of the sheds and have not been assessed as a separate scenario. Notes have been provided below in **Table 34** and **Table 35** detailing the expected noise reduction from acoustic sheds and non-acoustic sheds during spoil handling.

Equipment located underground has been modelled conservatively with 10 dB(A) insertion loss to account for shielding effects of terrain. Unless otherwise stated all construction equipment has been assumed to be operating simultaneously.

Blasting has been considered in **Section 4.4** of this report.

5.1.1 Construction noise assessment – Standard hours works

The noise modelling results for standard hours of construction are provided in **Table 36** to **Table 49**.

The tables present the noise management levels, the median construction noise level (typically the noise level two to three rows of houses behind the construction works) and the highest predicted construction noise levels for each noise catchment area. The tables also present the number of receivers where the construction noise levels are predicted to exceed the NML and the highly noise affected level for each noise catchment area. The predicted construction noise levels are also provided graphically in **Appendix G**.

The noise modelling results for other sensitive receivers, such as places of worships, schools and child care centres are provided in **Appendix H**.

It is important to consider that this assessment is representative of the worst case 15 minute period of construction activity and does not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. Particularly noisy activities, such as rock hammering and use of concrete saws, are likely to persist for only a fraction of the overall construction period. In addition the predictions use the shortest separation distance to each sensitive receiver, however in reality separation distances would vary between plant and sensitive receivers. For linear works (works that move along the road alignment, rather than works located at a construction compound) noise exposure at each receiver would reduce due to increases in distance loss as the works progress along the alignment.

The *Interim Construction Noise Guideline* states that where a construction noise impact level of greater than 75 dB(A) is predicted, a receiver is considered to be 'highly noise affected' and afforded additional consideration. The receivers where noise levels exceed 75 dB(A) can be identified on the noise contours provided in **Appendix G**. The potential for highly noise affected receivers would be confirmed during detailed construction planning. These receivers would receive additional consultation with regards to specific timing and impacts of construction works. Respite periods would also be considered for these receivers in accordance with the *Interim Construction Noise Guideline*.

The predictions indicate that noise levels at commercial and industrial receivers would generally remain compliant with the applicable noise management levels. This would be confirmed in more detail by the contractor in the Construction Noise and Vibration Management Plan.

Table 36 Surface works – Earthworks

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Power generator[1]						
NCA3	60	35	35	0	0	0
NCA4	67	48	50	0	0	0
NCA6	60	35	56	0	0	0
NCA7	62	38	58	0	0	0
NCA8	64	41	55	0	0	0
NCA9	70	32	36	0	0	0
NCA10	68	32	47	0	0	0
NCA18	58	32	43	0	0	0
NCA19	55	36	> 90	37	15	3
NCA20	60	31	31	0	0	0
NCA23	59	31	35	0	0	0
NCA24	60	34	42	0	0	0
NCA25	57	33	49	0	0	0
NCA26	57	32	41	0	0	0
Total					**15**	**3**
Installation of environmental controls						
NCA3	60	32	50	0	0	0
NCA4	67	60	60	0	0	0
NCA6	60	38	62	2	3	0
NCA7	62	48	65	3	2	0
NCA8	64	50	65	1	1	0
NCA9	70	34	43	0	0	0
NCA10	68	39	54	0	0	0
NCA11	68	37	39	0	0	0
NCA18	58	42	52	0	0	0
NCA19	55	42	> 90	36	53	17
NCA20	60	34	39	0	0	0
NCA23	59	33	41	0	0	0
NCA24	60	39	50	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA25	57	39	57	0	0	0
NCA26	57	35	49	0	0	0
Total					**59**	**17**
Demolition of existing structures (No rock hammering)						
NCA3	60	24	34	0	0	0
NCA4	67	65	66	0	0	0
NCA6	60	30	53	0	0	0
NCA7	62	34	57	0	0	0
NCA8	64	42	52	0	0	0
NCA9	70	28	41	0	0	0
NCA10	68	34	52	0	0	0
NCA11	68	33	39	0	0	0
NCA18	58	41	51	0	0	0
NCA19	55	37	66	11	5	0
NCA24	60	39	44	0	0	0
NCA25	57	38	57	0	0	0
NCA26	57	30	48	0	0	0
Total					**5**	**0**
Demolition of existing structures (Rock hammering only)						
NCA4	67	84	86	19	16	16
NCA6	60	50	73	13	34	0
NCA7	62	53	77	15	15	2
NCA8	64	62	72	8	7	0
NCA9	70	48	61	0	0	0
NCA10	68	54	72	4	5	0
NCA19	55	49	86	31	164	5
NCA25	57	58	77	20	124	1
Total					**365**	**24**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Crushing and screening						
NCA3	60	36	61	1	1	0
NCA4	67	70	71	4	14	0
NCA6	60	47	73	13	40	0
NCA7	62	57	76	14	19	1
NCA8	64	61	76	12	11	1
NCA9	70	44	54	0	0	0
NCA10	68	50	65	0	0	0
NCA11	68	46	50	0	0	0
NCA18	58	53	63	5	8	0
NCA19	55	52	> 90	47	146	28
NCA20	60	42	50	0	0	0
NCA23	59	41	52	0	0	0
NCA24	60	50	61	1	1	0
NCA25	57	49	68	11	20	0
NCA26	57	43	60	3	2	0
Total					**262**	**30**
Vegetation clearing						
NCA3	60	36	61	1	1	0
NCA4	67	70	71	4	14	0
NCA6	60	47	73	13	40	0
NCA7	62	57	76	14	19	1
NCA8	64	61	76	12	11	1
NCA9	70	44	54	0	0	0
NCA10	68	50	65	0	0	0
NCA11	68	46	50	0	0	0
NCA18	58	53	63	5	8	0
NCA19	55	52	> 90	47	146	28
NCA20	60	42	50	0	0	0
NCA23	59	41	52	0	0	0
NCA24	60	50	61	1	1	0
NCA25	57	49	68	11	20	0
NCA26	57	43	60	3	2	0
Total					**262**	**30**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Establishment of construction facilities						
NCA3	60	31	49	0	0	0
NCA4	67	59	59	0	0	0
NCA6	60	37	61	1	2	0
NCA7	62	47	64	2	1	0
NCA8	64	49	64	0	0	0
NCA9	70	33	42	0	0	0
NCA10	68	38	53	0	0	0
NCA11	68	36	38	0	0	0
NCA18	58	42	51	0	0	0
NCA19	55	42	90	35	51	15
NCA20	60	34	38	0	0	0
NCA23	59	33	40	0	0	0
NCA24	60	38	49	0	0	0
NCA25	57	38	56	0	0	0
NCA26	57	35	48	0	0	0
Total					**54**	**15**
Road and intersection modifications and installation of traffic controls						
NCA4	67	42	43	0	0	0
NCA6	60	36	60	0	0	0
NCA7	62	37	63	1	1	0
NCA8	64	34	48	0	0	0
NCA9	70	32	42	0	0	0
NCA10	68	37	53	0	0	0
NCA18	58	42	52	0	0	0
NCA19	55	42	> 90	37	46	16
NCA20	60	34	38	0	0	0
NCA23	59	33	41	0	0	0
NCA24	60	39	50	0	0	0
NCA25	57	38	57	0	0	0
NCA26	57	35	49	0	0	0
Total					**47**	**16**

Table 37 Surface works – Construction compound and car park generation operations (C1-C11)

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	67	39	41	0	0	0
NCA6	60	35	47	0	0	0
NCA7	62	36	49	0	0	0
NCA8	64	38	46	0	0	0
NCA10	68	37	38	0	0	0
NCA18	58	33	34	0	0	0
NCA19	55	33	83	28	7	1
NCA24	60	32	39	0	0	0
NCA25	57	32	40	0	0	0
NCA26	57	32	32	0	0	0
Total					**7**	**1**
Workshop; Deliveries; Maintenance storage						
NCA3	60	31	43	0	0	0
NCA4	67	55	56	0	0	0
NCA6	60	37	62	2	2	0
NCA7	62	45	65	3	2	0
NCA8	64	47	62	0	0	0
NCA9	70	33	42	0	0	0
NCA10	68	37	52	0	0	0
NCA11	68	35	35	0	0	0
NCA18	58	39	48	0	0	0
NCA19	55	40	> 90	42	26	7
NCA20	60	35	39	0	0	0
NCA23	59	33	41	0	0	0
NCA24	60	39	53	0	0	0
NCA25	57	38	54	0	0	0
NCA26	57	34	47	0	0	0
Total					**30**	**7**

Table 38 Surface works – Construction of portals (cut and cover tunnel)

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; excavation of decline						
NCA6	60	38	64	4	7	0
NCA7	62	35	68	6	2	0
NCA8	64	34	41	0	0	0
NCA9	70	37	50	0	0	0
NCA10	68	41	56	0	0	0
NCA19	55	47	72	17	83	0
NCA24	60	48	60	0	0	0
Total					**92**	**0**
Earthworks						
NCA4	67	54	57	0	0	0
NCA6	60	46	70	10	26	0
NCA7	62	48	76	14	11	1
NCA8	64	47	62	0	0	0
NCA9	70	45	56	0	0	0
NCA10	68	50	67	0	0	0
NCA19	55	53	> 90	51	196	29
NCA24	60	54	70	10	28	0
NCA25	57	52	66	9	17	0
Total					**278**	**30**
Road tie-in works						
NCA4	67	55	58	0	0	0
NCA6	60	47	71	11	27	0
NCA7	62	49	77	15	12	2
NCA8	64	48	63	0	0	0
NCA9	70	46	57	0	0	0
NCA10	68	51	68	0	0	0
NCA19	55	54	> 90	52	213	30
NCA24	60	55	71	11	32	0
NCA25	57	53	67	10	24	0
Total					**308**	**32**

Table 39 Surface works – M5 East Motorway road widening and realignment

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Earthworks (No rock hammering)						
NCA17	58	42	51	0	0	0
NCA18	58	43	84	26	18	3
NCA19	55	57	79	24	238	2
NCA20	60	55	> 90	34	91	16
NCA21	57	53	82	25	125	5
NCA22	57	60	79	22	143	7
NCA23	59	58	83	24	256	35
NCA24	60	59	90	30	98	14
NCA25	57	56	67	10	65	0
NCA26	57	46	61	4	2	0
NCA27	70	57	76	6	3	1
NCA28	62	42	58	0	0	0
NCA29	57	41	55	0	0	0
NCA30	63	56	77	14	36	2
Total					**1075**	**85**
Earthworks (Rock hammering only)						
NCA18	58	44	89	31	34	4
NCA19	55	60	84	29	350	21
NCA20	60	57	> 90	39	170	35
NCA21	57	53	87	30	167	18
NCA22	57	65	84	27	160	36
NCA23	59	62	88	29	438	61
NCA24	60	62	> 90	35	155	35
NCA25	57	60	72	15	171	0
NCA27	70	61	81	11	15	3
NCA30	63	61	82	19	80	8
Total					**1740**	**221**
Road tie-in works						
NCA17	58	39	48	0	0	0
NCA18	58	40	81	23	15	2
NCA19	55	54	76	21	157	2
NCA20	60	52	> 90	31	62	13
NCA21	57	50	79	22	106	2

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA22	57	57	76	19	93	4
NCA23	59	55	80	21	190	13
NCA24	60	56	87	27	79	5
NCA25	57	53	64	7	21	0
NCA26	57	43	58	1	1	0
NCA27	70	54	73	3	2	0
NCA28	62	39	55	0	0	0
NCA29	57	38	52	0	0	0
NCA30	63	53	74	11	20	0
Total					**746**	**41**

Table 40 Surface works – Construction of St Peters interchange

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; ground improvement						
NCA3	60	34	53	0	0	0
NCA4	67	64	65	0	0	0
NCA6	60	42	67	7	9	0
NCA7	62	51	70	8	4	0
NCA8	64	55	70	6	7	0
NCA9	70	38	48	0	0	0
NCA10	68	43	58	0	0	0
NCA11	68	39	44	0	0	0
Total					**20**	**0**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Earthworks (No rock hammering)						
NCA3	60	33	56	0	0	0
NCA4	67	68	69	2	13	0
NCA6	60	45	71	11	24	0
NCA7	62	54	74	12	12	0
NCA8	64	58	74	10	8	0
NCA9	70	42	51	0	0	0
NCA10	68	47	62	0	0	0
NCA11	68	43	48	0	0	0
Total					**57**	**0**
Earthworks (Rock hammering only)						
NCA3	60	44	67	7	2	0
NCA4	67	79	80	13	16	15
NCA6	60	56	82	22	145	9
NCA7	62	65	85	23	36	6
NCA8	64	69	85	21	18	8
NCA9	70	53	62	0	0	0
NCA10	68	58	73	5	5	0
NCA11	68	54	59	0	0	0
Total					**222**	**38**
Road tie-in works						
NCA3	60	39	65	5	1	0
NCA4	67	74	75	8	15	0
NCA6	60	51	77	17	62	3
NCA7	62	60	80	18	26	2
NCA8	64	64	80	16	11	6
NCA9	70	47	58	0	0	0
NCA10	68	53	68	0	0	0
Total					**115**	**11**

Table 41 Surface works – Construction of motorway operations complexes

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA6	60	33	36	0	0	0
NCA7	62	31	40	0	0	0
NCA8	64	31	31	0	0	0
NCA10	68	37	38	0	0	0
NCA12	65	34	44	0	0	0
NCA13	59	31	31	0	0	0
NCA15	61	31	37	0	0	0
NCA19	55	32	39	0	0	0
NCA24	60	32	39	0	0	0
NCA25	57	33	36	0	0	0
NCA26	57	35	48	0	0	0
Total					**0**	**0**
Workshop and deliveries						
NCA4	67	41	42	0	0	0
NCA6	60	36	53	0	0	0
NCA7	62	35	58	0	0	0
NCA8	64	33	46	0	0	0
NCA9	70	32	40	0	0	0
NCA10	68	35	52	0	0	0
NCA12	65	50	62	0	0	0
NCA13	59	42	47	0	0	0
NCA14	57	38	42	0	0	0
NCA15	61	37	53	0	0	0
NCA16	64	36	41	0	0	0
NCA17	58	33	45	0	0	0
NCA18	58	34	42	0	0	0
NCA19	55	41	55	0	0	0
NCA20	60	36	40	0	0	0
NCA23	59	33	42	0	0	0
NCA24	60	38	55	0	0	0
NCA25	57	38	50	0	0	0
NCA26	57	38	66	9	7	0
Total					**7**	**0**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Construction of motorway operations complex structures						
NCA4	67	59	62	0	0	0
NCA6	60	51	75	15	76	0
NCA7	62	53	81	19	19	2
NCA8	64	52	67	3	1	0
NCA9	70	50	61	0	0	0
NCA10	68	55	72	4	6	0
NCA12	65	71	83	18	79	20
NCA13	59	62	66	7	42	0
NCA14	57	54	62	5	29	0
NCA15	61	51	75	14	63	0
NCA16	64	47	63	0	0	0
NCA19	55	57	75	20	273	0
NCA24	60	57	75	15	71	0
NCA25	57	57	71	14	111	0
NCA26	57	54	86	29	233	11
Total					**1003**	**33**

Table 42 Surface works – Local road works including construction of the Campbell Road bridge

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Demolition of existing structures (No rock hammering)						
NCA1	67	30	42	0	0	0
NCA2	60	38	51	0	0	0
NCA3	60	41	85	25	29	5
NCA4	67	70	74	7	14	0
NCA6	60	40	90	30	70	20
NCA7	62	54	90	28	12	3
NCA8	64	64	90	26	12	7
NCA9	70	31	42	0	0	0
NCA10	68	36	52	0	0	0
NCA11	68	37	50	0	0	0
Total					**137**	**35**
Demolition of existing structures (Rock hammering only)						
NCA1	67	50	62	0	0	0
NCA2	60	58	71	11	92	0
NCA3	60	61	> 90	45	89	38
NCA4	67	90	> 90	27	16	16
NCA6	60	60	> 90	50	248	100
NCA7	62	74	> 90	48	54	27
NCA8	64	84	> 90	46	24	21
NCA9	70	51	62	0	0	0
NCA10	68	56	72	4	6	0
NCA11	68	57	70	2	1	0
Total					**530**	**202**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Earthworks (No rock hammering)						
NCA1	67	58	> 90	33	23	7
NCA2	60	52	78	18	33	1
NCA3	60	60	> 90	40	85	14
NCA4	67	> 90	> 90	33	16	16
NCA6	60	49	> 90	40	161	86
NCA7	62	69	> 90	38	38	18
NCA8	64	78	> 90	36	21	12
NCA9	70	42	48	0	0	0
NCA10	68	48	48	0	0	0
NCA11	68	65	> 90	29	12	8
Total					**389**	**162**
Earthworks (Rock hammering only)						
NCA1	67	68	> 90	43	109	29
NCA2	60	62	88	28	208	12
NCA3	60	70	> 90	50	168	55
NCA4	67	> 90	> 90	43	16	16
NCA6	60	59	> 90	50	244	138
NCA7	62	79	> 90	48	49	35
NCA8	64	88	> 90	46	24	21
NCA9	70	52	58	0	0	0
NCA10	68	58	58	0	0	0
NCA11	68	75	> 90	39	19	15
Total					**837**	**321**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Road tie-in works						
NCA1	67	56	> 90	38	13	7
NCA2	60	49	75	15	28	0
NCA3	60	57	> 90	45	65	12
NCA4	67	> 90	> 90	34	16	16
NCA6	60	48	> 90	46	143	74
NCA7	62	66	> 90	42	34	15
NCA8	64	75	> 90	42	18	12
NCA9	70	39	45	0	0	0
NCA10	68	45	45	0	0	0
NCA11	68	62	> 90	27	9	5
Total					**326**	**141**
Kerbing and drainage						
NCA1	67	63	> 90	43	45	13
NCA2	60	57	83	23	79	2
NCA3	60	65	> 90	50	104	39
NCA4	67	> 90	> 90	43	16	16
NCA6	60	53	> 90	50	216	107
NCA7	62	73	> 90	48	49	25
NCA8	64	82	> 90	46	24	15
NCA9	70	47	53	0	0	0
NCA10	68	52	53	0	0	0
NCA11	68	70	> 90	36	17	9
Total					**550**	**226**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Pedestrian bridges at Campbell Road						
NCA3	60	38	63	3	1	0
NCA4	67	71	88	21	15	7
NCA6	60	40	68	8	8	0
NCA7	62	55	76	14	19	1
NCA8	64	75	> 90	46	23	12
Total					**66**	**20**
Campbell Road bridge and Gardeners Road bridge						
NCA4	67	58	60	0	0	0
NCA8	64	41	55	0	0	0
Total					**0**	**0**

Table 43 Surface works – General utility installation and relocation

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Service installation and relocation						
NCA3	60	39	62	2	1	0
NCA4	67	74	> 90	24	16	11
NCA6	60	51	77	17	61	2
NCA7	62	60	80	18	24	2
NCA8	64	70	87	23	13	8
NCA9	70	47	57	0	0	0
NCA10	68	53	68	0	0	0
NCA11	68	50	55	0	0	0
NCA18	58	56	66	8	25	0
NCA19	55	56	> 90	55	208	26
NCA20	60	50	55	0	0	0
NCA23	59	47	57	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA24	60	55	70	10	32	0
NCA25	57	54	72	15	45	0
NCA26	57	46	63	6	3	0
Total					**428**	**49**

Table 44 Surface works – Construction of toll infrastructure

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Site establishment						
NCA15	61	34	49	0	0	0
NCA16	64	35	54	0	0	0
NCA17	58	36	52	0	0	0
NCA18	58	36	55	0	0	0
NCA25	57	34	35	0	0	0
NCA26	57	38	56	0	0	0
Total					**0**	**0**
Road works						
NCA15	61	47	65	4	12	0
NCA16	64	46	70	6	3	0
NCA17	58	47	67	9	31	0
NCA18	58	47	71	13	42	0
NCA26	57	50	72	15	101	0
Total					**189**	**0**
Construction of toll gantries						
NCA15	61	34	52	0	0	0
NCA16	64	32	57	0	0	0
NCA17	58	34	54	0	0	0
NCA18	58	34	58	0	0	0
NCA26	57	37	59	2	3	0
Total					**3**	**0**

Table 45 Surface works – Camdenville Park basin works

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Basin works						
NCA2	60	56	80	20	97	9
NCA3	60	60	> 90	35	63	6
NCA6	60	48	82	22	120	4
NCA7	62	48	58	0	0	0
Total					**280**	**19**

Table 46 Tunnelling works – Site establishment

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Power generator						
NCA6	60	32	35	0	0	0
NCA7	62	32	39	0	0	0
NCA8	64	30	30	0	0	0
NCA10	68	36	37	0	0	0
NCA12	65	34	43	0	0	0
NCA13	59	30	30	0	0	0
NCA18	58	32	33	0	0	0
NCA19	55	33	82	27	7	1
NCA24	60	31	38	0	0	0
NCA25	57	31	39	0	0	0
NCA26	57	31	31	0	0	0
Total					**7**	**1**
Installation of environmental controls						
NCA4	67	41	42	0	0	0
NCA6	60	36	59	0	0	0
NCA7	62	36	62	0	0	0
NCA8	64	34	47	0	0	0
NCA9	70	32	42	0	0	0
NCA10	68	36	53	0	0	0
NCA12	65	51	65	0	0	0
NCA13	59	42	47	0	0	0
NCA14	57	38	42	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA15	61	43	83	22	12	2
NCA16	64	43	71	7	3	0
NCA17	58	39	53	0	0	0
NCA18	58	41	51	0	0	0
NCA19	55	41	90	35	51	15
NCA20	60	35	40	0	0	0
NCA23	59	34	42	0	0	0
NCA24	60	39	55	0	0	0
NCA25	57	39	56	0	0	0
NCA26	57	40	66	9	7	0
Total					**73**	**17**
Demolition of existing structures (No rock hammering)						
NCA3	60	24	29	0	0	0
NCA4	67	42	43	0	0	0
NCA6	60	32	54	0	0	0
NCA7	62	35	59	0	0	0
NCA8	64	33	48	0	0	0
NCA9	70	30	41	0	0	0
NCA10	68	35	52	0	0	0
NCA12	65	51	63	0	0	0
NCA13	59	42	47	0	0	0
NCA14	57	34	43	0	0	0
NCA18	58	41	51	0	0	0
NCA19	55	41	> 90	40	41	9
NCA20	60	35	40	0	0	0
NCA23	59	32	42	0	0	0
NCA24	60	40	56	0	0	0
NCA25	57	39	57	0	0	0
NCA26	57	31	48	0	0	0
Total					**41**	**9**
Demolition of existing structures (Rock hammering)						
NCA4	67	60	63	0	0	0
NCA6	60	52	74	14	82	0
NCA7	62	54	79	17	18	2
NCA8	64	53	68	4	2	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA9	70	50	61	0	0	0
NCA10	68	55	72	4	5	0
NCA12	65	71	83	18	85	22
NCA13	59	62	67	8	46	0
NCA14	57	54	63	6	31	0
NCA19	55	59	> 90	60	322	41
NCA24	60	60	76	16	97	1
NCA25	57	59	77	20	159	1
Total					**847**	**67**
Vegetation clearing						
NCA12	65	65	78	13	52	7
NCA13	59	56	61	2	3	0
NCA14	57	48	56	0	0	0
NCA15	61	50	82	21	40	2
NCA16	64	52	75	11	10	0
NCA17	58	45	63	5	3	0
NCA18	58	37	50	0	0	0
NCA19	55	42	89	34	42	11
NCA20	60	35	42	0	0	0
NCA23	59	35	45	0	0	0
NCA24	60	40	58	0	0	0
NCA25	57	40	62	5	2	0
NCA26	57	48	71	14	54	0
Total					**206**	**20**
Establishment of construction facilities						
NCA4	67	41	42	0	0	0
NCA6	60	36	59	0	0	0
NCA7	62	36	62	0	0	0
NCA8	64	34	47	0	0	0
NCA9	70	32	42	0	0	0
NCA10	68	36	53	0	0	0
NCA12	65	51	65	0	0	0
NCA13	59	42	47	0	0	0
NCA14	57	38	42	0	0	0
NCA15	61	43	83	22	12	2

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA16	64	43	71	7	3	0
NCA17	58	39	53	0	0	0
NCA18	58	41	51	0	0	0
NCA19	55	41	90	35	51	15
NCA20	60	35	40	0	0	0
NCA23	59	34	42	0	0	0
NCA24	60	39	55	0	0	0
NCA25	57	39	56	0	0	0
NCA26	57	40	66	9	7	0
Total					**73**	**17**
Road and intersection modifications and installation of traffic controls						
NCA4	67	42	43	0	0	0
NCA6	60	36	60	0	0	0
NCA7	62	37	63	1	1	0
NCA8	64	34	48	0	0	0
NCA9	70	32	42	0	0	0
NCA10	68	37	53	0	0	0
NCA12	65	52	64	0	0	0
NCA13	59	43	48	0	0	0
NCA14	57	39	43	0	0	0
NCA15	61	43	84	23	16	2
NCA16	64	44	71	7	3	0
NCA17	58	39	54	0	0	0
NCA18	58	42	52	0	0	0
NCA19	55	42	> 90	37	46	16
NCA20	60	36	40	0	0	0
NCA23	59	34	43	0	0	0
NCA24	60	40	56	0	0	0
NCA25	57	40	57	0	0	0
NCA26	57	41	67	10	8	0
Total					**74**	**18**

Table 47 Tunnelling works – Construction compound and car park general operations

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	67	39	41	0	0	0
NCA6	60	35	47	0	0	0
NCA7	62	36	49	0	0	0
NCA8	64	38	46	0	0	0
NCA10	68	37	38	0	0	0
NCA12	65	34	44	0	0	0
NCA13	59	31	31	0	0	0
NCA15	61	35	68	7	2	0
NCA16	64	30	31	0	0	0
NCA17	58	30	30	0	0	0
NCA18	58	33	34	0	0	0
NCA19	55	33	83	28	7	1
NCA24	60	32	39	0	0	0
NCA25	57	31	39	0	0	0
NCA26	57	32	39	0	0	0
Total					**9**	**1**
Maintenance storage; Workshop deliveries						
NCA3	60	31	44	0	0	0
NCA4	67	56	57	0	0	0
NCA6	60	37	63	3	4	0
NCA7	62	46	66	4	2	0
NCA8	64	48	63	0	0	0
NCA9	70	34	43	0	0	0
NCA10	68	38	53	0	0	0
NCA11	68	36	36	0	0	0
NCA12	65	50	61	0	0	0
NCA13	59	42	48	0	0	0
NCA14	57	39	43	0	0	0
NCA15	61	38	84	23	7	2
NCA16	64	41	47	0	0	0
NCA17	58	37	46	0	0	0
NCA18	58	40	49	0	0	0
NCA19	55	41	> 90	43	30	7

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA20	60	35	40	0	0	0
NCA23	59	34	42	0	0	0
NCA24	60	40	54	0	0	0
NCA25	57	39	55	0	0	0
NCA26	57	40	56	0	0	0
Total					**43**	**9**

Table 48 Tunnelling works – Tunnelling support establishment

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; excavation of decline						
NCA3	60	30	34	0	0	0
NCA6	60	37	61	1	2	0
NCA7	62	36	65	3	2	0
NCA8	64	33	38	0	0	0
NCA9	70	36	47	0	0	0
NCA10	68	38	54	0	0	0
NCA12	65	48	60	0	0	0
NCA13	59	35	43	0	0	0
NCA15	61	49	77	16	35	6
NCA16	64	50	80	16	18	1
NCA17	58	45	60	2	5	0
NCA18	58	45	57	0	0	0
NCA19	55	44	70	15	15	0
NCA24	60	46	52	0	0	0
NCA25	57	44	60	3	2	0
NCA26	57	45	70	13	41	0
Total					**120**	**7**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Decline excavation and construction (No rock hammering)						
NCA3	60	37	40	0	0	0
NCA6	60	43	69	9	7	0
NCA7	62	42	73	11	4	0
NCA8	64	40	46	0	0	0
NCA9	70	42	55	0	0	0
NCA10	68	46	61	0	0	0
NCA12	65	56	67	2	3	0
NCA13	59	44	52	0	0	0
NCA15	61	56	85	24	97	18
NCA16	64	58	87	23	33	6
NCA17	58	52	68	10	41	0
NCA18	58	52	65	7	3	0
NCA19	55	52	78	23	52	1
NCA24	60	53	60	0	0	0
NCA25	57	52	67	10	29	0
NCA26	57	52	78	21	129	1
Total					**398**	**26**
Decline excavation and construction (Rock hammering only)						
NCA3	60	42	45	0	0	0
NCA6	60	48	74	14	30	0
NCA7	62	47	78	16	6	1
NCA8	64	45	51	0	0	0
NCA9	70	47	60	0	0	0
NCA10	68	51	66	0	0	0
NCA12	65	61	72	7	20	0
NCA13	59	49	57	0	0	0
NCA15	61	61	90	29	186	31
NCA16	64	63	> 90	28	44	18
NCA17	58	57	73	15	138	0
NCA18	58	57	70	12	44	0
NCA19	55	57	83	28	150	5

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA24	60	58	65	5	13	0
NCA25	57	57	72	15	99	0
NCA26	57	57	83	26	250	8
Total					**980**	**63**

Table 49 Tunnelling works – Tunnelling support site

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Tunnelling and support						
NCA6	60	34	52	0	0	0
NCA7	62	39	56	0	0	0
NCA9	70	32	38	0	0	0
NCA10	68	37	45	0	0	0
NCA12	65	39	51	0	0	0
NCA13	59	34	34	0	0	0
NCA15	61	40	68	7	11	0
NCA16	64	42	71	7	2	0
NCA17	58	37	51	0	0	0
NCA18	58	37	48	0	0	0
NCA19	55	36	61	6	4	0
NCA24	60	37	43	0	0	0
NCA25	57	36	51	0	0	0
NCA26	57	37	61	4	1	0
Total					**18**	**0**
Spoil handling						
NCA3	60	34	54	0	0	0
NCA4	67	66	67	0	0	0
NCA6	60	38	61	1	2	0
NCA7	62	48	65	3	2	0
NCA8	64	56	70	6	7	0
NCA9	70	36	47	0	0	0
NCA10	68	38	54	0	0	0
NCA12	65	31	35	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA15	61	35	52	0	0	0
NCA16	64	38	55	0	0	0
NCA17	58	32	35	0	0	0
NCA18	58	33	42	0	0	0
NCA19	55	42	76	21	25	1
NCA20	60	35	37	0	0	0
NCA24	60	38	49	0	0	0
NCA25	57	39	50	0	0	0
NCA26	57	34	45	0	0	0
Total					**36**	**1**
Tunnel lining						
NCA6	60	34	56	0	0	0
NCA7	62	40	59	0	0	0
NCA8	64	31	34	0	0	0
NCA9	70	32	42	0	0	0
NCA10	68	32	48	0	0	0
NCA12	65	44	55	0	0	0
NCA13	59	36	39	0	0	0
NCA15	61	43	73	12	18	0
NCA16	64	46	75	11	3	0
NCA17	58	40	56	0	0	0
NCA18	58	39	53	0	0	0
NCA19	55	40	65	10	5	0
NCA24	60	41	47	0	0	0
NCA25	57	39	54	0	0	0
NCA26	57	40	65	8	7	0
Total					**33**	**0**

5.1.2 Out of hours work activities

The types of activities that would be undertaken outside standard construction hours are provided in **Section 0**. This would include tunnelling works (including tunnel fitout) which would be undertaken on a 24 hour basis. Other work may be required to be undertaken out of hours work for health and safety reasons, to prevent traffic congestion on major roads during peak periods, or for particular construction requirements.

Scenarios which include out of hours works are as follows:

- Tunnelling and tunnel support activities.
- Road tie-in works including road and ramp construction

5.1.2.1 Airborne L_{Aeq} noise levels

The out of hours work construction noise modelling results are provided in **Table 50** to **Table 70**. The results are also provided graphically in **Appendix G**. The preliminary assessment is based on the activities detailed in **Table 32** and **Table 33**. In practice the scale of works may be reduced during the night-time period and therefore this assessment presents a conservative approach.

All feasible and reasonable mitigation measures, as provided in **Chapter 7.0**, would be implemented to ensure that the potential for adverse impact on the local community is minimised. These mitigation measures would be further developed during detailed design by the contractor and provided in the Construction Noise and Vibration Management Plan.

It is important to consider that this assessment is representative of the worst case 15 minute period of construction activity and does not necessarily represent the noise impact at noise sensitive receivers for an extended period of time. Particularly noisy activities, such as rock hammering and use of concrete saws, are likely to persist for only a fraction of the overall construction period. In addition the predictions use the shortest separation distance to each sensitive receiver, however in reality separation distances would vary between plant and sensitive receivers. For linear works (works that move along the road alignment, rather than works located at a construction compound) noise exposure at each receiver would reduce due to increases in distance loss as the works progress along the alignment.

The *Interim Construction Noise Guideline* states that where a construction noise impact level of greater than 75 dB(A) is predicted, a receiver is considered to be 'highly noise affected' and afforded additional consideration. The highly noise affected level under the *Interim Construction Noise Guideline* strictly applies to standard construction hours only. However, it has been considered in this assessment to provide additional impact information. The receivers where noise levels exceed 75 dB(A) can be identified on the noise contours provided in **Appendix G**. The potential for highly noise affected receivers would be confirmed during detailed construction planning. Receivers that are above the noise management levels, as well as receivers predicted to exceed the sleep disturbance awakening criteria, would inform feasible and reasonable mitigation measures as well as consultation and respite periods.

Table 50 Out of hours work predicted noise – Site establishment – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Power Generator						
NCA3	51	35	35	0	0	0
NCA4	56	48	50	0	0	0
NCA6	51	35	56	5	6	0
NCA7	55	38	58	3	2	0
NCA8	50	41	55	5	7	0
NCA9	59	32	36	0	0	0
NCA10	61	32	47	0	0	0
NCA18	53	32	43	0	0	0
NCA19	50	36	> 90	42	20	3
NCA20	54	31	31	0	0	0
NCA23	54	31	35	0	0	0
NCA24	55	34	42	0	0	0
NCA25	52	33	49	0	0	0
NCA26	52	32	41	0	0	0
Total					**35**	**3**

Table 51 Out of hours work predicted noise – Construction compound and car park generation operations (C1-C11) - Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	56	39	41	0	0	0
NCA6	51	35	47	0	0	0
NCA7	55	36	49	0	0	0
NCA8	50	38	46	0	0	0
NCA10	61	37	38	0	0	0
NCA18	53	33	34	0	0	0
NCA19	50	33	83	33	9	1
NCA24	55	32	39	0	0	0
NCA25	52	32	40	0	0	0
NCA26	52	32	32	0	0	0
Total					**9**	**1**
Workshop; Deliveries; Maintenance storage						
NCA3	51	29	41	0	0	0
NCA4	56	53	54	0	0	0
NCA6	51	35	60	9	14	0
NCA7	55	43	63	8	2	0
NCA8	50	45	60	10	8	0
NCA9	59	31	40	0	0	0
NCA10	61	35	50	0	0	0
NCA11	57	33	33	0	0	0
NCA18	53	37	46	0	0	0
NCA19	50	38	> 90	45	37	7
NCA20	54	33	37	0	0	0
NCA23	54	31	39	0	0	0
NCA24	55	37	51	0	0	0
NCA25	52	36	52	0	0	0
NCA26	52	32	45	0	0	0
Total					**61**	**7**

Table 52 Out of hours work predicted noise – Construction of portals (cut and cover tunnel) – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; excavation of decline						
NCA3	51	21	25	0	0	0
NCA6	51	28	53	2	4	0
NCA7	55	28	57	2	1	0
NCA8	50	25	30	0	0	0
NCA9	59	27	39	0	0	0
NCA10	61	30	45	0	0	0
NCA18	53	24	38	0	0	0
NCA19	50	39	61	11	29	0
NCA20	54	31	37	0	0	0
NCA23	54	32	41	0	0	0
NCA24	55	37	49	0	0	0
NCA25	52	32	41	0	0	0
Total					**34**	**0**
Earthworks						
NCA3	51	26	31	0	0	0
NCA4	56	44	45	0	0	0
NCA6	51	34	58	7	10	0
NCA7	55	37	64	9	2	0
NCA8	50	35	50	0	0	0
NCA9	59	33	44	0	0	0
NCA10	61	38	55	0	0	0
NCA18	53	37	46	0	0	0
NCA19	50	43	> 90	44	86	17
NCA20	54	37	42	0	0	0
NCA23	54	34	45	0	0	0
NCA24	55	42	58	3	4	0
NCA25	52	41	54	2	1	0
NCA26	52	37	43	0	0	0
Total					**103**	**17**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Road tie-in works						
NCA4	56	29	30	0	0	0
NCA7	55	22	49	0	0	0
NCA8	50	20	35	0	0	0
NCA10	61	23	40	0	0	0
NCA18	53	22	31	0	0	0
NCA19	50	28	79	29	28	2
NCA20	54	22	27	0	0	0
NCA24	55	27	43	0	0	0
NCA25	52	26	39	0	0	0
NCA26	52	22	28	0	0	0
Total					**28**	**2**

Table 53 Out of hours work predicted noise – M5 East Motorway road widening and realignment – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Earthworks (No rock hammering)						
NCA17	53	30	39	0	0	0
NCA18	53	31	72	19	10	0
NCA19	50	45	67	17	89	0
NCA20	54	43	82	28	49	3
NCA21	51	41	70	19	80	0
NCA22	51	48	67	16	64	0
NCA23	54	46	71	17	109	0
NCA24	55	47	78	23	60	4
NCA25	52	44	55	3	3	0
NCA26	52	34	49	0	0	0
NCA27	63	45	64	1	1	0
NCA28	56	30	46	0	0	0
NCA30	57	44	65	8	10	0
Total					**475**	**7**

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Road tie-in works						
NCA18	53	15	56	3	1	0
NCA19	50	29	51	1	2	0
NCA20	54	27	66	12	5	0
NCA21	51	25	54	3	1	0
NCA23	54	30	55	1	2	0
NCA24	55	31	62	7	4	0
Total					**15**	**0**

Table 54 Out of hours work predicted noise - Construction of St Peters interchange – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Earthworks (No rock hammering)						
NCA3	51	29	52	1	1	0
NCA4	56	64	65	9	15	0
NCA6	51	41	67	16	56	0
NCA7	55	50	70	15	16	0
NCA8	50	54	70	20	18	0
NCA9	59	38	47	0	0	0
NCA10	61	43	58	0	0	0
NCA11	57	39	44	0	0	0
Total					**106**	**0**
Road tie-in works						
NCA3	51	22	48	0	0	0
NCA4	56	57	58	2	13	0
NCA6	51	34	60	9	15	0
NCA7	55	43	63	8	4	0
NCA8	50	47	63	13	11	0
NCA9	59	31	41	0	0	0
NCA10	61	36	51	0	0	0
NCA11	57	32	37	0	0	0
Total					**43**	**0**

Table 55 Out of hours work predicted noise - Construction of motorway operations complexes – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)[2]	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA6	51	33	36	0	0	0
NCA7	55	31	40	0	0	0
NCA8	50	31	31	0	0	0
NCA10	61	37	38	0	0	0
NCA12	60	34	44	0	0	0
NCA13	53	31	31	0	0	0
NCA15	56	31	37	0	0	0
NCA19	50	32	39	0	0	0
NCA24	55	32	39	0	0	0
NCA25	52	33	36	0	0	0
NCA26	52	35	48	0	0	0
Total					**0**	**0**

Table 56 Out of hours work predicted noise - Local road works including construction of the Campbell Road Bridge – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Road tie-in works						
NCA1	56	55	> 90	48	77	6
NCA2	51	48	74	23	82	0
NCA3	51	56	> 90	53	107	12
NCA4	56	> 90	> 90	44	16	16
NCA6	51	47	> 90	54	218	65
NCA7	55	65	> 90	48	45	13
NCA8	50	74	> 90	55	24	12
NCA9	59	38	44	0	0	0
NCA10	61	44	44	0	0	0
NCA11	57	61	> 90	37	19	5
Total					588	129

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Kerbing and drainage						
NCA1	56	63	> 90	54	153	13
NCA2	51	57	83	32	303	2
NCA3	51	65	> 90	59	174	39
NCA4	56	> 90	> 90	54	16	16
NCA6	51	53	> 90	59	273	107
NCA7	55	73	> 90	55	50	25
NCA8	50	82	> 90	60	24	15
NCA9	59	47	53	0	0	0
NCA10	61	52	53	0	0	0
NCA11	57	70	> 90	47	24	9
Total					**1017**	**226**
Pedestrian bridges to Campbell Road						
NCA2	51	42	43	0	0	0
NCA3	51	37	60	9	1	0
NCA4	56	68	85	29	16	5
NCA6	51	42	65	14	24	0
NCA7	55	52	73	18	22	0
NCA8	50	72	> 90	57	24	12
NCA10	61	41	41	0	0	0
Total					**87**	**17**
Campbell Road bridge						
NCA4	56	49	50	0	0	0
NCA6	51	30	35	0	0	0
NCA7	55	33	42	0	0	0
NCA8	50	41	45	0	0	0
NCA11	57	35	45	0	0	0
Total					**0**	**0**

Table 57 Out of hours work predicted noise – General utility installation and relocation – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Service installation and relocation						
NCA3	51	33	56	5	1	0
NCA4	56	68	85	29	16	4
NCA6	51	45	71	20	106	0
NCA7	55	54	74	19	28	0
NCA8	50	64	81	31	20	2
NCA9	59	41	51	0	0	0
NCA10	61	47	62	1	1	0
NCA11	57	44	49	0	0	0
NCA18	53	50	60	7	10	0
NCA19	50	50	> 90	54	190	19
NCA20	54	44	49	0	0	0
NCA23	54	41	51	0	0	0
NCA24	55	49	64	9	26	0
NCA25	52	48	66	14	33	0
NCA26	52	40	57	5	3	0
Total					**434**	**25**

Table 58 Out of hours work predicted noise – Construction of tolling infrastructure – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Site establishment						
NCA15	56	34	49	0	0	0
NCA16	59	35	54	0	0	0
NCA17	53	36	52	0	0	0
NCA18	53	36	55	2	3	0
NCA25	52	34	35	0	0	0
NCA26	52	38	56	4	12	0
Total					**15**	**0**
Road works						
NCA15	56	47	65	9	57	0
NCA16	59	46	70	11	11	0
NCA17	53	47	67	14	74	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA18	53	47	71	18	60	0
NCA26	52	50	72	20	260	0
Total					**462**	**0**
Construction of toll gantries						
NCA15	56	34	52	0	0	0
NCA16	59	32	57	0	0	0
NCA17	53	34	54	1	1	0
NCA18	53	34	58	5	3	0
NCA26	52	37	59	7	13	0
Total					**17**	**0**

Table 59 Out of hours work predicted noise – Construction compound and carpark generation operations – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	56	39	41	0	0	0
NCA6	51	35	47	0	0	0
NCA7	55	36	49	0	0	0
NCA8	50	38	46	0	0	0
NCA10	61	37	38	0	0	0
NCA12	60	34	44	0	0	0
NCA13	53	31	31	0	0	0
NCA15	56	35	68	12	3	0
NCA16	59	30	31	0	0	0
NCA17	53	30	30	0	0	0
NCA18	53	33	34	0	0	0
NCA19	50	33	83	33	9	1
NCA24	55	32	39	0	0	0
NCA25	52	31	39	0	0	0
NCA26	52	32	39	0	0	0
Total					**12**	**1**
Maintenance storage; Workshop deliveries						
NCA3	51	29	42	0	0	0
NCA4	56	54	55	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA6	51	35	61	10	15	0
NCA7	55	44	64	9	3	0
NCA8	50	46	61	11	10	0
NCA9	59	32	41	0	0	0
NCA10	61	36	51	0	0	0
NCA11	57	34	34	0	0	0
NCA12	60	48	59	0	0	0
NCA13	53	40	46	0	0	0
NCA14	52	37	41	0	0	0
NCA15	56	36	82	26	8	2
NCA16	59	39	45	0	0	0
NCA17	53	35	44	0	0	0
NCA18	53	38	47	0	0	0
NCA19	50	39	> 90	46	42	7
NCA20	54	33	38	0	0	0
NCA23	54	32	40	0	0	0
NCA24	55	38	52	0	0	0
NCA25	52	37	53	1	1	0
NCA26	52	38	54	2	1	0
Total					**80**	**9**

Table 60 Out of hours work predicted noise – Tunnelling site establishment – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; excavation of decline						
NCA3	51	22	26	0	0	0
NCA6	51	29	53	2	4	0
NCA7	55	28	57	2	1	0
NCA8	50	25	30	0	0	0
NCA9	59	28	39	0	0	0
NCA10	61	30	46	0	0	0
NCA12	60	40	52	0	0	0
NCA13	53	27	35	0	0	0
NCA15	56	41	69	13	27	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA16	59	42	72	13	10	0
NCA17	53	37	52	0	0	0
NCA18	53	37	49	0	0	0
NCA19	50	36	62	12	7	0
NCA24	55	38	44	0	0	0
NCA25	52	36	52	0	0	0
NCA26	52	37	62	10	21	0
Total					**70**	**0**
Decline excavation and construction (No rock breaking)						
NCA3	51	25	28	0	0	0
NCA6	51	31	57	6	7	0
NCA7	55	30	61	6	2	0
NCA8	50	28	34	0	0	0
NCA9	59	30	43	0	0	0
NCA10	61	34	49	0	0	0
NCA12	60	44	55	0	0	0
NCA13	53	32	40	0	0	0
NCA15	56	44	73	17	35	0
NCA16	59	46	75	16	18	0
NCA17	53	40	56	3	6	0
NCA18	53	40	53	0	0	0
NCA19	50	40	66	16	16	0
NCA24	55	41	48	0	0	0
NCA25	52	40	55	3	2	0
NCA26	52	40	66	14	42	0
Total					**128**	**0**

Table 61 Out of hours work predicted noise – Tunnelling support site – Evening

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Tunnelling and support						
NCA6	51	34	52	1	2	0
NCA7	55	39	56	1	1	0
NCA9	59	32	38	0	0	0
NCA10	61	37	45	0	0	0
NCA12	60	39	51	0	0	0
NCA13	53	34	34	0	0	0
NCA15	56	40	68	12	23	0
NCA16	59	42	71	12	6	0
NCA17	53	37	51	0	0	0
NCA18	53	37	48	0	0	0
NCA19	50	36	61	11	7	0
NCA24	55	37	43	0	0	0
NCA25	52	36	51	0	0	0
NCA26	52	37	61	9	13	0
Total					**52**	**0**
Spoil handling						
NCA3	51	34	54	3	1	0
NCA4	56	66	67	11	16	0
NCA6	51	38	61	10	24	0
NCA7	55	48	65	10	13	0
NCA8	50	56	70	20	18	0
NCA9	59	36	47	0	0	0
NCA10	61	38	54	0	0	0
NCA12	60	31	35	0	0	0
NCA15	56	35	52	0	0	0
NCA16	59	38	55	0	0	0
NCA17	53	32	35	0	0	0
NCA26	52	34	45	0	0	0
Total					**72**	**0**
Tunnel lining						
NCA6	51	31	53	2	2	0
NCA7	55	37	56	1	1	0
NCA8	50	28	31	0	0	0
NCA9	59	29	39	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA10	61	29	45	0	0	0
NCA12	60	41	52	0	0	0
NCA13	53	33	36	0	0	0
NCA15	56	40	70	14	25	0
NCA16	59	43	72	13	4	0
NCA17	53	37	53	0	0	0
NCA18	53	36	50	0	0	0
NCA19	50	37	62	12	7	0
NCA24	55	38	44	0	0	0
NCA25	52	36	51	0	0	0
NCA26	52	37	62	10	17	0
Total					**56**	**0**

Table 62 Out of hours work predicted noise – Site establishment – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Power Generator						
NCA3	44	35	35	0	0	0
NCA4	45	48	50	5	15	0
NCA6	44	35	56	12	21	0
NCA7	49	38	58	9	3	0
NCA8	45	41	55	10	10	0
NCA9	48	32	36	0	0	0
NCA10	54	32	47	0	0	0
NCA18	48	32	43	0	0	0
NCA19	48	36	> 90	44	24	3
NCA20	45	31	31	0	0	0
NCA23	47	31	35	0	0	0
NCA24	47	34	42	0	0	0
NCA25	46	33	49	3	1	0
NCA26	46	32	41	0	0	0
Total					**74**	**3**

Table 63 Out of hours work predicted noise – Construction compound and car park generation operations (C1-C11) – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	45	39	41	0	0	0
NCA6	44	35	47	3	3	0
NCA7	49	36	49	0	0	0
NCA8	45	38	46	1	1	0
NCA10	54	37	38	0	0	0
NCA18	48	33	34	0	0	0
NCA19	48	33	83	35	9	1
NCA24	47	32	39	0	0	0
NCA25	46	32	40	0	0	0
NCA26	46	32	32	0	0	0
Total					**13**	**1**
Workshop; Deliveries; Maintenance storage						
NCA4	45	43	44	0	0	0
NCA6	44	25	50	6	7	0
NCA7	49	33	53	4	2	0
NCA8	45	35	50	5	6	0
NCA9	48	21	30	0	0	0
NCA10	54	25	40	0	0	0
NCA11	47	23	23	0	0	0
NCA18	48	27	36	0	0	0
NCA19	48	28	85	37	20	2
NCA20	45	23	27	0	0	0
NCA23	47	21	29	0	0	0
NCA24	47	27	41	0	0	0
NCA25	46	26	42	0	0	0
NCA26	46	22	35	0	0	0
Total					**35**	**2**

Table 64 Out of hours work predicted noise - Construction of motorway operations complexes – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA6	44	33	36	0	0	0
NCA7	49	31	40	0	0	0
NCA8	45	31	31	0	0	0
NCA10	54	37	38	0	0	0
NCA12	50	34	44	0	0	0
NCA13	47	31	31	0	0	0
NCA15	48	31	37	0	0	0
NCA19	48	32	39	0	0	0
NCA24	47	32	39	0	0	0
NCA25	46	33	36	0	0	0
NCA26	46	35	48	2	3	0
Total					**3**	**0**

Table 65 Out of hours work predicted noise – Local road works including construction of the Campbell Road bridge – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Road tie-in works						
NCA1	45	55	> 90	59	163	6
NCA2	44	48	74	30	265	0
NCA3	44	56	> 90	60	170	12
NCA4	45	> 90	> 90	55	17	16
NCA6	44	47	> 90	61	259	65
NCA7	49	65	> 90	54	49	13
NCA8	45	74	> 90	60	24	12
NCA9	48	38	44	0	0	0
NCA10	54	44	44	0	0	0
NCA11	47	61	> 90	47	27	5
Total					**974**	**129**
Kerbing and drainage						
NCA1	45	63	> 90	65	180	13
NCA2	44	57	83	39	335	2
NCA3	44	65	> 90	66	174	39

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA4	45	> 90	> 90	65	26	16
NCA6	44	53	> 90	66	425	107
NCA7	49	73	> 90	61	55	25
NCA8	45	82	> 90	65	24	15
NCA9	48	47	53	5	13	0
NCA10	54	52	53	0	0	0
NCA11	47	70	> 90	57	30	9
Total					**1262**	**226**
Pedestrian bridges to Campbell Road						
NCA2	44	32	33	0	0	0
NCA3	44	27	50	6	1	0
NCA4	45	58	75	30	16	0
NCA6	44	32	55	11	11	0
NCA7	49	42	63	14	19	0
NCA8	45	62	> 90	52	24	7
NCA10	54	31	31	0	0	0
Total					**71**	**7**
Campbell Road bridge						
NCA4	45	56	57	12	16	0
NCA6	44	37	42	0	0	0
NCA7	49	39.5	49	0	0	0
NCA8	45	48	52	7	11	0
NCA11	47	42	52	5	5	0
Total					**32**	**0**

Table 66 Out of hours work predicted noise – General utility installation and relocation – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Service installation and relocation						
NCA3	44	21	44	0	0	0
NCA4	45	56	73	28	16	0
NCA6	44	33	59	15	50	0
NCA7	49	42	62	13	12	0
NCA8	45	52	69	24	14	0
NCA9	48	29	39	0	0	0
NCA10	54	35	50	0	0	0
NCA11	47	32	37	0	0	0
NCA18	48	38	48	0	0	0
NCA19	48	38	> 90	44	57	7
NCA20	45	32	37	0	0	0
NCA23	47	29	39	0	0	0
NCA24	47	37	52	5	8	0
NCA25	46	36	54	8	6	0
NCA26	46	28	45	0	0	0
Total					**163**	**7**

Table 67 Out of hours work predicted noise – Construction of toll infrastructure – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Site establishment						
NCA15	48	34	49	1	5	0
NCA16	45	35	54	9	9	0
NCA17	48	36	52	4	4	0
NCA18	48	36	55	7	10	0
NCA25	46	34	35	0	0	0
NCA26	46	38	56	10	26	0
Total					**54**	**0**
Road works						
NCA15	48	46	64	16	140	0
NCA16	45	45	69	24	47	0
NCA17	48	46	66	18	156	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA18	48	46	70	22	113	0
NCA26	46	49	71	25	394	0
Total					**850**	**0**
Construction of toll gantries						
NCA15	48	34	52	4	12	0
NCA16	45	32	57	12	16	0
NCA17	48	34	54	6	17	0
NCA18	48	34	58	10	23	0
NCA26	46	37	59	13	65	0
Total					**133**	**0**

Table 68 Out of hours work predicted noise - Construction compound and car park generation operations – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
General worksite and car parking						
NCA4	45	39	41	0	0	0
NCA6	44	35	47	3	3	0
NCA7	49	36	49	0	0	0
NCA8	45	38	46	1	1	0
NCA10	54	37	38	0	0	0
NCA12	50	34	44	0	0	0
NCA13	47	31	31	0	0	0
NCA15	48	35	68	20	4	0
NCA16	45	30	31	0	0	0
NCA17	48	30	30	0	0	0
NCA18	48	33	34	0	0	0
NCA19	48	33	83	35	9	1
NCA24	47	32	39	0	0	0
NCA25	46	31	39	0	0	0
NCA26	46	32	39	0	0	0
Total					**17**	**1**
Maintenance storage; Workshop deliveries						
NCA3	44	20	33	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA4	45	45	46	1	8	0
NCA6	44	26	52	8	10	0
NCA7	49	35	55	6	2	0
NCA8	45	37	52	7	7	0
NCA9	48	23	32	0	0	0
NCA10	54	27	42	0	0	0
NCA11	47	25	25	0	0	0
NCA12	50	39	50	0	0	0
NCA13	47	31	37	0	0	0
NCA14	44	28	32	0	0	0
NCA15	48	27	73	25	8	0
NCA16	45	30	36	0	0	0
NCA17	48	26	35	0	0	0
NCA18	48	29	38	0	0	0
NCA19	48	30	87	39	22	2
NCA20	45	24	29	0	0	0
NCA23	47	23	31	0	0	0
NCA24	47	29	43	0	0	0
NCA25	46	28	44	0	0	0
NCA26	46	29	45	0	0	0
Total					**57**	**2**

Table 69 Out of hours work predicted noise – Tunnelling support establishment – Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Piling; excavation of decline (No rock hammering)						
NCA3	44	22	26	0	0	0
NCA6	44	29	53	9	11	0
NCA7	49	28	57	8	3	0
NCA8	45	25	30	0	0	0
NCA9	48	28	39	0	0	0
NCA10	54	30	46	0	0	0
NCA12	50	40	52	2	3	0
NCA13	47	27	35	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA15	48	41	69	21	70	0
NCA16	45	42	72	27	41	0
NCA17	48	37	52	4	7	0
NCA18	48	37	49	1	1	0
NCA19	48	36	62	14	11	0
NCA24	47	38	44	0	0	0
NCA25	46	36	52	6	4	0
NCA26	46	37	62	16	51	0
Total					**202**	**0**
Decline excavation and construction (No rock hammering)						
NCA3	44	25	28	0	0	0
NCA6	44	31	57	13	28	0
NCA7	49	30	61	12	6	0
NCA8	45	28	34	0	0	0
NCA9	48	30	43	0	0	0
NCA10	54	34	49	0	0	0
NCA12	50	44	55	5	11	0
NCA13	47	32	40	0	0	0
NCA15	48	44	73	25	108	0
NCA16	45	46	75	30	48	0
NCA17	48	40	56	8	19	0
NCA18	48	40	53	5	3	0
NCA19	48	40	66	18	20	0
NCA24	47	41	48	1	1	0
NCA25	46	40	55	9	19	0
NCA26	46	40	66	20	109	0
Total					**372**	**0**

Table 70 Out of hours work predicted noise – Tunnelling support site - Night

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
Tunnelling and support						
NCA6	44	34	52	8	7	0
NCA7	49	39	56	7	2	0
NCA9	48	32	38	0	0	0
NCA10	54	37	45	0	0	0
NCA12	50	39	51	1	2	0
NCA13	47	34	34	0	0	0
NCA15	48	40	68	20	59	0
NCA16	45	42	71	26	38	0
NCA17	48	37	51	3	6	0
NCA18	48	37	48	0	0	0
NCA19	48	36	61	13	9	0
NCA24	47	37	43	0	0	0
NCA25	46	36	51	5	3	0
NCA26	46	37	61	15	50	0
Total					**176**	**0**
Spoil handling						
NCA3	44	34	54	10	3	0
NCA4	45	66	67	22	16	0
NCA6	44	38	61	17	73	0
NCA7	49	48	65	16	22	0
NCA8	45	56	70	25	24	0
NCA9	48	36	47	0	0	0
NCA10	54	38	54	0	0	0
NCA12	50	31	35	0	0	0
NCA15	48	35	52	4	8	0
NCA16	45	38	55	10	3	0
NCA17	48	32	35	0	0	0
NCA26	46	34	45	0	0	0
Total					**149**	**0**
Tunnel lining						
NCA6	44	31	53	9	7	0
NCA7	49	37	56	7	2	0
NCA8	45	28	31	0	0	0
NCA9	48	29	39	0	0	0

NCA	L_{Aeq} Noise management level dB(A)	Predicted median L_{Aeq} noise level dB(A)	Predicted maximum L_{Aeq} noise level, dB(A)	Predicted highest exceedance of the NML, dB(A)	Number of receivers where NMLs are exceeded	Number of highly noise affected receivers
NCA10	54	29	45	0	0	0
NCA12	50	41	52	2	3	0
NCA13	47	33	36	0	0	0
NCA15	48	40	70	22	62	0
NCA16	45	43	72	27	39	0
NCA17	48	37	53	5	6	0
NCA18	48	36	50	2	1	0
NCA19	48	37	62	14	11	0
NCA24	47	38	44	0	0	0
NCA25	46	36	51	5	2	0
NCA26	46	37	62	16	48	0
Total					**181**	**0**

5.1.3 Sleep disturbance

Sleep disturbance is assessed using an $L_{A1(1\ min)}$ parameter, which is considered to be the maximum noise level excluding extraneous noise events. A sleep disturbance assessment has been undertaken for the proposed night works with the construction information available to date. The noise modelling results are provided in **Table 71** to **Table 79**, with predicted noise levels compared with the sleep disturbance screening criteria and the awakening reaction criteria. The results are also provided graphically in **Appendix I**.

Table 71 Sleep disturbance assessment – Site establishment

NCA	Predicted median $L_{A1(1\ min)}$ noise level dB(A)	Predicted highest $L_{A1(1\ min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Power Generator						
NCA3	43	43	54	0	65	0
NCA4	56	58	55	13	65	0
NCA6	43	64	54	13	65	0
NCA7	46	66	59	2	65	1
NCA8	49	63	55	7	65	0
NCA9	40	44	58	0	65	0
NCA10	40	55	64	0	65	0
NCA18	40	51	58	0	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A)	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA19	44	> 90	58	20	65	9
NCA20	39	39	55	0	65	0
NCA23	39	43	57	0	65	0
NCA24	42	50	57	0	65	0
NCA25	41	57	56	1	65	0
NCA26	40	49	56	0	65	0
Total				**56**		**10**

Table 72 Sleep disturbance assessment – Construction compound and car park generation operations (C1-C11)

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A)	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
General worksite and car parking						
NCA4	47	49	55	0	65	0
NCA6	43	55	54	1	65	0
NCA7	44	57	59	0	65	0
NCA8	46	54	55	0	65	0
NCA10	45	46	64	0	65	0
NCA18	41	42	58	0	65	0
NCA19	41	> 90	58	9	65	7
NCA24	40	47	57	0	65	0
NCA25	40	48	56	0	65	0
NCA26	40	40	56	0	65	0
Total				**10**		**7**
Workshop; Deliveries; Maintenance Storage						
NCA3	27	39	54	0	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A)	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA4	51	52	55	0	65	0
NCA6	33	58	54	4	65	0
NCA7	41	61	59	1	65	0
NCA8	43	58	55	3	65	0
NCA9	29	38	58	0	65	0
NCA10	33	48	64	0	65	0
NCA11	31	31	57	0	65	0
NCA18	35	44	58	0	65	0
NCA19	36	> 90	58	19	65	9
NCA20	31	35	55	0	65	0
NCA23	29	37	57	0	65	0
NCA24	35	49	57	0	65	0
NCA25	34	50	56	0	65	0
NCA26	30	43	56	0	65	0
Total				**27**		**9**

Table 73 Sleep disturbance assessment – Construction of motorway operations complexes

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A)	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
General worksite and car parking						
NCA6	41	44	54	0	65	0
NCA7	39	48	59	0	65	0
NCA8	39	39	55	0	65	0
NCA10	45	46	64	0	65	0
NCA12	42	52	60	0	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A)	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA13	39	39	57	0	65	0
NCA15	39	45	58	0	65	0
NCA19	40	47	58	0	65	0
NCA24	40	47	57	0	65	0
NCA25	41	44	56	0	65	0
NCA26	43	56	56	0	65	0
Total				**0**		**0**

Table 74 Sleep disturbance assessment – Local road works including construction of the Campbell Road bridge

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Road tie in works						
NCA1	63	> 90	55	153	65	67
NCA2	56	82	54	204	65	30
NCA3	64	> 90	54	168	65	75
NCA4	> 90	> 90	55	16	65	16
NCA6	55	> 90	54	243	65	156
NCA7	73	> 90	59	49	65	39
NCA8	82	> 90	55	24	65	23
NCA9	46	52	58	0	65	0
NCA10	52	52	64	0	65	0
NCA11	69	> 90	57	24	65	19
Total				**881**		**425**
Kerbing and drainage						
NCA1	71	> 90	55	177	65	151

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA2	65	> 90	54	334	65	154
NCA3	73	> 90	54	174	65	157
NCA4	> 90	> 90	55	26	65	16
NCA6	61	> 90	54	375	65	229
NCA7	81	> 90	59	53	65	49
NCA8	90	> 90	55	24	65	24
NCA9	55	61	58	7	65	0
NCA10	60	61	64	0	65	0
NCA11	78	> 90	57	30	65	24
Total				**1200**		**804**
Pedestrian and cyclist at Campbell Road						
NCA2	40	41	54	0	65	0
NCA3	35	58	54	1	65	0
NCA4	66	83	55	16	65	13
NCA6	40	63	54	8	65	0
NCA7	50	71	59	13	65	6
NCA8	70	> 90	55	24	65	15
NCA10	39	39	64	0	65	0
Total				**62**		**34**
Campbell Road bridge and Gardeners Road bridge construction						
NCA4	64	65	55	16	65	0
NCA6	45	50	54	0	65	0
NCA7	48	57	59	0	65	0
NCA8	56	60	55	8	65	0
NCA11	50	60	57	1	65	0
Total				**25**		**0**

Table 75 Sleep disturbance assessment – General utility installation and relocation

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Service installation and relocation						
NCA3	29	52	54	0	65	0
NCA4	64	81	55	16	65	11
NCA6	41	67	54	38	65	2
NCA7	50	70	59	9	65	2
NCA8	60	77	55	13	65	8
NCA9	37	47	58	0	65	0
NCA10	43	58	64	0	65	0
NCA11	40	45	57	0	65	0
NCA18	46	56	58	0	65	0
NCA19	46	> 90	58	47	65	26
NCA20	40	45	55	0	65	0
NCA23	37	47	57	0	65	0
NCA24	45	60	57	6	65	0
NCA25	44	62	56	5	65	0
NCA26	36	53	56	0	65	0
Total				**134**		**49**

Table 76 Sleep disturbance assessment – Construction of toll infrastructure

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Site establishment						
NCA15	42	57	58	0	65	0
NCA16	43	62	55	4	65	0
NCA17	44	60	58	1	65	0
NCA18	44	63	58	3	65	0
NCA25	42	43	56	0	65	0
NCA26	46	64	56	16	65	0
Total				**24**		**0**
Road works						
NCA15	55	73	58	125	65	49
NCA16	54	78	55	39	65	17
NCA17	55	75	58	141	65	36
NCA18	55	79	58	103	65	43
NCA26	58	80	56	370	65	101
Total				**778**		**246**
Construction of toll gantries						
NCA15	42	60	58	9	65	0
NCA16	40	65	55	9	65	0
NCA17	42	62	58	9	65	0
NCA18	42	66	58	14	65	1
NCA26	45	67	56	27	65	3
Total				**68**		**4**

Table 77 Sleep disturbance assessment – Construction compound and car park generation activities

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
General worksite and car parking						
NCA4	47	49	55	0	65	0
NCA6	43	55	54	1	65	0
NCA7	44	57	59	0	65	0
NCA8	46	54	55	0	65	0
NCA10	45	46	64	0	65	0
NCA12	42	52	60	0	65	0
NCA13	39	39	57	0	65	0
NCA15	43	76	58	4	65	3
NCA16	38	39	55	0	65	0
NCA17	38	38	58	0	65	0
NCA18	41	42	58	0	65	0
NCA19	41	> 90	58	9	65	7
NCA24	40	47	57	0	65	0
NCA25	39	47	56	0	65	0
NCA26	40	47	56	0	65	0
Total				**14**		**10**
Maintenance storage; Workshop deliveries						
NCA3	28	41	54	0	65	0
NCA4	53	54	55	0	65	0
NCA6	34	60	54	7	65	0
NCA7	43	63	59	2	65	0
NCA8	45	60	55	6	65	0
NCA9	31	40	58	0	65	0
NCA10	35	50	64	0	65	0
NCA11	33	33	57	0	65	0
NCA12	47	58	60	0	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA13	39	45	57	0	65	0
NCA14	36	40	54	0	65	0
NCA15	35	81	58	7	65	4
NCA16	38	44	55	0	65	0
NCA17	34	43	58	0	65	0
NCA18	37	46	58	0	65	0
NCA19	38	> 90	58	20	65	9
NCA20	32	37	55	0	65	0
NCA23	31	39	57	0	65	0
NCA24	37	51	57	0	65	0
NCA25	36	52	56	0	65	0
NCA26	37	53	56	0	65	0
Total				**42**		**13**

Table 78 Sleep disturbance assessment - Tunnelling support establishment

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Piling; excavation of decline						
NCA3	30	34	54	0	65	0
NCA6	37	61	54	7	65	0
NCA7	36	65	59	2	65	0
NCA8	33	38	55	0	65	0
NCA9	36	47	58	0	65	0
NCA10	38	54	64	0	65	0
NCA12	48	60	60	0	65	0
NCA13	35	43	57	0	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA15	49	77	58	50	65	23
NCA16	50	80	55	35	65	17
NCA17	45	60	58	5	65	0
NCA18	45	57	58	0	65	0
NCA19	44	70	58	7	65	1
NCA24	46	52	57	0	65	0
NCA25	44	60	56	2	65	0
NCA26	45	70	56	46	65	3
Total				**154**		**44**
Decline excavation and construction (No rock hammering)						
NCA3	33	36	54	0	65	0
NCA6	39	65	54	18	65	0
NCA7	38	69	59	4	65	2
NCA8	36	42	55	0	65	0
NCA9	38	51	58	0	65	0
NCA10	42	57	64	0	65	0
NCA12	52	63	60	4	65	0
NCA13	40	48	57	0	65	0
NCA15	52	81	58	82	65	34
NCA16	54	83	55	44	65	20
NCA17	48	64	58	13	65	0
NCA18	48	61	58	2	65	0
NCA19	48	74	58	16	65	5
NCA24	49	56	57	0	65	0
NCA25	48	63	56	10	65	0
NCA26	48	74	56	67	65	12
Total				**260**		**73**

Table 79 Sleep disturbance assessment – Tunnelling support site

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
Tunnelling and support						
NCA6	42	60	54	7	65	0
NCA7	47	64	59	2	65	0
NCA9	40	46	58	0	65	0
NCA10	45	53	64	0	65	0
NCA12	47	59	60	0	65	0
NCA13	42	42	57	0	65	0
NCA15	48	76	58	47	65	21
NCA16	50	79	55	34	65	15
NCA17	45	59	58	2	65	0
NCA18	45	56	58	0	65	0
NCA19	44	69	58	7	65	1
NCA24	45	51	57	0	65	0
NCA25	44	59	56	2	65	0
NCA26	45	69	56	41	65	1
Total				**142**		**38**
Spoil handling						
NCA3	42	62	54	2	65	0
NCA4	74	75	55	16	65	15
NCA6	46	69	54	42	65	8
NCA7	56	73	59	17	65	5
NCA8	64	78	55	24	65	11
NCA9	44	55	58	0	65	0
NCA10	46	62	64	0	65	0
NCA12	39	43	60	0	65	0
NCA15	43	60	58	6	65	0
NCA16	46	63	55	3	65	0

NCA	Predicted median $L_{A1(1min)}$ noise level dB(A))	Predicted highest $L_{A1(1min)}$ noise level dB(A))	$L_{A1(1min)}$ Sleep disturbance screening criteria, dB(A)		$L_{A1(1min)}$ Sleep disturbance awakening reaction criteria, dB(A)	
			Criteria	Number of receivers where criteria are exceeded	Criteria	Number of receivers where criteria are exceeded
NCA17	40	43	58	0	65	0
NCA18	41	50	58	0	65	0
NCA19	50	84	58	46	65	18
NCA20	43	45	55	0	65	0
NCA24	46	57	57	0	65	0
NCA25	47	58	56	2	65	0
NCA26	42	53	56	0	65	0
Total				**158**		**57**
Tunnel lining						
NCA6	39	61	54	7	65	0
NCA7	45	64	59	2	65	0
NCA8	36	39	55	0	65	0
NCA9	37	47	58	0	65	0
NCA10	37	53	64	0	65	0
NCA12	49	60	60	0	65	0
NCA13	41	44	57	0	65	0
NCA15	48	78	58	48	65	24
NCA16	51	80	55	35	65	12
NCA17	45	61	58	3	65	0
NCA18	44	58	58	0	65	0
NCA19	45	70	58	7	65	1
NCA24	46	52	57	0	65	0
NCA25	44	59	56	2	65	0
NCA26	45	70	56	42	65	3
Total				**146**		**40**

5.2 Cumulative noise assessment

5.2.1 Cumulative impacts from the project

Simultaneous noise, from works within a site compound and road construction works associated with the project, has the potential to increase noise levels at nearby sensitive receivers. Noise levels as a result of the cumulative impact could increase by up to 3 dB(A) higher than the maximum noise level predicted for the site compound works and alignment works individually. In addition an increase in the frequency of potential construction noise impacts may occur.

Detailed construction scheduling is not yet complete for the New M5 Motorway therefore it is not clear which works would occur concurrently with others. As noted above the maximum noise level increase would be 3 dB(A) on the maximum noise level predicted for the individual construction scenarios. It should be noted that an increase of this magnitude would be unlikely due to the following reasons:

- The construction noise assessment for each scenario has been completed on a worst case basis, assuming all equipment is operating simultaneously and are all positioned at the worst possible position within the construction footprint. If all equipment does not operate or if acoustic shielding or distance loss is provided the noise levels would be lower than presented in this technical paper
- It is likely that one scenario would be the dominant source at any residential receiver and therefore the cumulative impact would be less than an increase of 3 dB(A).

Given that the potential increase due to cumulative impacts is a maximum of 3 dB(A), which is widely accepted as being ‘just perceptible”, and is more likely to be less than 3 dB(A), it is not considered beneficial to provide further analysis at this stage. In any case all feasible and reasonable noise mitigation measures would be implemented and an increase of up to 3 dB(A) is unlikely to modify these mitigation measures.

Should any receivers become ‘highly noise affected’ due to concurrent noise activities, such receivers would be afforded additional consideration in accordance with the requirements of the *Interim Construction Noise Guideline*.

5.2.2 Cumulative impacts from other projects

Currently there are no major projects in the direct vicinity of the project that could result in cumulative construction noise impacts other than the King Georges Road Interchange Upgrade (KGRIU) project. The future M4-M5 Link and the future Sydney Gateway may also occur concurrently, subject to obtaining the relevant approvals.

Construction of the KGRIU project has commenced and is due for completion during 2017. Construction of the KGRIU project may occur in the vicinity of the project. It is also possible that construction road traffic from the KGRIU project and the New M5 project may use some common routes. As the New M5 would commence construction mid-2016, it is expected that there would be an overlap period of up to 12 months.

The NCAs potentially impacted by cumulative noise from the project and the KGRIU project are located close to the western extent of the project. Four NCAs lie to the west of King Georges Road, NCA27 – NCA30, and six NCAs lie to the east of King Georges Road, NCA19 – NCA24.

There is a large offset between the construction compound works for the New M5 and the NCAs located to the west of King Georges Road. These NCAs would only be affected by road surface works of the New M5, located to the east of King George Road, which are limited to daytime and evening periods only. Therefore any cumulative noise impacts would be limited to less critical periods of the day. The New M5 surface work stages which are likely to impact these NCAs would be road tie-in works and large exceedances of the construction noise management levels are not expected. Considering the KGRIU works would be dominant, cumulative construction noise levels are not likely to increase significantly from the levels predicted for the KGRIU project.

Works for both projects east of King Georges Road share a similar roadworks construction footprint, therefore it would not be possible for simultaneous works to be completed for both projects in the same area. Construction compounds used by both projects are sufficiently offset from each other for cumulative impacts to be negligible. Therefore for NCAs east of King Georges Road cumulative impacts are limited to situations where KGRIU road surface works occur concurrently with tunnelling or compound operations from the New M5 or the New M5 road surface works occur concurrently with compound operations from the KGRIU. In either case one set of works would be dominant and so the cumulative increase is likely to be less than 3 dB(A). Cumulative impacts would be limited to daytime and evening periods only.

It should be noted that the construction noise assessments assume that a reasonable composition of construction equipment operate simultaneously and are all positioned at the worst possible position within the construction footprint. On-site, all equipment considered would not always be operating simultaneously and noise from mobile equipment would incur higher levels of shielding from construction hoarding and buildings than modelled.

The cumulative noise impacts of nearby major projects such as the KGRIU project should be further considered during detailed construction planning for the New M5. Consultation should be undertaken with the KGRIU contractors to manage cumulative impacts on sensitive receivers within common areas. Feasible and reasonable mitigation measures should be detailed in the CNVMP.

Subject to environmental planning approval, there is the potential for construction of the future M4-M5 Link to commence in 2019 when the New M5 would be in the late stages of construction. The future Sydney Gateway may also commence in early 2018.

It is expected that peak construction of the New M5 would be complete, and the construction activities would largely comprise mechanical and electrical fit-out and landscaping and rehabilitation works.

There is the potential for localised cumulative construction works around the St Peters interchange as a result of the future M4-M5 Link or Sydney Gateway. This includes a portion of the site potentially used for a construction compound for the future M4-M5 Link. As the New M5 and these projects would likely be at different stages and unlikely to have concurrent peak construction periods, and the local road upgrades would be complete, it is expected that the potential for significant cumulative noise impacts would be limited.

During construction, ongoing consultation would be undertaken with local communities potentially affected by concurrent construction of projects that form part of the WestConnex program of works. Additionally, consultation would be undertaken with proponents of other nearby projects to increase the overall awareness of project timeframes and impact.

5.3 Ground-borne L_{Aeq} noise levels

The ground-borne noise experienced in any residential property would be dependent on the generation and propagation of vibration associated with tunnelling activities. For this project vibration would be generated during tunnelling from the operation of road headers. Typically road headers generate less vibration than tunnel-boring machines.

From the source vibration propagates through the ground, decreasing over distance. The rate at which the vibration decreases over distance is highly variable and dependent on factors such as the soil or rock type, which affect the speed of wave propagation and the damping provided. When vibrations reach a building they enter the foundations, which are subject to a coupling loss and are then transmitted into the walls and ceiling. The excitation of the walls and ceiling results in the generation of low-frequency noise which could be audible if the vibration levels are high enough. The noise is typically considered to be a low ‘rumble’.

The noise that is generated within a room is highly dependent on the soil and rock strata, the distance to the source and the construction of the building. AECOM have undertaken a conservative assessment to determine the likely ground-borne noise impact on a building construction that would experience elevated noise levels when compared to other constructions. The prediction of ground-borne noise has been based on previous measurements of tunnelling activities from road headers and tunnel-boring machines in Sydney, using methods in accordance with ISO14837: Mechanical vibration - Ground-borne noise and vibration arising from rail systems, where relevant. The measurements demonstrate an exponential relationship. Peak particle velocities were predicted at receiver locations based on the slant distance from the alignment assuming uniform ground conditions.

Ground-borne L_{Aeq} noise levels have been calculated for properties located above the main tunnel alignments, as well as the M4-M5 Link stubs.

The results are provided in **Table 80**. The maximum exceedance would be up to 5 dB(A) during the evening time and up to 10 dB(A) during the night-time period. The results are also provided graphically in Appendix J.

Table 80 Ground-borne noise assessment – tunnelling activities

L_{Aeq} Criteria		Number of receivers where criteria are exceeded	
Evening	Night-time	Evening	Night-time
40 dB(A)	35 dB(A)	60	369

Tunnelling would typically progress around a maximum of seven metres per day. It is likely that ground-borne noise would be discernible for up to five days at each affected receiver with exceedances occurring for up to two days. Tunnelling advance rates would reduce to two to five metres a day around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the noise levels experienced would be lower.

It is noted that there is no daytime criterion for ground-borne noise. However, noise levels during the daytime would be consistent with predicted levels during the evening and night time periods.

The predicted ground-borne noise levels presented in this section are considered typical for construction works of this nature. There are no practical vibration mitigation opportunities for this type of work and management measures must be relied upon. Noise and vibration management measures are discussed further in **Chapter 7.0**.

5.4 Construction road traffic noise

Construction road traffic noise would be generated by vehicles associated with the construction of the project, including heavy vehicles transporting spoil and light vehicle movements generated by construction workers.

For the purposes of the construction traffic impact assessment, the period of construction activity that generates the peak volume of heavy vehicles was assessed to represent the worst case scenario. This peak construction period assumes that 80 per cent of heavy vehicle volumes would be associated with spoil related activities and remaining 20 per cent would comprise of delivery vehicles associated with other activities associated with construction activities.

Construction vehicles movements would be generated by all compounds, however, the Kingsgrove South construction compound vehicles would access/depart via the Kingsgrove North construction compound. Tunnel support compounds, which would generate the majority of spoil vehicles, are located at Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Arncliffe (C7) and Canal Road (C8) construction compounds.

The nominated construction vehicles routes to/from compounds are identified in the Technical Working Paper: Traffic and Transport. The majority of traffic flows would occur on major roads and compounds have been selected to minimise the use of local roads. However, construction vehicles may use local roads that do not form part of the construction compound vehicle routes to access construction areas (such as along local roads that are subject to construction activities). However, these would not constitute major haulage routes.

For the purposes of the road traffic noise assessment during construction, the following assumptions have been made:

- The hourly movement during the peak and off-peak periods would remain at a constant per hour during the nominated period. This would be irrespective of changes in construction activity over a 24 hour period, where construction activities at some compounds would reduce during evening and night time periods
- The traffic movements predicted to occur during that hour would be occurring on all nominated construction vehicle routes
- During off-peak periods, the minimum hourly movement for existing traffic volumes has been applied
- All construction vehicles would be on the road network at the same time (presenting a cumulative impact).

As a result, this assessment has assumed a worst case scenario.

For the purposes of this assessment, the construction noise assessment has been grouped as follows:

- Kingsgrove area, which encompasses the construction routes for the Kingsgrove North, Kingsgrove South and Commercial Road construction compounds

- Bexley area, which encompasses the construction routes for the Bexley Road North, South and East construction compounds
- Arncliffe area, which encompasses the construction routes for the Arncliffe construction compound
- St Peters area, which encompasses the construction routes for the Canal Road, Campbell Road, Landfill Closure, Burrows Road, Campbell Road bridge, Gardeners Road bridge and Sydney Park construction compounds.

Residential receivers along local roads that would be used by the Bexley Road East construction compound (being Wolli Avenue, Frost Street, and Douglas Street) would experience a minor increase in traffic flow of 16 light vehicles in any hour of the day. The increased traffic flow is associated with cars arriving or departing at the Bexley East construction compound carpark. The noise increase due to this volume of cars would be considerably low. The minimum existing traffic flow would need to be 27 cars per hour for a relative increase of 2 dB to arise. The dominant noise environment is likely to be influenced by heavy traffic along Bexley Road rather than local traffic. For this reason, the increased traffic flows for these roads have not been considered further.

5.4.1 Peak Movements

Provided in **Table 81** and **Table 82** are summaries of the existing, forecasted additional traffic flow and the resultant noise increases for the AM and PM peak periods. These periods occur between 6:30 am and 9:30 am and between 3:30 pm and 7:00 pm.

Table 81 Construction road traffic during AM peak hour

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Kingsgrove area					
Wirega Avenue	353	35	39	73	3.1
Moorefields Road – West of Wirega Avenue	1242	41	39	73	1.6
M5 East Motorway – West of Kingsgrove construction compounds	6524	539	39	73	0.2
M5 East Motorway – East of Kingsgrove construction compound	6524	539	39	73	0.2
Kingsgrove Road – North of M5 East Motorway	2671	189	39	73	0.7
Moorefields Road – East of Wirega Avenue	1505	45	39	73	1.4
Commercial Road	1038	24	39	73	2.0
Kingsgrove Road – South of M5 East Motorway	2339	58	39	73	1.0
M5 East Motorway – East of Kingsgrove Road	6524	539	39	73	0.2
Bexley area					
Bexley Road, between M5 East Motorway and M5 East Motorway on-ramp	2974	98	40	36	0.4
M5 East Motorway – West of Bexley Road	6010.8	454.2	40	36	0.1

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
M5 East Motorway – West of King Georges Road	6524	539	40	36	0.1
Canterbury Road – Between King Georges Road and Bexley Road	1884.4	119.6	40	36	0.5
Bexley Road, north of M5 East Motorway	3103	93	40	36	0.4
Bexley Road, south of M5 East Motorway	2974	98	40	36	0.4
Stoney Creek Road	4753.6	312.4	40	36	0.2
Arncliffe area					
Marsh Street – North of Innesdale Road	4503	182	17	60	0.4
Marsh Street – Between Innesdale Road and Valda Avenue	4186	177	17	60	0.4
Marsh Street – Between M5 East Motorway and West Botany Street	3111	171	17	60	0.5
West Botany Street - North of M5 East Motorway	596	24	17	60	2.3
West Botany Street - South of M5 East Motorway	3448	106	17	60	0.5
Wickham Street	1992	113	17	60	0.8
Princes Highway – South of Forest Road	3548	111	17	60	0.4
St Peters area					
Princes Highway – North of Campbell Road	2633	114	134	113	1.2
Campbell Road – West of compound	927	43	134	113	3.0
Campbell Road – East of compound	949	112	134	113	2.1
Burrows Road – Northern end	782	151	134	113	1.9
Burrows Road – Southern end	748	27	134	113	3.7
Canal Road	2639	119	134	113	1.2
Princes Highway – South of Canal Road	4449	182	134	113	0.8
Princes Highway – Between Campbell Road and Canal Road	3006	127	134	113	1.1

Table 82 Construction road traffic during PM peak hour

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Kingsgrove area					
Wirega Avenue	321	50	39	73	2.8
Moorefields Road – West of Wirega Avenue	1129	58	39	73	1.6
M5 East Motorway – West of Kingsgrove construction compounds	4762	655	39	73	0.2
M5 East Motorway – East of Kingsgrove construction compounds	4762	655	39	73	0.2
Kingsgrove Road – North of M5 East Motorway	1173	100	39	73	1.3
Moorefields Road – East of Wirega Avenue	1368	64	39	73	1.4
Commercial Road	944	34	39	73	2.0
Kingsgrove Road – South of M5 East Motorway	1027	31	39	73	1.9
M5 East Motorway – East of Kingsgrove Road	4762	655	39	73	0.2
Bexley area					
Bexley Road, between M5 East Motorway and M5 East Motorway on-ramp	1306	52	40	36	0.8
M5 East Motorway – West of Bexley Road	5289	771	40	36	0.1
M5 East Motorway – West of King Georges Road	4762	655	40	36	0.1
Canterbury Road – Between King Georges Road and Bexley Road	1713	170	40	36	0.5
Bexley Road, north of M5 East Motorway	1362	49	40	36	0.8
Bexley Road, south of M5 East Motorway	1306	52	40	36	0.8
Stoney Creek Road	2087	165	40	36	0.4

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Arncliffe area					
Marsh Street – North of Innesdale Rd	3691	139	17	60	0.4
Marsh Street – Between Innesdale Road and Valda Avenue	3431	135	17	60	0.5
Marsh Street – Between M5 East Motorway and West Botany Street	2550	131	17	60	0.6
West Botany Street – North of M5 East Motorway	904	125	17	60	1.1
West Botany Street – South of M5 East Motorway	2543	154	17	60	0.6
Wickham Street	1469	165	17	60	0.8
Princes Highway – South of Forest Road	2617	162	17	60	0.5
St Peters area					
Princes Highway – North of Campbell Road	1934	84	134	113	1.6
Campbell Road – West of compound	810	46	134	113	3.1
Campbell Rd - East of compound	829	120	134	113	2.1
Burrows Road – Northern end	683	162	134	113	1.9
Burrows Road – Southern end	653	29	134	113	3.8
Canal Road	1938	88	134	113	1.6
Princes Highway – South of Canal Road	3268	134	134	113	1.0
Princes Highway – Between Campbell Road and Canal Road	2208	94	134	113	1.4

5.4.2 Off-peak movements

Provided in **Table 83** and **Table 84** are summaries of the existing, forecasted additional traffic flow and the resultant noise increase during the period of time when existing traffic flows are likely to be at the lowest over a 24 hour period. For this assessment, the lowest off-peak hours are between 9:30 am – 3:30 pm and 7:00 pm – 6:30 am. Only vehicles associated with the tunnel support compounds would be using the road network at this hour.

Table 83 Construction road traffic during AM off-peak hour

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Kingsgrove area					
Wirega Avenue	229	7	52	102	6.4
Moorefields Road – West of Wirega Avenue	806	9	52	102	3.3
M5 East Motorway – West of Kingsgrove construction compounds	3643	107	52	102	0.7
M5 East Motorway – East of Kingsgrove construction compounds	3643	107	52	102	0.7
Kingsgrove Road – North of M5 Motorway	611	22	52	102	3.5
Moorefields Road – East of Wirega Avenue	977	9	52	102	2.9
Commercial Road	674	5	52	102	3.8
Kingsgrove Road – South of M5 East Motorway	535	7	52	102	4.3
M5 East Motorway – East of Kingsgrove Road	3643	107	52	102	0.7
Bexley area					
Bexley Road, between M5 East Motorway and M5 East Motorway on-ramp	681	11	20	36	1.6
M5 East Motorway – West of Bexley Road	3925	229	20	36	0.2
M5 East Motorway – West of King Georges Road	3643	107	20	36	0.2
Canterbury Road – Between King Georges Road and Bexley Road	1224	25	20	36	1.0
Bexley Road, north of M5 East Motorway	710	11	20	36	1.6
Bexley Road, south of M5 East Motorway	681	11	20	36	1.6
Stoney Creek Road	1088	36	20	36	1.0

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Arncliffe area					
Marsh Street – North of Innesdale Road	2275	77	15	38	0.5
Marsh Street - Between Innesdale Road and Valda Avenue	2115	75	15	38	0.5
Marsh Street – Between M5 East Motorway and West Botany St	1572	72	15	38	0.6
West Botany Street – North of M5 East Motorway	588	28	15	38	1.6
West Botany Street - South of M5 East Motorway	1598	35	15	38	0.8
Wickham Street	923	37	15	38	1.1
Princes Highway – South of Forest Road	1645	36	15	38	0.6
St Peters area					
Princes Highway – North of Campbell Road	1065	29	120	83	2.2
Campbell Road – West of compound	158	4	120	83	7.9
Campbell Rd – East of compound	161	9	120	83	6.9
Burrows Road – Northern end	133	13	120	83	6.8
Burrows Road – Southern end	127	2	120	83	8.9
Canal Road	1068	31	120	83	2.2
Princes Highway – South of Canal Road	1800	47	120	83	1.5
Princes Highway – Between Campbell Road and Canal Road	1216	33	120	83	2.0

Table 84 Construction road traffic during PM off-peak hour

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Kingsgrove area					
Wirega Avenue	39	6	52	102	10.5
Moorefields Road – West of Wirega Avenue	137	7	52	102	7.7
M5 East Motorway – West of Kingsgrove construction compound	439	61	52	102	2.7
M5 East Motorway – East of Kingsgrove Construction Compound	439	61	52	102	2.7
Kingsgrove Road – North of M5 Motorway	54	13	52	102	8.4
Moorefields Road – East of Wirega Avenue	165	8	52	102	7.1
Commercial Road	114	4	52	102	8.7
Kingsgrove Road – South of M5 East Motorway	47	4	52	102	11.2
M5 East Motorway – East of Kingsgrove Road	439	61	52	102	2.7
Bexley area					
Bexley Road, between M5 East Motorway and M5 East Motorway on-ramp	60	7	20	36	6.0
M5 East Motorway – West of Bexley Road	508	146	20	36	0.7
M5 East Motorway – West of King Georges Road	439	61	20	36	1.2
Canterbury Road – Between King Georges Road and Bexley Road	207	22	20	36	2.7
Bexley Road, north of M5 East Motorway	62	6	20	36	6.0
Bexley Road, south of M5 East Motorway	60	7	20	36	6.0
Stoney Creek Road	96	21	20	36	3.5

Route/Direction	Existing (hourly)		Additional (hourly)		Relative noise level increase, dB(A)
	Light	Heavy	Light	Heavy	
Arncliffe area					
Marsh Street – North of Innesdale Road	201	36	15	38	2.2
Marsh Street – Between Innesdale Road and Valda Avenue	187	35	15	38	2.3
Marsh Street – Between M5 East Motorway and West Botany St	139	34	15	38	2.5
West Botany Street – North of M5 East Motorway	111	18	15	38	3.6
West Botany Street – South of M5 East Motorway	243	19	15	38	2.7
Wickham Street	140	20	15	38	3.3
Princes Highway – South of Forest Road	250	20	15	38	2.4
St Peters area					
Princes Highway – North of Campbell Road	233	23	120	83	4.8
Campbell Road – West of compound	59	3	120	83	10.9
Campbell Rd – East of compound	61	7	120	83	9.1
Burrows Road – Northern end	50	10	120	83	8.7
Burrows Road – Southern end	48	2	120	83	12.1
Canal Road	234	24	120	83	4.7
Princes Highway – South of Canal Road	394	37	120	83	3.5
Princes Highway – Between Campbell Road and Canal Road	266	26	120	83	4.4

The predicted increase in road traffic noise for the AM and PM peak periods are expected to generally be under 2 dB(A) and are therefore within the recommended construction traffic noise goal. Exceptions to this, where there are existing residential receivers, include Wirega Avenue and West Botany Street (north of M5 East Motorway).

The predicted increase in road traffic noise for the AM off-peak periods around the Bexley and Arncliffe areas are less than 2 dB(A). In the areas surrounding the Kingsgrove and St Peters area increases of more than 2 dB(A) would be expected.

During the quietest periods of the night-time the predicted increases in road traffic noise around all the construction compounds are more than 2 dB(A). It is noted that given the speed limits on the local roads and the road gradients and curvatures it is unlikely that engine compression braking would be utilised by construction traffic.

Spoil would be moved during the day where practical, and feasible and reasonable management strategies would be investigated, in consultation with the NSW Environment Protection Authority, to minimise the volume of heavy vehicle movements at night. These would be detailed in the Construction Noise and Vibration Management Plan and implemented in accordance with the *Interim Construction Noise Guideline*. Further discussion on noise management measures is provided in **Section 7.2.1**.

5.5 Construction vibration

5.5.1 Surface works

In order to comply with the cosmetic/structural damage and human discomfort criteria presented in **Section 4.2** the safe working distances presented in **Table 85** should not be encroached.

Table 85 Recommended safe working distances for vibration intensive plant

Plant	Rating/description	Safe working distance	
		Cosmetic damage (metres)	Human response (metres)
Vibratory roller	< 50 kN (Typically 1-2 T)	5	15-20
	< 100 kN (Typically 2-4 T)	6	20
	< 200 kN (Typically 4-6 T)	12	40
	< 300 kN (Typically 7-13 T)	15	100
	> 300 kN (Typically 13-18 T)	20	100
	> 300 kN (> 18 T)	25	100
Small hydraulic hammer	(300 kg – 5-12 T excavator)	2	7
Medium hydraulic hammer	(900 kg – 12-18 T excavator)	7	23
Large hydraulic hammer	(1,600 kg – 18-34 T excavator)	22	73
Vibratory pile driver	Sheet piles	2-20	20
Pile boring	≤ 800 mm	2 nominal	N/A
Jack hammer	Handheld	Avoid contact with structure	Avoid contact with structure

Note: More stringent conditions may apply to heritage or other sensitive structures. Any heritage property would need to be considered on a case

Depending on the construction equipment that is used, the safe working distances outlined in **Table 85** may be encroached. The primary form of mitigation of vibration would be ensuring vibration intensive works do not occur within the safe working distances. If vibration intensive works are planned within the safe working distances identified, alternative equipment would be identified and vibration monitoring would be implemented. Further mitigation of vibration would not be required where the safe working distances are adhered to.

In some circumstances, construction activity within the safe working distance cannot be avoided due to the work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced, resulting in a potential change in operating equipment. Approaches to manage such circumstances are discussed in **Chapter 7.0**.

5.5.2 Tunnel works

Vibration associated with the use of road headers has been calculated for properties located above the main tunnel alignments. The number of receivers where the criteria are exceeded is provided in **Table 86**. The results are also provided graphically in **Appendix K**.

This assessment relates to human comfort. The structural damage criteria would not be exceeded by the tunnelling activities.

Tunnelling would typically progress around a maximum of seven metres per day, it is likely that vibration would be discernible for up to five days at each affected receiver with exceedances occurring for up to two days. Tunnelling advance rates would reduce to two to five metres a day around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the vibration experienced would be lower.

Table 86 Vibration assessment – tunnelling activities

Human comfort peak particle velocity criteria			Number of receivers where criteria are exceeded	
	Evening	Night-time	Evening	Night-time
Preferred	0.28 mm/s	0.2 mm/s	0	163
Maximum	0.56 mm/s	0.4 mm/s	0	0

The preferred and maximum criteria relate to how sensitive people may be to the vibration generated. By proper management such as informing affected receivers that they may feel vibration and providing complaint hotlines, the sensitivity to vibration can be reduced.

Considering the works are not ongoing (generally receivers would not be impacted by the project for greater than a week) and that appropriate management measures would be implemented, the maximum criteria should be applied. This is consistent with other recent major infrastructure projects.

5.5.3 Blasting

Blasting would be undertaken along the length of the alignment during the excavation of the tunnel. Impacts created by blasting are largely dependent on the blast methodology. The size of the charge, spaces between charge and timing between charges results in a large variability in the vibration generated by a blast. This variability necessitates the use of a specialised blast consultant to design blasts to achieve compliance with the applicable vibration criteria.

Using the formula provided in AS2187.2-2006 'Explosives – Storage and use – Use of explosives', the maximum effective charge mass per delay to achieve compliance with the criteria is calculated to be 7 kilograms at a depth of 30 metres. However the standard notes *"In practice due to variations in ground conditions and other factors, the resulting vibration levels can vary from two-fifths to four times that estimated"*. As such, this information should be used as an indicative guide only.

It is recommended that a certified blast engineer undertake test blasts when undertaking blasting in new areas across the project. The blast should be designed to ensure compliance with the blast criteria specified in **Section 4.4**.

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6.0 Operational noise assessment

6.1 Road traffic noise assessment

This assessment is limited to the New M5, which would extend from St Peters to Beverly Hills. The opening of Westconnex M4-M5 link, the Sydney Gateway and Southern extension in 2023, which would link to the St Peters interchange, would increase direct traffic flows through infrastructure delivered as part of the project.

The noise mitigation requirements have been assessed based on the most stringent scenario, which is the assessed Year of Opening for WestConnex New M5 (2021). The noise impact at the Design Year (2031) assuming the future stages of the WestConnex program of works are in operation has also been included in the assessment to ensure that all impacts have been considered adequately.

Results have been presented for the following scenarios:

- **Year 2021 No Build scenario -** Year of opening (2021) with M4 Widening and King Georges Road Interchange Upgrade only in operation.
- **Year 2021 Build scenario -** Year of opening (2021) with M4 Widening, King Georges Road Interchange Upgrade and New M5 only in operation.
- **Year 2031 No Build scenario** - Design Year (2031) with WestConnex M4 Widening, King Georges Road Interchange Upgrade only in operation.
- **Year 2031 Build scenario -** Design Year (2031) with the full WestConnex program of works are operation (including the future M4-M5 Link) and the future Southern extension.

The assessment has been completed in accordance with the *Road Noise Policy*, the *Noise Criteria Guideline* and the *Noise Mitigation Guideline*. The *Noise Criteria Guideline* and the *Noise Mitigation Guideline* provide details of the practical application of the criteria presented in the *Road Noise Policy*.

To assess the potential impacts of the project on noise sensitive receivers, the following steps have been completed:

- Existing road traffic noise levels have been modelled with existing (2014/2015) road traffic volumes. This model has been validated with noise measurements and road traffic surveys. This is discussed further in **Section 6.1.3**.
- Future road traffic noise levels have been modelled for the Build (with project) and No Build (without project) scenarios for the year of opening (2021). This is discussed further in **Section 6.1.4** and results are presented in **Section 6.1.7** and **Section 6.1.9**. This model included a replacement barrier at Beverly Grove Park.
- Future road traffic noise levels with WestConnex program of works and future Southern extension in operation for both the Build (with project) and No Build (without project) scenarios for the design year (2031) have also been modelled. This is discussed further in **Section 6.1.4** and results presented in **Section 6.1.7** and **Section 6.1.9**.

6.1.1 Road traffic noise modelling methodology

Road traffic noise levels were calculated using SoundPLAN v7.3 software, which implements the Calculation of Road Traffic Noise (CoRTN) algorithm. The UK Department of Transport devised the CoRTN algorithm and with suitable corrections, this method has been shown to give accurate predictions of road traffic noise under Australian conditions.

The modelling parameters which are included in the model are detailed in **Table 87**.

Table 87 Modelling noise parameters

Parameter	Comment
Traffic volumes and mix	The number of vehicles using the road and the percentage of heavy vehicles. A higher percentage of heavy vehicles would increase the road traffic noise levels. Existing traffic volumes were obtained from traffic count data recorded at various locations along the proposed alignment. Predicted traffic volumes for the year of opening (2021) for both the No Build and Build scenarios and for the design year (2031) for both the No Build and the Build with and without WestConnex program of works (including the future M4-M5 Link) and the Southern extension were sourced from traffic modelling as presented within Section 4.1.1 of the Technical Working Paper: Traffic and transport (AECOM, 2015). Modified additional local road arrangements have been included in the traffic modelling for May Street/Princes Highway intersection and Mitchell Road/Sydney Park Road intersection. Roads and Maritime would monitor the traffic movements at these locations closely upon opening of the New M5 and, if required and subject to the successful outcome of further consultation with the local councils, stakeholders and community, plan to implement localised schemes. Further detail can be found in Section 4.1.3.2 of the Technical working paper: Traffic and transport (AECOM, 2015) for the project.
Traffic speeds	An increase in speed generally causes an increase in road traffic noise. Traffic speeds have been based on posted road speeds for existing roads and proposed speeds for the main alignment (80 kilometres per hour), ramps and local roads (60 kilometres per hour).
Traffic noise source heights	Road traffic noise is generally considered to comprise three source heights: Light vehicles: 0.5 metres. Truck tyres and engines: 1.5 metres. Truck exhausts: 3.6 metres. Corrections were made to the road traffic noise model to take account of the relative source contributions of the truck tyres and engines (-0.6 dB(A)) and truck exhausts (-8.6 dB(A)) compared with light vehicle sources.
Roadway gradient	Road traffic noise level s vary dependent on the gradient of the roadway compared with a flat roadway. CoRTN calculates this variation, however it does not take into account noise from heavy vehicle engine braking.
Road surface	Road surface characteristics would determine the level of road / tyre interfacial noise created. Dense graded asphalt (DGA) is accepted as the standard road surface with other road surfaces such as open graded asphalt (OGA) being considered a 'low noise' surface. Transversely tyned concrete road surfaces generate more road / tyre interfacial noise than DGA. OGA road surfaces were modelled on the New M5, DGA surfaces were modelled for the St Peters Interchange and surrounding roads. Corrections were applied to the road traffic noise model to account for the proposed road surfaces in accordance with direction provided by Roads and Maritime. The following corrections were applied: - OGA / SMA: -2 dB(A) - DGA: 0 dB(A) - PCP / CRCP: +3 dB(A)
Ground absorption	Road traffic noise levels reduce with increasing distance from the noise source along the ground. Ground absorption factors of 0.75 through areas of vegetation and 0.5 through urban areas were applied.

Parameter	Comment
Terrain	Natural topographical features such as hills and valleys can shield sensitive receivers from road traffic noise. These effects are taken account of in the model which incorporates one metre terrain contours.
Buildings	The height of receiver buildings in the study area affects the road traffic noise exposure. It can also affect the amount of acoustic shielding provided to other nearby buildings. The height of all buildings within the study area was determined through a ground-truthing exercise and the heights were then included in the road traffic noise model.
Noise barriers	Existing noise barrier locations and heights were largely provided by the survey data. The heights of these barriers were estimated from site inspections.
Facade	A correction of 2.5 dB(A) was added to all road traffic noise levels to take account of façade reflection effects in accordance with the *NSW Road Noise Policy*. Noise levels have been calculated and assessed at each façade of each sensitive receiver location. Only the most affected façade for each receiver is presented in this report.
Road network	All existing and proposed major roads were included in the noise model. For this project noise levels at sensitive receiver locations are predominantly controlled by the main alignment of the motorway and other arterial roads and highways. This was verified by attended noise measurements throughout the study extents of the project. On this basis local roads have been excluded in the noise modelling.
Standard corrections	CoRTN provides L_{A10} road traffic noise levels. The industry standard correction of -3 dB(A) was applied to convert the L_{A10} levels to L_{Aeq} road traffic noise levels to allow assessment of the results against the *Road Noise Policy* and *Noise Criteria Guideline* criteria. ARRB's Australian condition correction of -1.7 dB(A) has been applied.

6.1.2 Study areas

The study area for the operational road traffic noise assessment has been divided into two study areas:

- The western study area which accounts for areas impacted by the western surface works
- St Peters interchange and the local road upgrades.

This reflects where the project would involve works at the surface and where the tunnels would emerge to the surface.

The *NSW Road Noise Policy* defines the study areas as comprising locations within a distance of 600 metres from the centre line of the outermost traffic lane on each side of the each road under consideration. However in highly urban areas such as around St Peters interchange, a boundary width either side of the project of 600 metres may include other significant roads with noise levels that dominate at nearby receivers. In accordance with the Roads and Maritime's *Noise Criteria Guideline* the width of the study area has been reduced to where the noise levels from the project contribute slightly less than half of the total noise level. This is considered to be where the project adds no more than 2.0 dB(A) to the total noise level. These boundaries have been adjusted to coincide with natural boundaries such as roads, as far as possible. A map of the St Peters interchange area is provided in **Appendix F**.

6.1.3 Existing road traffic noise model

An existing road traffic noise model was developed incorporating the existing traffic flows and alignment for validation with road traffic noise measurements. The traffic flows used in the model were provided by tube counts that were deployed concurrently with noise logging for the project. Noise logging charts are provided in **Appendix D**. Road traffic volumes are presented in **Appendix E**.

If it can be proven that the predicted road traffic noise levels are accurate at discrete locations across the extents of a project, then it is reasonable to assume that the road traffic noise levels are accurate at all modelled receivers. Furthermore, it can be assumed that if the same road traffic noise model is updated to include the project design model parameters (eg including alignment, traffic flow etc), then the design noise model would predict to the same level of accuracy.

As discussed in **Section 6.1.1**, the CoRTN algorithm was utilised to calculate road traffic noise. For a project corridor of 600 metres either side of the road, this algorithm has a well-documented accuracy of ±2 dB(A). If the differences between measured and predicted road traffic noise levels fall within this factor, then the model is considered to have a suitable level of accuracy for that location. Attention should be given to noise measurements that fall outside this range. Common reasons for poor validation of road traffic noise models include extraneous noise sources and poor logger placement. Although the aim during logger deployment was to minimise these issues, they may still occur.

Provided below in **Table 88** is a summary of the noise logger validation results. Discussion on loggers that fall outside the acceptable validation allowance of ±2 dB(A) is presented after the table.

Table 88 Noise logger validation

Noise logger	Measured $L_{Aeq(15hour)}$ noise level, dB(A)	Predicted $L_{Aeq(15hour)}$ noise level, dB(A)	Difference, dB(A)	Measured $L_{Aeq(9hour)}$ noise level, dB(A)	Predicted $L_{Aeq(9hour)}$ noise level, dB(A)	Difference, dB(A)
NL01	66.7	67.6	1.2	62.5	61.8	-0.7
NL02	68.1	66.9	-1.2	61.4	60.9	-0.5
NL03	67.4	66.3	-1.1	61.9	61.1	-0.8
NL04	68.1	67.9	-0.2	63.3	61.7	-1.6
NL05	64	64.4	0.4	57.9	60.1	2.2
NL07	63.3	64.1	0.8	58.8	59.9	1.1
NL08	54.3	53.2	-1.1	50.4	52.4	2.0
NL09	54.2	53.5	-0.7	51.3	52.6	1.3
NL11	73.0	73.5	0.5	70.4	70.5	0.1
NL12	53.9	54	0.1	50.9	51.3	0.4
NL13	72.0	70.5	-1.5	69.2	67.8	-1.4
NL14	55.5	56.2	0.7	52	53.8	1.8
NL15	71.9	72.2	0.3	69.2	69.3	0.1
Average			-0.1			0.4

Note 1: Shaded cell indicates that the predicted level is outside the measured noise level + 2 dB(A).

It is noted that noise levels for logger at location NL05 over predicts by 2.2 dB(A), slightly more than the acceptable 2.0 dB(A). It is likely that lower traffic speeds in the early hours of the morning attribute to the noise model over-predicting. Considering that this road is outside the project area and the model is resulting in a conservative prediction, this single outlier is not considered to adversely affect the validation of the noise model.

Over the project area, noise levels during the daytime and night-time periods are generally being over-predicted by less than half a decibel. Considering all but one receiver validates effectively during the more stringent night-time period, the road traffic noise model can be considered to be operating with acceptable accuracy.

6.1.4 Noise modelling scenarios

As previously noted the *Road Noise Policy* requires the assessment of road traffic noise at the year of opening and at the design year. To determine the appropriate noise mitigation, only the more stringent year has been discussed within this report (design year, 2021). However the predicted road traffic noise levels with the recommended noise mitigation have been presented for both the year of opening (2021) and the design year

(2031). For the design year results have been presented with full WestConnex program of works in operation. Receivers have generally been labelled from eastern end of the project to the western end.

Noise levels for both the daytime and night-time periods have been assessed. The assessed scenarios are:

- **No Build** – This scenario is assessed for both the year of opening (2021) and the design year (2031) and incorporates the existing alignment and traffic flows for the applicable year. All major arterial roads have been included in the noise modelling. Both of these scenarios assume only the M4 Widening and King Georges Road Interchange upgrade is in operation.
- **Build** – These scenarios incorporate the project design alignment, including the portals, ramps and all existing major arterial roads. The year of opening scenario (2021) assumes only the M4 Widening, King Georges Road Interchange upgrade and the project (New M5) is in operation. The design year scenario (2031) assumes full WestConnex program of works and the future Southern extension are in operation.

6.1.5 Portal noise

Portal noise from road traffic within the main tunnels has been modelled using SoundPLAN. As the CoRTN algorithm does not provide a procedure for the calculation of noise breakout from tunnel openings, the Nord 2000 algorithm has been implemented in SoundPLAN.

Breakout noise from the operation of the jet fans has been assessed separately in accordance with the *Industrial Noise Policy*, and is addressed in **Section 6.2**.

6.1.6 Project impact

Noise sensitive receivers within the study areas of the project are currently affected by appreciable levels of road traffic noise. This project is only required to mitigate noise impacts resulting and associated with this project. Existing noise issues, such as residential receivers exceeding the acute noise levels, are mitigated through the Roads and Maritime noise abatement program.

6.1.7 Noise modelling results – Western surface works study area (Year 2021 and Year 2031)

The project would alter the volumes of traffic on the existing M5 East Motorway. As the L_{Aeq} road traffic noise levels are largely controlled by traffic volumes this project would result in an appreciable reduction in noise levels along the existing M5 East Motorway (between Beverly Hills and Kingsgrove). Road traffic noise maps are presented in **Appendix L**. Detailed noise prediction results are provided in **Appendix O**.

Considering the impacts in both Year 2021 and Year 2031 during the daytime period:

- Daytime road traffic noise levels are predicted to exceed the $L_{Aeq(15hour)}$ noise criterion of 60 dB(A) at a total of 53 residential receivers and one school receiver
- Noise levels that exceed the applicable daytime noise criterion are not predicted to increase by more than 2 dB(A) at any noise sensitive receiver
- Noise levels are predicted to exceed the cumulative limit at one residential receiver. (i.e. ≥ $L_{Aeq(15\ hour)}$ noise criterion + 5 dB(A))
- One residential receiver is considered eligible for the consideration of feasible and reasonable noise mitigation measures.

Considering the impacts in both Year 2021 and Year 2031 during the night-time period:

- Night-time road traffic noise levels are predicted to exceed the $L_{Aeq(9hour)}$ noise criterion of 55 dB(A) at a total of 65 residential receivers
- Noise levels are not predicted to exceed the applicable night-time noise criterion and increase by more than 2 dB(A) at any noise sensitive receiver;
- Noise levels are predicted to exceed the cumulative limit at one sensitive receiver. (ie ≥ $L_{Aeq(9\ hour)}$ noise criterion + 5 dB(A)
- One sensitive receiver is considered eligible for the consideration of feasible and reasonable noise mitigation measures.

As discussed in **Section 4.5.2**, a sensitive receiver would be considered eligible for the consideration of noise mitigation where:

- The predicted Build noise level exceeds the *Noise Criteria Guideline* controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the Build minus the No Build) is greater than 2.0 dB(A); or
- The predicted Build noise level is 5 dB(A) or more above the criteria (exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project;

Peripheral areas of Canterbury Golf Course and Beverly Grove Park (active recreation areas) would be exposed to road traffic noise levels which exceed the applicable noise criteria.

Road traffic noise levels at all childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The design of noise walls for areas where the noise wall needs to be moved as a result of the proposed works is considered further in **Section 8.1.2**.

6.1.8 Noise sensitive receivers eligible for consideration of addition noise mitigation

Likely mitigation for all eligible sensitive receivers is considered further in the operational noise mitigation section (refer to **Section 8.0**).

Table 89 Receivers eligible for consideration of additional mitigation measures (Kingsgrove) (2021)

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
9382	1 Kirrang Street, Beverly Hills	Residential/Redeveloped road	61	60	-1.1

6.1.9 Noise modelling results – St Peters interchange (Year 2021 and Year 2031)

The existing noise environment throughout the project area is generally dominated by road traffic noise from the road adjacent to the sensitive receiver. Through some areas this project would appreciably change the traffic flows and hence the noise environment of the area.

Considering the impacts in both 2021 and 2031 during the daytime period (7 am to 10 pm):

- A total of 373 receivers are predicted to be affected by the project. At these receivers the noise from the project contributes more than 2 dB(A) to the overall noise levels.
- A total of 133 receivers are predicted to be exposed to road traffic noise levels which exceed the applicable L_{Aeq} noise criteria.
- Noise levels at 121 residential receivers and two school buildings exceed the applicable noise criteria and are predicted to also increase by more than 2 dB(A)
- A total of 74 residential receivers are predicted to be exposed to road traffic noise levels which exceed the cumulative limit (ie ≥ $L_{Aeq(15\ hour)}$ + 5 dB(A))
- A total of 129 receivers (127 residential receivers and 2 school buildings) are eligible for the consideration of additional noise mitigation. These receivers exceed the new/existing road noise criteria, and are affected by noise levels which are either predicted to increase by more than 2 dB(A) or exceed the cumulative limit as a result of the project.

Considering the impacts in both 2021 and 2031 during the night-time period (10 pm to 7 am):

- A total of 373 noise sensitive receivers are predicted to be affected by the project. At these receivers the noise from the project contributes more than 2 dB(A) to the overall noise levels.
- A total of 145 receivers are predicted to be exposed to road traffic noise levels which exceed the applicable L_{Aeq} noise criterion.
- Noise levels at 141 residential receivers exceed the applicable noise criteria and are predicted to also increase by more than 2 dB(A)

- A total of 92 receivers are predicted to be exposed to road traffic noise levels which exceed the cumulative limit (ie ≥ $L_{Aeq(9\ hour)}$ + 5 dB(A))
- A total of 144 receivers (all residential receivers) are eligible for the consideration of additional noise mitigation. These receivers exceed the new/existing road noise criteria, are affected by noise levels which are either predicted to increase by more than 2 dB(A) or exceed the cumulative limit.

In total, 144 residential receivers are eligible for the consideration of feasible and reasonable noise mitigation.

In addition two school buildings (St Peters Public School) are eligible during the daytime only. Peripheral areas of Sydney Park and the majority of Simpson Park (active recreation areas) would be exposed to road traffic noise levels which also exceed the applicable noise criteria.

Road traffic noise levels at all childcare centres, commercial properties and places of worship are predicted to comply with the criteria.

The applicable noise criteria for St Peters Public School is an $L_{Aeq(1hour)}$ noise criteria during normal school hours. The predicted road traffic noise levels at St Peters public school are up to $L_{Aeq(1hour)}$ 55 dB(A) during the daytime. The internal noise criteria is $L_{Aeq(1hour)}$ 40 dB(A).

Reviewing the noise logger graphs suggests that the $L_{Aeq(15hour)}$ noise level experienced at this location is reasonably consistent with the $L_{Aeq(1hour)}$ noise levels during school hours. On this basis no correction has been made converting from an $L_{Aeq(15hour)}$ parameter to an $L_{Aeq(1hour)}$ parameter. The school noise criterion is also an internal noise criterion. Internal noise levels are only determinable through measurements inside and outside of the building. This would be completed at the detailed design stage. This is discussed further in **Section 8.0**.

A summary of the sensitive receivers that have been found eligible for the consideration of further noise mitigation measures is provided in **Section 8.0**. This should be subject to confirmation during detailed design. Road traffic noise maps are presented in **Appendix L**. Detailed noise prediction results are provided in **Appendix M**.

6.1.10 Noise sensitive receivers eligible for consideration of additional noise mitigation

Likely mitigation for all eligible sensitive receivers is considered further in the operational noise mitigation section (refer to **Section 8.0**).

Table 90 Receivers eligible for consideration of additional mitigation measures (St Peters interchange and local road works) (2021)

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
1424	220-230 Lawrence Street Alexandria	Residential Redeveloped	58	59	0.6
1629	93-103 Euston Road Alexandria	Residential Redeveloped	71	74	2.8
1984	125 Euston Road Alexandria	Residential Redeveloped	72	74	1.7
2012	288-302 Lawrence Street Alexandria	Residential Redeveloped	67	66	-0.5
3439	58 Hutchinson Street St Peters	Residential New	53	54	1.1
3443	71 Hutchinson Street St Peters	Residential New	52	54	2.1
3445	73 Hutchinson Street St Peters	Residential New	52	55	2.5
3454	60 Hutchinson Street St Peters	Residential New	54	56	2.4
3456	68 Hutchinson Street St Peters	Residential New	57	59	2.9
3457	77 Hutchinson Street St Peters	Residential New	55	58	3.3
3459	79 Hutchinson Street St Peters	Residential New	55	59	3.3
3461	51 Lackey Street St Peters	Residential New	56	59	3.0
3462	55 Lackey Street St Peters	Residential New	56	59	3.1

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
3465	53 Lackey Street St Peters	Residential New	56	59	3.1
3467	47 Lackey Street St Peters	Residential New	56	59	3.1
3468	81 Hutchinson Street St Peters	Residential New	56	59	3.2
3469	49 Lackey Street St Peters	Residential New	56	59	3.0
3470	41 Lackey Street St Peters	Residential New	55	59	3.2
3473	43 Lackey Street St Peters	Residential New	55	59	3.2
3474	45 Lackey Street St Peters	Residential New	55	59	3.3
3477	35 Lackey Street St Peters	Residential New	55	58	3.0
3479	83 Hutchinson Street St Peters	Residential New	56	59	3.1
3480	39 Lackey Street St Peters	Residential New	55	59	3.2
3481	37 Lackey Street St Peters	Residential New	55	58	3.1
3482	33 Lackey Street St Peters	Residential New	55	58	3.1
3484	31 Lackey Street St Peters	Residential New	55	58	3.1
3485	23 Lackey Street St Peters	Residential New	54	57	2.9
3486	29 Lackey Street St Peters	Residential New	55	58	3.2
3487	27 Lackey Street St Peters	Residential New	55	58	2.9
3488	25 Lackey Street St Peters	Residential New	55	58	3.1
3489	21 Lackey Street St Peters	Residential New	54	56	2.5
3490	85 Hutchinson Street St Peters	Residential New	57	60	3.1
3494	19 Lackey Street St Peters	Residential New	53	55	2.2
3511	87 Hutchinson Street St Peters	Residential New	57	60	3.3
3518	35 Barwon Park Road St Peters	Residential New	53	55	2.1
3526	65 Crown Street St Peters	Residential New	55	53	-1.7
3527	31 Barwon Park Road St Peters	Residential New	52	55	2.3
3532	101 Hutchinson Street St Peters	Residential New	66	68	2.1
3533	67 Crown Street St Peters	Residential New	55	53	-1.5
3544	71 Crown Street St Peters	Residential New	51	54	2.3
3548	38 Crown Street St Peters	Residential New	52	54	1.7
3551	67 Campbell Road St Peters	Residential New	62	64	1.8
3553	73 Crown Street St Peters	Residential New	53	55	1.7
3555	63 Campbell Street St Peters	Residential New	69	68	-0.3
3557	75 Crown Street St Peters	Residential New	56	57	0.8
3558	44 Crown Street St Peters	Residential New	54	57	2.8
3560	47 Barwon Park Road St Peters	Residential New	55	59	4.1
3562	49 Barwon Park Road St Peters	Residential New	56	61	4.5
3565	51 Barwon Park Road St Peters	Residential New	58	62	4.2

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
3570	25 Campbell Road St Peters	Residential New	71	73	1.1
3573	29 Campbell Road St Peters	Residential New	73	72	-0.3
3576	27 Campbell Road St Peters	Residential New	71	73	1.2
3577	21 Campbell Road St Peters	Residential New	71	73	1.3
3671	2 Campbell Road Alexandria	Residential New	69	72	3.3
3672	6 Campbell Road Alexandria	Residential New	69	72	3.3
3673	8 Campbell Road Alexandria	Residential New	69	72	3.3
3674	10 Campbell Road Alexandria	Residential New	69	72	3.3
3675	12 Campbell Road Alexandria	Residential New	69	72	3.3
3676	14 Campbell Road Alexandria	Residential New	69	72	3.3
3677	16 Campbell Road Alexandria	Residential New	69	72	3.4
3678	18 Campbell Road Alexandria	Residential New	69	72	3.4
3679	20 Campbell Road Alexandria	Residential New	69	72	3.4
3680	32 Campbell Road Alexandria	Residential New	69	72	3.4
3681	24 Campbell Road Alexandria	Residential New	69	72	3.4
3682	22 Campbell Road Alexandria	Residential New	69	72	3.4
3683	26 Campbell Road Alexandria	Residential New	69	72	3.4
3684	28 Campbell Road Alexandria	Residential New	69	72	3.5
3685	30 Campbell Road Alexandria	Residential New	69	72	3.4
3686	32 Campbell Road Alexandria	Residential New	63	68	4.8
3687	23-29 Campbell Road St Peters	Residential New	71	73	1.3
3688	19 Campbell Road St Peters	Residential New	71	73	1.4
3689	53 Barwon Park Road St Peters	Residential New	71	73	2.2
3795	75 Church Street St Peters	Residential New	59	67	8.1
3797	3 Brown Street St Peters	Residential New	56	68	12.8
3805	77 Church Street St Peters	Residential New	57	65	7.2
3808	5 Brown Street St Peters	Residential New	56	63	7.7
3809	79 Church Street St Peters	Residential New	55	64	9.5
3817	81 Church Street St Peters	Residential New	52	64	11.5
3818	4 St Peters Street St Peters	Residential New	52	65	13.1
3822	7 Brown Street St Peters	Residential New	54	62	8.5
3826	6 St Peters Street St Peters	Residential New	55	62	7.5
3829	83 Church Street St Peters	Residential New	55	62	7.4
3831	9 Brown Street St Peters	Residential New	53	62	8.7
3834	7 Florence Street St Peters	Residential New	48	66	17.4
3838	1b St Peters Street St Peters	Residential New	56	65	8.7

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
3839	8 St Peters Street St Peters	Residential New	53	60	6.9
3840	85 Church Street St Peters	Residential New	50	61	11.8
3843	10 Brown Street St Peters	Residential New	50	64	13.8
3846	11 Brown Street St Peters	Residential New	52	59	7.2
3849	9 Florence Street St Peters	Residential New	50	61	10.5
3851	4 Florence Street St Peters	Residential New	50	64	14.5
3852	87 Church Street St Peters	Residential New	54	60	5.9
3855	1/12 Brown Street St Peters	Residential New	50	59	9.2
3856	11 Florence Street St Peters	Residential New	52	61	8.7
3859	13 Brown Street St Peters	Residential New	52	58	6.1
3860	6 Florence Street St Peters	Residential New	51	60	9.4
3861	5 St Peters Street St Peters	Residential New	55	63	7.5
3862	89 Church Street St Peters	Residential New	53	59	5.4
3867	1/12 Brown Street St Peters	Residential New	52	61	9.2
3868	12 St Peters Street St Peters	Residential New	53	58	5.0
3872	16 Brown Street St Peters	Residential New	52	56	4.2
3873	7 St Peters Street St Peters	Residential New	52	58	5.5
3874	91a Church Street St Peters	Residential New	52	57	4.8
3877	15 Brown Street St Peters	Residential New	52	56	4.9
3882	13 Florence Street St Peters	Residential New	51	58	7.3
3883	8 Florence Street St Peters	Residential New	54	61	7.3
3885	17 Brown Street St Peters	Residential New	51	56	4.4
3886	159 Princes Highway St Peters	Residential New	62	66	4.2
3887	91b Church Street St Peters	Residential New	53	57	4.4
3890	9 St Peters Street St Peters	Residential New	48	55	6.2
3894	16 St Peters Street St Peters	Residential New	51	55	3.6
3895	18 St Peters Street St Peters	Residential New	52	58	5.6
3896	91c Church Street St Peters	Residential New	52	56	3.9
3897	22 Brown Street St Peters	Residential New	50	54	4.5
3899	19 Brown Street St Peters	Residential New	51	55	3.2
3903	10 Florence Street St Peters	Residential New	52	57	4.9
3907	15 Florence Street St Peters	Residential New	50	56	6.0
3908	91d Church Street St Peters	Residential New	53	56	3.4
3909	12 Florence Street St Peters	Residential New	52	57	4.8
3910	11 St Peters Street St Peters	Residential New	51	56	5.9
3913	21 Brown Street St Peters	Residential New	51	54	3.1

ID	Address	Use/Road category	$L_{Aeq(9hour)}$ noise level dB(A)		Change in noise level dB(A)
			No Build	Build	
3914	24 Brown Street St Peters	Residential New	50	54	4.2
3916	14 Florence Street St Peters	Residential New	52	56	3.9
3921	17 Florence Street St Peters	Residential New	51	55	4.6
3923	13 St Peters Street St Peters	Residential New	51	56	5.5
3925	16 Florence Street St Peters	Residential New	51	56	4.3
3926	18 St Peters Street St Peters	Residential New	51	54	3.1
3927	23 Brown Street St Peters	Residential New	51	53	2.6
3928	18 Florence Street St Peters	Residential New	52	55	3.8
3934	19 Florence Street St Peters	Residential New	51	55	4.3
3935	20 Florence Street St Peters	Residential New	51	55	3.9
3936	15 St Peters Street St Peters	Residential New	52	57	5.3
3940	17 St Peters Street St Peters	Residential New	50	54	3.4
4059	8/635 Gardeners Road Mascot	Residential New	59	60	1.7
4086	21 St Peters Street St Peters	Residential New	50	53	3.2
4089	23 St Peters Street St Peters	Residential New	51	54	2.9
4090	24 Florence Street St Peters	Residential New	50	54	3.3
4092	21 Florence Street St Peters	Residential New	51	55	3.9
4096	30 Brown Street St Peters	Residential New	50	53	3.5
4099	31 St Peters Street St Peters	Residential New	52	56	3.9
4100	25 Brown Street St Peters	Residential New	51	53	2.3
4103	26 Florence Street St Peters	Residential New	50	53	3.1
4115	29 Florence Street St Peters	Residential New	50	53	2.6
4117	31 St Peters Street St Peters	Residential New	51	54	3.2

6.1.11 Parallel routes assessment

As a result of the project it is likely that traffic would be redistributed across the road network. This has the potential to have a road traffic noise impact on receivers located on parallel routes. These routes comprise roads which have not been considered as project roads. The *Noise Criteria Guideline* considers any project to be a traffic generating development if it is predicted to increase noise levels by greater than 2.0 dB(A) on any other road. Therefore an assessment of the potential impacts is required.

Provided below is a summary of the traffic figures and associated change in noise levels for a number of key routes that would be affected by this project.

The noise levels presented in **Table 92** and **Table 94** above show that generally noise levels would increase by 1 dB(A) or less, which is generally considered to be indiscernible. As mentioned previously, to be considered a traffic generating development noise levels would need to increase by greater than 2.0 dB(A). As such further consideration of the impacts on parallel routes does not require further consideration.

Table 91 Year 2021 parallel routes traffic flows

Location	Build				No Build			
	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
King Georges Road	65,328	7,838	13,800	1,613	53,590	6,429	11,320	1,323
Stoney Creek Road	24,144	1,613	5,427	552	15,446	1,032	3,472	353
Vanessa Street	10,395	357	1,168	57	9,739	334	1,094	54
Bexley Road	29,413	2,063	7,162	585	25,997	1,823	6,330	517
Moorefields Road	18,364	1,185	2,739	167	14,391	928	2,146	131

Table 92 Year 2021 parallel routes noise impact, 10 metres from the kerb

Location	Build		No Build		Increase in noise	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
King Georges Road	78.3	73.7	77.5	72.8	0.9	0.9
Stoney Creek Road	71.9	69.1	69.9	67.1	1.9	1.9
Vanessa Street	66.6	60.1	66.3	59.8	0.3	0.3
Bexley Road	72.9	69.5	72.4	68.9	0.5	0.5
Moorefields Road	70.6	64.4	69.5	63.3	1.1	1.1

Table 93 Year 2031 parallel routes traffic flows

Location	Build				No Build			
	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
King Georges Road	66,160	7,937	13,976	1,634	57,085	6,849	12059	1410
Stoney Creek Road	23,967	1,452	6,230	545	19,844	1,326	4460	453
Vanessa Street	11,416	392	1,283	63	11,820	406	1328	65
Bexley Road	29,494	2,069	7,182	586	30,202	2118	7354	601
Moorefields Road	18,364	1,185	2,739	167	17,618	1136	2628	160

Table 94 Year 2031 parallel routes noise impact, 10 metres from the kerb

Location	Build		No Build		Increase in noise	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
King Georges Road	78.4	73.7	77.7	73.1	0.6	0.6
Stoney Creek Road	71.6	69.1	71.0	68.2	0.5	0.9
Vanessa Street	67.0	60.5	67.1	60.7	-0.2	-0.2
Bexley Road	72.9	69.5	73.0	69.6	-0.1	-0.1
Moorefields Road	70.6	64.4	70.4	64.2	0.2	0.2

6.1.12 Maximum noise level assessment

The *NSW Road Noise Policy* includes a review of international sleep arousal research and concludes that at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance.

The *Environmental Noise Management Manual* considers a maximum noise level event to be defined as a vehicle pass-by event for which the $L_{A,max}$ noise level is equal to or greater than 15 dB(A) above the $L_{Aeq(1hour)}$. The emergence of noise levels has been considered at two locations, one along the M5 East Motorway (97 Tallawalla Street, Beverly Hills) and one in the St Peters interchange (108 Campbell Street, St Peters).

Maximum noise levels are generally dependent on truck engine braking events. A truck may engage its engine brakes at any location on the project alignment, however the likelihood is dependent on a range of factors. Maximum noise events are less likely further away from the alignment, as maximum noise levels decrease at a faster rate with distance than is the case for L_{Aeq} road traffic noise levels.

Although it is not possible to state that any given location is generally representative of the whole project, these locations are considered to present the typical worst case scenarios.

Figure 3 presents the current number of maximum noise events at 97 Tallawalla Street, Beverly Hills for a 7-day period from 16 March 2015, 10 pm to 23 March 2015, 7 am. Figure 4 presents the current number of maximum noise events at 108 Campbell Street, St Peters for a 7-day period from 31 August 2015, 10 pm to 9 September 2015, 7 am excluding the nights of 2 to 3 and 3 to 4 September 2015 due to rain. Table 87 presents the typical number of maximum noise events per night, the range of maximum noise levels and the average maximum noise level causing maximum noise events.

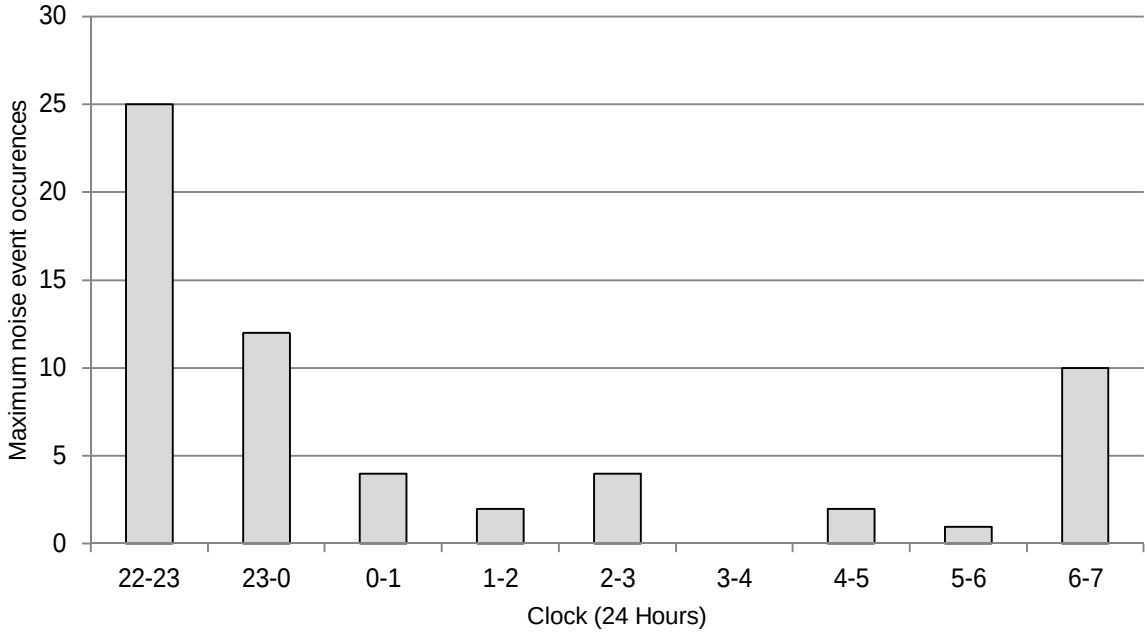


Figure 3 Number of maximum noise events during one week within the monitoring period – 97 Tallawalla Street, Beverly Hills

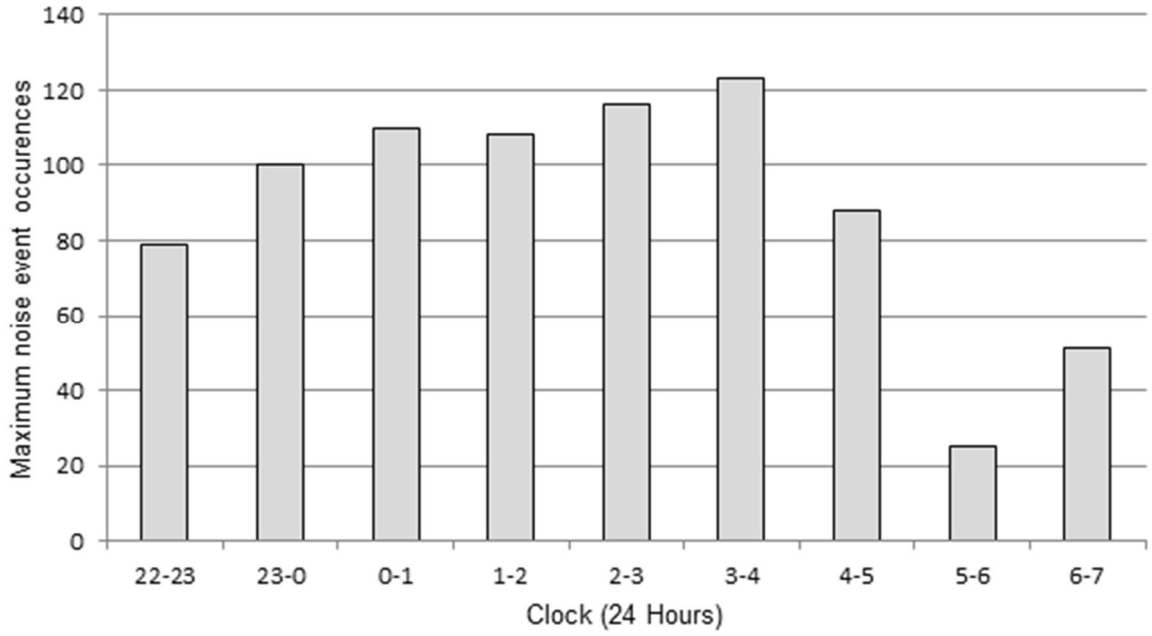


Figure 4 Number of maximum noise events during seven nights within the monitoring period – 108 Campbell Street, St Peters

Table 95 Maximum noise events assessment details

Address	Distance from alignment (metres)	Typical number of maximum noise events per night	Range of measured maximum noise levels causing maximum noise events, dB(A)	Average measured maximum noise level causing maximum noise events, dB(A)
97 Tallawalla Street, Beverly Hills	89	8	65-88	75
108 Campbell Street, St Peters	6	126	65-112	97

Figure 3 indicates that maximum noise events are most likely to occur between 10:00pm and 12 midnight or in the morning after 6:00am in the Beverly Hills area. This is likely to be linked to increased heavy vehicle movements during these periods. In addition the likelihood of the use of truck engine braking may rise as a result of the increased traffic flows. During the middle of the night-time (12 midnight to 6:00am) it is likely that trucks do not need to engage their engine brakes due to free flowing traffic conditions, but as traffic volumes are higher before 12 midnight and after 6:00am engine brakes are engaged much more frequently.

On the eastbound on-ramp at Kingsgrove, the use of engine braking is likely to increase on the descent into the tunnel portals. However the sides of the cutting are likely to provide acoustic shielding to noise sensitive receivers.

Figure 4 indicates that there are currently many maximum noise events at the St Peters location in Campbell Street. This is partly due to the proximity of the logger to the road (six metres), which was located in line with the front façade of nearby residences. The number of events is higher during the middle of the night, because the ambient noise level drops during that period. It is likely that nearly every vehicle passing through Campbell Street during the night caused a maximum noise event. Based on the predicted traffic flows for 2031 the incidence of maximum noise events throughout the St Peters areas is likely to increase further in the future as the percentage of heavy vehicles increases. The widening of Euston Road and Sydney Park Road are also likely to contribute to the incidence of additional maximum noise events. There is also the potential for heavy vehicles using the ramps at St Peters interchange to engage engine brakes as they descend into the tunnel portals. However as with the Kingsgrove on-ramps the sides of the cutting are likely to provide acoustic shielding to noise sensitive receivers. In addition it is noted that generally noise sensitive receivers are shielded to an extent by existing commercial and industrial buildings.

It is not possible to determine the future number and degree of maximum noise level events as a result of this project. If this information is required, it is recommended that a detailed noise assessment is undertaken once the project opens and maximum noise level events can be measured.

Roads and Maritime do not provide any requirements to provide noise mitigation options on the basis of the maximum noise level assessment. Rather, maximum noise levels assessment can be used to prioritise the application of noise mitigation measures.

6.2 Industrial noise assessment (fixed facilities)

Fixed facilities which would operate as part of the project are:

- Kingsgrove motorway operations complex:
    - Western tunnel portals (one eastbound and one westbound portal)
    - Ventilation facility (exhaust)
    - Distribution substation
    - Fire pump room and deluge water tanks
    - Maintenance facility

  - Workshop
  - Emergency response system
  - Car parking
- Bexley Road South motorway operations complex:
  - Emergency smoke extraction facility
  - Distribution substation
- Arncliffe motorway operations complex:
  - Ventilation facility (air intake, outlet and smoke extraction)
  - Distribution substation
  - Water treatment plant
  - Car parking
- St Peters motorway operations complex:
  - Eastern tunnel portals (one eastbound and one westbound portal)
  - Ventilation facility (exhaust)
  - Distribution substation
  - Fire pump room and water deluge tanks (below ground)
  - Car parking
- Burrows Road motorway operations complex:
  - Motorway Control Centre (MCC) (including workshop activities)
  - Car parking
  - Distribution substation.

The noise sources from these fixed facilities are summarised as:

- Axial ventilation fans housed within buildings, noise emissions would be via the external outlets/inlets
- In-tunnel jet fans noise break-out from tunnel portal openings
- Switches within switch rooms of the substations
- Transformers within substations
- Noise associated with car parking facilities such as accelerating cars, door / boot slamming and people talking
- Pumps and blowers within water treatment facility.

The fixed facilities assessed within this section have been indicated on Appendix B. Further details on the fixed facilities can be found in Chapter 5 of the environmental impact statement for the project.

Three operational scenarios have been assessed under neutral and adverse weather (wind speed and temperature inversion) conditions:

- Normal traffic conditions, ie when traffic speeds are around the posted speed limit
- Low speed traffic conditions, ie when traffic speeds slow towards 40 kilometres per hour or less
- Emergency conditions, invoked in the event of a fire incident.

Emergency operations are not typically regulated through the application of noise limits, however the potential noise impacts of emergency operations have been assessed as good practice.

Each set of conditions would invoke different equipment operating modes which are described below. An assessment of the noise from the operation of these facilities is presented in **Section 6.2.4**.

6.2.1 Normal traffic conditions

Normal traffic conditions are when traffic is travelling around the posted speed limit. During normal traffic conditions the ventilation facilities would be used to control portal emissions. Additionally, the jet fans within the tunnel would be turned off, as the vehicle piston effect generates sufficient tunnel airflow to meet air quality criteria.

6.2.1.1 Ventilation facilities

During normal operating conditions tunnel exhaust systems near the exit portals at Kingsgrove and St Peters and at Arncliffe would be used to capture the vitiated tunnel air and disperse the pollutants into the atmosphere via ventilation outlets.

At the western exit portal, the Kingsgrove ventilation facility would be located above the roadway in the cut-and-cover section near the portal. The ventilation facility would consist of three tall vertical structures, where one houses one fan and two contain two fans, hence containing at total of four operational fans and one stand-by fan. The top of the vents would be 33 metres above the local ground level, which is equal to 57 metres RL. The fans would be located directly above the westbound exit carriageway.

At Arncliffe the ventilation facility would be located within the Arncliffe motorway operations complex near Marsh Street. The ventilation facility would have a fan room with five operational and one stand-by fan. The fan room would be connected to four ventilation outlets, which would each be sub-divided in two ducts. The ventilation outlets would be about 35 metres above local ground level which is 40 metres RL.

At the eastern portal, the St Peters ventilation facility would be located above the roadway in the cut-and-cover section near the portal. The ventilation facility would have a two-level fan room, where the lower level would be entirely below ground level. The fan room would house two horizontally oriented fans on both floors. The two-level fan room would end in a plenum which would be connected to two ventilation outlets, each ventilation stack would be subdivided in two ducts. The ventilation outlet would be 25.5 metres above the local ground level or 20.5 metres RL.

All fans would be provided with baffle-type attenuators.

The assessment assumes that the building fabric (ie walls, roof, doors and louvres) housing the ventilation equipment, would reduce the noise emission from the building to be at least 10 dB(A) less than the contribution from the outlets. The final noise emission from the building fabric may change subject to the detailed design but in any case when considered in combination with the noise from the outlets would be controlled to satisfy the appropriate operational noise criteria.

The sound power of each fan is provided in **Table 92**, and attenuation details for the intake and discharge sides are provided in Table 93.

Table 96 Ventilation facilities equipment sound power levels, dB (per fan)

Facility	Equipment	Octave band centre frequency, Hz								Overall dB(A) level
		63	125	250	500	1000	2000	4000	8000	
Kingsgrove ventilation facility	Fan (4 operational + 1 stand-by)[1]	130	124	120	119	113	107	108	108	120
St Peters ventilation facility	Fan (3 operational + 1 stand-by) [1]	118	116	117	114	110	106	101	97	116
Arncliffe ventilation facility	Fan (4 operational + 1 stand-by)	118	116	117	114	110	106	101	97	116

Note 1: The fan selections are indicative and may change subject to detailed design.

Table 97 Ventilation facilities attenuator insertion loss, dB

Facility	Octave band centre frequency, Hz							
	63	125	250	500	1000	2000	4000	8000
Kingsgrove ventilation facility[1]	28	41	68	70	70	70	58	42
St Peters ventilation facility[1]	23	41	54	57	64	60	49	35
Arncliffe ventilation facility[1]	23	41	54	57	64	60	49	35

Note 1: The attenuator selections provided are indicative and may change subject to detailed design.

6.2.1.2 Substations

In total the project would have five substations to supply the main line east-west tunnel and ramps. There would be one substation at each ventilation facility: Kingsgrove, St Peters and Arncliffe. Another would be located at the emergency smoke extraction facility at Bexley Road South motorway operations complex. The fifth substation would be located at Burrows Road motorway operations complex.

Each substation would contain several switch rooms and a transformer yard. All switches would be located within the switch rooms and consequently any environmental noise emission, from the operation of the switches, would be insignificant.

The dominant noise sources within the substations would be the transformers. The sound power of a transformer is a function of its capacity. The overall sound power levels of the transformers have been calculated using Australian/New Zealand Standard – Power Transformers – Part 10 Determination of sound levels (IEC 90076-10, Ed.1 (2001) MOD). The sound power spectrum for a 25 MVA transformer was measured previously by AECOM and has been applied to the substations sound power levels. The sound power spectra and levels are presented in **Table 98**. For this assessment it is assumed that the transformers would be located on the ground with no housing. This represents a worst-case scenario. The noise source is assumed to be 1.5 metres above ground level.

Table 98 Transformer sound power level (dB)

Location	MVA	Octave band centre frequency, Hz						Overall dB(A) level
		63	125	250	500	1000	2000	
Kingsgrove substation	4	76	84	75	68	69	67	74
	4	76	84	75	68	69	67	74
	Total	**79**	**87**	**78**	**72**	**72**	**70**	**77**
Bexley Road South substation	3.15	75	83	73	67	67	65	73
	3.15	75	83	73	67	67	65	73
	3.15	75	83	73	67	67	65	73
	3.15	75	83	73	67	67	65	73
	Total	**81**	**89**	**79**	**73**	**73**	**71**	**79**
Arncliffe substation	5	78	86	76	70	70	68	76
	5	78	86	76	70	70	68	76
	5	78	86	76	70	70	68	76
	5	78	86	76	70	70	68	76
	5	78	86	76	70	70	68	76
	5	78	86	76	70	70	68	76
	Total	**86**	**94**	**84**	**78**	**78**	**76**	**84**
St Peters	3.15	75	83	73	67	67	65	73

Location	MVA	Octave band centre frequency, Hz						Overall dB(A) level
		63	125	250	500	1000	2000	
substation	3.15	75	83	73	67	67	65	73
	3.15	75	83	73	67	67	65	73
	3.15	75	83	73	67	67	65	73
	Total	**81**	**89**	**79**	**73**	**73**	**71**	**79**
Burrows Road substation	1	68	76	66	60	60	58	66
	1	68	76	66	60	60	58	66
	Total	**71**	**79**	**69**	**63**	**63**	**61**	**69**

It is anticipated that fans and other mechanical cooling equipment would be included into the design of the substations, however, any acoustic issues associated with these fans are expected to be treated with standard engineering solutions during the detailed design stage. Engineering solutions to treat noise emission from the fans would include:

- Re-selection of fans with minimised noise
- Orientation and location of the fan
- In-duct noise attenuation
- Noise enclosures for case radiated noise.

6.2.1.3 Motorway control centre and emergency response system

The motorway control centre at Burrows Road motorway operations complex at St Peters is located on a site at the corner of Campbell Road and Burrows Road. The emergency response system is located at Kingsgrove motorway operations complex, near the western portals. Both centres are buildings that would consist of heating, ventilation and air conditioning services (HVAC) similar to a commercial building, however, the acoustic issues associated with building HVAC are expected to be treated with standard engineering solutions during the detailed design stage.

Both the motorway control centre and emergency response system incorporate a car park with around fifty and eighty car spaces respectively. The car park of the motorway control centre is located at ground level of the building and is open on all sides. The car park of the Kingsgrove motorway operations complex is located next to the building at ground level.

The noise sources associated with the motorway control centre and emergency response system that have been assessed are:

- Door / boot slamming
- People talking
- Car accelerating.

Time weighting reductions have been applied to the sound power levels to account for the duration which these events would occur.

6.2.1.4 Water treatment facility

A water treatment plant is located at Arncliffe motorway operations complex, near Marsh Street. The water treatment plant would treat water collected within the tunnel prior to discharge to the Cooks River. The assumed noise sound power levels for equipment in the water treatment plant are given in **Table 99**.

Table 99 Water treatment plant at Arncliffe, source sound power levels (dB)

Equipment	Octave band centre frequency, Hz							Overall dB(A) level
	63	125	250	500	1000	2000	4000	
Blower[1]	90	87	80	81	76	72	69	82
Pump[1]	71	72	74	74	77	74	70	80
Total	**90**	**87**	**80**	**81**	**76**	**72**	**69**	**82**

Note 1: The equipment sound power levels are indicative and may change subject to detailed design.

6.2.2 Low speed traffic conditions

At low speeds, the piston effect would not be adequate anymore to ventilate the tunnel and the jet fans would be used in direction of travel to generate more tunnel airflow. When traffic speeds further reduce and the tunnel becomes congested, additional fresh air can be supplied through the Bexley Road South motorway operations complex. All equipment operating during normal traffic conditions would continue to operate during low speed traffic conditions. This includes the air intake facility at the Arncliffe motorway operations complex.

6.2.2.1 Jet fans

The noise emission due to jet fans would propagate from within the tunnels through the portal openings. The project comprises four portal openings – one eastbound and one westbound portal at Kingsgrove and one eastbound and one westbound portal at St Peters.

It is assumed that the jet fans would be located at a minimum distance of 50 metres from the portal entrances. Consecutive fans thereafter would be located at 120 metres intervals. Furthermore it is assumed that the jet fans are installed in banks of three.

The jet fans would be selected by the contractors to meet the in-tunnel noise level of Noise Rating 85 (NR 85) at 1.5 metres above centreline of the road at any point, with all fans running. Concrete surfaces have been assumed for floor, ceiling and tunnel walls. The sound power levels for the selected jet fans are presented in **Table 100**. During slow traffic conditions the jet fans would always operate in forward mode.

The portal opening sound power levels and dimensions have been shown in **Table 101**.

Table 100 Jet fan sound power levels, dB (per fan)

Equipment	Octave band centre frequency, Hz								Overall dB(A) level
	63	125	250	500	1000	2000	4000	8000	
Jet fans	95	100	101	102	100	96	88	82	104

Table 101 Assessed sound power level at portal opening

Portal	Area, (m^2)	Octave band centre frequency, Hz								Overall dB(A) level
		63	125	250	500	1000	2000	4000	8000	
Kingsgrove eastbound portal	69	75	80	81	82	80	75	67	58	84
Kingsgrove westbound portal	112	74	79	80	81	79	74	66	57	83
St Peters eastbound portal	144	74	79	80	81	78	74	65	56	82
St Peters westbound portal	168	73	78	79	80	78	73	64	55	82

6.2.2.2 Air intake

During congested traffic conditions, the emergency smoke extraction facility at Bexley Road South motorway operations complex would be used to supply fresh air into the tunnel. The air intake facility at Arncliffe would supply fresh air to the eastbound tunnel during normal and congested conditions.

The Bexley Road South emergency smoke extraction facility at would have one fan room, located below ground level, with three operational fans and one stand-by fan, positioned vertically. The fan room would be connected to the one circular vent shaft. The top of the vent would be located four metres above the local ground level, which equals to 16 metres RL.

The air intake facility at Arncliffe motorway operations complex would be located near Marsh Street. It would have one fan room, located below ground level, with five operational fans and one stand-by fan, positioned vertically. The fan room would connected to one rectangular vent shaft. The top of the vent would be located about six metres above local ground level or 11 metres RL.

Both ventilation facilities would be connected to both the eastbound and westbound tunnels. Additionally, all fans would be provided with baffle-type attenuators.

The sound power levels of the selected fans at their maximum flow capacity have been provided for the intake and discharge in **Table 102** and attenuation details for the intake and discharge sides are provided in **Table 103**.

It is likely that the fans would run at a reduced capacity and therefore would have a reduced sound power level. A reduction has not been applied to the assessment to provide a conservative approach.

Table 102 Emergency smoke extraction facilities equipment sound power levels, dB (per fan)

Facility	Equipment	Octave band centre frequency, Hz								Overall dB(A) level
		63	125	250	500	1000	2000	4000	8000	
Bexley Road South[1]	Fan (3 operational + 1 stand-by) [1]	129	131	129	127	121	116	113	104	128
Arncliffe[1]	Fan (5 operational + 1 stand-by) [1]	129	131	129	127	121	116	113	104	128

Note 1: The fan selections are indicative and may change subject to detailed design.

Table 103 Fresh air supply and smoke exhaust ventilation facilities' attenuator insertion loss, dB

Facility	Octave band centre frequency, Hz							
	63	125	250	500	1000	2000	4000	8000
Bexley Road South[1]	34	49	70	70	70	70	65	49
Arncliffe[1]	23	41	54	57	64	60	49	35

Note 1: The attenuator selections provided are indicative and may change subject to detailed design.

6.2.3 Emergency operating conditions

Emergency operation is activated in the event of an incident where smoke control is required. During the emergency operation mode the ventilation facilities (at Kingsgrove, St Peters and Arncliffe) would continue to extract air from the tunnel and they would be run at similar noise levels to the normal traffic conditions.

The emergency smoke extraction facilities at Bexley Road South and Arncliffe motorway operations complexes would be used to extract smoke out of the tunnels. The sound power levels for the emergency smoke extraction facilities are the same for fresh air supply and smoke extraction modes and are given in **Table 103**.

During emergency conditions jet fans would be operated in the direction of the nearest exhaust facility in order to get the smoke out of the tunnel. This means that jet fans could be operating in reverse mode. The sound power level for jet fans operating in reverse mode is assumed to be the same as the sound power level for the jet fans operating in forward mode, as given in **Table 100**.

The frequency of this mode of operation being activated is unknown. All equipment which operates under normal operating conditions would continue to run during emergency operating conditions.

6.2.4 Assessment

The noise catchment areas (NCA) potentially affected by each fixed facility and their corresponding criteria have been presented in **Table 30**. For each noise catchment area the highest predicted noise level has been presented. Results for residential receivers are presented within **Table 104** to **Table 109**.

The noise emissions from permanent operational fixed facilities and from the jet fans within the tunnels were assessed for three different weather conditions. The predicted noise levels demonstrate that during both normal traffic conditions and low speed traffic conditions the operational noise criteria would not be exceeded during neutral or adverse weather conditions.

Operational noise levels at all non-residential sensitive receivers comply with the appropriate criteria.

The characteristics of fixed facility operational noise have been assessed at noise sensitive receiver locations in accordance with the procedures set out in the *Industrial Noise Policy*. The assessment has been completed for the night-time period when background noise levels are lowest. The assessment has also considered worst case weather and operational conditions. The assessment found that the noise would not contain any low-frequency or tonal characteristics at any of the sensitive receivers.

Tonality and low frequency corrections apply at the receiver (rather than at the source). The fixed facilities are located in close proximity to major roads and the ambient noise levels are relatively high at residential receivers potentially affected, including during the night time period. These ambient noise levels, generally caused by road traffic noise, have been found to effectively mask any low frequency or tonal characteristics. In addition, given the nature of the sources, they are also not considered to be impulsive or intermittent. Therefore, in accordance with the requirements of the *Industrial Noise Policy* no modification factors are required.

All finalised plant should be assessed during the detailed design phase and appropriate noise mitigation measures incorporated.

Emergency operations are not typically regulated through the application of noise limits, however the potential noise impacts of emergency operations have been predicted as good practice. The noise levels from these facilities during emergency operations are the same as the levels predicted during low speed traffic conditions which have been demonstrated to result in an acceptable noise outcome.

Given the steady nature of the noise sources associated with the fixed facilities, $L_{A1(1min)}$ levels would be less than 3 dB(A) higher than L_{Aeq} levels. The $L_{A1(1min)}$ levels at all receivers from all facilities would comply with the sleep disturbance noise screening criteria as presented in **Table 31**. Therefore no further sleep disturbance assessment is required.

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Table 104 Highest predicted noise levels at the most affected receiver during neutral weather conditions and low speed traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	19	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	28	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	25	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	25	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	29	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	19	55	0	45	0	40	0
	NCA17	61 Warejee Street, Kingsgrove	19	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	30	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	24 Marsh Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	69 West Botany Street, Arncliffe	28	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	25	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	29	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	29	57	0	53	0	45	0
	NCA10	315 Princess Highway, St Peters	20	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	31	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

Table 105 Highest predicted noise levels at the most affected receiver during F-class inversions and low speed traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	23	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	32	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	29	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	29	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	31	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	23	55	0	45	0	40	0
	NCA17	61 Warejee Street, Kingsgrove	24	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	32	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	41 Flora Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	7 Eve Street, Arncliffe	31	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	28	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	33	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	32	57	0	53	0	45	0
	NCA10	315 Princes Highway, St Peters	24	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	35	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

Table 106 Highest predicted noise levels at the most affected receiver during 3 m/s source to receiver winds low speed traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	23	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	32	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	29	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	29	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	31	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	23	55	0	45	0	40	0
	NCA17	61 Warejee Street, Kingsgrove	24	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	32	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	41 Flora Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	7 Eve Street, Arncliffe	31	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	28	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	33	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	32	57	0	53	0	45	0
	NCA10	315 Princes Highway, St Peters	24	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	35	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

Table 107 Highest predicted noise levels at the most affected receiver during neutral weather conditions and normal traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	19	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	28	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	24	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	25	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	28	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	18	55	0	45	0	40	0
	NCA17	61 Warejee Street, Kingsgrove	19	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	29	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	24 Marsh Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	9 Eve Street, Arncliffe	27	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	24	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	29	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	28	57	0	53	0	45	0
	NCA10	315 Princess Highway, St Peters	19	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	31	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

Table 108 Highest predicted noise levels at the most affected receiver during F-class inversions and normal traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	23	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	31	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	29	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	29	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	31	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	23	55	0	45	0	40	0
	NCA17	36 Poole Street, Kingsgrove	24	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	31	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	24 Marsh Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	7 Eve Street, Arncliffe	30	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	28	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	33	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	32	57	0	53	0	45	0
	NCA10	315 Princes Highway, St Peters	23	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	35	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

Table 109 Highest predicted noise levels at the most affected receiver during 3 m/s source to receiver winds and normal traffic conditions

Facility	Location	Most affected receiver	Predicted $L_{Aeq,15min}$ dB(A)	Day		Evening		Night	
				Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances	Criteria $L_{Aeq,15min}$ dB(A)	Number of exceedances
Kingsgrove (MOC1) and western portals	NCA18	13-15 Forrester Street, Kingsgrove	23	53	0	45	0	38	0
	NCA19	91 Glamis Street, Kingsgrove	31	50	0	45	0	40	0
	NCA24	68-72 Morgan Street, Kingsgrove	29	55	0	45	0	40	0
	NCA25	14 Sutcliffe Street, Kingsgrove	29	52	0	45	0	40	0
Bexley Road South (MOC2)	NCA15	88 Wolli Avenue, Earlwood	31	55	0	45	0	40	0
	NCA16	52 Poole Street, Kingsgrove	23	55	0	45	0	40	0
	NCA17	36 Poole Street, Kingsgrove	24	53	0	45	0	40	0
	NCA26	1 Kingsgrove Avenue, Kingsgrove	31	52	0	45	0	40	0
Arncliffe (MOC3)	NCA12	24 Marsh Street, Arncliffe	42	60	0	50	0	45	0
	NCA13	7 Eve Street, Arncliffe	30	54	0	50	0	45	0
	NCA14	10 Brennans Road, Arncliffe	28	52	0	50	0	44	0
St Peters (MOC4) and eastern portals	NCA06	3A Edith Street, St Peters	33	55	0	45	0	44	0
	NCA07	1 Edith Street, St Peters	32	57	0	53	0	45	0
	NCA10	315 Princes Highway, St Peters	23	58	0	57	0	52	0
Burrows Road (MOC5)	NCA04	30 Campbell Road, Alexandria	35	60	0	51	0	45	0
	NCA05	-	-	60	0	51	0	45	0
	NCA11	-	-	59	0	55	0	47	0

7.0 Construction noise and vibration mitigation

This section of the report presents construction noise and vibration mitigation measures to be considered for implementation to minimise and manage construction noise impacts.

The construction noise and vibration assessment presented in **Chapter 5.0** of this report detailed a number of exceedances of the noise management levels within this project. These were predicted as a result of various different construction activities. A number of exceedances of the 'highly noise affected' criteria have also been predicted within the study area. As a result of these exceedances, and potential exceedances of vibration criteria, the following generic and receiver specific mitigation measures have been identified.

7.1 Construction noise and vibration

7.1.1 Construction noise and vibration management plan

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared. The CNVMP would include the following:

- Identification of nearby residences and other sensitive land uses.
- Description of approved hours of work.
- Description and identification of all construction activities, including work areas, equipment and duration.
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration.
- A complaints handling process.
- Noise and vibration monitoring procedures.
- Overview of community consultation required for identified high impact works.

The CNVMP should include consideration of the following issues:

- Cumulative construction noise impacts.
- Construction noise fatigue.

The cumulative noise impacts of nearby major projects such as the KGRIU project should be further considered by the contractor when a detailed construction schedule becomes available for the project. In addition the contractor should periodically check for other approved construction projects would affect noise sensitive receivers impacted by the project. Consultation should be undertaken with the KGRIU and other contractors to manage cumulative impacts on sensitive receivers within common areas. Feasible and reasonable mitigation measures should be detailed in the CNVMP and updated as necessary.

Feasible and reasonable mitigation measures would be detailed within the CNVMP to manage predicted noise levels at sensitive receivers and areas where construction fatigue could occur. Consultation with the affected community would also occur prior to and during construction.

7.1.2 Community consultation and complaints handling

All residents impacted by noise from the proposed works which are expected to exceed the construction noise management levels (NML) should be consulted about the project prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.

The information provided to the residents should include:

- An overview of the construction works to be undertaken
- Programmed times and locations of construction work
- The hours of proposed works
- Construction noise and vibration impact predictions
- Construction noise and vibration mitigation measures being implemented on site.

Community consultation regarding construction noise and vibration would be detailed in the Community Involvement Plan for the construction of the project and would include a 24 hour hotline and complaints management process.

For out-of-hours works, consultation would take place with consideration to Practice note vii of Roads and Maritime's *Environmental Noise Management Manual* and Strategy 2 of the *Interim Construction Noise Guideline*.

7.1.3 Work practices

Induction and training would be provided to relevant staff and sub-contractors outlining their responsibilities with regard to noise and vibration.

7.1.4 Construction hours and work scheduling

Details of all out of hours work required would form part of the CNVMP.

Noisy work would be scheduled to be undertaken during the standard hours as far as possible. Noisy activities that cannot be undertaken during standard construction hours are to be scheduled as early as possible during the evening and / or night-time periods.

Particularly noisy activities such as the use of impact piling rigs, road and concrete saws, rock hammers, should be scheduled where feasible and reasonable around times of high background noise to provide masking.

Deliveries would be carried out during standard construction hours where feasible and reasonable.

Consideration would be given to construction timetabling to minimise noise impacts such as respite periods.

7.1.5 Respite

A protocol would be developed to identify the need for and provision of respite measures for residential receivers in accordance with the *Interim Construction Noise Guideline*. Respite measures may include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as alternative accommodation.

The protocol would form part of the Construction Noise and Vibration Management Plan.

7.2 Construction noise

7.2.1 Construction traffic

The following measures would be implemented to reduce and manage noise and vibration impacts:

- Truck drivers would be advised of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (ie minimising/restricting the use of engine compression brakes, and no extended periods of engine idling).
- Site access and egress points would be located away from residences and other sensitive land uses, where feasible and reasonable.
- Deliveries and spoil removal would be planned to avoid queuing of trucks on or around the compounds.
- Construction sites would be arranged to limit the need for reversing associated with regular / repeatable movements (eg trucks transporting spoil) to minimise the use of reversing alarms.
- Where feasible and reasonable, non-tonal reversing alarms would be used, taking into account the requirements of the Workplace Health and Safety legislation.

- Heavy vehicle movements outside of standard construction hours associated with tunnel support works (spoil removal, concrete delivery and other truck movements) would only occur via access and egress directly to and from the M5 East and would occur through the applicable construction ancillary facilities.

Spoil would be moved during the day where practical, and feasible and reasonable management strategies would be investigated in consultation with the NSW Environment Protection Authority to minimise the volume of heavy vehicle movements at night.

7.2.2 Construction compound sites

The noise associated with the operation of compound sites would primarily result from the operation of fixed and mobile plant and truck movements. Consideration would be given to the layout of the site in order to maximise distance and shielding to nearby receivers.

Sheds would be erected at the construction compounds that are proposed to support 24 hour tunnelling activities. Acoustic sheds would be utilised at Kingsgrove North (C1), Bexley Road North (C4) and Bexley Road South (C5) construction compounds. The indicative insertion loss of the acoustic sheds would be around 25 dB(A), however this would be confirmed during the detailed design phase. During night time tunnelling activities, all works would be located within the sheds and doors would be kept closed. Non-acoustic sheds would be erected at Commercial Road (C3) and Arncliffe (C7) construction compounds. The indicative insertion loss of the non-acoustic sheds would be around 10 dB(A), however this would be confirmed during the detailed design phase. The proposed shed locations can be found in **Table 9**.

7.2.3 Plant and equipment selection and location

The selection of plant and equipment can have a significant impact on construction noise levels. Appropriate plant would be selected for each task to minimise the noise contributions.

Alternative works methods such as use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented where feasible and reasonable. The use of alternative machines that perform the same function (such as rubber wheeler plant) would be considered in place of steel tracked plant.

Equipment would be regularly inspected and maintained to ensure it is in good working order.

Plant should be located on site with as much distance as possible between the plant and noise sensitive receivers. Noisy equipment would be orientated away from residential receivers where feasible and reasonable.

7.2.4 Noise barriers

Where practicable, permanent noise barriers would be scheduled for completion as early as possible so they can assist in mitigating construction noise. However, in a number of areas, the existing noise walls or parts of the existing noise walls would have to be demolished before the new wall can be constructed due to accessibility and safety. In these circumstances, an assessment of feasible and reasonable noise mitigation measures would be undertaken.

Where feasible and reasonable, the use of temporary noise walls or hoarding would be investigated where works or compounds are in proximity to residential receivers. The proposed noise barrier locations can be found in **Table 9**.

The noise barrier between the Kingsgrove North construction compound and residences has been identified as roadside barrier requiring increased height, to provide additional noise mitigation to highly affected residents. The height increase of the noise barrier would be confirmed during the initial construction stages.

Both the northern and southern noise barriers on the M5 East Motorway would need to be removed for a period of time while new walls are being constructed. At this early stage it is not possible to determine if temporary barriers can be provided in front of the existing noise walls to provide noise mitigation while new barriers are being constructed. Further details would be confirmed by the contractor during the development of the construction staging plan.

In the event that temporary noise walls are not found to be feasible, road traffic noise levels may increase by 5 – 10 dB(A) for up to three weeks, dependent on the location of the receiver and nature of the works.

7.2.5 Noise monitoring

Noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress. The results would be reviewed to determine if additional mitigation measures are required. All measurements would be undertaken in accordance with Australian Standard 1055.1-1997 – *Acoustics – Description and measurement of environmental noise, Part 1: General procedures*.

A noise monitoring program would be presented in the Construction Noise and Vibration Management Plan.

If regenerated noise is reported to be a problem during vibration intensive works, attended and / or unattended noise measurements would be undertaken in the relevant building spaces to determine the level of regenerated noise.

7.3 Construction vibration

In some circumstances, construction activity within the safe working distance cannot be avoided due to the work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced. For vibration intensive activities that occur within the safe working distances, management methods to mitigate should include:

- Equipment selection and maintenance.
- Construction scheduling.
- Dilapidation surveys.
- Supplementary vibration monitoring.

Dilapidation surveys

Prior to the commencement of tunnelling or other vibration intensive work at each site, existing condition surveys would be undertaken on all properties and structures within the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres from surface works.

Equipment selection and maintenance

Equipment size would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver.

The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures.

Equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.

Works scheduling

Wherever feasible and reasonable, vibration intensive works should be limited to the least sensitive times of the day.

Supplementary vibration monitoring

If the use of vibration intensive plant cannot be avoided within the safe working distance for cosmetic damage the following procedure would occur as a minimum:

- Notification of the works to the affected residents and community.
- Works would not proceed until attended vibration measurements are undertaken.

If ongoing works are required a temporary relocatable vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.

8.0 Operational noise mitigation

Where feasible and reasonable, road traffic noise levels from the operation of redeveloped and new roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land-use developments, reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles, greater use of public transport, and alternative methods of freight haulage.

The hierarchy of noise mitigation is firstly to consider at-source noise mitigation measures such as road design and traffic management, then the use of quieter pavements. If these measures cannot be designed to meet the noise criteria the use of 'in corridor' mitigation measures should be considered, which are generally noise barriers and mounds. Finally, if the applicable noise criteria cannot be met by using a combination of all these methods, at-receiver mitigation measures can be considered such as architectural treatments and property boundary walls.

As discussed in **Section 4.5.2**, a sensitive receiver would be considered eligible for the consideration of noise mitigation where:

- The predicted Build noise level exceeds the *Noise Criteria Guideline* controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the Build minus the No Build) is greater than 2.0 dB(A); or
- The predicted Build noise level is 5 dB(A) or more above the criteria (exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project; or
- The noise level contribution from the road project is acute (daytime $L_{Aeq(15hour)}$ 65 dB(A) or higher, or night time $L_{Aeq(9hour)}$ 60 dB(A) or higher) then it qualifies for consideration of noise mitigation even if noise levels are dominated by another road.

When designing noise mitigation, the target noise level is the lowest applicable noise criterion or controlling criterion, however it may not be feasible and reasonable to achieve these levels.

8.1 Western surface works

In **Section 6.1**, one receiver was identified as eligible for consideration of additional noise mitigation measures.

For this project, road design and traffic management options have been considered. A low-noise pavement is already proposed for this area in the form of OGA. As only one receiver is eligible for consideration it is not reasonable to build a noise barrier to mitigate the noise impacts.

Due to the limited availability of noise mitigation options, one sensitive receiver would continue to have residual noise levels above the controlling criterion. This receiver would be eligible for the consideration of at-property treatments to achieve compliance with the applicable noise goals.

8.1.1 Additional architectural treatment

For properties where exceedances are up to 10 dB(A), fresh air ventilation, sealing of wall vents and upgraded window and door seals are generally considered appropriate (Architectural treatment type 1). Where exceedances are over 10 dB(A) additional upgrade of windows and doors may be considered (Architectural treatment type 2). Architectural treatments are generally only applied to the first two floors of eligible properties.

Provided in **Table 110** are the details of the residential receiver eligible for consideration of architectural treatment. This would be confirmed during detailed design.

Table 110 Residential receivers eligible for consideration of architectural treatments (Kingsgrove area)

Receiver ID	Address	Architectural type
9382	1 Kirrang Street, Beverly Hills	Type 1

8.1.2 Existing noise barriers

Although the design of additional or modified noise barriers is not required to be considered throughout this area, the project would need to remove and then rebuild noise barriers wherever an existing barrier exists. The Roads and Maritime's requirement is to ensure that any augmented barrier provides the same insertion loss as the existing noise barrier. For most barriers such as those adjacent Kirrang Street and Tallwalla Street, this means that the same height noise barrier above the existing road is provided.

An existing noise berm is located south of Beverly Grove Park. This berm is around eight metres to nine metres high at its highest point. This barrier must be removed to allow for the new road alignment. The design alignment is moving further north so that reinstating this barrier would significantly decrease the amount of available land in this area. It would effectively eliminate usable park area, which the community has shown a strong preference to maintain. As such a noise barrier, or combination of noise mound and noise barrier, has been considered at this location to maintain the existing noise reduction provided by the berm.

An assessment was undertaken to determine the impact of replacing the existing berm with a noise barrier. The highest point of the berm is set back from the near lane of traffic by around 25 metres. A noise barrier with the highest point closer to the road can provide significantly higher noise attenuation. The final design of the noise barrier is not yet available, however an indicative analysis has been undertaken incorporating a noise barrier 6.5 metres high to determine the insertion loss of the barrier. The existing noise berm was found to provide an insertion loss of around L_{Aeq} 8 dB(A) and L_{Amax} of less than 11 dB(A). The proposed noise barrier would result in an insertion loss of L_{Aeq} 7 dB(A) and L_{Amax} of 8 dB(A). As such, the proposed barrier has a marginally lesser performance of 1 dB(A) for L_{Aeq} noise levels and 3 dB(A) for L_{Amax} levels.

It is important to note that the L_{Amax} noise assessment was modelled at the height of the truck exhaust. Modelling corrections suggest that most of the noise is emitted from the engine, rather than the exhaust. However this would be highly dependent on the make and model of the truck in question. The modelling also does not take into account that the road design is optimised to reduce engine braking as much as practicably possible.

A change in noise of less than 3 dB(A) is typically considered indiscernible. Considering the difference in the L_{Aeq} insertion loss is around 1 dB(A), this is considered a negligible change in noise. The L_{Amax} is somewhat higher, however considering the reduction in heavy vehicles adjacent to the sensitive receivers as a result of the project, the change in noise would likely be on the point of discernibility. The provision of a full height noise barrier (8.5 metres to 9 metres) is unlikely to be practical in terms of urban design, therefore a 6.5 metre noise barrier is considered to be appropriate at this location.

On this basis and consistent with the requirements of the *Noise Mitigation Guideline*, a noise barrier 6.5 metres above the existing alignment has been included in the assessment. Further analysis would be undertaken at the detailed design to confirm if this would be a noise wall only, or a combination of noise wall and berm. Other factors such as landscaping and visual impact of the options would also be considered at this stage.

8.2 St Peters interchange

In **Section 6.1**, a total of 144 residential receivers were identified as eligible for consideration of additional noise mitigation measures. In addition two buildings within St Peters Public School are likely to experience noise levels which exceed the internal noise criteria with windows open.

For this project, road design and traffic management options have been considered. Given the speed limit in this area, a low-noise pavement is not considered suitable and has therefore not been considered further.

A noise barrier was initially considered to the south of the proposed alignment. As access to properties and existing roads would need to be maintained, it would not be feasible to build noise barriers to mitigate the noise impacts. It was also not considered reasonable to build a noise barrier to the north of Campbell Street due to visual amenity and other urban design aspects.

Due to the limited availability of noise mitigation options, 144 residential receivers would continue to have residual noise levels above the controlling criterion. These receivers would be eligible for the consideration of at-property treatments to achieve compliance with the applicable noise goals. This should be subject to confirmation during detailed design.

8.2.1 Additional architectural treatment

For properties where exceedances are up to 10 dB(A), fresh air ventilation, sealing of wall vents and upgraded window and door seals are generally considered appropriate (Architectural treatment type 1). Where exceedances are over 10 dB(A) additional upgrade of windows and doors may be considered (Architectural treatment type 2). Architectural treatments are generally only applied to the first two floors of eligible properties.

Provided in **Table 111** is a list of the 144 residential receivers eligible for consideration of architectural treatment. This should be subject to confirmation during detailed design.

Table 111 Residential receivers eligible for consideration of architectural treatments (St Peters interchange)

Receiver ID	Address	Architectural type
1424	220-230 Lawrence Street Alexandria	Type 1
1629	93-103 Euston Road Alexandria	Type 2
1984	125 Euston Road Alexandria	Type 2
2012	288-302 Lawrence Street Alexandria	Type 2
3439	58 Hutchinson Street St Peters	Type 1
3443	71 Hutchinson Street St Peters	Type 1
3445	73 Hutchinson Street St Peters	Type 1
3454	60 Hutchinson Street St Peters	Type 1
3456	68 Hutchinson Street St Peters	Type 1
3457	77 Hutchinson Street St Peters	Type 1
3459	79 Hutchinson Street St Peters	Type 1
3461	51 Lackey Street St Peters	Type 1
3462	55 Lackey Street St Peters	Type 1
3465	53 Lackey Street St Peters	Type 1
3467	47 Lackey Street St Peters	Type 1
3468	81 Hutchinson Street St Peters	Type 1
3469	49 Lackey Street St Peters	Type 1
3470	41 Lackey Street St Peters	Type 1
3473	43 Lackey Street St Peters	Type 1
3474	45 Lackey Street St Peters	Type 1
3477	35 Lackey Street St Peters	Type 1
3479	83 Hutchinson Street St Peters	Type 1
3480	39 Lackey Street St Peters	Type 1
3481	37 Lackey Street St Peters	Type 1
3482	33 Lackey Street St Peters	Type 1
3484	31 Lackey Street St Peters	Type 1
3485	23 Lackey Street St Peters	Type 1
3486	29 Lackey Street St Peters	Type 1
3487	27 Lackey Street St Peters	Type 1

Receiver ID	Address	Architectural type
3488	25 Lackey Street St Peters	Type 1
3489	21 Lackey Street St Peters	Type 1
3490	85 Hutchinson Street St Peters	Type 1
3494	19 Lackey Street St Peters	Type 1
3511	87 Hutchinson Street St Peters	Type 2
3518	35 Barwon Park Road St Peters	Type 1
3526	65 Crown Street St Peters	Type 1
3527	31 Barwon Park Road St Peters	Type 1
3532	101 Hutchinson Street St Peters	Type 2
3533	67 Crown Street St Peters	Type 1
3544	71 Crown Street St Peters	Type 1
3548	38 Crown Street St Peters	Type 1
3551	67 Campbell Road St Peters	Type 2
3553	73 Crown Street St Peters	Type 1
3555	63 Campbell Street St Peters	Type 2
3557	75 Crown Street St Peters	Type 1
3558	44 Crown Street St Peters	Type 1
3560	47 Barwon Park Road St Peters	Type 1
3562	49 Barwon Park Road St Peters	Type 2
3565	51 Barwon Park Road St Peters	Type 2
3570	25 Campbell Road St Peters	Type 2
3573	29 Campbell Road St Peters	Type 2
3576	27 Campbell Road St Peters	Type 2
3577	21 Campbell Road St Peters	Type 2
3671	2 Campbell Road Alexandria	Type 2
3672	6 Campbell Road Alexandria	Type 2
3673	8 Campbell Road Alexandria	Type 2
3674	10 Campbell Road Alexandria	Type 2
3675	12 Campbell Road Alexandria	Type 2
3676	14 Campbell Road Alexandria	Type 2
3677	16 Campbell Road Alexandria	Type 2
3678	18 Campbell Road Alexandria	Type 2
3679	20 Campbell Road Alexandria	Type 2
3680	32 Campbell Road Alexandria	Type 2
3681	24 Campbell Road Alexandria	Type 2
3682	22 Campbell Road Alexandria	Type 2

Receiver ID	Address	Architectural type
3683	26 Campbell Road Alexandria	Type 2
3684	28 Campbell Road Alexandria	Type 2
3685	30 Campbell Road Alexandria	Type 2
3686	32 Campbell Road Alexandria	Type 2
3687	23-29 Campbell Road St Peters	Type 2
3688	19 Campbell Road St Peters	Type 2
3689	53 Barwon Park Road St Peters	Type 2
3795	75 Church Street St Peters	Type 2
3797	3 Brown Street St Peters	Type 2
3805	77 Church Street St Peters	Type 2
3808	5 Brown Street St Peters	Type 2
3809	79 Church Street St Peters	Type 2
3817	81 Church Street St Peters	Type 2
3818	4 St Peters Street St Peters	Type 2
3822	7 Brown Street St Peters	Type 2
3826	6 St Peters Street St Peters	Type 2
3829	83 Church Street St Peters	Type 2
3831	9 Brown Street St Peters	Type 2
3834	7 Florence Street St Peters	Type 2
3838	1b St Peters Street St Peters	Type 2
3839	8 St Peters Street St Peters	Type 2
3840	85 Church Street St Peters	Type 2
3843	10 Brown Street St Peters	Type 2
3846	11 Brown Street St Peters	Type 1
3849	9 Florence Street St Peters	Type 2
3851	4 Florence Street St Peters	Type 2
3852	87 Church Street St Peters	Type 1
3855	1/12 Brown Street St Peters	Type 1
3856	11 Florence Street St Peters	Type 2
3859	13 Brown Street St Peters	Type 1
3860	6 Florence Street St Peters	Type 2
3861	5 St Peters Street St Peters	Type 2
3862	89 Church Street St Peters	Type 1
3867	1/12 Brown Street St Peters	Type 2
3868	12 St Peters Street St Peters	Type 1
3872	16 Brown Street St Peters	Type 1

Receiver ID	Address	Architectural type
3873	7 St Peters Street St Peters	Type 1
3874	91a Church Street St Peters	Type 1
3877	15 Brown Street St Peters	Type 1
3882	13 Florence Street St Peters	Type 1
3883	8 Florence Street St Peters	Type 2
3885	17 Brown Street St Peters	Type 1
3886	159 Princes Highway St Peters	Type 2
3887	91b Church Street St Peters	Type 1
3890	9 St Peters Street St Peters	Type 1
3894	16 St Peters Street St Peters	Type 1
3895	18 St Peters Street St Peters	Type 1
3896	91c Church Street St Peters	Type 1
3897	22 Brown Street St Peters	Type 1
3899	19 Brown Street St Peters	Type 1
3903	10 Florence Street St Peters	Type 1
3907	15 Florence Street St Peters	Type 1
3908	91d Church Street St Peters	Type 1
3909	12 Florence Street St Peters	Type 1
3910	11 St Peters Street St Peters	Type 1
3913	21 Brown Street St Peters	Type 1
3914	24 Brown Street St Peters	Type 1
3916	14 Florence Street St Peters	Type 1
3921	17 Florence Street St Peters	Type 1
3923	13 St Peters Street St Peters	Type 1
3925	16 Florence Street St Peters	Type 1
3926	18 St Peters Street St Peters	Type 1
3927	23 Brown Street St Peters	Type 1
3928	18 Florence Street St Peters	Type 1
3934	19 Florence Street St Peters	Type 1
3935	20 Florence Street St Peters	Type 1
3936	15 St Peters Street St Peters	Type 1
3940	17 St Peters Street St Peters	Type 1
4059	8/635 Gardeners Road Mascot	Type 2
4086	21 St Peters Street St Peters	Type 1
4089	23 St Peters Street St Peters	Type 1
4090	24 Florence Street St Peters	Type 1

Receiver ID	Address	Architectural type
4092	21 Florence Street St Peters	Type 1
4096	30 Brown Street St Peters	Type 1
4099	31 St Peters Street St Peters	Type 1
4100	25 Brown Street St Peters	Type 1
4103	26 Florence Street St Peters	Type 1
4115	29 Florence Street St Peters	Type 1
4117	31 St Peters Street St Peters	Type 1

St Peters Public School has been identified as potentially exceeding the applicable noise criteria. Internal noise measurements and insertion loss investigations would need to be undertaken at the detailed design phase to determine the likely internal noise impact and determine if the school is eligible for architectural noise treatment. If the school is found to be eligible for the consideration of additional noise mitigation, suitable noise mitigation would be recommended to comply with the applicable noise criterion.

8.3 Operational noise monitoring

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable mitigation measures would be undertaken to meet the project noise requirements.

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9.0 Noise and vibration impact summaries

9.1 Construction noise and vibration and fixed facilities impact summaries

NCA 1

Construction noise and vibration

Receivers within NCA 1 are primarily residential, comprising both medium density apartments and single and double storey semi-detached houses.

The existing acoustic environment is considered as urban and is dominated by traffic noise from Sydney Park Road and to a lesser extent Mitchell Road, Euston Road and the East Hills, Airport and Inner West railway line.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 10 metres extending to 450 metres away.

The construction works which would potentially impact NCA 1 are as follows:

- Surface works
    - Local roadworks
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 1 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major noise management level (NML) exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks associated with local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

The proposed construction traffic routes would not utilise roads close to NCA 1, therefore the impact of construction traffic noise would likely be negligible.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 1 to the St Peters ventilation facility and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 2

Construction noise and vibration

Receivers within NCA 2 are primarily residential, comprising single and double storey semi-detached and detached houses.

The existing acoustic environment is considered as urban and is dominated by traffic noise from King Street and to a lesser extent rail traffic the local road network and the East Hills, Airport and Inner West railway line.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 50 metres extending to around 800 metres away.

The construction works which would potentially impact NCA 2 are as follows:

- Surface works
    - Local roadworks
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 2 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

The proposed construction traffic routes would not utilise roads close to NCA 2, therefore the impact of construction traffic noise would likely be negligible.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 2 to the St Peters ventilation facility and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 3

Construction noise and vibration

NCA 3 comprises a mix of commercial, industrial and residential receivers. Residential receivers are generally single storey detached buildings and two to three storey apartment buildings.

The existing acoustic environment is considered as urban and is dominated by traffic along May Street, the Princes Highway, Campbell Street and the East Hills, Airport and Inner West railway line.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than10 metres extending to 650 metres away.

The construction works which would potentially impact NCA 3 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Campbell Road construction compound (C9)
    - Landfill closure construction compound (C10)
    - Sydney Park construction compound (C14)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 3 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause minor NML exceedances.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in major NML exceedances. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and a temporary noise barrier would be located around the perimeter of the Campbell Road construction compound (C9) in order to manage the long term noise impact. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the Princes Highway which would affect receivers within NCA 3. The increase in construction traffic noise may exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 3 to the St Peters ventilation facility and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 4

Construction noise and vibration

Receivers within NCA 4 are primarily commercial and recreational with a small number of residential receivers comprising single and double storey houses.

The existing acoustic environment is considered as urban and is dominated by traffic along the Princes Highway, Campbell Road and Sydney Park Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres.

The construction works which would potentially impact NCA 4 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Campbell Road construction compound (C9)
    - Landfill closure construction compound (C10)
    - Burrows Road construction compound (C11)
    - Alexandra Canal construction compound (C12)
    - Gardeners Road bridge construction compound (C13)
    - Sydney Park construction compound (C14)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 4 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in major NML exceedances during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would also cause major NML exceedances.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in major NML exceedances. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and a temporary noise barrier would be located around the perimeter of the Campbell Road construction compound (C9) in order to manage the long term noise impact. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise Campbell Road which would affect residential receivers within NCA 4. The increase in construction traffic noise would likely exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the St Peters ventilation facility and the Burrows Road Motorway Control centre and from the eastern tunnel portals are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 31 dB(A) during neutral weather conditions and 35 dB(A) during adverse weather conditions.

NCA 5

Construction noise and vibration

NCA 5 comprises industrial and commercial receivers only; no noise sensitive receivers are located within this NCA. Industrial and commercial receivers typically only operate within the daytime. Commercial and industrial receivers generally have a higher tolerance to noise than residential receivers and other types of sensitive receivers.

The predicted noise impact on the commercial and industrial receivers is minor. The use of high noise equipment would occur directly outside these receivers however; these works are expected to be short term in nature.

NCA 6

Construction noise and vibration

Receivers within NCA 6 are primarily residential, comprising single and double storey terrace, semi-detached and detached houses.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along the Princes Highway, Unwins Bridge Road and local roads and rail traffic on the East Hills, Airport and Inner West railway line. Aircraft noise also contributes to the noise environment.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 550 metres away.

The construction works which would potentially impact NCA 6 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Canal Road construction compound (C8)
    - Campbell Road construction compound (C9)
    - Landfill Closure construction compound (C10)
    - Sydney Park construction compound (C14)
- Tunnel works
    - M4-M5 Link tunnel stubs

NCA 6 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and temporary noise barriers would be located around the perimeters of the Canal Road and Campbell Road construction compounds (C8 and C9) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within NCA 6 would be impacted by tunnelling work activities for the M4-M5 Link stubs. The ground-borne noise levels would exceed the night-time criteria by up to 10 dB(A) for worst affected receivers. Ground-borne vibration levels would also exceed the night-time criteria by up to 0.02 mm / s. The slant distance between the tunnel and worst affected property is around 30 metres. The works would only occur for a period of around five days as tunnelling progresses beneath the residential receivers.

Construction traffic would utilise roads close to NCA 6 including the Princes Highway and Canal Road. The increase in construction traffic noise would likely comply with the noise goal.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the St Peters ventilation facility and from the eastern tunnel portals are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 29 dB(A) during neutral weather conditions and 33 dB(A) during adverse weather conditions.

NCA 7

Construction noise and vibration

Receivers within NCA 7 comprise mostly commercial receivers (including a hotel), industrial receivers, with some residential receivers and a school. Residential receivers include single and double storey, terraced and detached buildings and two to three storey mixed-used buildings.

The existing acoustic environment is considered as urban and is dominated by road traffic noise from the Princes Highway and to a lesser extent Campbell Street.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 400 metres away.

The construction works which would potentially impact NCA 7 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Canal Road construction compound (C8)
    - Campbell Road construction compound (C9)
    - Landfill Closure construction compound (C10)
    - Sydney Park construction compound (C14)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 7 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in moderate NML exceedances (between 11 and 20 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause moderate NML exceedances (between 11 and 20 dB(A)).

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are also likely to result in major NML exceedances. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and temporary noise barriers would be located around the perimeters of the Canal Road and Campbell Road construction compounds (C8 and C9) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 7 including the Princes Highway and Campbell Road. The increase in construction traffic noise would likely exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the St Peters ventilation facility and from the eastern tunnel ports are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 29 dB(A) during neutral weather conditions and 32 dB(A) during adverse weather conditions.

NCA 8

Construction noise and vibration

Receivers within NCA 8 are primarily residential single storey semi-detached and terraced houses.

The existing acoustic environment is considered as urban and is dominated by road traffic on Princes Highway, Campbell Road, Campbell Street and Barwon Park Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 250 metres away.

The construction works which would potentially impact NCA 8 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Campbell Road construction compound (C9)
    - Landfill closure construction compound (C10)
    - Alexandra Canal construction compound (C12)
    - Sydney Park construction compound (C14)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 8 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are also likely to result in major NML exceedances during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause moderate NML exceedances (between 11 and 20 dB(A)).

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers and at receivers located further from the works are likely to result in major NML exceedances. The sleep disturbance criteria may be exceeded at

residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and a temporary noise barrier would be located around the perimeter of the Campbell Road construction compound (C9) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise Campbell Road which passes through NCA 8. The increase in construction traffic noise would likely exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 8 to the St Peters ventilation facility and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 9

Construction noise and vibration

Receivers within NCA 9 are predominantly residential single and double storey semi-detached and detached houses.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along the Princes Highway and to a lesser extent Railway Road. Rail traffic on the East Hills, Airport and Inner West railway line also contributes to the ambient noise environment in addition to aircraft noise.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 300 metres extending to 800 metres away.

The construction works which would potentially impact NCA 9 are as follows:

- Surface works
    - Local roadworks
- Construction compounds
    - Canal Road construction compound (C8)
- Tunnel works
    - Main alignment tunnels

NCA 9 would be affected by works during out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works and at receivers further away are likely to result in compliance with the NML during all works.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers are likely to result in minor NML exceedances (between 1 and 10 dB(A)). L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria would not be exceeded for residences within

this NCA. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Hoarding and temporary noise barriers would be located around the perimeter of the Canal Road construction compound (C8) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within NCA 9 would be impacted by tunnelling work activities for the main tunnel alignment. The ground-borne noise levels would exceed the night-time criteria by up to 10 dB(A) for worst affected receivers. Ground-borne vibration levels would also exceed the night-time criteria by up to 0.02 mm/s. The slant distance between the tunnel and worst affected property is around 28 metres. The works would only occur for a period of around five days as tunnelling progresses beneath the residential receivers.

Construction traffic would utilise the Princes Highway which runs close to NCA 9. The increase in construction traffic noise would likely comply with the noise goal.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 9 to the St Peters ventilation facility and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 10

Construction noise and vibration

Receivers within NCA 10 are predominantly industrial and commercial, with some single storey detached residential receivers along the Princes Highway.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along the Princes Highway. Air traffic also significantly contributes to the noise environment.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 100 metres extending to 700 metres away.

The construction works which would potentially impact NCA 10 are as follows:

- Surface works
    - Local roadworks
    - St Peters Interchange works
- Construction compounds
    - Canal Road construction compound (C8)
    - Landfill closure construction compound (C10)
    - Burrows Road construction compound (C11)
- Tunnel works
    - Main tunnel alignment

NCA 10 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located

immediately adjacent to the works, are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in moderate NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Hoarding and temporary noise barriers would be located around the perimeter of the Canal Road construction compound (C8) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within NCA 10 would be impacted by tunnelling work activities for the main tunnel alignment. The ground-borne noise levels would exceed the night-time criteria by up to 10 dB(A) for worst affected receivers. Ground-borne vibration levels would also exceed the night-time criteria by up to 0.04 mm / s. The slant distance between the tunnel and worst affected property is around 12 metres. The works would only occur for a period of around five days as tunnelling progresses beneath the residential receivers.

Construction traffic would utilise roads within NCA 10 including Canal Road and the Princes Highway. The increase in construction traffic noise would likely exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of St Peters ventilation facility and from the eastern tunnel ports are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 20 dB(A) during neutral weather conditions and 24 dB(A) during adverse weather conditions.

NCA 11

Construction noise and vibration

Receivers within NCA 11 are predominantly industrial and commercial, with some medium density apartment buildings at the eastern side of the NCA.

The existing acoustic environment is considered as urban and is dominated by road traffic movements along the Gardeners Road and O'Riordan Street.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 20 metres extending to 350 metres away.

The construction works which would potentially impact NCA 11 are as follows:

- Surface works
    - Local roadworks
- Construction compounds
    - Landfill closure construction compound (C10)
    - Burrows Road construction compound (C11)
    - Alexandra Canal bridge construction compound (C12)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 11 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks for local road works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause minor NML exceedances.

During the night-time period the works stage which would have the greatest impact would be kerbing and drainage for the local roadworks. L_{Aeq} noise levels at the most affected receivers and at receivers located further from the works are likely to result in major NML exceedances. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

As the roadworks are linear the works would progress along the alignment, therefore receivers would not be affected for the entire construction period.

Vibration intensive works during earthworks for local road works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 11 including Canal Road and Burrows Road. The increase in construction traffic noise would likely exceed the noise goal at times.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 11 to fixed facilities and the eastern tunnel portals operational noise levels would comply with the operational noise criteria at all noise sensitive receivers.

NCA 12

Construction noise and vibration

Receivers within NCA 12 are primarily residential, comprising single or double storey detached houses.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along Marsh Street, West Botany Street and the Princes Highway and aircraft noise from Sydney Airport.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 20 metres extending to 350 metres away.

The construction works which would potentially impact NCA 12 are as follows:

- Surface works
    - There would be no impact from surface works.
- Construction compounds
    - Arncliffe construction compound (C7)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 12 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in moderate NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause minor NML exceedances.

During the night-time period the works stage which would have the greatest impact would be excavation of the decline and tunnel shaft. L_{Aeq} noise levels at the most affected receivers are likely to result in minor NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria would not be exceeded for residences within this NCA. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, a shed would be constructed which would provide acoustic shielding from the works.

Hoarding and temporary noise barriers would be located around the perimeter of the Arncliffe construction compound (C7) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 12 including West Botany Street and Marsh Street. The increase in construction traffic noise would generally comply with the noise goal, however small exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the Arncliffe ventilation and emergency smoke extraction facilities are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise emission is predicted to be 42 dB(A) during neutral weather conditions and 42 dB(A) during adverse weather conditions.

NCA 13

Construction noise and vibration

Receivers within NCA 13 are primarily residential, comprising mainly single storey detached houses.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along the M5 East Motorway, West Botany Street and Wickham Street and aircraft noise from Sydney Airport.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 250 metres extending to 450 metres away.

The construction works which would potentially impact NCA 13 are as follows:

- Surface works
    - There would be no impact from surface works.
- Construction compounds
    - Arncliffe construction compound (C7)

- Tunnel works
    - There would be no impact from tunnelling works.

NCA 13 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, and those located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)). When rock hammering is not in operation minor NML exceedances would be likely to occur.

Hoarding and temporary noise barriers would be located around the perimeter of the Arncliffe construction compound (C7) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 13 including West Botany Street, Marsh Street and Wickham Street. The increase in construction traffic noise would generally comply with the noise goal, however small exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the Arncliffe ventilation and emergency smoke extraction facilities are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise emission is predicted to be 28 dB(A) during neutral weather conditions and 31 dB(A) during adverse weather conditions.

NCA 14

Construction noise and vibration

Receivers within NCA 14 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as urban and is dominated by road traffic travelling along the M5 East Motorway and West Botany Street and aircraft noise from Sydney Airport.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 300 metres extending to 650 metres away.

The construction works which would potentially impact NCA 14 are as follows:

- Surface works
    - There would be no impact from surface works.
- Construction compounds
    - Arncliffe construction compound (C7)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 14 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in minor NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Hoarding and temporary noise barriers would be located around the perimeter of the Arncliffe construction compound (C7) in order to manage the long term noise impacts. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 14 including West Botany Street. The increase in construction traffic noise would generally comply with the noise goal, however small exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the Arncliffe ventilation and emergency smoke extraction facilities are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 25 dB(A) during neutral weather conditions and 28 dB(A) during adverse weather conditions.

NCA 15

Construction noise and vibration

Receivers within NCA 15 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along Bexley Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 450 metres away.

The construction works which would potentially impact NCA 15 are as follows:

- Surface works
    - Toll infrastructure works
- Construction compounds
    - Bexley Road North construction compound (C4)
    - Bexley Road South construction compound (C5)
    - Bexley Road East construction compound (C6)
- Tunnel works
    - Main alignment tunnel

NCA 15 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be excavation of the decline and tunnel shaft including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be excavation of the decline and tunnel shaft. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeters of the Bexley Road North, Bexley Road South and Bexley Road East construction compounds (C4, C5 and C6) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, acoustic sheds would be constructed within the Bexley Road North and Bexley Road South construction compounds (C4 and C5) which would provide acoustic shielding from the works. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during excavation of the decline and tunnel shaft may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within NCA 15 would be impacted by tunnelling work activities for the main tunnel alignment. The ground-borne noise levels would exceed the night-time criteria by up to 10 dB(A) for worst affected receivers. Ground-borne vibration levels would also exceed the night-time criteria by up to 0.02 mm / s. The slant distance between the tunnel and worst affected property is around 29 metres. The works would only occur for a period of around five days as tunnelling progresses beneath the residential receivers.

Construction traffic would utilise roads close to NCA 15 including Bexley Road and the M5 East Motorway. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during pm off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the nearby Bexley emergency smoke extraction facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 29 dB(A) during neutral weather conditions and 31 dB(A) during adverse weather conditions.

NCA 16

Construction noise and vibration

Receivers within NCA 16 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along Bexley Road and the M5 East Motorway.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 500 metres away.

The construction works which would potentially impact NCA 16 are as follows:

- Surface works
    - Toll infrastructure works
- Construction compounds
    - Bexley Road North construction compound (C4)
    - Bexley Road South construction compound (C5)
    - Bexley Road East construction compound (C6)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 16 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be excavation of the decline and tunnel shaft including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be excavation of the decline and tunnel shaft. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeters of the Bexley Road North, Bexley Road South and Bexley Road East construction compounds (C4, C5 and C6) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, acoustic sheds would be constructed within the Bexley Road North and Bexley Road South construction compounds (C4 and C5) which would provide acoustic shielding from the works. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during excavation of the decline and tunnel shaft may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 16 including Bexley Road and the M5 East Motorway. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during pm off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the nearby Bexley emergency smoke extraction facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 19 dB(A) during neutral weather conditions and 23 d6B(A) during adverse weather conditions.

NCA 17

Construction noise and vibration

Receivers within NCA 17 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway, Bexley Road, Homer Street and to a lesser extent the local road network.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 30 metres extending to 750 metres away.

The construction works which would potentially impact NCA 17 are as follows:

- Surface works
    - Western surface works
    - Toll infrastructure works
- Construction compounds
    - Bexley Road North construction compound (C4)
    - Bexley Road South construction compound (C5)
    - Bexley Road East construction compound (C6)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 17 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be excavation of the decline and tunnel shaft including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in minor NML exceedances (between 1 and 10 dB(A)) and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be road works associated with the construction of toll infrastructure. L_{Aeq} noise levels at the most affected receivers are likely to result in moderate NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeters of the Bexley Road North, Bexley Road South and Bexley Road East construction compounds (C4, C5 and C6) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, acoustic sheds would be constructed within the Bexley Road North and Bexley Road South construction compounds (C4 and C5) which would provide acoustic shielding from the works. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during excavation of the decline and tunnel shaft may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway which runs through NCA 17. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during the off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the nearby Bexley emergency smoke extraction facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 19 dB(A) during neutral weather conditions and 24 dB(A) during adverse weather conditions.

NCA 18

Construction noise and vibration

NCA 18 comprises commercial, industrial and residential receivers. The residential receivers are generally single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and Kingsgrove Road with some industrial noise contributions.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area is around 40 metres extending to 750 metres away.

The construction works which would potentially impact NCA 18 are as follows:

- Surface works
    - Western surface works
    - Toll infrastructure works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
    - Commercial Road construction compound (C3)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 18 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be road works associated with the construction of toll infrastructure. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove

North construction compound (C1) and a non-acoustic shed would be constructed within the Commercial Road construction compound (C3). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway, Kingsgrove Road, Wirega Avenue and Moorefields Road which run through NCA 18. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during pm off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the nearby Kingsgrove ventilation facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise emission is predicted to be 19 dB(A) during neutral weather conditions and 23 dB(A) during adverse weather conditions.

NCA 19

Construction noise and vibration

Receivers within NCA 19 are primarily residential, comprising single and double storey detached houses. Some commercial receivers are located at the eastern side of the NCA.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and Moorefields Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be less than 10 metres extending to 750 metres away.

The construction works which would potentially impact NCA 19 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
    - Commercial Road construction compound (C3)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 19 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause minor NML exceedances.

During the night-time period the works stage which would have the greatest impact would be general utility installation and relocation. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove North construction compound (C1) and a non-acoustic shed would be constructed within the Commercial Road construction compound (C3). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 19 including the M5 East Motorway, Moorefields Road and Wirega Avenue. Construction traffic using Wirega Avenue may cause exceedances of the noise goals during all periods of the day. In all other areas of NCA 19 the increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during pm off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the Kingsgrove ventilation facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 28 dB(A) during neutral weather conditions and 32 dB(A) during adverse weather conditions.

NCA 20

Construction noise and vibration

Receivers within NCA 20 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and Moorefields Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 20 metres extending to 700 metres away.

The construction works which would potentially impact NCA 20 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 20 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie

those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Temporary noise barriers would be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove North construction compound (C1). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 20 including the M5 East Motorway and Moorefields Road. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 20 to fixed facilities and the western tunnel portals operational noise levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 21

Construction noise and vibration

Receivers within NCA 21 are primarily residential with some commercial receivers along King Georges Road. The residential receivers generally comprise single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along King Georges Road, the M5 East Motorway and Moorefields Road.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 20 metres extending to 800 metres away.

The construction works which would potentially impact NCA 21 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 21 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works would comply with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 21 including the M5 East Motorway and Moorefields Road. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 21 to fixed facilities and western tunnel portals operational noise levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 22

Construction noise and vibration

Receivers within NCA 22 are primarily residential with some commercial receivers along King Georges Road. The residential receivers generally comprise single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along King Georges Road and the M5 East Motorway.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 30 metres extending to 650 metres away.

The construction works which would potentially impact NCA 22 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 22 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would cause minor NML exceedances.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 22 including the M5 East Motorway. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 22 to fixed facilities and western tunnel portals operational noise levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 23

Construction noise and vibration

Receivers within NCA 23 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and rail traffic on the East Hills and Airport railway line.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 30 metres extending to 750 metres away.

The construction works which would potentially impact NCA 23 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 23 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Temporary noise barrierswould be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove North construction compound (C1). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway which passes through NCA 23. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 23 to fixed facilities and western tunnel portals operational noise levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 24

Construction noise and vibration

NCA 24 comprises residential and industrial receivers. The residential receivers include single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 20 metres extending to 650 metres away.

The construction works which would potentially impact NCA 24 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 24 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in major NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be general utility installation and relocation. L_{Aeq} noise levels at the most affected receivers are likely to result in minor NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove North construction compound (C1). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway which passes through NCA 24. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the Kingsgrove ventilation facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels predicted to be 25 dB(A) during neutral weather conditions and 29 dB(A) during adverse weather conditions.

NCA 25

Construction noise and vibration

NCA 25 comprises residential and industrial/commercial receivers. The residential receivers are generally single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by rail traffic travelling along the East Hills and Airport railway line and by road traffic on local roads.

The offset distance from the construction works to the nearest sensitive receivers within the noise catchment area would be around 120 metres extending to 500 metres away.

The construction works which would potentially impact NCA 25 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - Kingsgrove North construction compound (C1)
    - Kingsgrove South construction compound (C2)
    - Commercial Road construction compound (C3)
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 25 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be demolition of existing structures including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)) during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in moderate NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

During the night-time period the works stage which would have the greatest impact would be excavation of the decline and tunnel shaft. L_{Aeq} noise levels at the most affected receivers are likely to result in minor NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in compliance with the NML. The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeter of the Kingsgrove North construction compound (C1) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, an acoustic shed would be constructed within the Kingsgrove North construction compound (C1) and a non-acoustic shed would be constructed within the Commercial road construction compound (C3). Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during demolition of existing structures may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 25 including the M5 East Motorway, Kingsgrove Road and Commercial Road. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the Kingsgrove ventilation facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 25 dB(A) during neutral weather conditions and 29 dB(A) during adverse weather conditions.

NCA 26

Construction noise and vibration

Receivers within NCA 26 are primarily residential, comprising single and double storey stand-alone houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and Bexley Road and by rail traffic on the East Hills and Airport railway line.

The offset distance from the construction works to the nearest sensitive receivers within the catchment area would be around 50 metres extending to 1,000 metres away.

The construction works which would potentially impact NCA 26 are as follows:

- Surface works
    - Toll infrastructure works
    - Western surface works
- Construction compounds
    - Commercial Road construction compound (C3)
    - Bexley Road North construction compound (C4)
    - Bexley Road South construction compound (C5)
    - Bexley Road East construction compound (C6)
- Tunnel works
    - Main tunnel alignment

NCA 26 would be affected by works during both standard hours and out of hours.

The works stage which would have the greatest impact during the daytime would be construction of the emergency smoke extraction facility. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in major NML exceedances (more than 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML.

During the night-time period the works stage which would have the greatest impact would be road works associated with the construction of toll infrastructure. L_{Aeq} noise levels at the most affected receivers are likely to result in major NML exceedances. L_{Aeq} noise levels at receivers located further from the works are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The sleep disturbance criteria may be exceeded at residences when works are located immediately adjacent to the receivers. Temporary noise barriers would be used around particularly noisy pieces of equipment such as concrete saws.

Temporary noise barriers would be located around the perimeters of the Bexley Road North, Bexley Road South and Bexley Road East construction compounds (C4, C5 and C6) in order to manage the long term noise impacts. Excavation of the shaft would not occur for an extended period of time. Upon completion of the excavation, acoustic sheds would be constructed within the Bexley Road North and Bexley Road South construction compounds (C4 and C5) and a non-acoustic shed would be constructed within the Commercial road construction compound (C3) which would provide acoustic shielding from the works. Where feasible, fixed plant within the compounds would be strategically located to achieve the greatest noise reduction at residential receivers.

Vibration intensive works during construction of the emergency smoke extraction facility may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within NCA 26 would be impacted by tunnelling work activities for the main tunnel alignment. The ground-borne noise levels would exceed the criteria by up to 10 dB(A) for worst affected receivers. The works would only occur for a period of around 5 days as tunnelling progresses beneath the residential receivers.

Residential receivers within NCA 26 would be impacted by tunnelling work activities for the main tunnel alignment. The ground-borne noise levels would exceed the night-time criteria by up to 10 dB(A) for worst affected receivers. Ground-borne vibration levels would also exceed the night-time criteria by up to 0.04 mm/s. The slant distance between the tunnel and worst affected property is around 14 metres. The works would only occur for a period of around five days as tunnelling progresses beneath the residential receivers.

Construction traffic would utilise roads within NCA 26 including the M5 East Motorway and Kingsgrove Road. The increase in construction traffic noise would generally comply with the noise goal, however exceedances may occur during pm off peak hours.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Noise emissions from the operation of the nearby Bexley Road South emergency smoke extraction facility are not expected to exceed the industrial noise criteria for any receiver within this NCA, during any period of the day. The worst-case noise levels are predicted to be 30 dB(A) during normal weather conditions and 32 dB(A) during adverse weather conditions.

NCA 27

Construction noise and vibration

Receivers within NCA 27 are primarily residential, comprising single and double storey detached houses. Beverly Hills North Public School is located within this NCA.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along King Georges Road and the M5 East Motorway and to a lesser extent by Shorter Avenue and Penshurst Road.

The offset distance from the construction works to the nearest sensitive receivers within the noise catchment area would be around 20 metres extending to 600 metres away.

The construction works which would potentially impact NCA 27 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 27 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in minor NML exceedances (between 1 and 10 dB(A)) and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway which runs next to NCA 27. The increase in construction traffic noise would likely comply with the noise goal

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 27 to the Kingsgrove ventilation facility and the western tunnel portals operational levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 28

Construction noise and vibration

Receivers within NCA 28 are primarily residential, comprising single and double storey detached houses.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and local traffic.

The offset distance from the construction works to the nearest sensitive receivers within the noise catchment area would be around 30 metres extending to 750 metres away.

The construction works which would potentially impact NCA 28 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 28 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely comply with the NML.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise the M5 East Motorway which passes through NCA 28. The increase in construction traffic noise would likely comply with the noise goal

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 28 to the Kingsgrove ventilation facility and western tunnel portals operational levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 29

Construction noise and vibration

Receivers within NCA 29 are primarily residential, comprising single and double storey detached houses. Narwee Public School is located within this NCA.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along the M5 East Motorway and rail traffic travelling on the East Hills and Airport railway line and to a lesser extent road traffic on Broadarrow Road.

The offset distance from the construction works to the nearest sensitive receivers within the noise catchment area would be around 150 metres extending to 650 metres away.

The construction works which would potentially impact NCA 29 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works
    - There would be no impact from tunnelling works.

NCA 29 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in minor NML exceedances (between 1 and 10 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely comply with the NML.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

The proposed construction traffic would not utilise roads close to NCA 29, therefore the impact of construction traffic noise would likely be negligible.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 29 to the Kingsgrove ventilation facility and the western tunnel portals operational levels would likely comply with the operational noise criteria at all noise sensitive receivers.

NCA 30

Construction noise and vibration

Receivers within NCA 30 are primarily residential, comprising single and double storey detached houses. Beverly Hills Girls High School is located within this NCA.

The existing acoustic environment is considered as suburban and is dominated by road traffic travelling along King Georges Road, the M5 East Motorway, Broadarrow Road and rail traffic on the East Hills and Airport railway line.

The offset distance from the construction works to the nearest sensitive receivers within the noise catchment area would be around 20 metres extending to 650 metres away.

The construction works which would potentially impact NCA 30 are as follows:

- Surface works
    - Western surface works
- Construction compounds
    - There would be no impact from construction compound works.
- Tunnel works

    There would be no impact from tunnelling works.

NCA 30 would be affected by works during standard hours.

The works stage which would have the greatest impact during the daytime would be earthworks associated with the western surface works including rock hammering. The L_{Aeq} noise levels at the most affected receivers, ie those located immediately adjacent to the works, are likely to result in moderate NML exceedances (between 11 and 20 dB(A)). The L_{Aeq} levels at receivers located further from the works are likely to result in compliance with the NML during rock hammering. When rock hammering is not in operation the L_{Aeq} levels at the most affected receivers would likely result in moderater NML exceedances and L_{Aeq} noise levels at receivers located further from the works would comply with the NML.

Vibration intensive works during earthworks associated with the western surface works may exceed the nominated residential safe working distances for cosmetic damage and would require vibration monitoring at the outset of these works to ensure vibration levels are within acceptable limits.

Residential receivers within this NCA would not be impacted by ground-borne noise due to tunnelling work activities.

Construction traffic would utilise roads within NCA 30 including the M5 East Motorway and King Georges Road. The increase in construction traffic noise would likely comply with the noise goal.

A construction noise and vibration management plan would be prepared during construction planning in order to manage the potential noise and vibration impacts during construction.

Fixed facility operational noise

Due to the distance from NCA 30 to the Kingsgrove ventilation facility and the western tunnel portals operational levels would likely comply with the operational noise criteria at all noise sensitive receivers.

9.2 Operational impact summaries

9.2.1 Western surface works

To the south of Beverley Grove Park the existing noise berm would be removed and the existing road alignment would be widened to allow for the new portals. The eastbound portal would sink between the eastbound M5 East Motorway lanes and the westbound portal sinks between the westbound M5 East Motorway lanes.

A new motorway operations complex would be located to the south of the new alignment, adjacent to the existing industrial area. Operations of this facility would not be audible to sensitive receivers on the noise side of the alignment due to traffic noise associated with the project.

In Year 2021 when comparing the No Build to the Build situations, traffic flows are expected to reduce on the M5 East and New M5 due to tolling. This has resulted in a small decrease in noise levels of around 1 dB(A). In Year 2031 the difference in traffic flows is expected to reduce further resulting in a larger decrease in noise.

One sensitive receiver was identified as being eligible for the consideration of noise mitigation. In accordance with the Roads and Maritime's *Noise Mitigation Guideline*, where eligible receivers are in groups of three or less, it is not considered to be reasonable and feasible to provide additional noise mitigation in the form of pavements or noise barriers. Architectural treatments have been proposed for this receiver.

Noise barriers that would need to be augmented would need to maintain their existing heights above the alignment. The berm that is being removed would be replaced by a noise barrier or combination of noise barrier and berm that would provide at least the same noise reduction as the existing berm. A noise barrier of around 6.5 metres above the road level is currently proposed. The location, final height and urban design would be subject to detailed design.

9.2.2 St Peters interchange

Campbell Road

Campbell Road is currently considered to be a collector road because it links the Princes Highway to industrial areas on local roads. The project would change this road to a sub-arterial and appreciably change the traffic flows. AADT traffic flows if the project was not to proceed would be in the order of 13,000 movements per day, and these are predicted to increase to almost 59,000 movements per day in 2031. Physically the road would change from a single lane in each direction to two lanes in each direction (as well as turning lanes at some locations).

As a result of these changes noise levels are predicted to increase by as much as 5 dB(A) for noise sensitive receivers located adjacent to this road. Consideration of feasible and reasonable mitigation is required for some noise sensitive receivers adjacent to this road.

Low-noise pavements and noise barriers were not considered to be feasible and reasonable throughout this area. As such, architectural treatments have been proposed for receivers that have been found to be eligible for the consideration of additional noise mitigation measures on this road.

Campbell Street

Campbell Street is currently considered to be a collector road because it links the Princes Highway to local roads, providing access to residential areas.

Like Campbell Road, road traffic noise would increase by as much as 22 dB(A) on this street due to a significant change in traffic flows on the existing road, traffic moving closer to some sensitive receivers and the removal of buildings which currently shield receivers from road traffic noise. Consideration of feasible and reasonable noise mitigation is required to ensure that noise is appropriately mitigated.

Low-noise pavements and noise barriers were not considered to be feasible and reasonable and feasible throughout this area. As such, architectural treatments have been proposed for receivers that have been found to be eligible for the consideration of additional noise mitigation measures on this road.

Euston Road

Euston Road south of Sydney Park Road would experience significant changes as a result of the project. However all receivers on this section of road are commercial or industrial and are not subject to operational noise criteria.

North of Sydney Park Road minor realignment works would take place. This qualifies these receivers for consideration under the redeveloped road noise criteria. The residential apartments located on Euston Road have been found to exceed the applicable operational noise criteria and would be considered for additional noise mitigation. Architectural treatments have been recommended (where appropriate) due to a limited number of mitigation options throughout this area.

Mascot

A new road and bridge would link Campbell Road with Bourke Street. Another bridge would also be built to link the interchange with Gardeners Road. This region is predominantly comprised of commercial and industrial receivers which are not subject to operational noise criteria. Residential receivers scattered throughout the area where found to not be appreciably impacted due to existing traffic noise throughout the area.

Other roads

Due to the change in traffic conditions lower traffic flows and associated noise levels have been identified on the following roads:

- Sydney Park Road
- Princes Highway north of Campbell Road
- May Street
- Unwins Bridge Road.

9.2.3 Parallel routes

Increased traffic flows have been identified on other routes due to the introduction of a toll on the M5 East Motorway and New M5. On these routes a maximum increase of 1.9 dB(A) has been identified (an increase in noise of 2 dB(A) is generally considered barely perceptible). In accordance with the Roads and Maritime's *Noise Criteria Guideline*, to be considered a traffic generating development (which would require further consideration of mitigation measures) the road would need to increase noise levels by more than 2.0 dB(A). The impact has been considered to be minor and would not appreciably impact other routes.

10.0 Conclusion

Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the New M5 (the project), which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road, and St Peters. The project would also include an interchange at St Peters and connections to the existing road network.

A construction noise assessment was conducted in accordance with *Interim Construction Noise Guideline*. Reasonable worst case construction scenarios have been considered. Construction of the project is likely to primarily occur during the standard construction hours with the exception of the tunnelling and associated support activities, and bridge works. Other out of hours work, such as road works and traffic changes to minimise impacts to the road network and delivery and removal of over-sized plant and equipment, would be required and would be subject to the processes outlined in **Section 0**.

The noise assessment associated with the construction of the project indicates some exceedances of the *Interim Construction Noise Guideline* noise management levels at the most affected sensitive receivers. The level and number of exceedances are provided in **Chapter 5.0**. Exceedances of the noise management levels occur during the day and night at the most affected sensitive receivers during certain activities.

Measures have been recommended to mitigate the construction noise impact at adjacent sensitive receivers. The measures include:

- Completion of a Construction Noise and Vibration Management Plan
- Community consultation
- Appropriate selection and maintenance of equipment
- Use of noise barriers
- Scheduling of work for less sensitive time periods
- Situating plant in less noise sensitive locations
- Training of construction site workers
- Construction traffic management
- Noise monitoring
- Respite protocol.

Safe working distances for vibration intensive construction works have been presented. Equipment size would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver. If works need to be undertaken within safe working distances, vibration monitoring would be undertaken. Blasting would be undertaken to comply with the relevant guidelines and criteria.

Construction traffic would increase road traffic noise level but this would remain in most instances under 2 dB(A), which would meet the applicable target criterion in accordance with the *Road Noise Policy*. The exceptions are during tunnelling activities when heavy vehicles movements would occur during evening and night-time periods when background traffic flows are low. The use of local roads by heavy vehicles during these periods would be reviewed during construction planning.

Cumulative noise impacts may occur as a result of other major projects occurring within proximity to the project. Consultation would be undertaken between the projects to minimise potential impacts where feasible and reasonable.

An operational road traffic noise assessment was completed in accordance with the Environment Protection Authority's *NSW Road Noise Policy* and Roads and Maritime's *Noise Criteria Guideline* and *Noise Mitigation Guideline*.

Noise levels have been predicted at sensitive receiver locations throughout the project area for both the daytime and night-time scenarios. The opening of the full WestConnex program of works (including the future M4-M5 Link) and the Southern extension would increase direct traffic flows on infrastructure delivered as part of this project. Therefore the noise assessment has been completed for the most stringent scenario, which is the Design year for WestConnex Stage 2 (2031) assuming the full WestConnex program of works and the future Southern extension is operational.

Around the existing M5 East Motorway in the Kingsgrove area, road traffic volumes would reduce. This would result in an appreciable reduction in noise levels throughout the study area along the alignment of the project and M5 East Motorway (between Beverly Hills and Kingsgrove). However road traffic noise levels are predicted to be 'acute' at one noise sensitive receiver. This receiver would be eligible for consideration of additional noise mitigation. No additional receivers would be eligible for consideration.

For the St Peters interchange the night-time period was the more stringent time period. Road traffic noise levels at a total of 145 residential sensitive receivers exceeded the $L_{Aeq(9hour)}$ noise criterion. In accordance with the *Noise Mitigation Guideline* it was not considered reasonable to consider additional noise mitigation measures at receivers that would experience an increase in road traffic noise levels of 2 dB(A) or less, and were not considered 'acute'. As such a total of 144 residential receivers were considered for additional noise mitigation measures. In addition two school buildings (St Peters Public School) are eligible during the daytime only.

Around St Peters interchange, receivers are eligible for the consideration of the provision of architectural treatments. Each property would be inspected at the detailed design stage and noise mitigation provided where appropriate, in accordance with the *Noise Mitigation Guideline*.The recommended mitigation measures would ensure that the levels of road traffic noise experienced by residents would be reduced as low as feasible and reasonable. The requirements and the form of noise mitigation would be confirmed when assessed against the detailed design.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels as predicted during detailed design, consideration of additional feasible and reasonable mitigation measures would be undertaken to meet the applicable predicted levels.

An assessment of operational facilities, or 'fixed' facilities, was undertaken in accordance with the Environment Protection Authority's *Industrial Noise Policy*. This found that the fixed facilities would comply with the applicable criteria at the most affected residential receivers, this would be confirmed during the detailed design phase.

Appendix A

Acoustic glossary

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Appendix A Acoustic glossary

The following is a brief description of acoustic terminology used in this report.

Term	Definition
Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1 kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB(A) increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB(A) increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows: 0 dB(A) Threshold of human hearing 30 dB(A) A quiet country park 40 dB(A) Whisper in a library 50 dB(A) Open office space 70 dB(A) Inside a car on a freeway 80 dB(A) Outboard motor 90 dB(A) Heavy truck pass-by 100 dB(A) Jack hammer / subway train 110 dB(A) Rock Concert 115 dB(A) Limit of sound permitted in industry 120 dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Insertion loss	Reduction in noise by inserting a barrier between the source and receiver
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period

Term	Definition
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L90 sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	**Construction noise** The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays. **Road traffic noise** The period from 0700 to 2200 h every day of the week.
Evening	**Construction noise** The period from 1800 to 2200 h Monday to Sunday and Public Holidays. **Road traffic noise** Not applicable.
Night	**Construction noise** The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays. **Road traffic noise** The period from 2200 to 0700 h every day of the week.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the EPA’s *Industrial Noise Policy* and *Road Noise Policy*.

Appendix B

Construction and operational layouts

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Figure 1 Project construction footprint - map 1



Figure 2 Project construction footprint - map 2



Figure 3 Project construction footprint - map 3

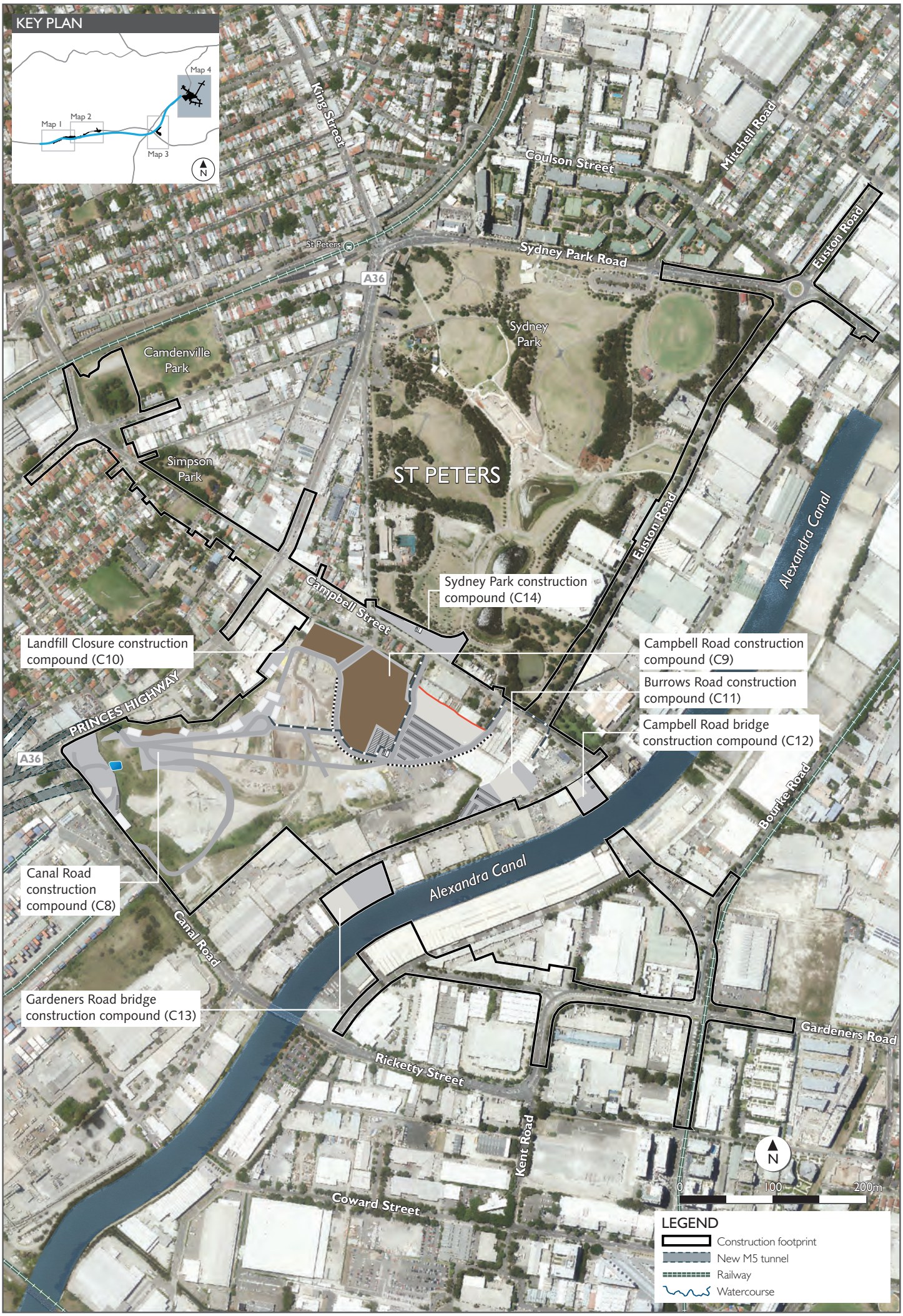


Figure 4 Project construction footprint - map 4

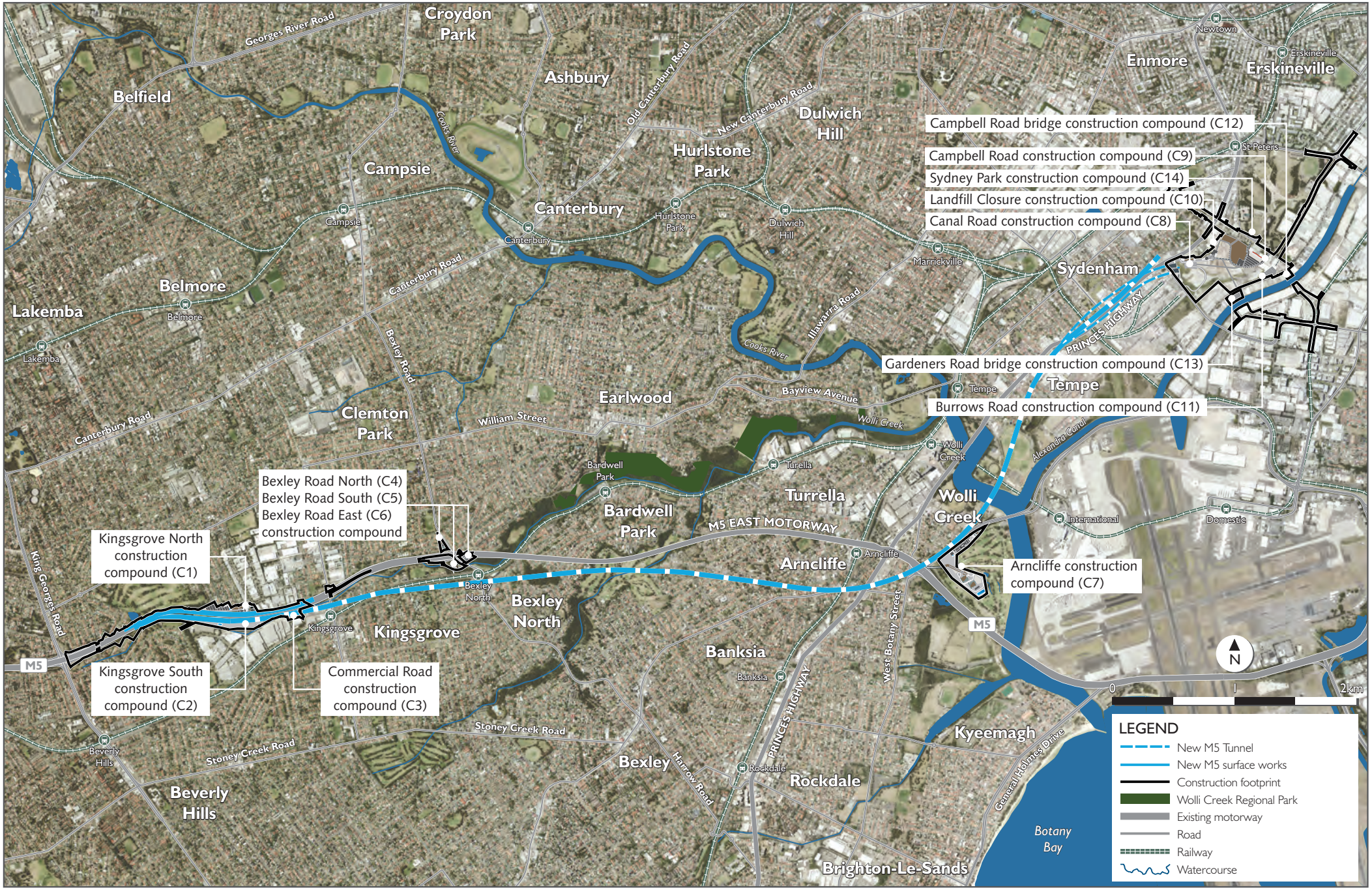


Figure 5 Overview of construction compounds

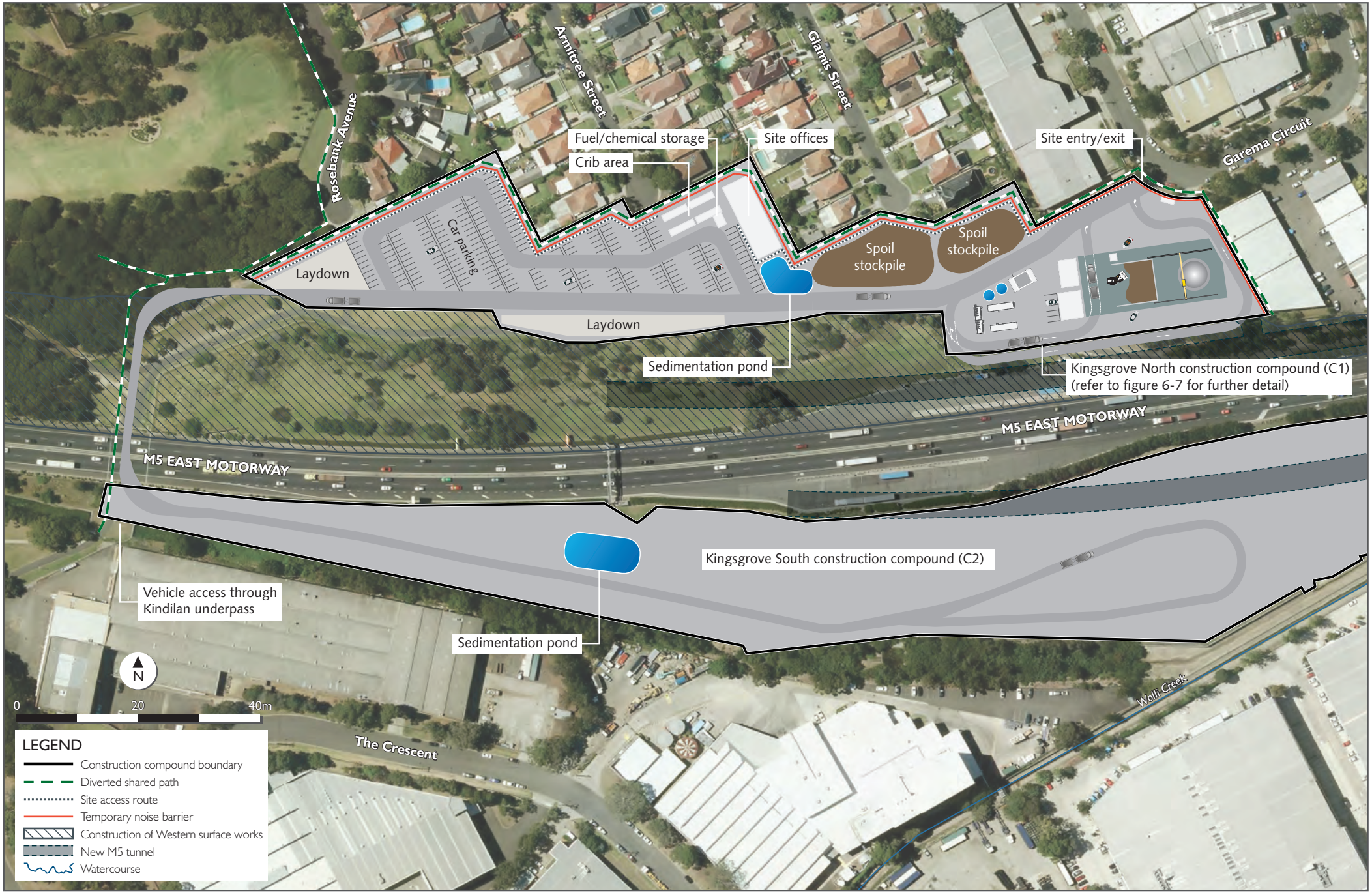


Figure 6 Kingsgrove North (C1) and Kingsgrove South (C2) construction compound layouts

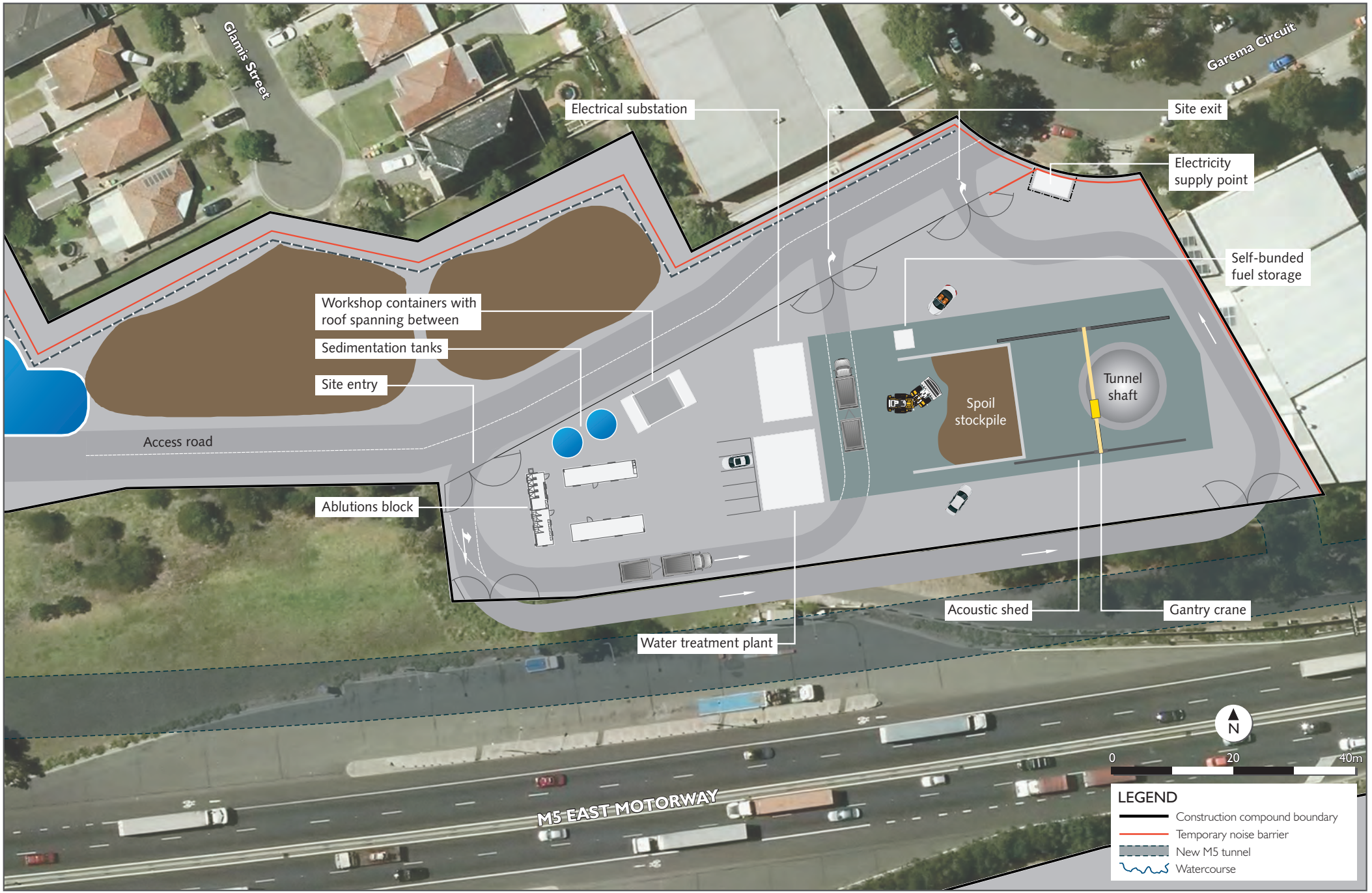


Figure 7 Kingsgrove North construction compound (C1) - tunnelling support layout

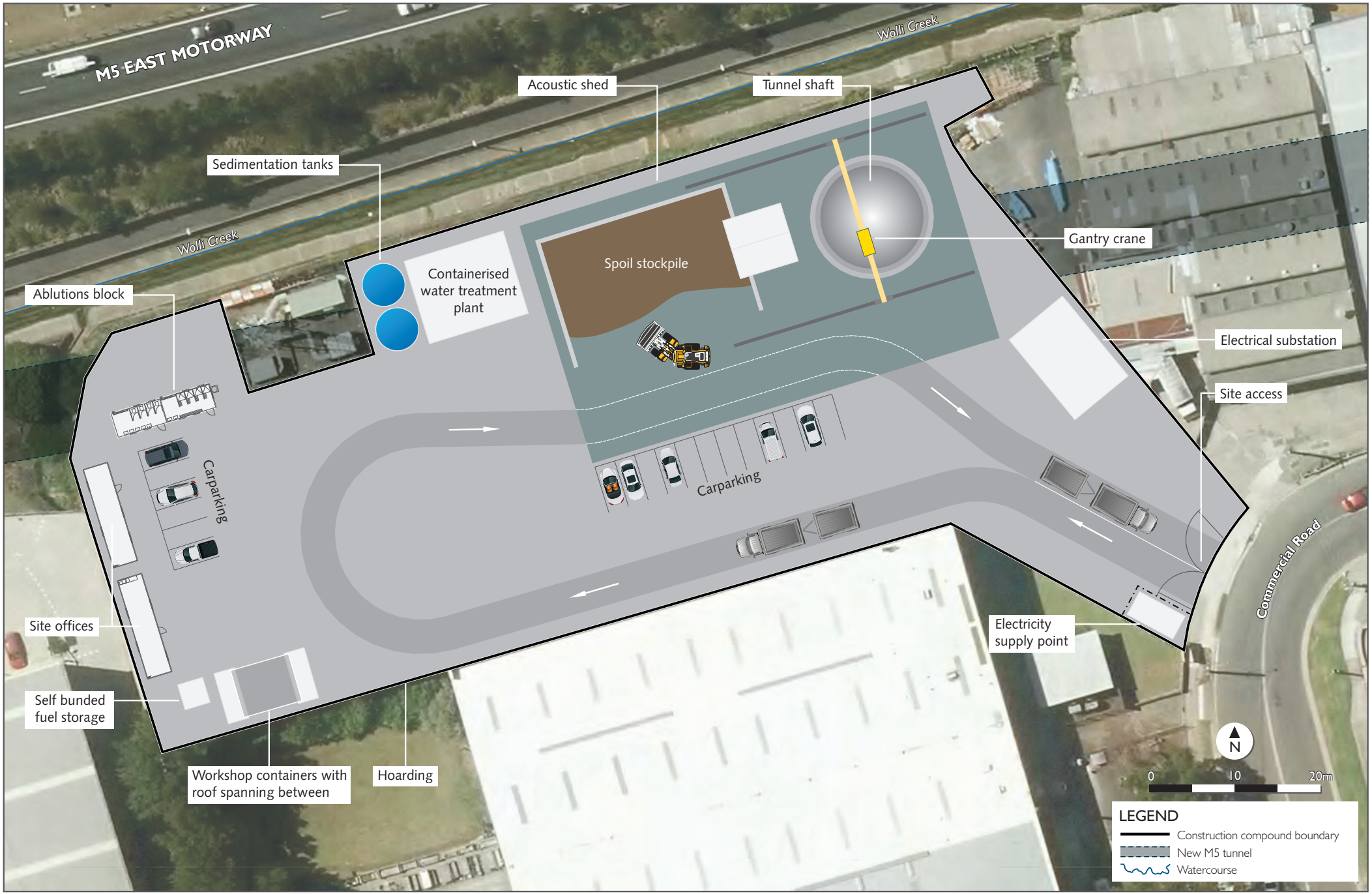


Figure 8 Commercial Road construction compound (C3) layout



Figure 9 Bexley Road North construction compound (C4) layout

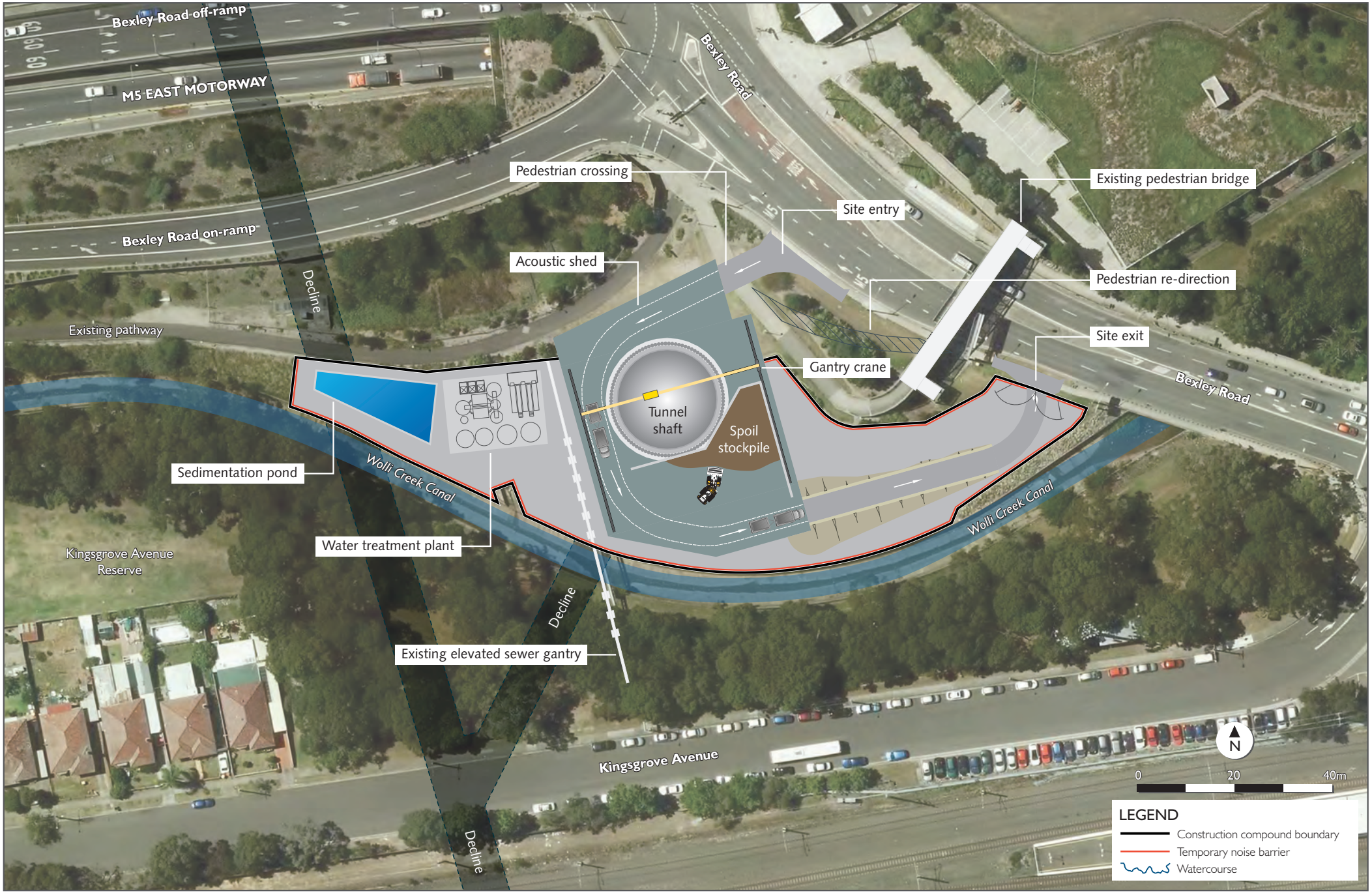


Figure 10 Bexley Road South construction (C5) compound layout



Figure 11 Bexley Road East construction compound (C6) layout



Figure 12 Indicative Arncliffe construction compound (C7) layout



Figure 13 Canal Road construction compound (C8) layout



Figure 14 Campbell Road (C9) and landfill closure (C10) construction compound layouts



Figure 15 Burrows Road (C11), Campbell Road bridge (C12) and Gardeners Road bridge (C13) construction compound layouts



Figure 16 Sydney Park construction compound (C14) layout



Figure 17 Project operational footprint - map 1



Figure 18 Project operational footprint - map 2



Figure 19 Project operational footprint - map 3



Figure 20 Project operational footprint - map 4

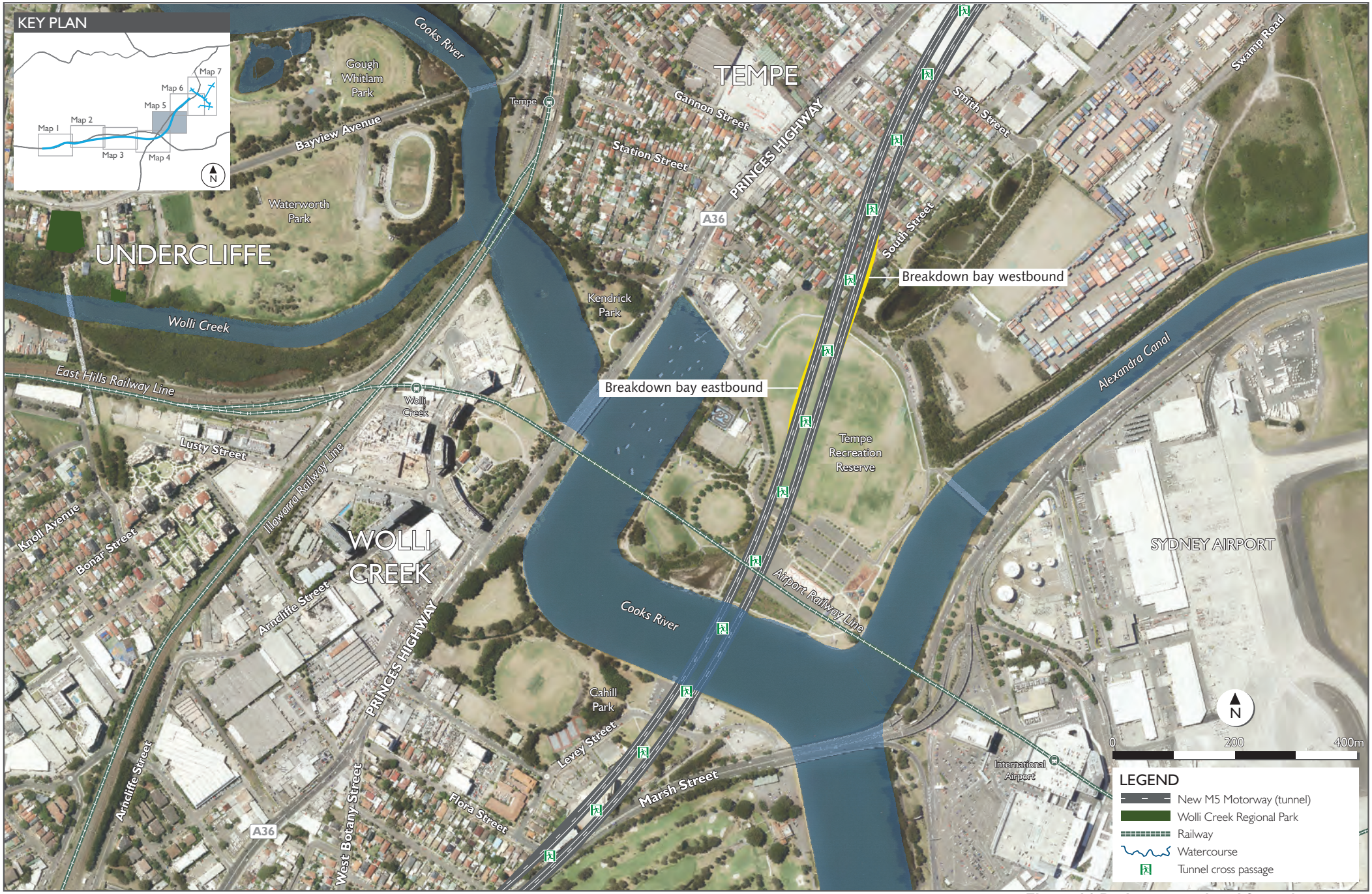


Figure 21 Project operational footprint - map 5



Figure 22 Project operational footprint - map 6



Figure 23 Project operational footprint - map 7



Figure 24 Kingsgrove motorway operations complex (MOC 1)

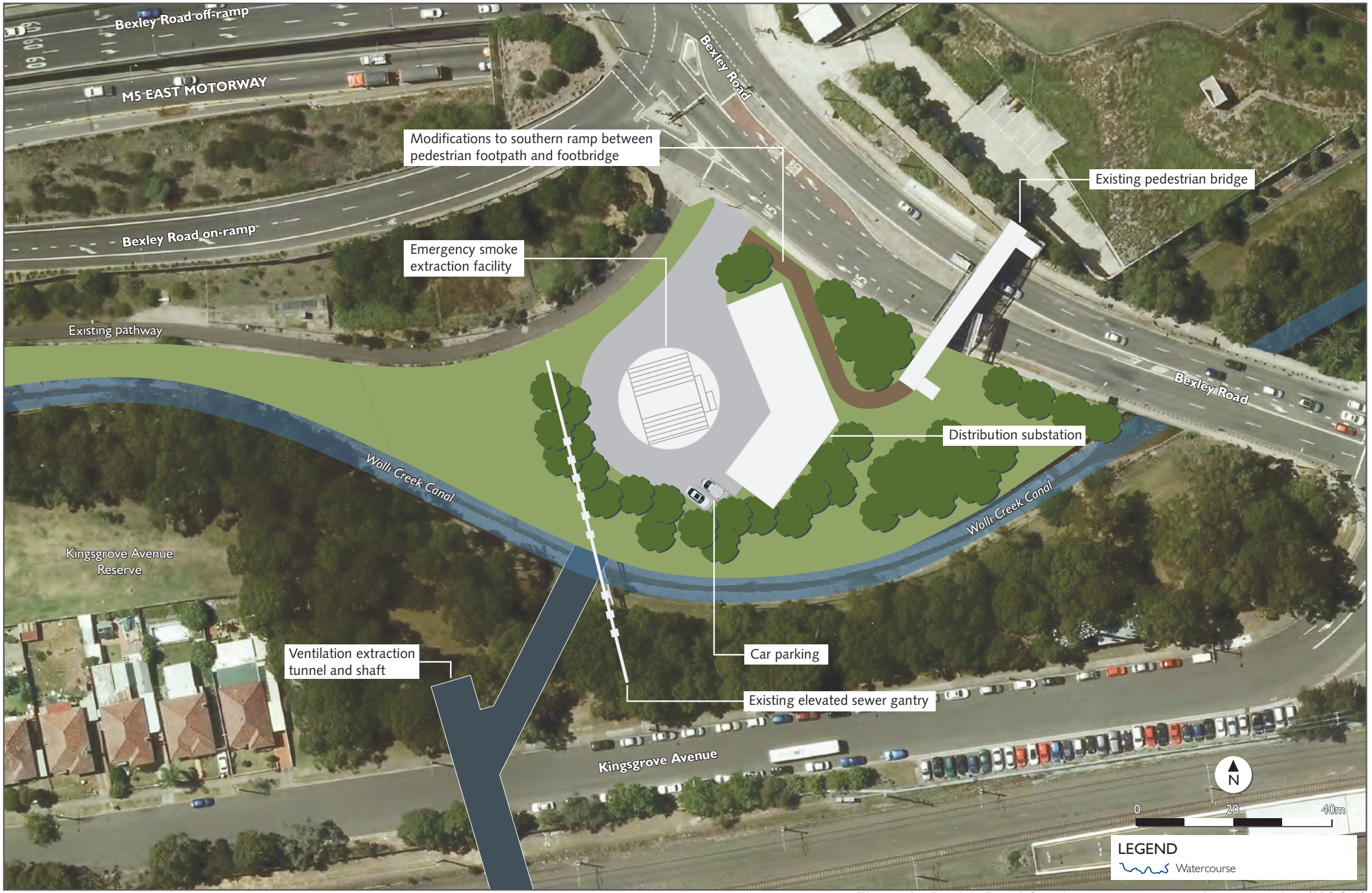


Figure 25 Bexley Road South motorway operations complex (MOC 2)



Figure 26 Arncliffe motorway operations complex (MOC 3)

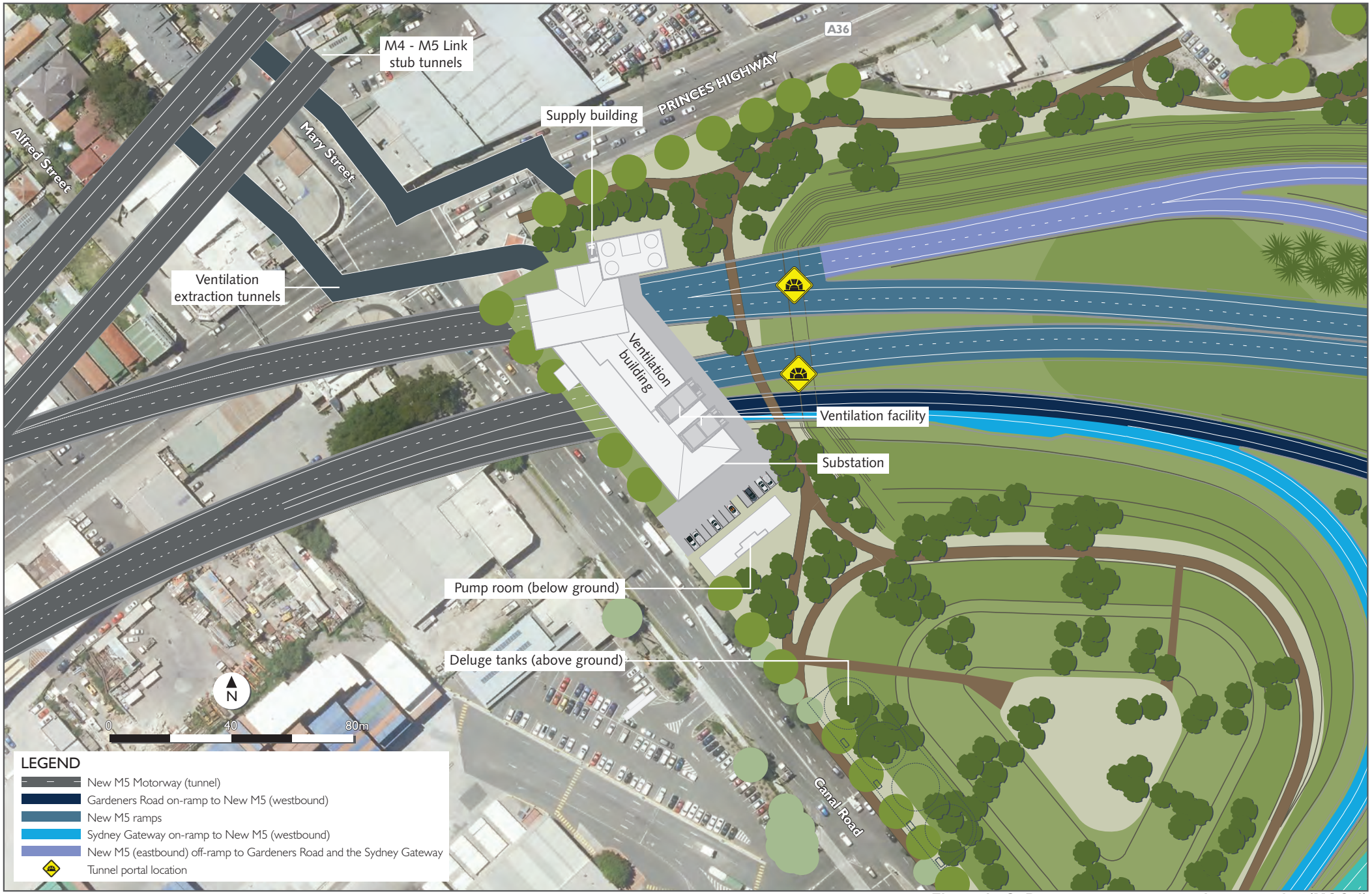


Figure 27 St Peters motorway operations complex (MOC 4)

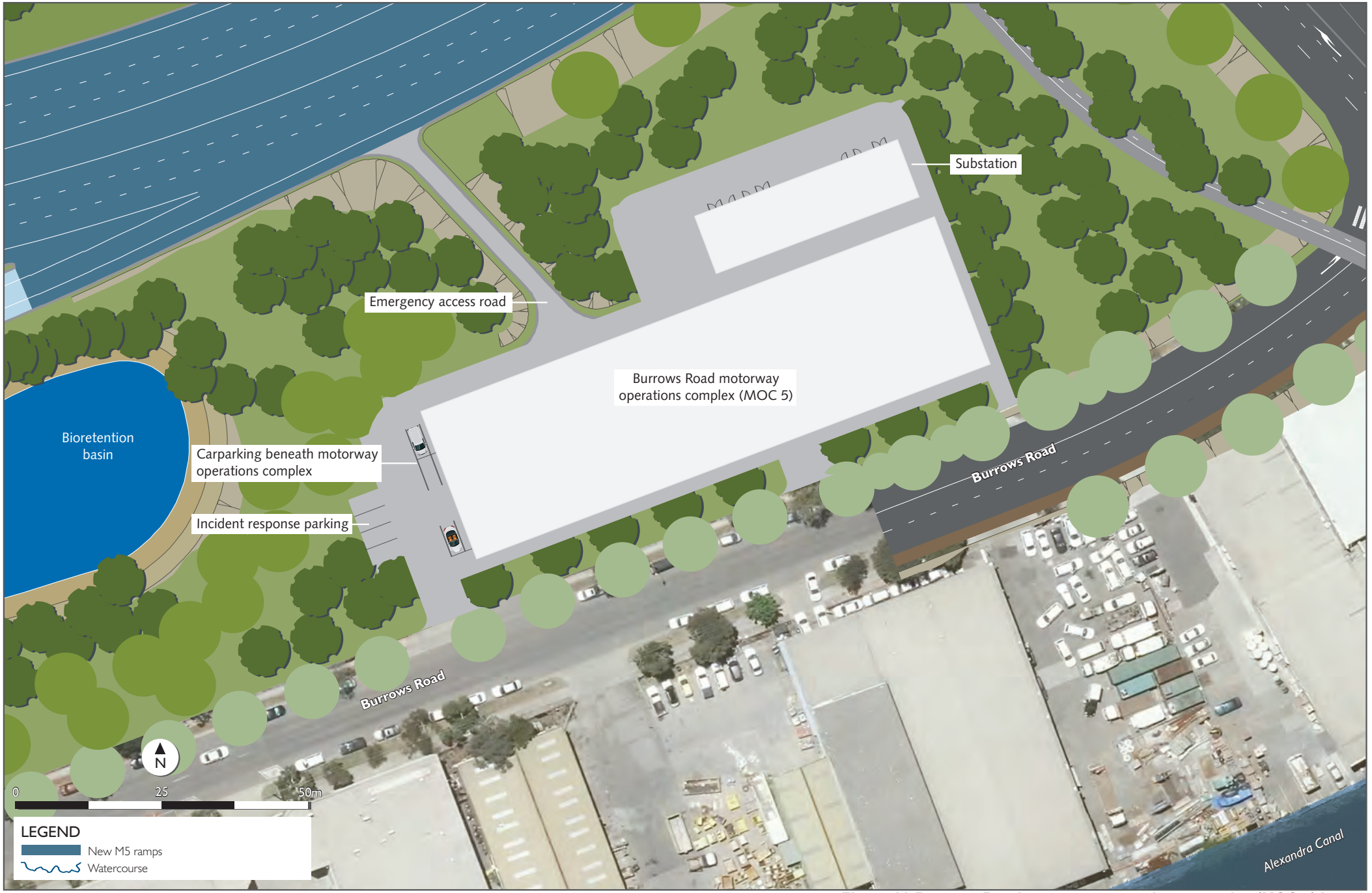


Figure 28 Burrows Road motorway operations complex (MOC 5) layout

Appendix C

Noise catchment areas

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AECOM

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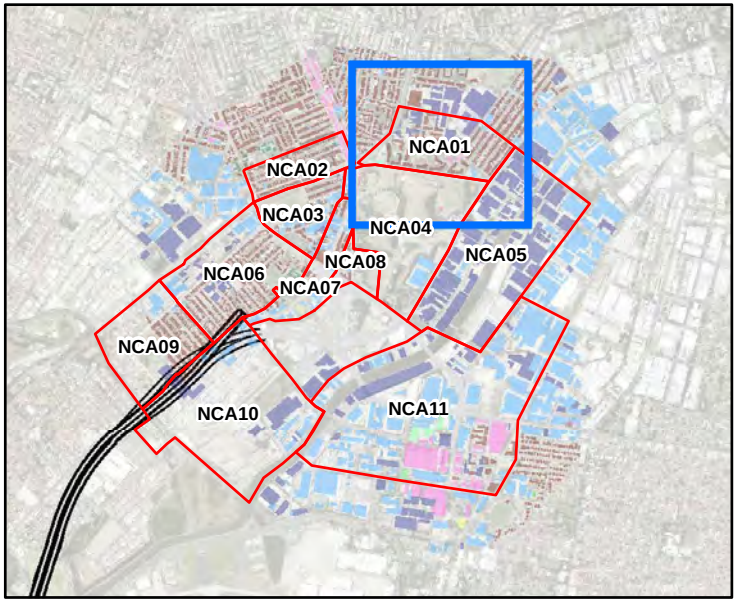
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 1

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **1**

AECOM

Legend

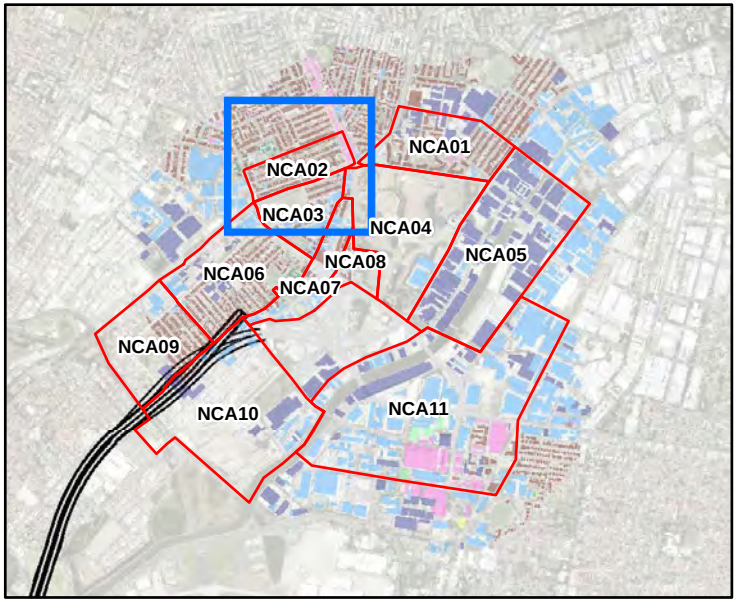
- Logger Locations
- Noise Catchment areas

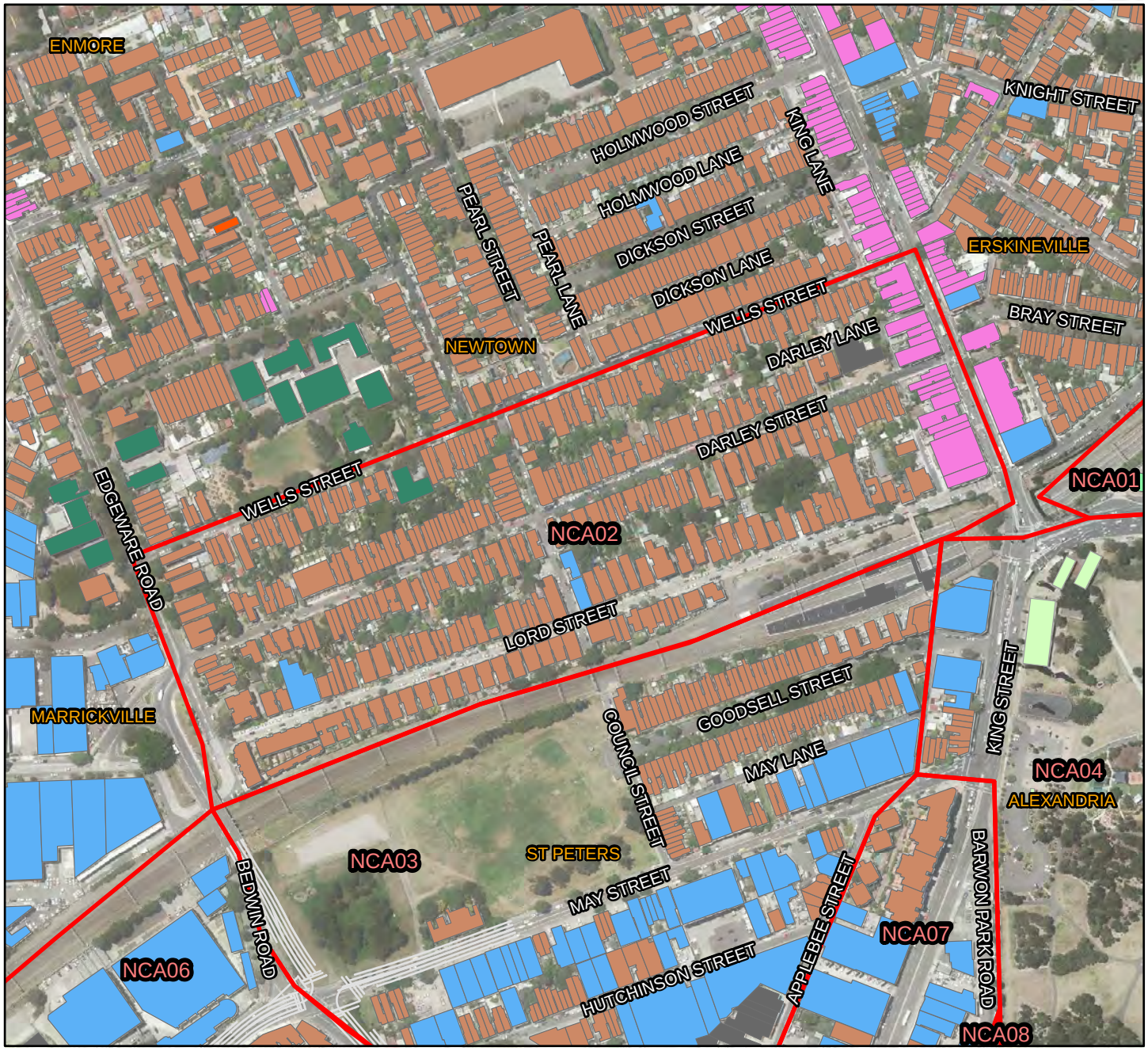
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 2

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **2**

AECOM

Legend

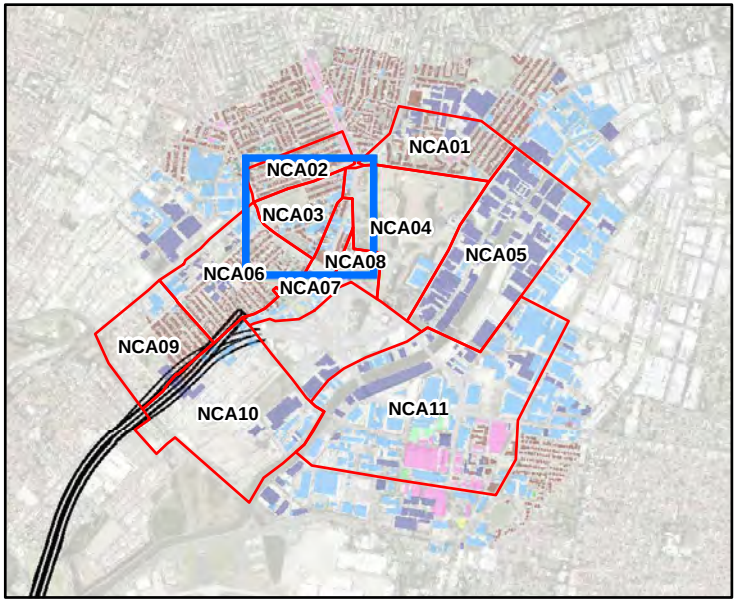
- Logger Locations
- Noise Catchment areas

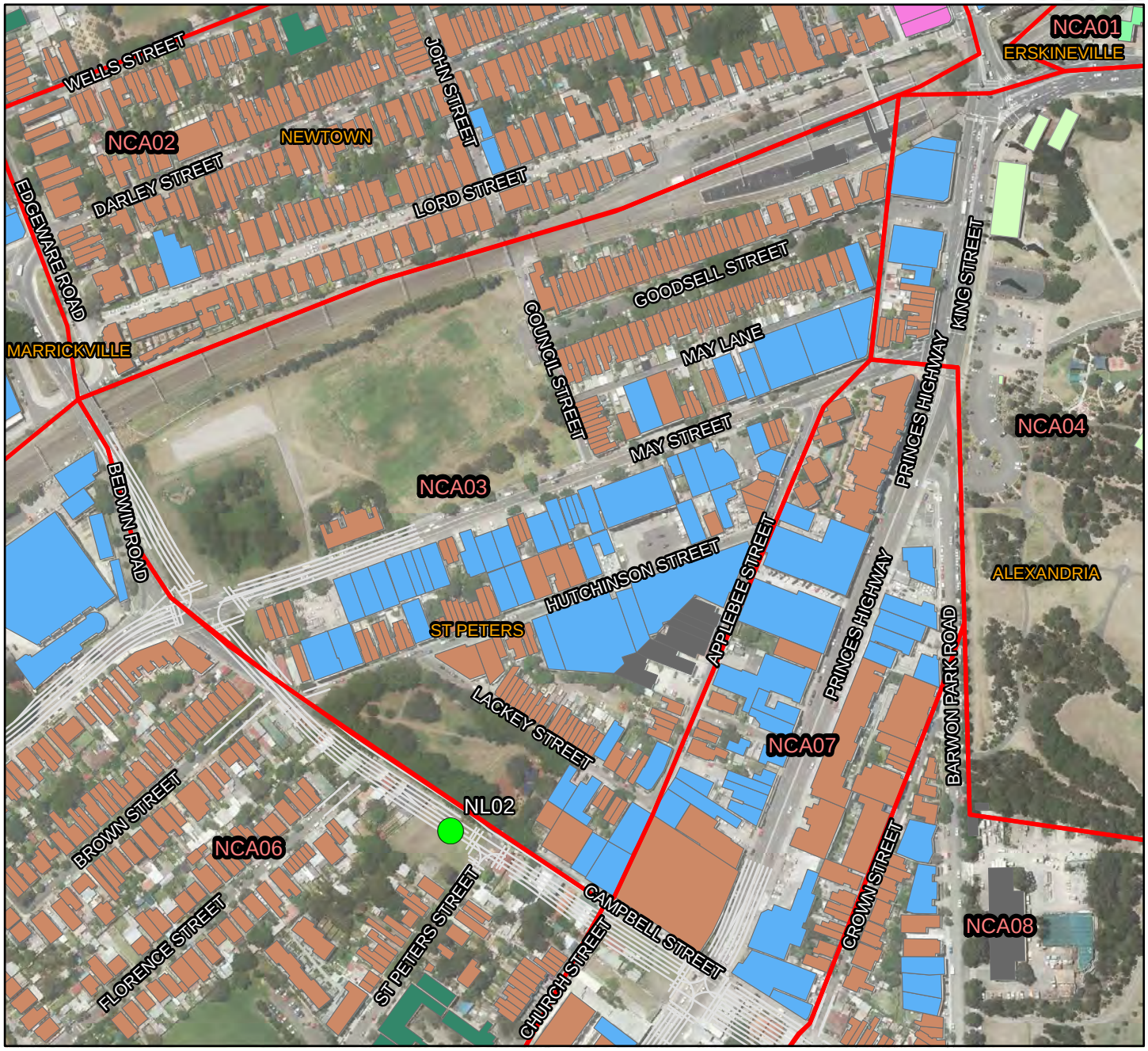
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 3

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **3**

AECOM

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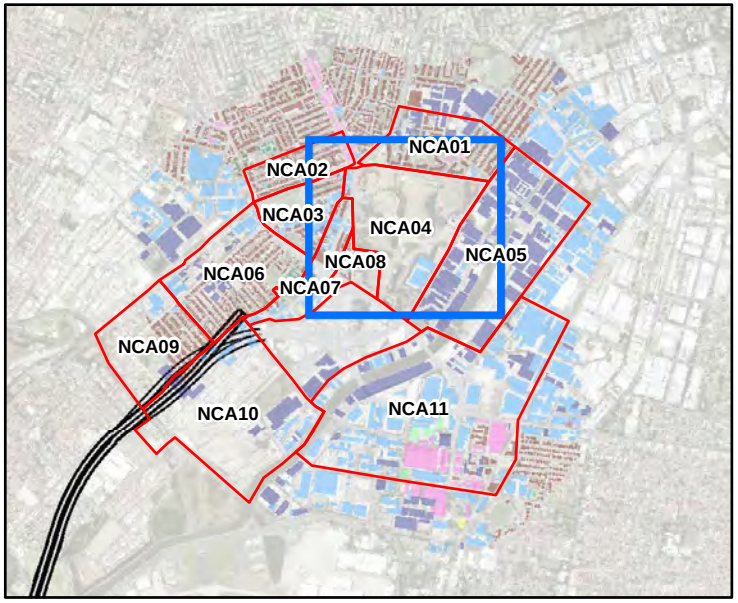
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 4

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **4**

AECOM

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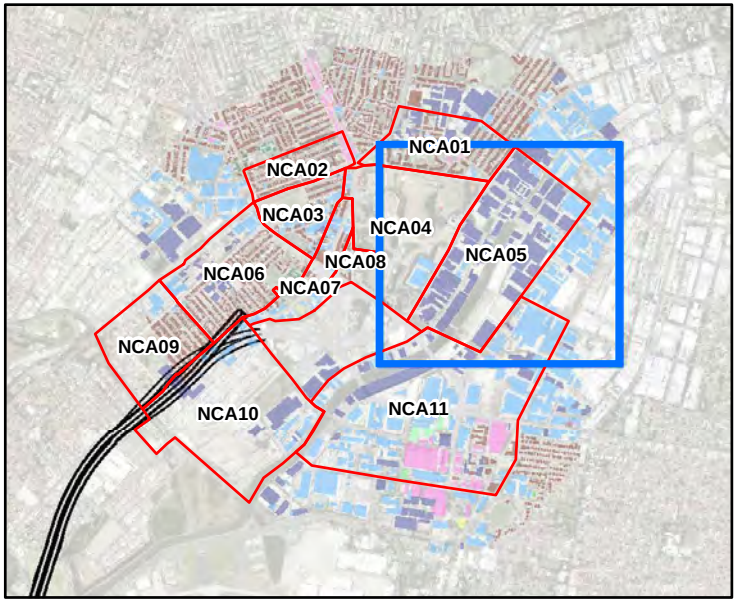
- Logger Locations
- Noise Catchment areas

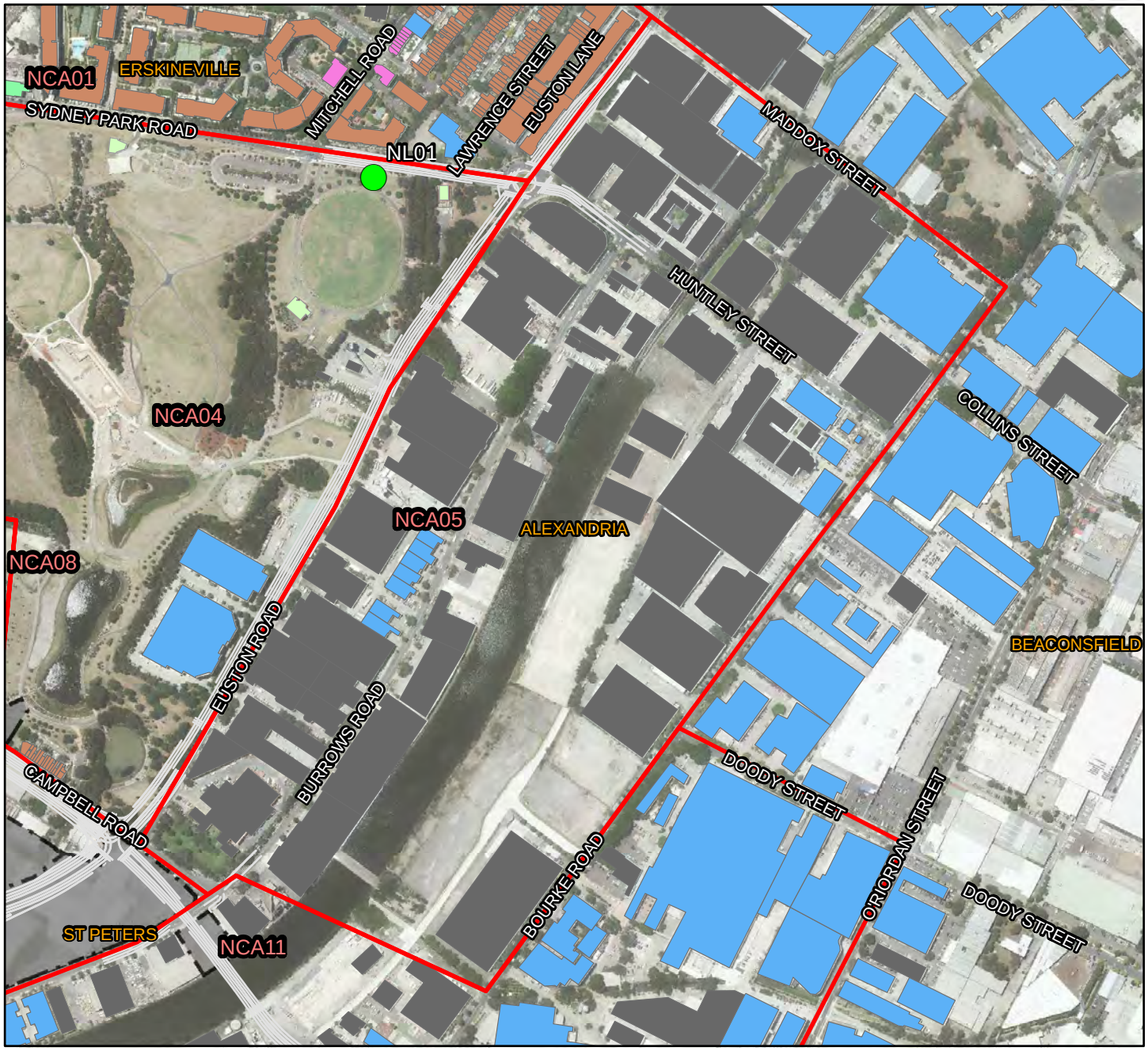
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 5

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **5**

AECOM

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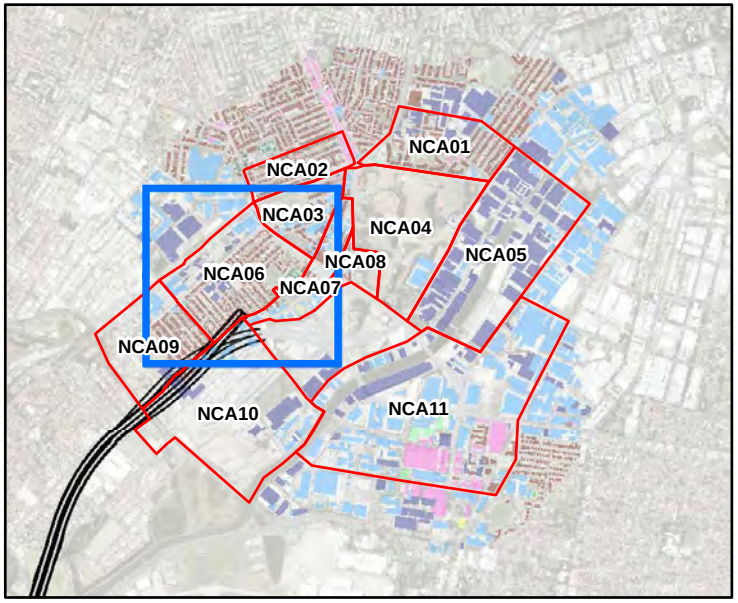
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 6

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **6**

AECOM

Legend

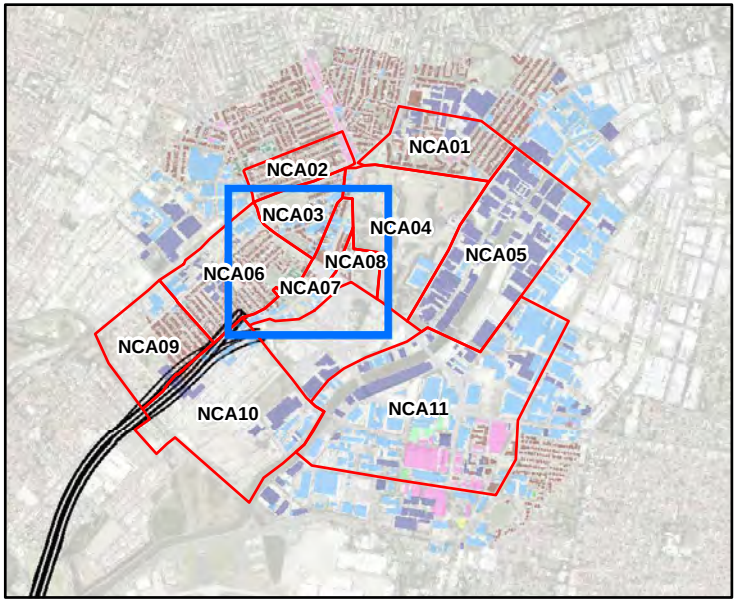
- Logger Locations
- Noise Catchment areas

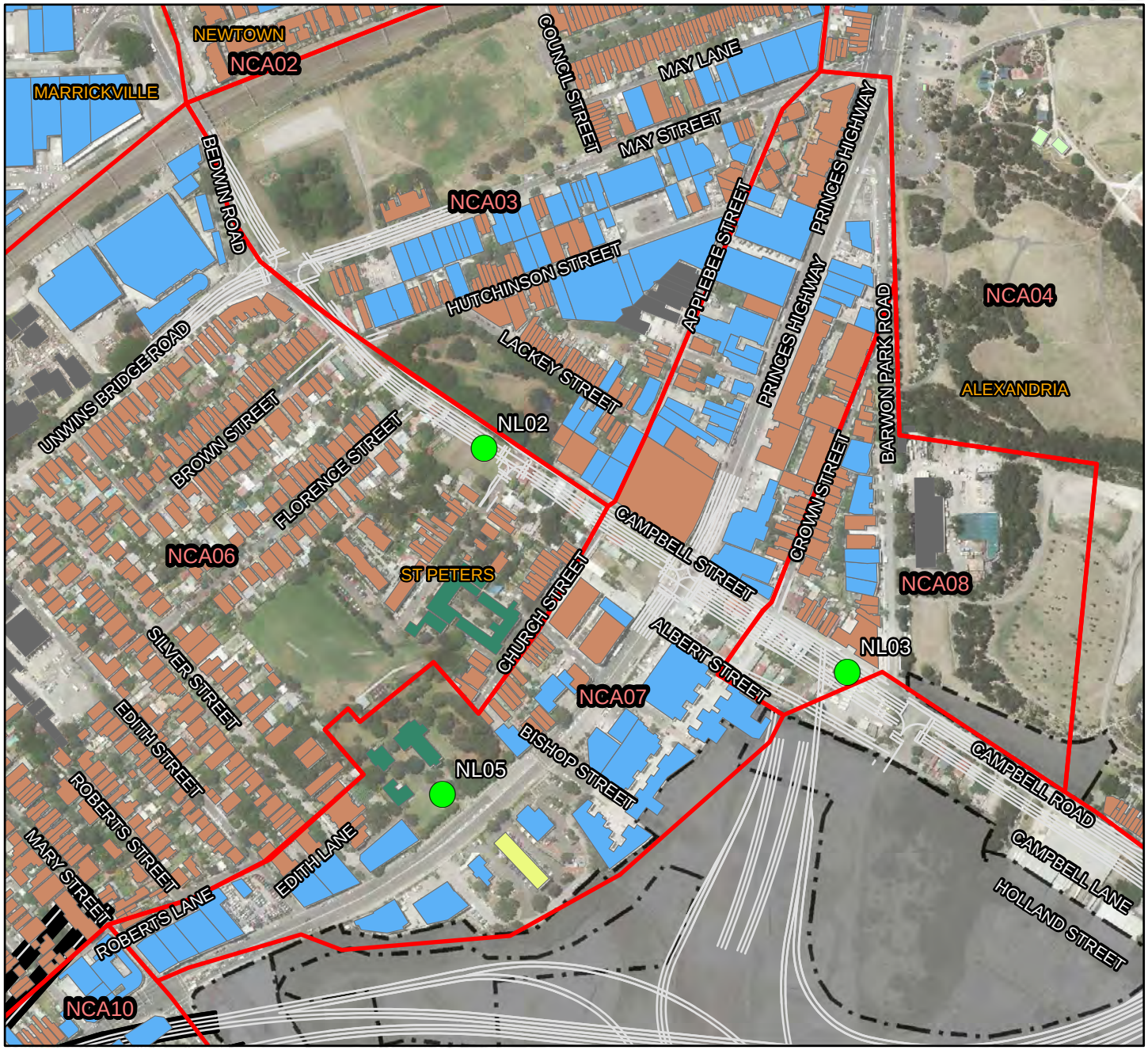
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 7

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **7**

AECOM

Legend

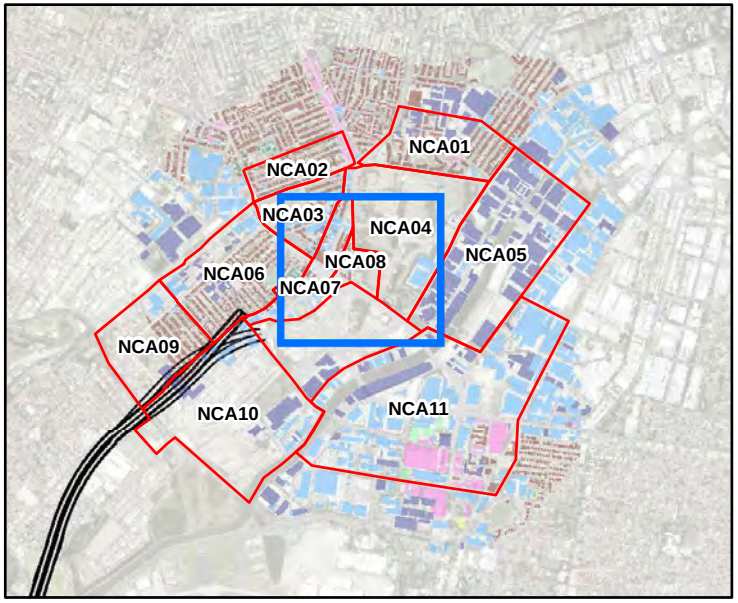
- Logger Locations
- Noise Catchment areas

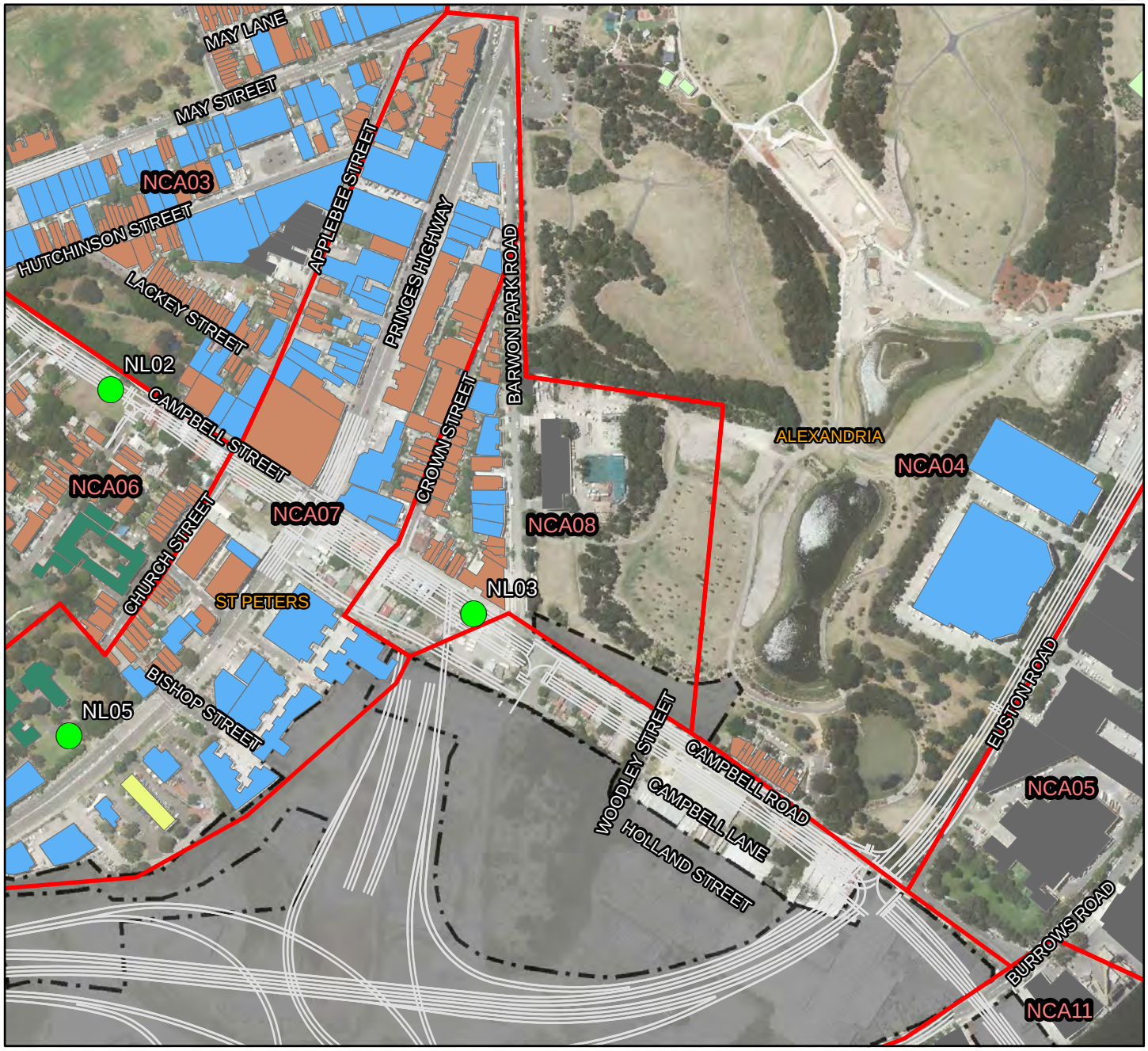
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 8

Source: SKM2014

0 50 100 200 m

N

NOV 2015

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Fig. **8**

AECOM

Legend

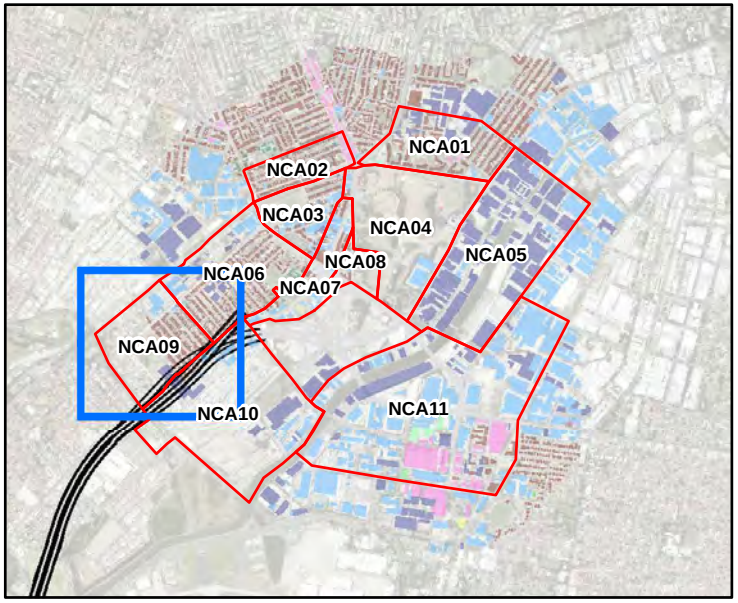
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 9

Source: SKM2014

0 50 100 200 m

N

NOV 2015

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Fig. **9**

AECOM

Legend

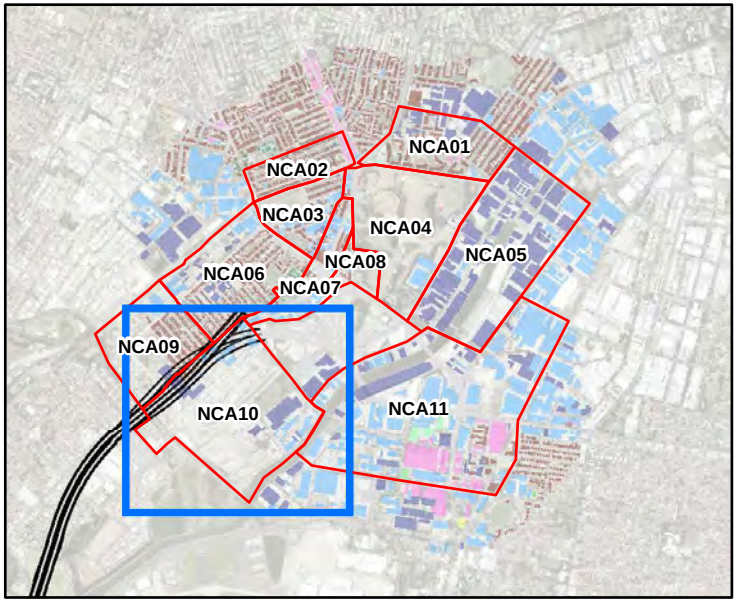
- Logger Locations
- Noise Catchment areas

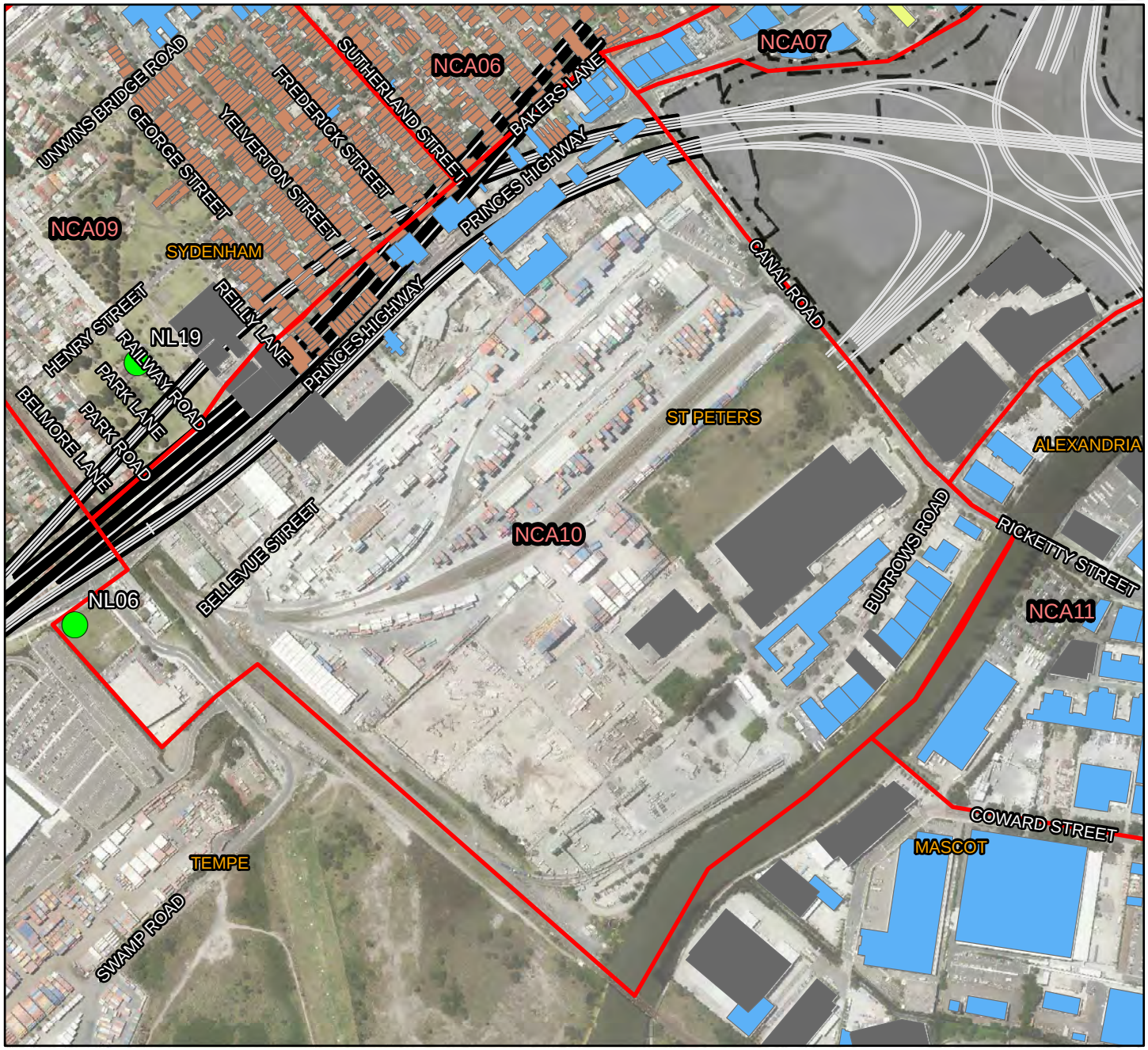
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 10

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **10**

AECOM

Legend

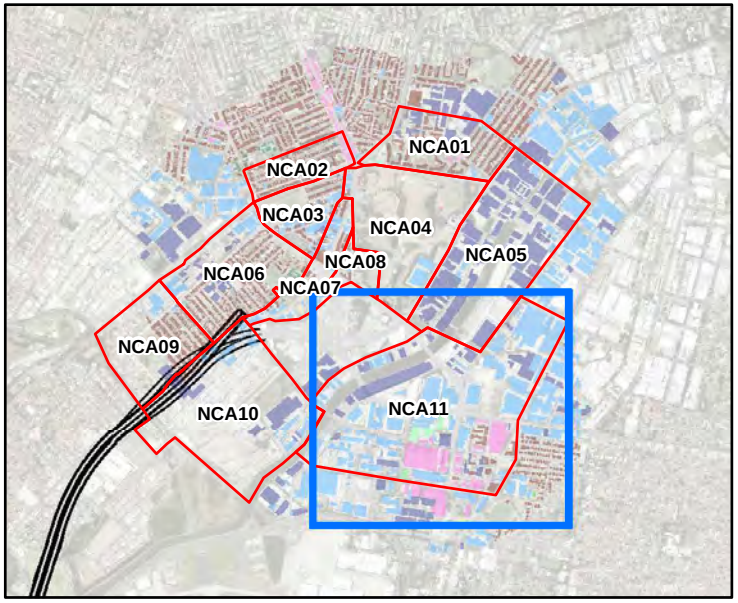
- Logger Locations
- Noise Catchment areas

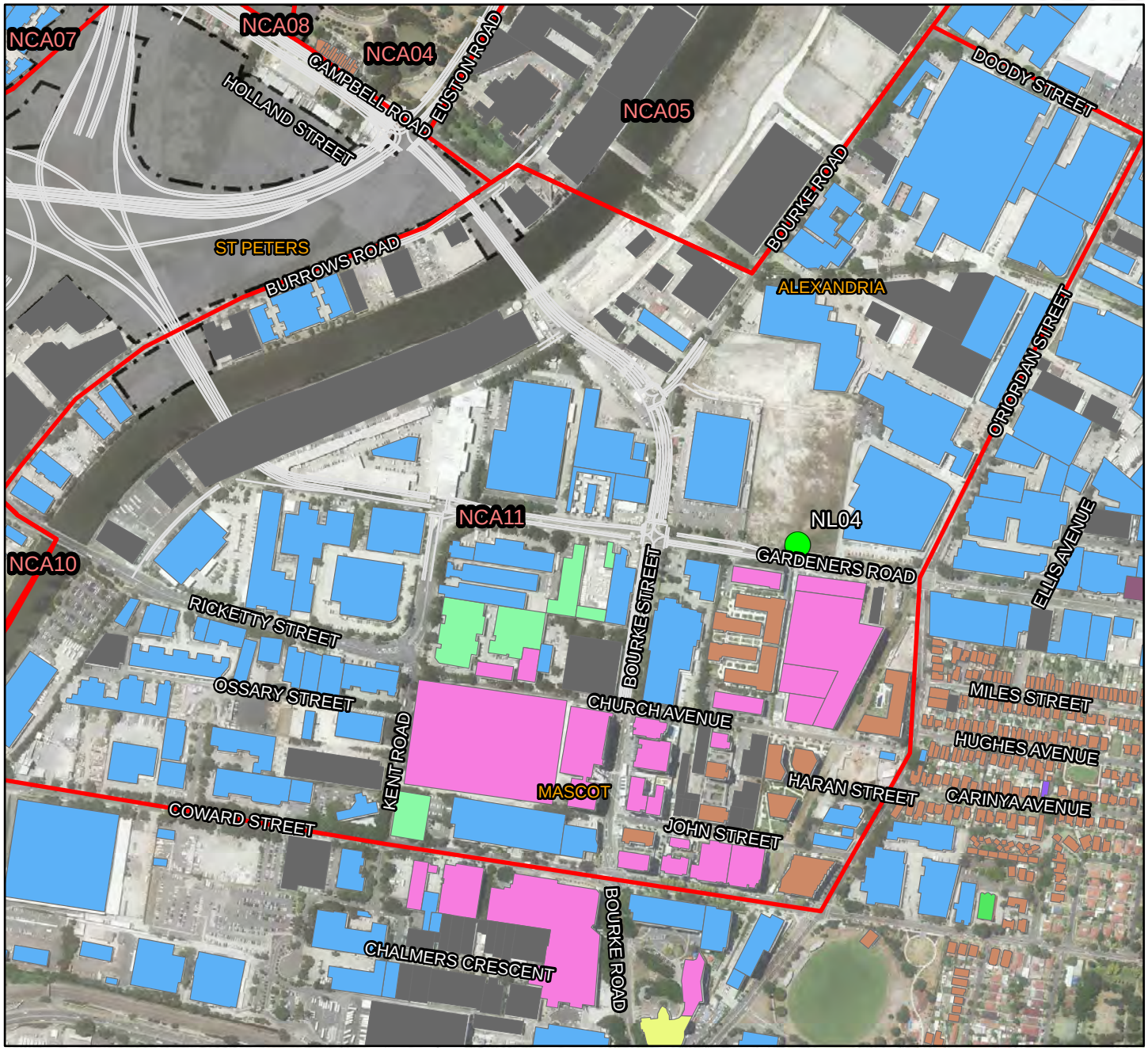
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 11

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **11**

AECOM

Legend

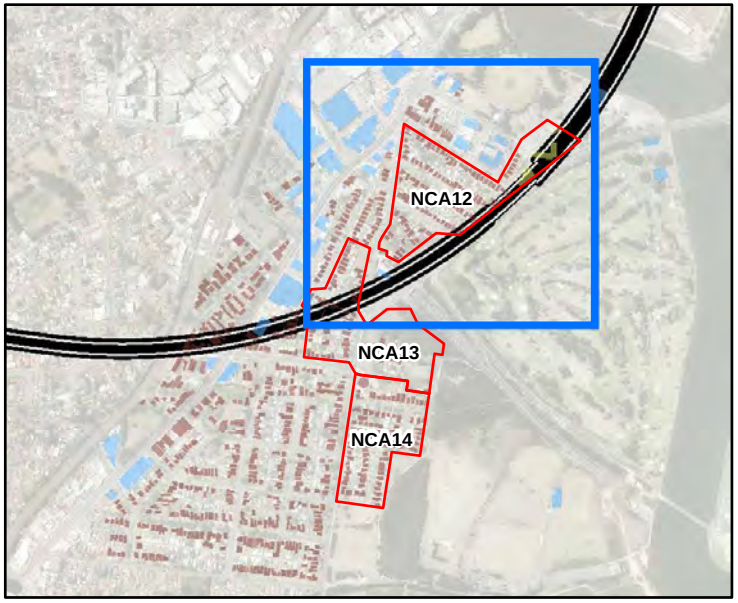
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 12

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **12**

AECOM

Legend

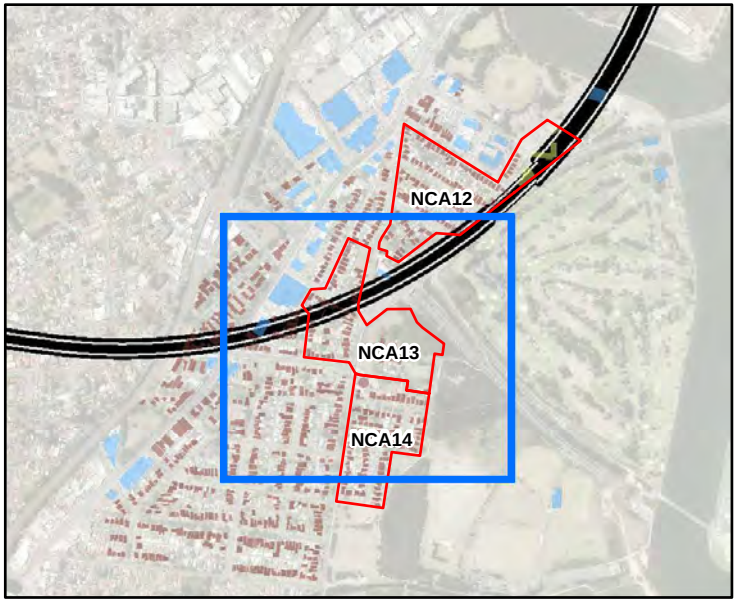
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 13

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **13**

AECOM

Legend

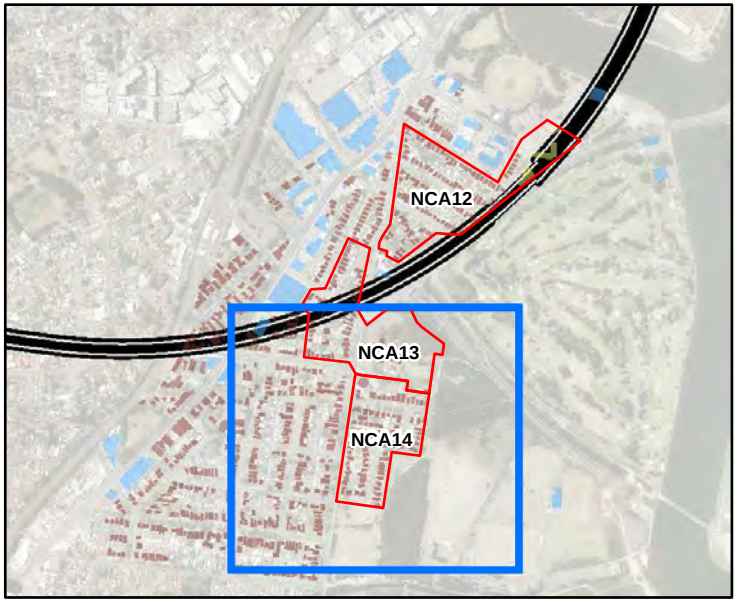
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 14

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **14**

AECOM

Legend

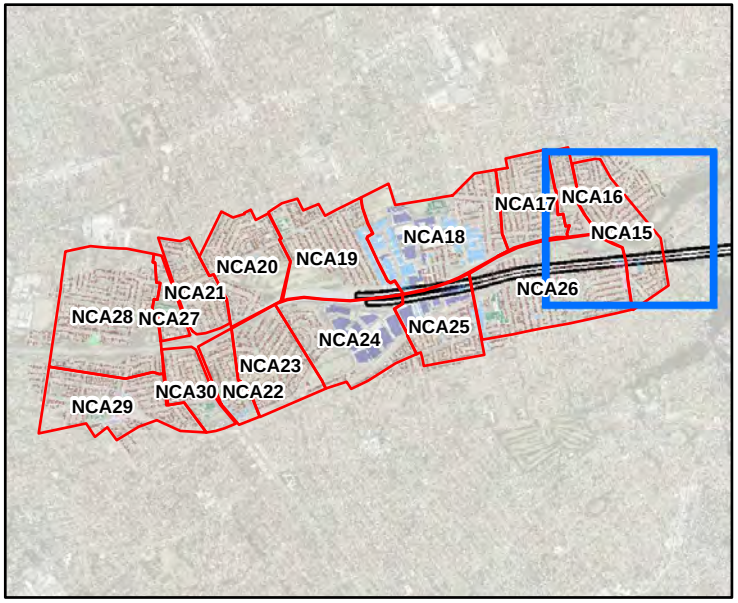
- Logger Locations
- Noise Catchment areas

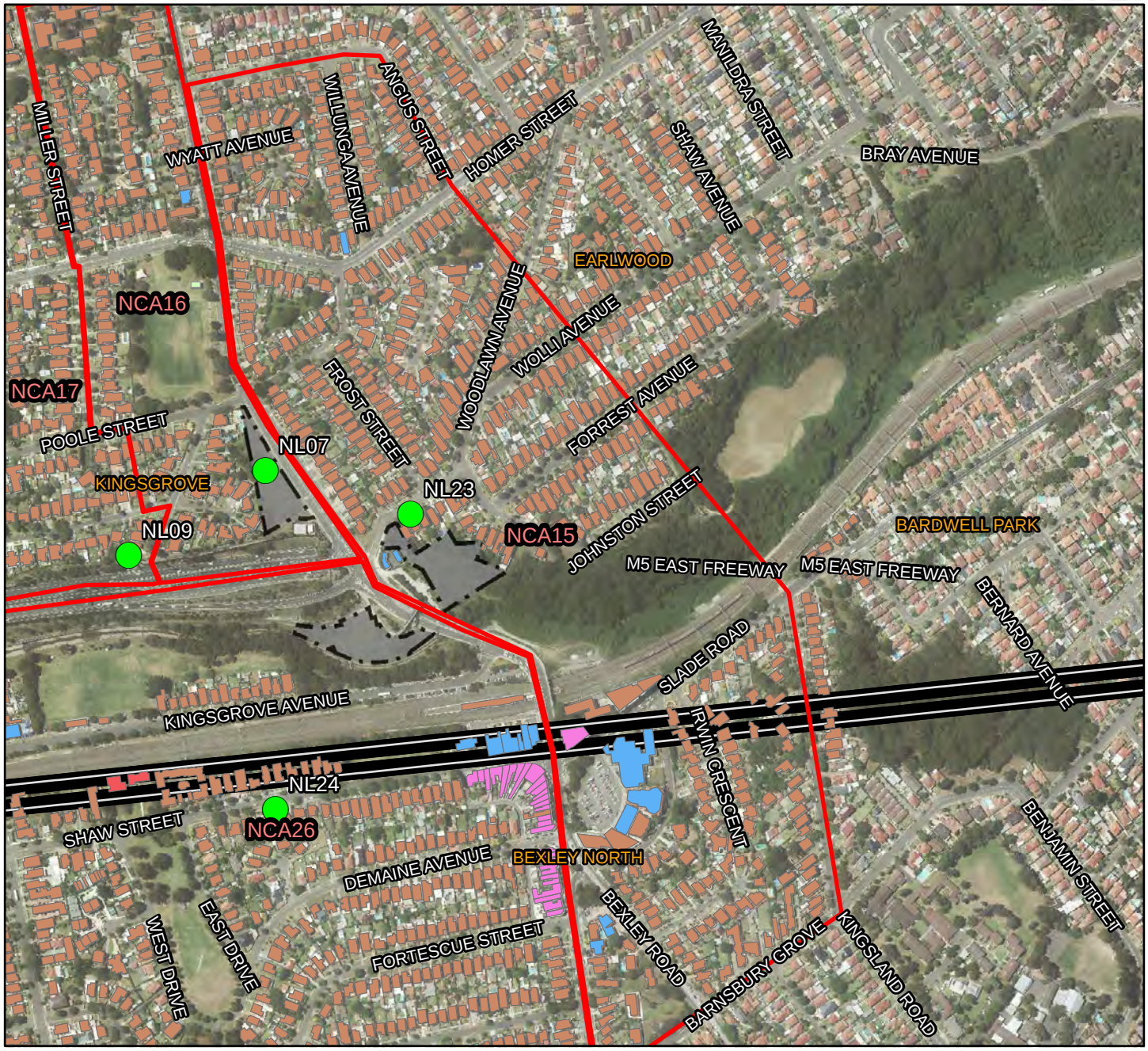
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 15

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **15**

AECOM

Legend

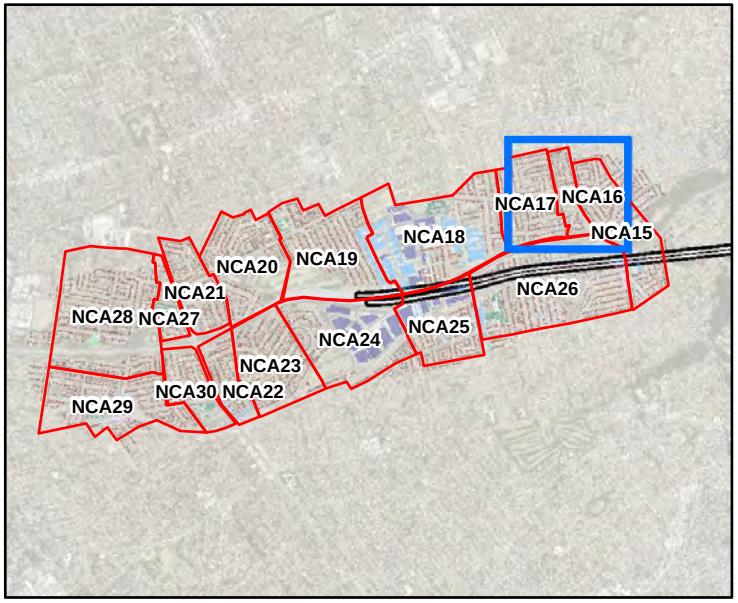
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 16

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **16**

AECOM

Legend

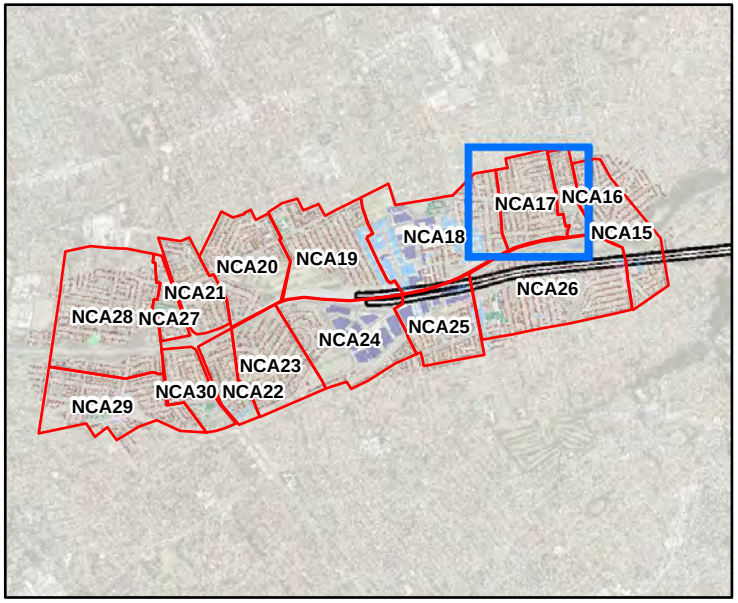
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 17

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **17**

AECOM

Legend

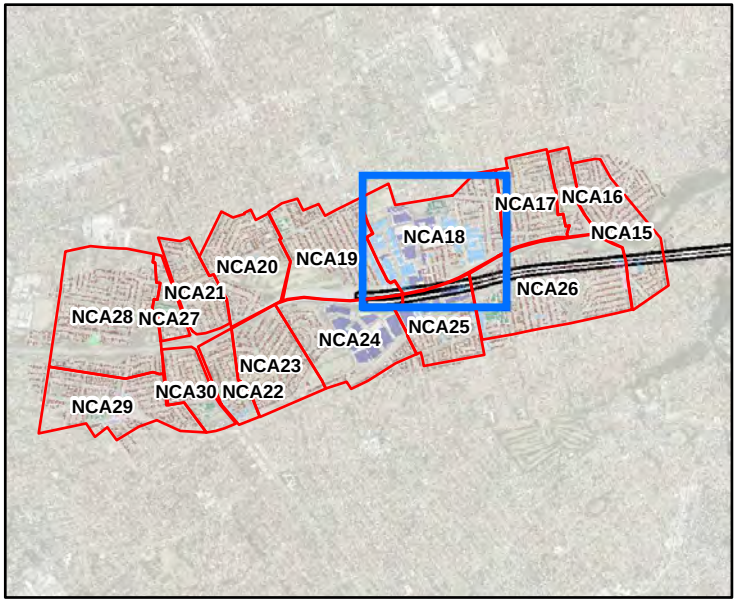
- Logger Locations
- Noise Catchment areas

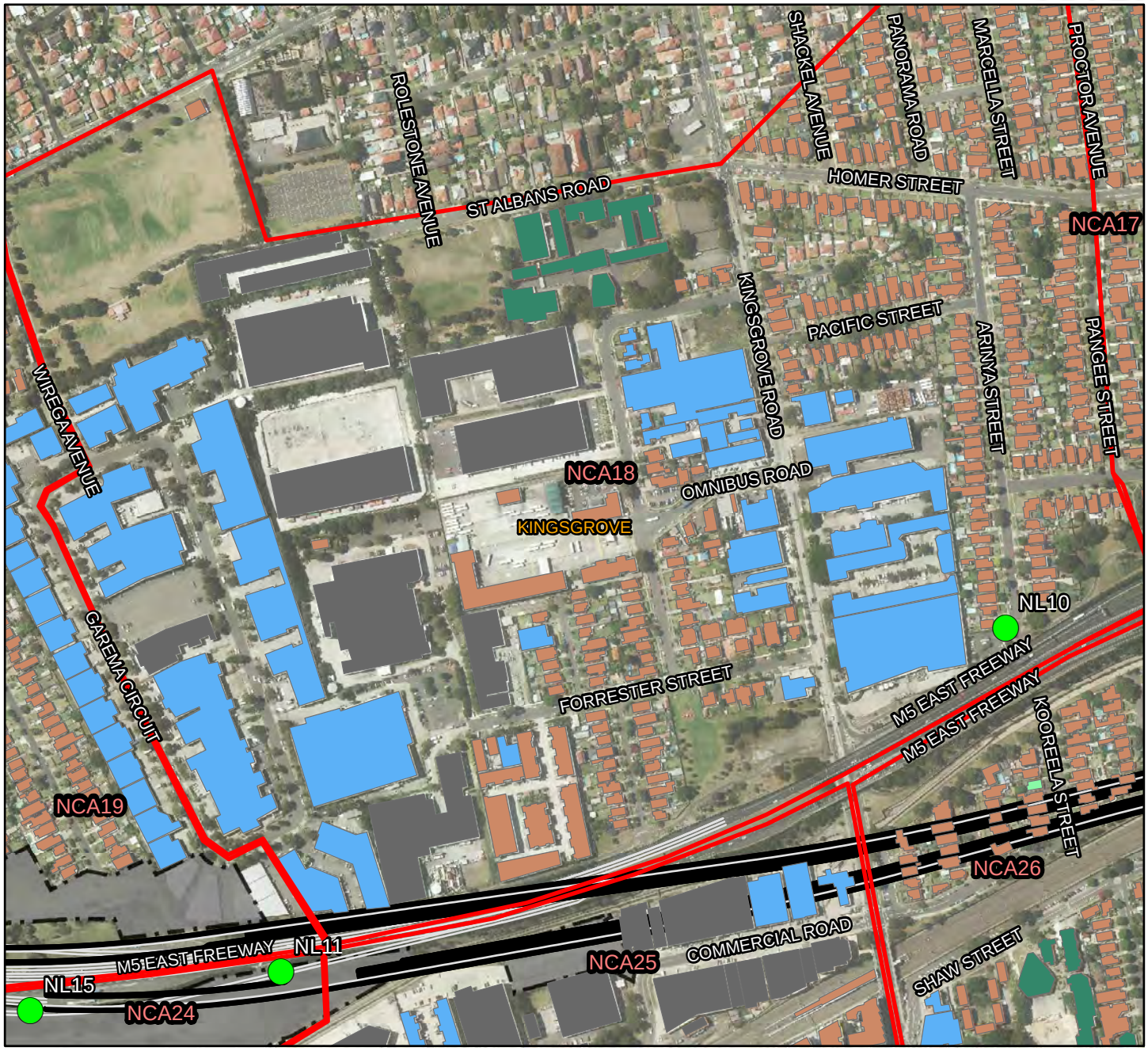
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 18

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **18**

AECOM

Legend

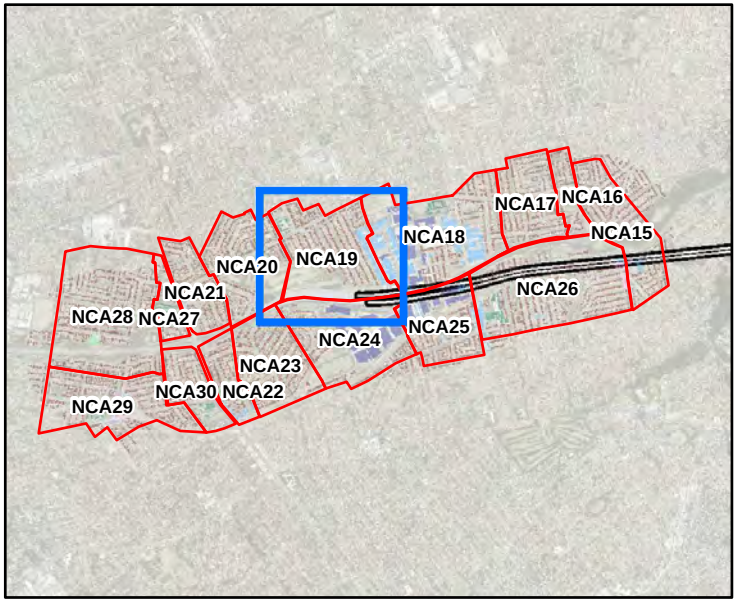
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 19

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **19**

AECOM

Legend

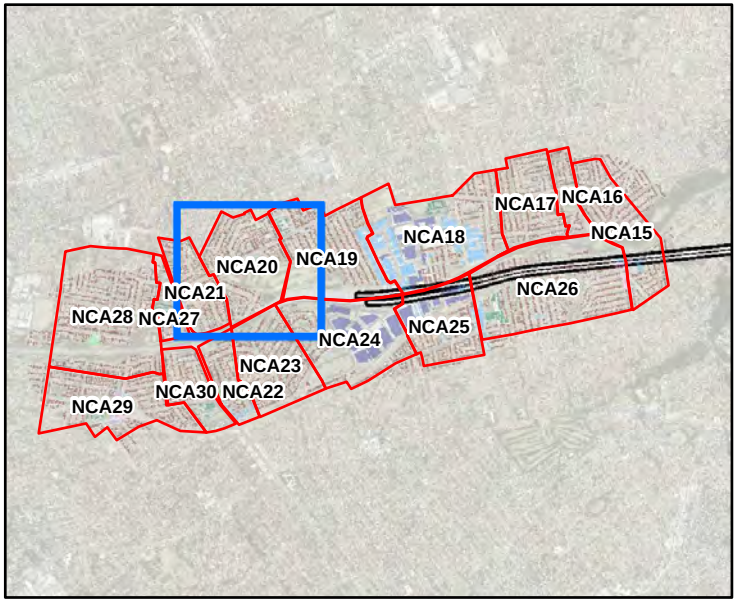
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 20

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **20**

AECOM

Legend

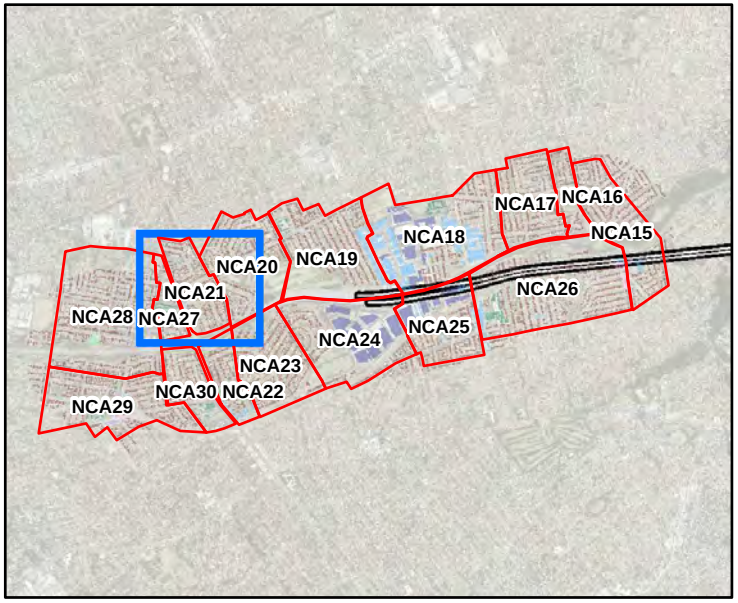
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 21

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **21**

AECOM

Legend

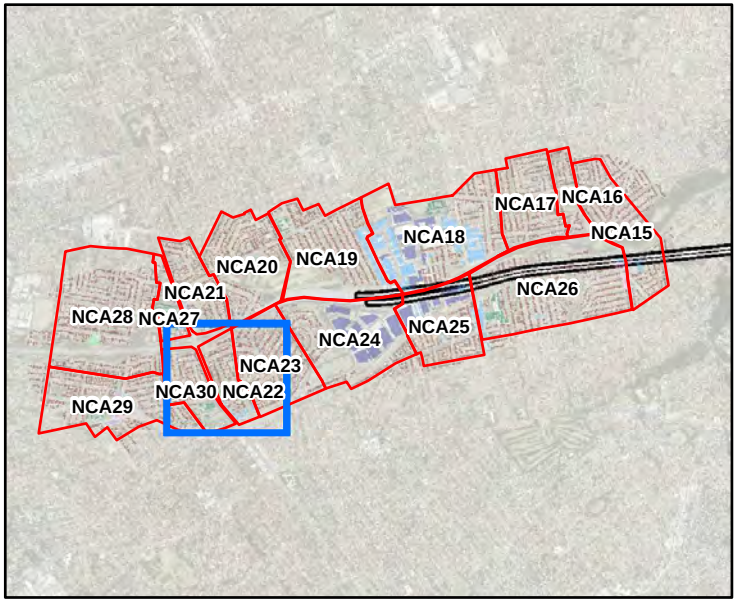
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 22

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **22**

AECOM

Legend

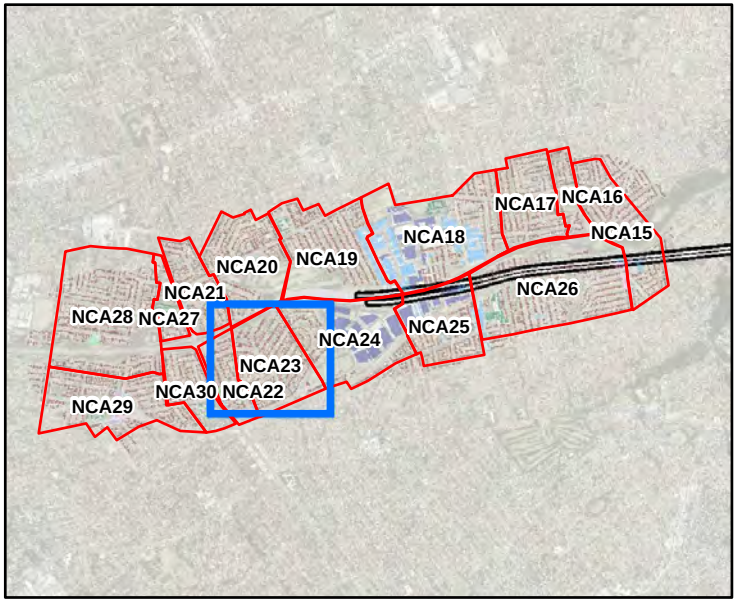
- Logger Locations
- Noise Catchment areas

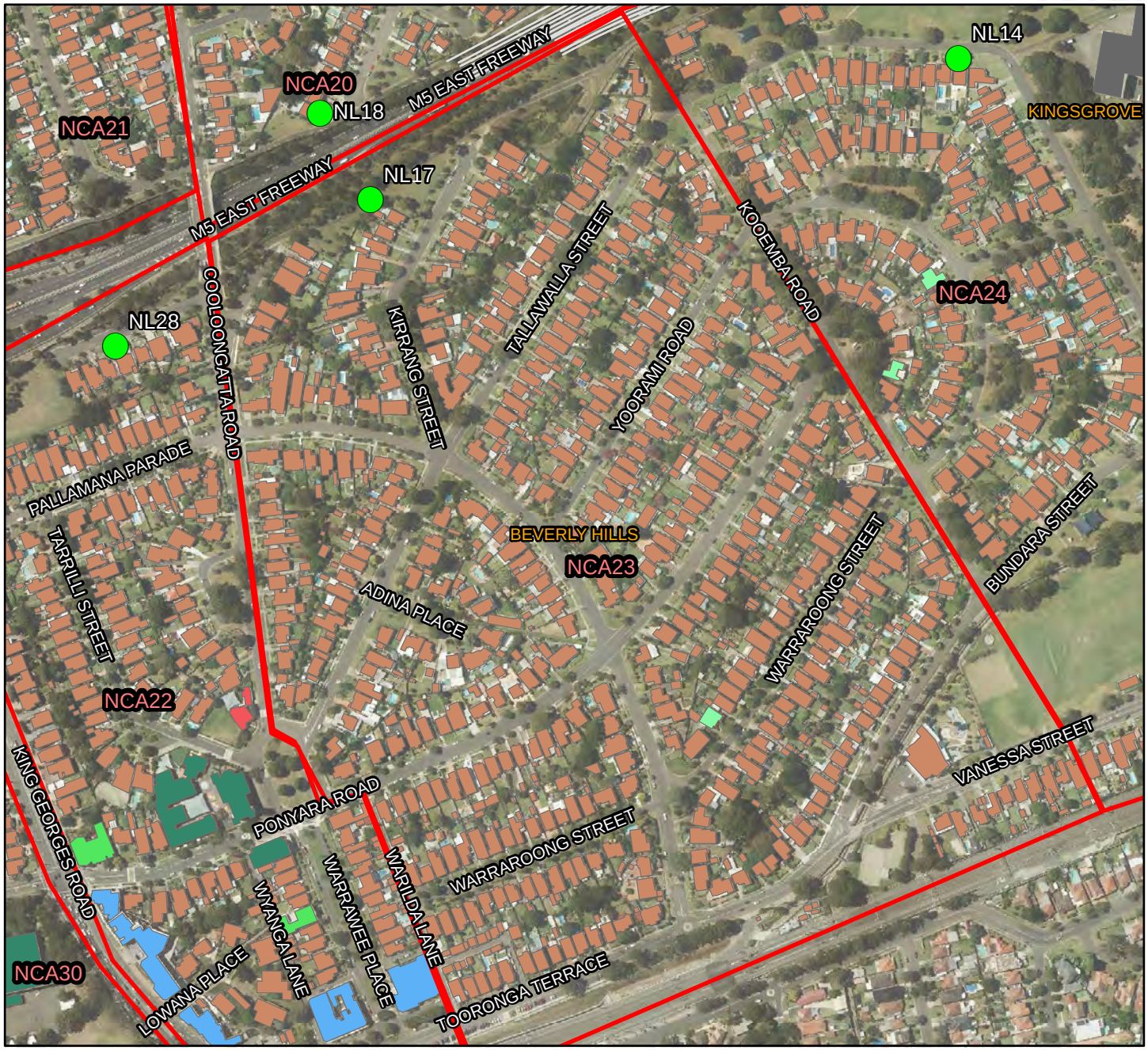
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 23

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **23**

AECOM

Legend

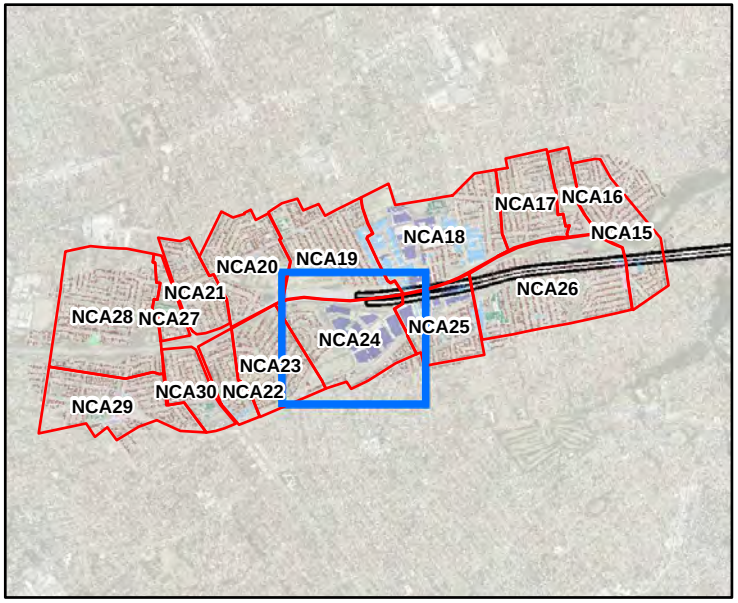
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 24

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **24**

AECOM

Legend

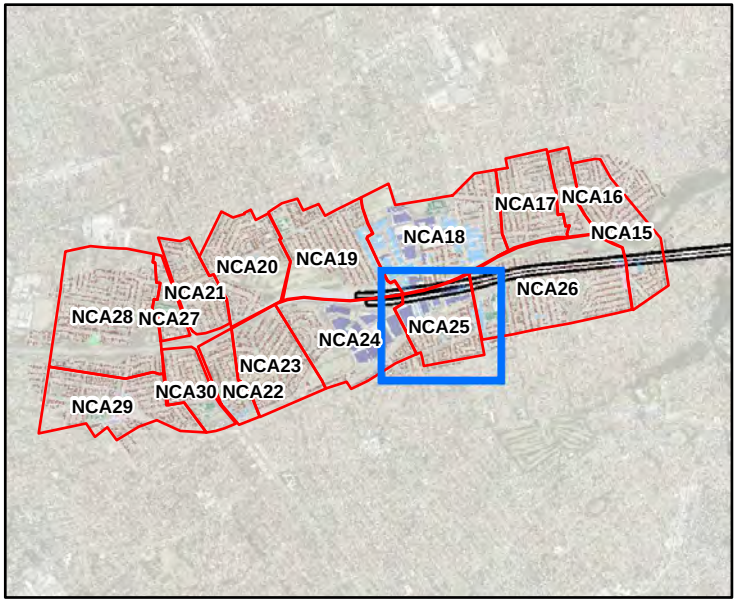
- Logger Locations
- Noise Catchment areas

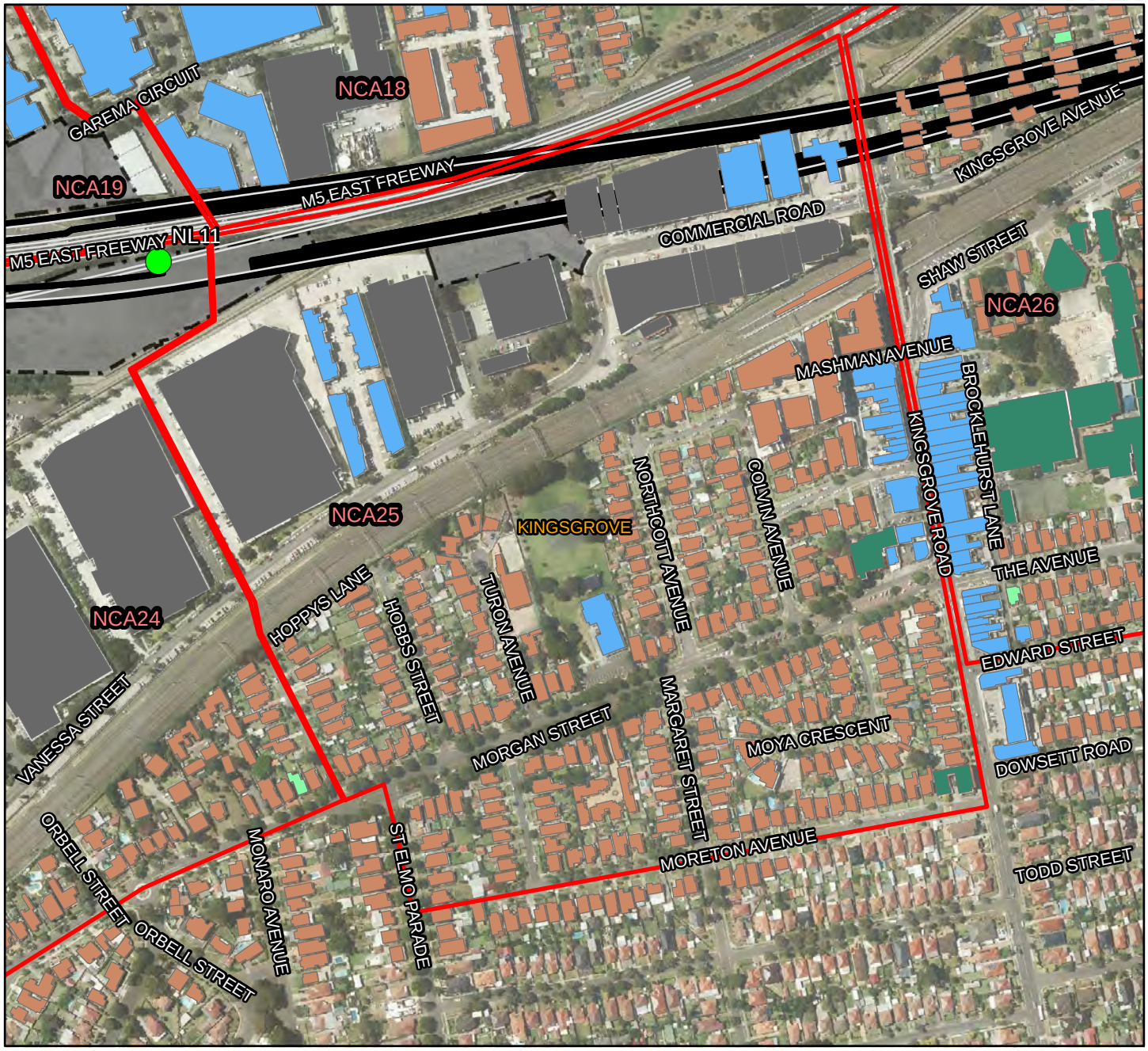
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 25

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **25**

AECOM

Legend

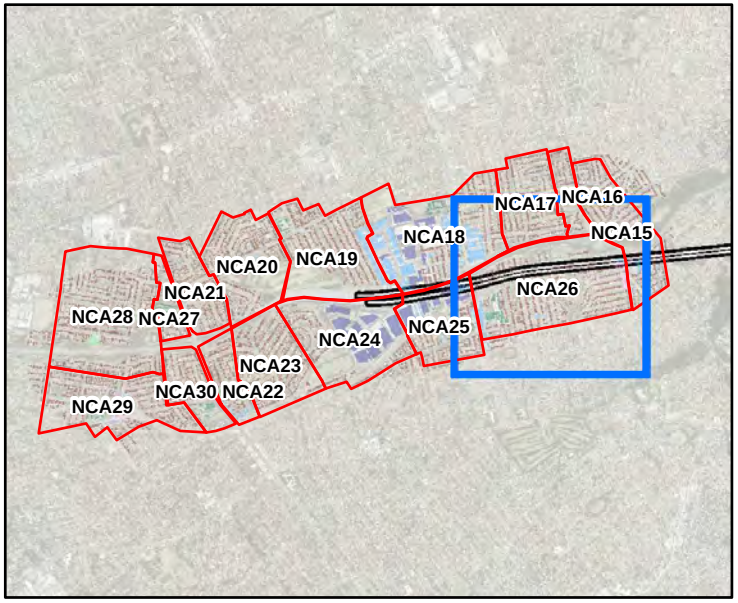
- Logger Locations
- Noise Catchment areas

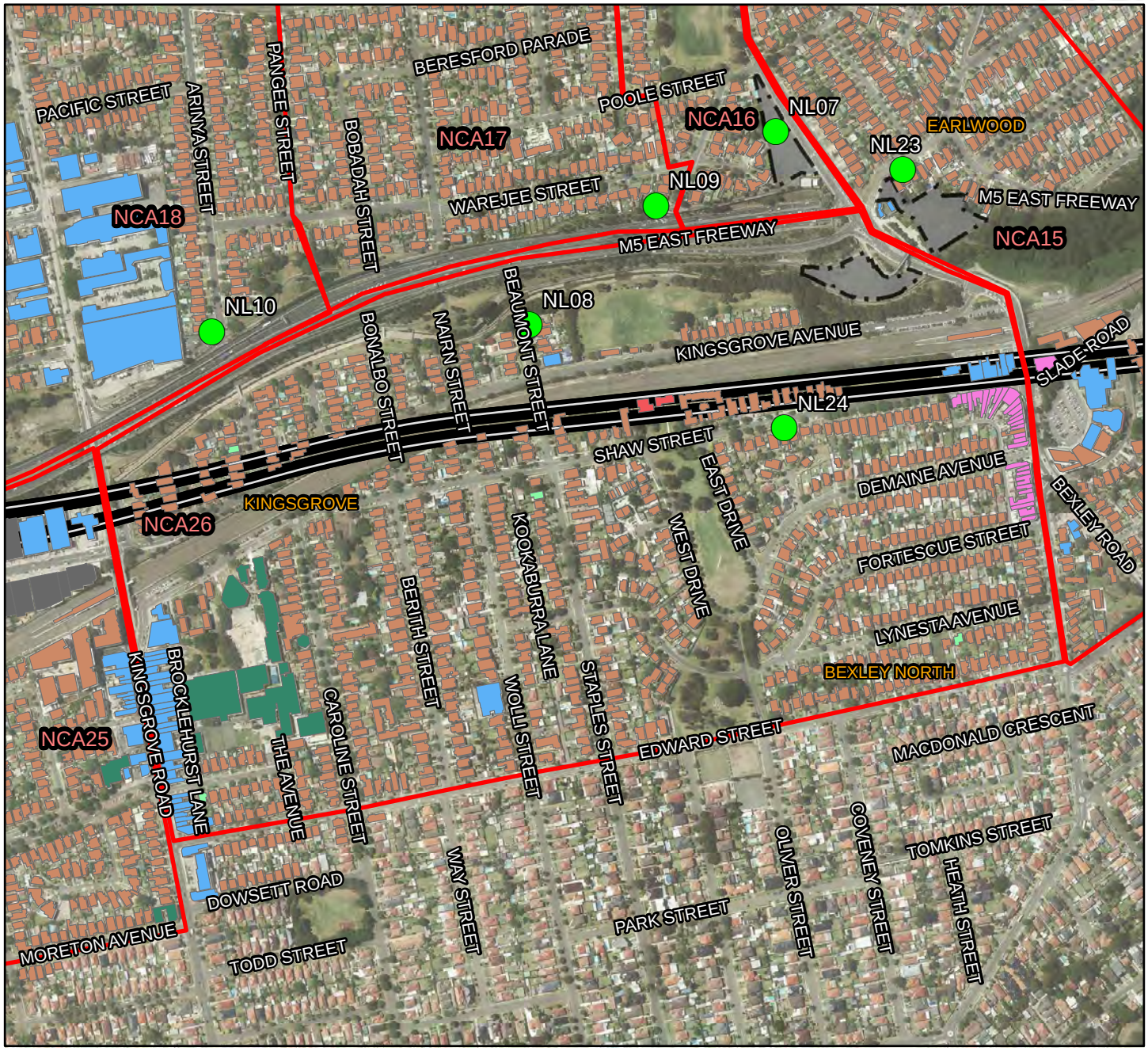
Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 26

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **26**

AECOM

Legend

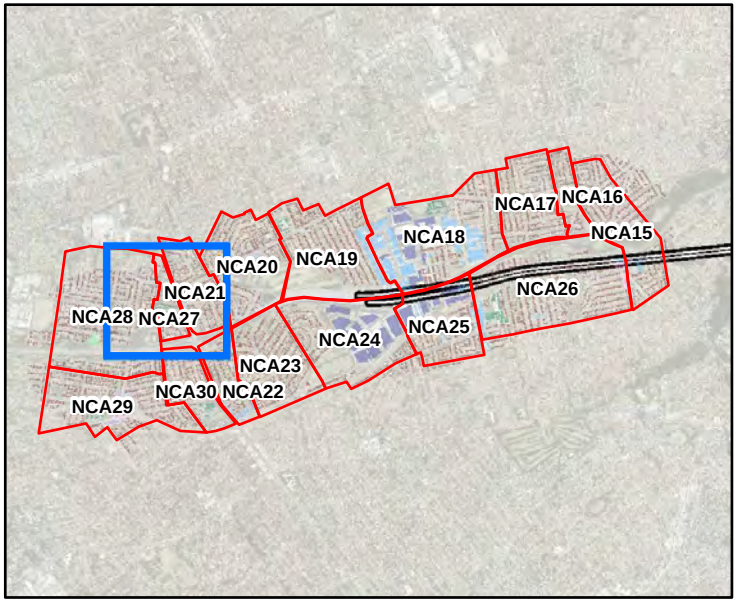
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 27

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **27**

AECOM

Legend

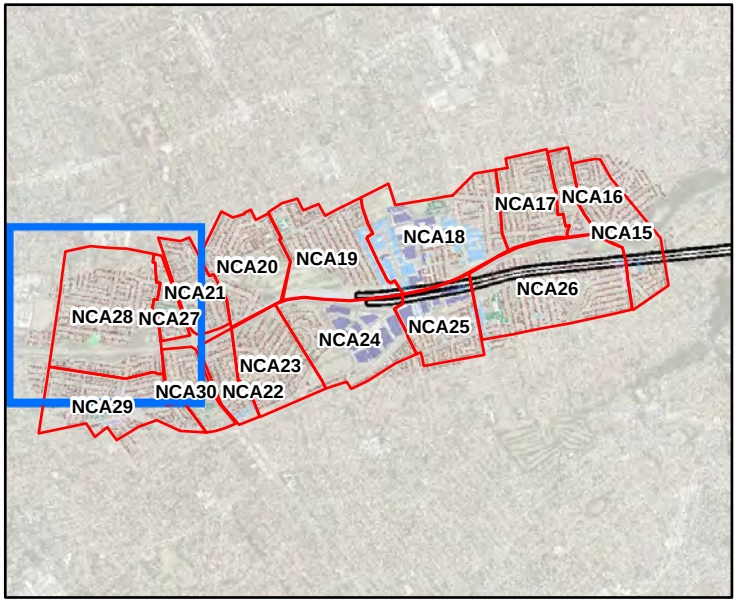
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 28

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **28**

AECOM

Legend

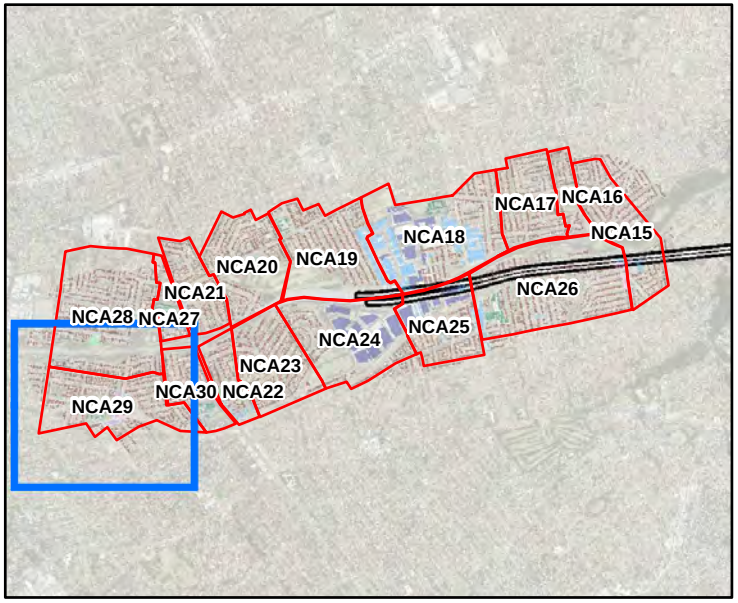
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 29

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **29**

AECOM

Legend

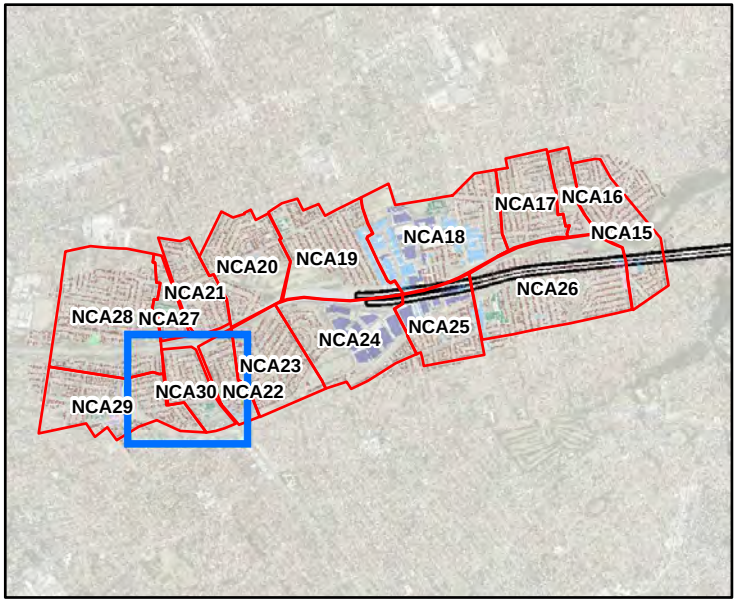
- Logger Locations
- Noise Catchment areas

Project Features

- Construction Compounds
- Tunnel
- Road Works

Building Usages

- Aged care
- Child Care
- Church
- Commercial
- Community Centre
- Empty Lot
- Fire Station
- Hotel
- Industrial
- Mixed Use
- Recreational
- Residential
- School
- Under Construction





WestConnex Stage 2

Noise Catchment Area - NCA 30

Source: SKM2014

0 50 100 200 m

N

NOV 2015

60327128

Fig. **30**

Appendix D

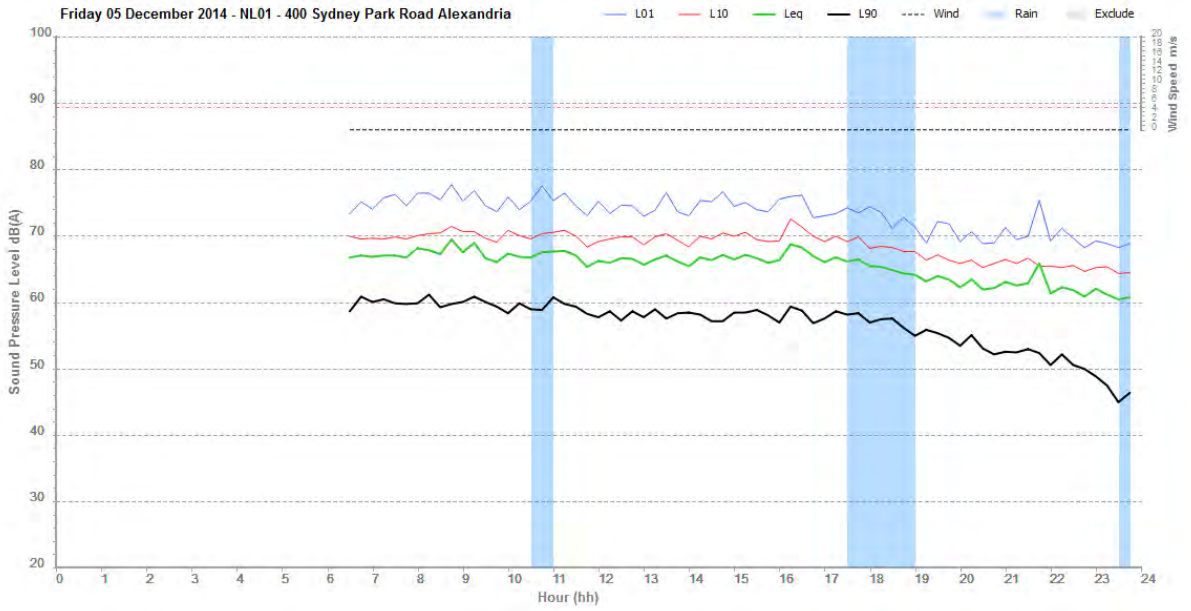
Noise logger results

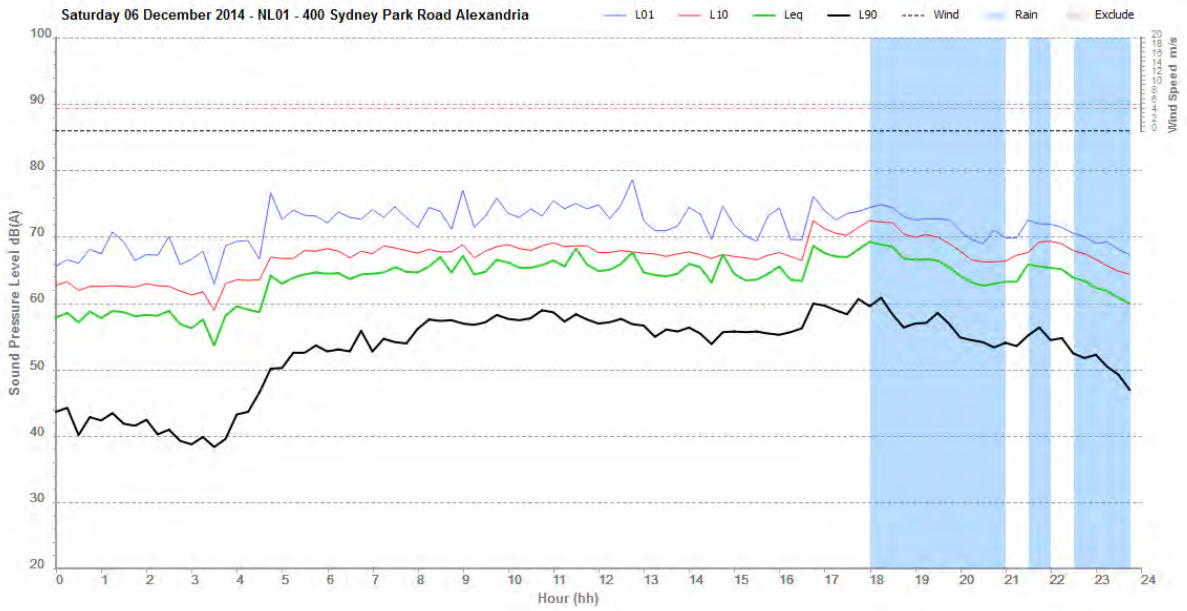
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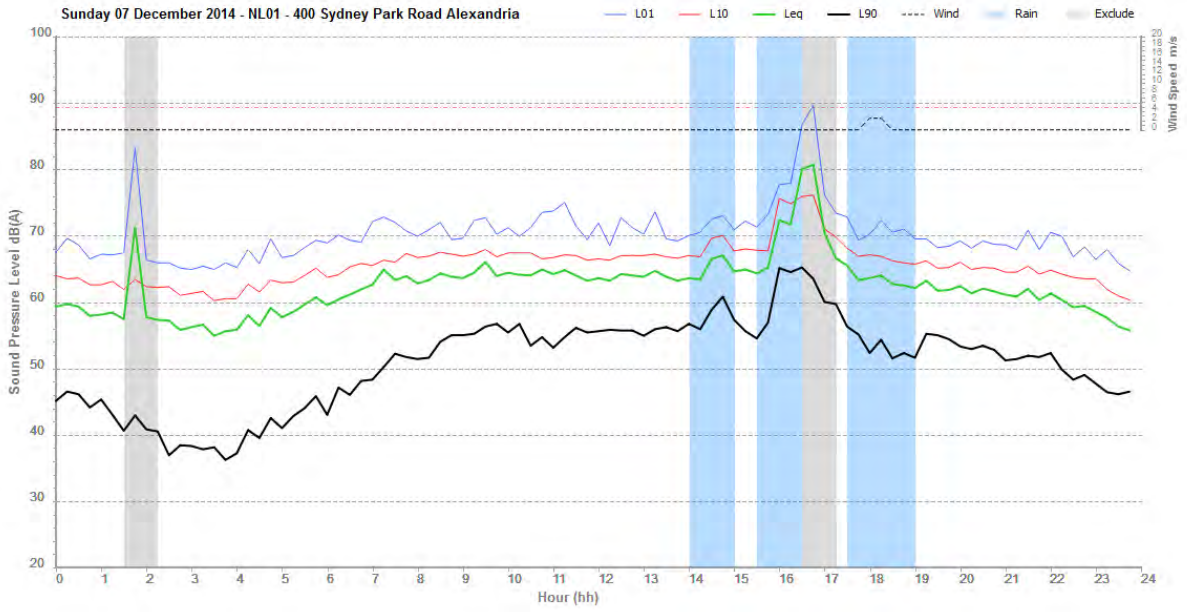
Appendix D Noise logger results

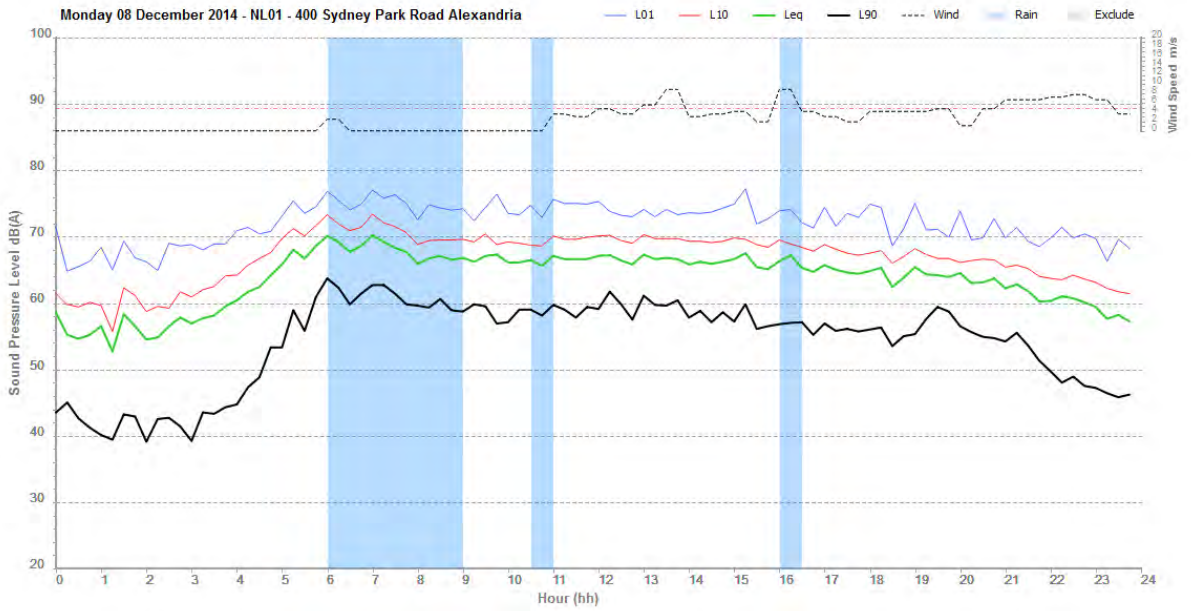
NL01 – 400 Sydney Park Road, Alexandria – ARL 16 203 505

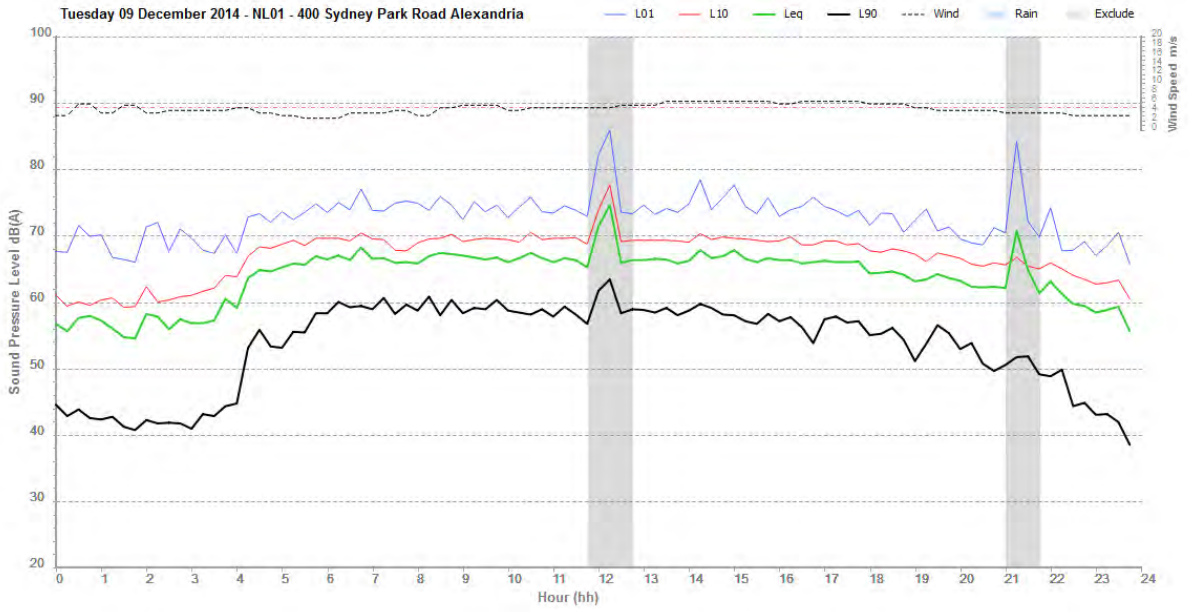


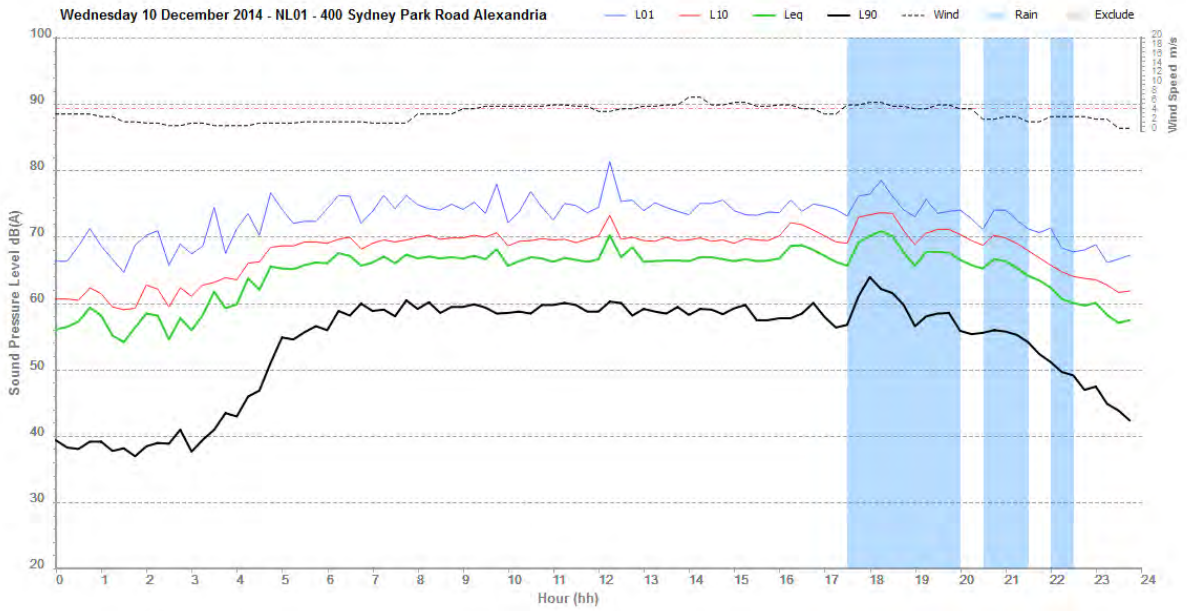


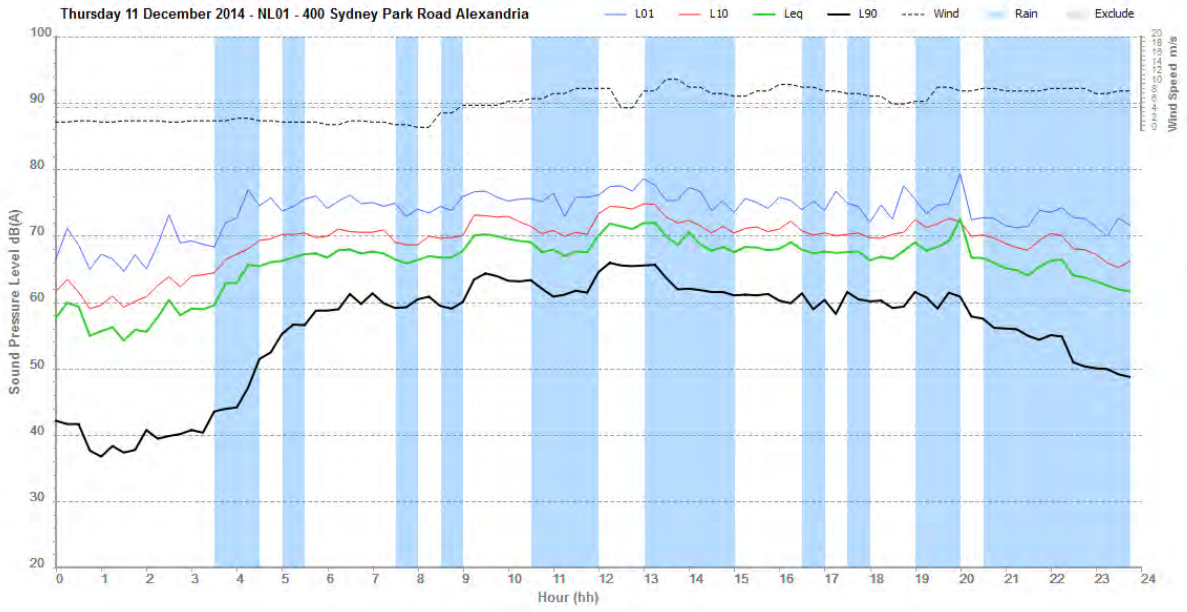

Saturday 06 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

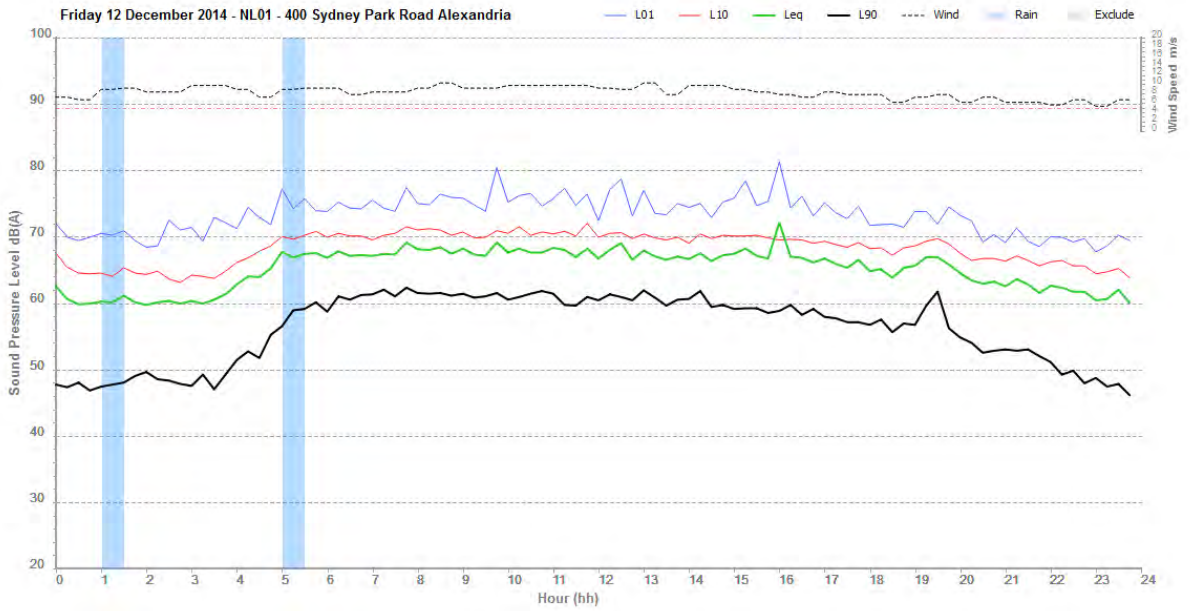

Sunday 07 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

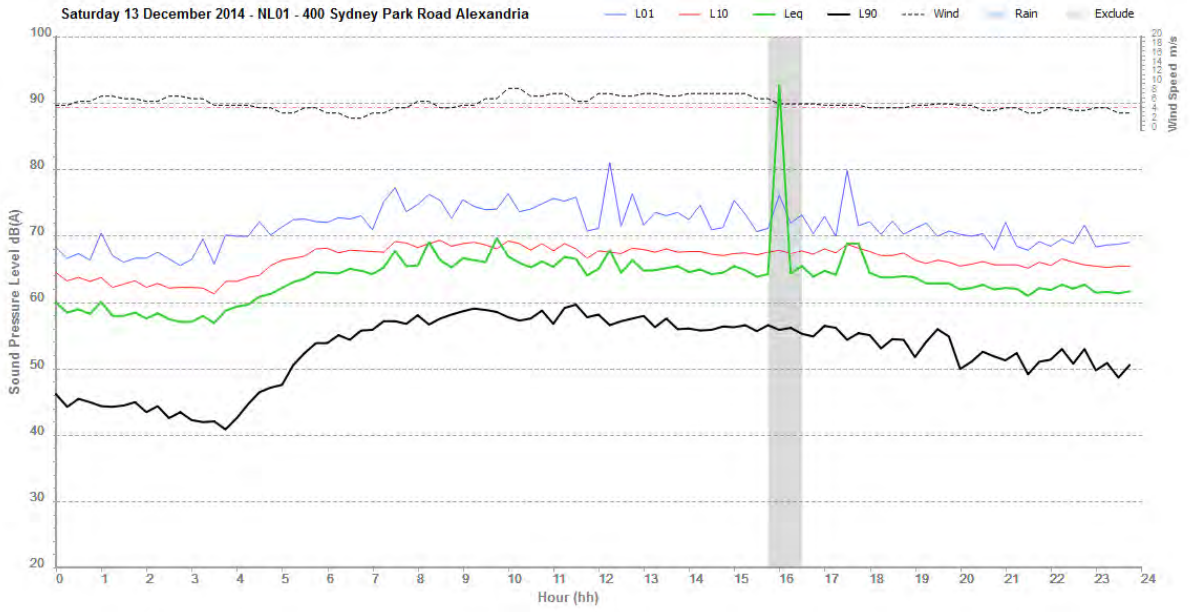

Monday 08 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

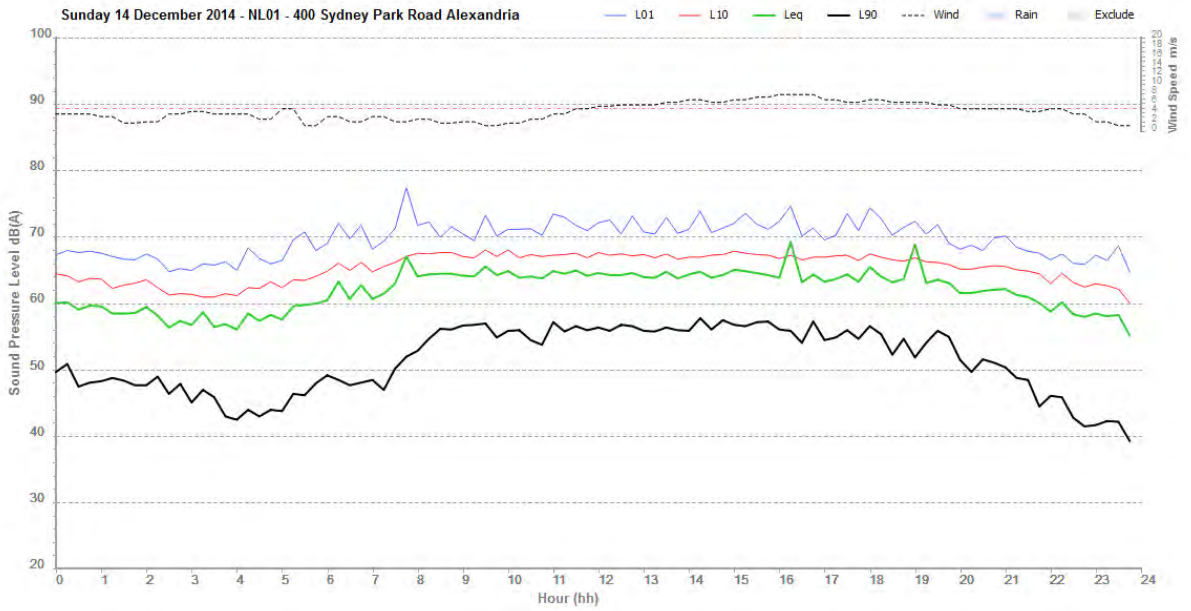

Tuesday 09 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

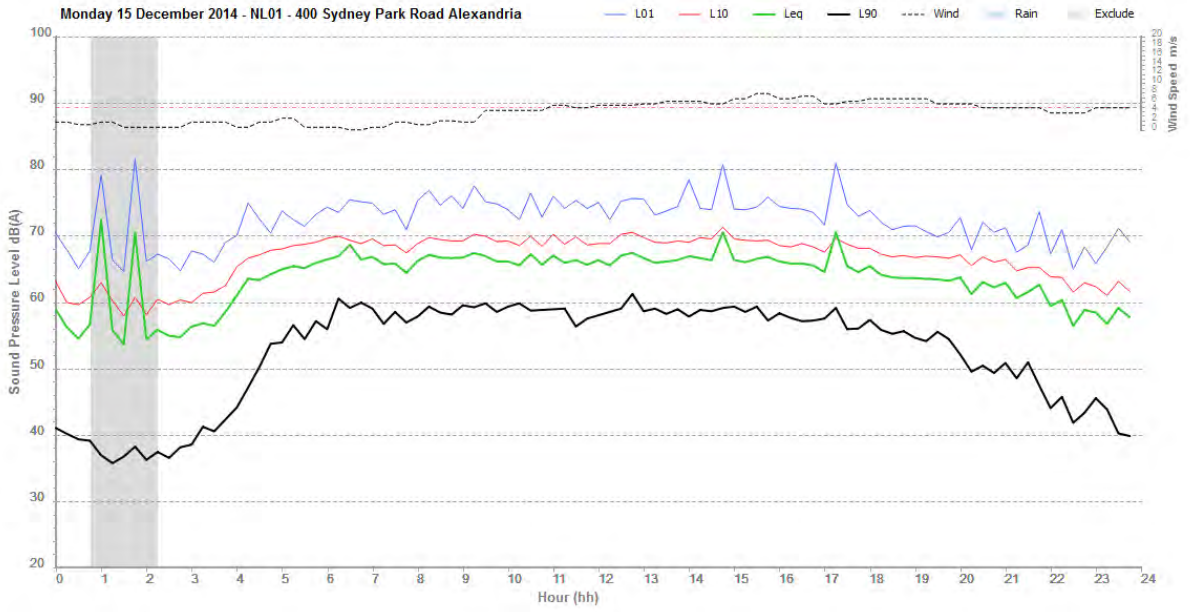

Wednesday 10 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

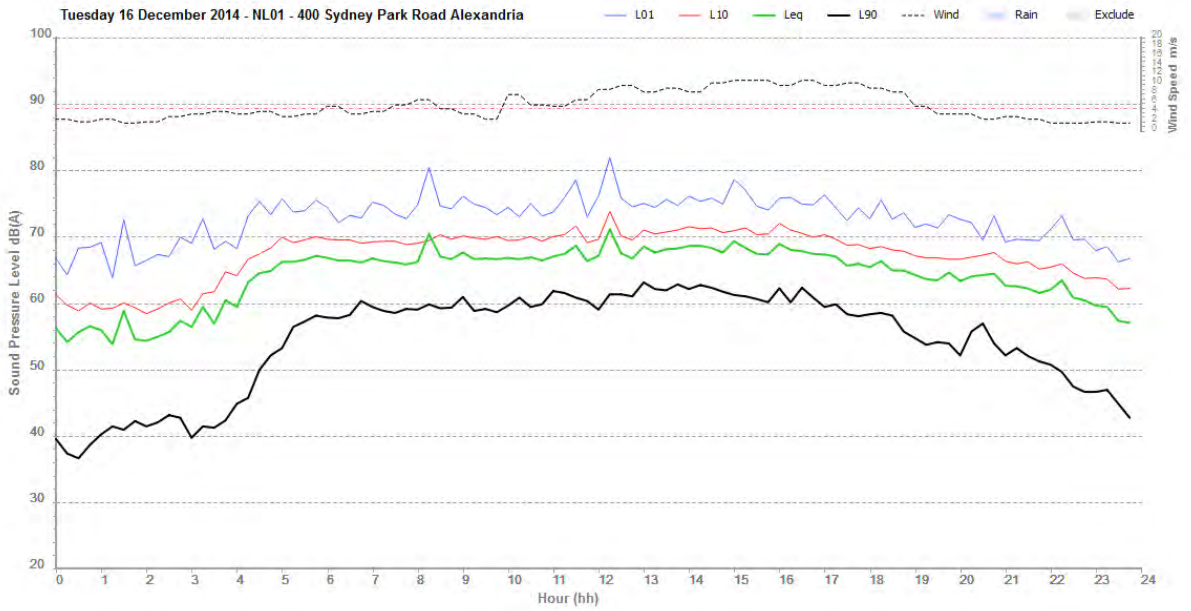

Thursday 11 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

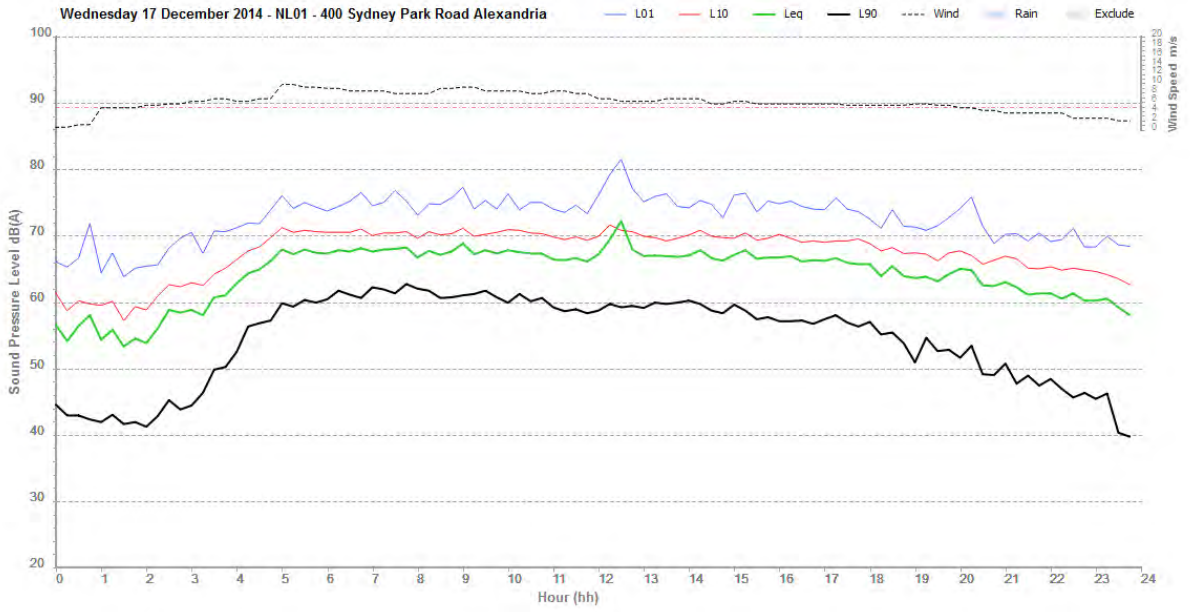

Friday 12 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

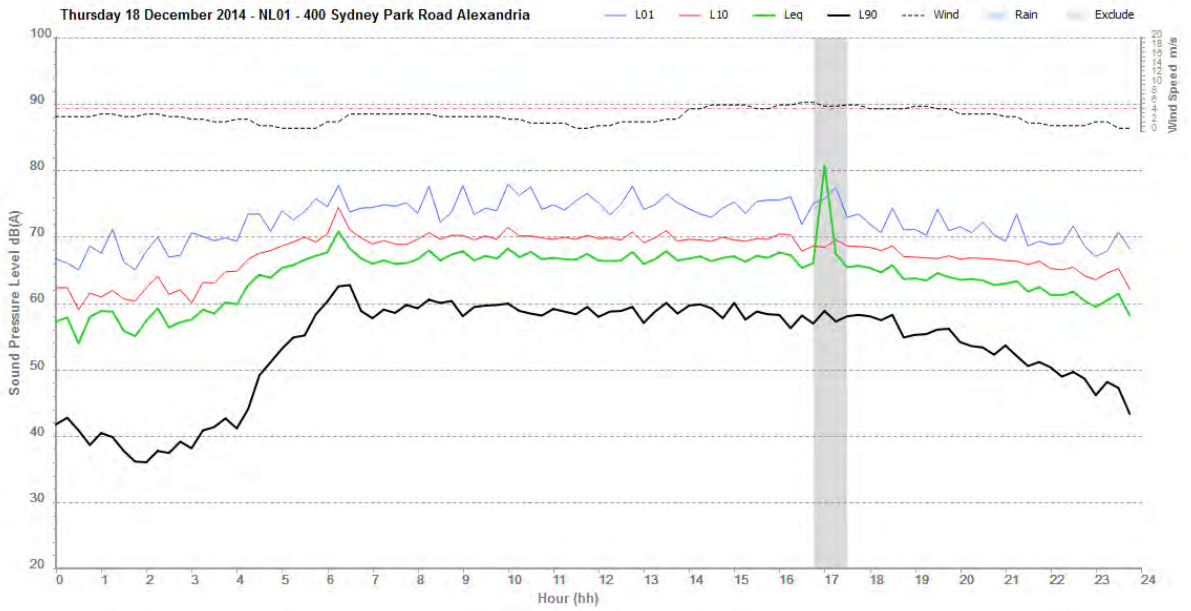

Saturday 13 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

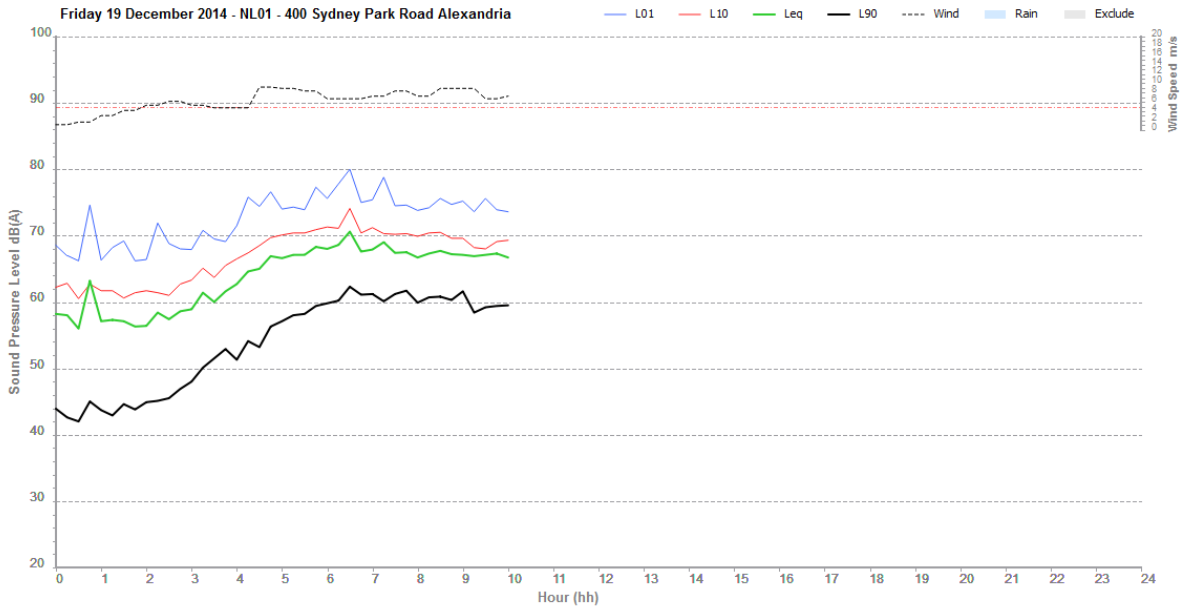

Sunday 14 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 15 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

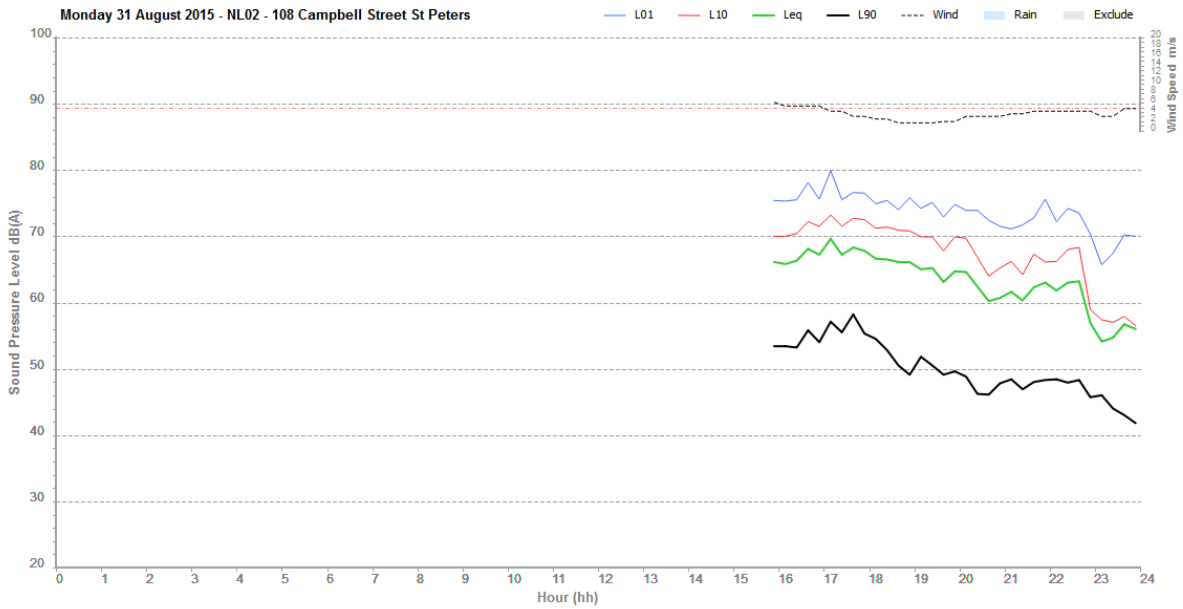

Wednesday 17 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

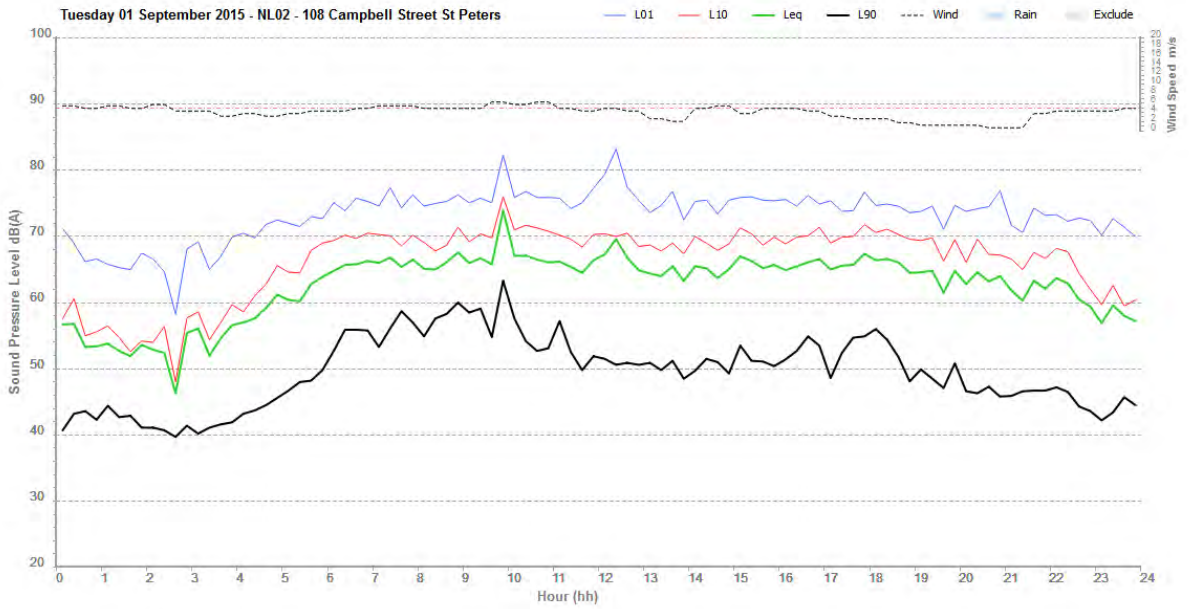

Thursday 18 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

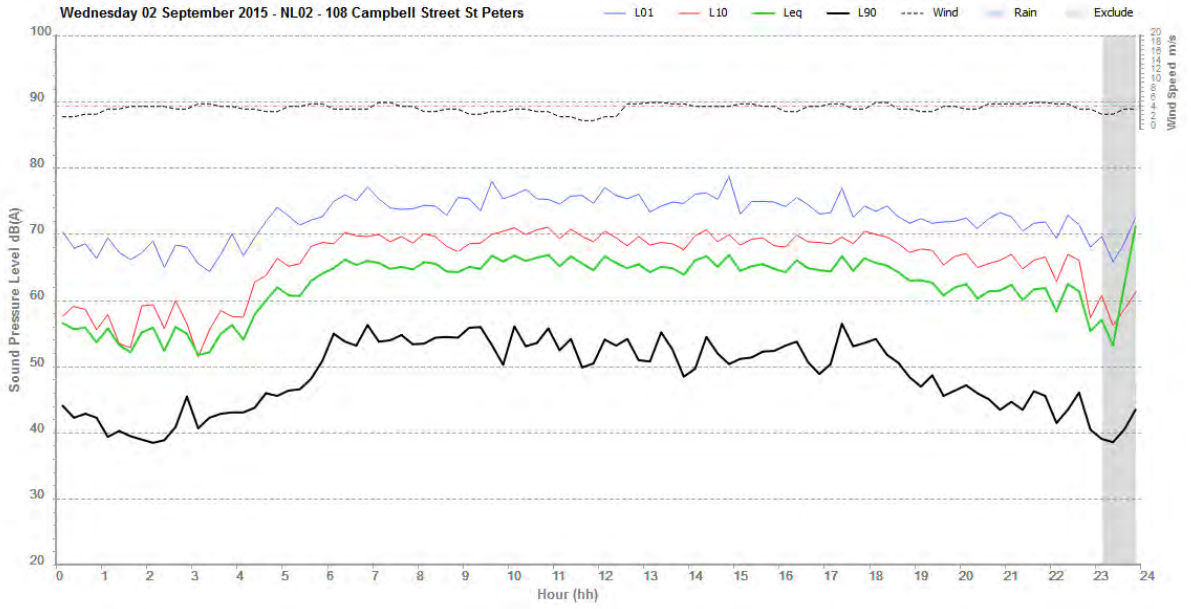

Friday 19 December 2014 - NL01 - 400 Sydney Park Road Alexandria
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

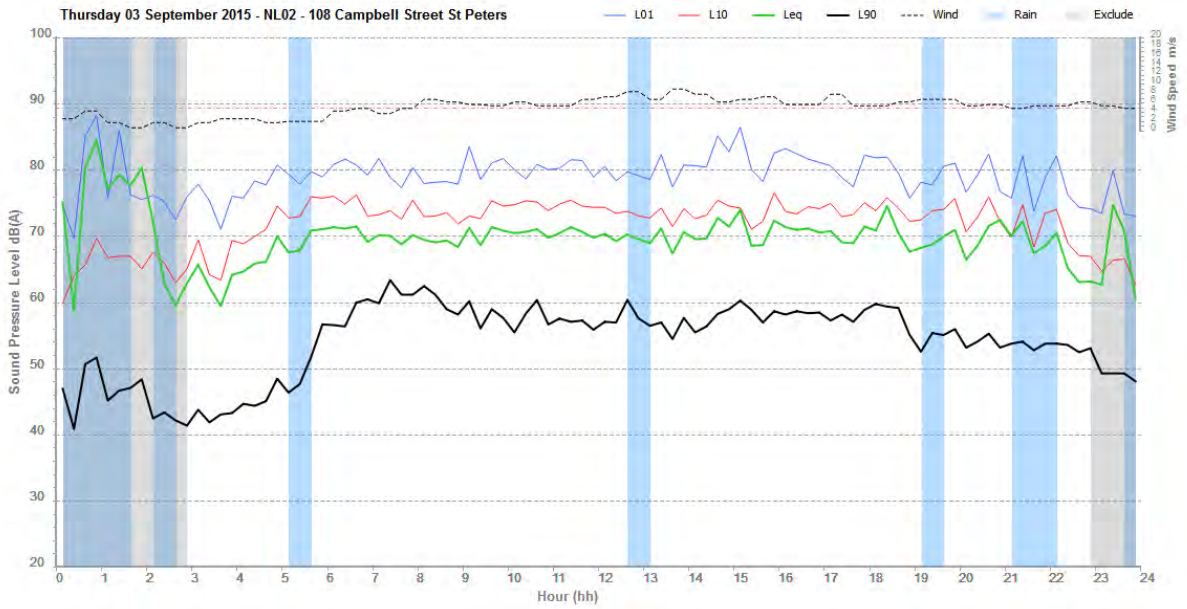
NL02 – 108 Campbell St, St Peters – SVAN 957 23855

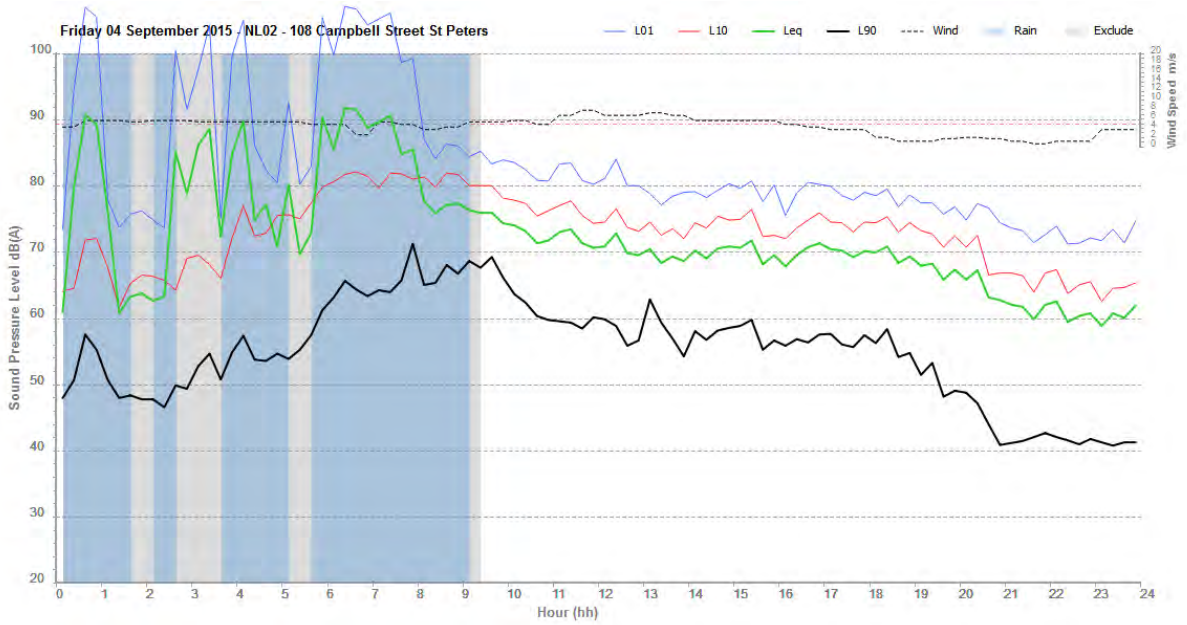


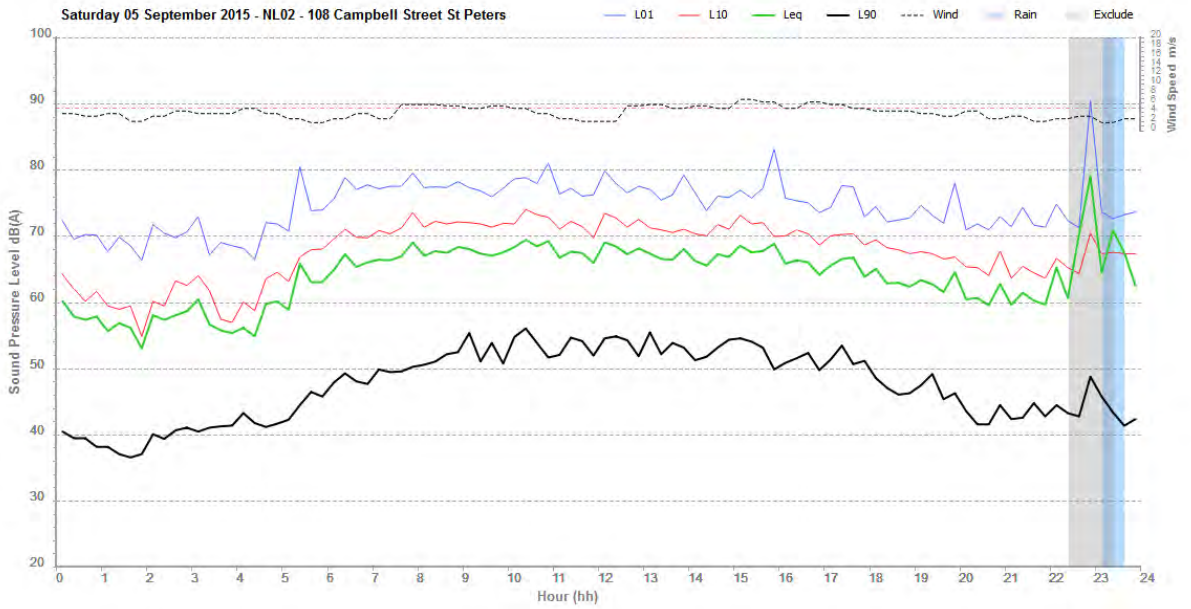


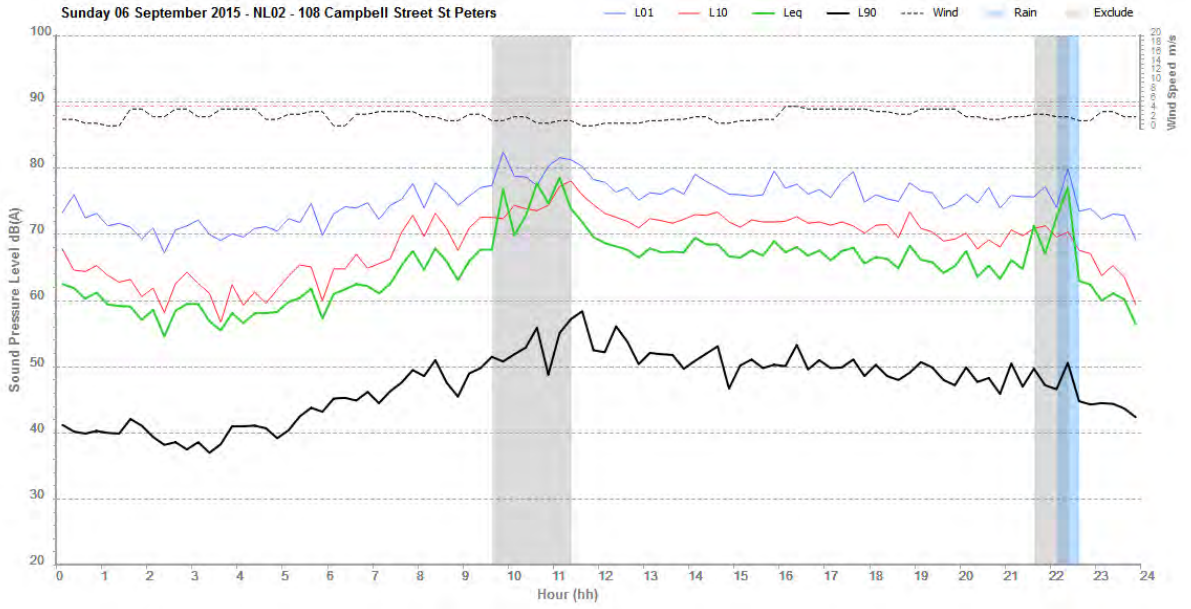

Tuesday 01 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

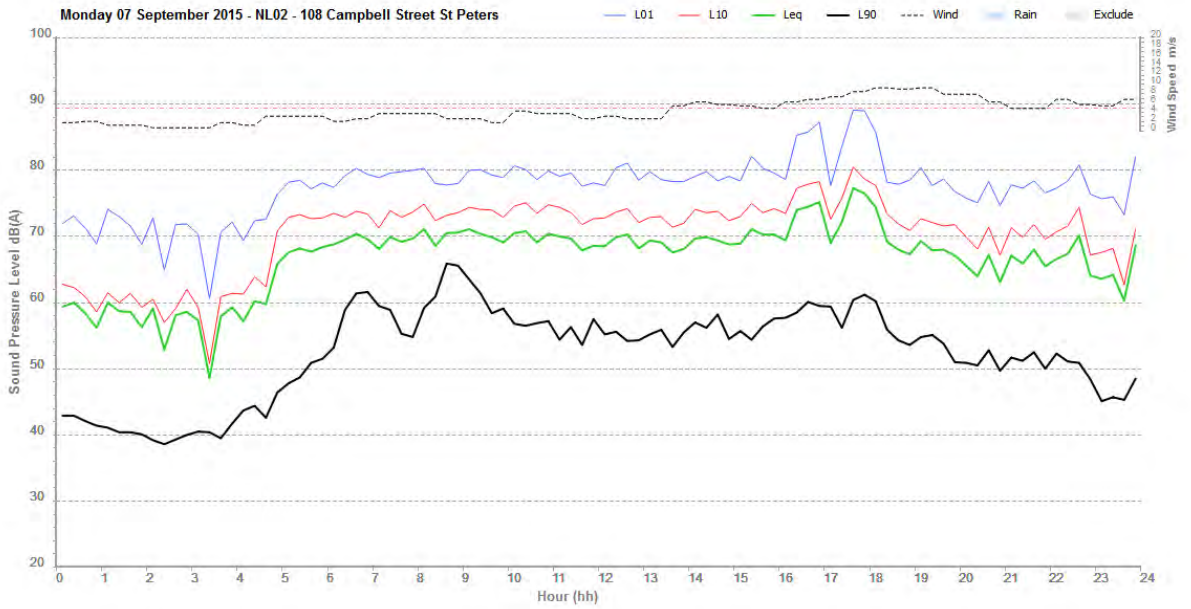

Wednesday 02 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

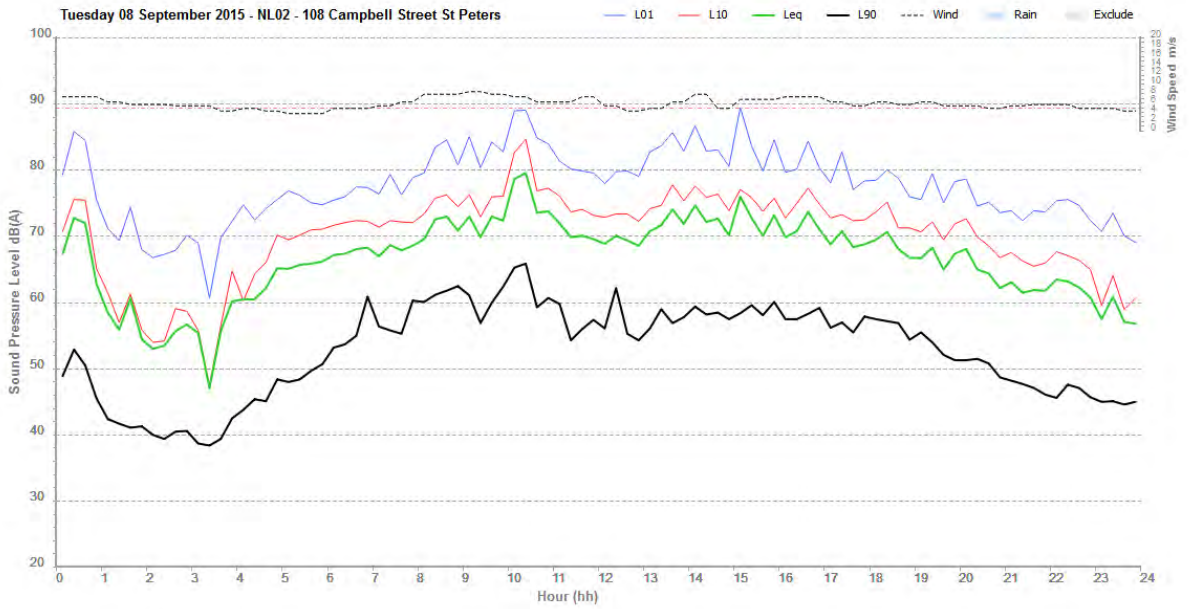

Thursday 03 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

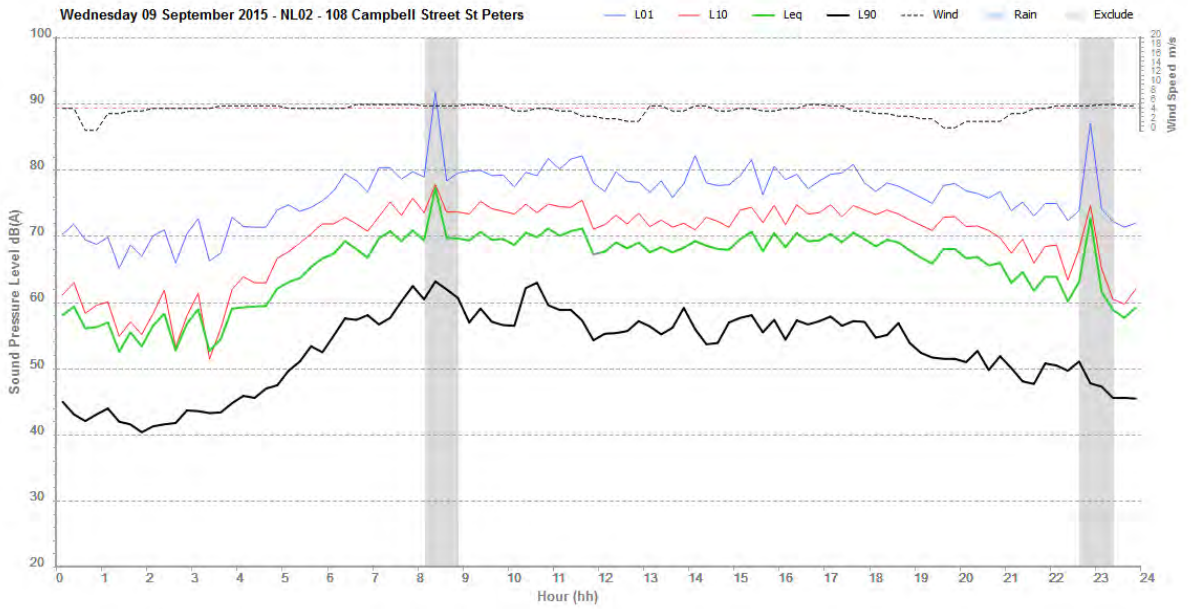

Friday 04 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

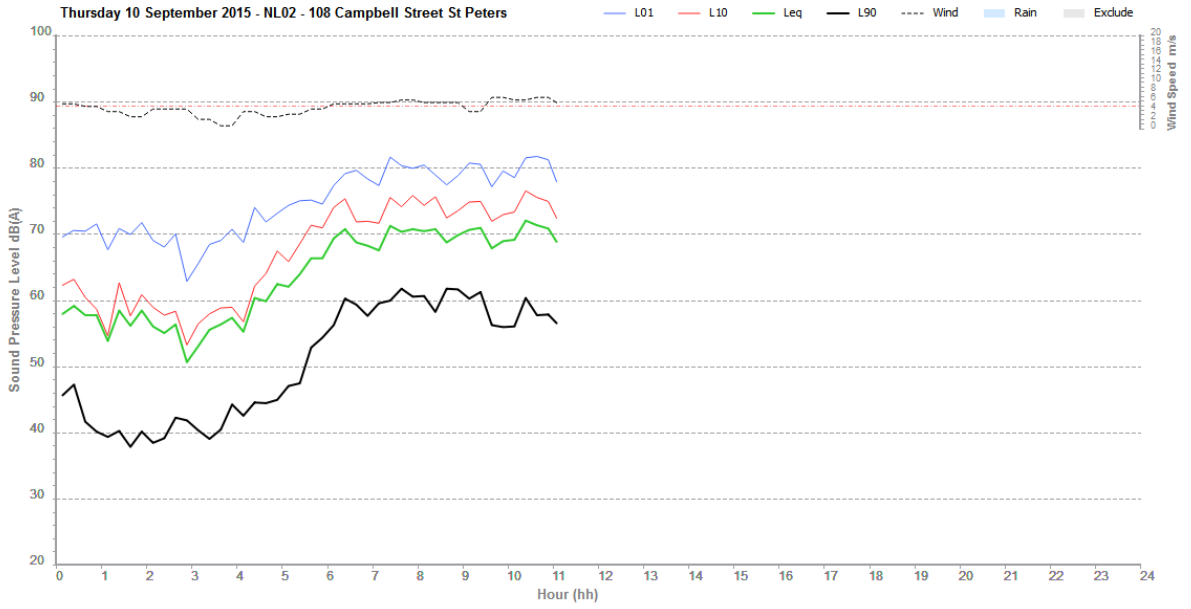

Saturday 05 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 06 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

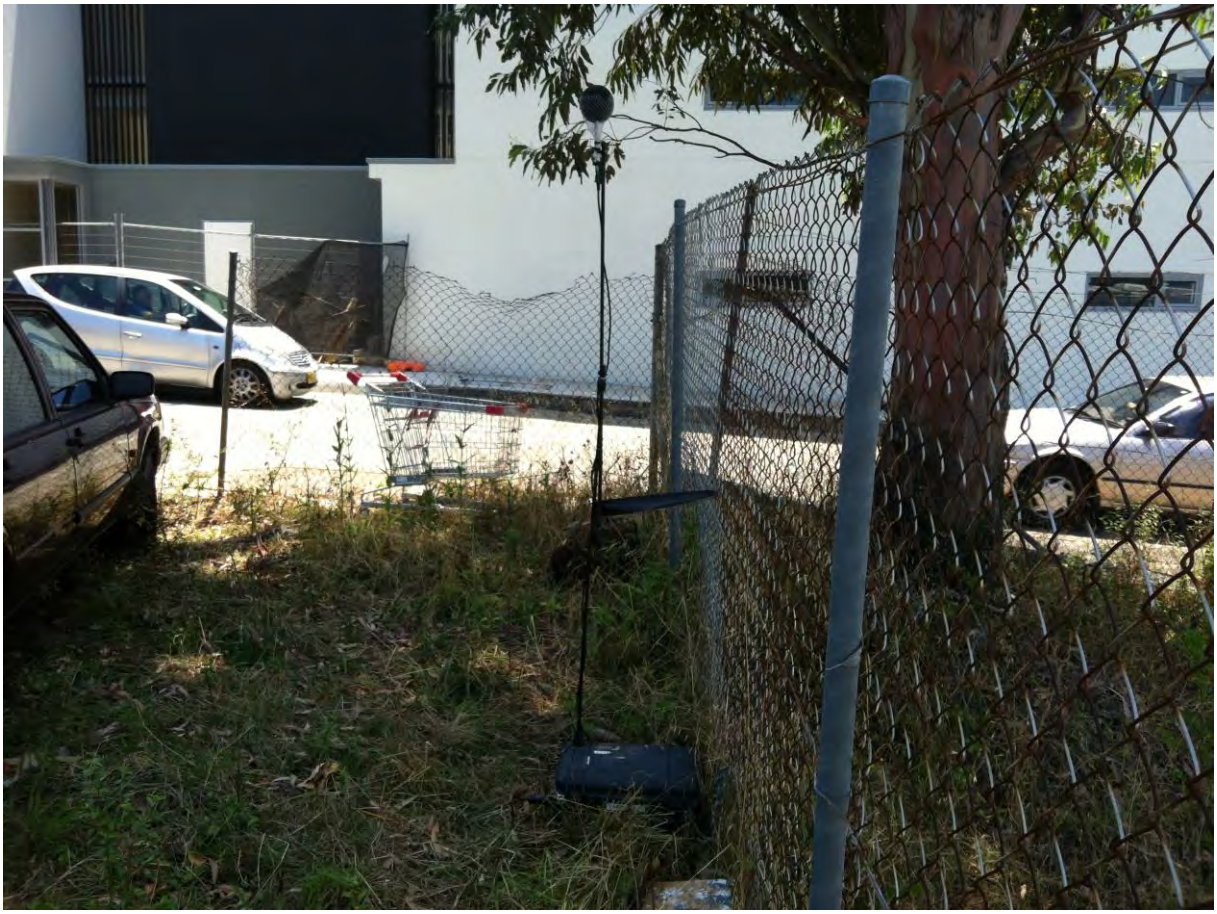

Monday 07 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

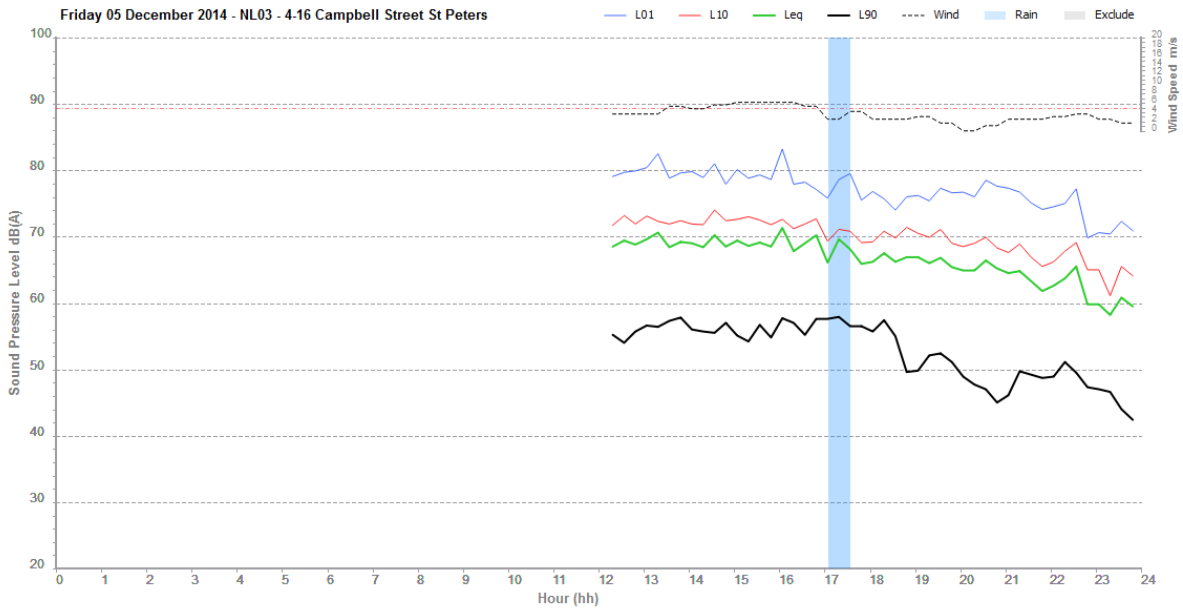

Tuesday 08 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

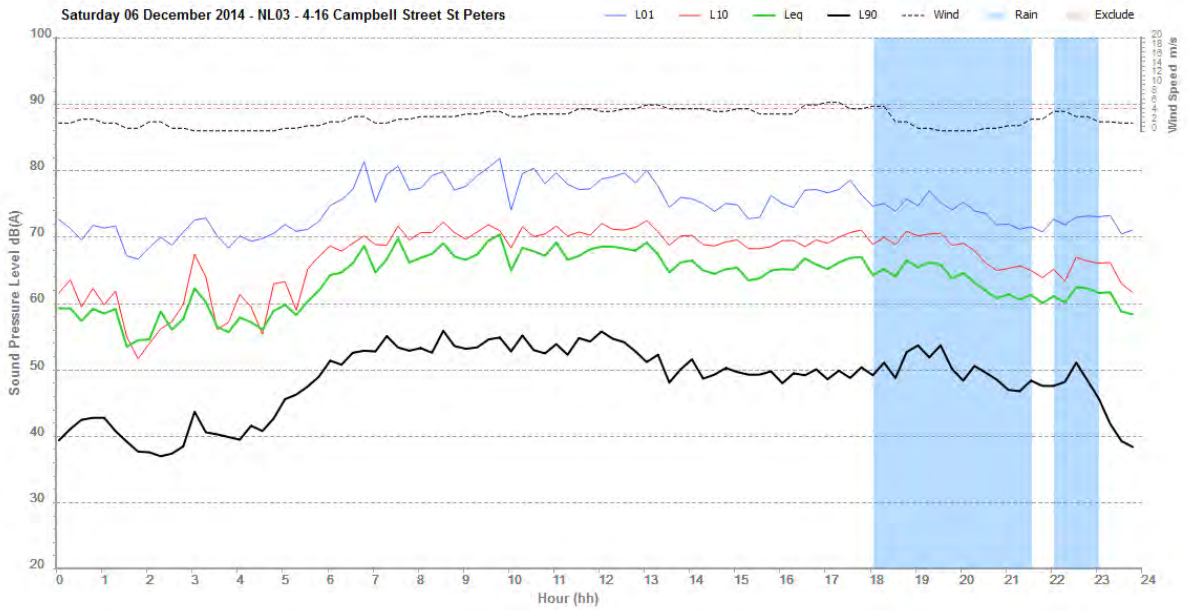

Wednesday 09 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

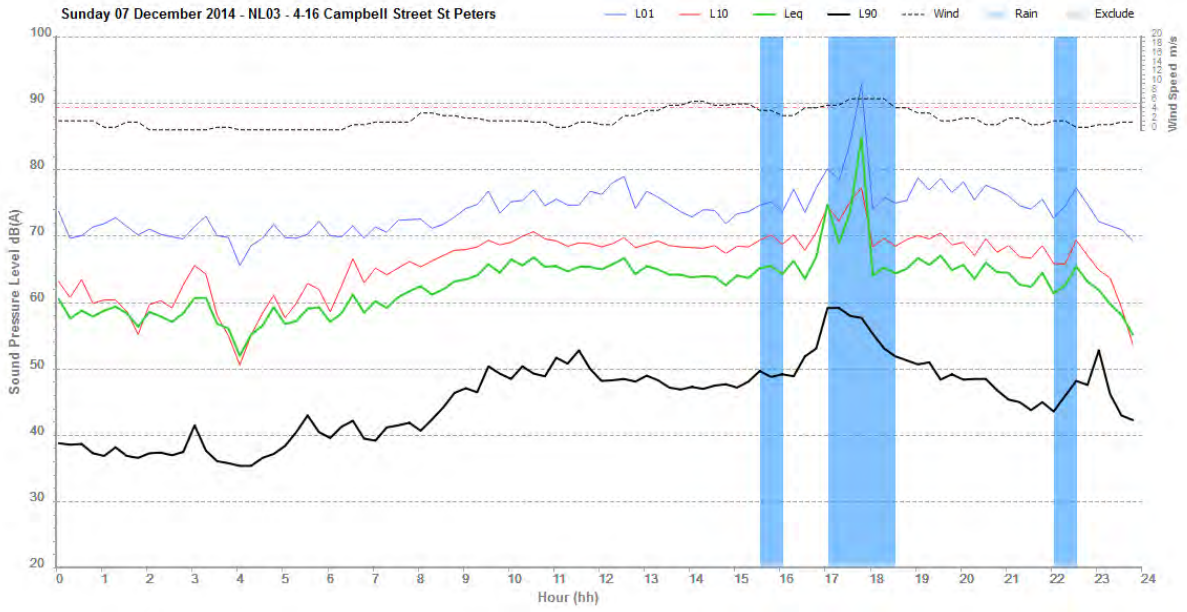

Thursday 10 September 2015 - NL02 - 108 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

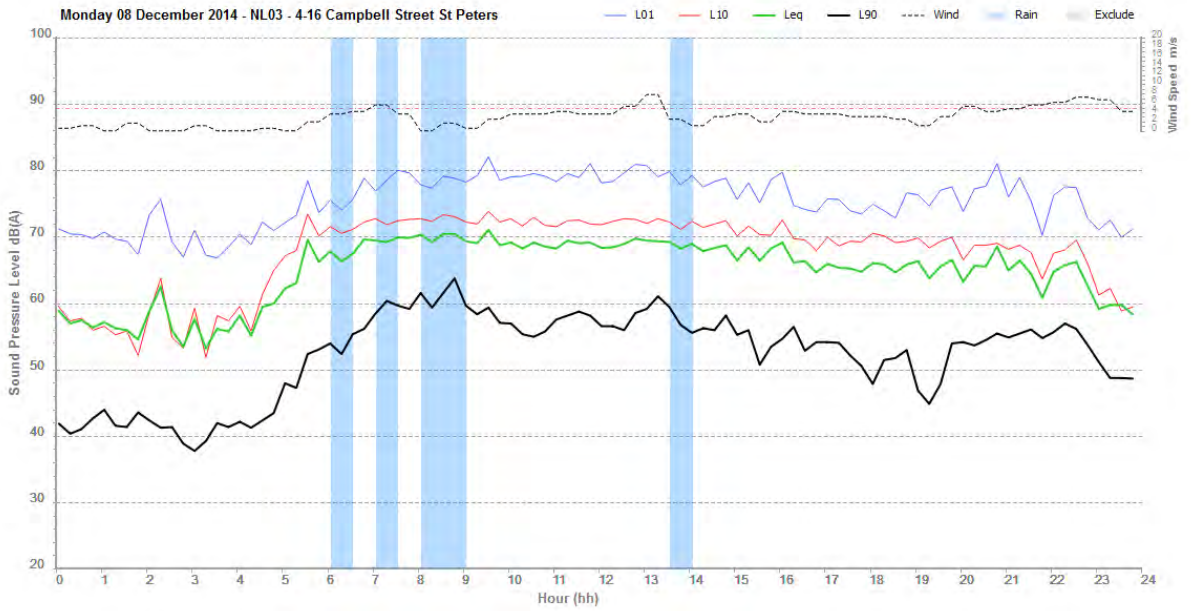
NL03 – 4-16 Campbell Street, St Peters – SVAN 957 23293

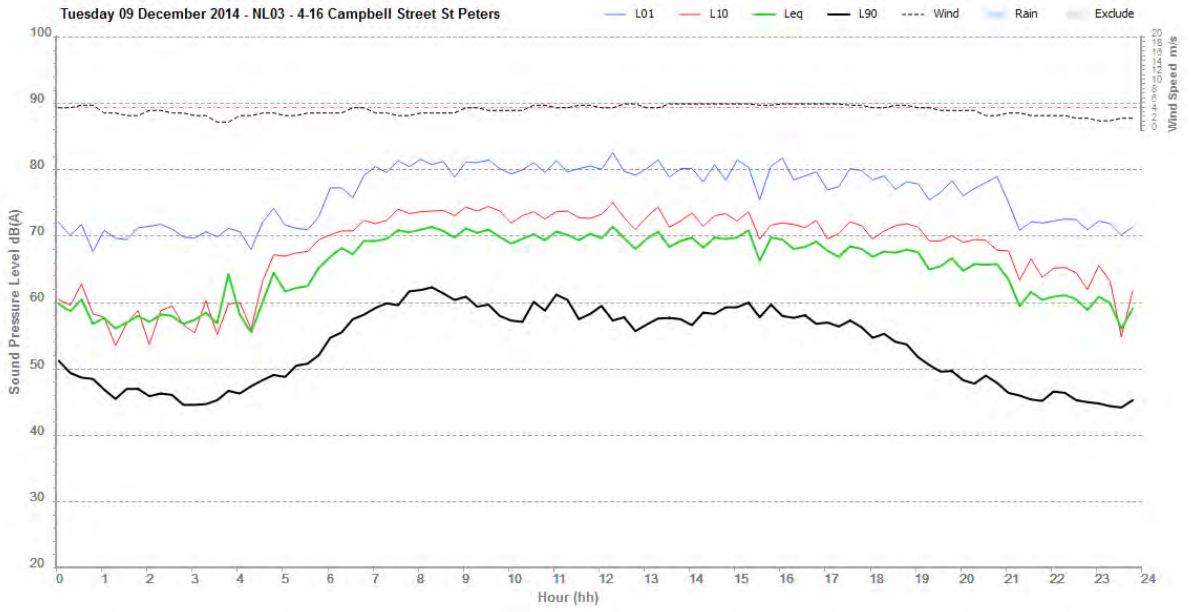


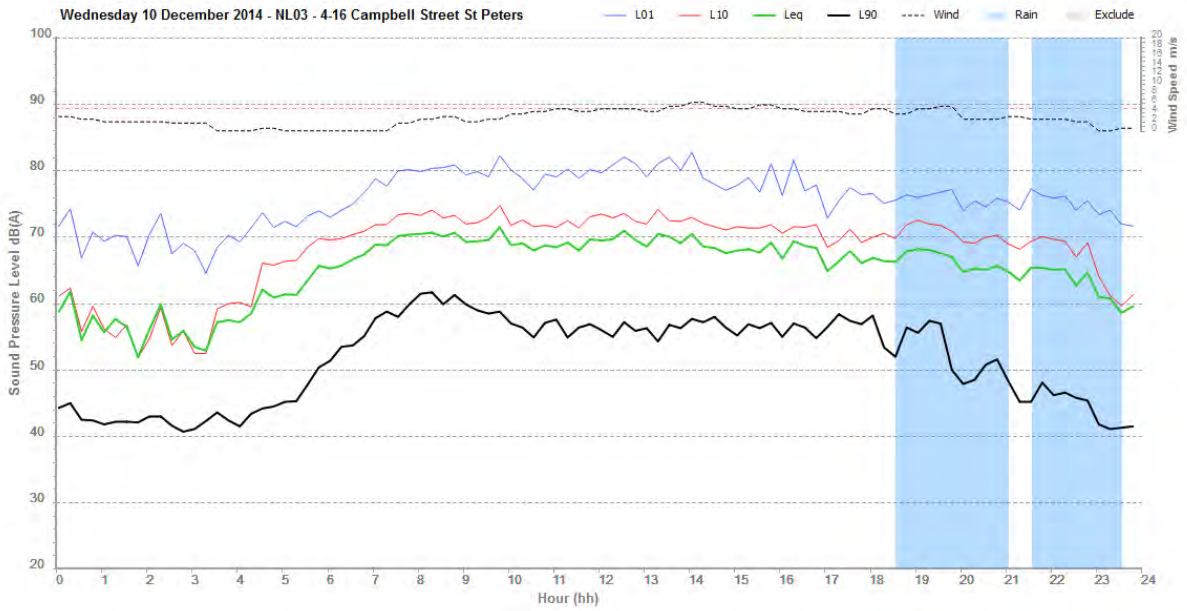


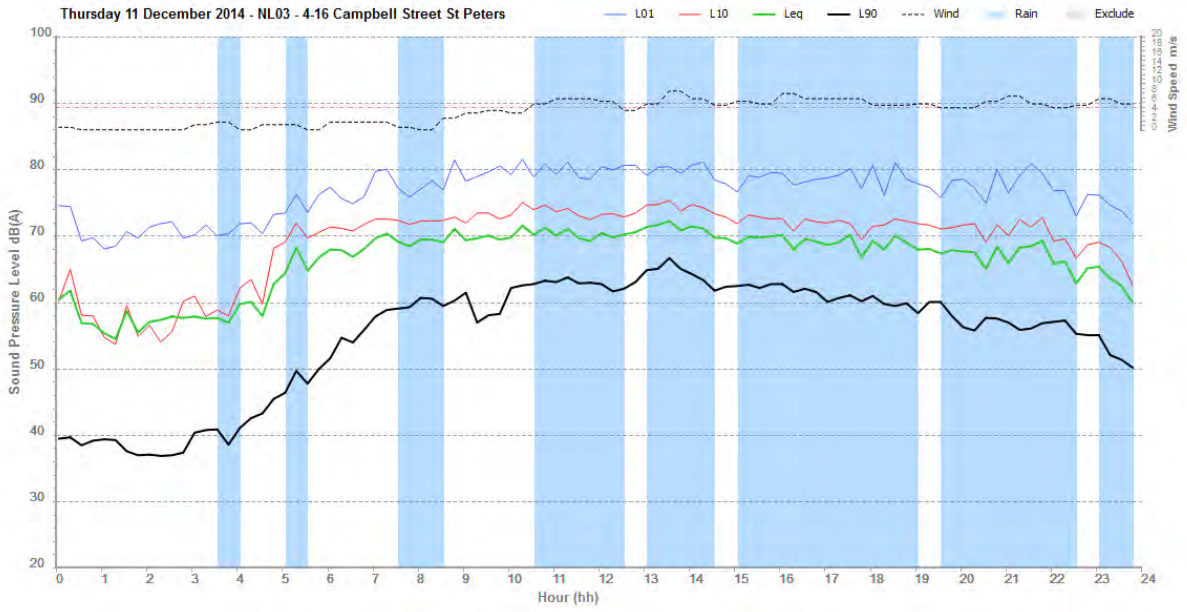

Saturday 06 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

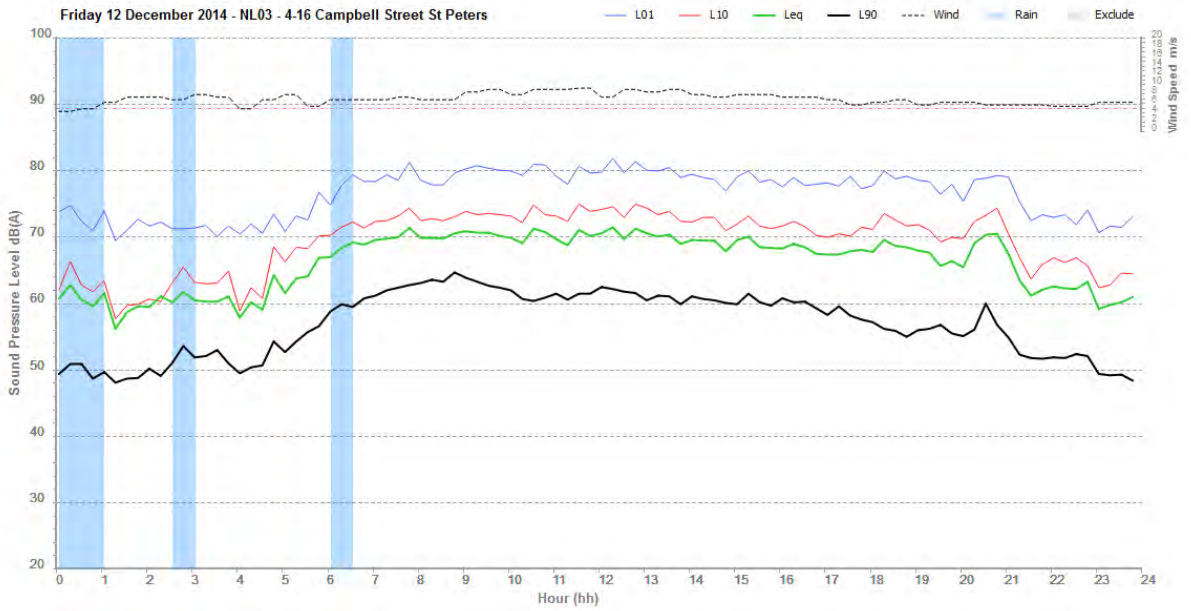

Sunday 07 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

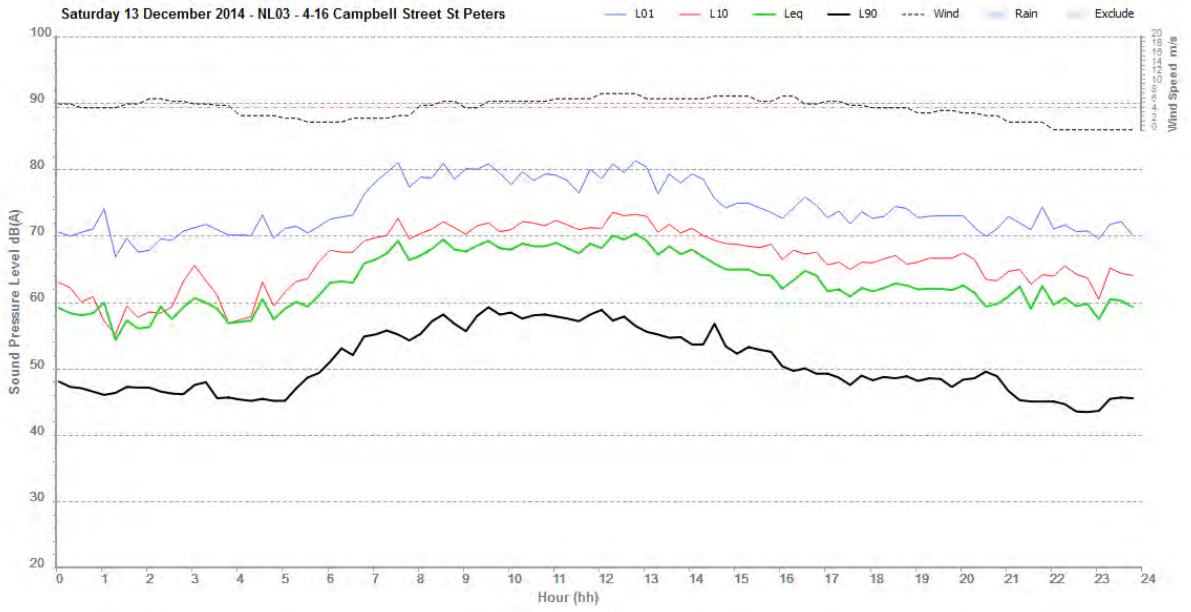

Monday 08 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

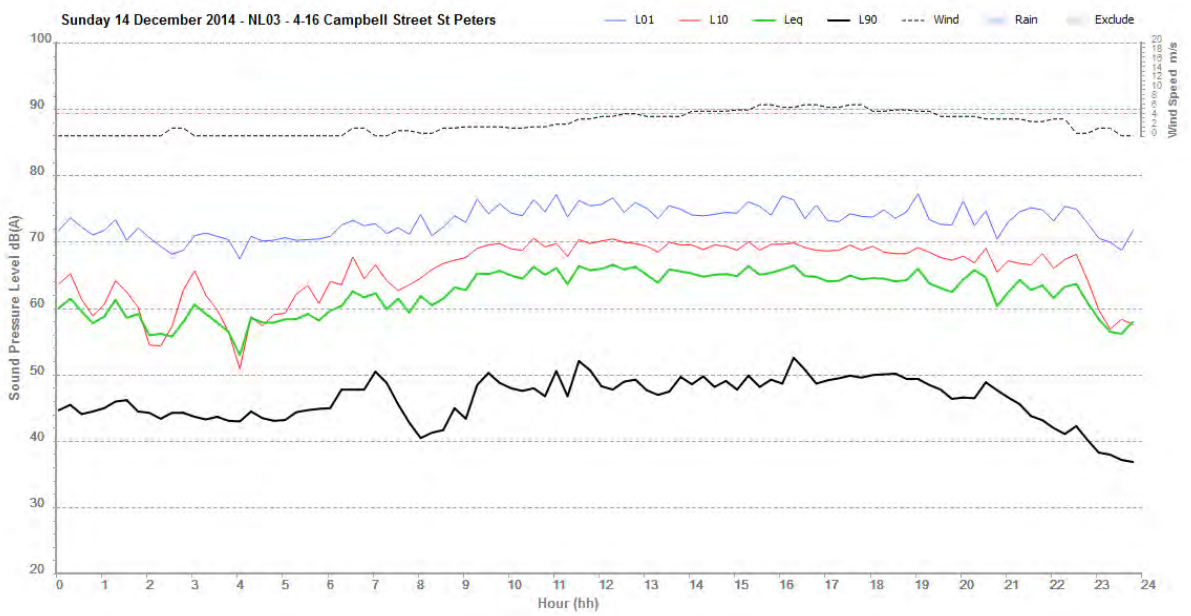

Tuesday 09 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

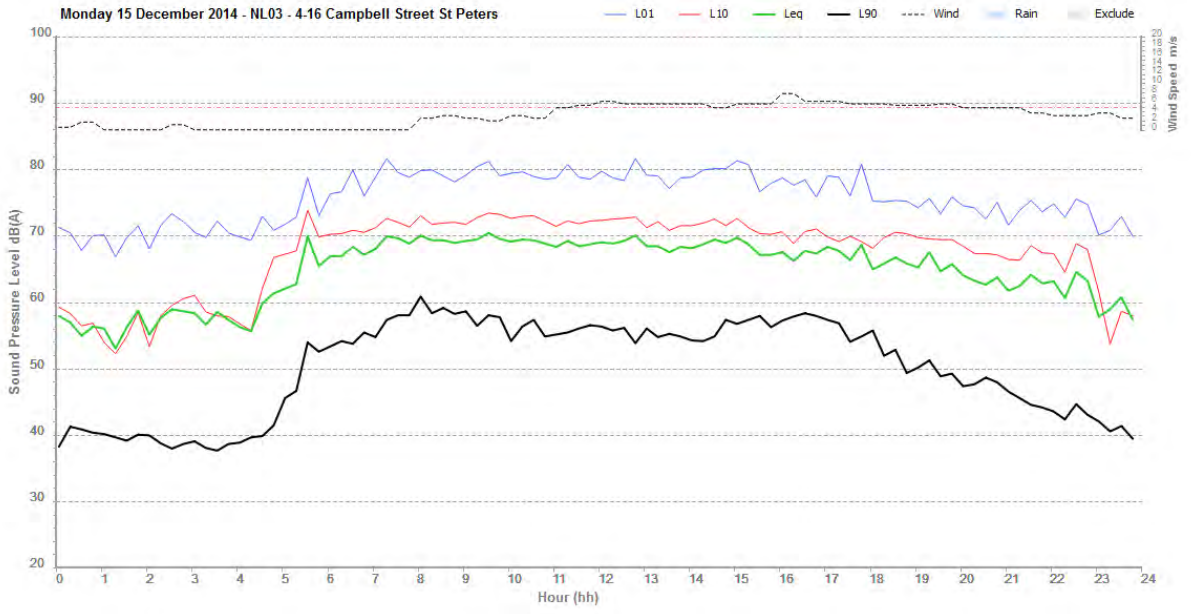

Wednesday 10 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

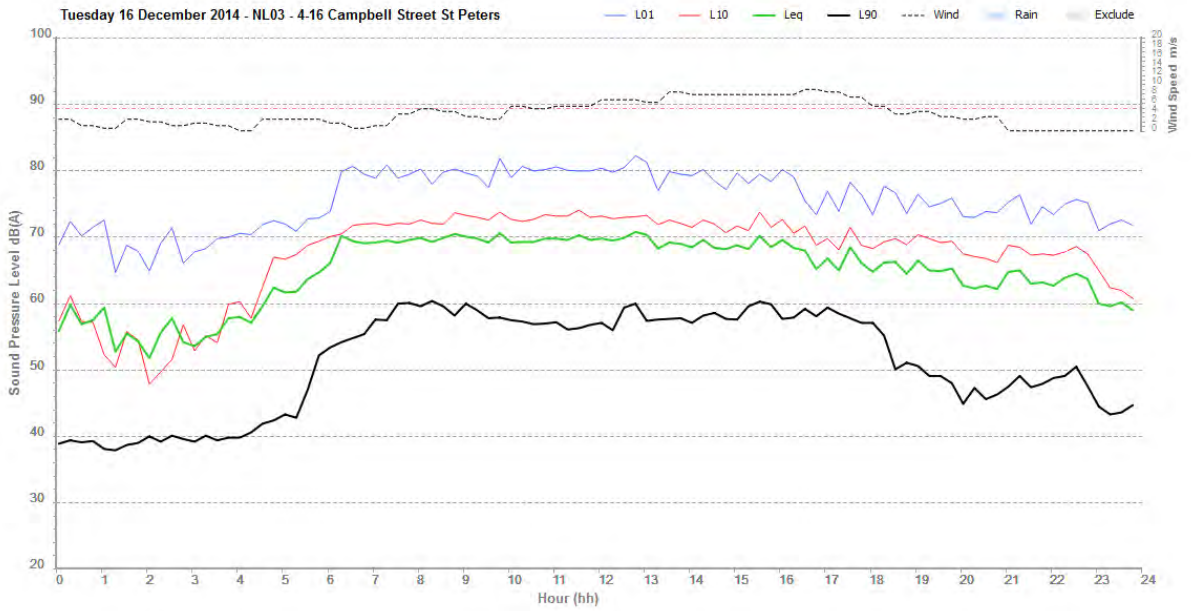

Thursday 11 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

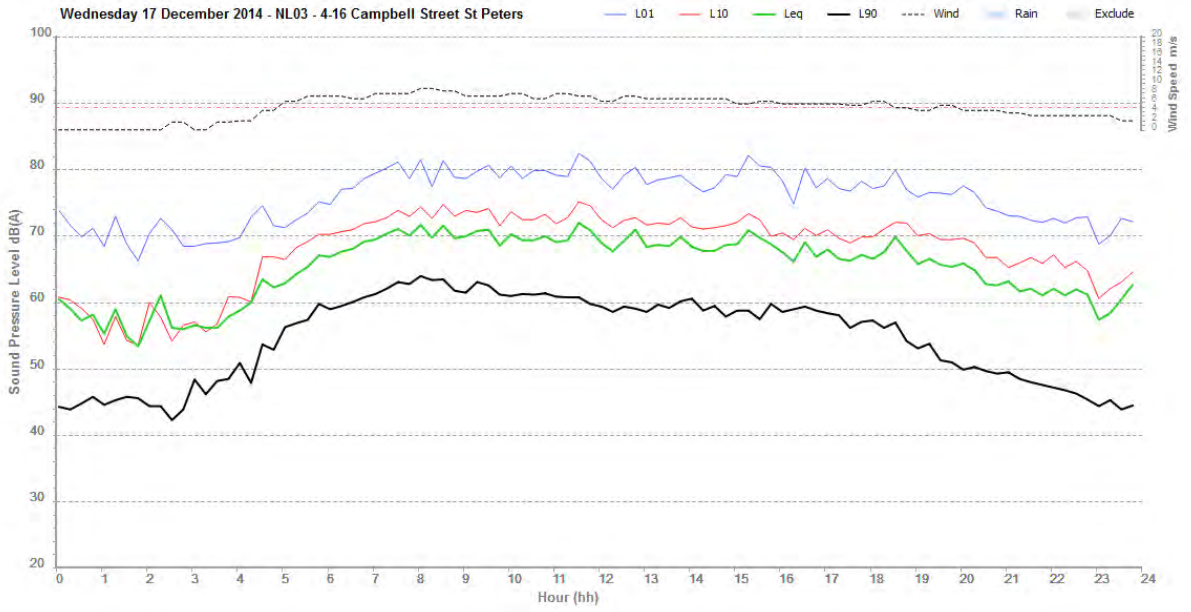

Friday 12 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

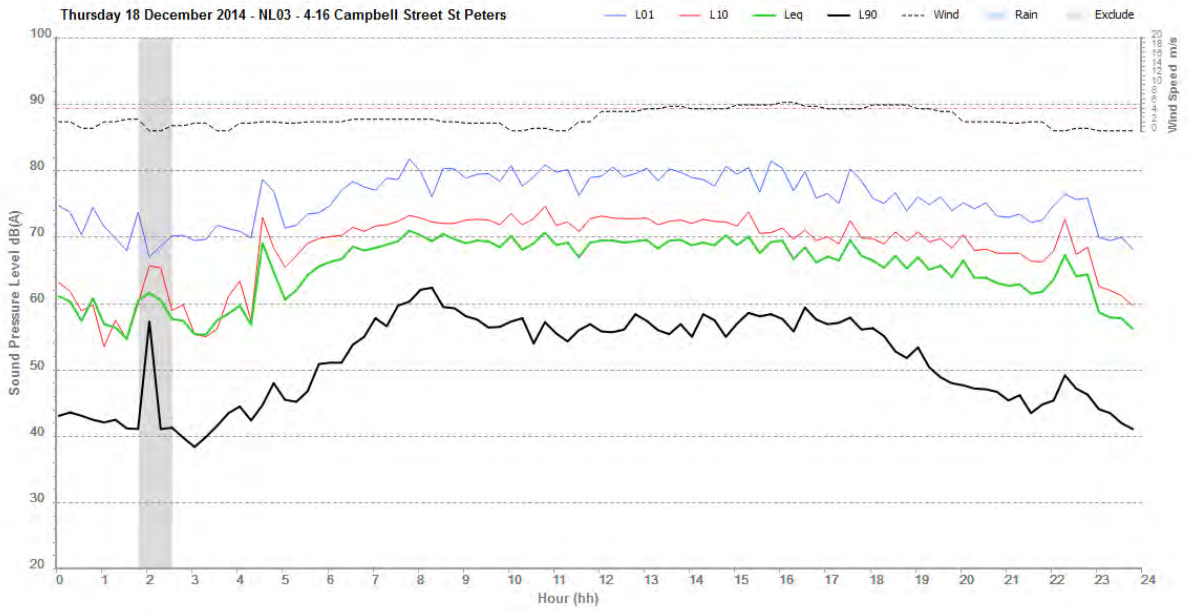

Saturday 13 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

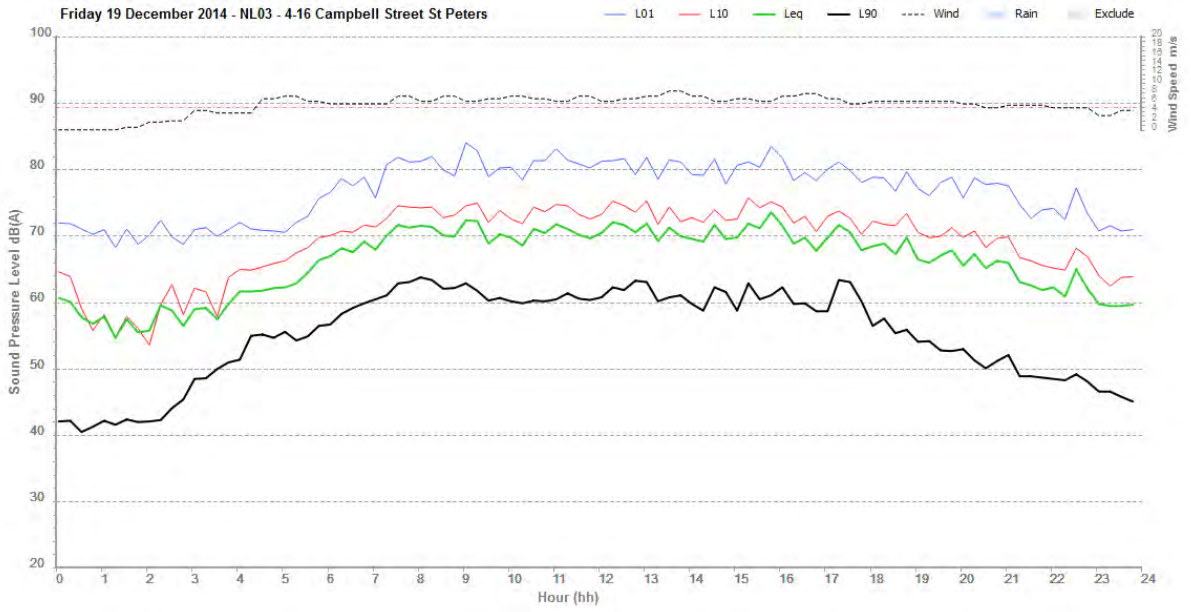

Sunday 14 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

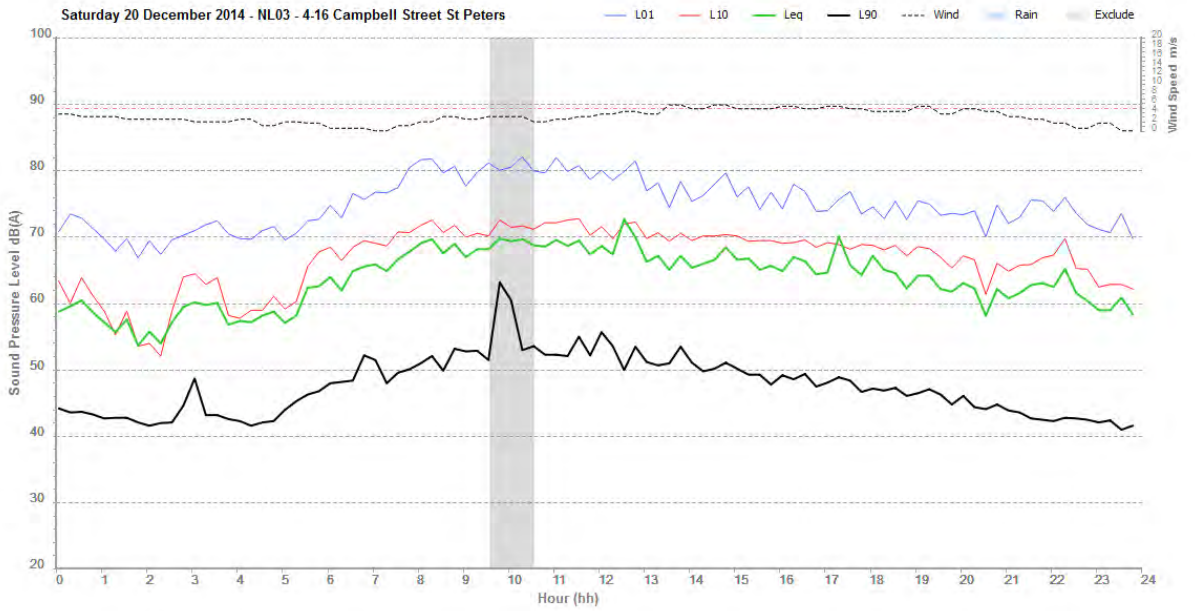

Monday 15 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Wednesday 17 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

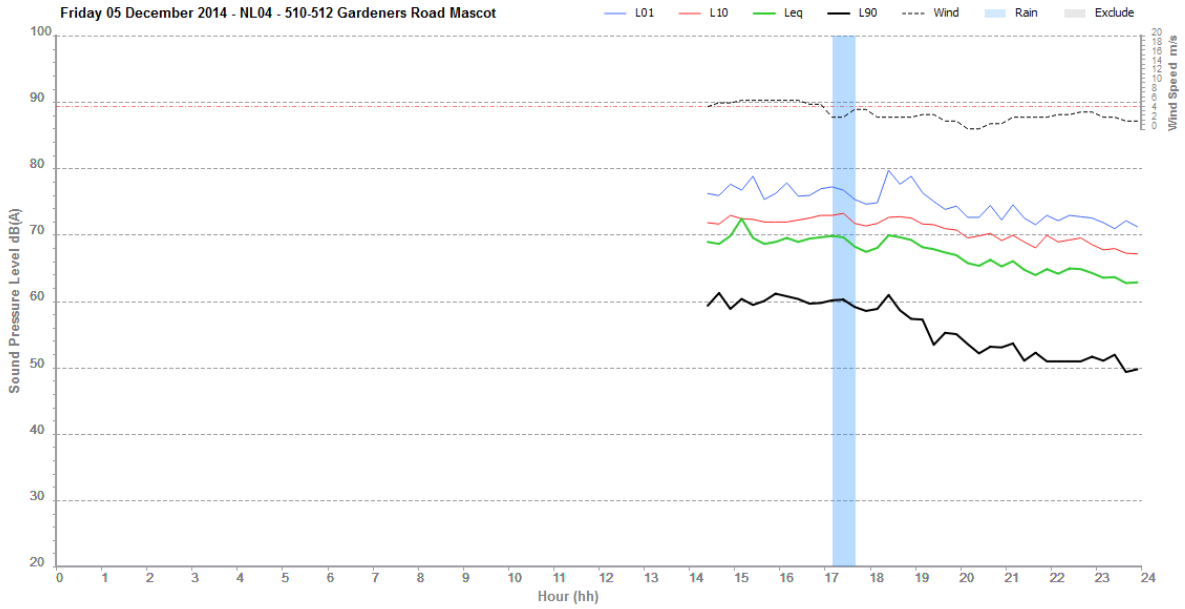

Thursday 18 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

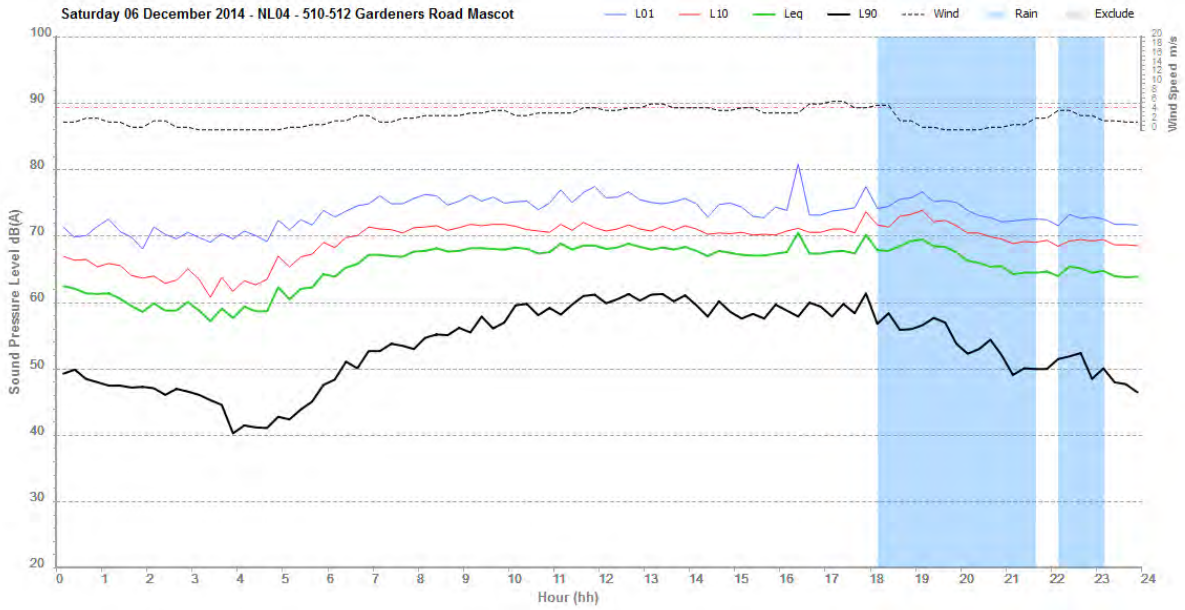

Friday 19 December 2014 - NL03 - 4-16 Campbell Street St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

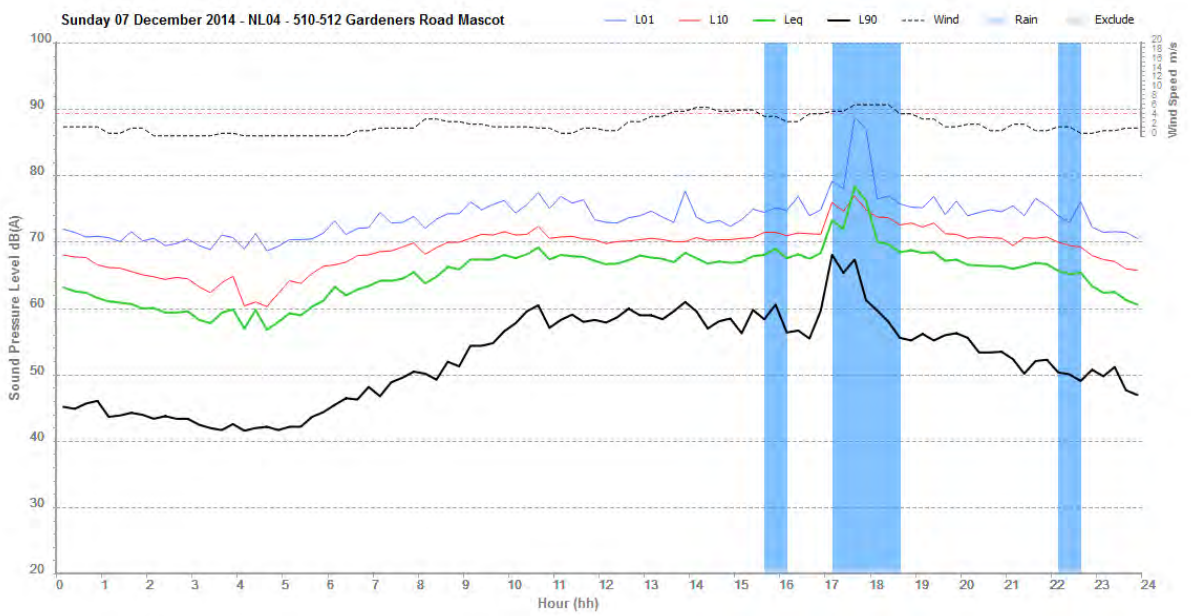


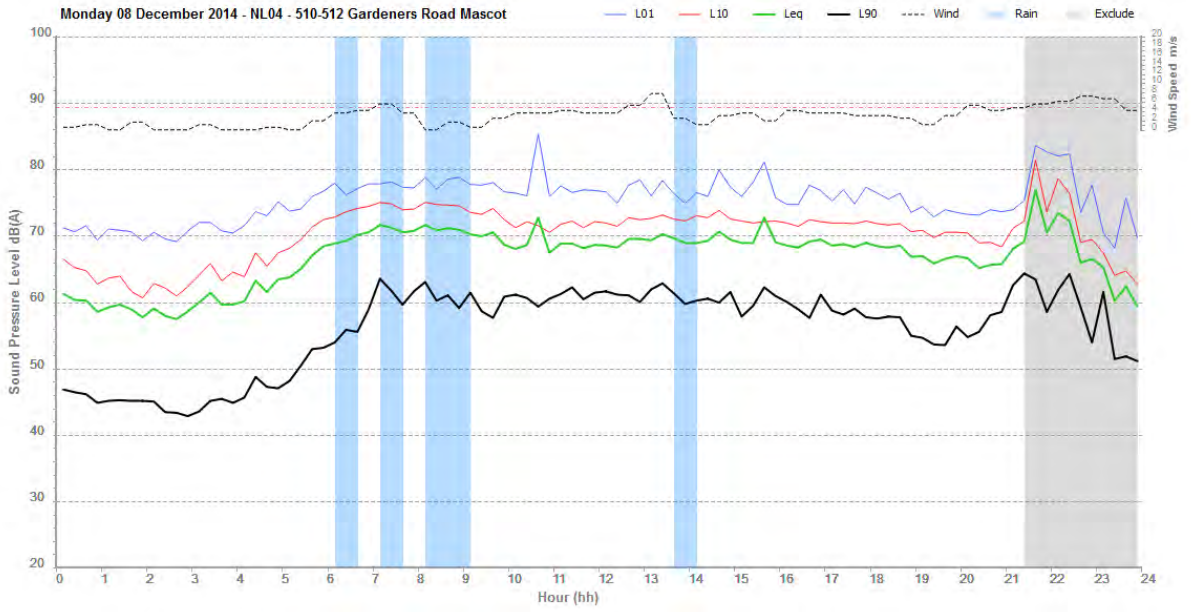
NL04 – 510-512 Gardeners Road, Mascot – SVAN 957 27579

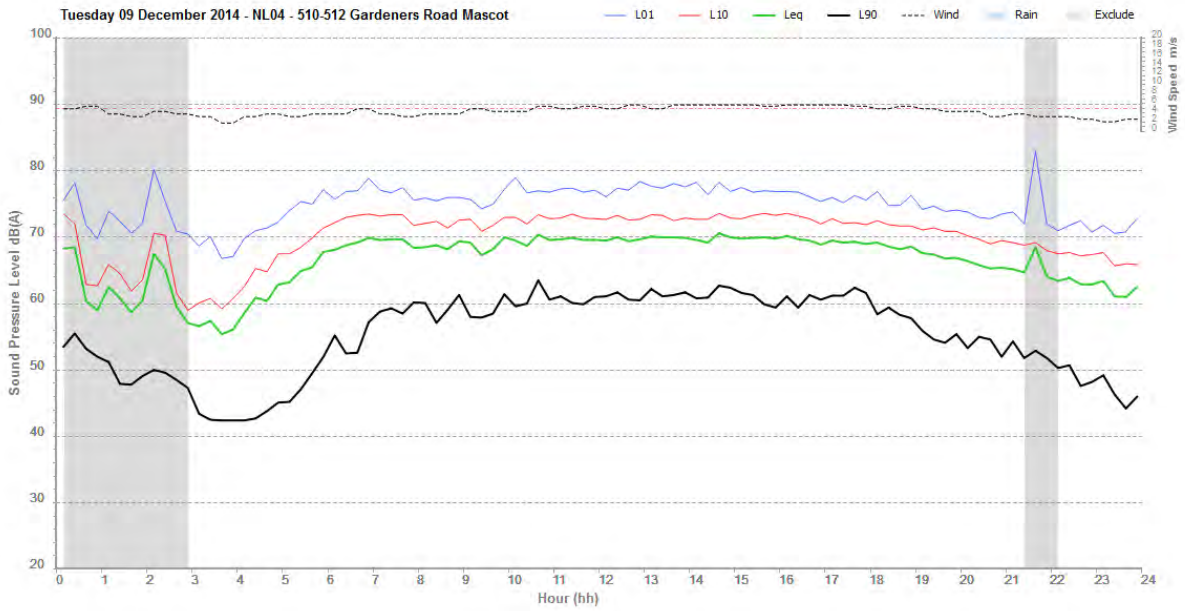


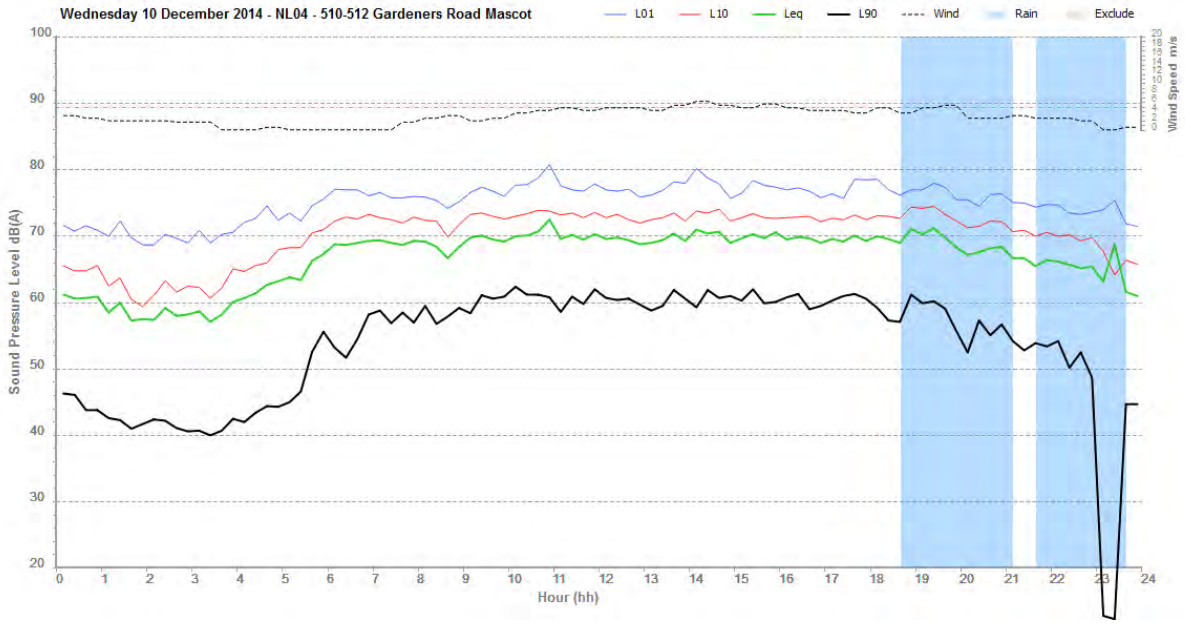

Friday 05 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

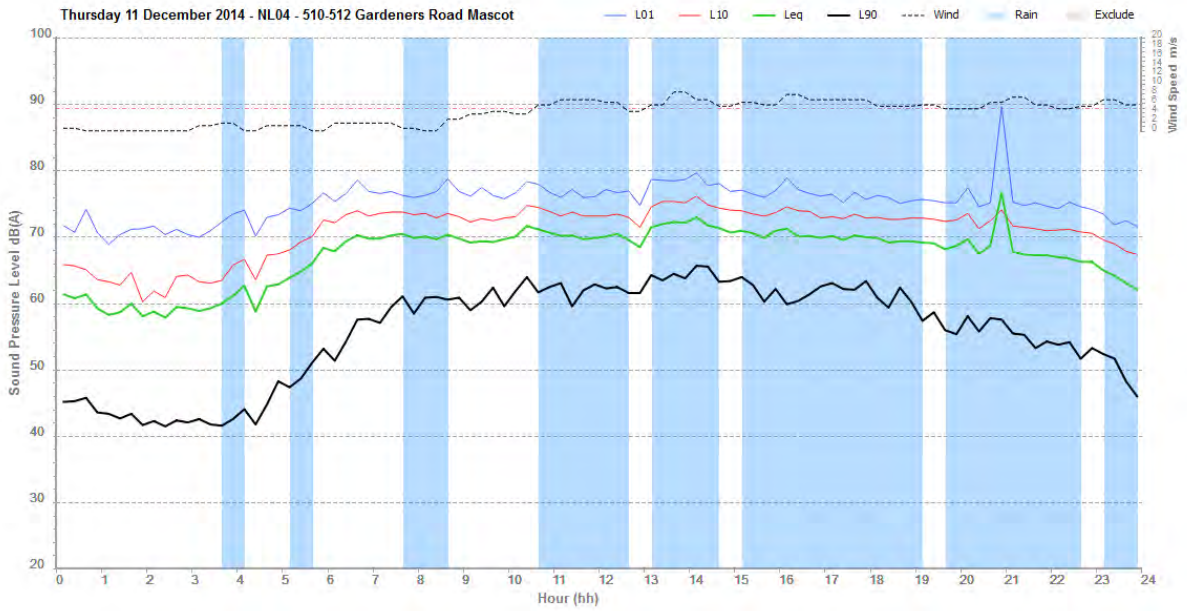

Saturday 06 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

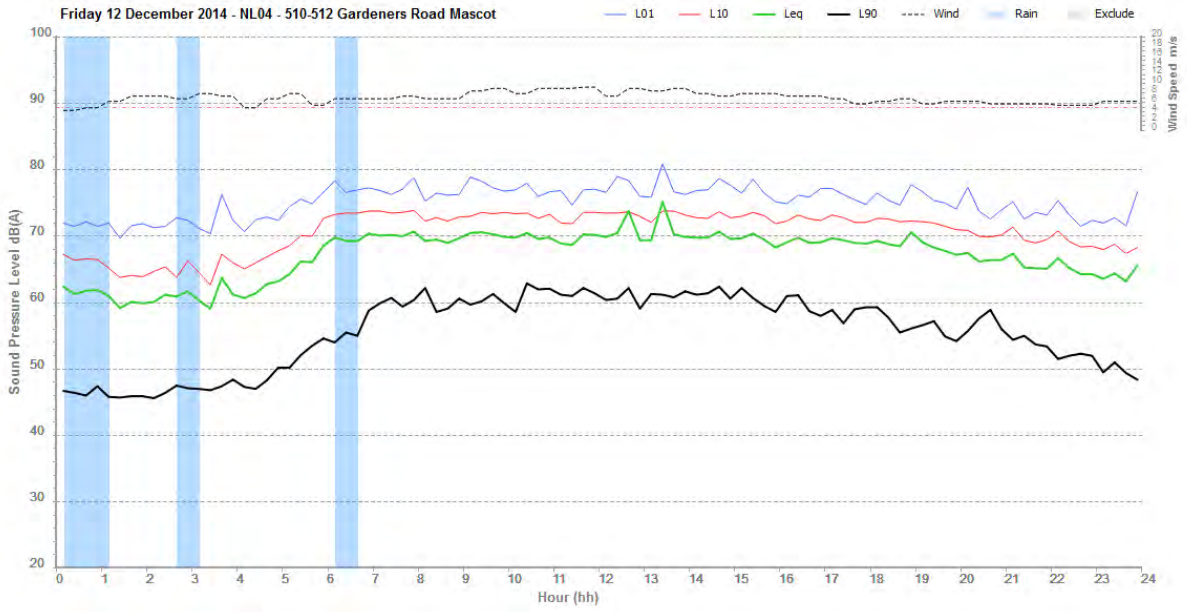

Sunday 07 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

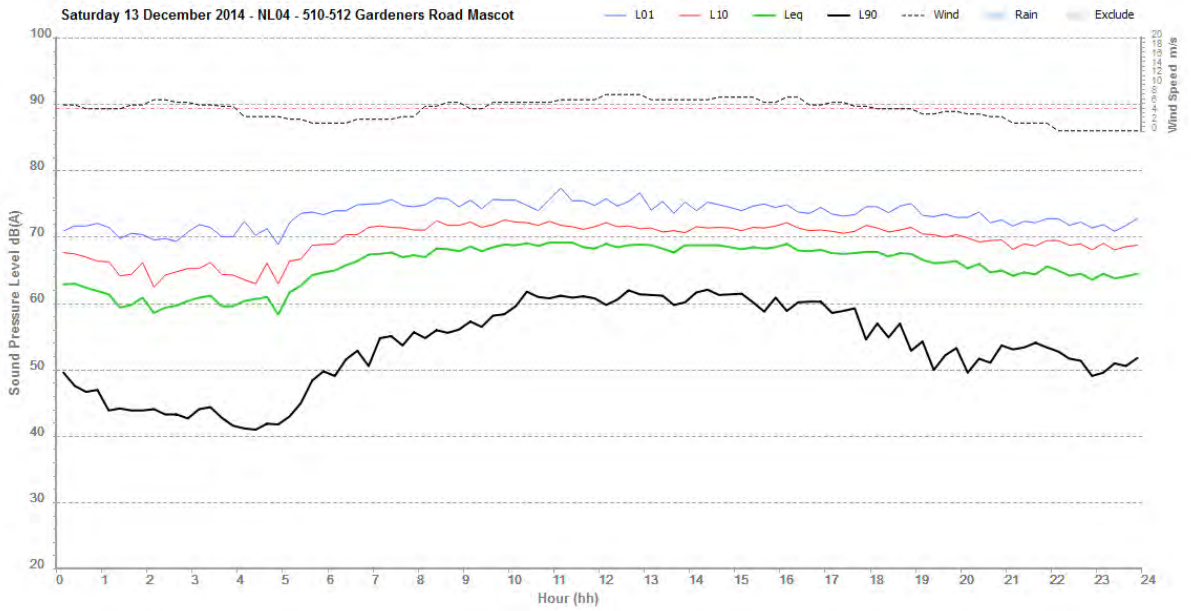

Monday 08 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

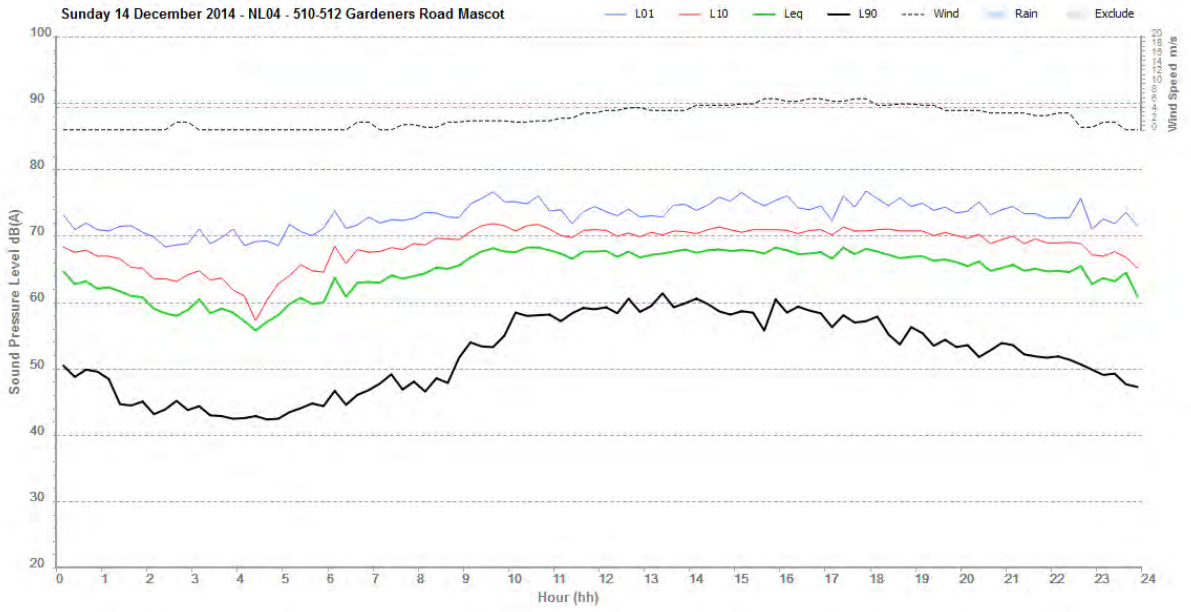

Tuesday 09 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

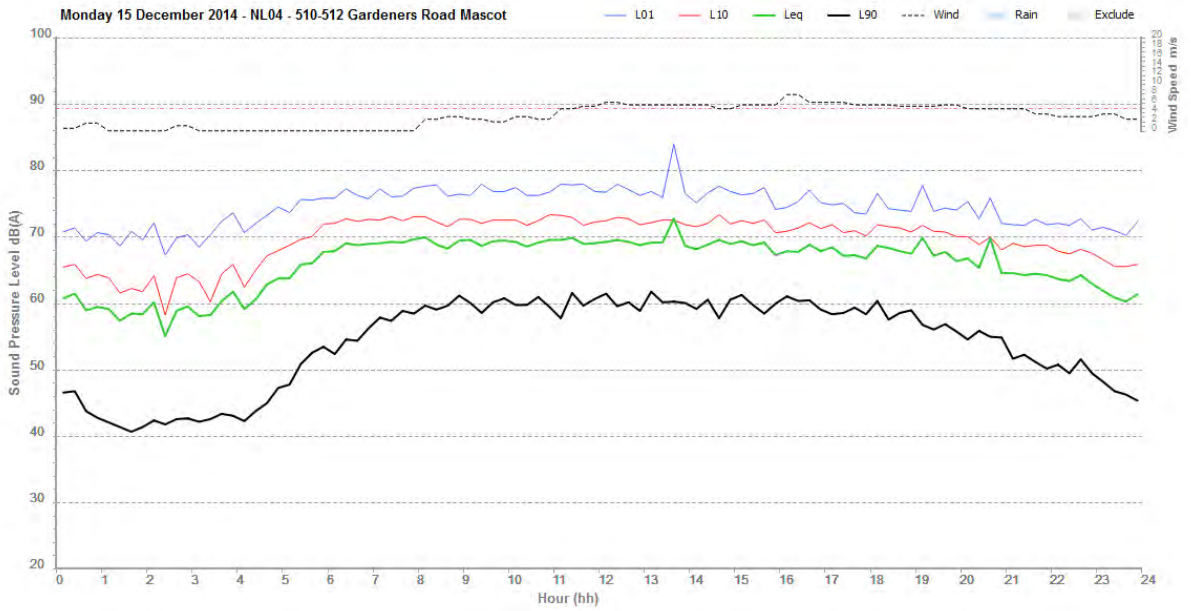

Wednesday 10 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

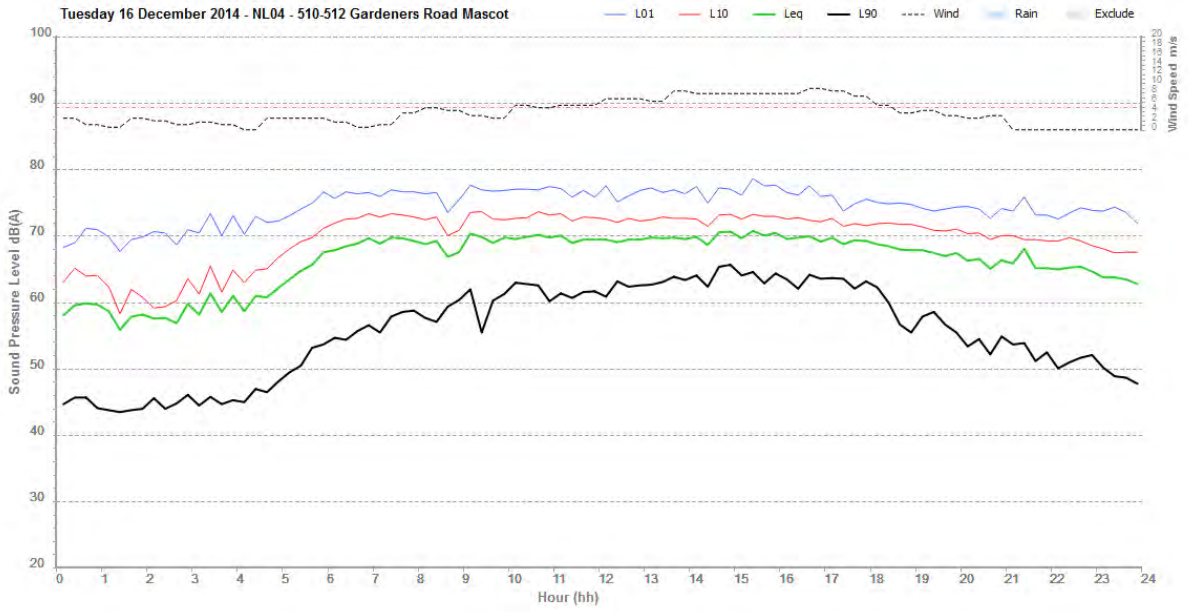

Thursday 11 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

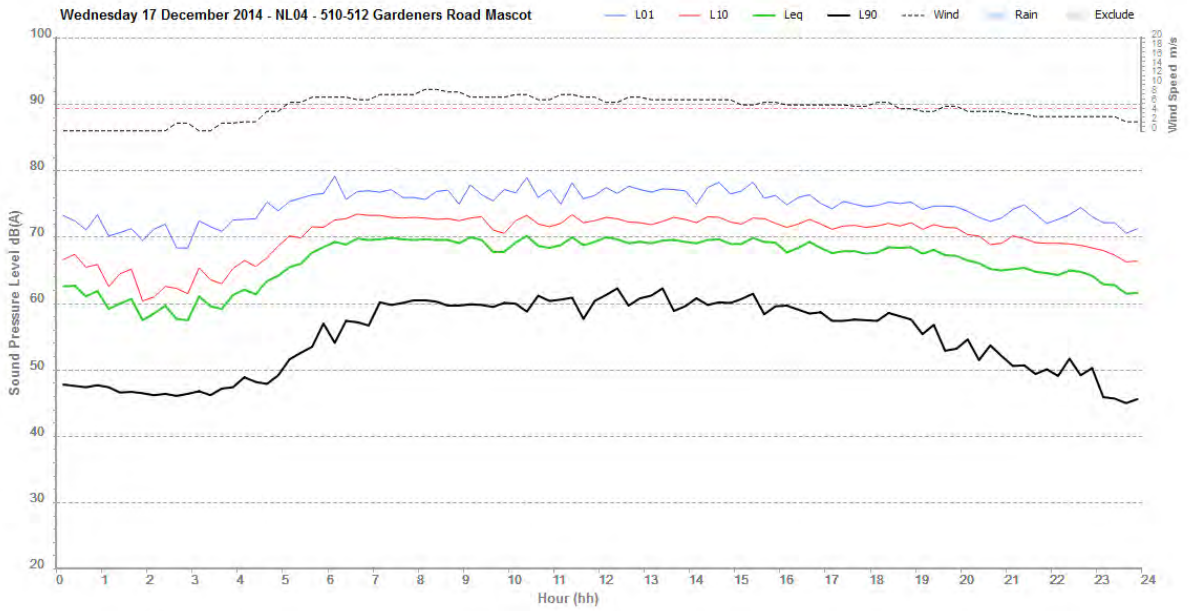

Friday 12 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

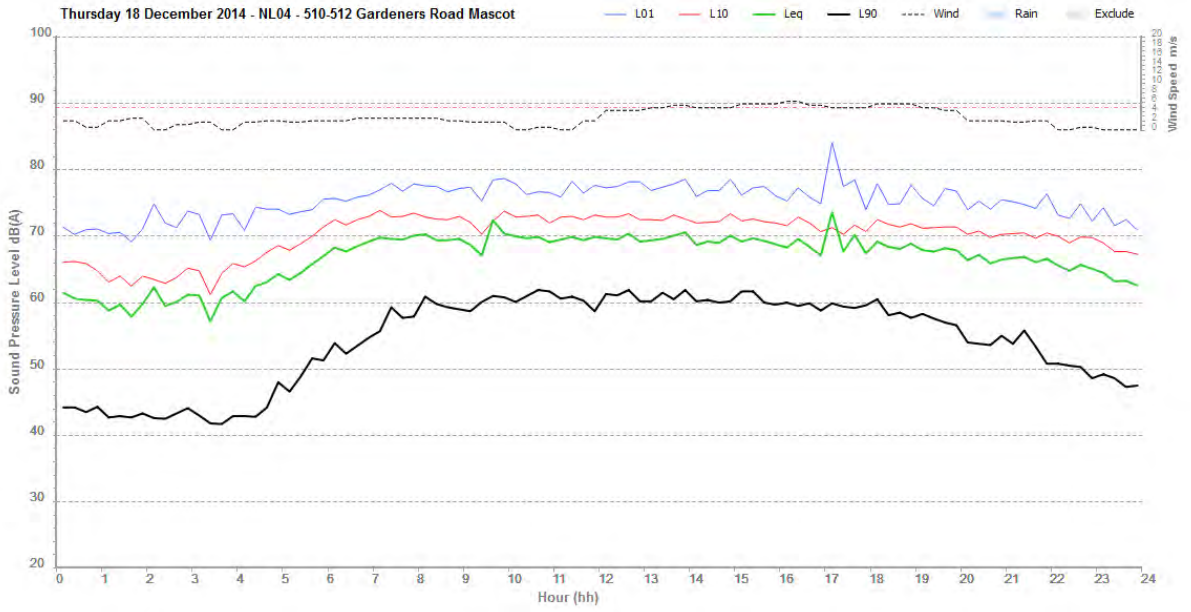

Saturday 13 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

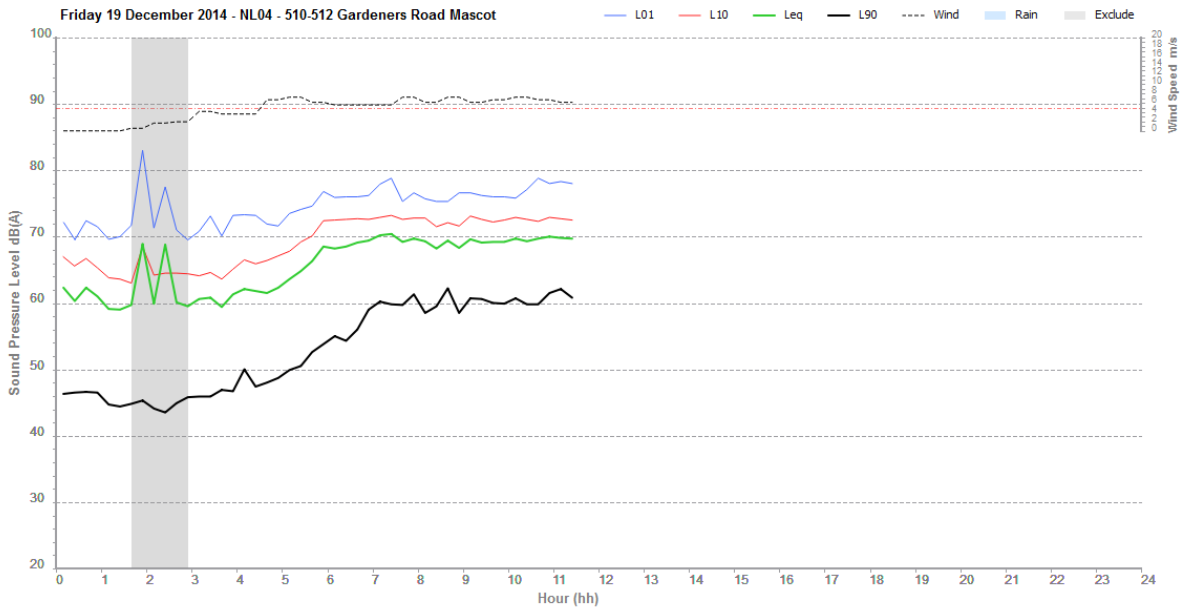

Sunday 14 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 15 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Wednesday 17 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

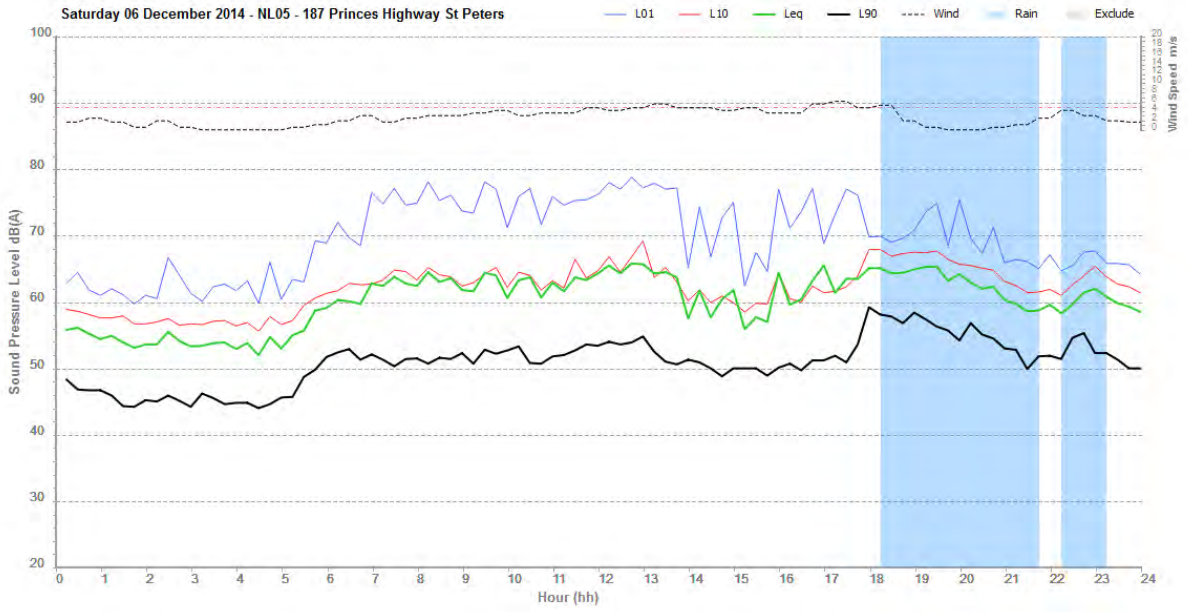

Thursday 18 December 2014 - NL04 - 510-512 Gardeners Road Mascot
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)



NL05 – 187 Princes Highway, St Peters

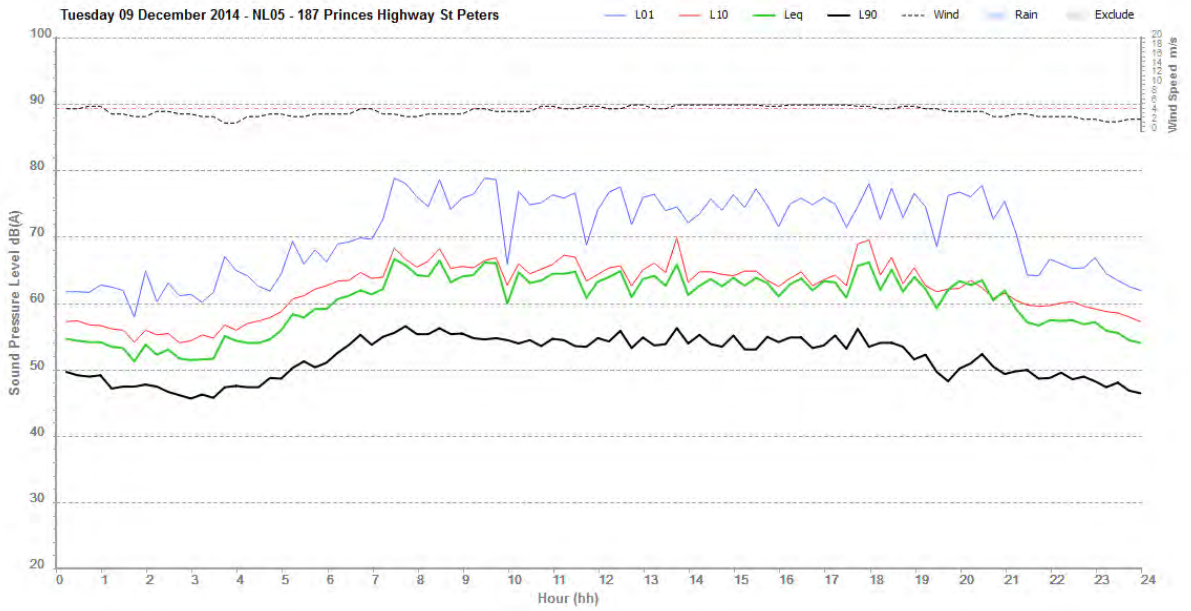


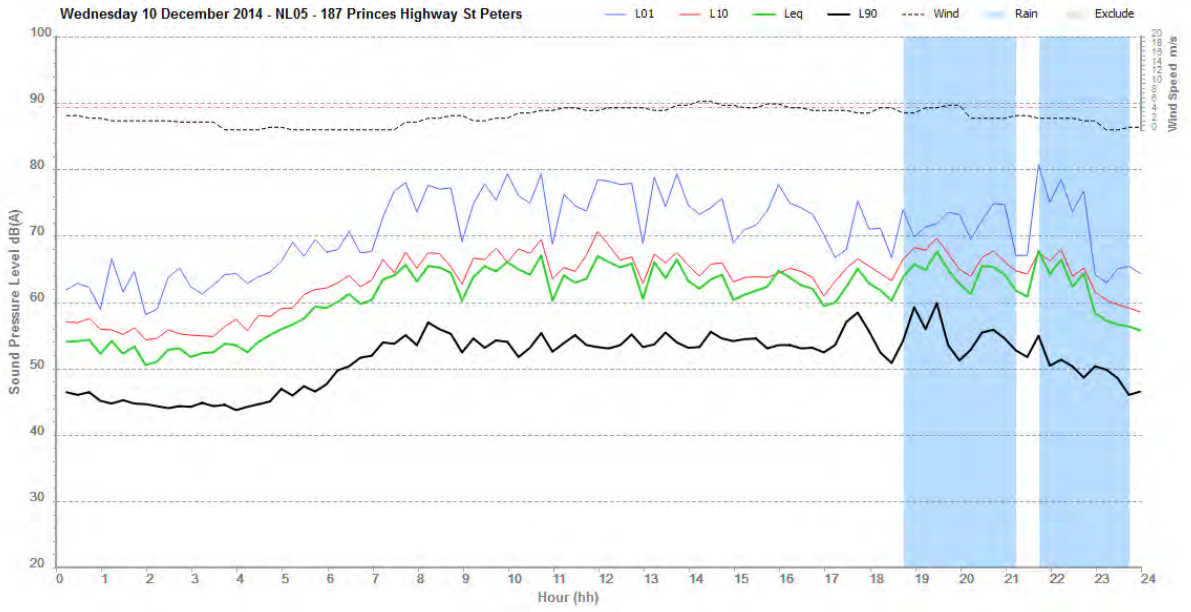

Friday 05 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 06 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 07 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

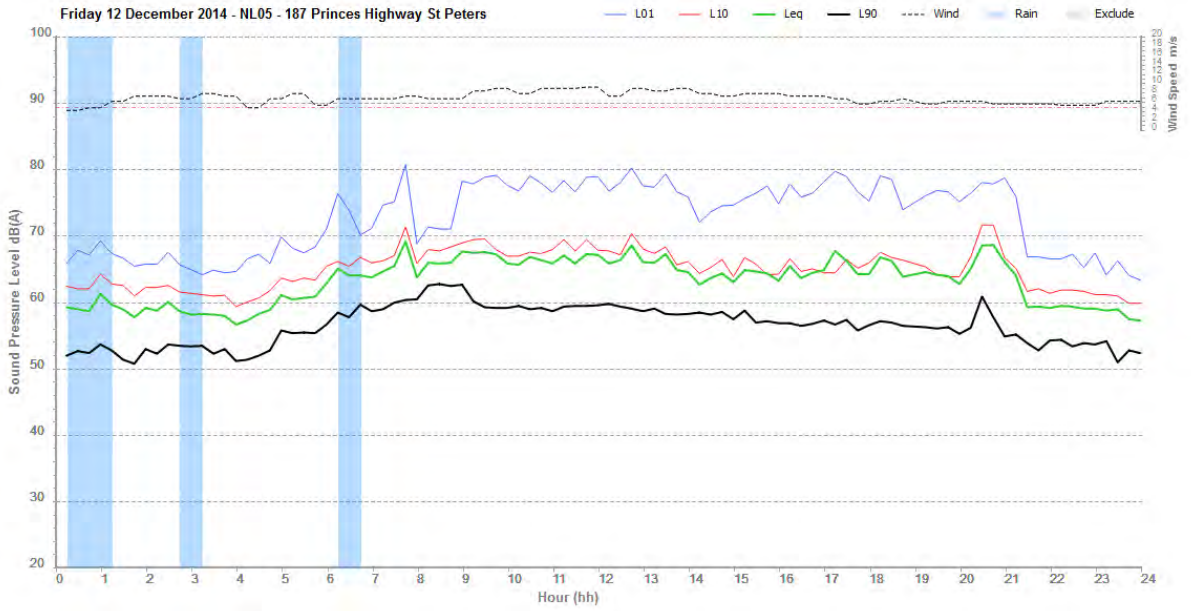

Monday 08 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

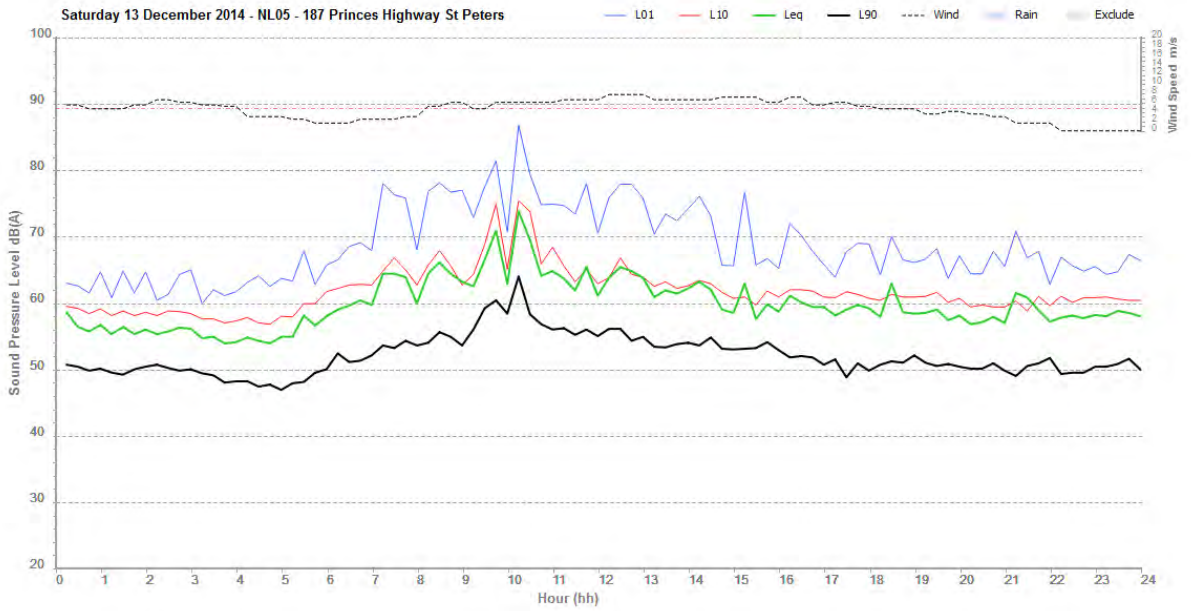

Tuesday 09 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

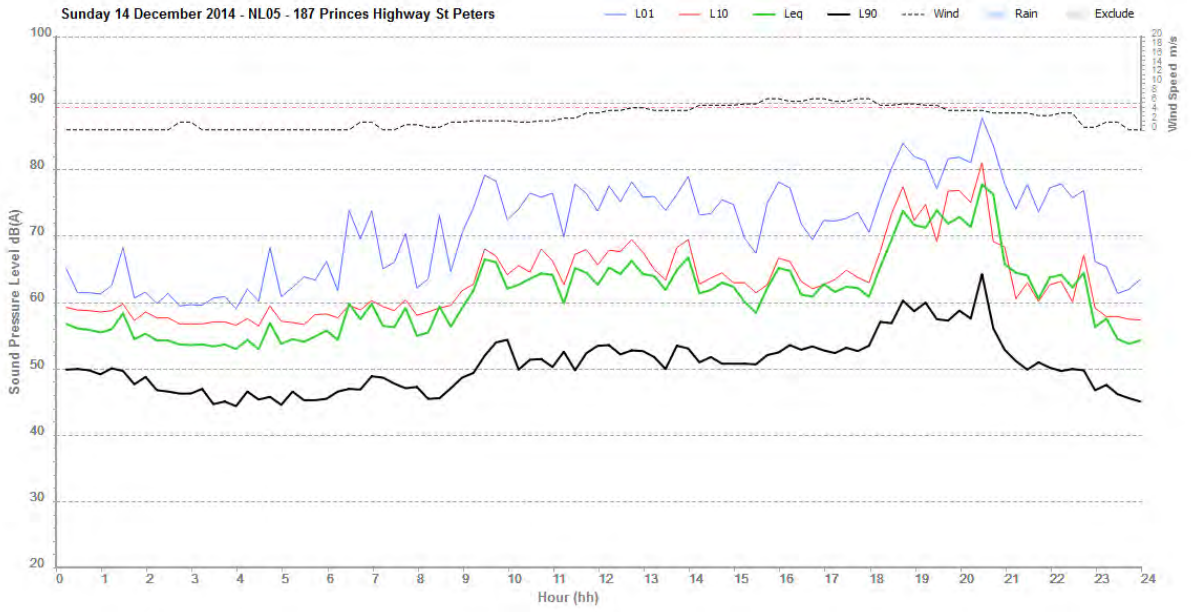

Wednesday 10 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

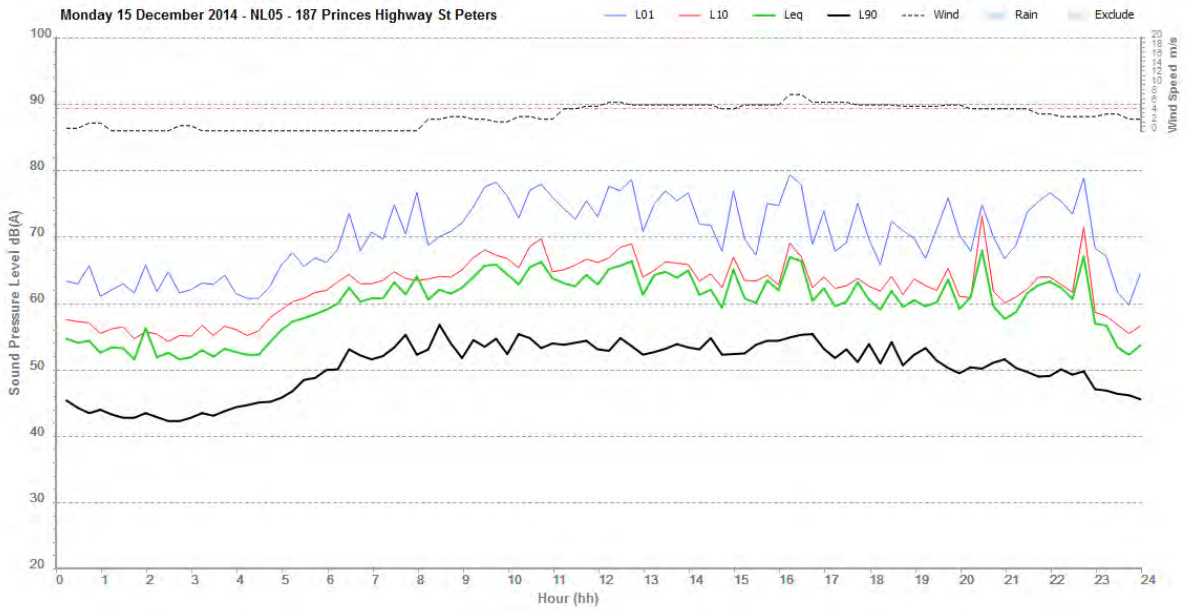
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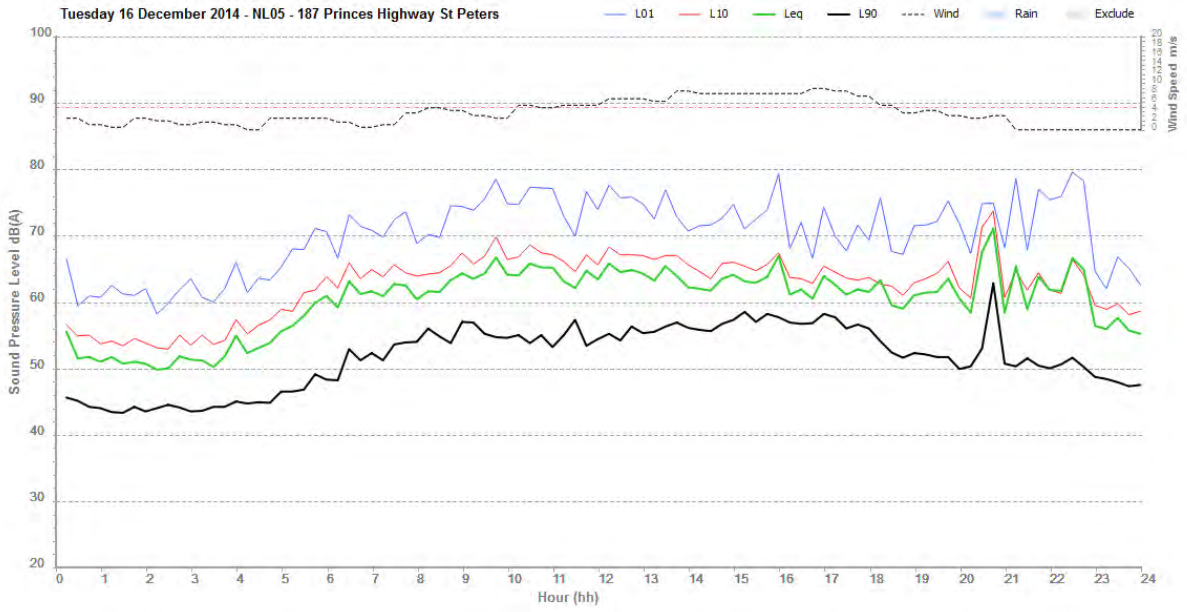

Thursday 11 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

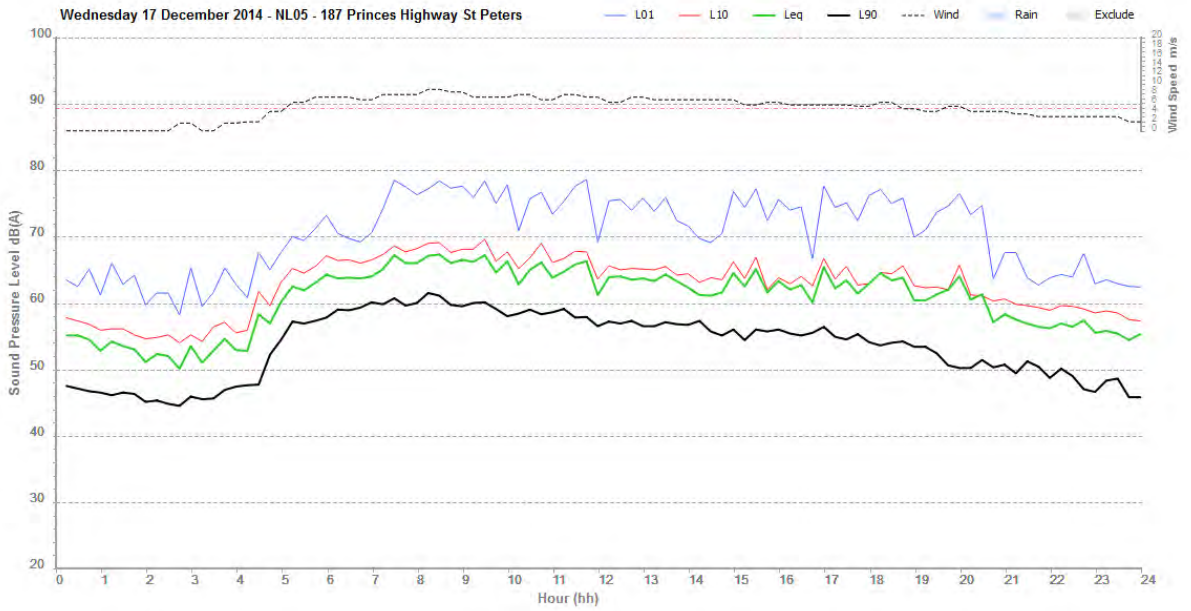

Friday 12 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

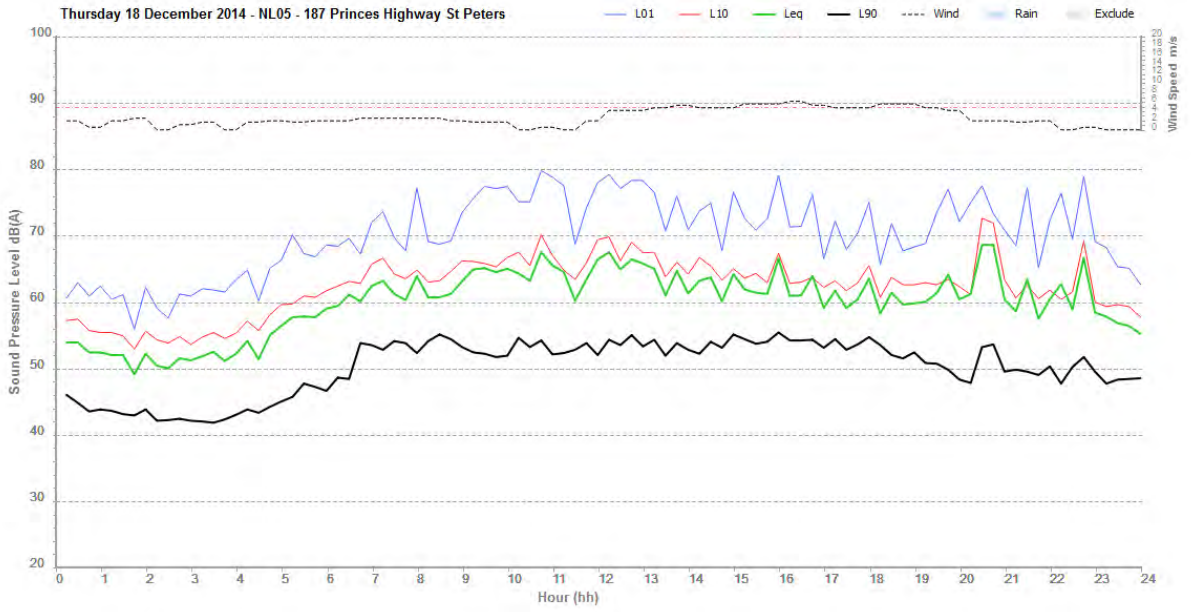

Saturday 13 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

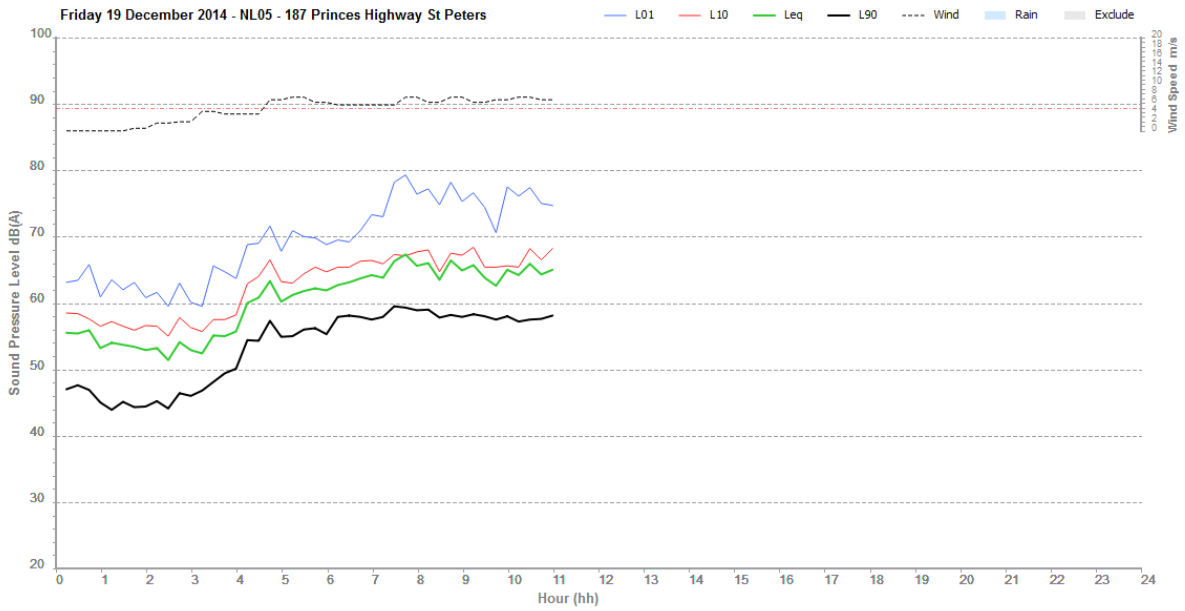

Sunday 14 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 15 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Wednesday 17 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

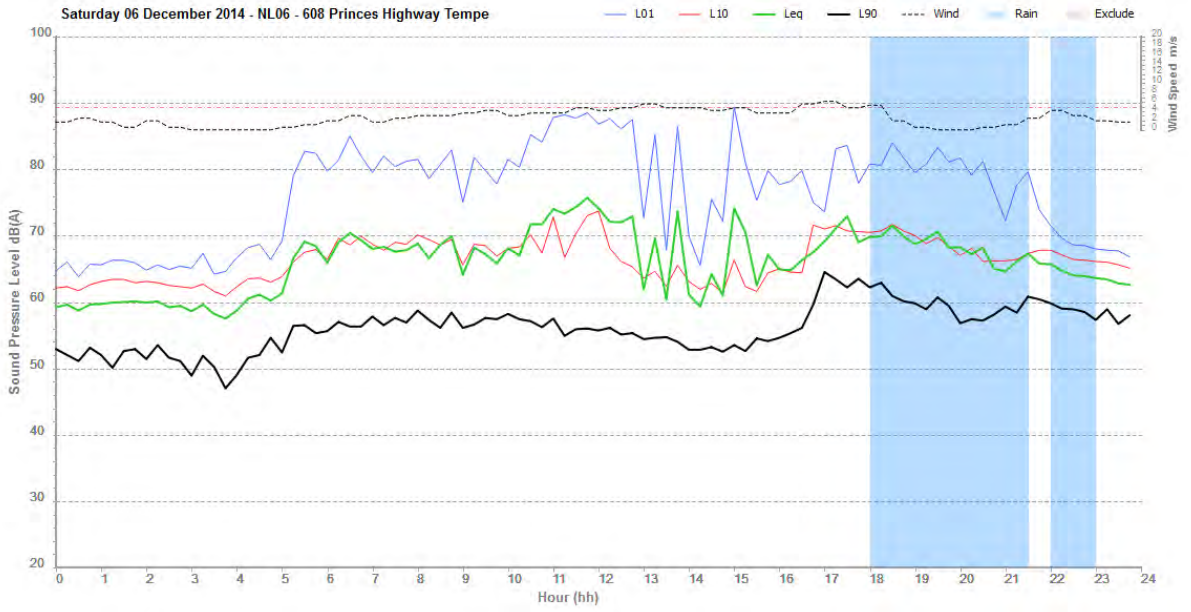

Thursday 18 December 2014 - NL05 - 187 Princes Highway St Peters
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

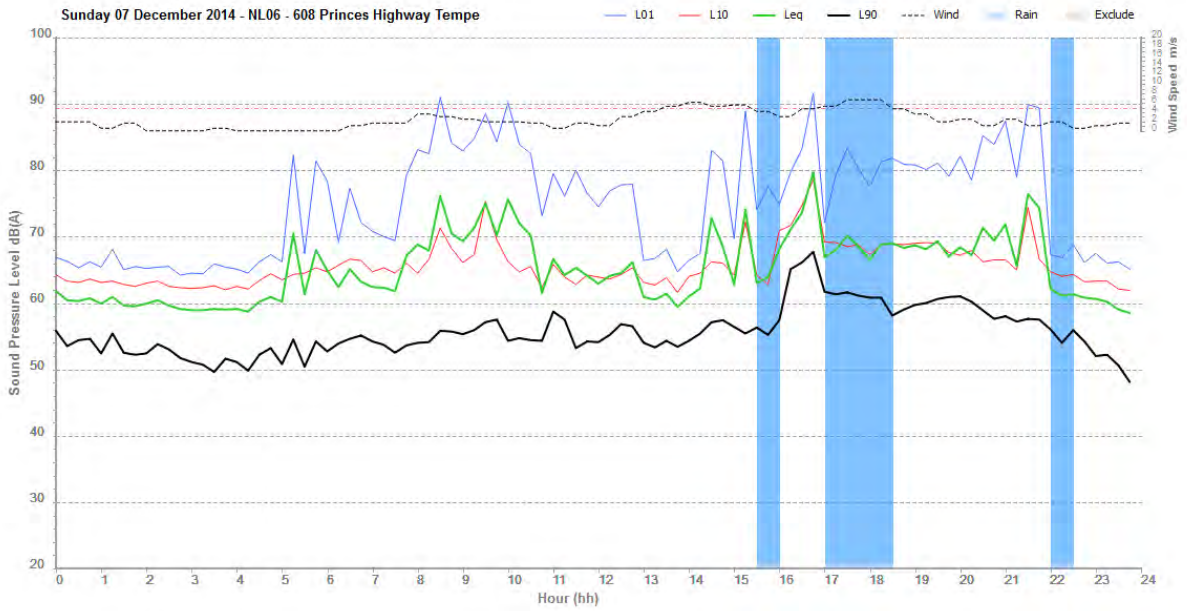


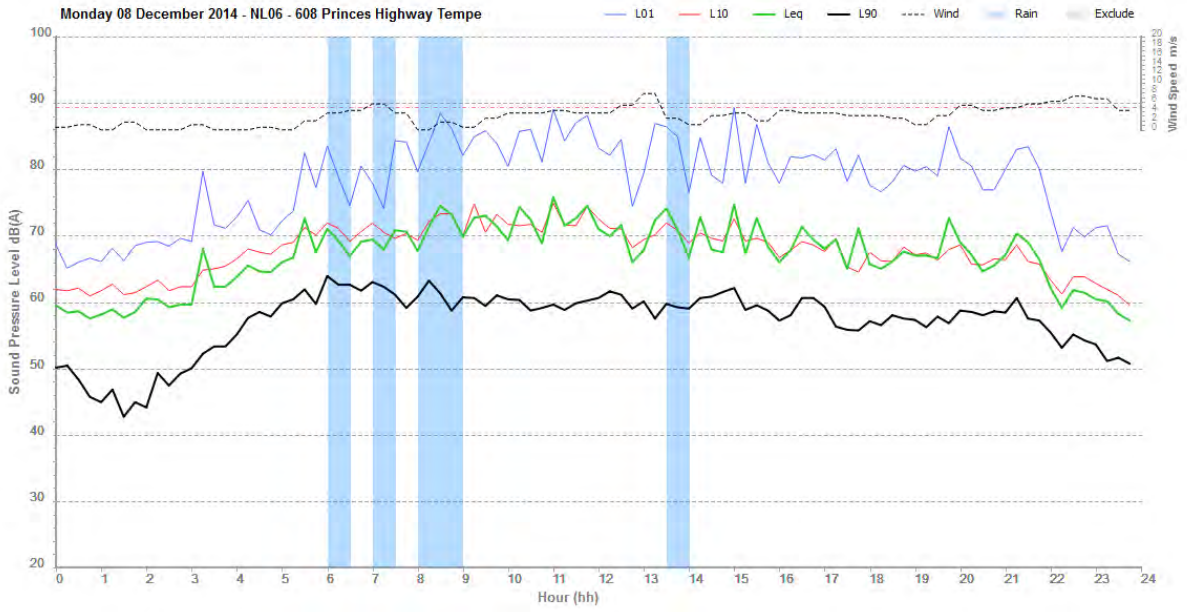
NL06 – 608 Princes Highway, Tempe – ARL 16 203 526

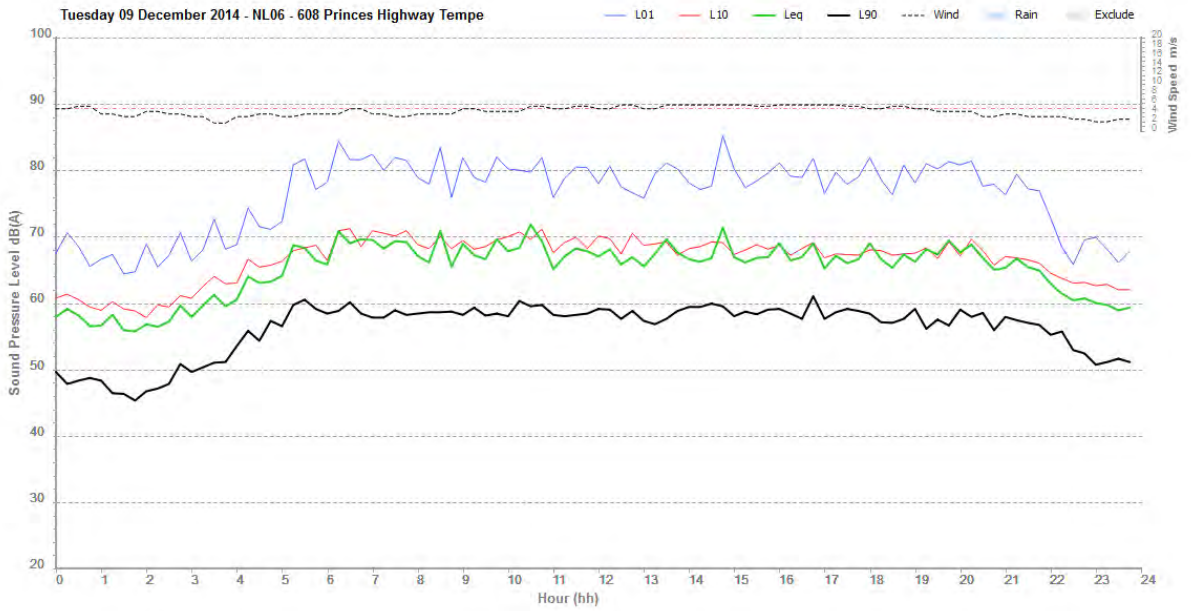


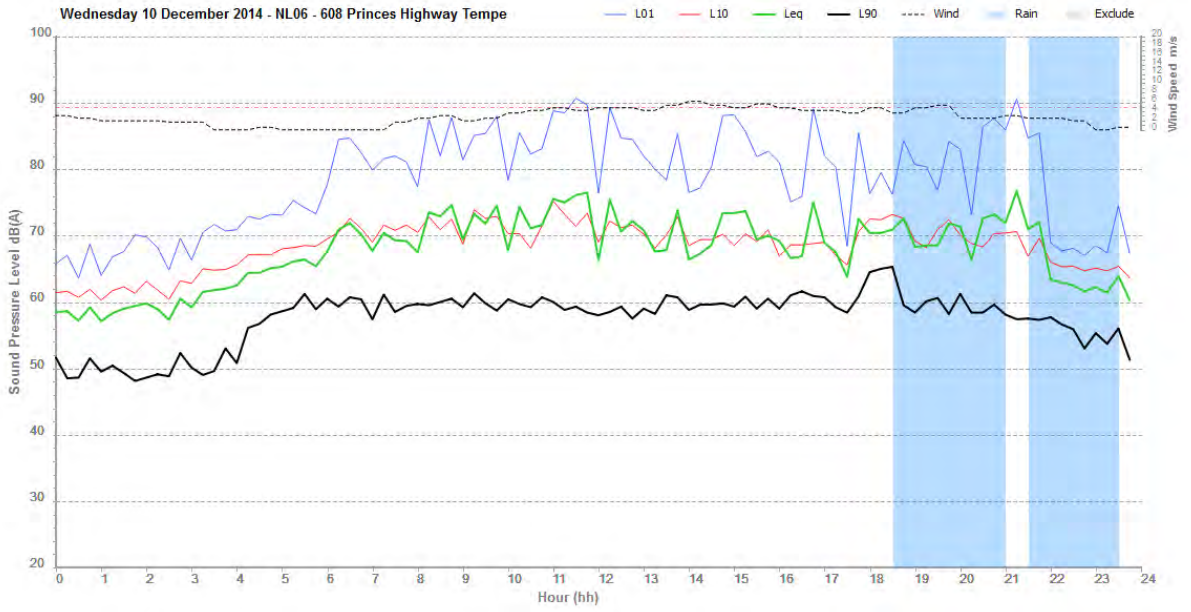

Friday 05 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

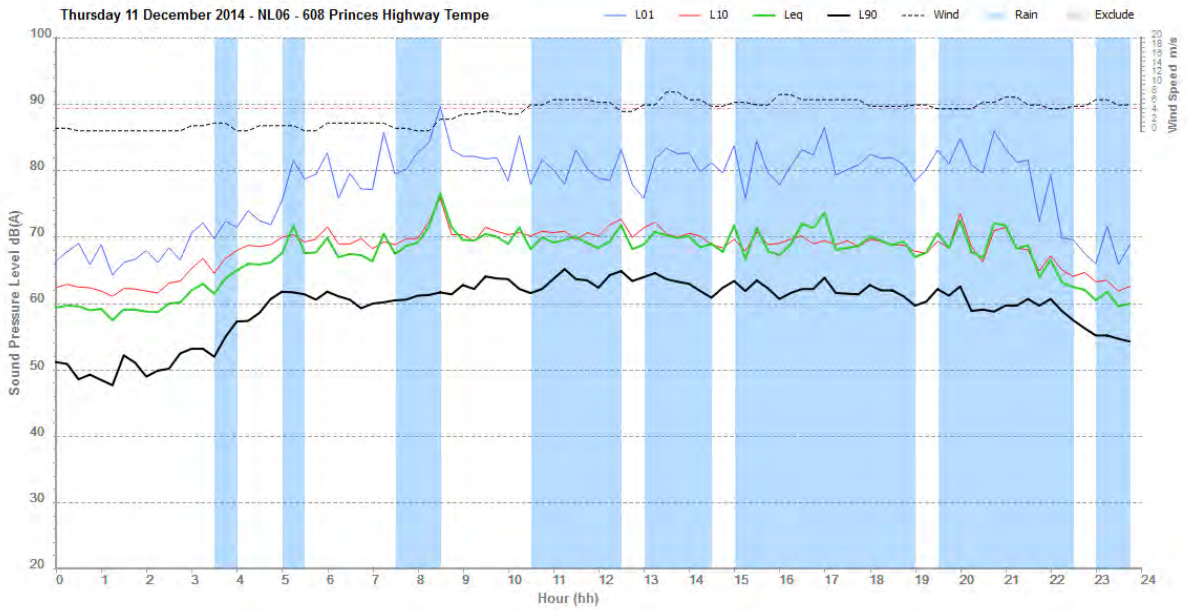

Saturday 06 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

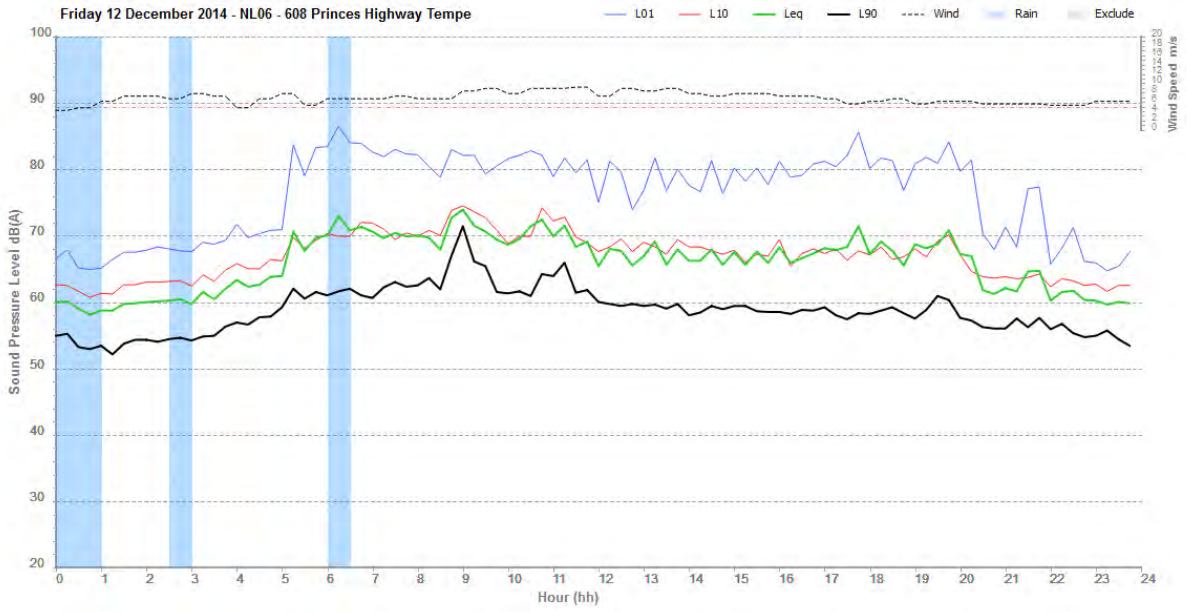

Sunday 07 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 08 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

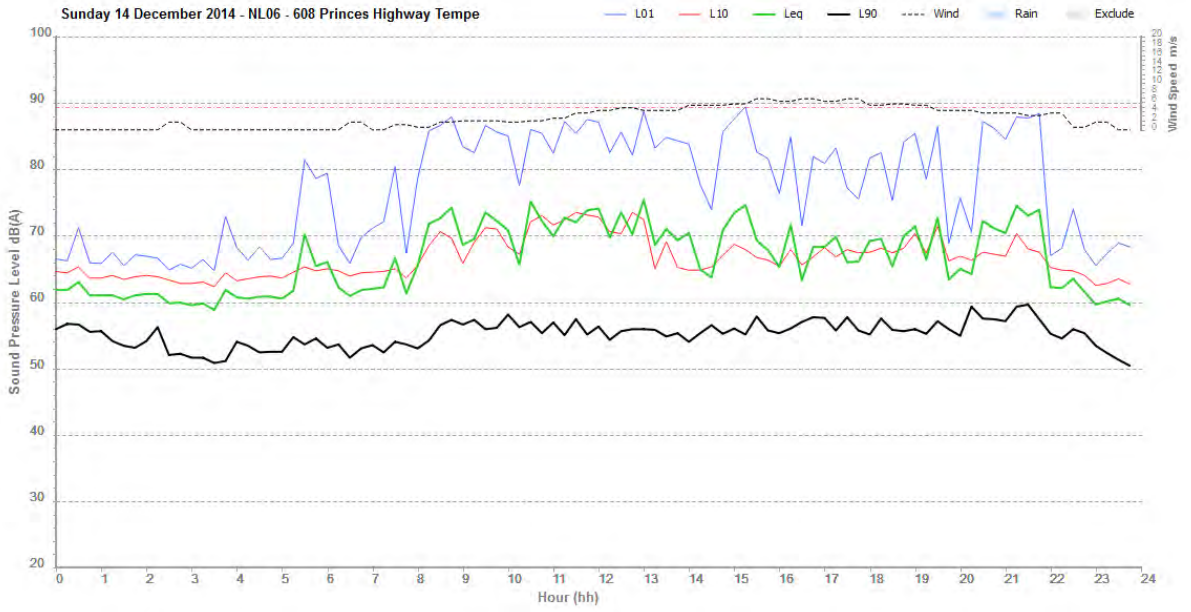

Tuesday 09 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

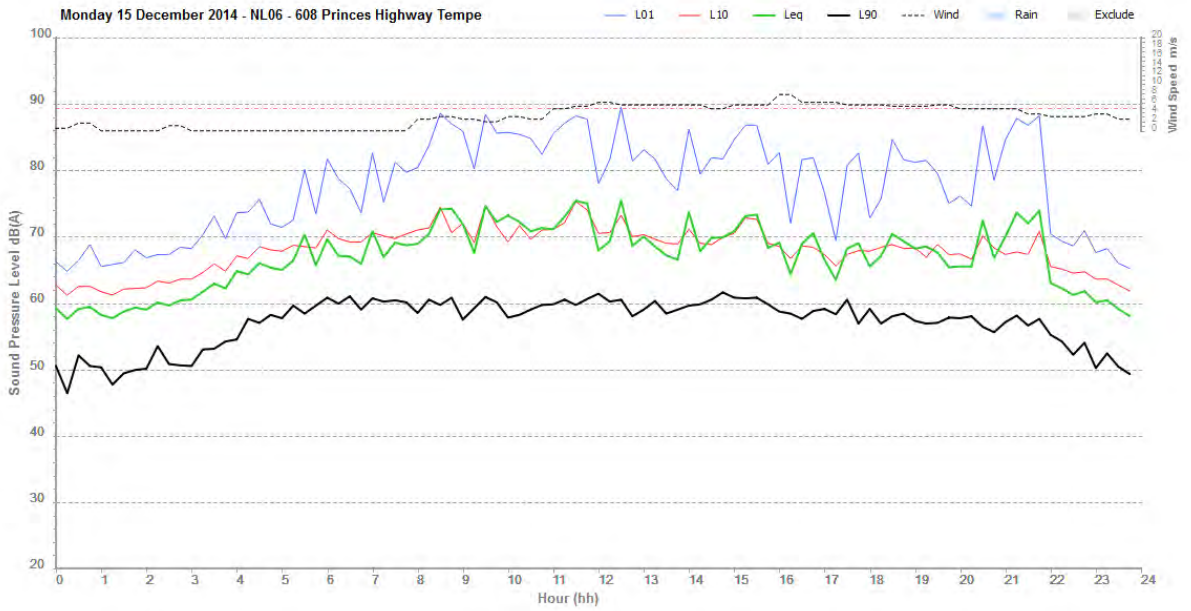

Wednesday 10 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

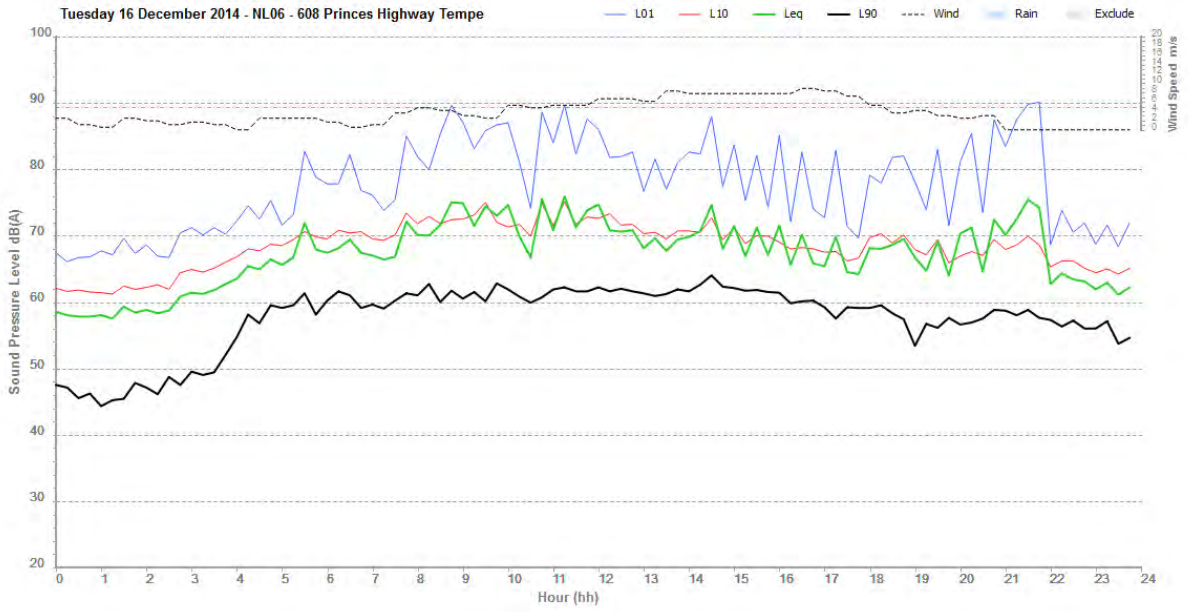

Thursday 11 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

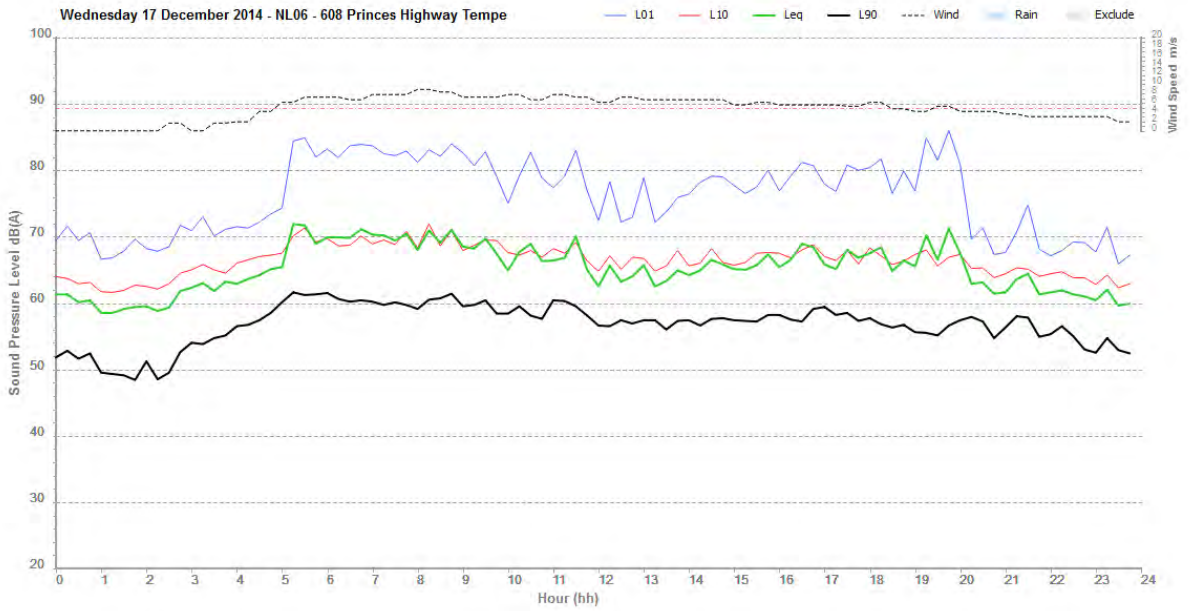

Friday 12 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

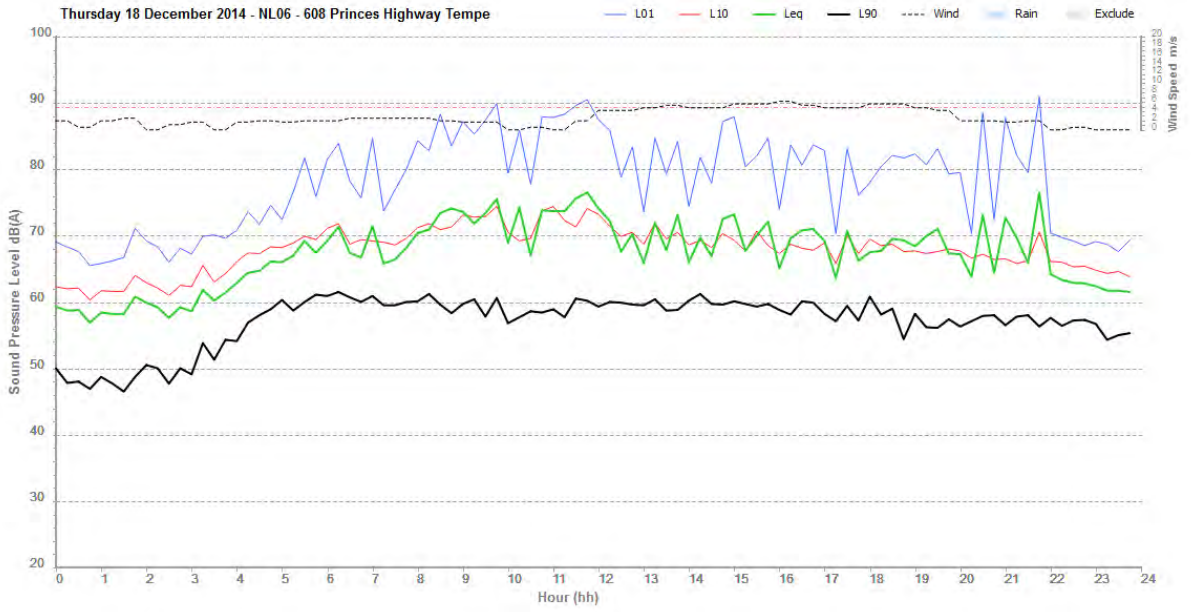

Saturday 13 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

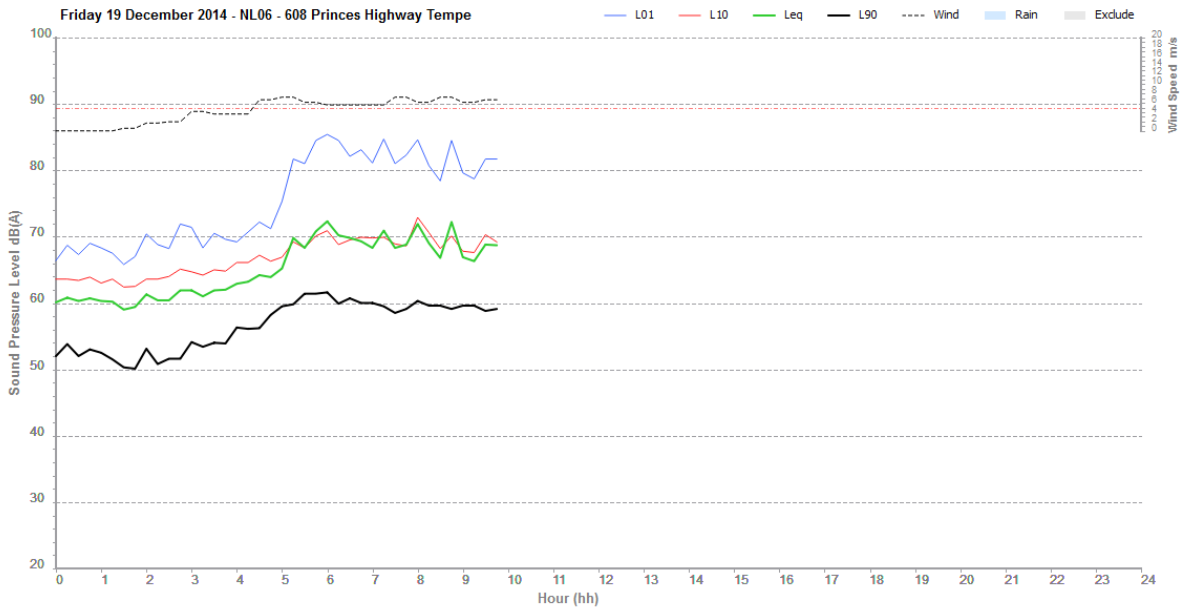

Sunday 14 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 15 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

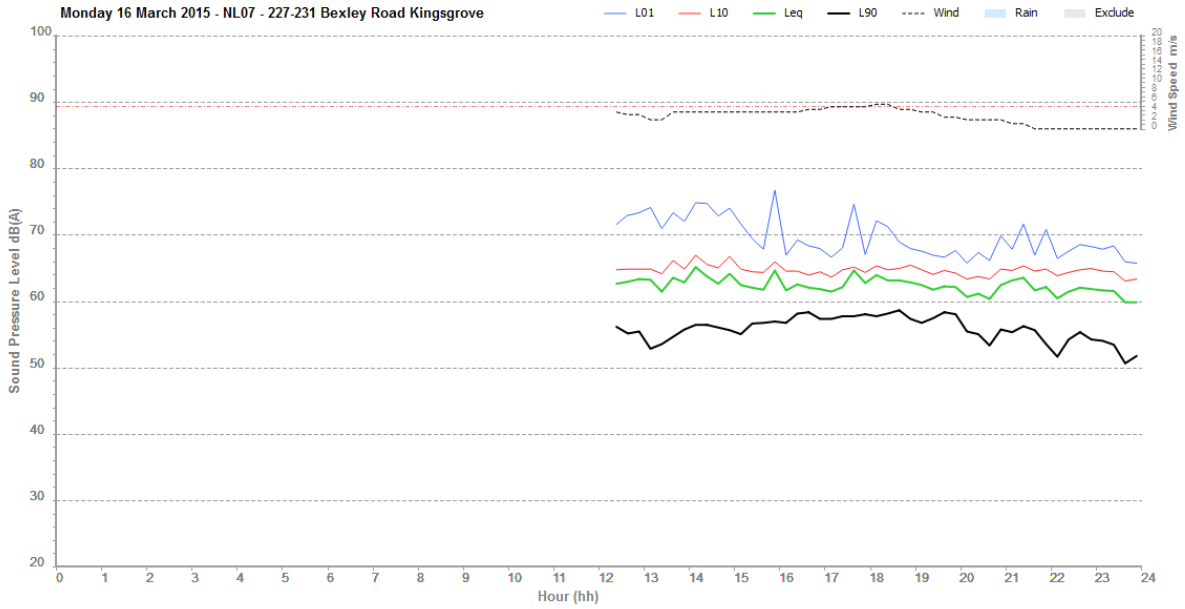

Wednesday 17 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

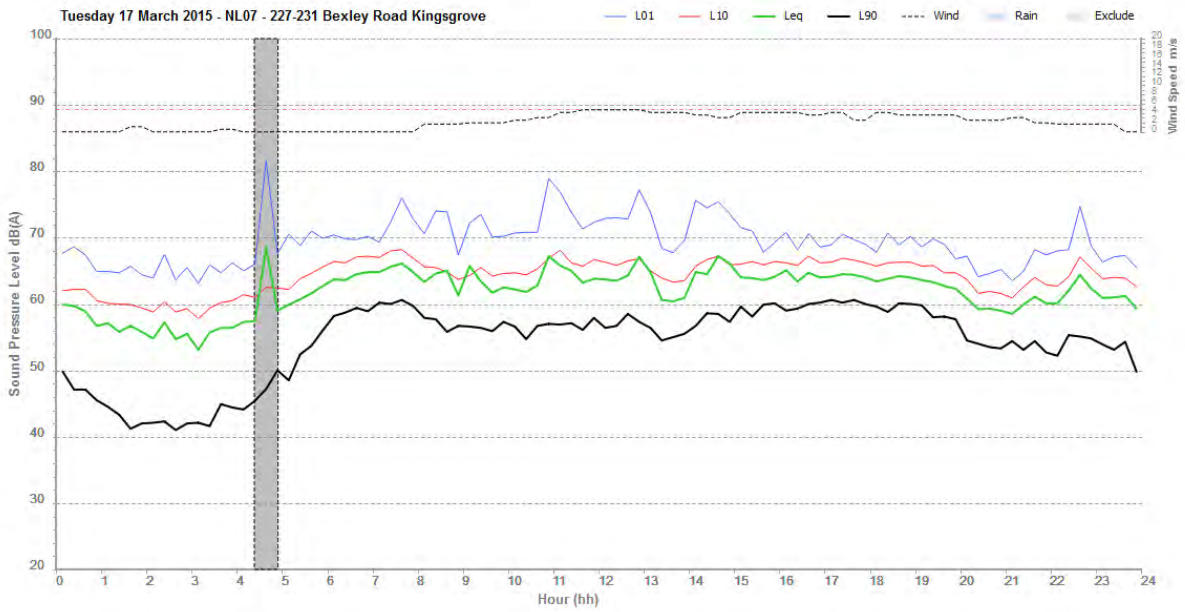

Thursday 18 December 2014 - NL06 - 608 Princes Highway Tempe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

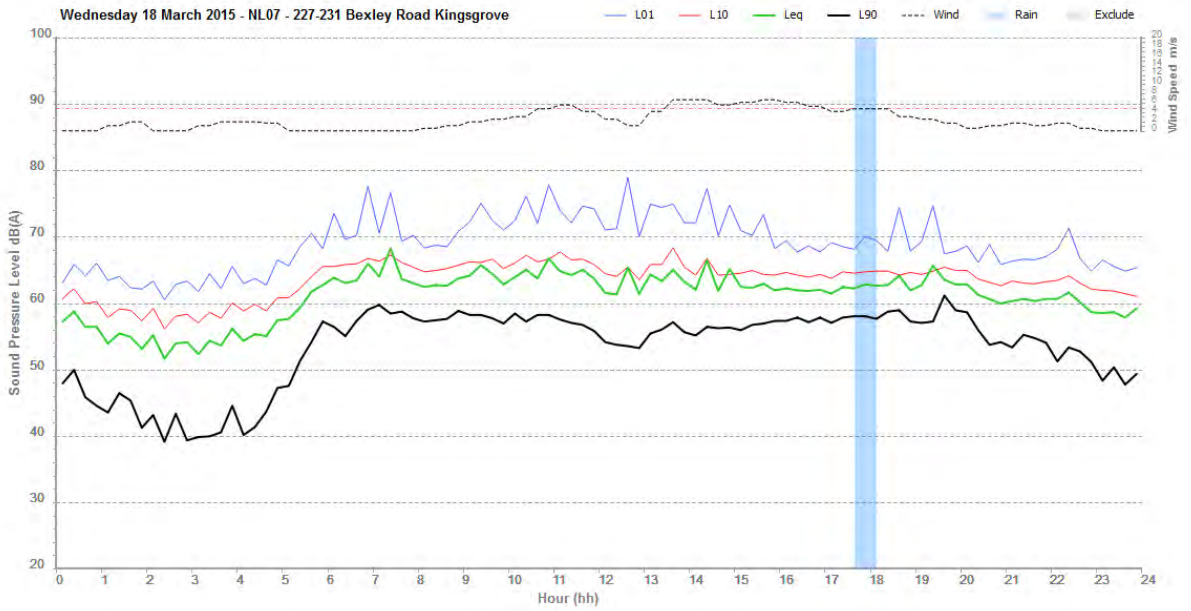


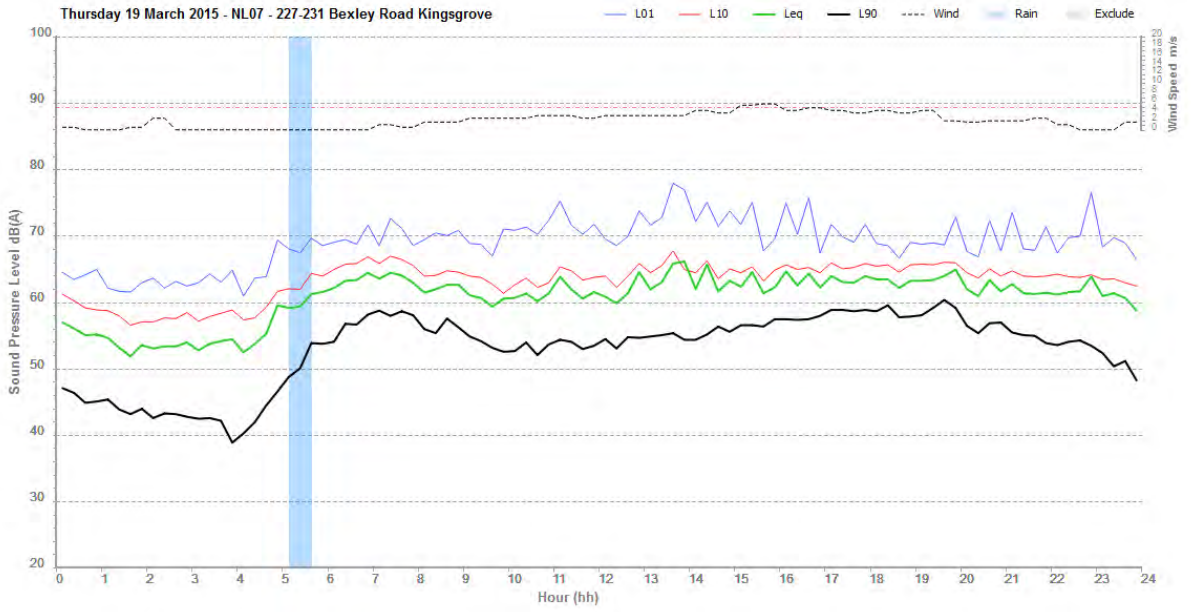
NL07 – 227-231 Bexley Road, Kingsgrove – SVAN 957 20674

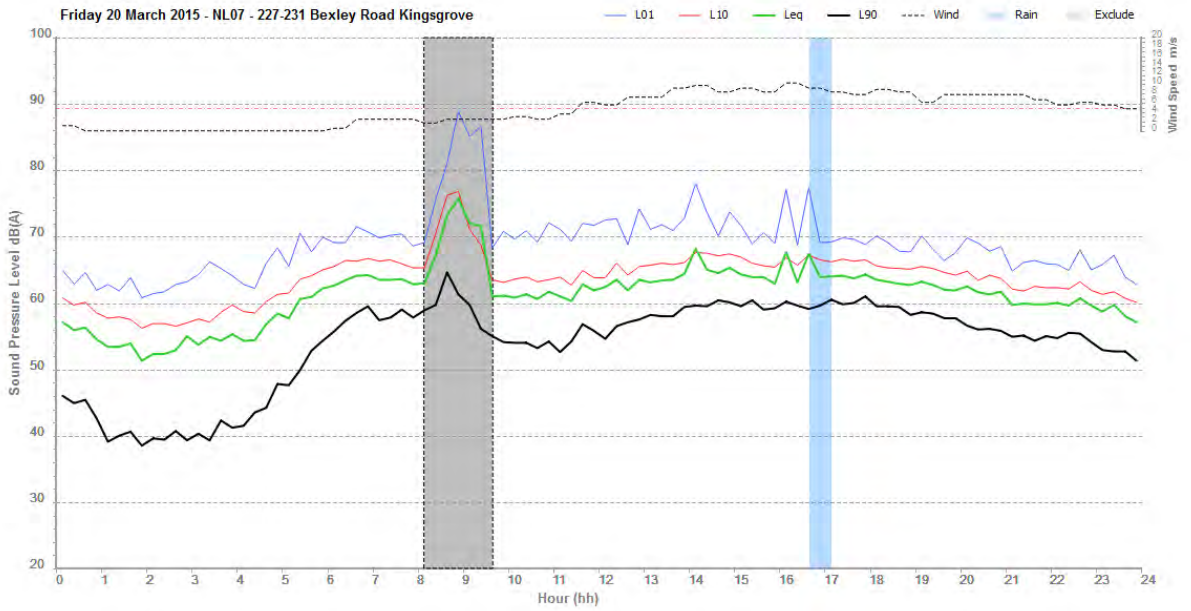


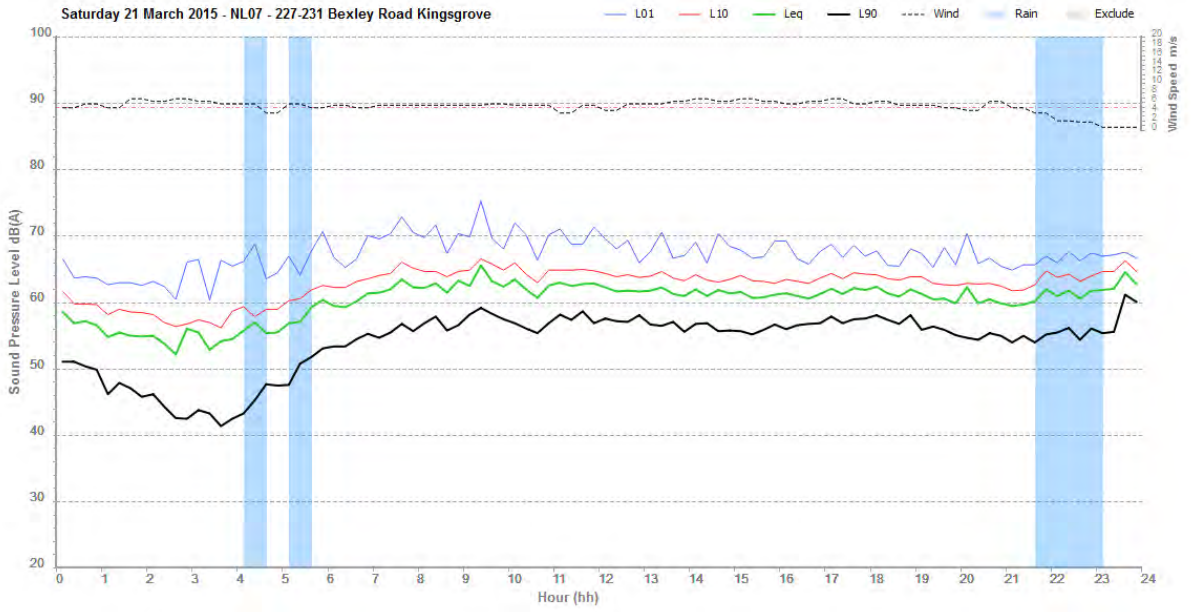

Monday 16 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

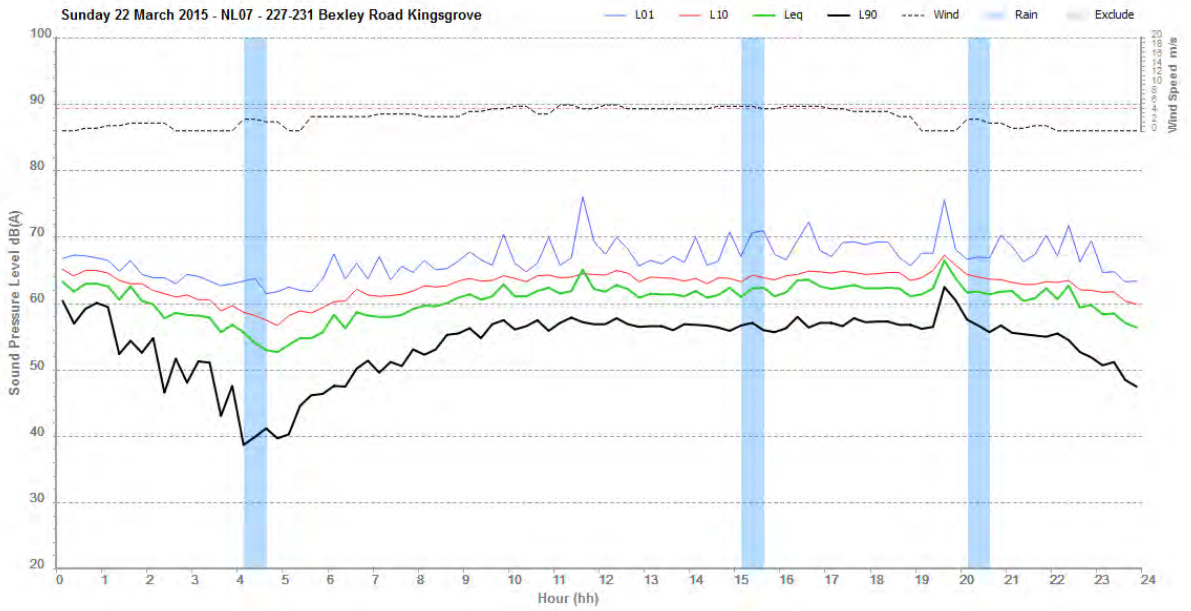

Tuesday 17 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

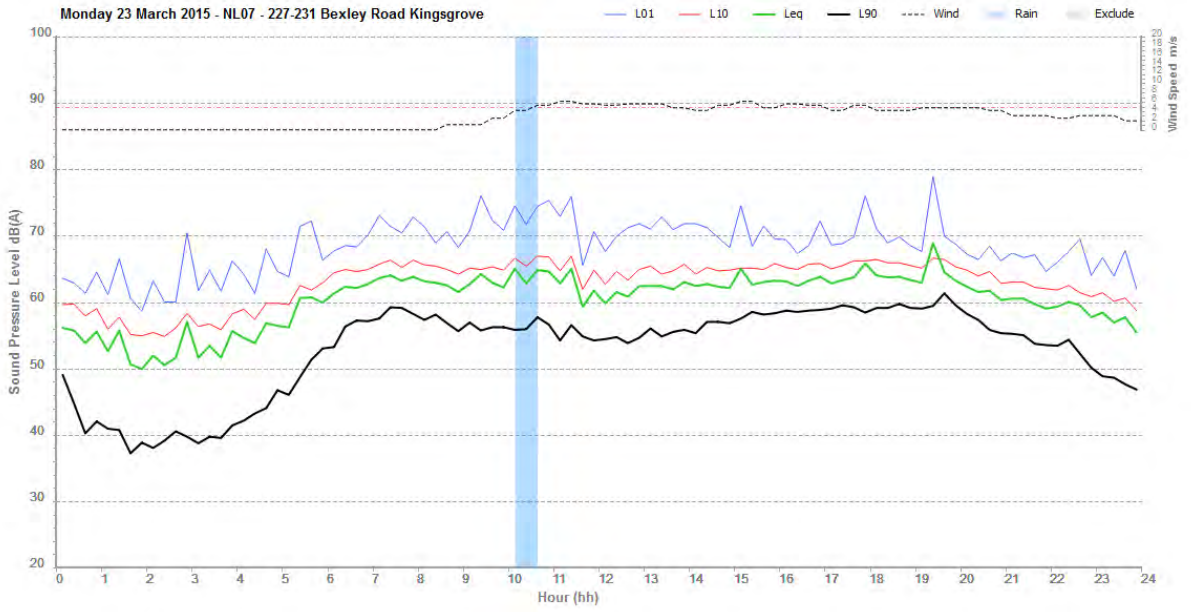

Wednesday 18 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

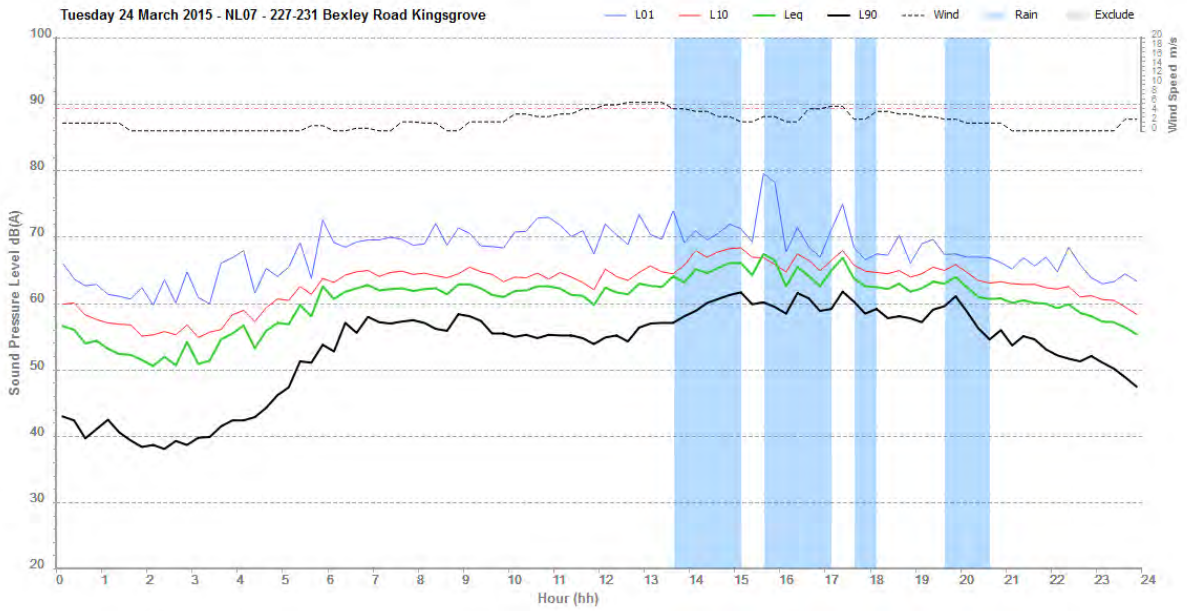

Thursday 19 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

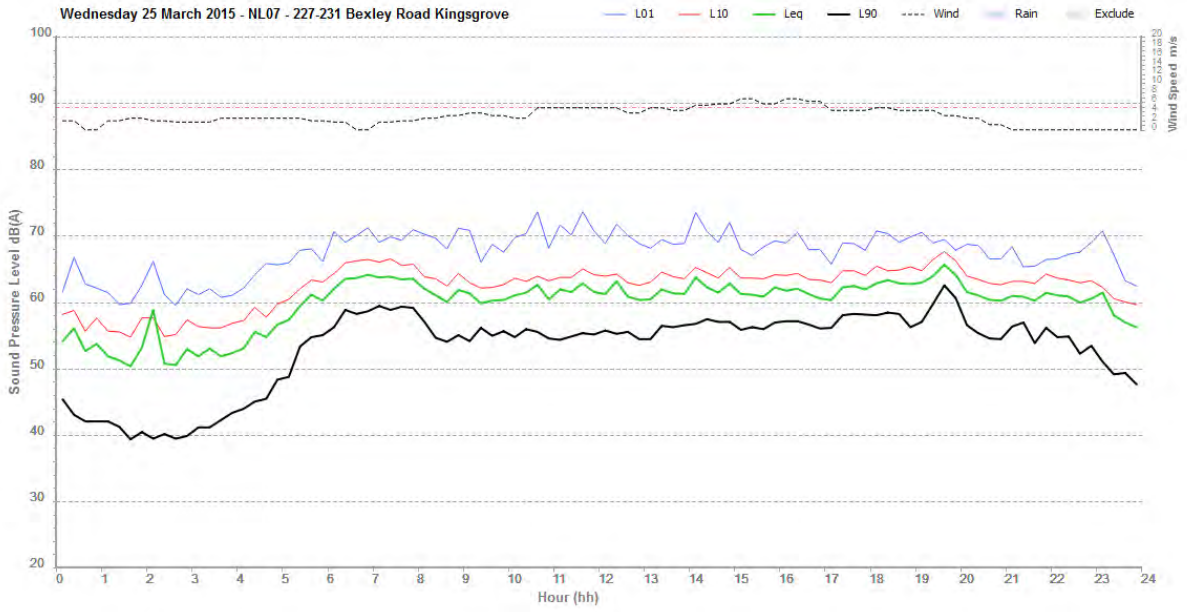

Friday 20 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

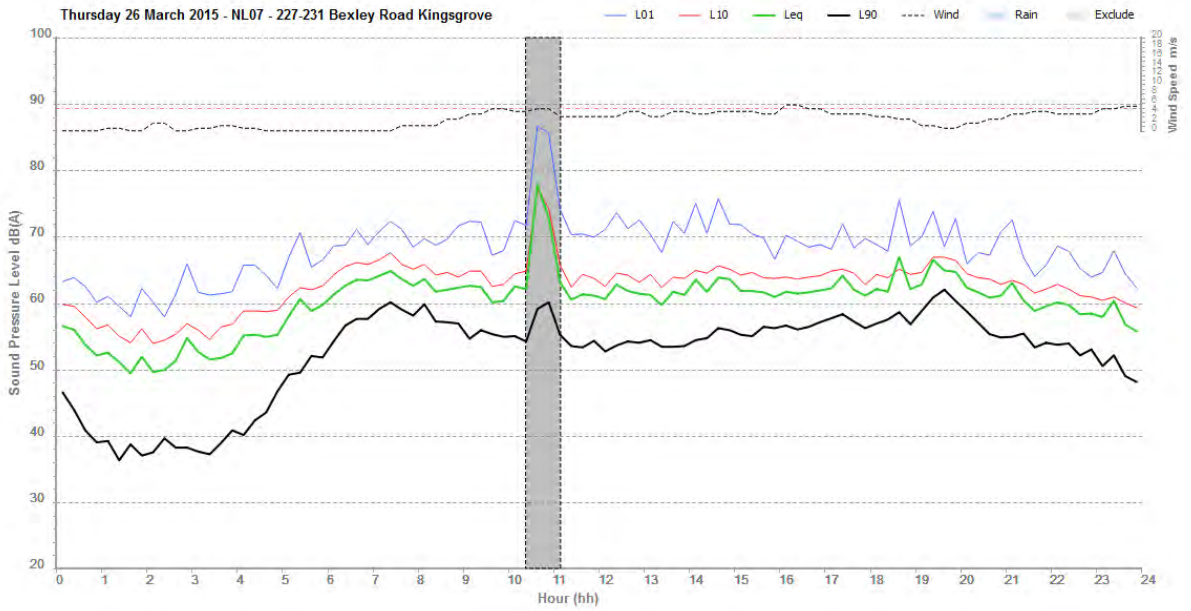

Saturday 21 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

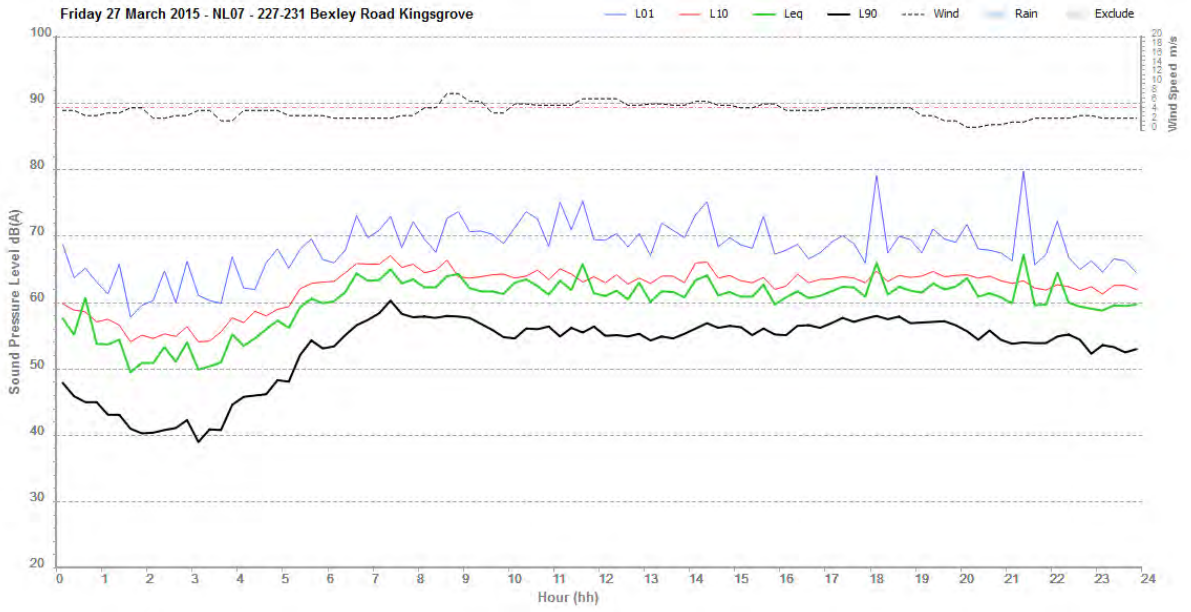

Sunday 22 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

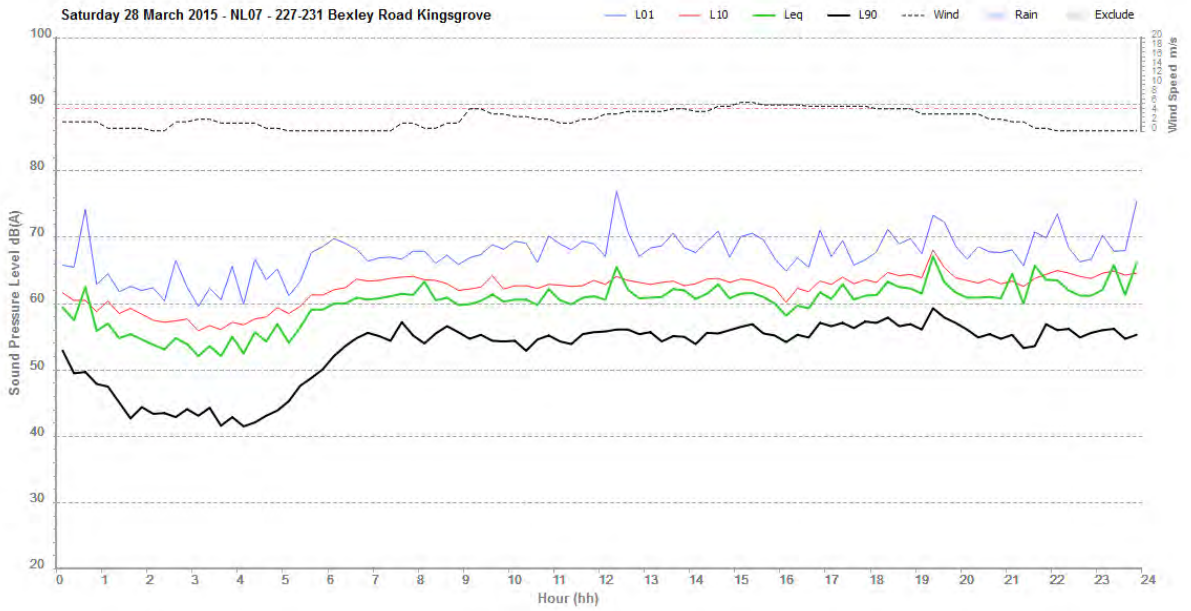

Monday 23 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

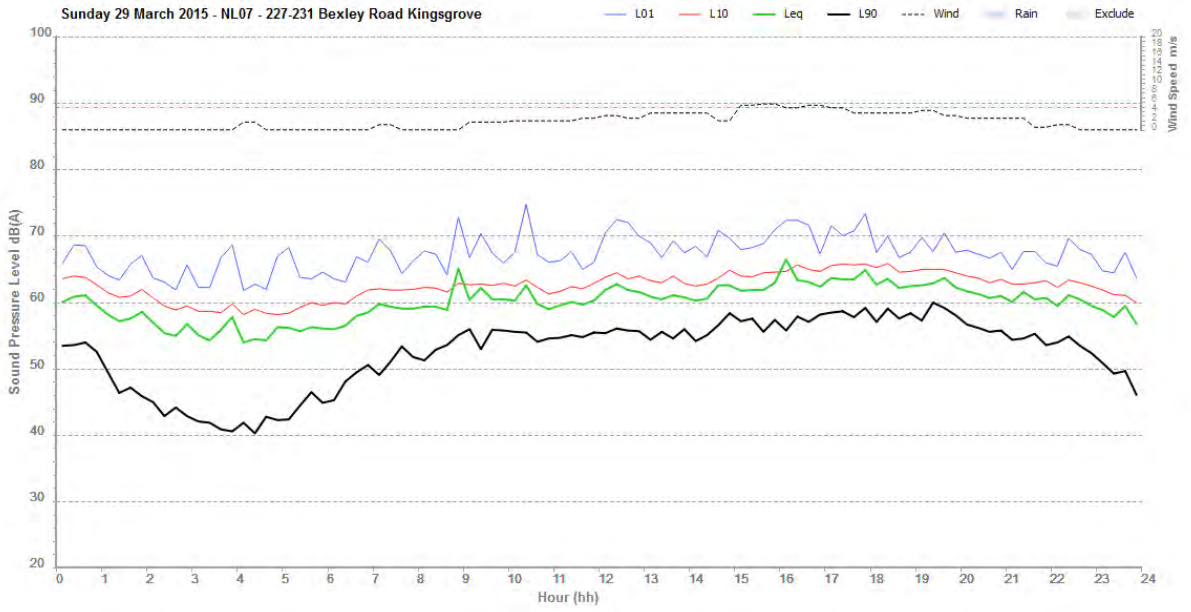

Tuesday 24 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

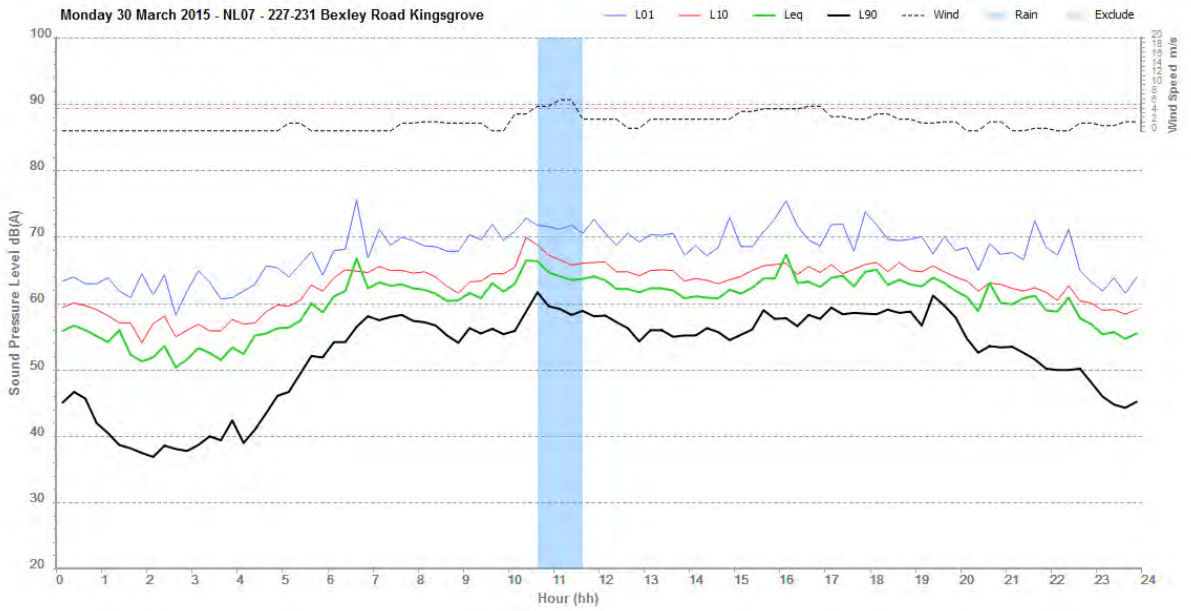

Wednesday 25 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

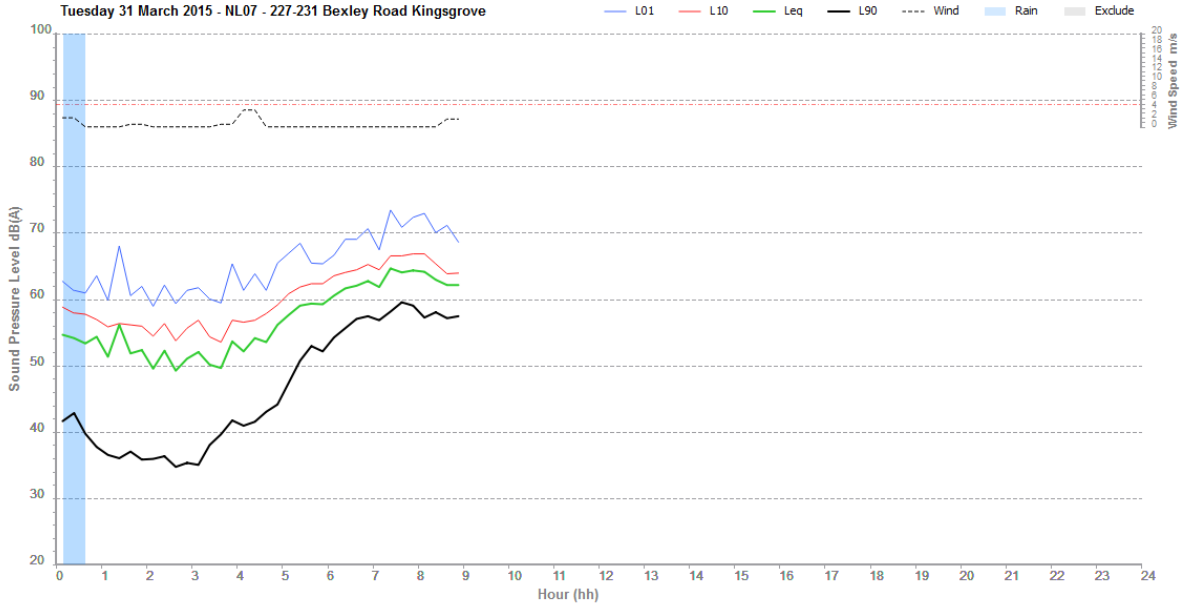

Thursday 26 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

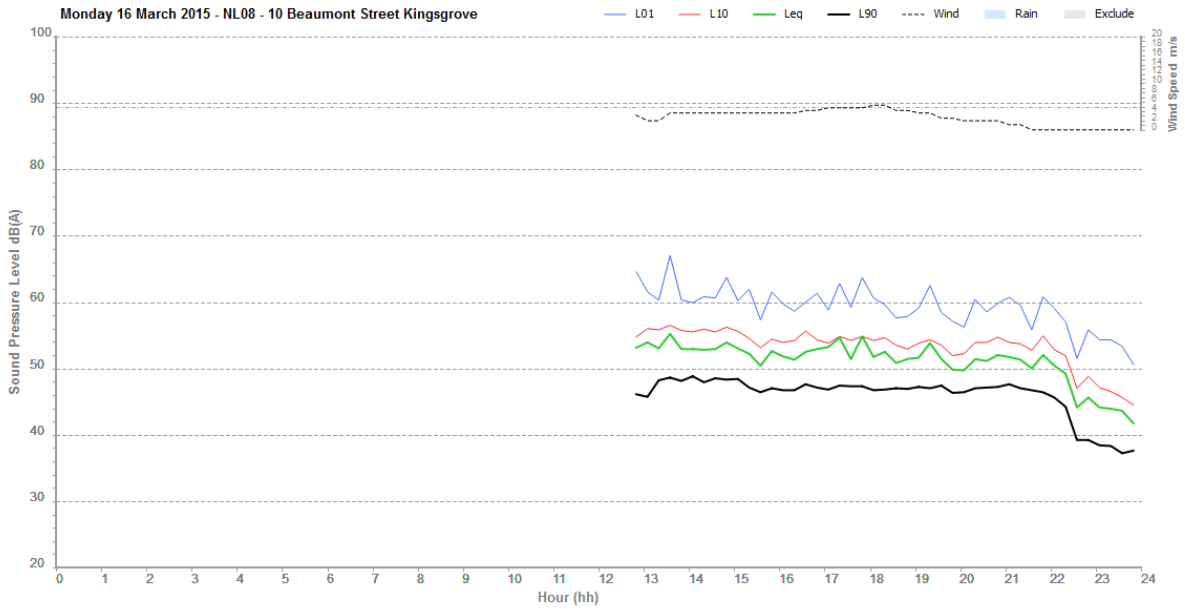

Sunday 29 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

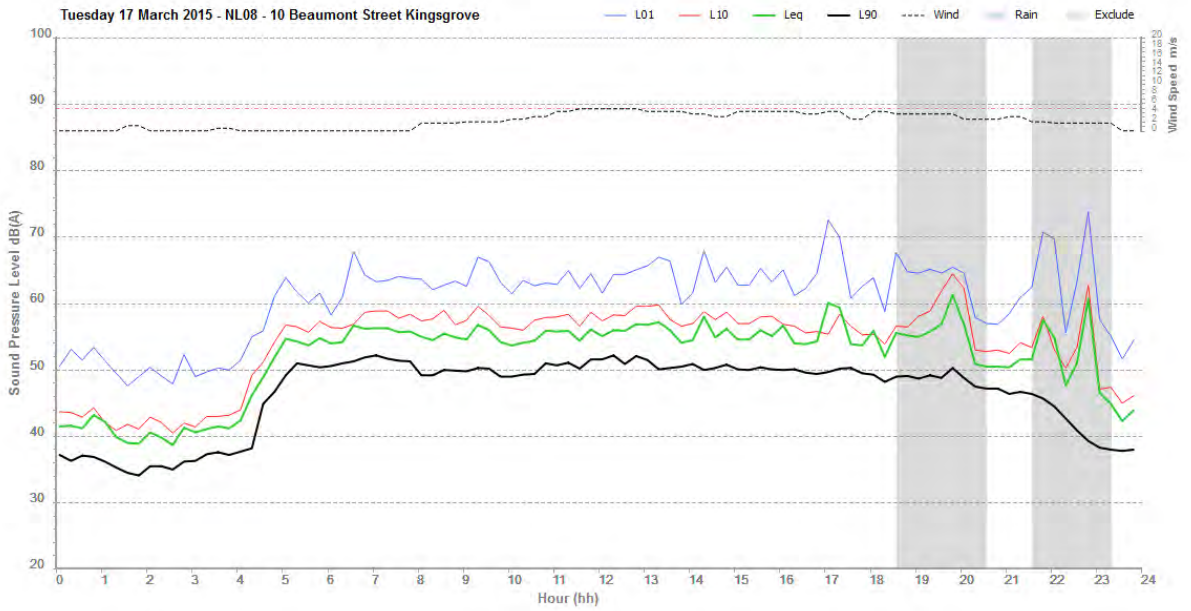

Monday 30 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

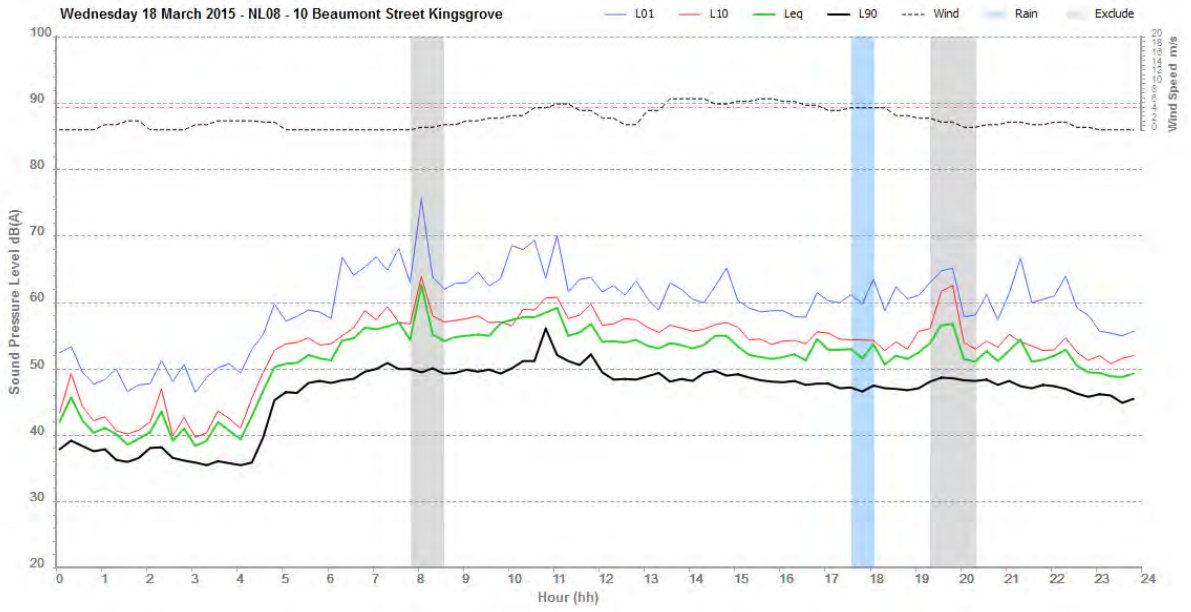

Tuesday 31 March 2015 - NL07 - 227-231 Bexley Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

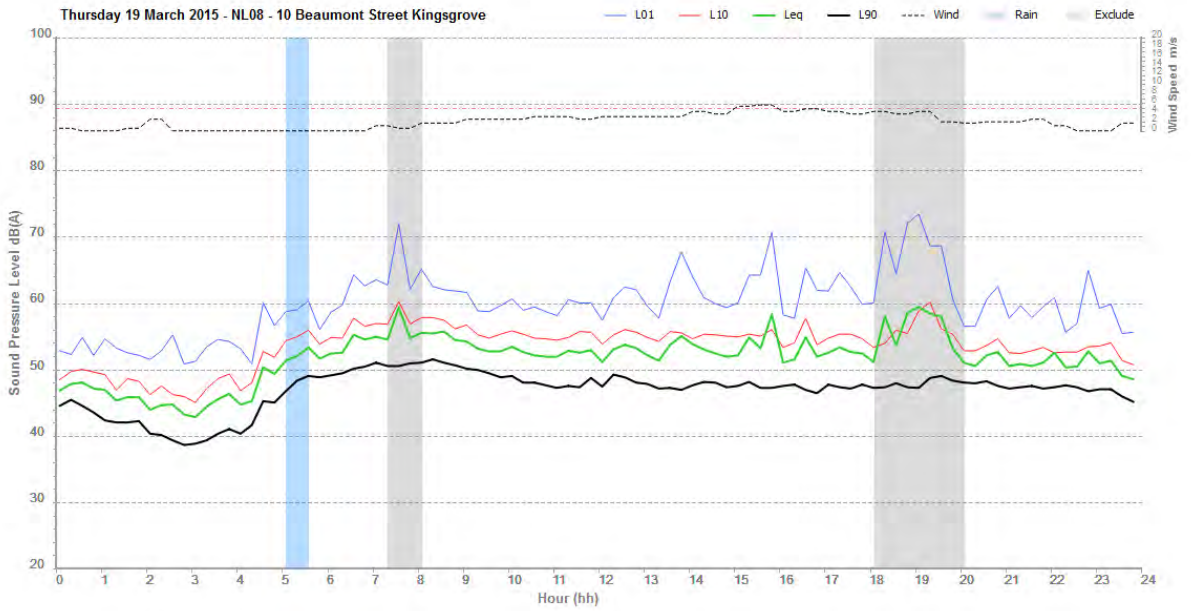
NL08 – 10 Beaumont Street, Kingsgrove – SVAN 957 27522

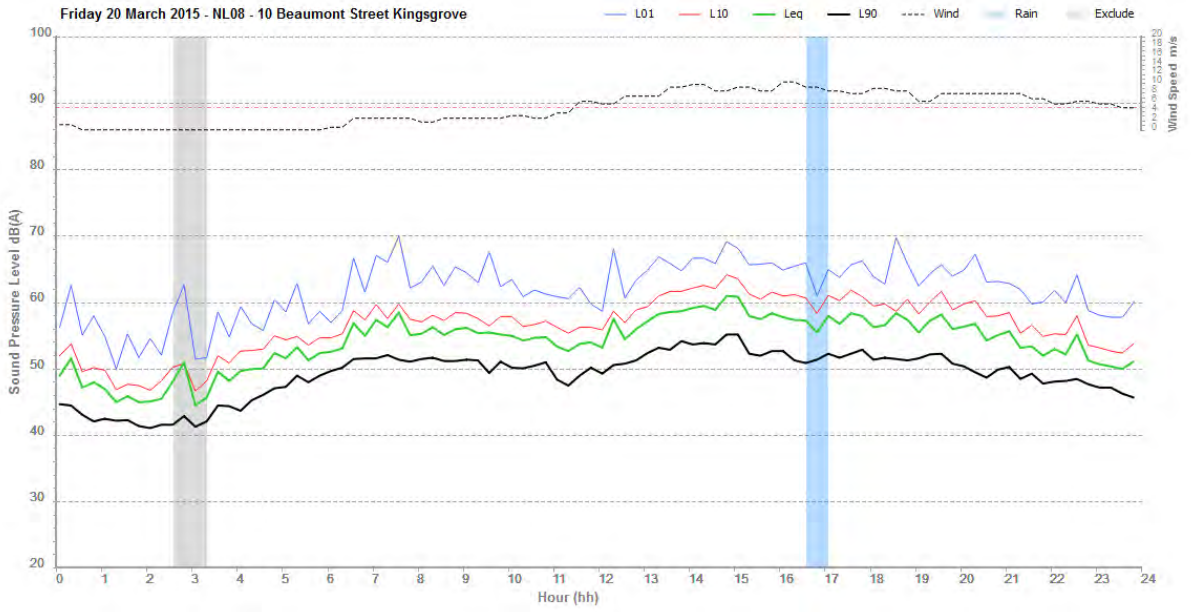


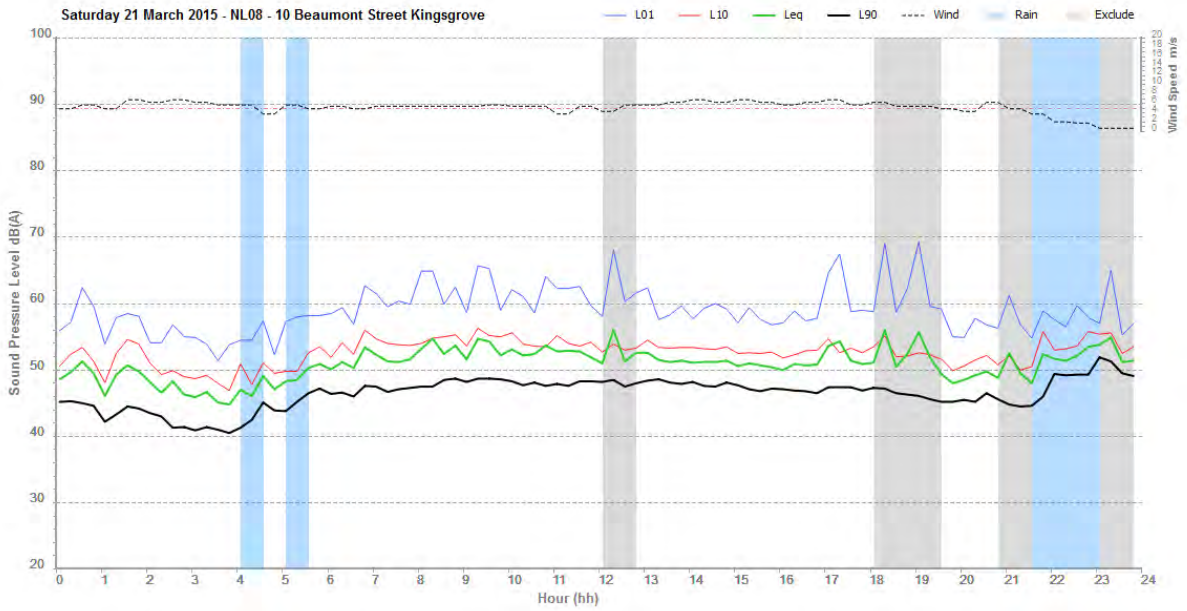


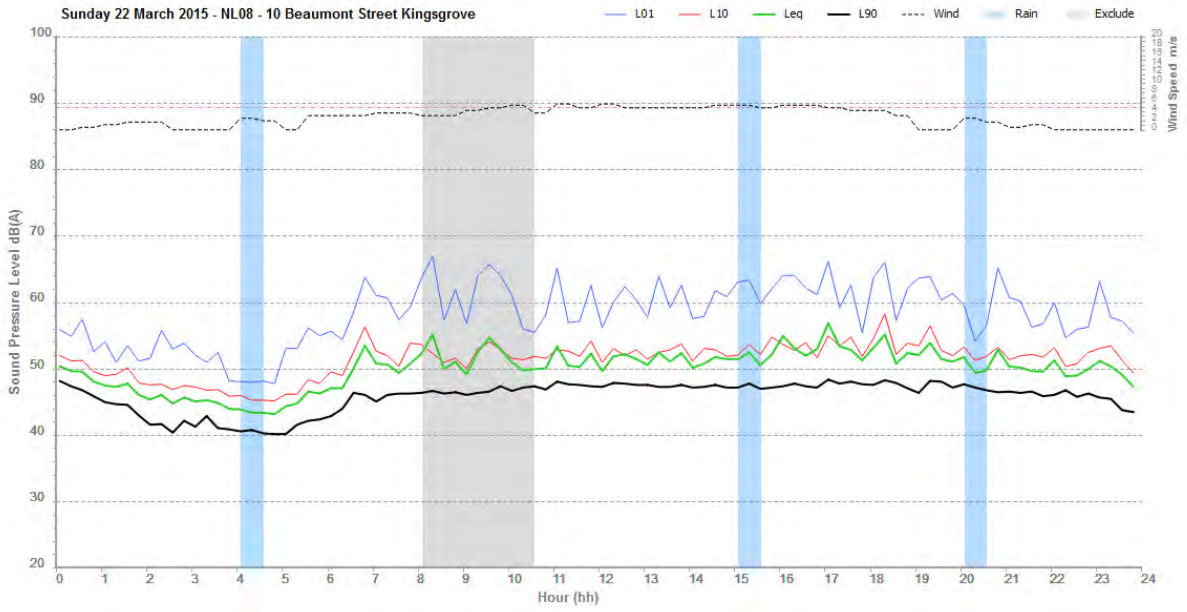

Tuesday 17 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

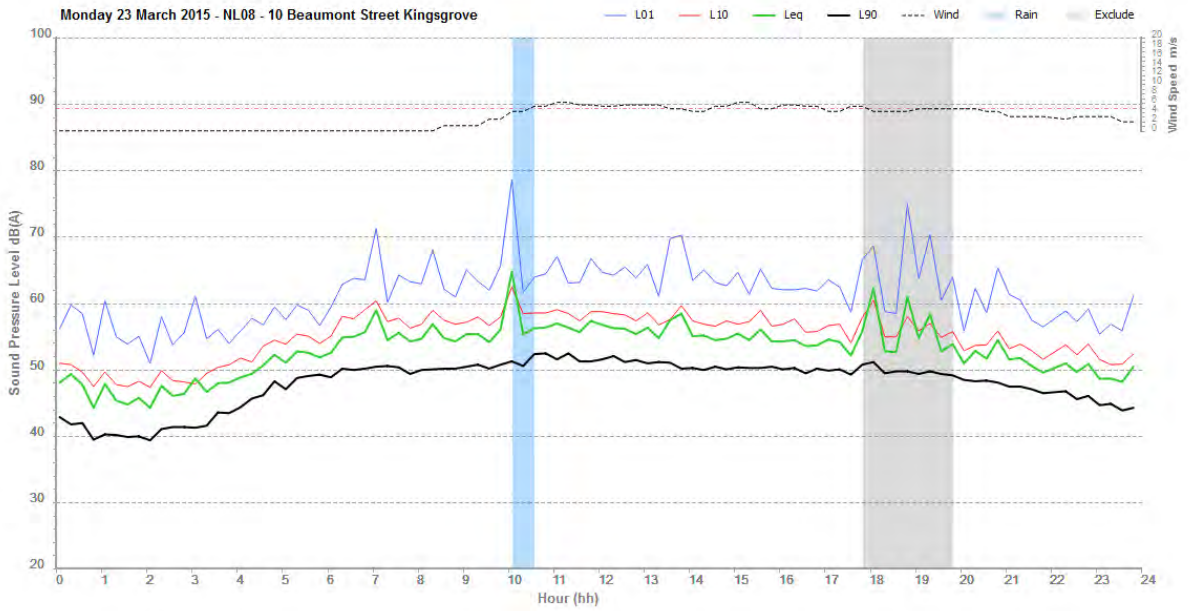

Wednesday 18 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

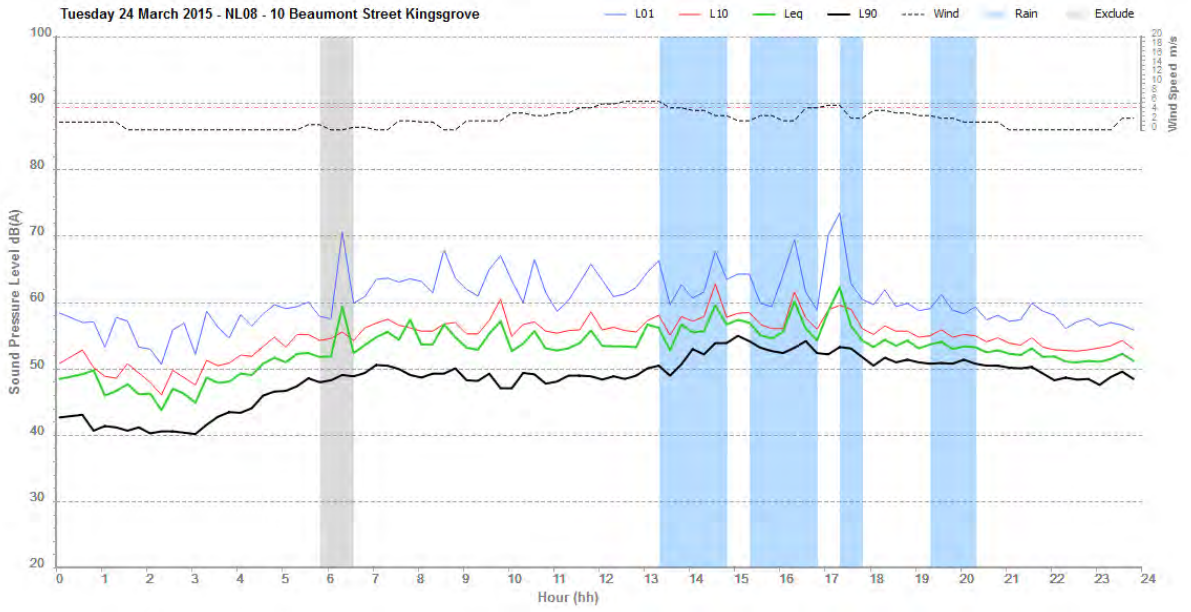

Thursday 19 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

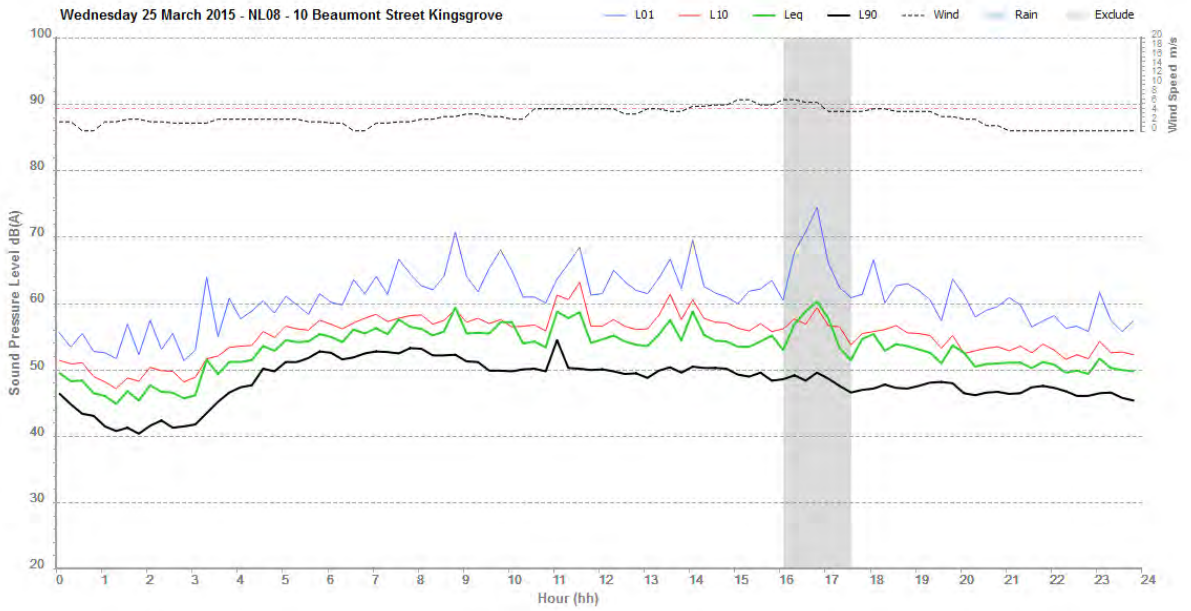

Friday 20 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

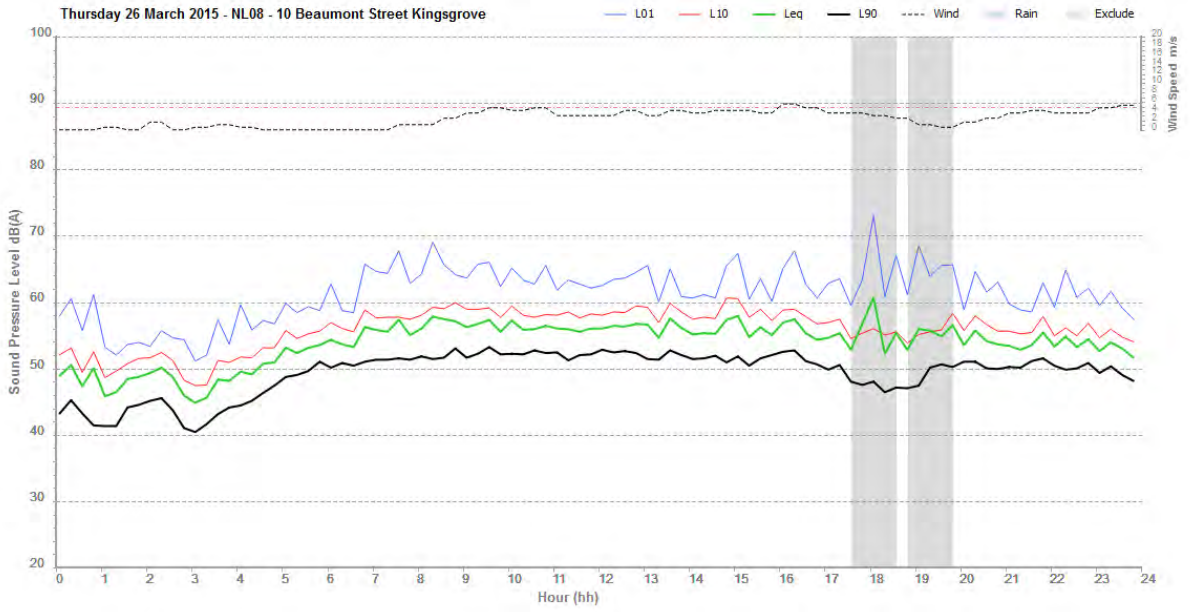

Saturday 21 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

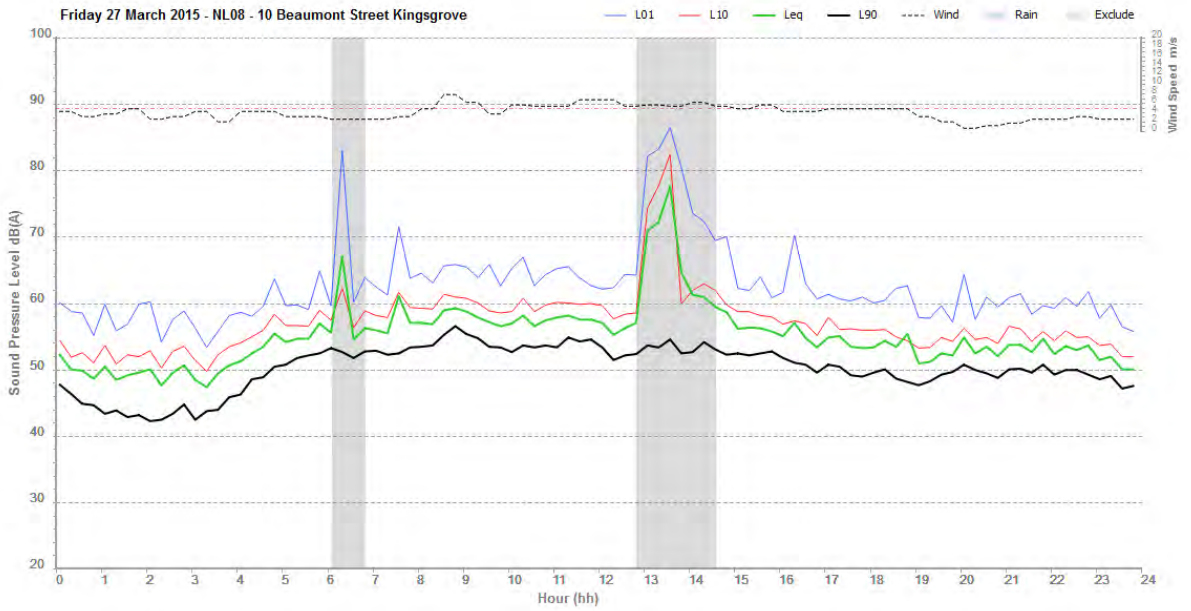

Sunday 22 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

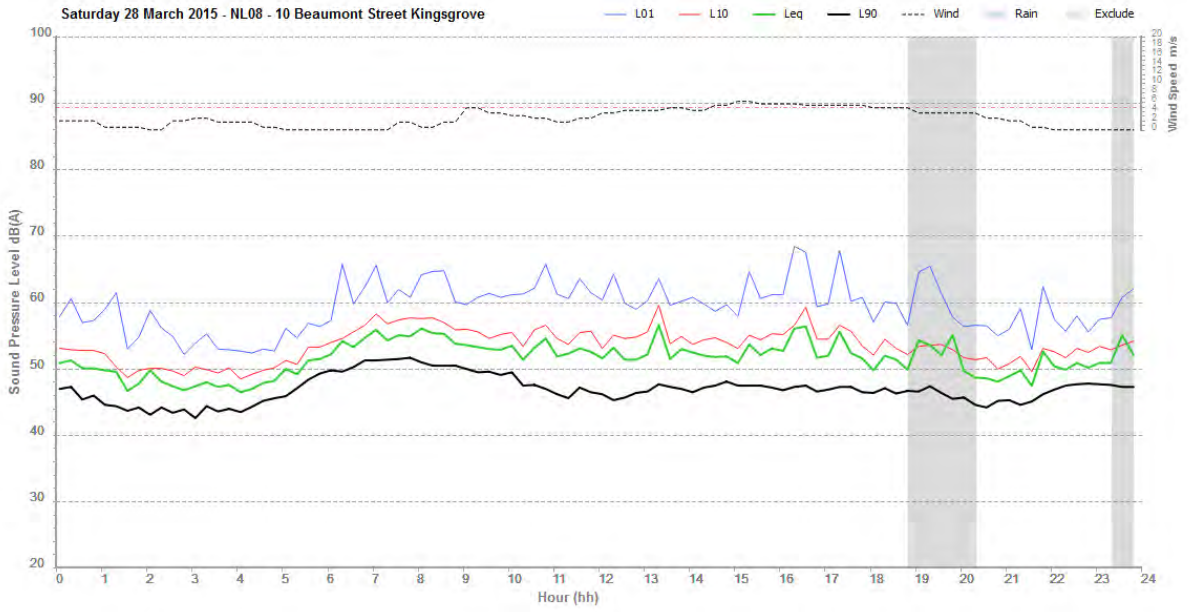

Monday 23 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

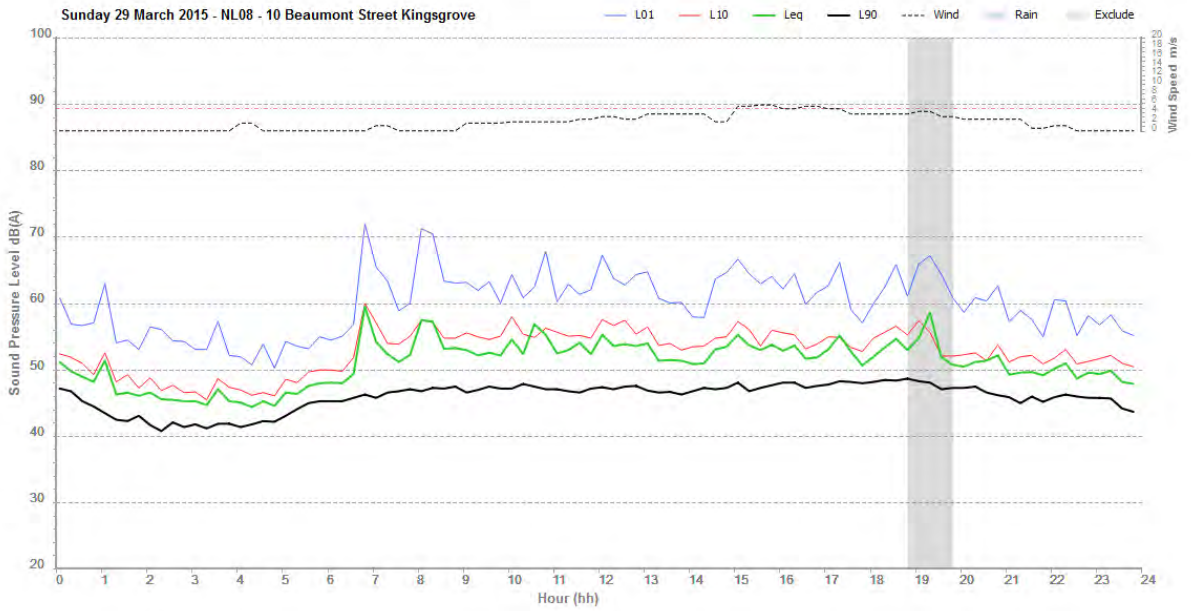

Tuesday 24 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

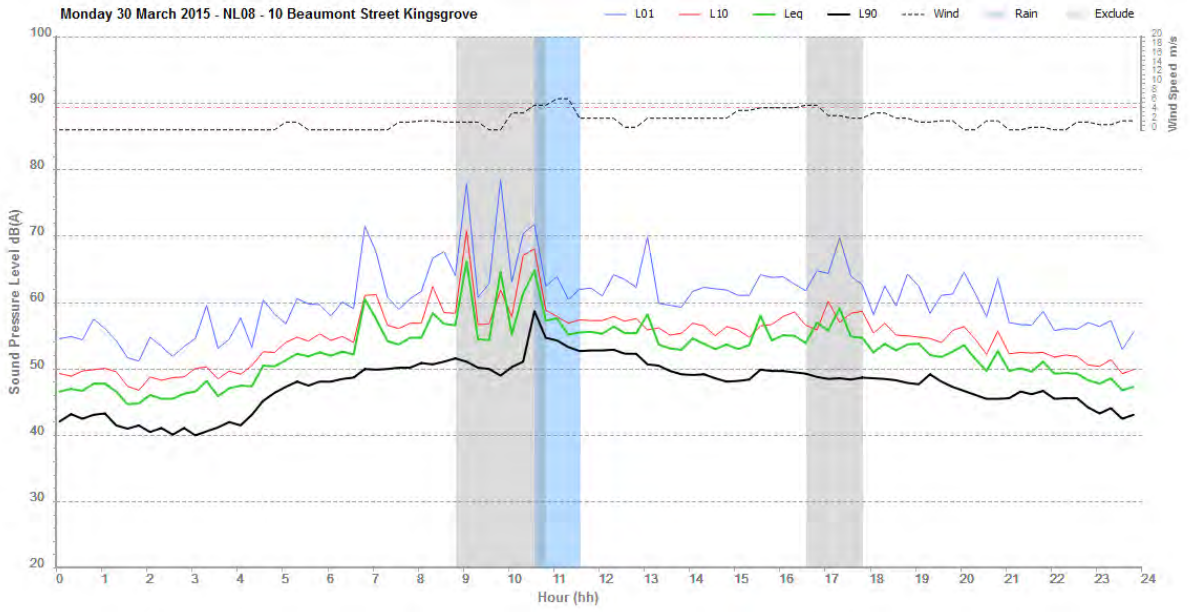

Wednesday 25 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

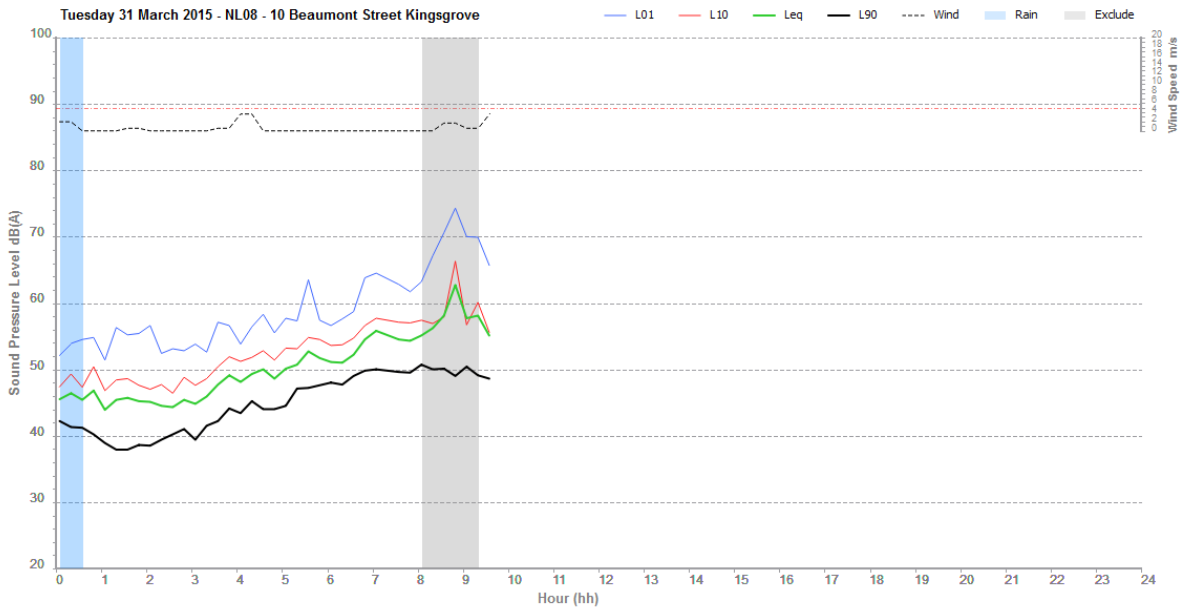

Thursday 26 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

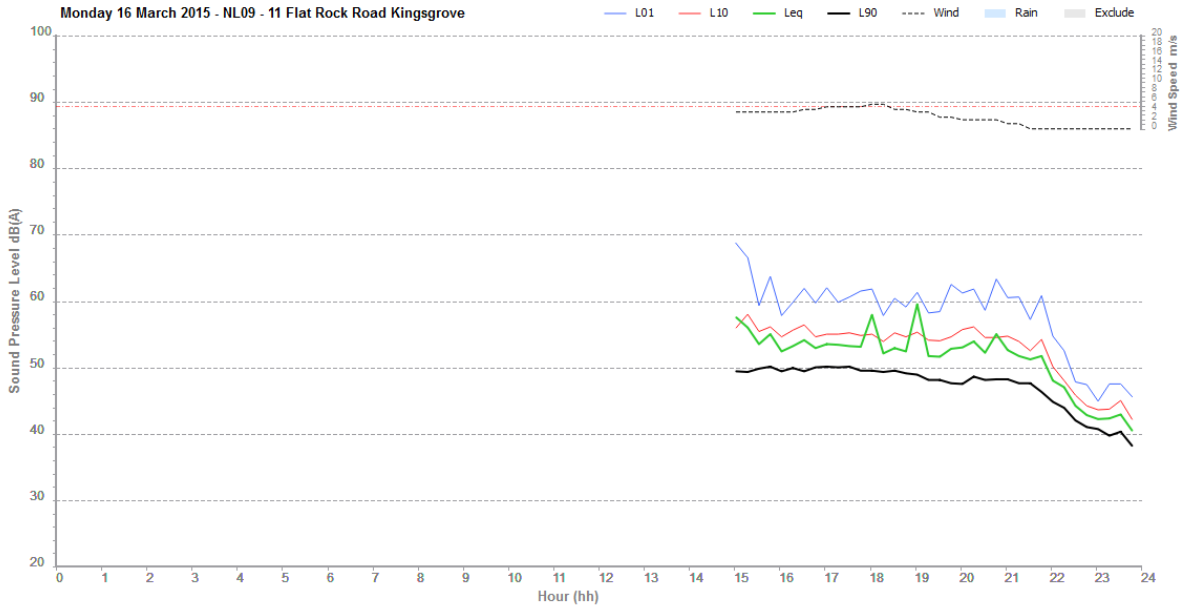

Sunday 29 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

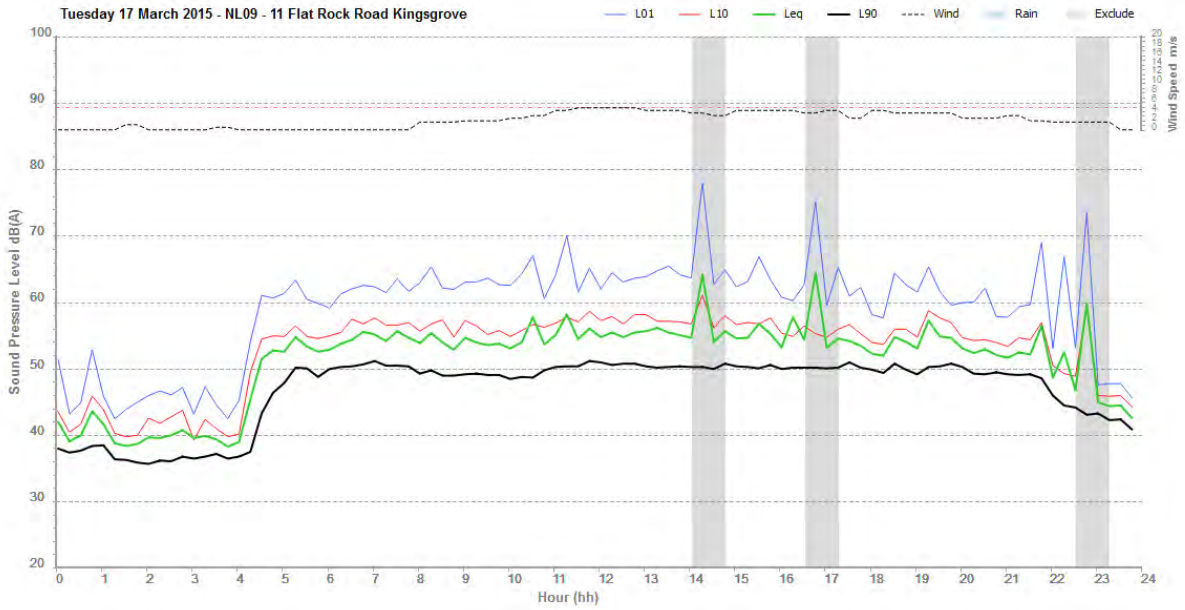

Monday 30 March 2015 - NL08 - 10 Beaumont Street Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

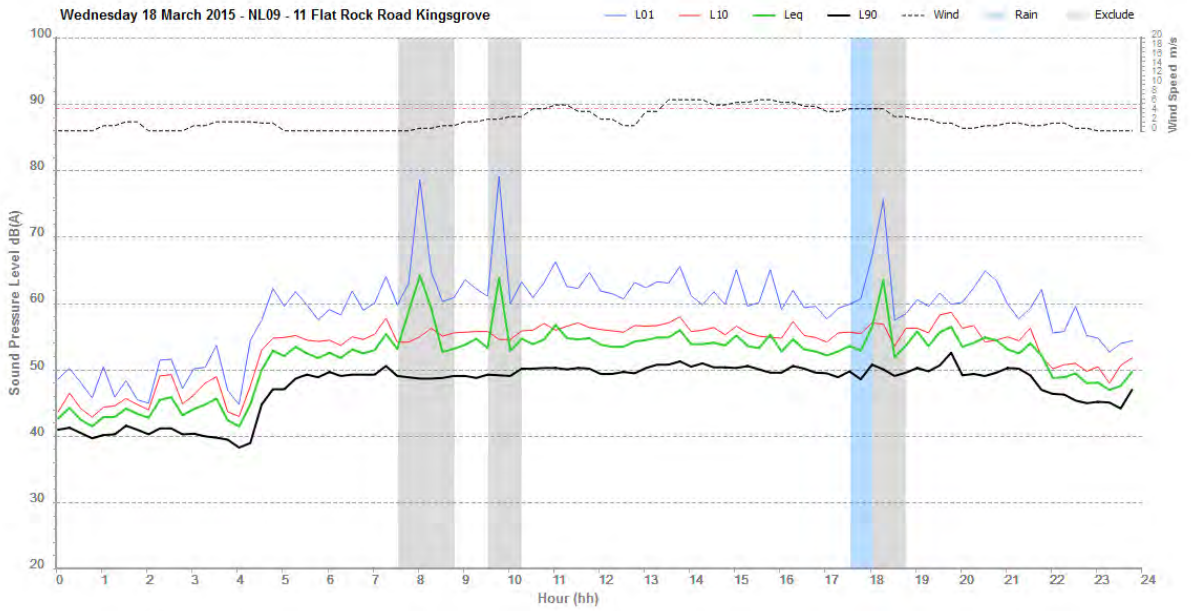


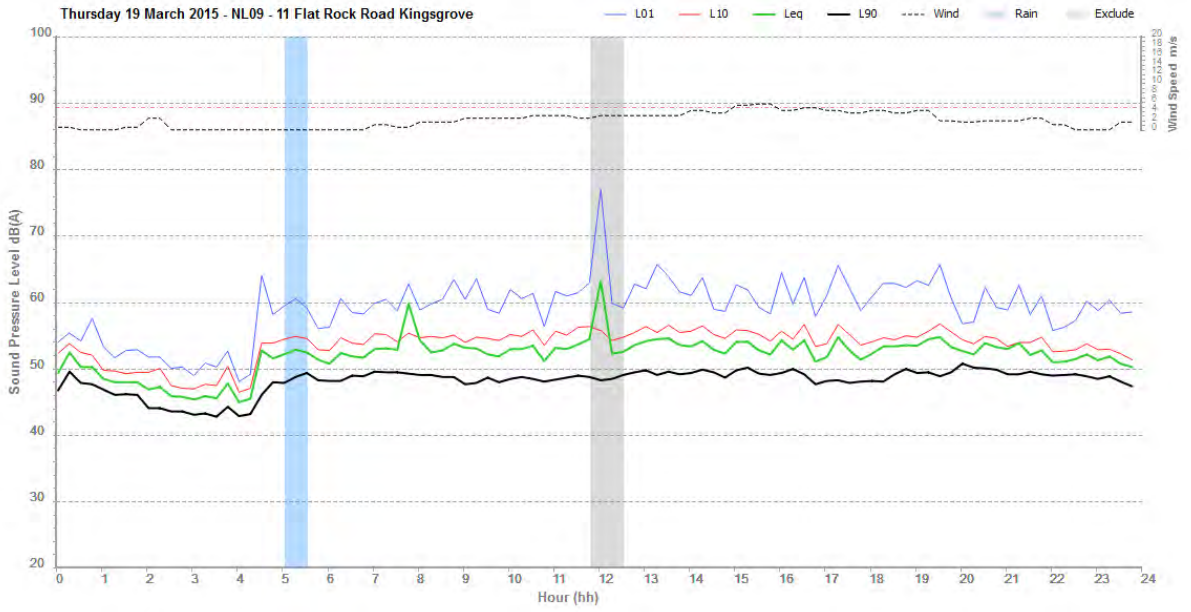
NL09 – 11 Flat Rock Road, Kingsgrove – SVAN 957 23244

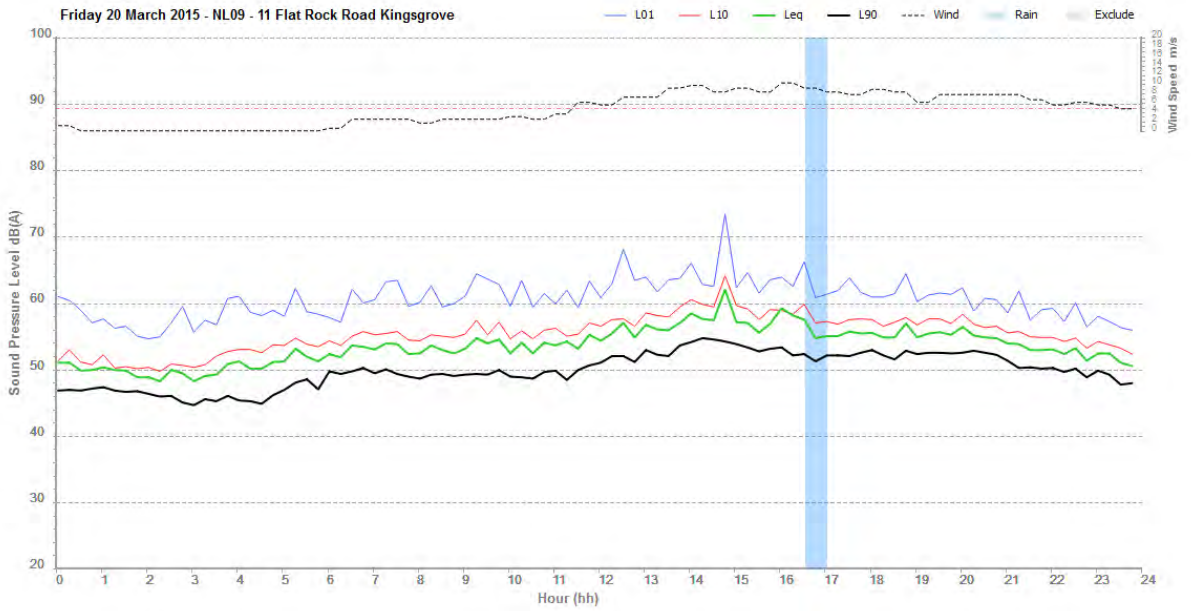


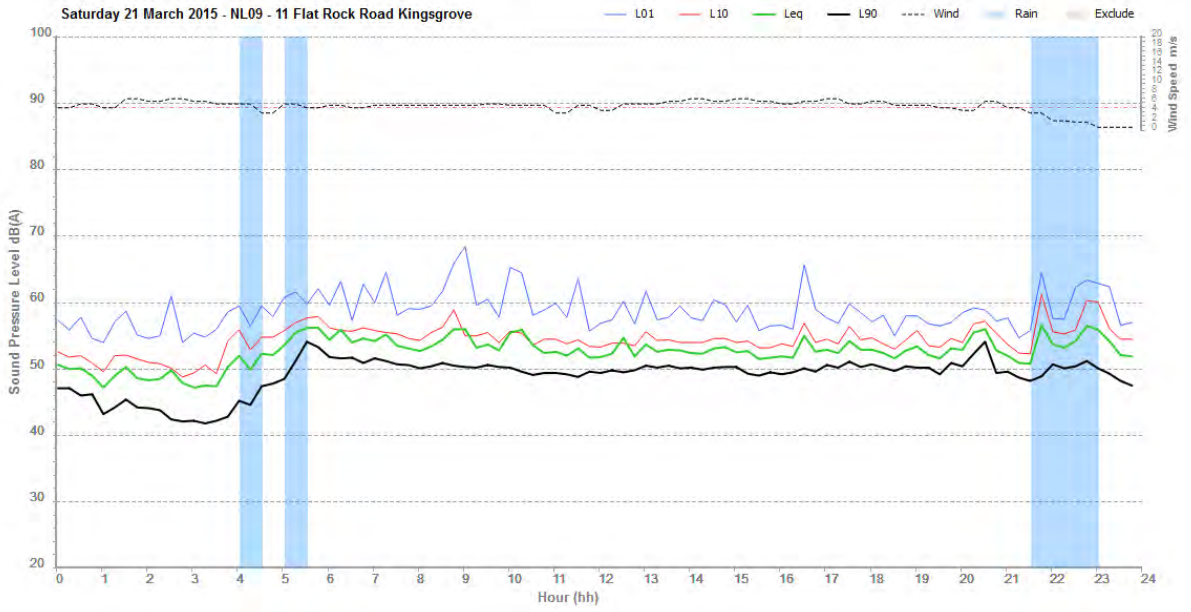

Monday 16 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

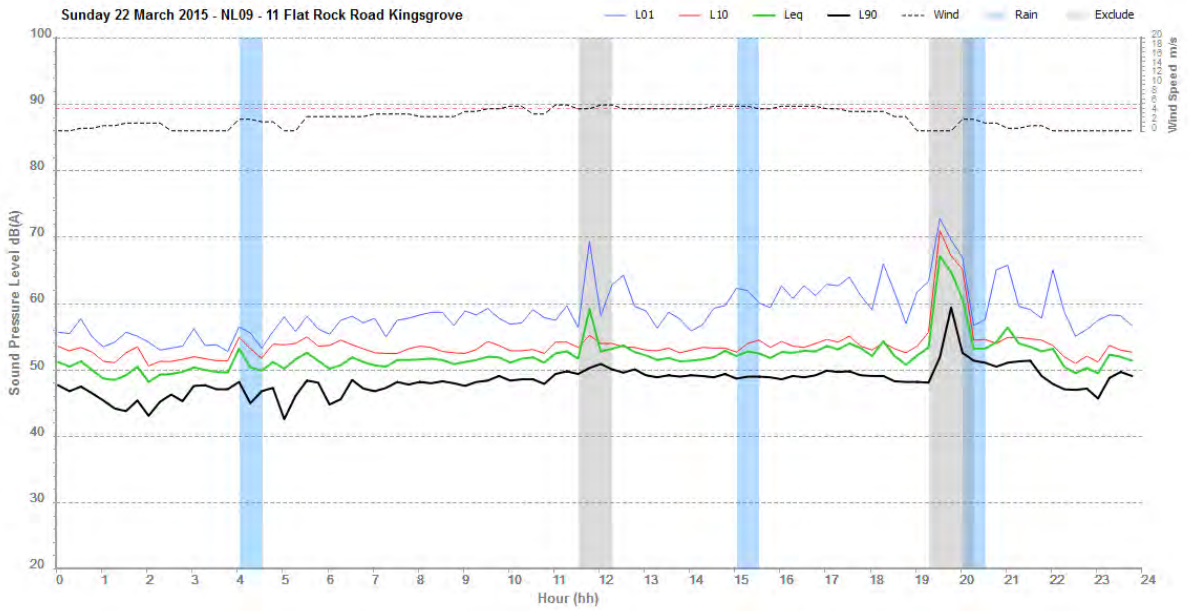

Tuesday 17 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

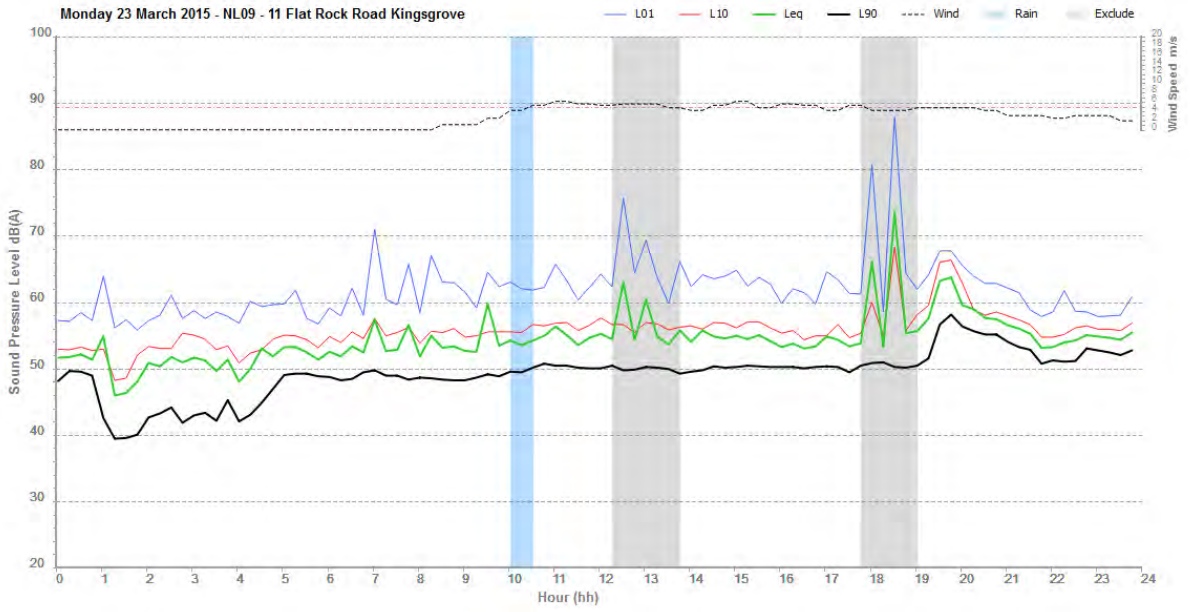

Wednesday 18 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

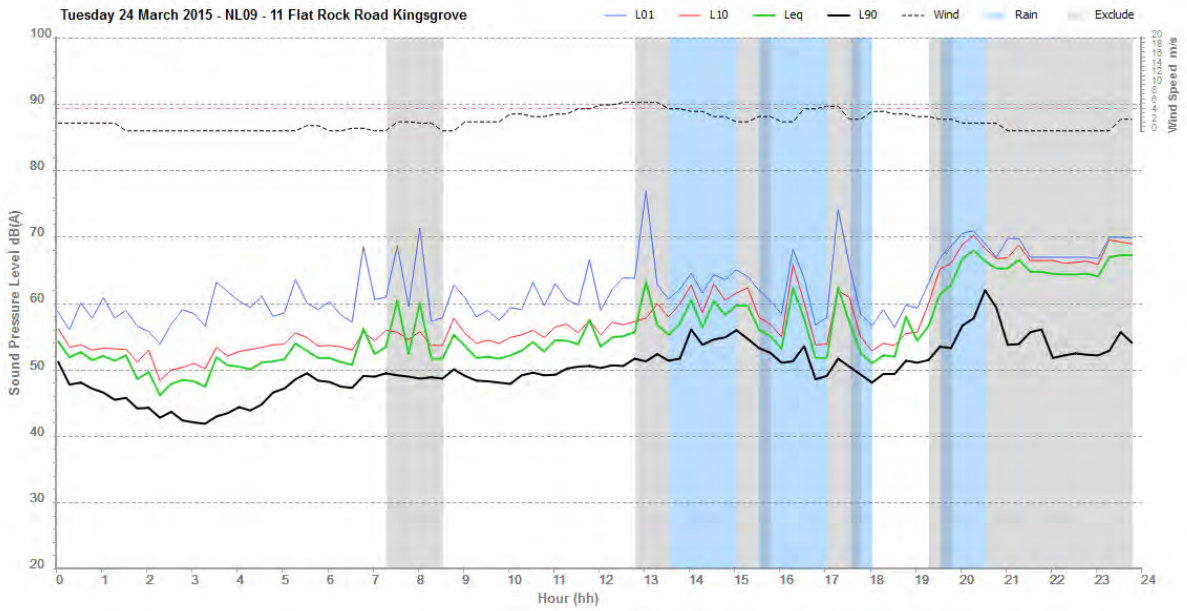

Thursday 19 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

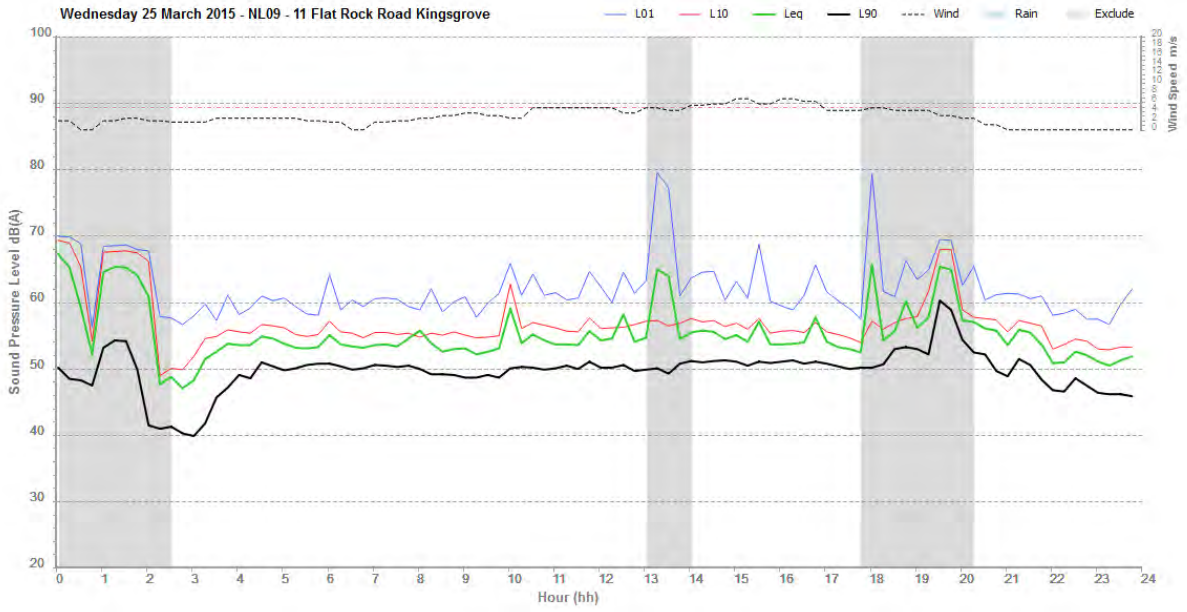

Friday 20 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

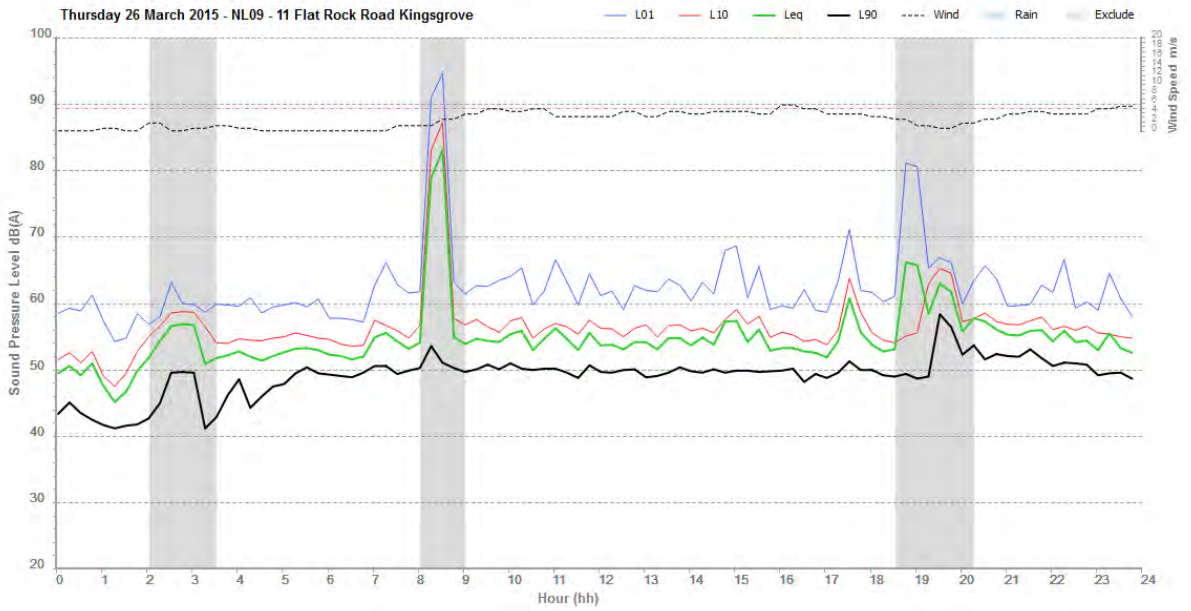

Saturday 21 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

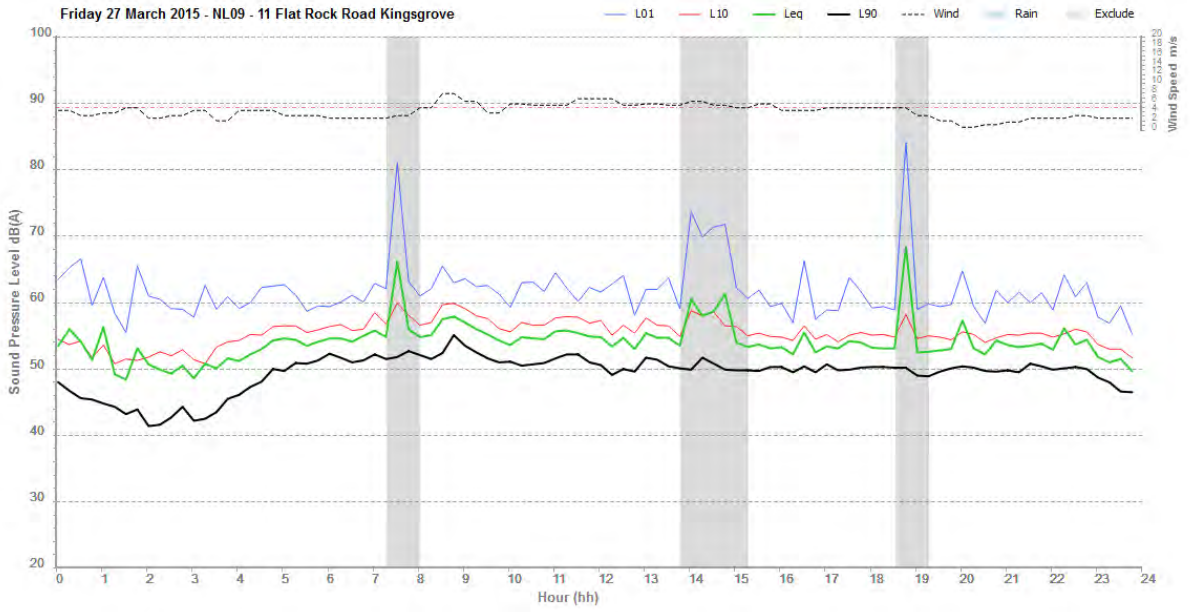

Sunday 22 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

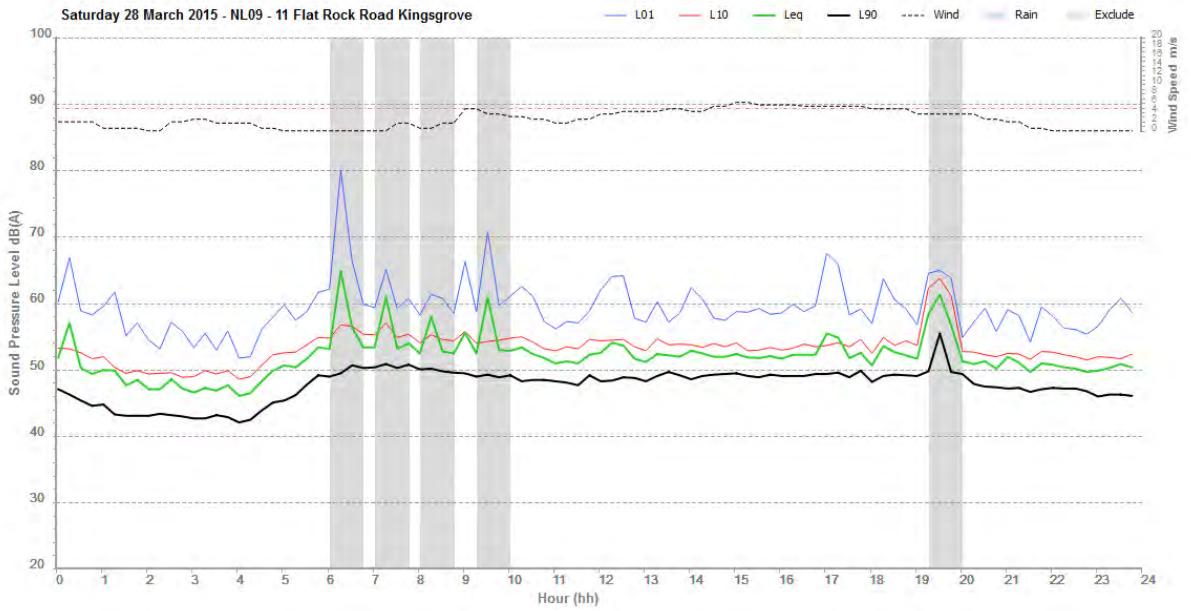

Monday 23 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

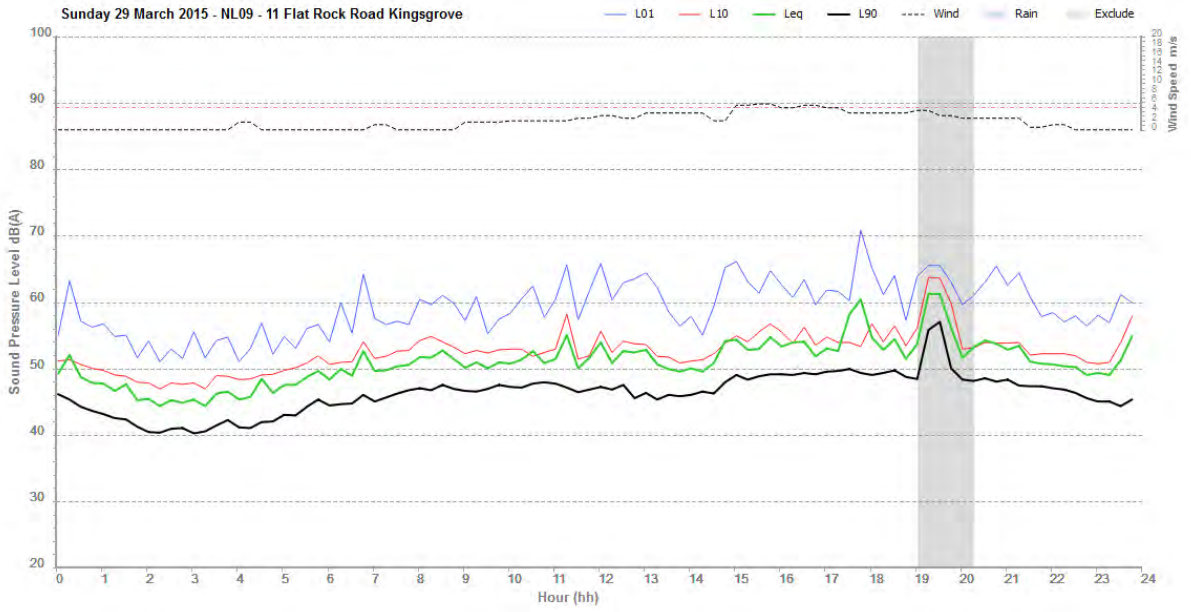

Tuesday 24 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

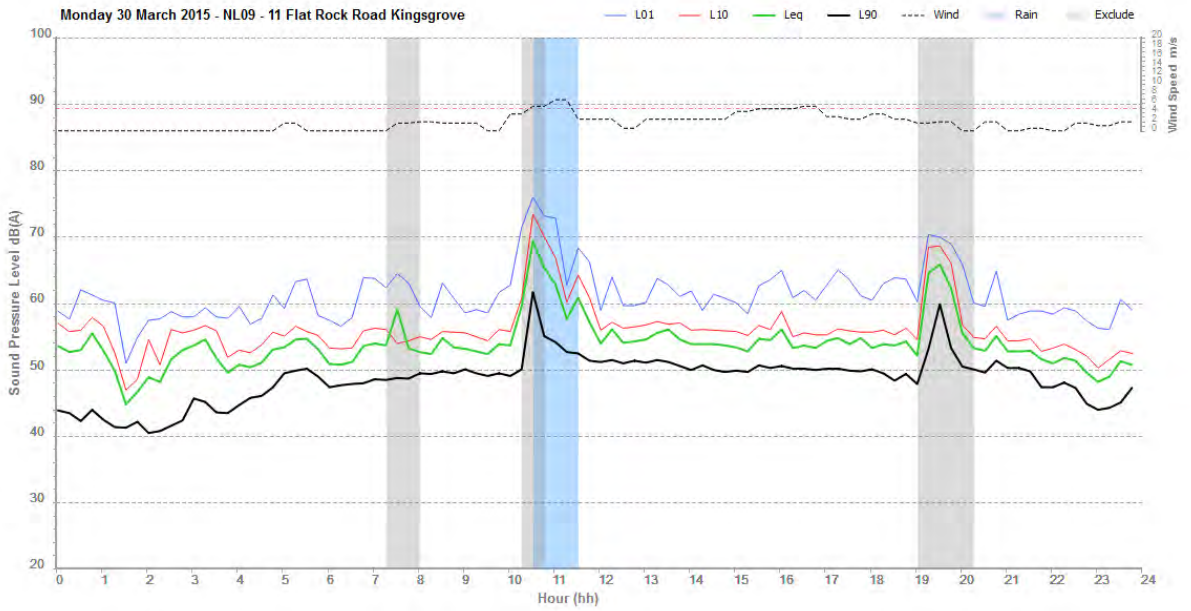

Wednesday 25 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

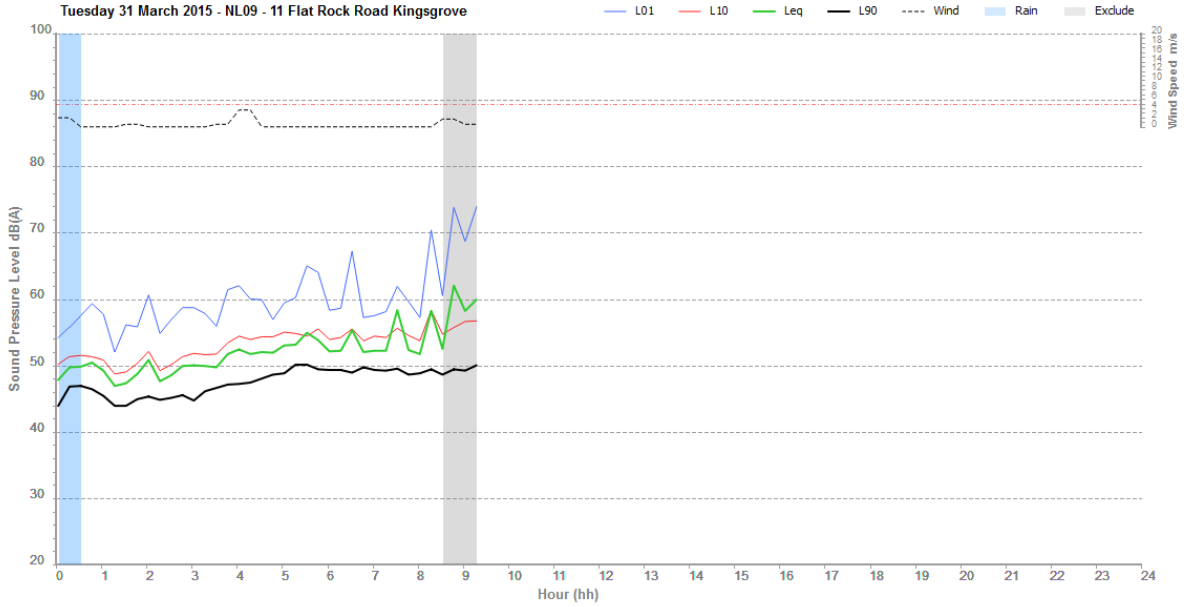

Thursday 26 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

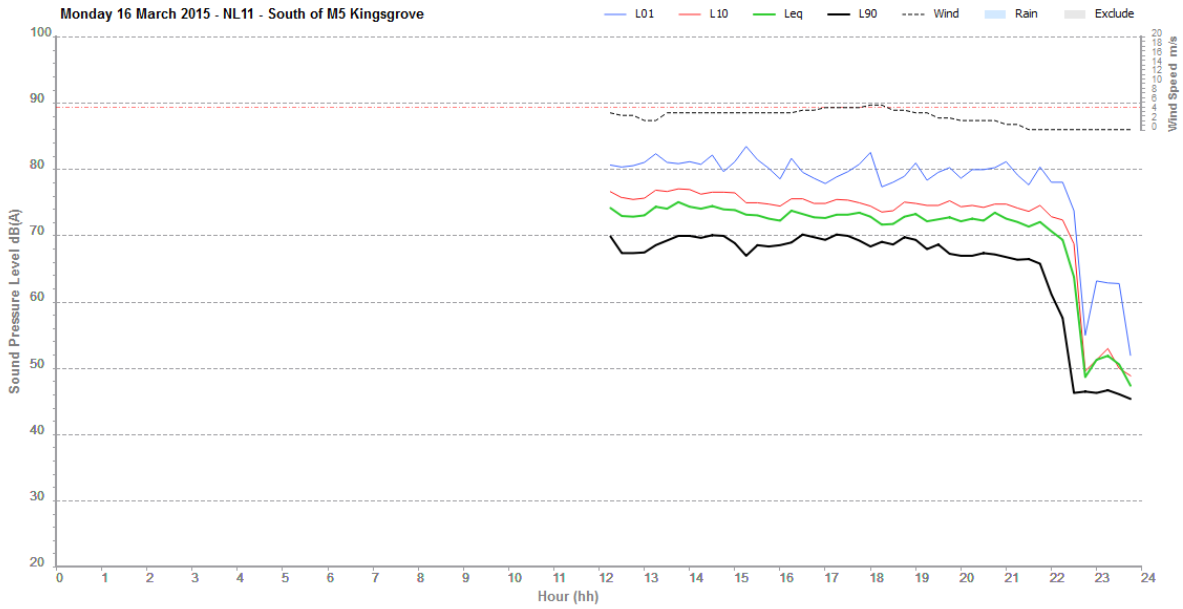

Sunday 29 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

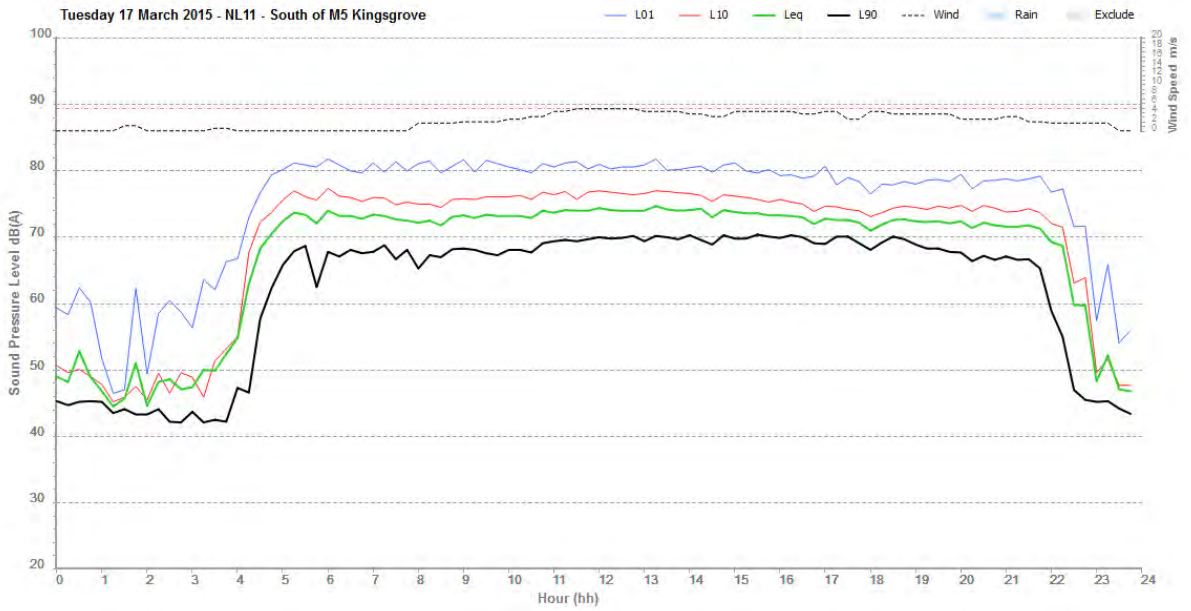

Monday 30 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

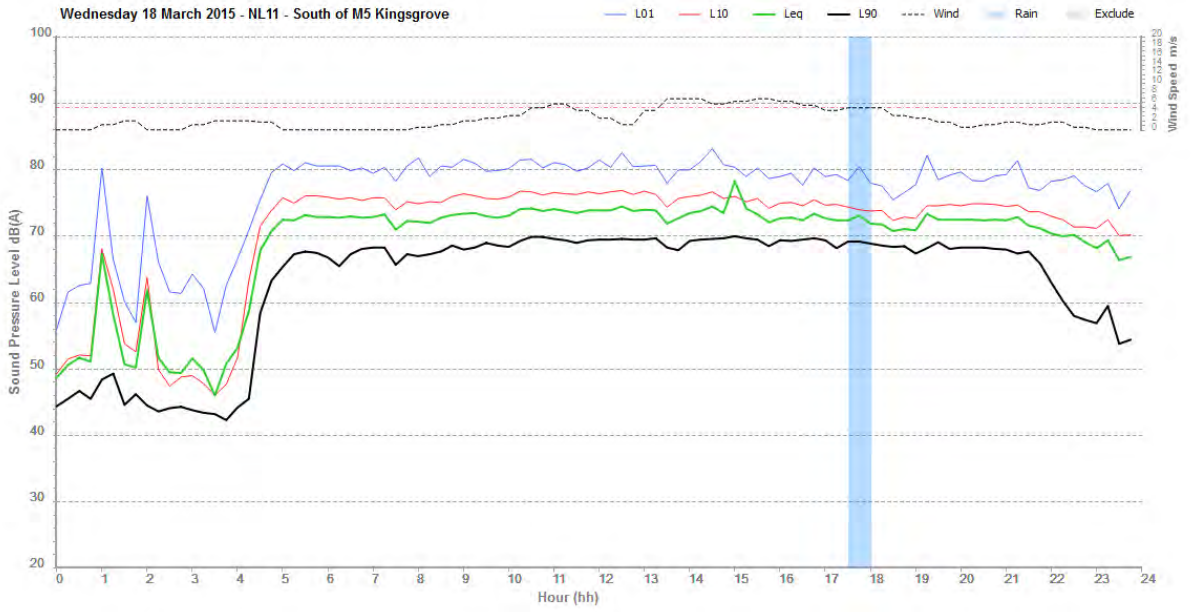

Tuesday 31 March 2015 - NL09 - 11 Flat Rock Road Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

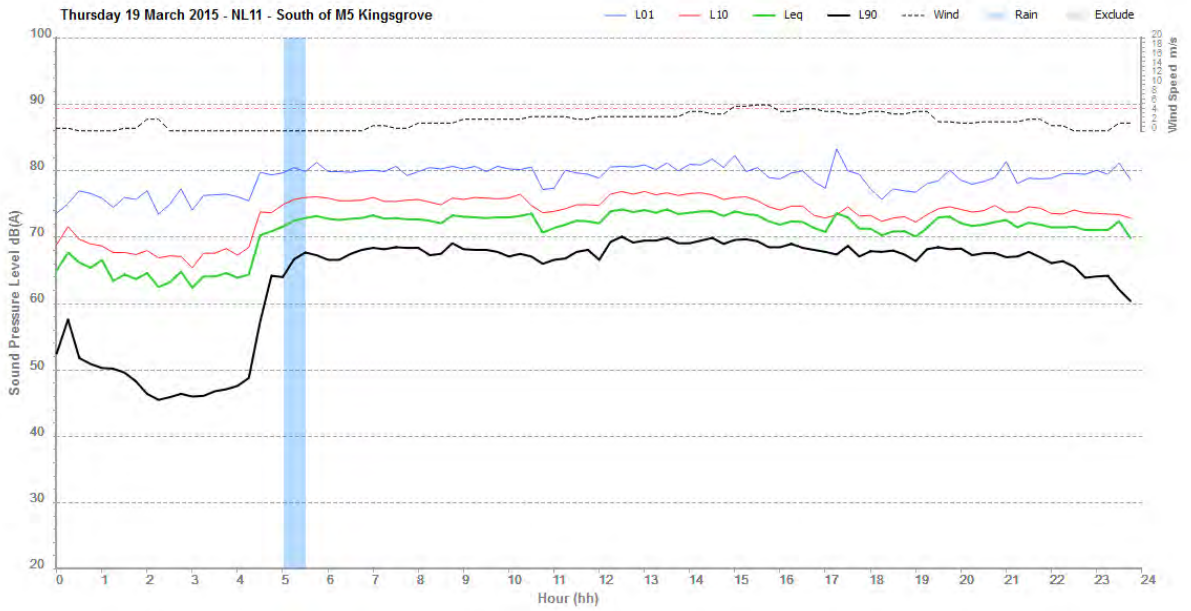
NL11 – South of M5, Kingsgrove – SVAN 957 20665

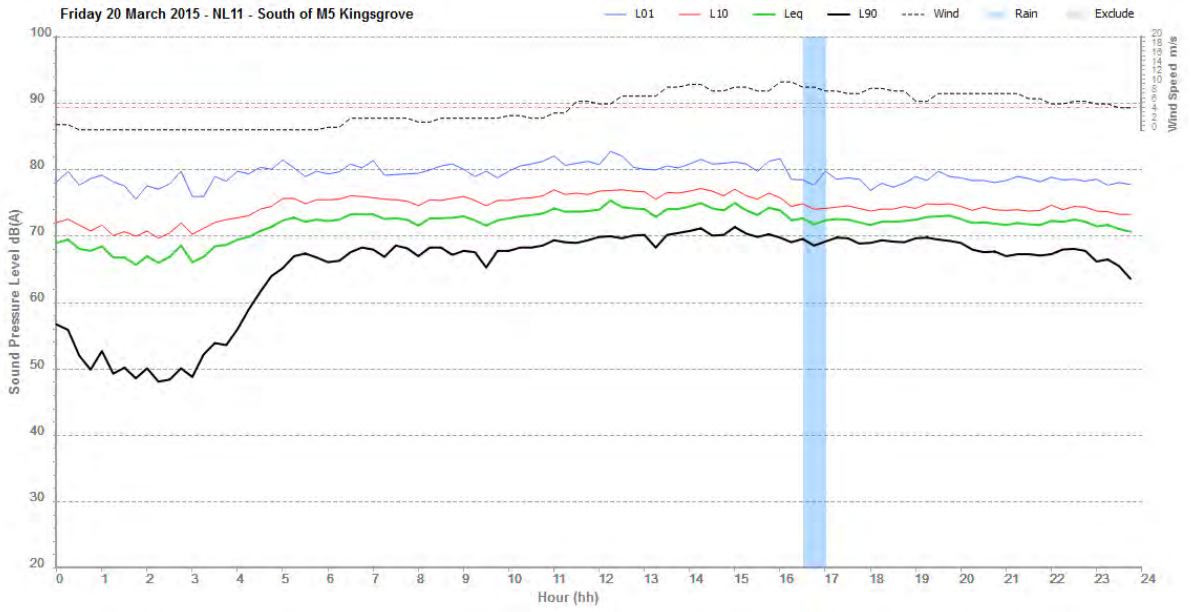


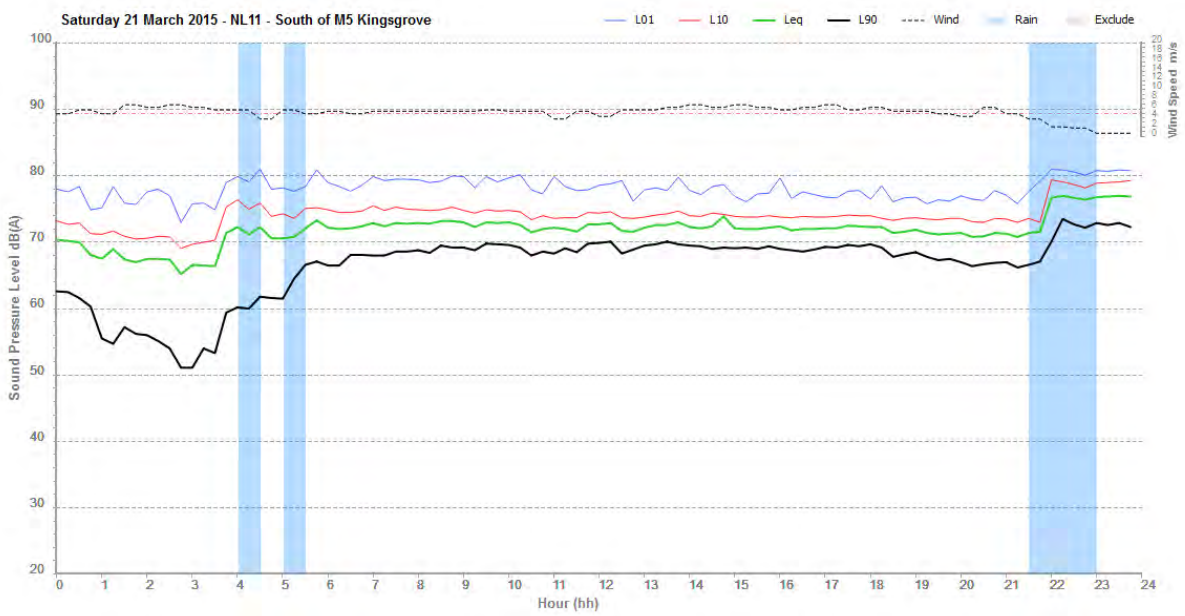


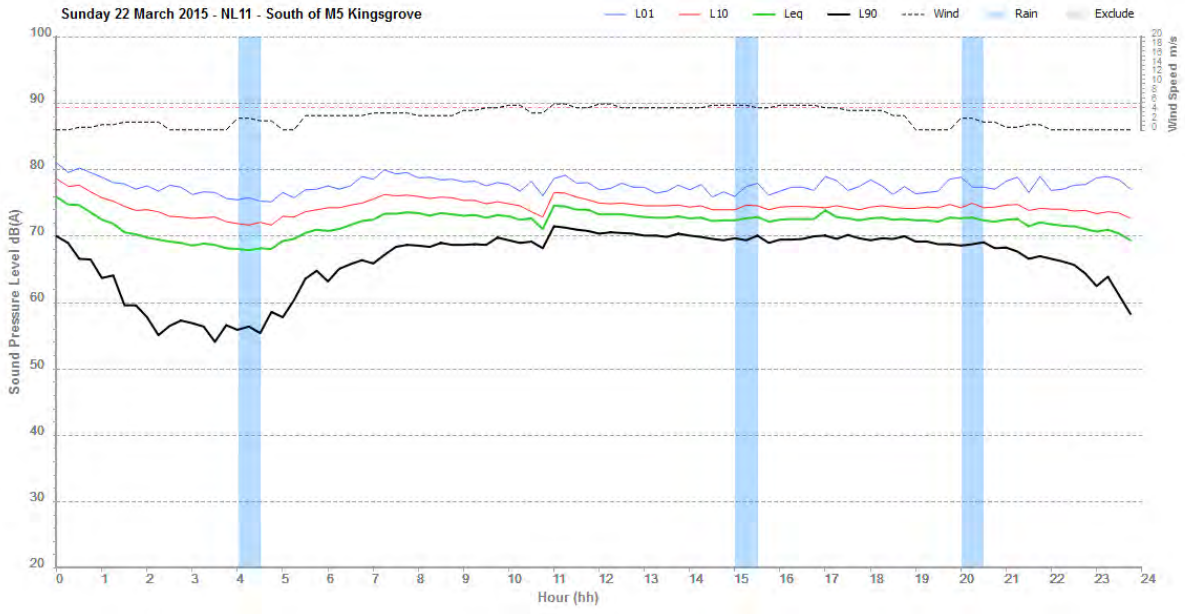

Tuesday 17 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

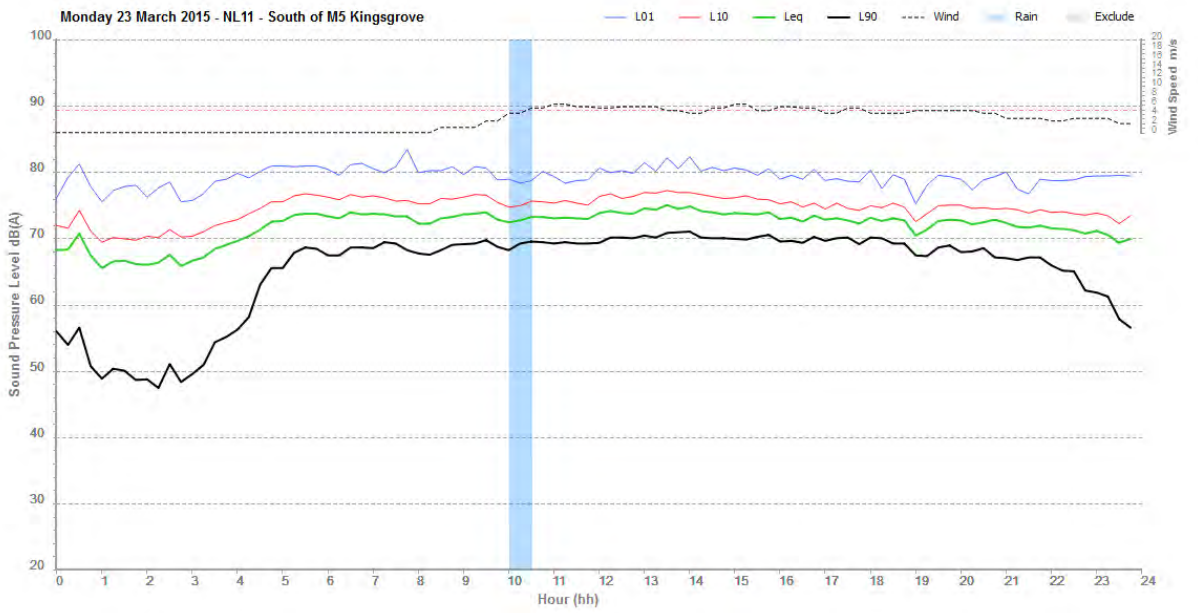

Wednesday 18 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

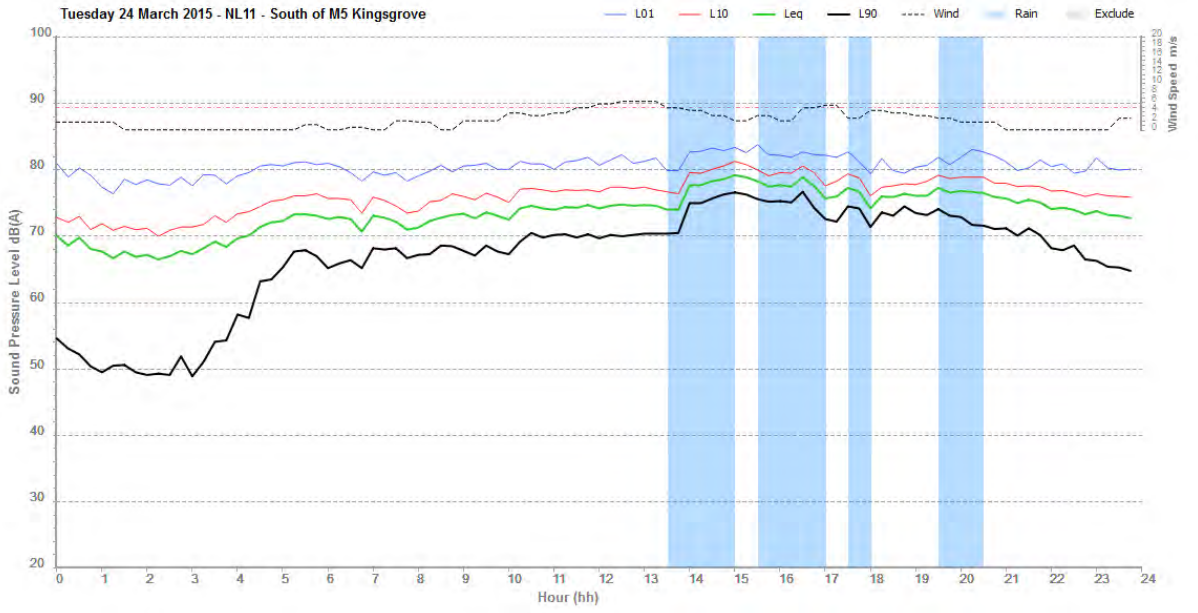

Thursday 19 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

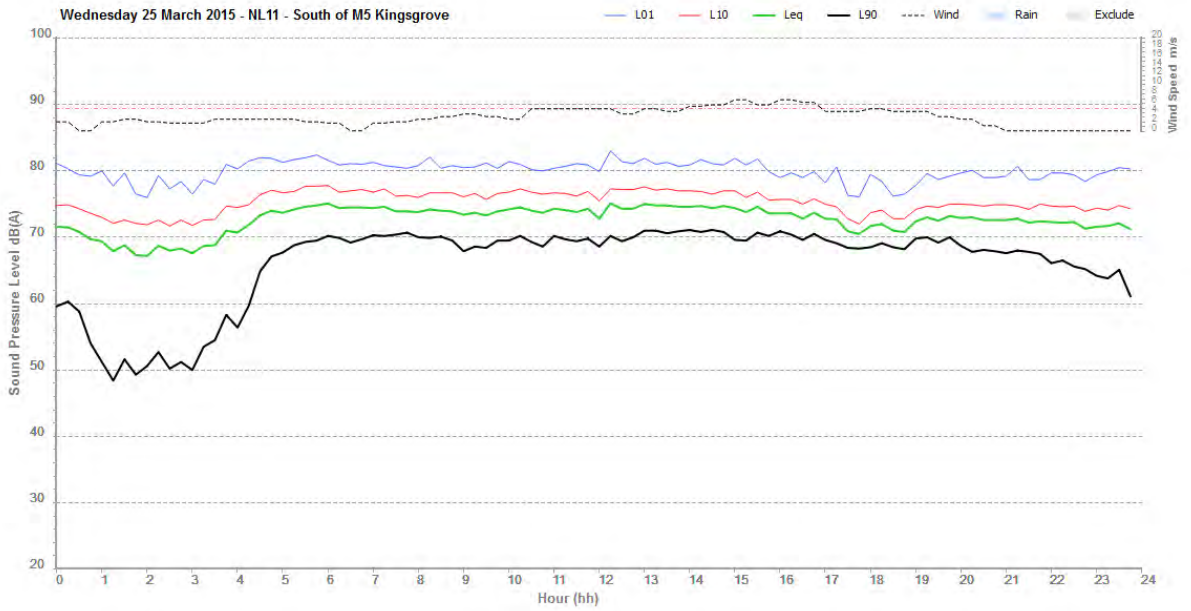

Friday 20 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

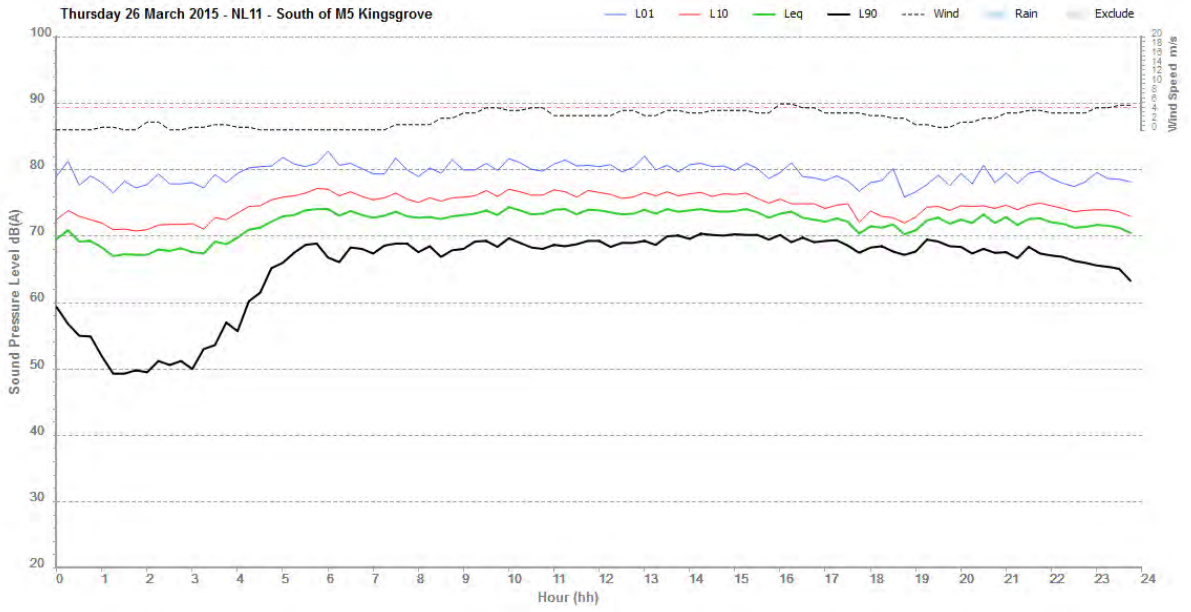

Saturday 21 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

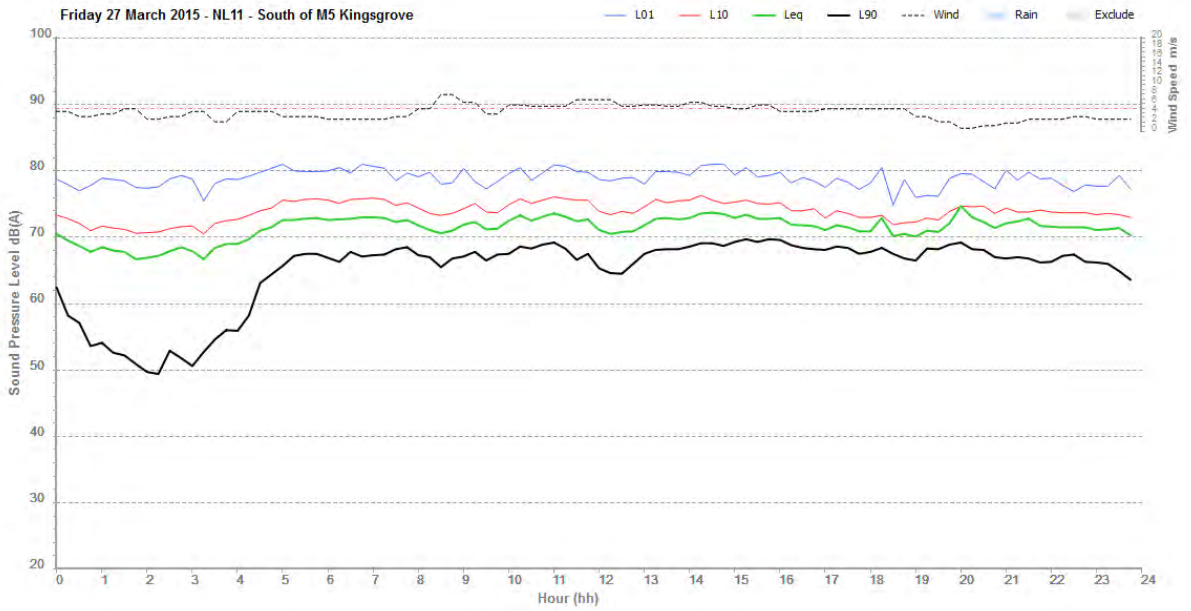

Sunday 22 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

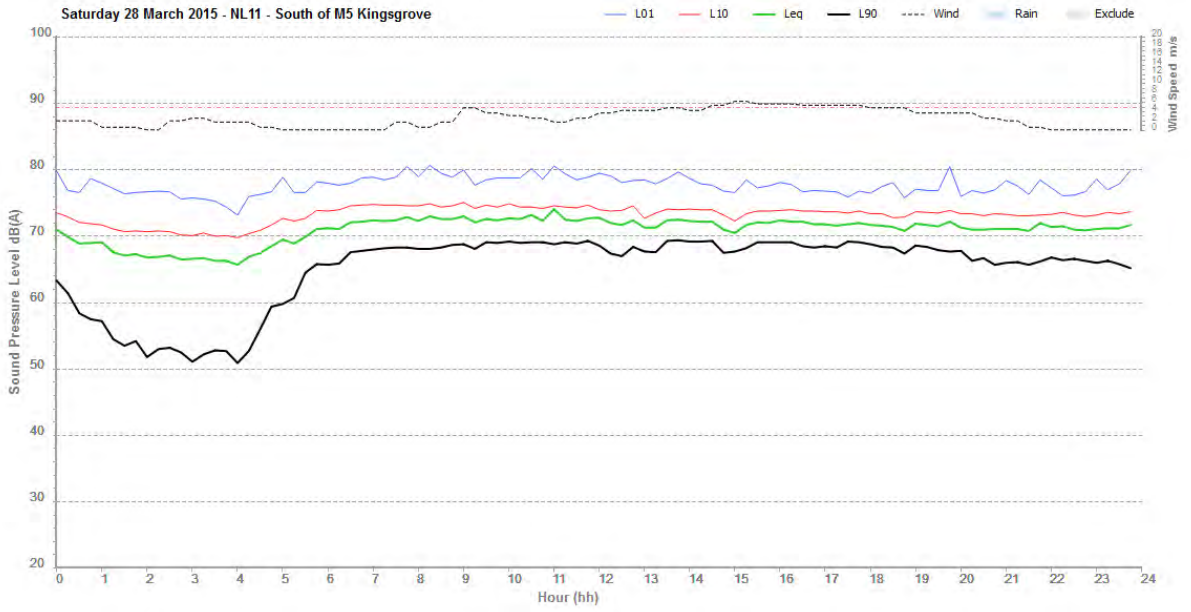

Monday 23 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

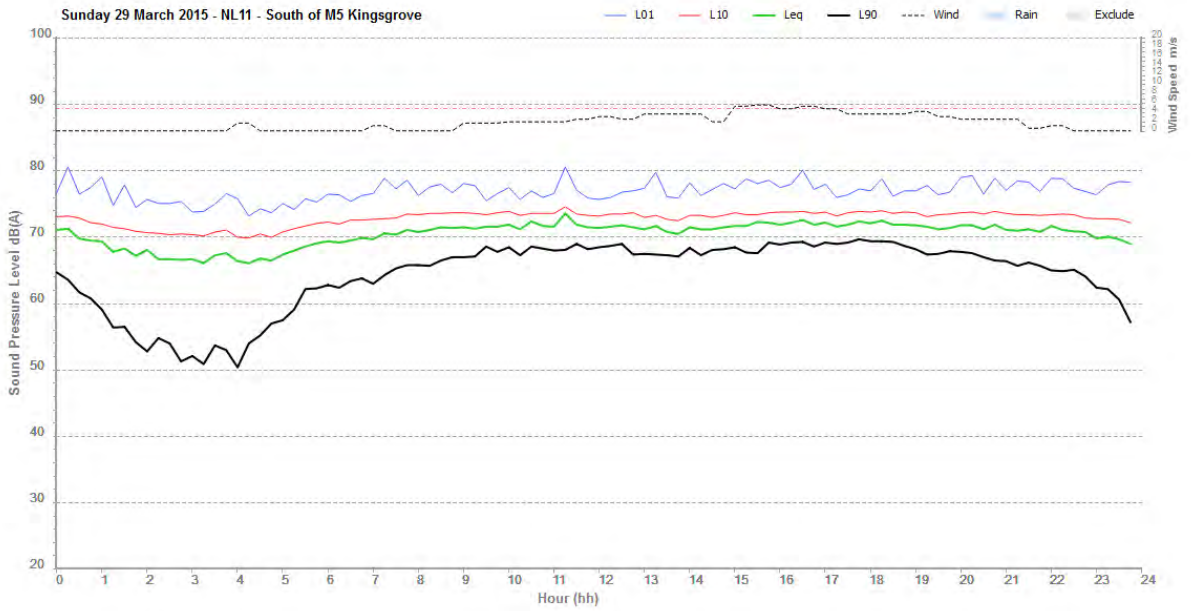

Tuesday 24 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

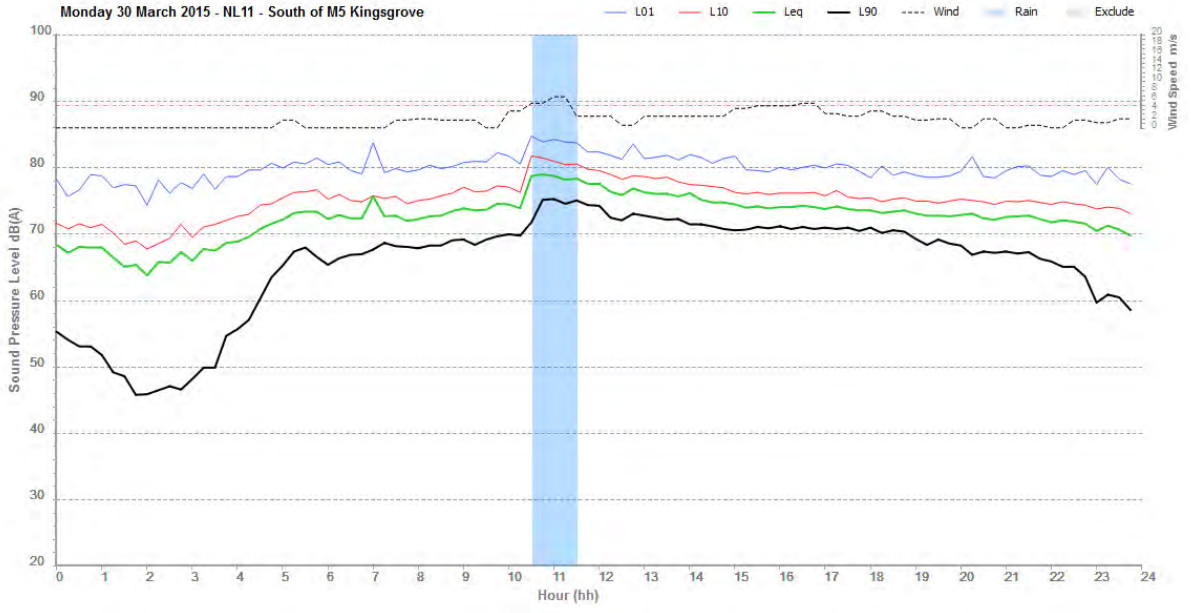

Wednesday 25 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

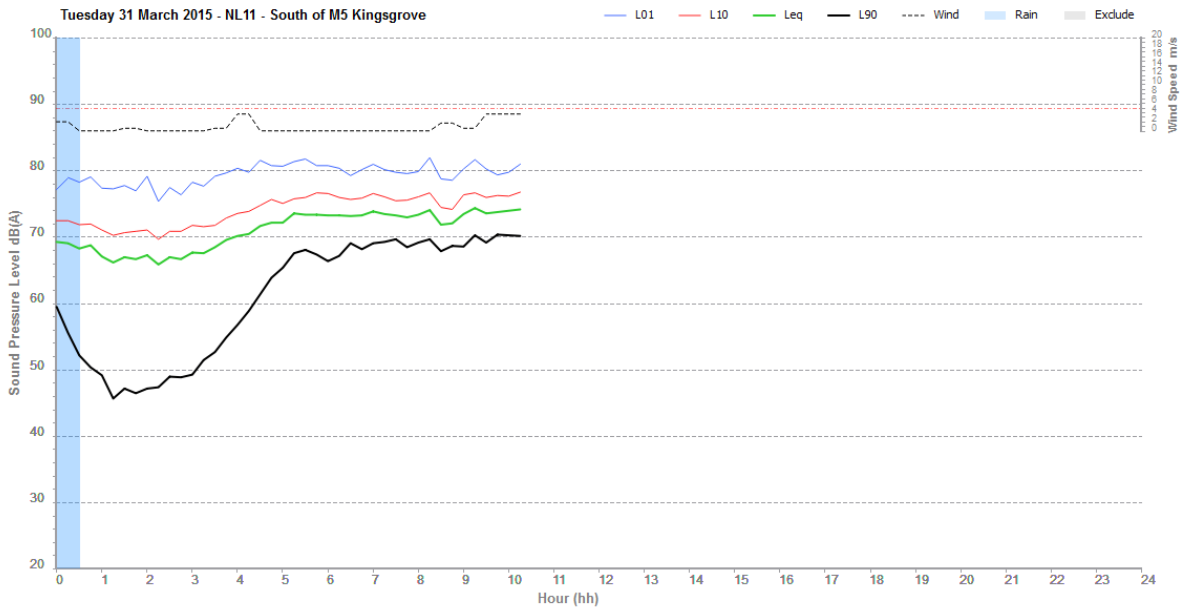

Thursday 26 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

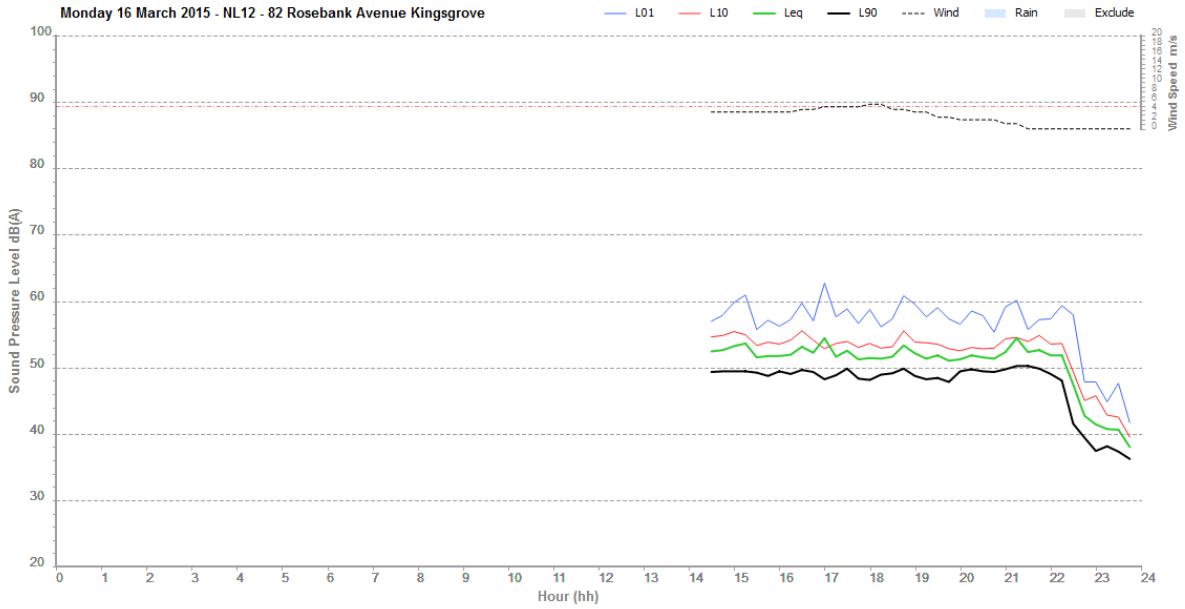

Sunday 29 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

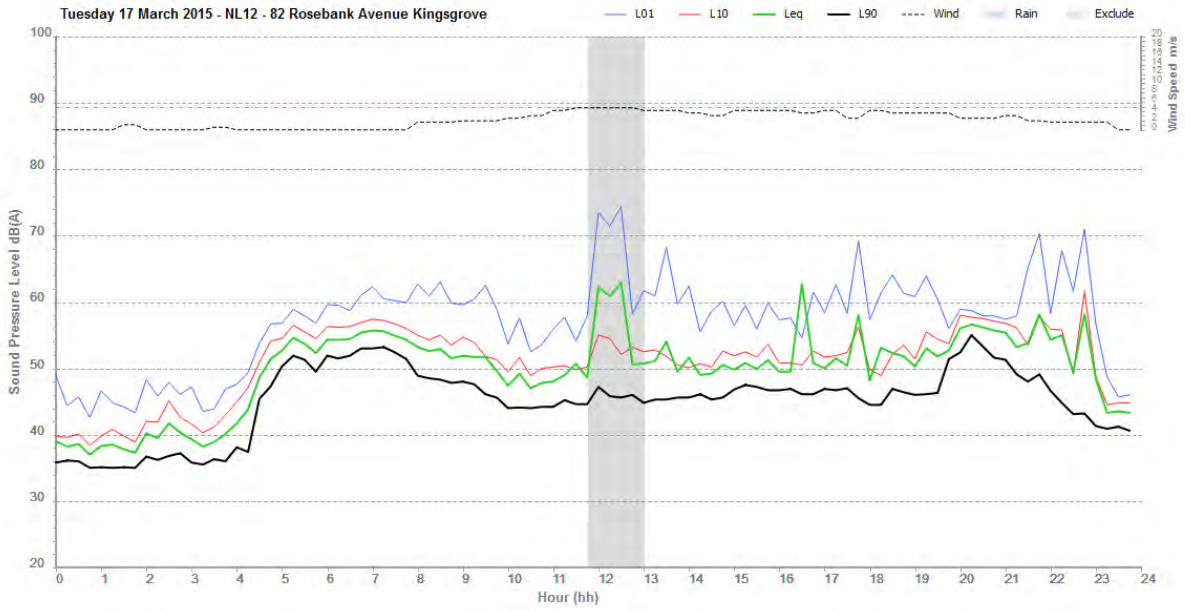

Monday 30 March 2015 - NL11 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

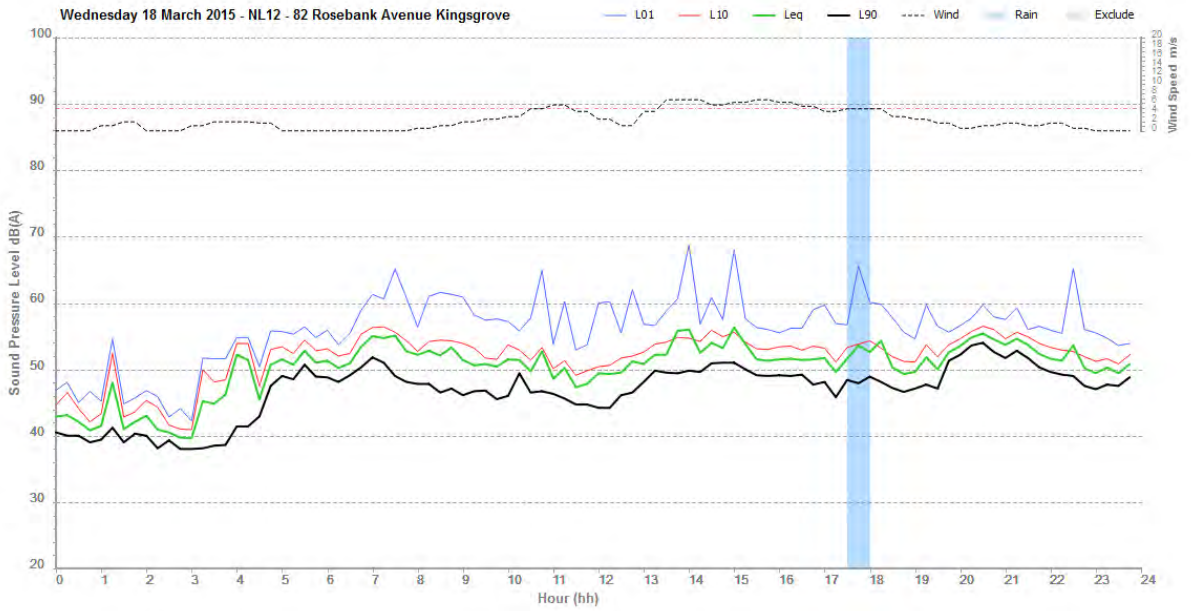


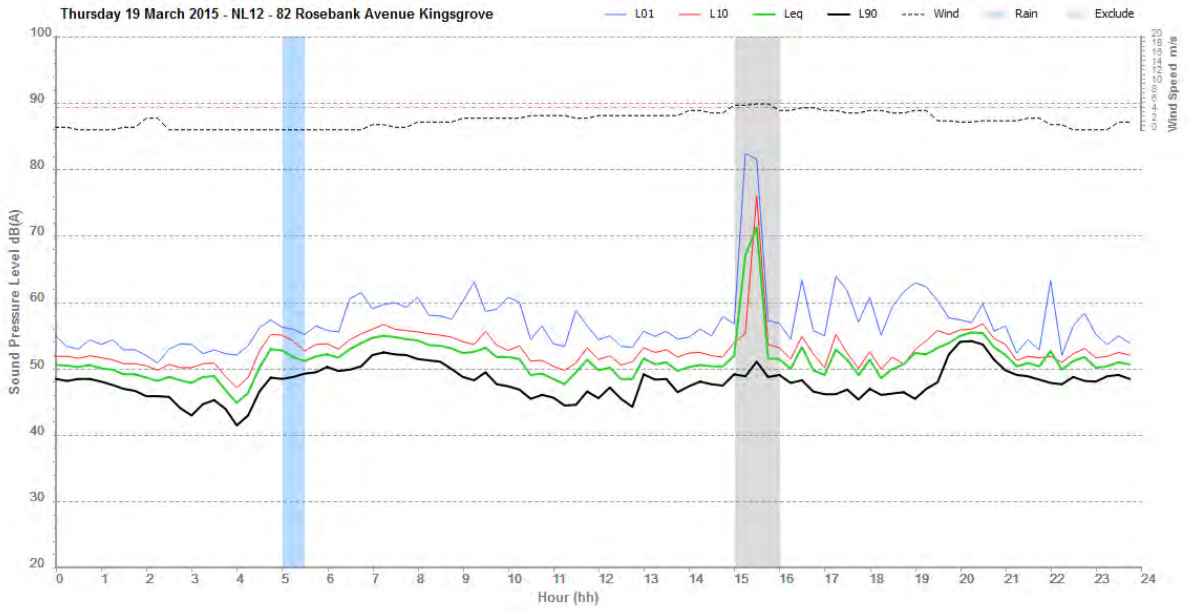
NL12 – 82 Rosebank Avenue, Kingsgrove – SVAN 957 20670

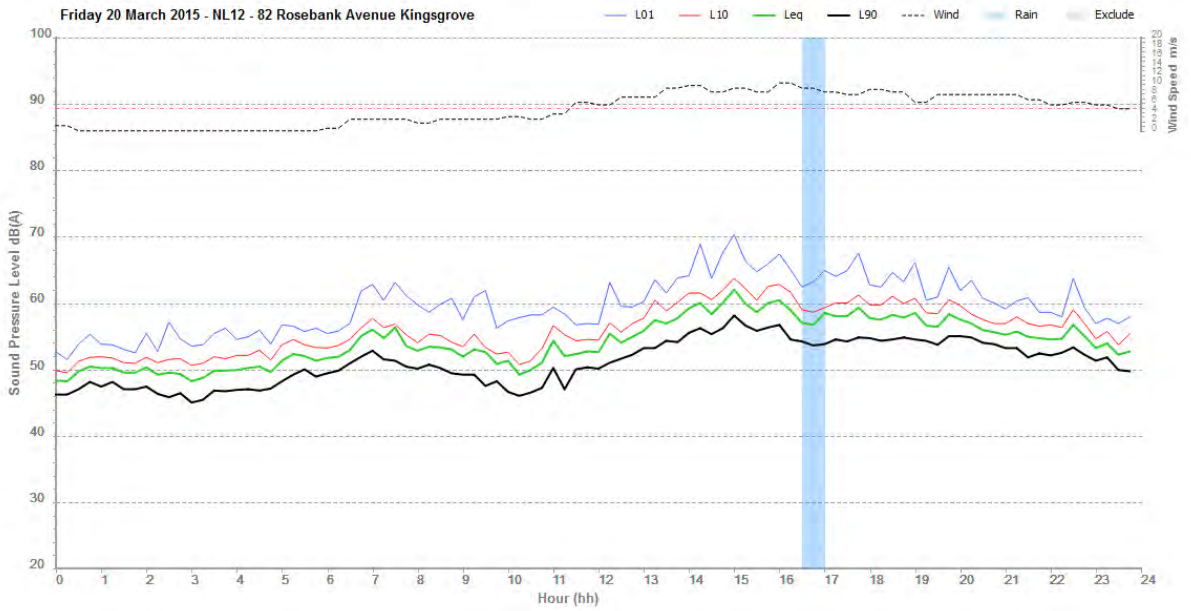


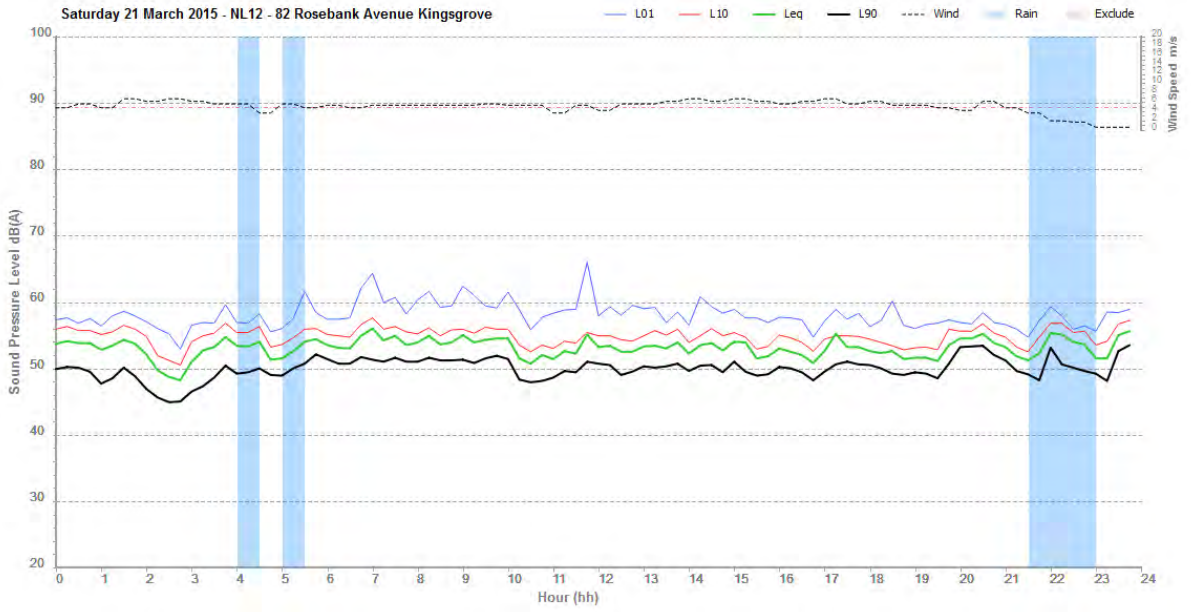

Monday 16 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

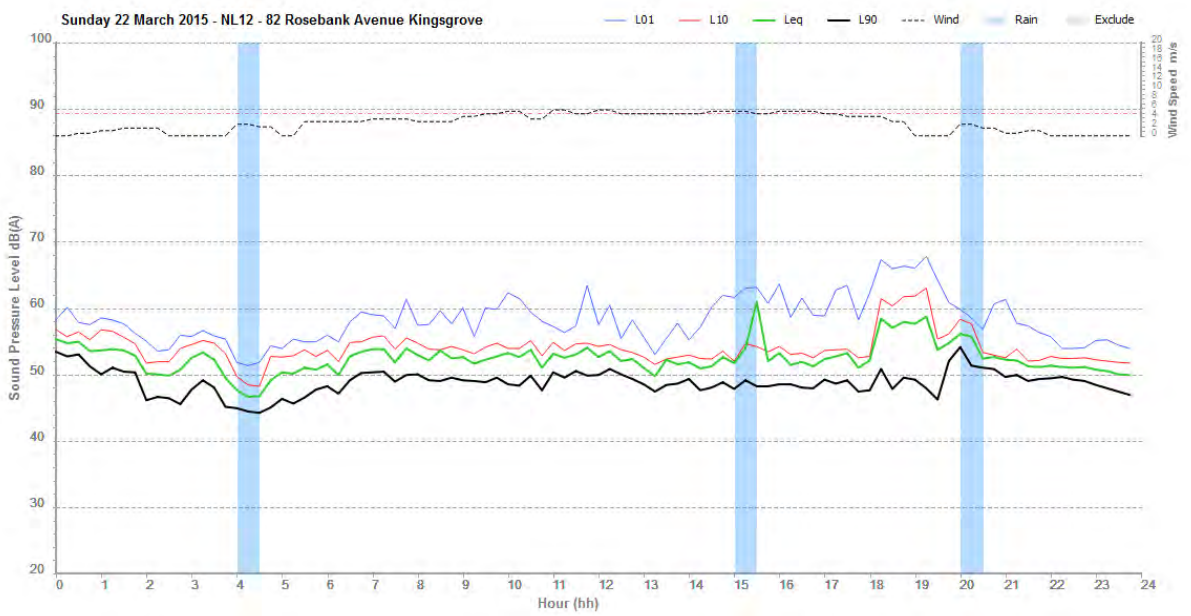

Tuesday 17 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

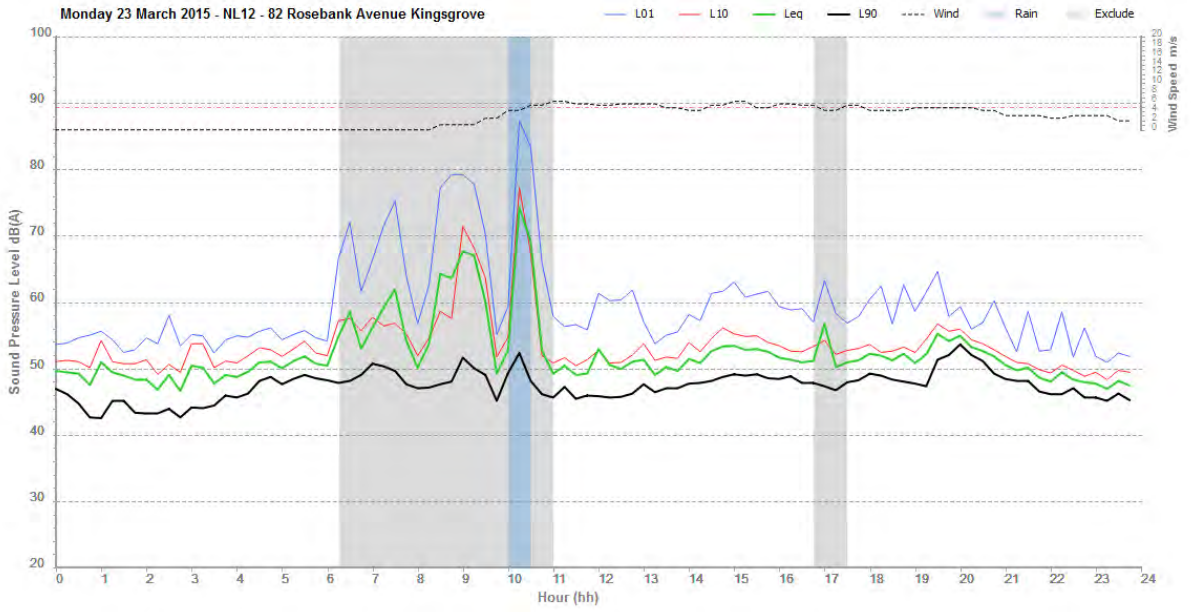

Wednesday 18 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

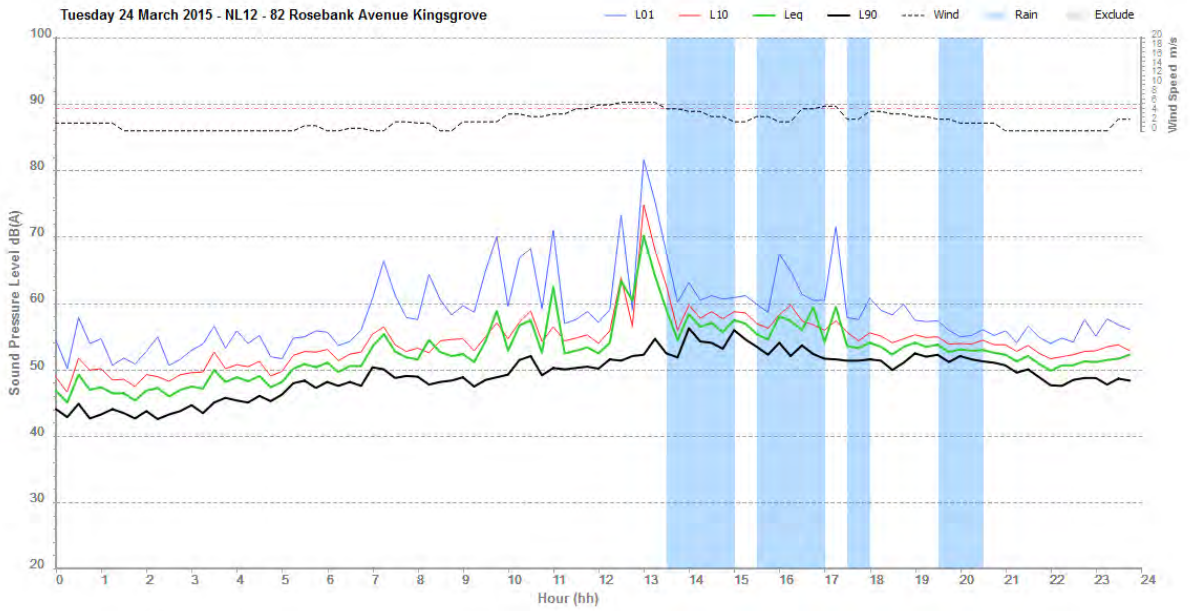

Thursday 19 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

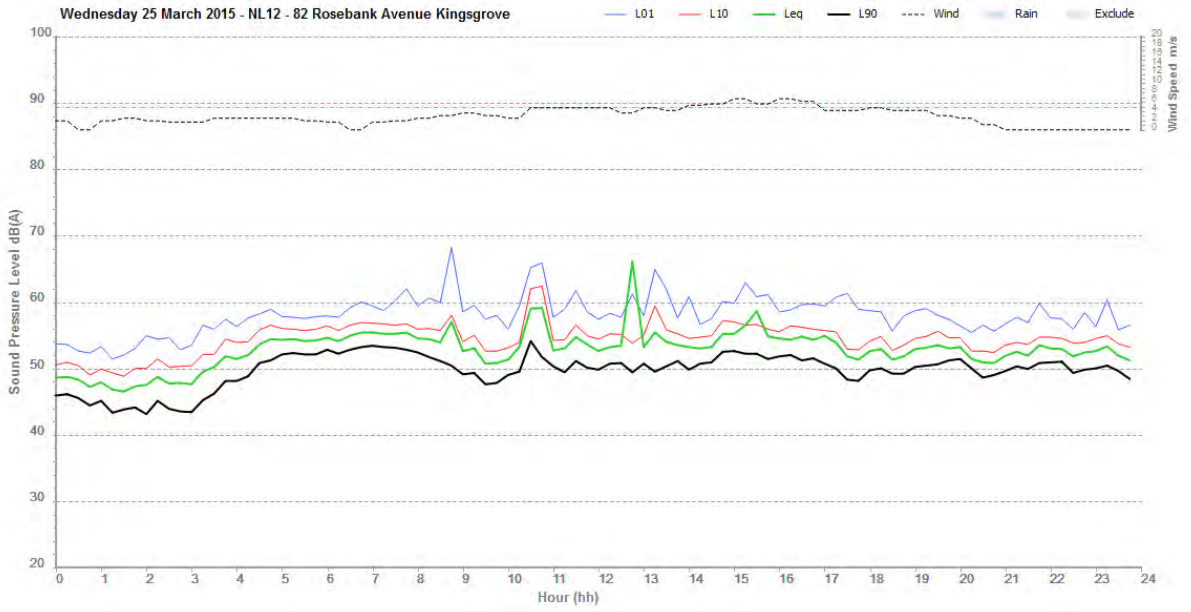

Friday 20 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

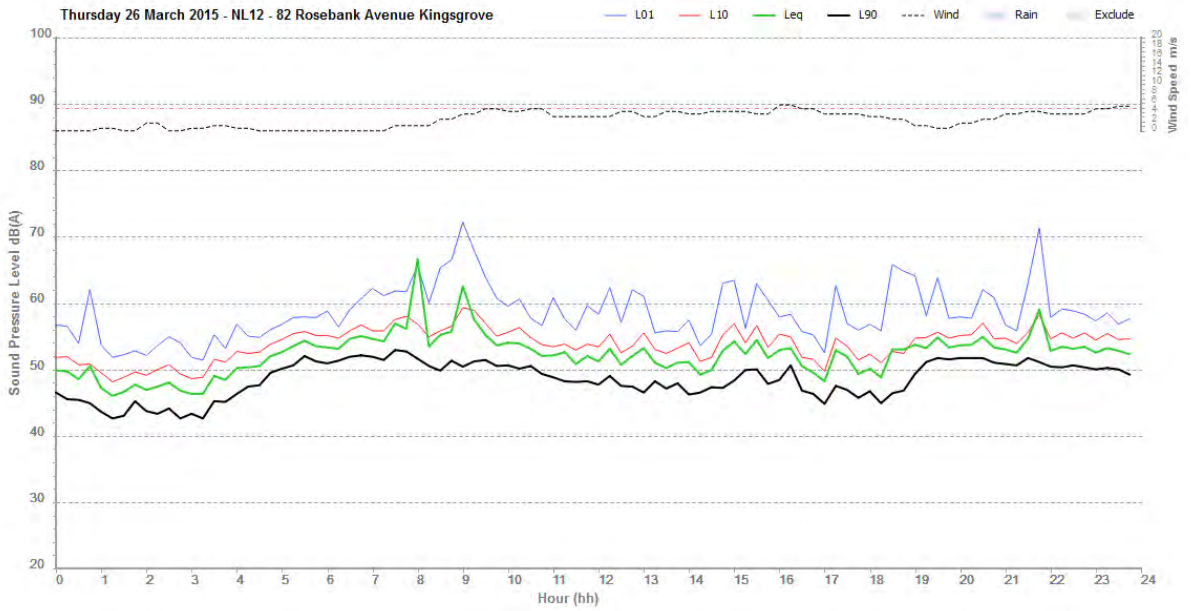

Saturday 21 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

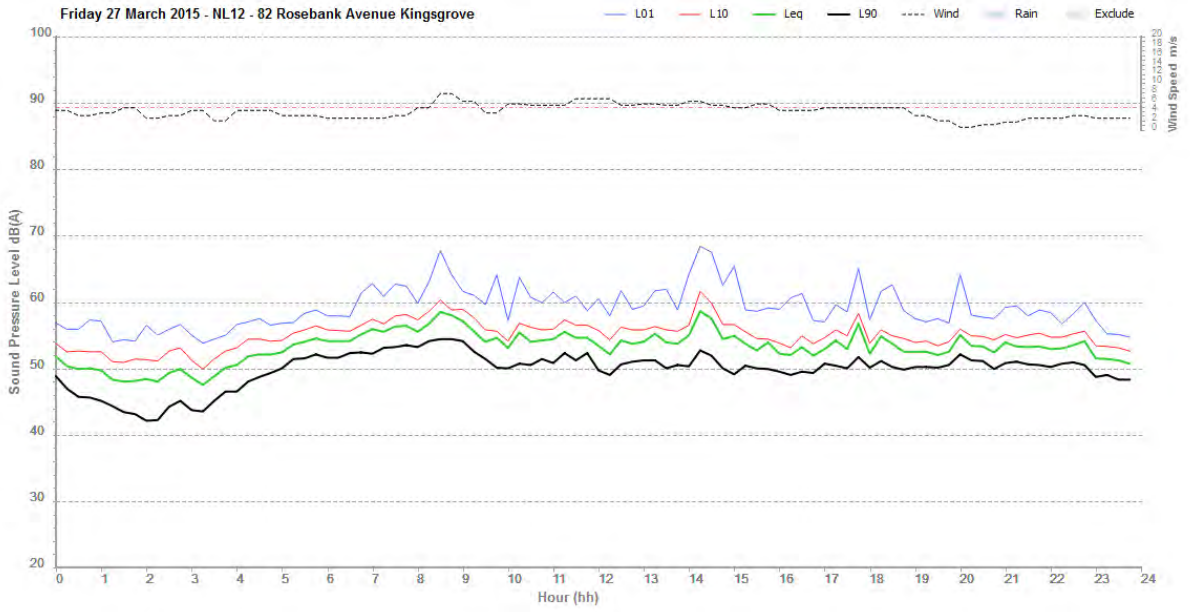

Sunday 22 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

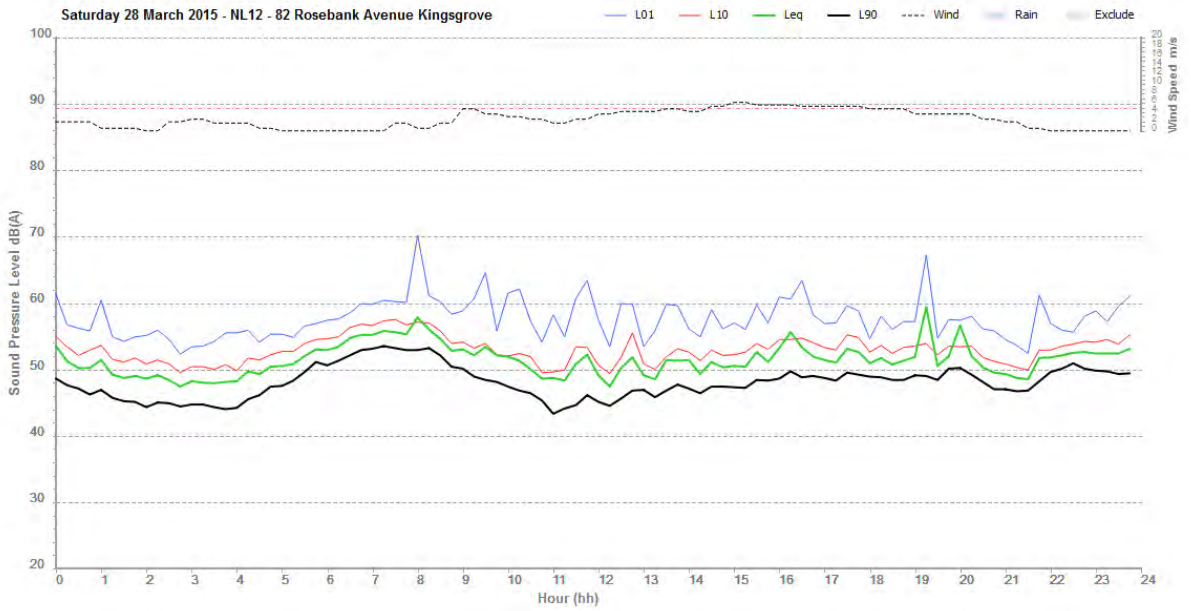

Monday 23 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

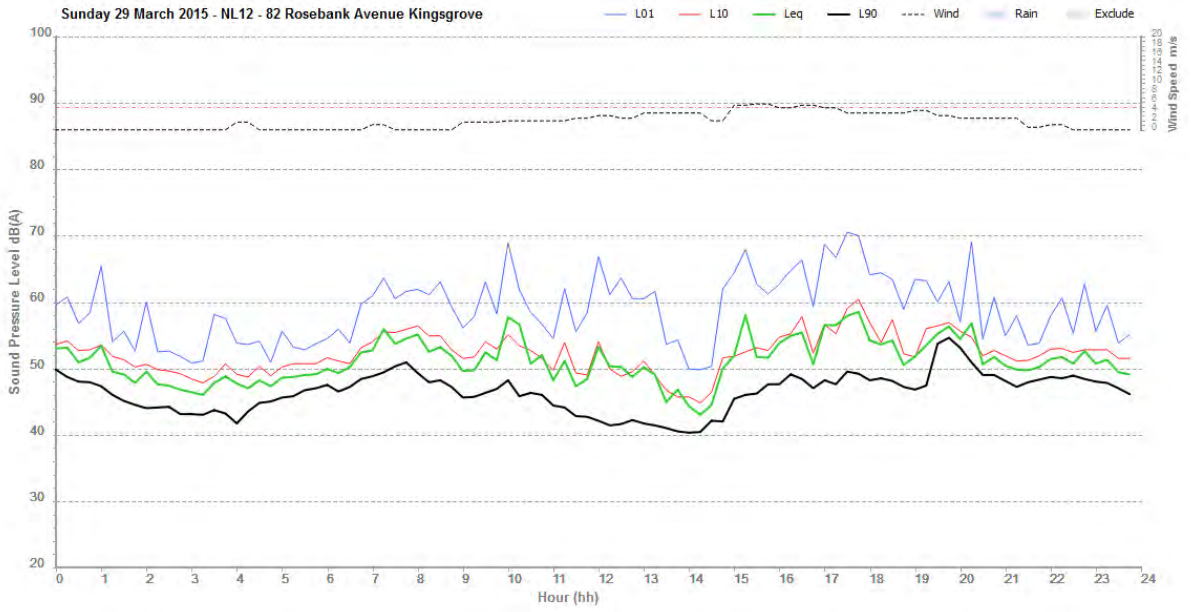

Tuesday 24 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

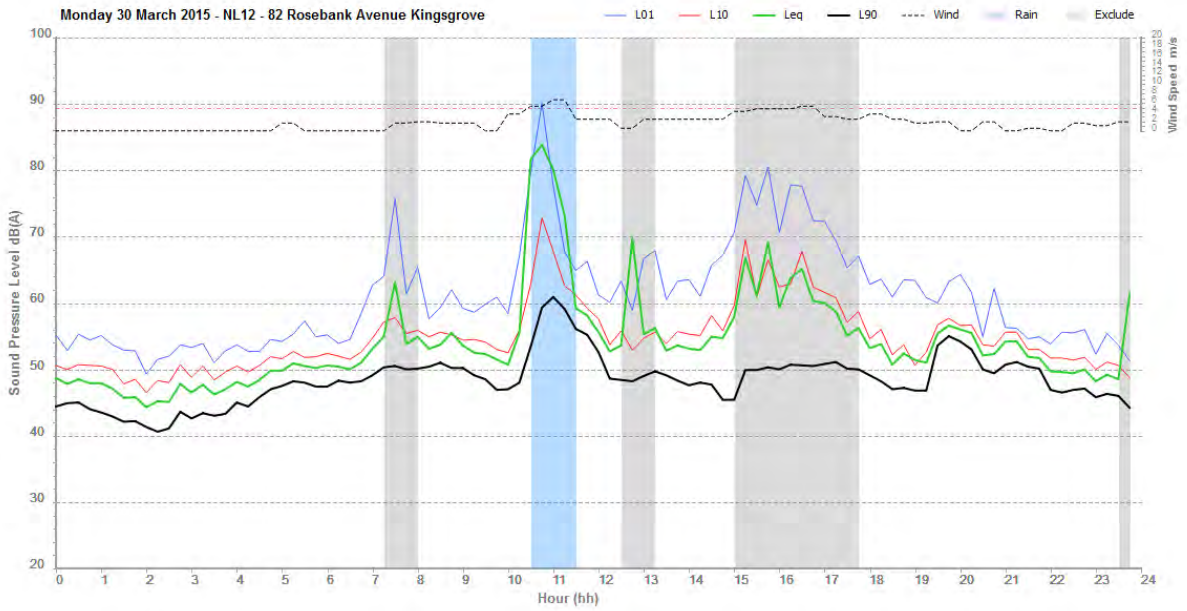

Wednesday 25 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

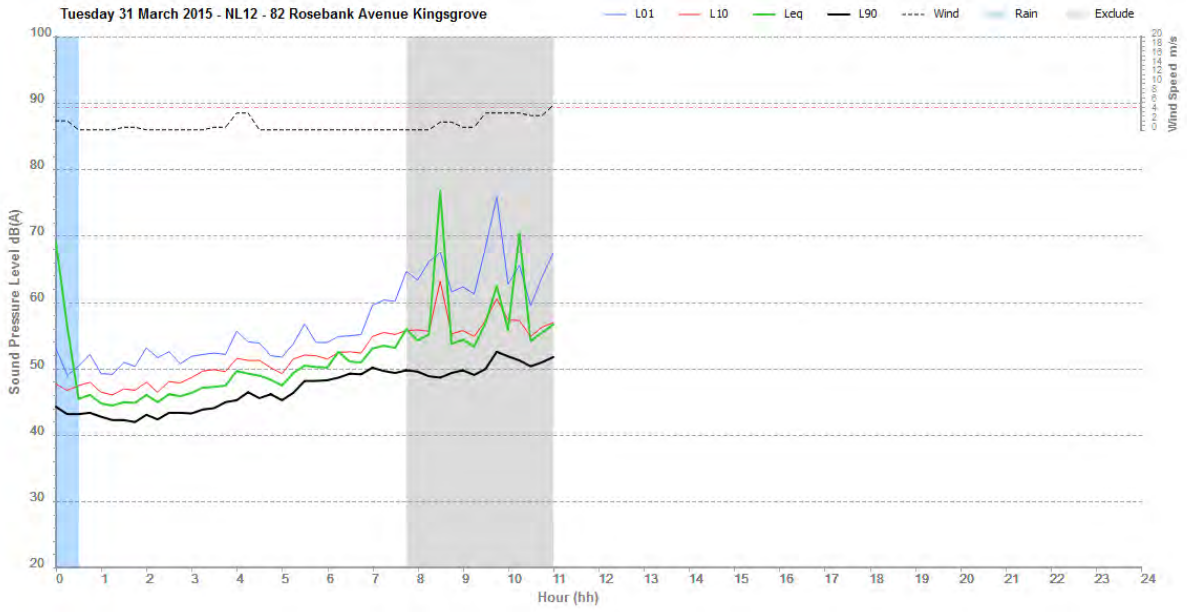

Thursday 26 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

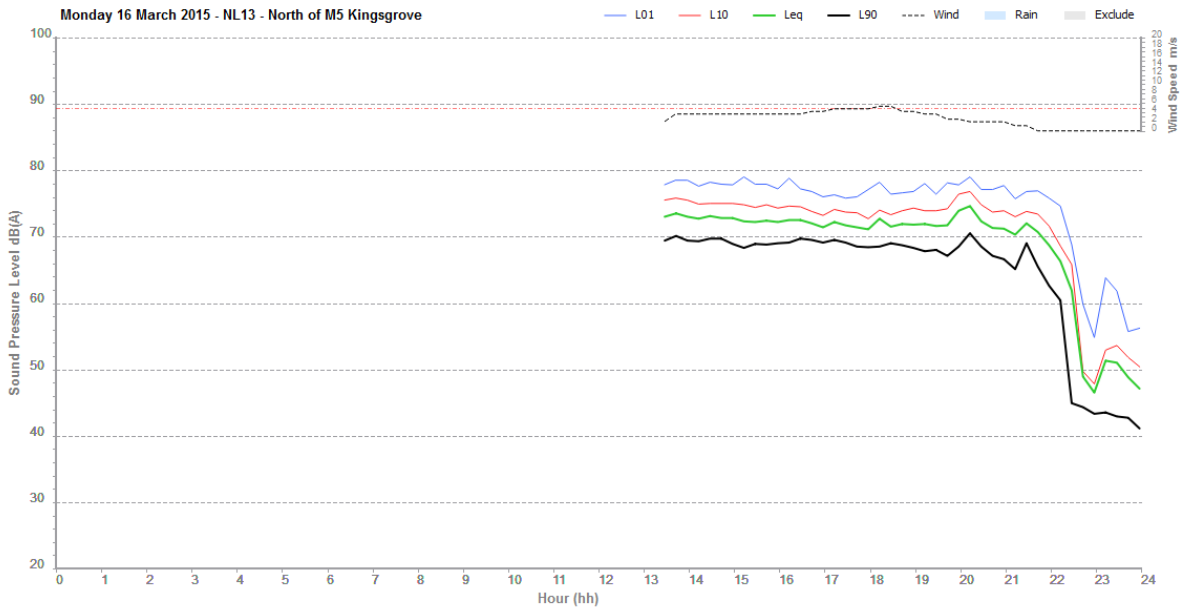

Sunday 29 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

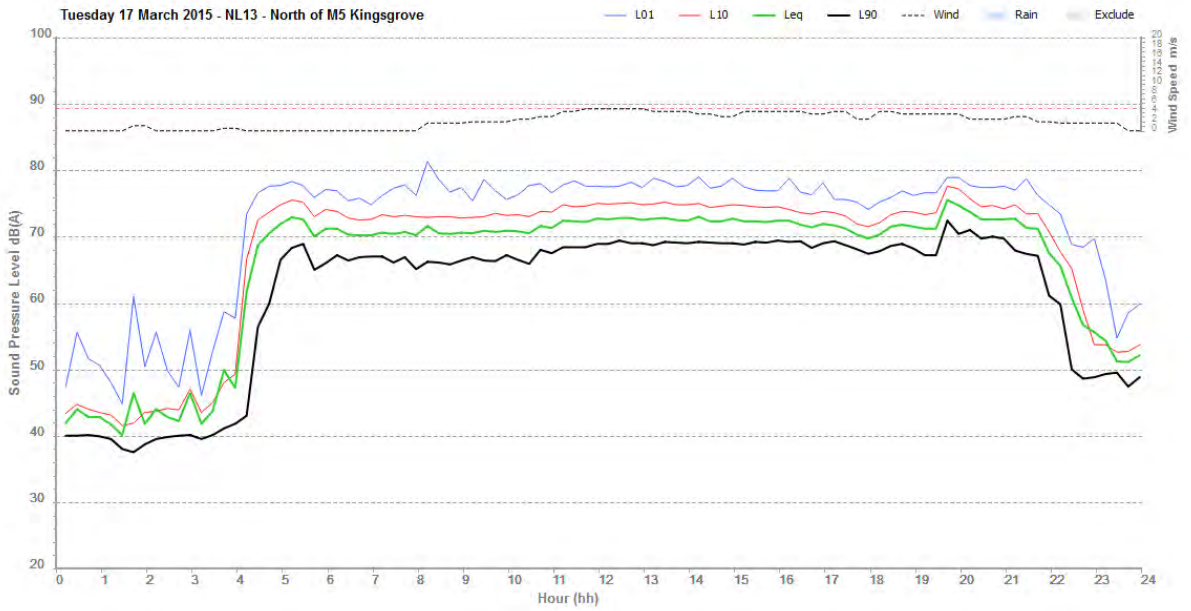

Monday 30 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

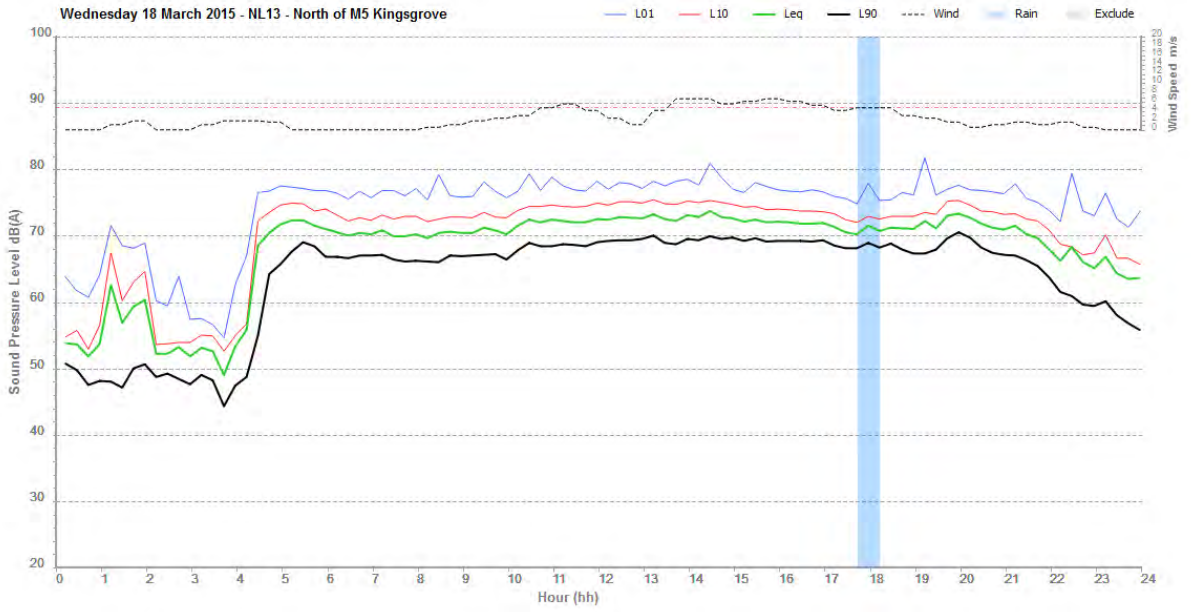

Tuesday 31 March 2015 - NL12 - 82 Rosebank Avenue Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

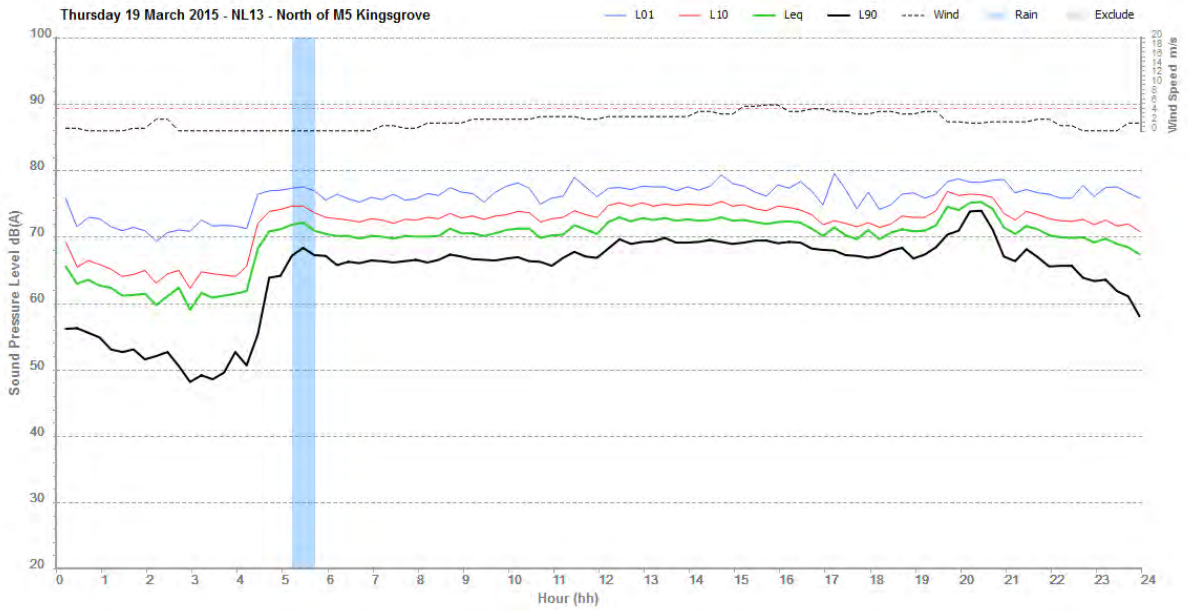
NL13 – North of M5, Kingsgrove – SVAN 957 – 23243

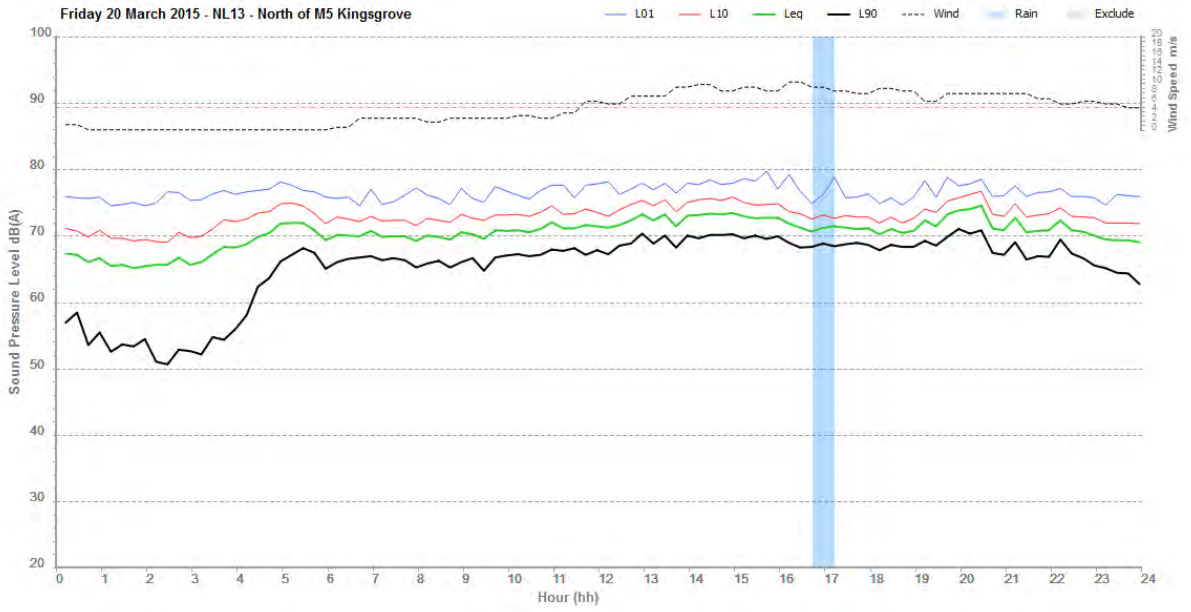


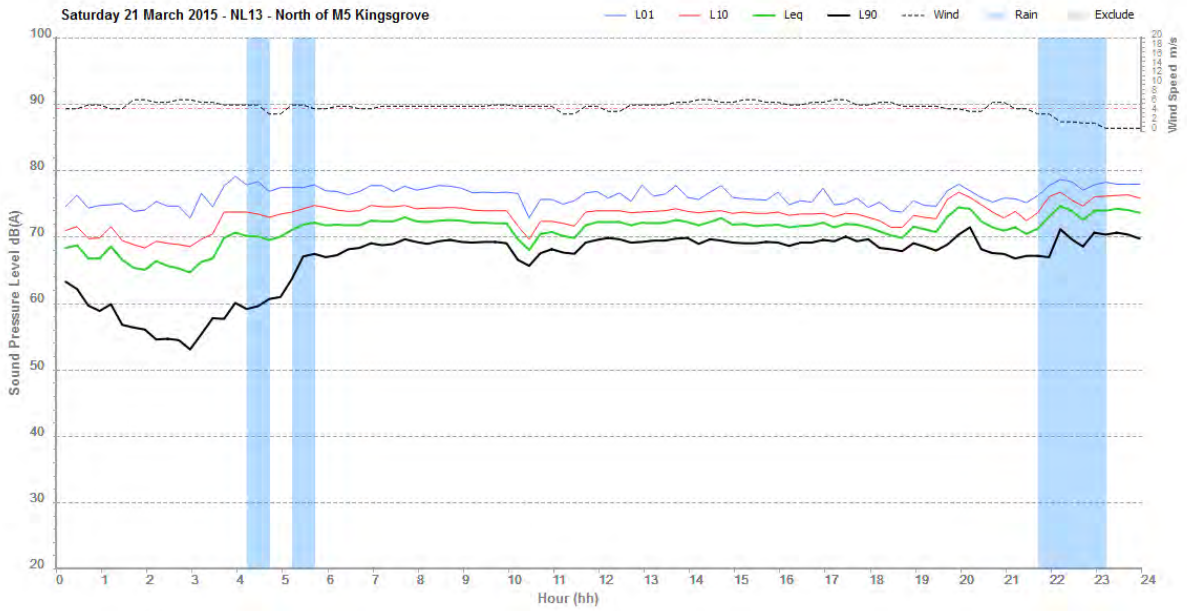


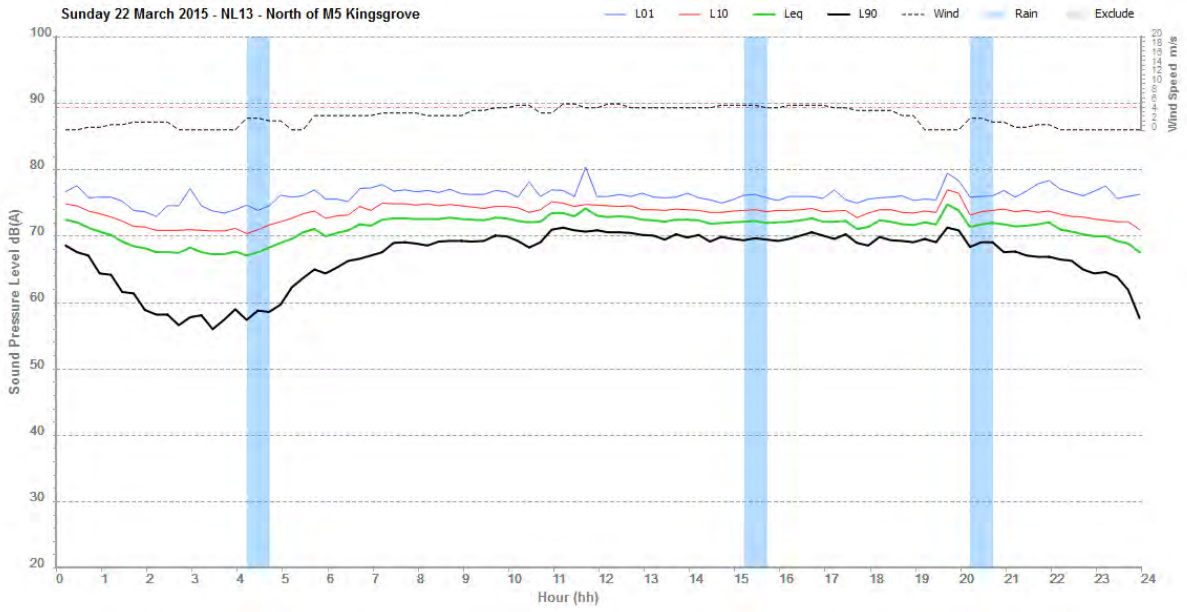

Tuesday 17 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

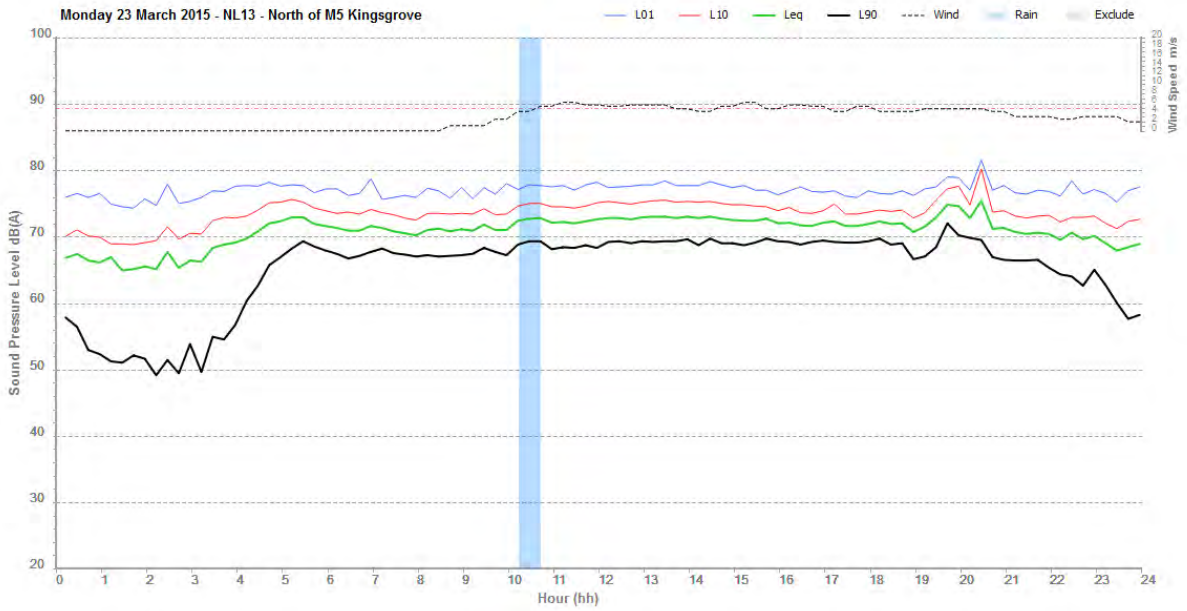

Wednesday 18 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

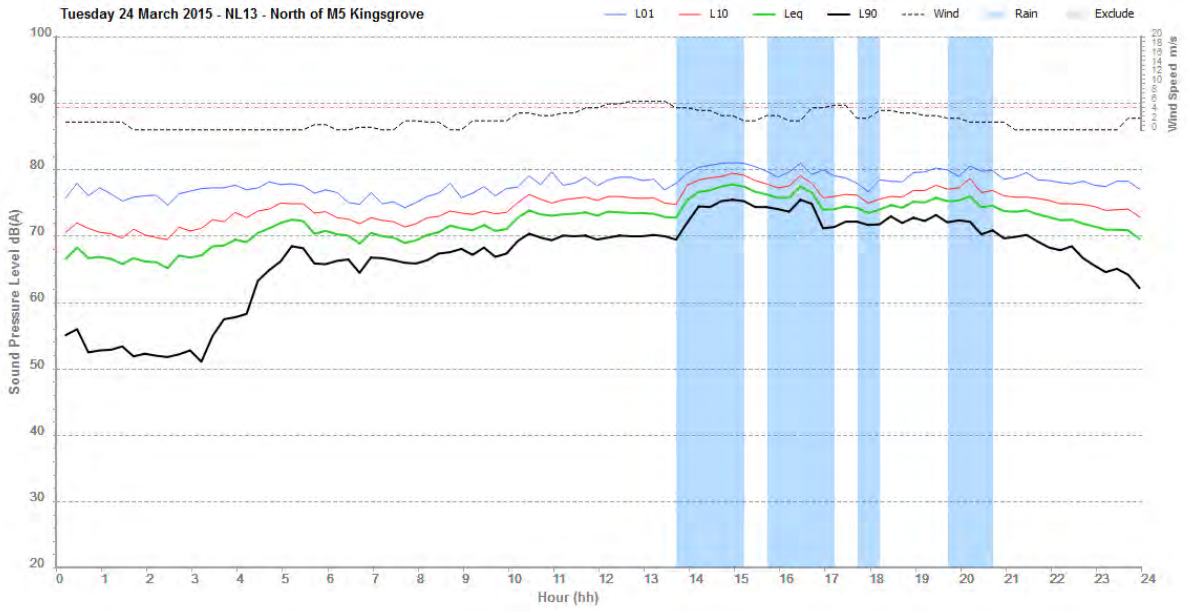

Thursday 19 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

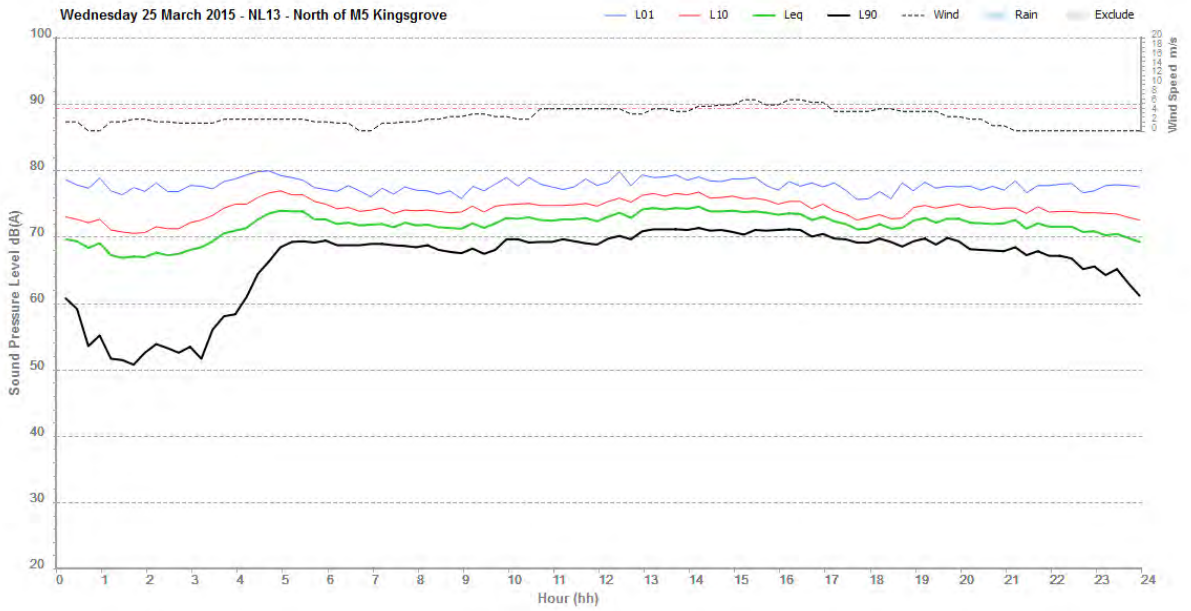

Friday 20 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

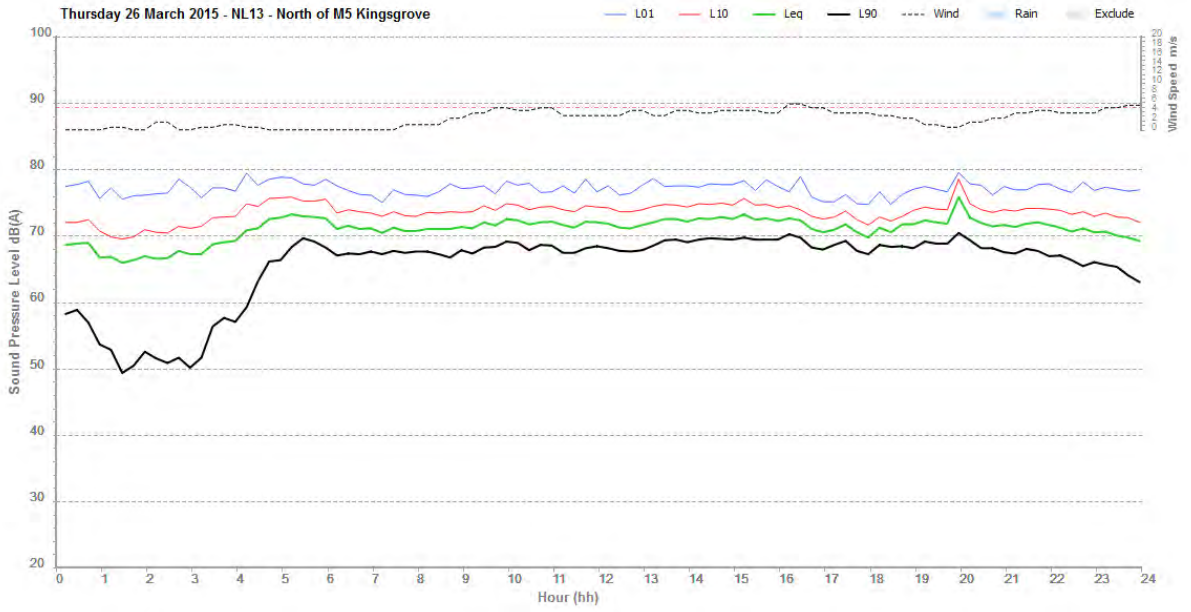

Saturday 21 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

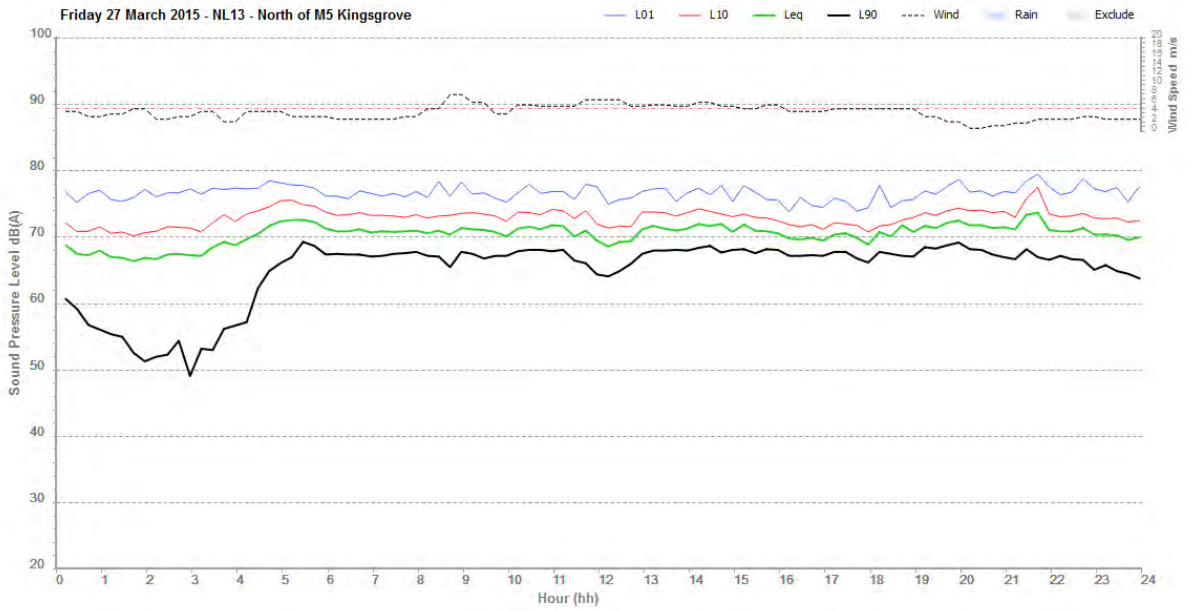

Sunday 22 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

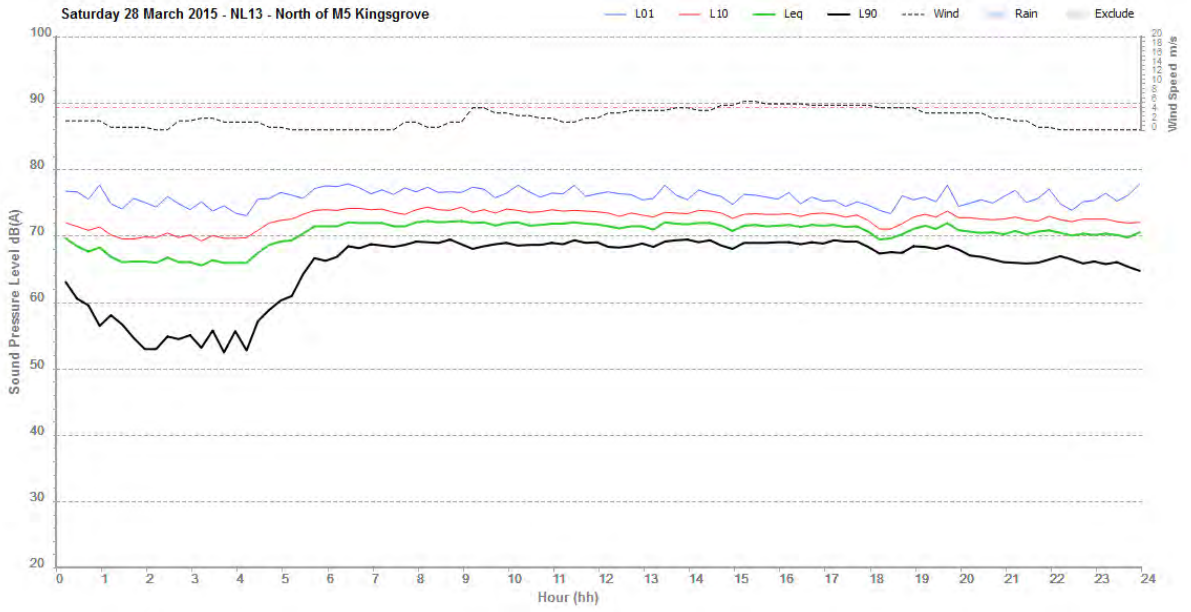

Monday 23 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

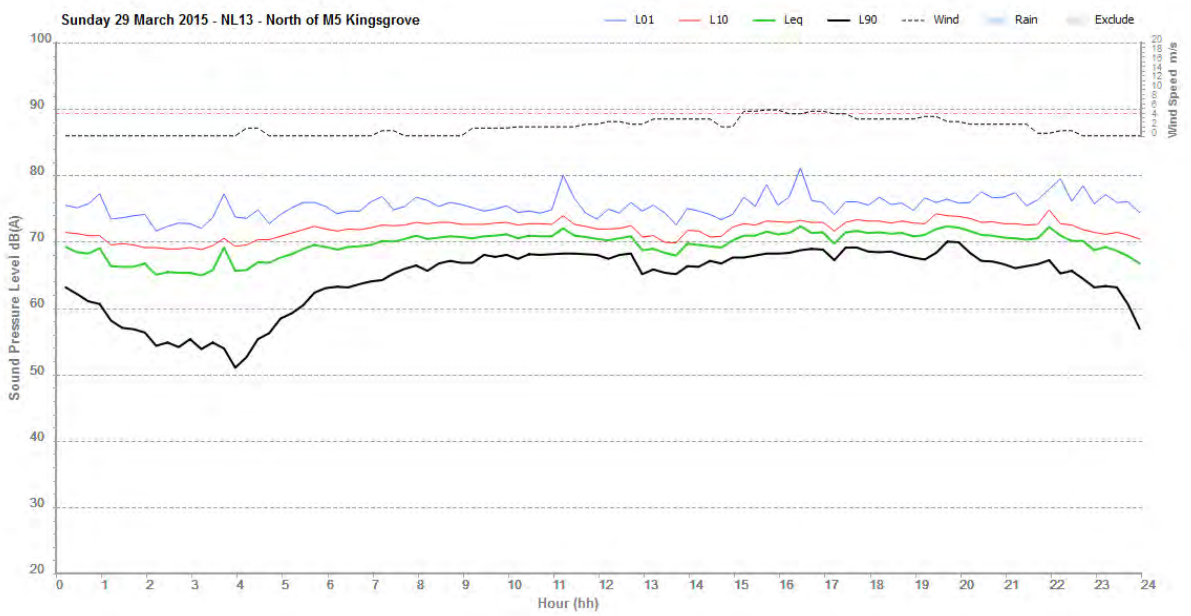

Tuesday 24 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

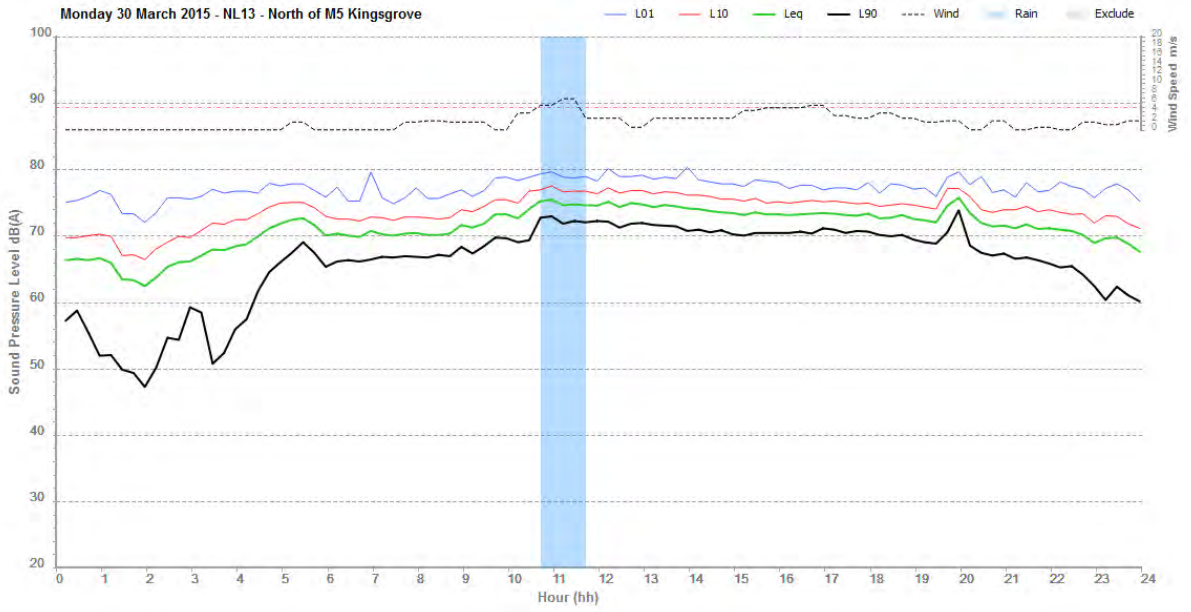

Wednesday 25 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

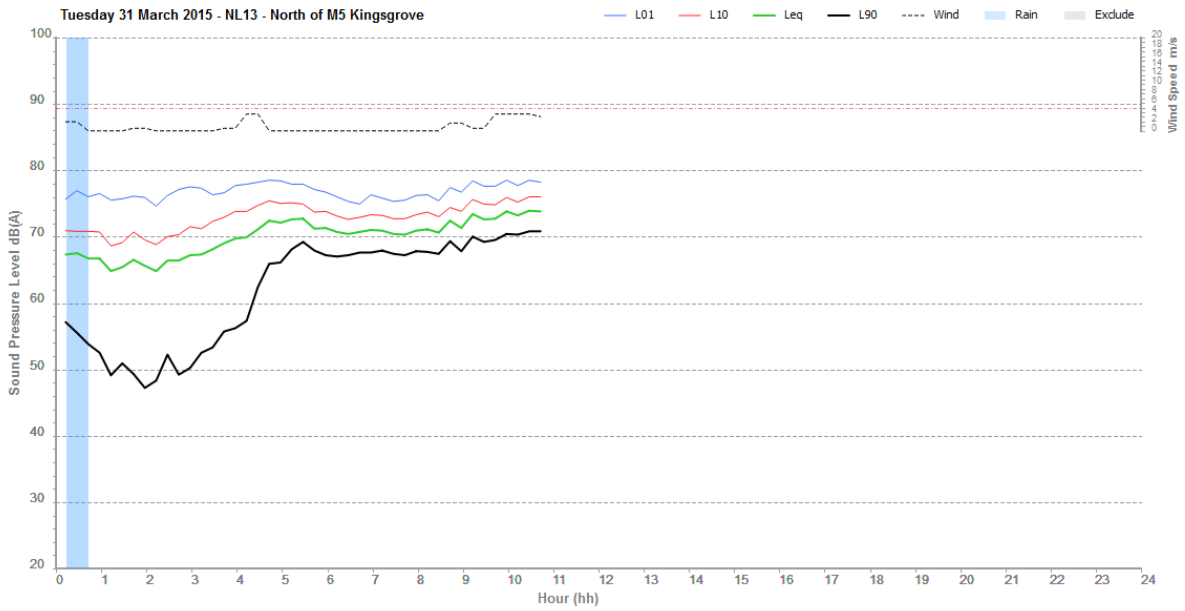

Thursday 26 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

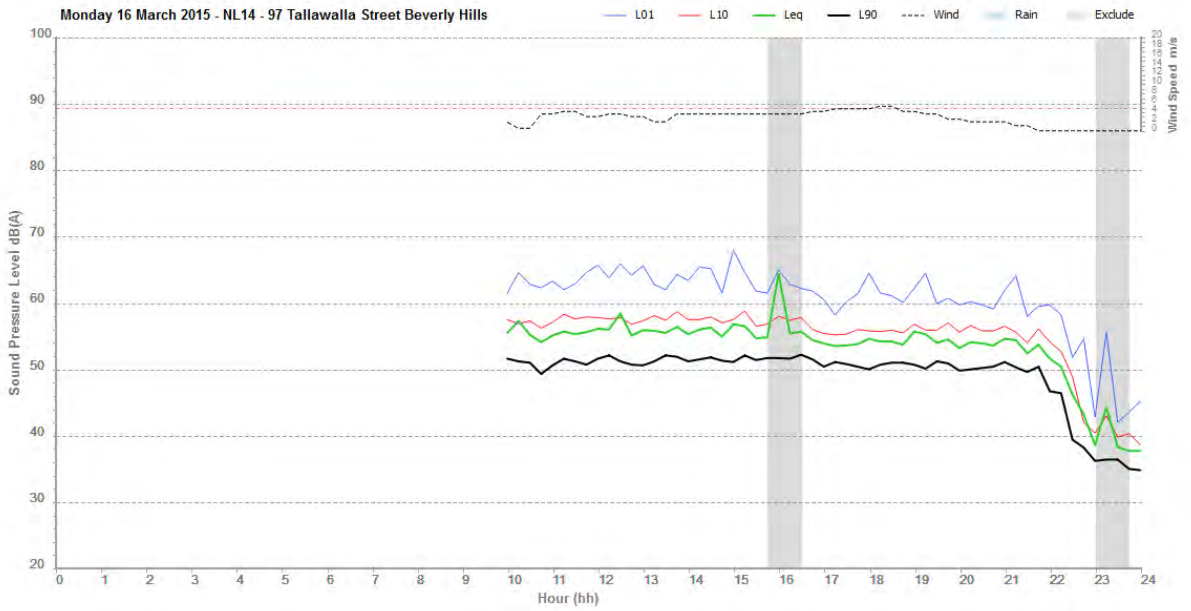

Sunday 29 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

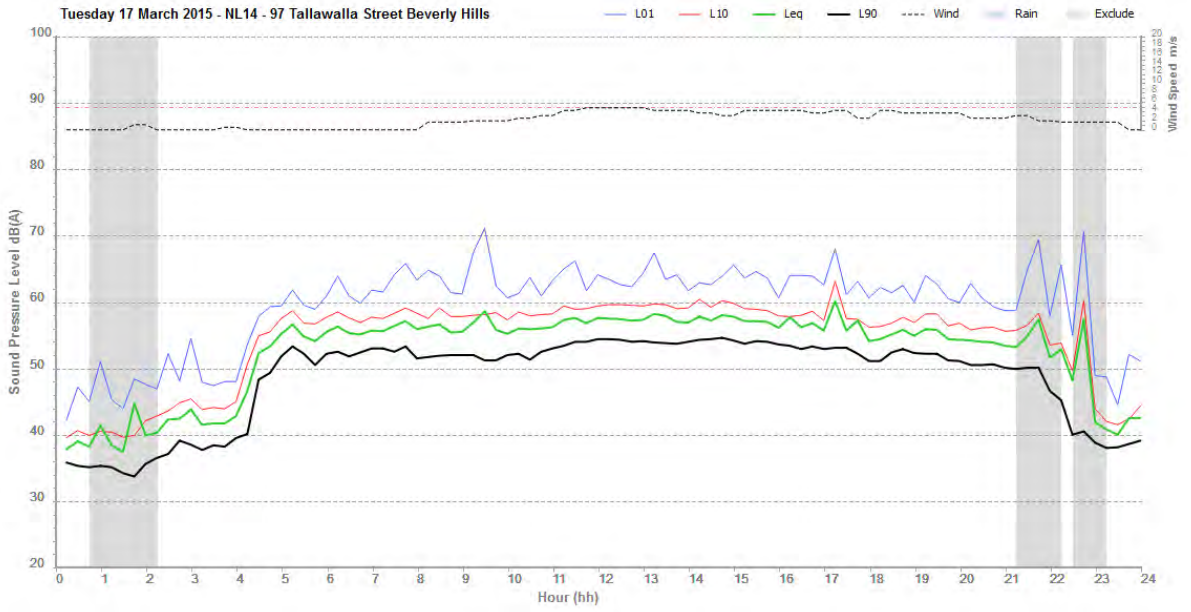

Monday 30 March 2015 - NL13 - North of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

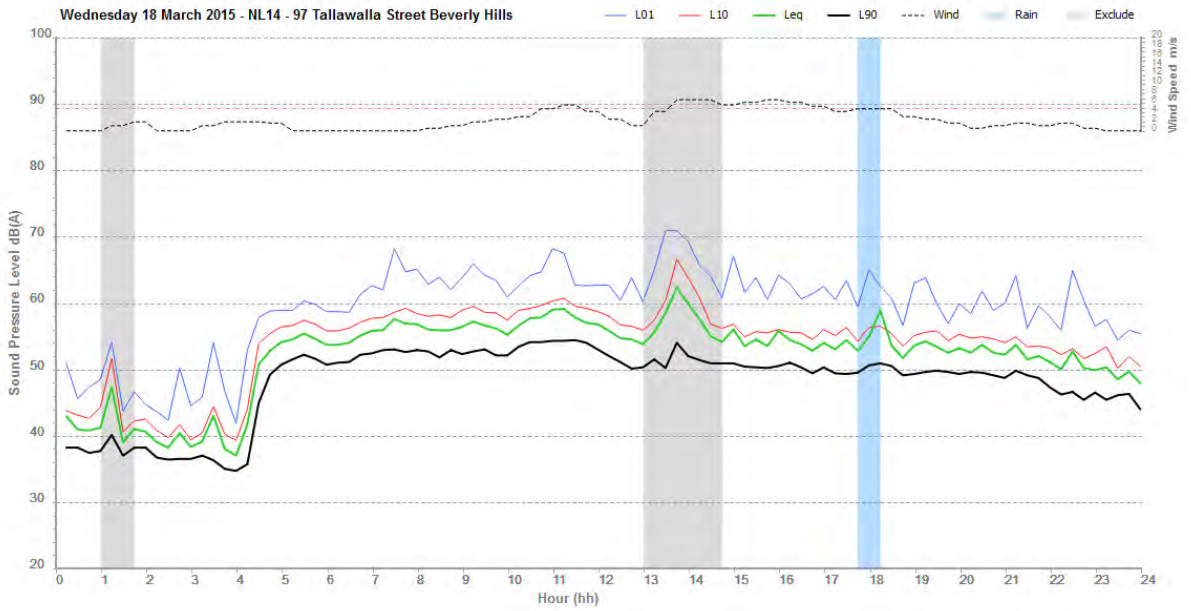


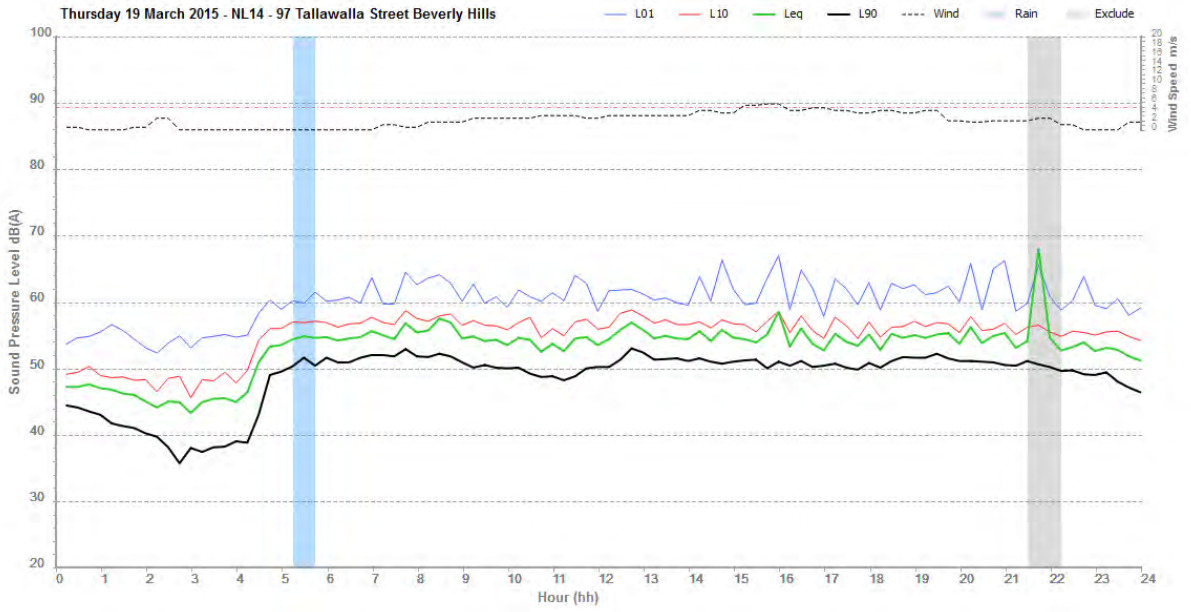
NL14 – 97 Tallawalla Street, Beverly Hills – SVAN 957 27579

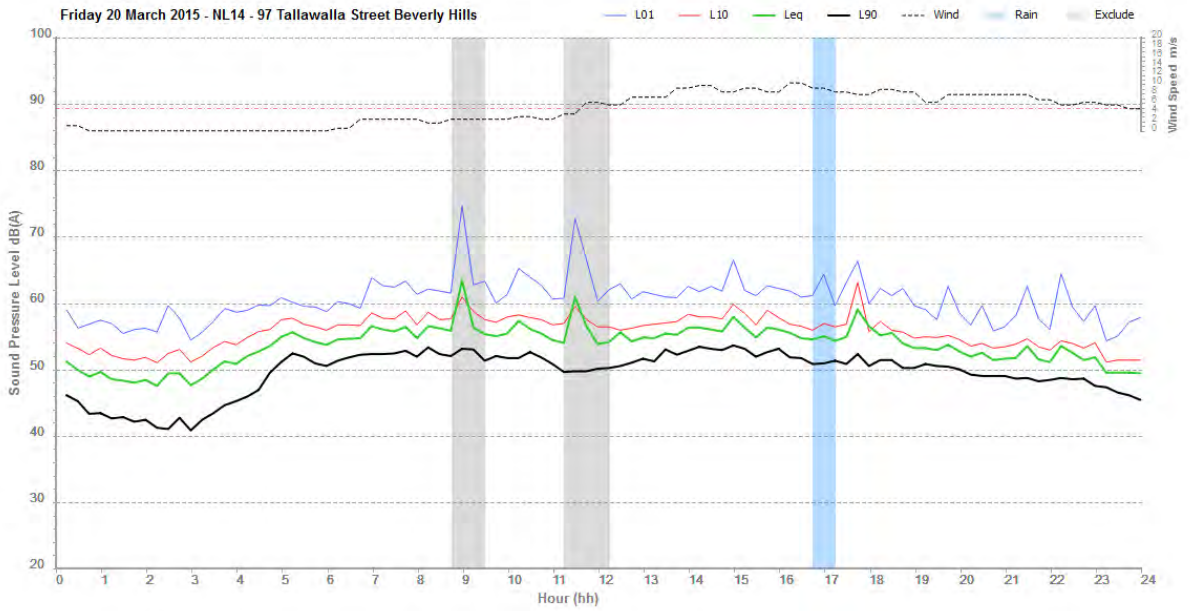


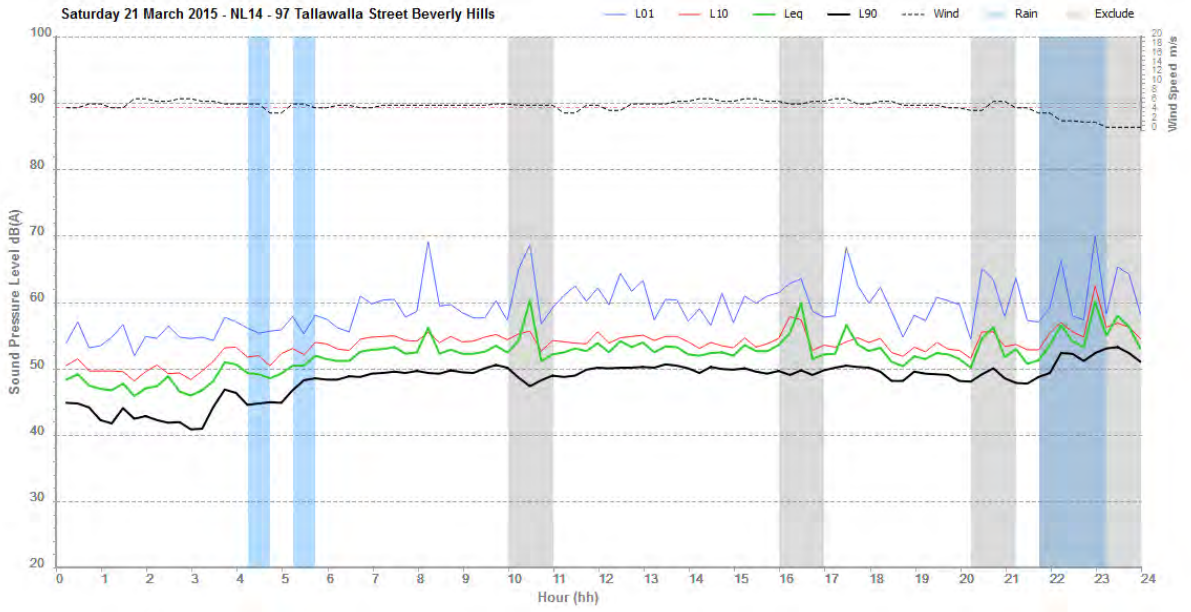

Monday 16 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

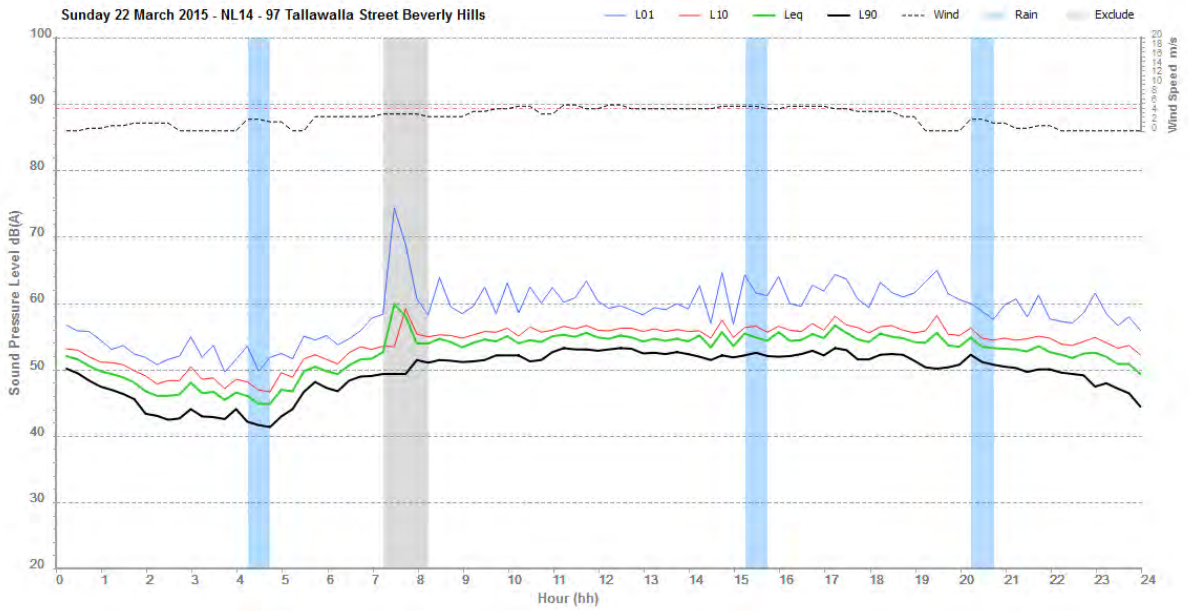

Tuesday 17 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

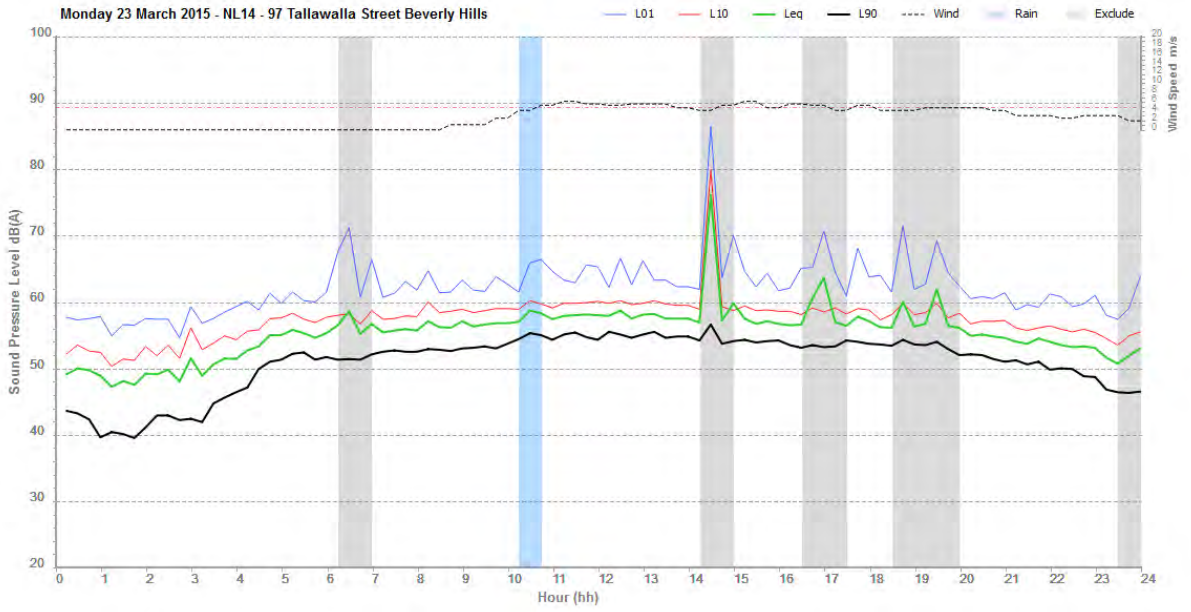

Wednesday 18 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

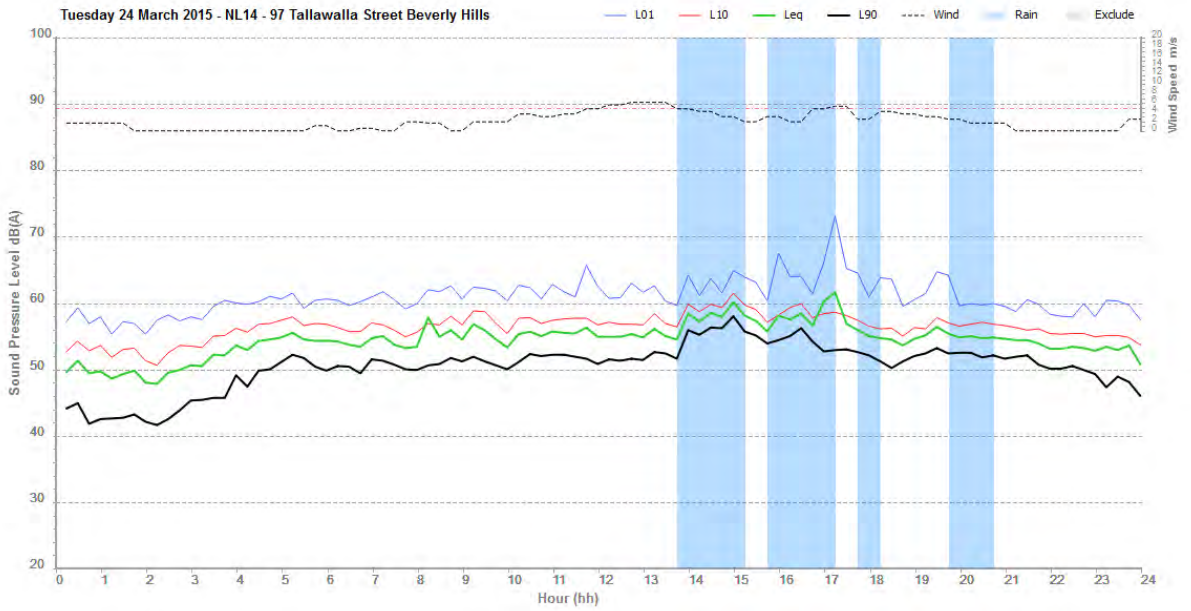

Thursday 19 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

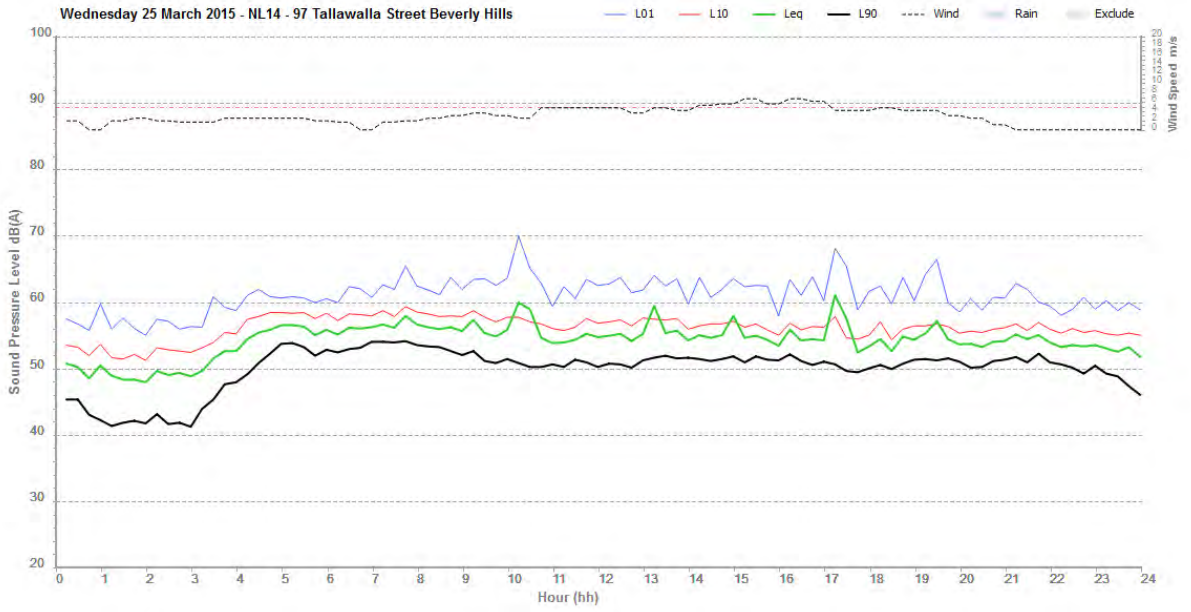

Friday 20 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

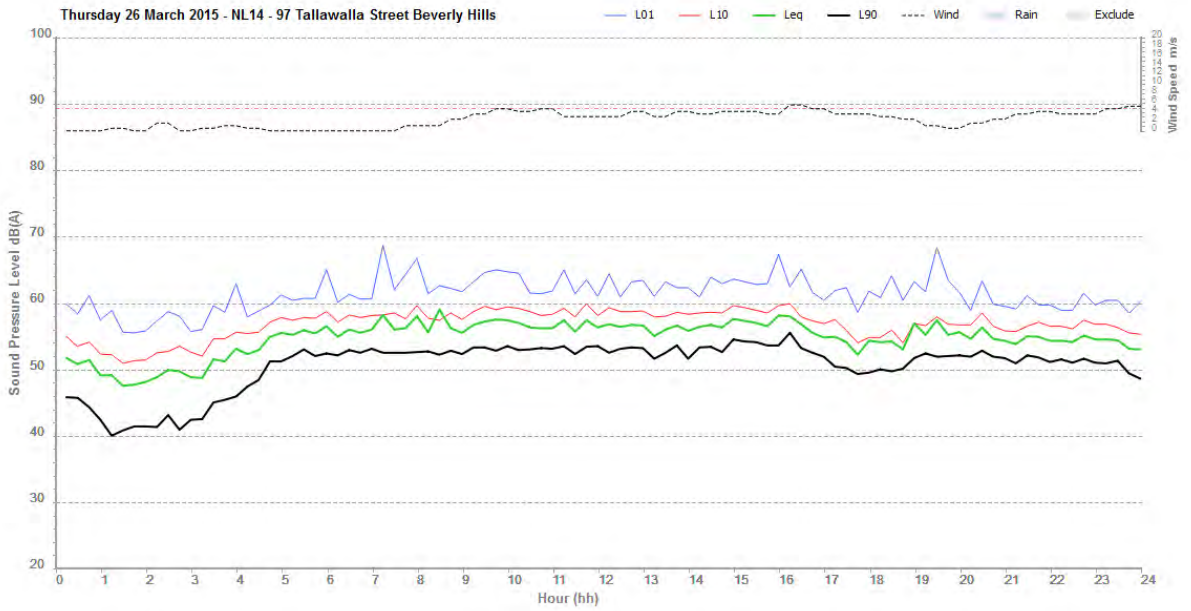

Saturday 21 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

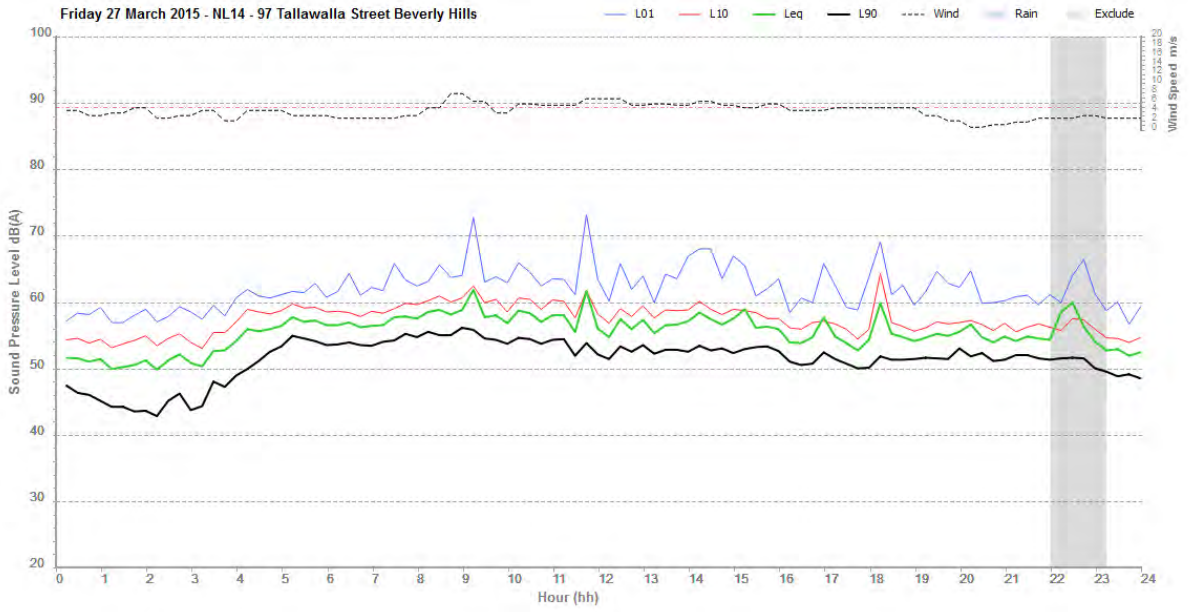

Sunday 22 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

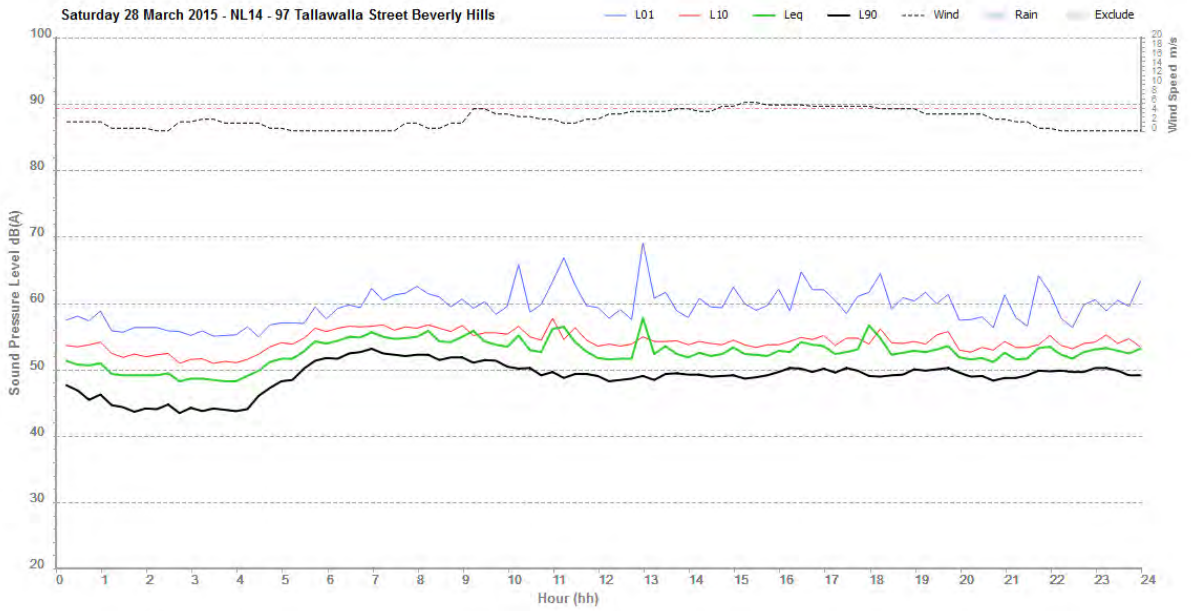

Monday 23 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

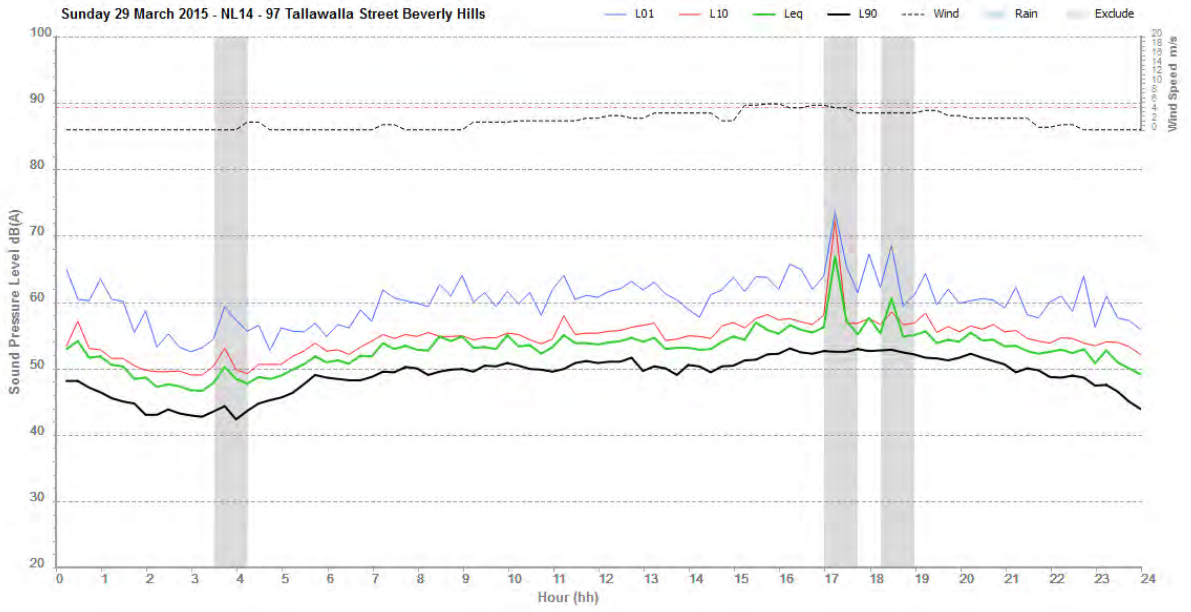

Tuesday 24 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

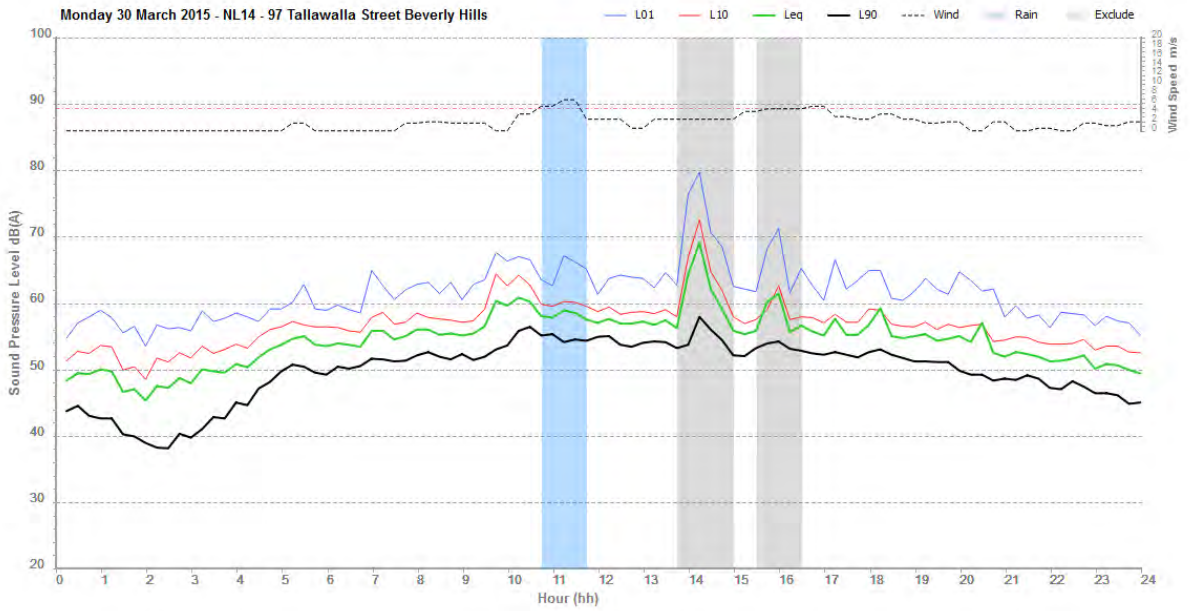

Wednesday 25 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

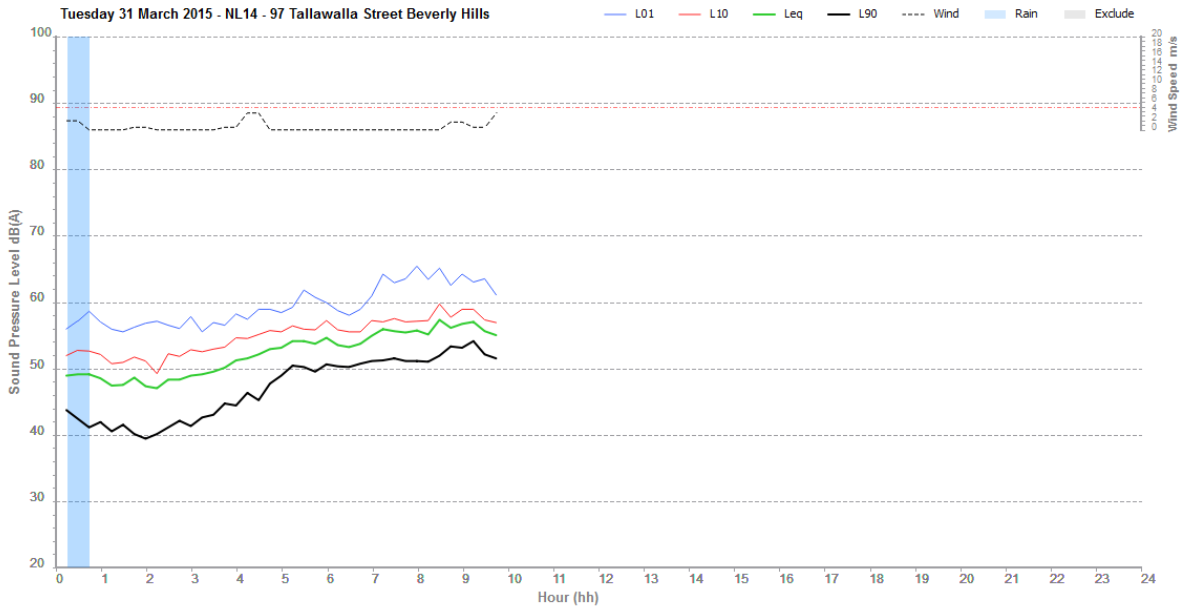

Thursday 26 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

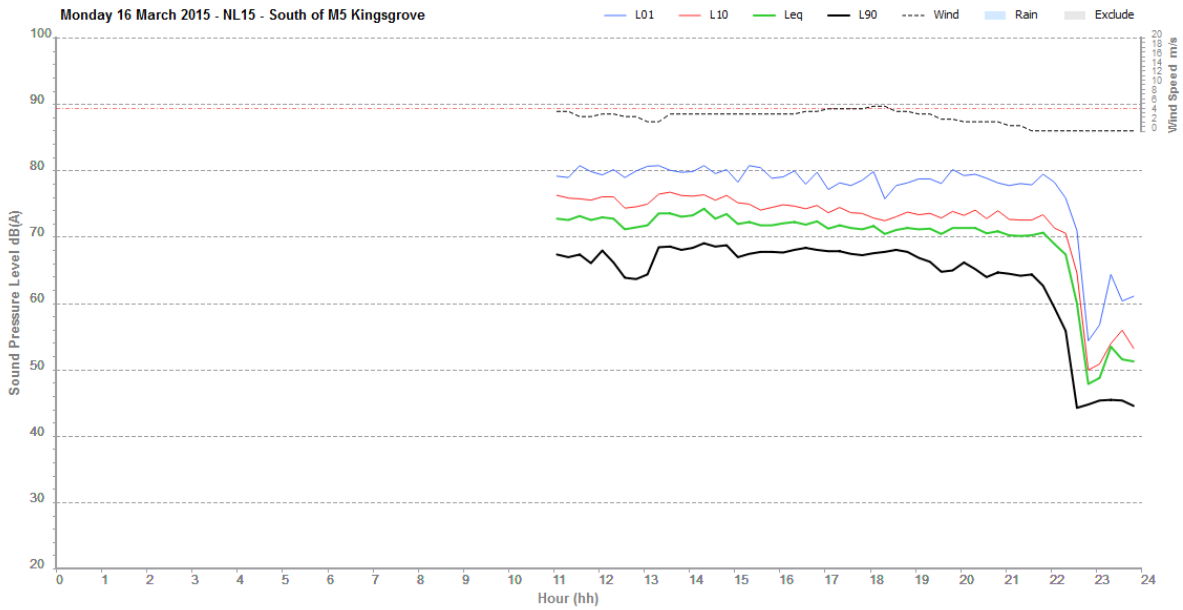

Sunday 29 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

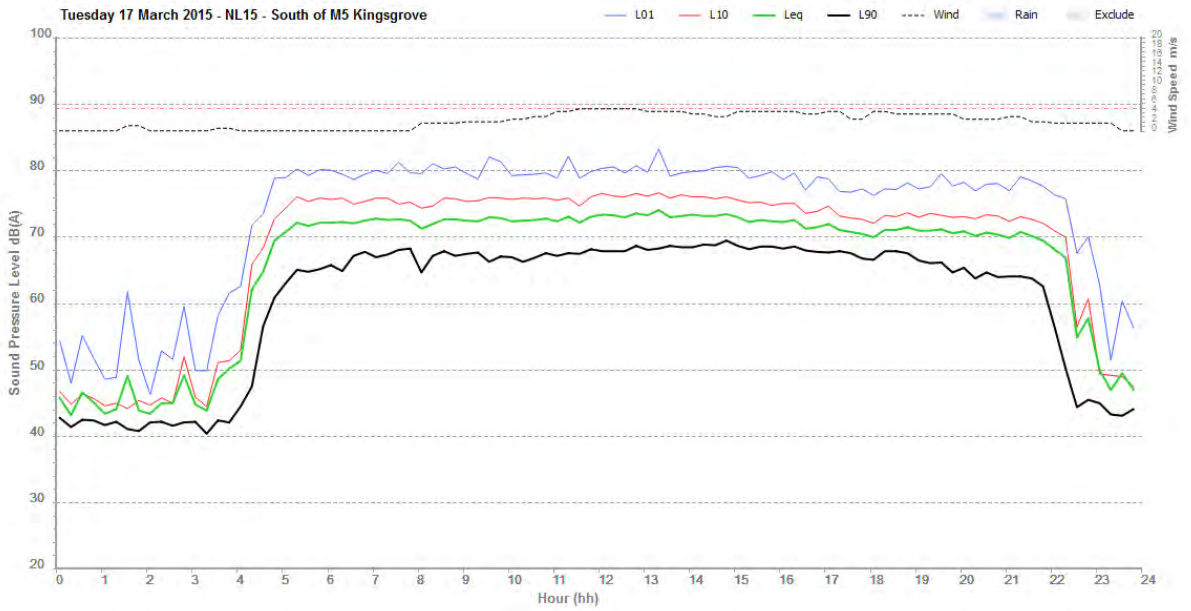

Monday 30 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

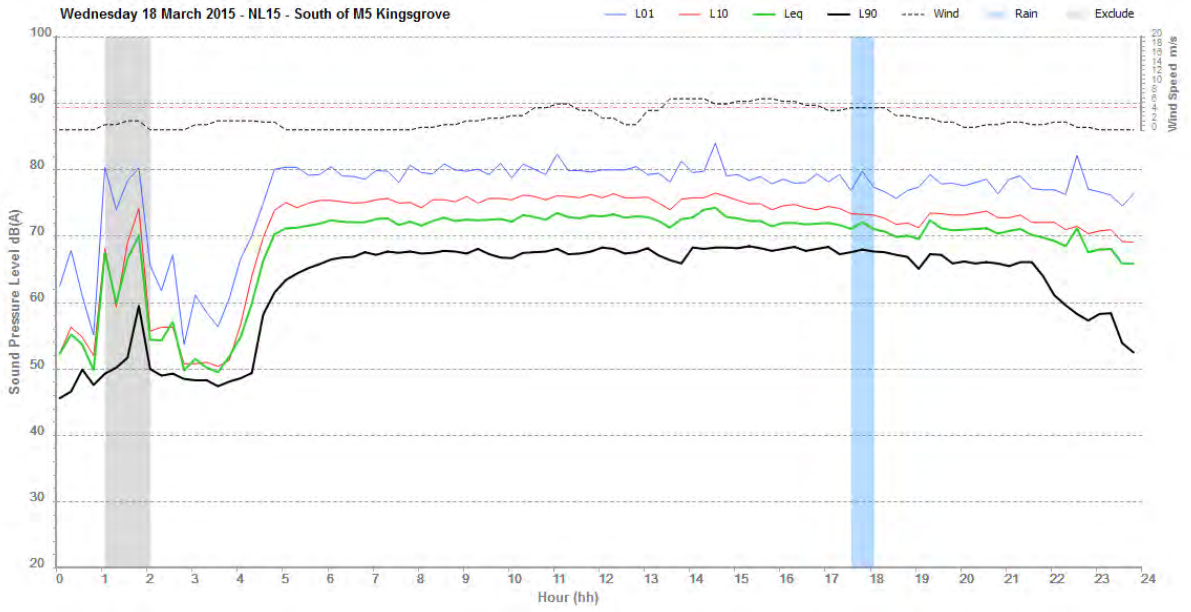

Tuesday 31 March 2015 - NL14 - 97 Tallawalla Street Beverly Hills
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

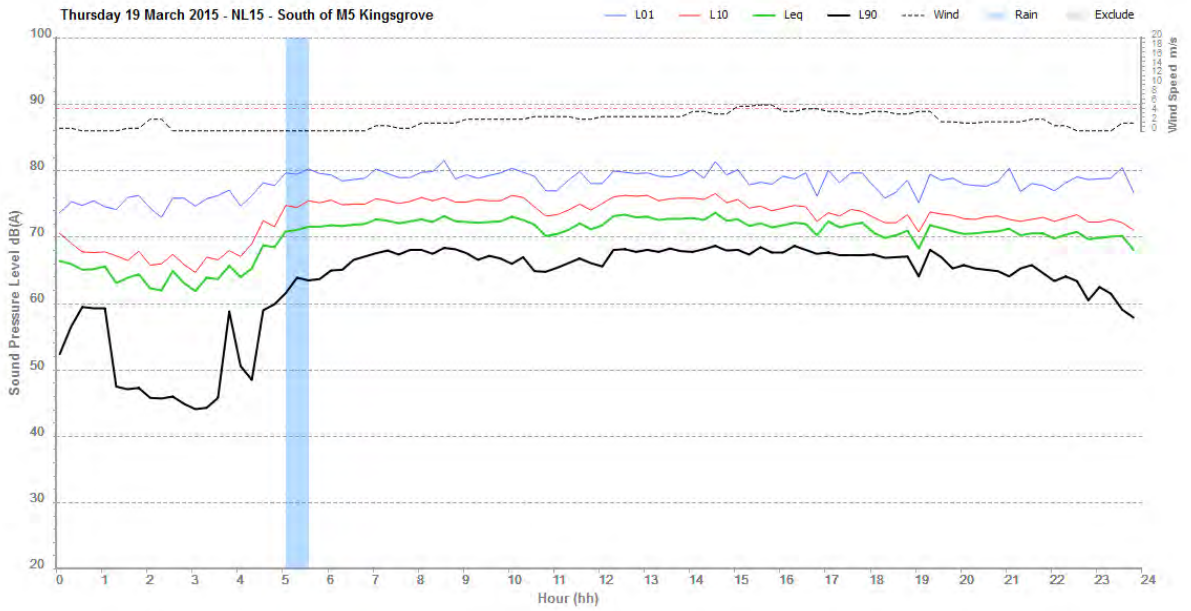
NL15 – South of M5, Kingsgrove – SVAN 957 27578

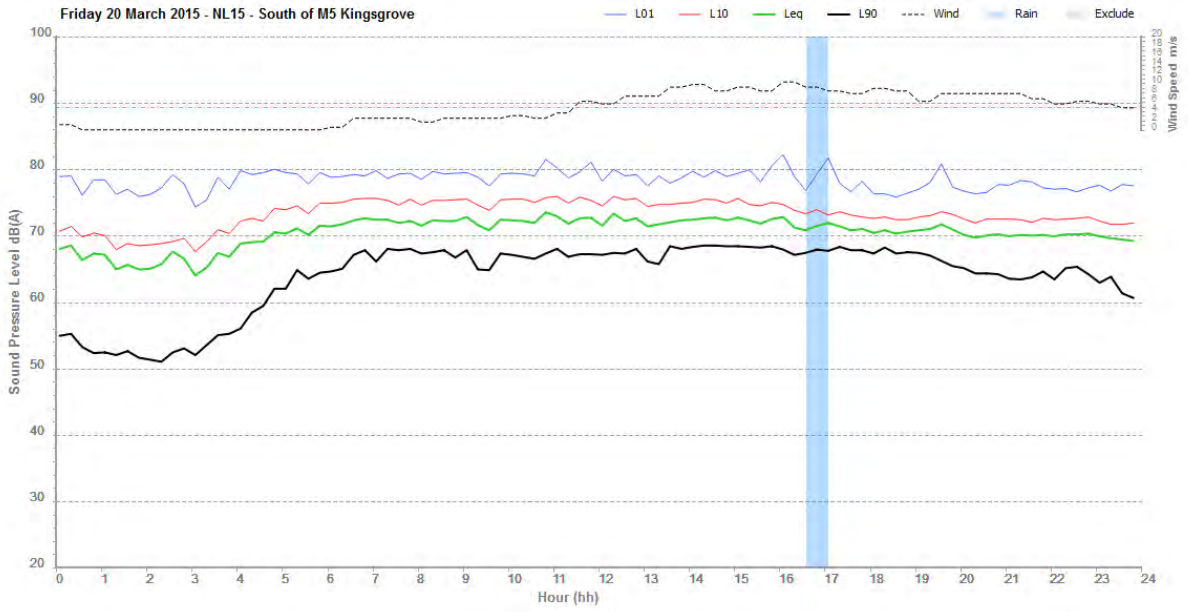


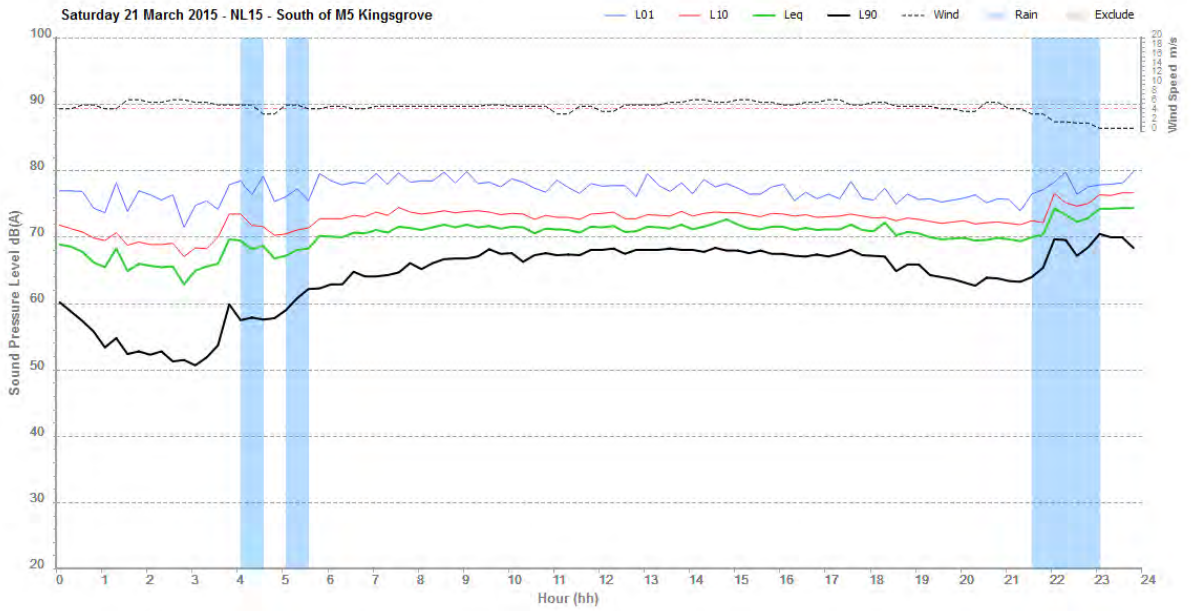


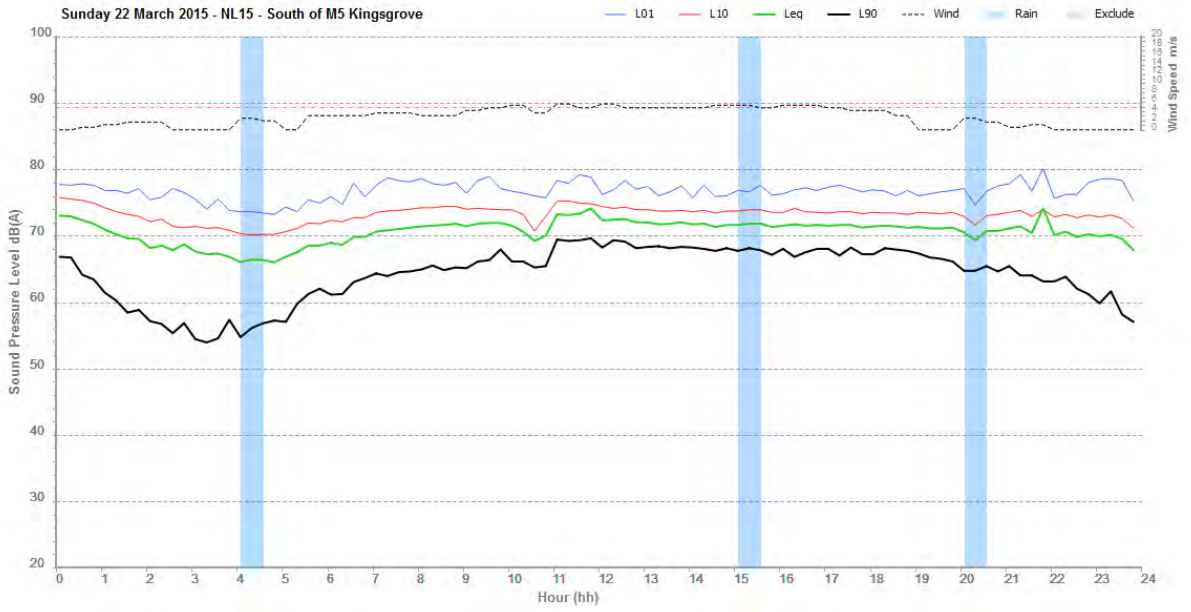

Tuesday 17 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

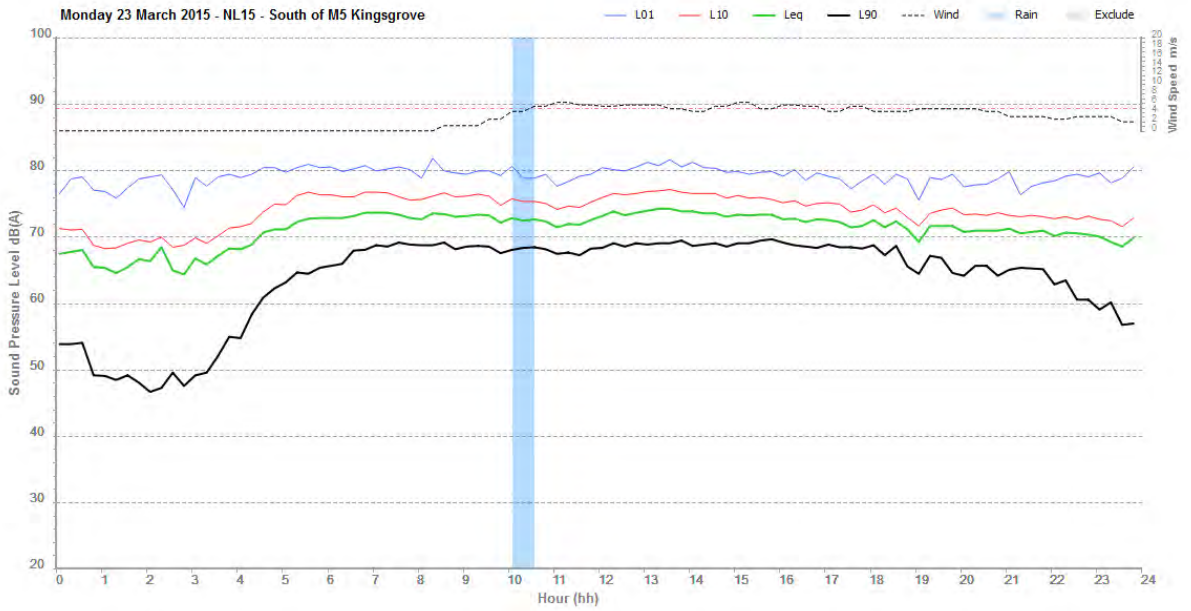

Wednesday 18 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

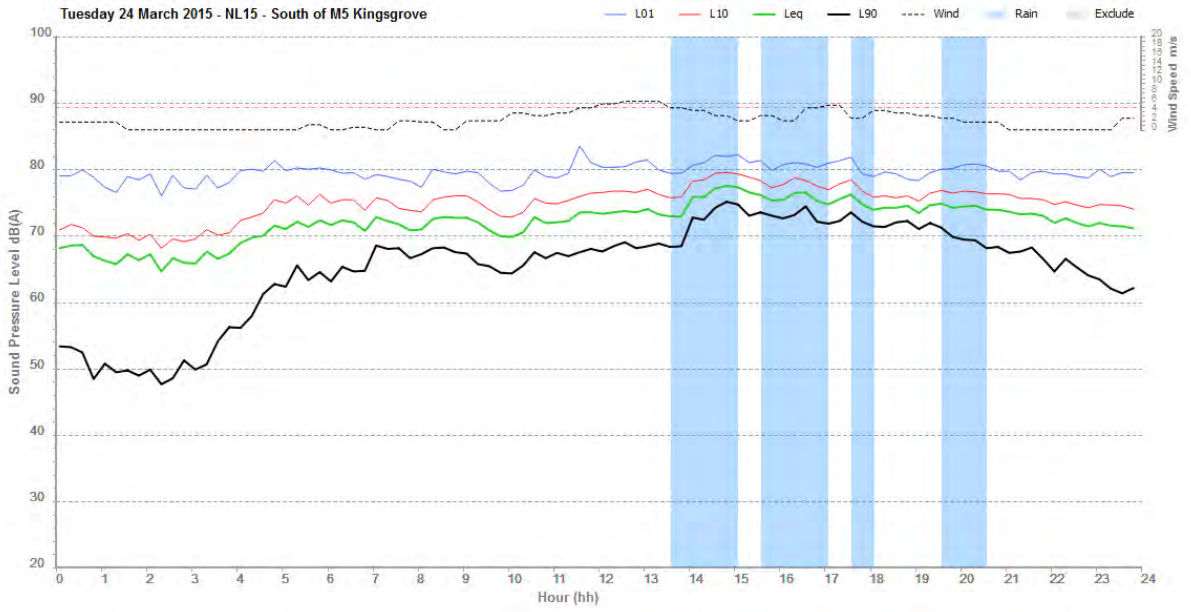

Thursday 19 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

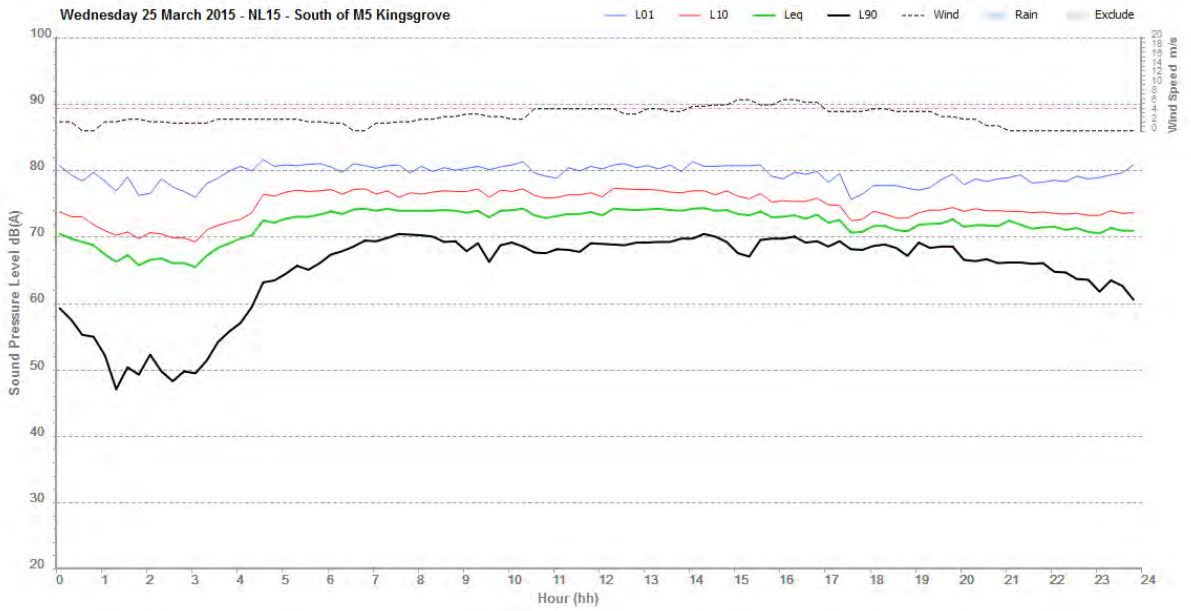

Friday 20 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

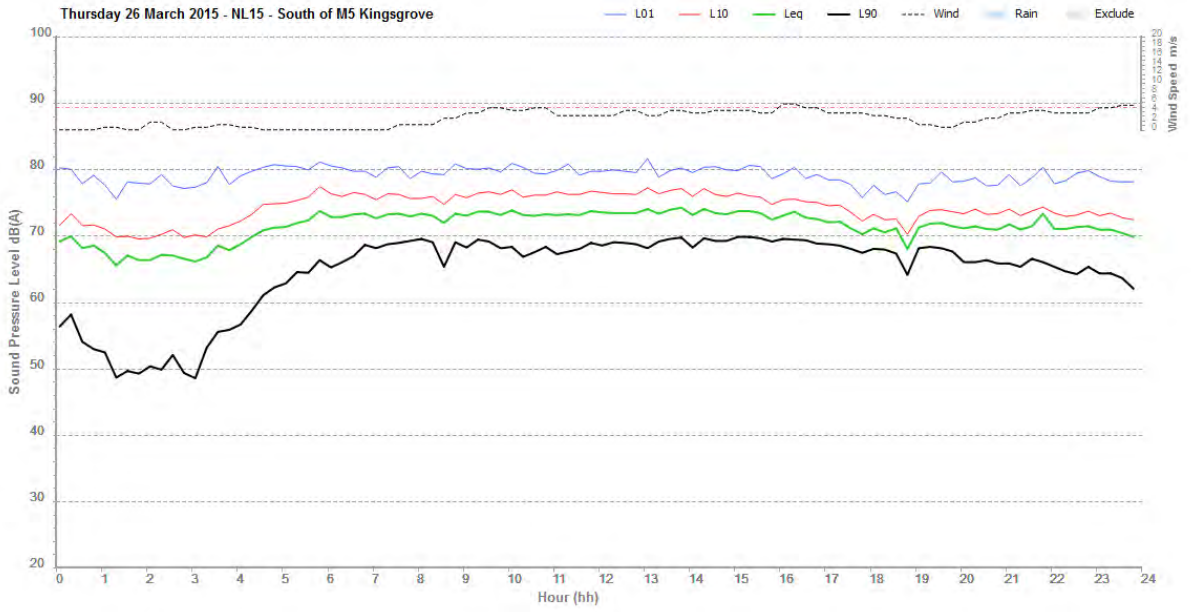

Saturday 21 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

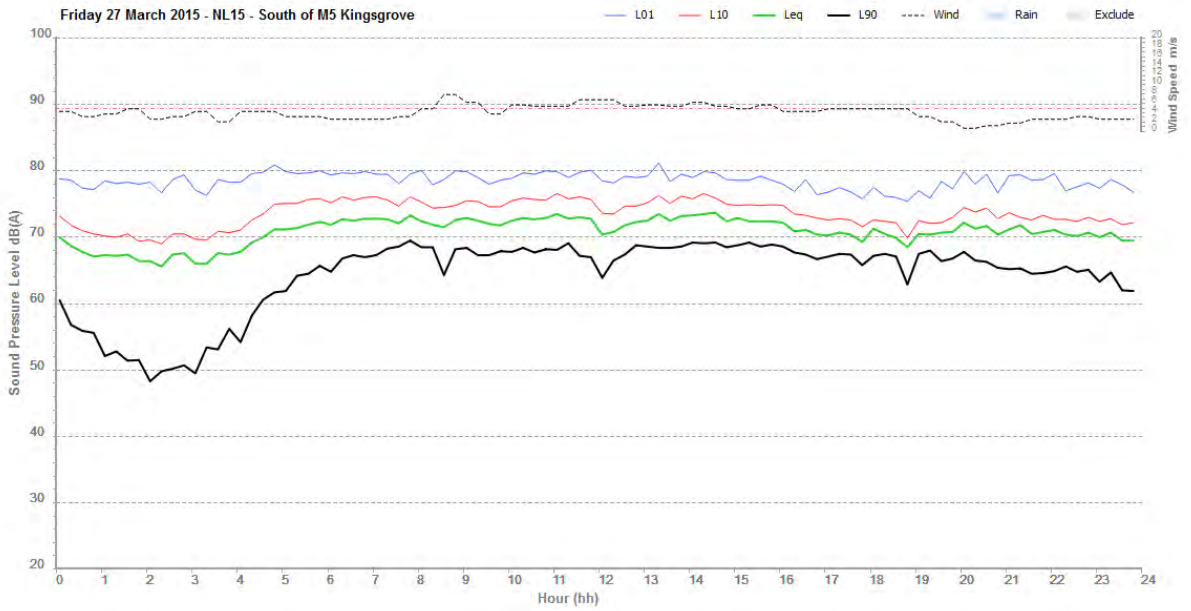

Sunday 22 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

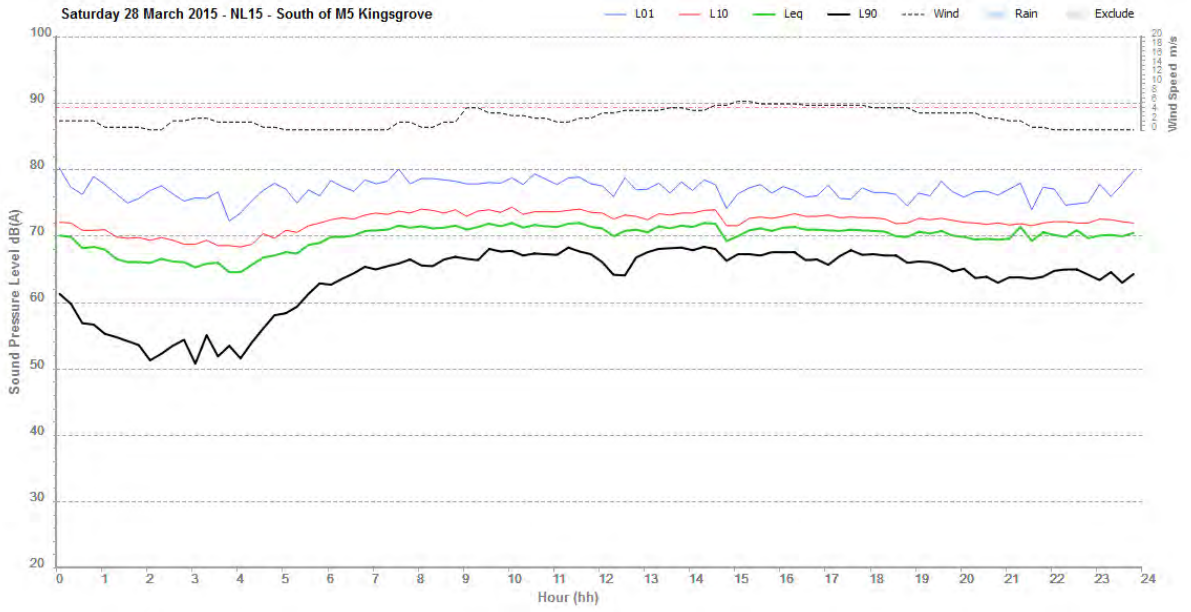

Monday 23 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

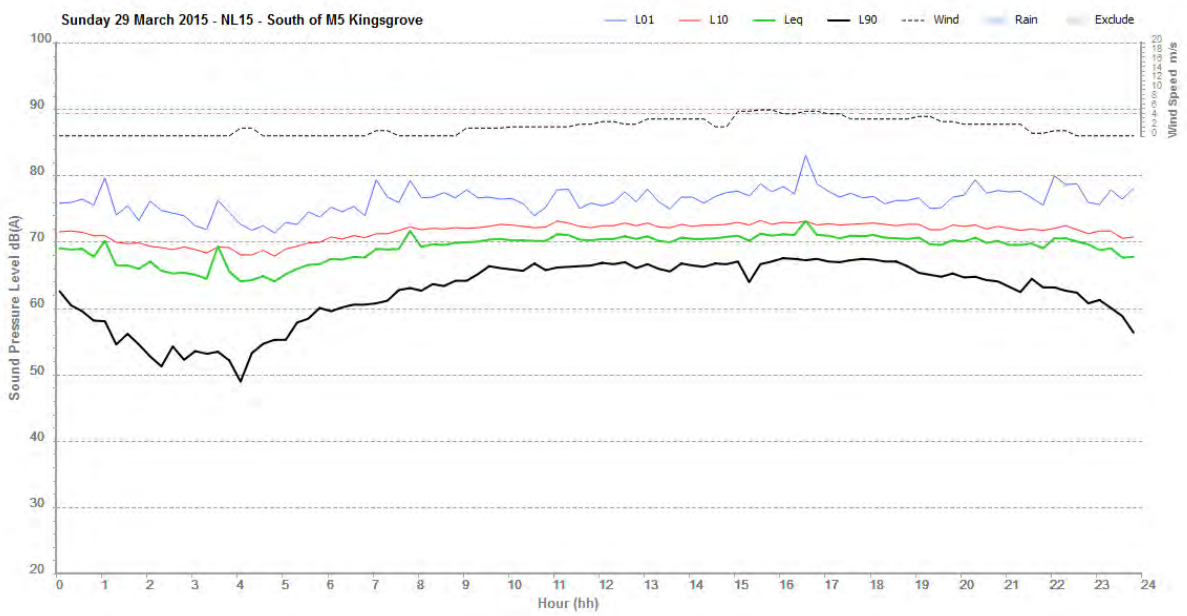

Tuesday 24 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

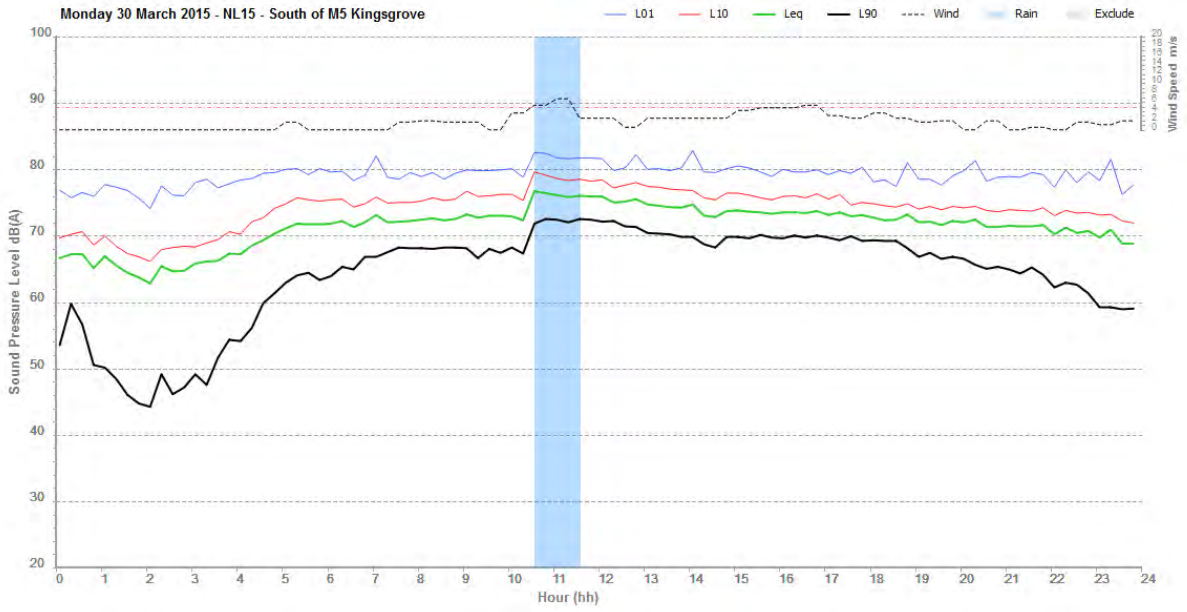

Wednesday 25 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

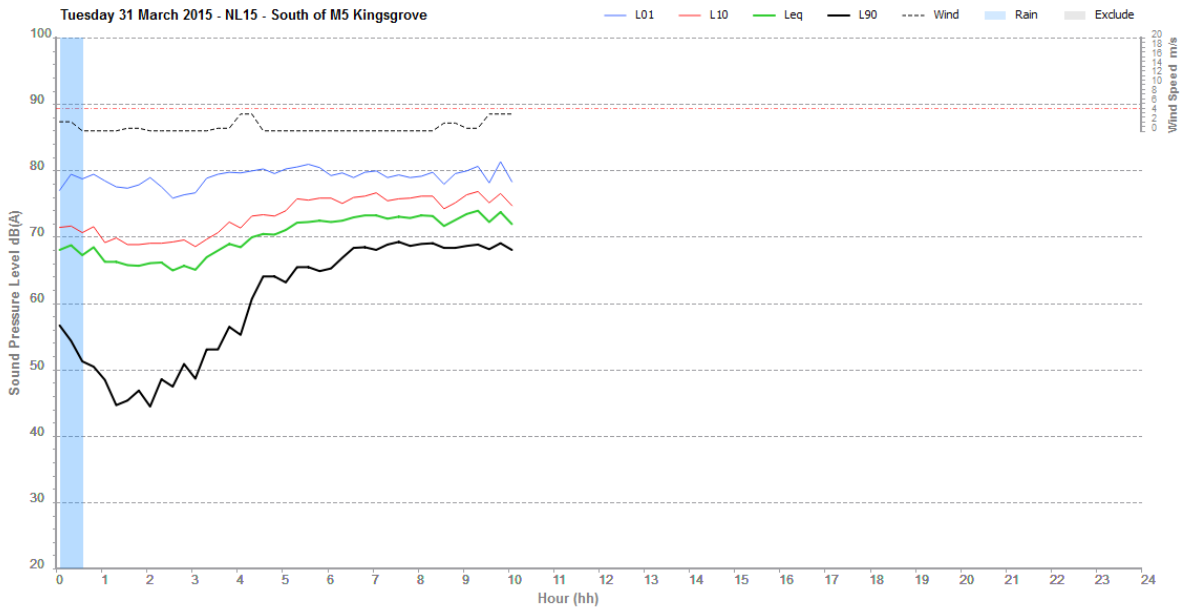

Thursday 26 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Friday 27 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 28 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 29 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 30 March 2015 - NL15 - South of M5 Kingsgrove
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)



NL16 – 36 Allambee Crescent, Beverly Hills – SVAN957 27523

Refer to:

SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

NL17 – 25 Kirrang Street, Beverly Hills – SVAN 957 20670

Refer to:

SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

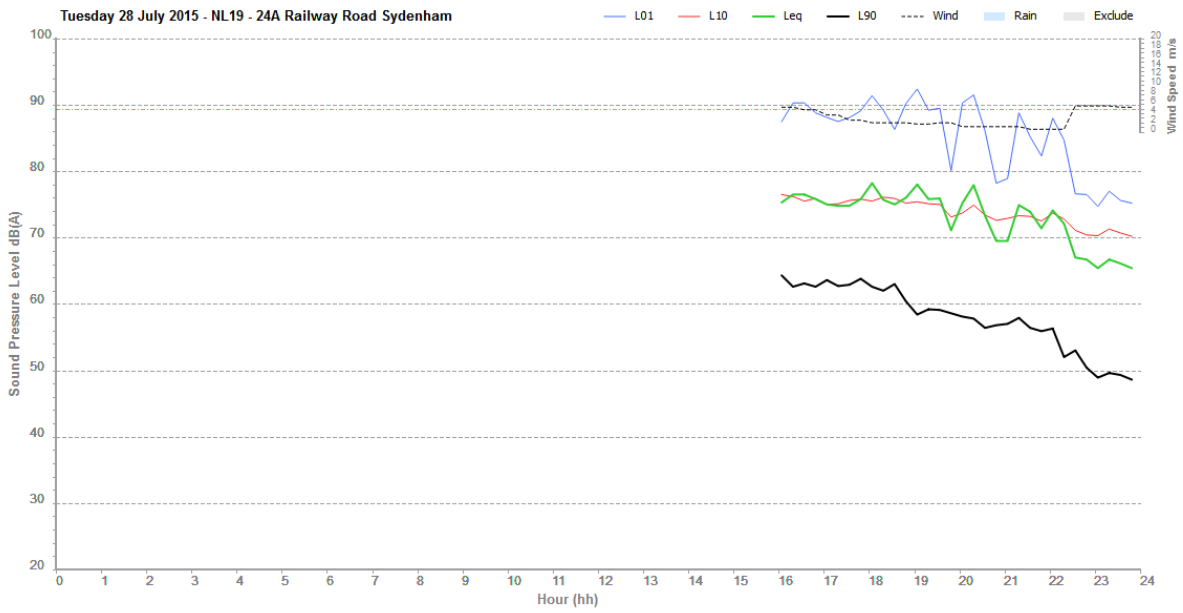
NL18 – 19 Elouera Street, Beverly Hills – SVAN 957 20668

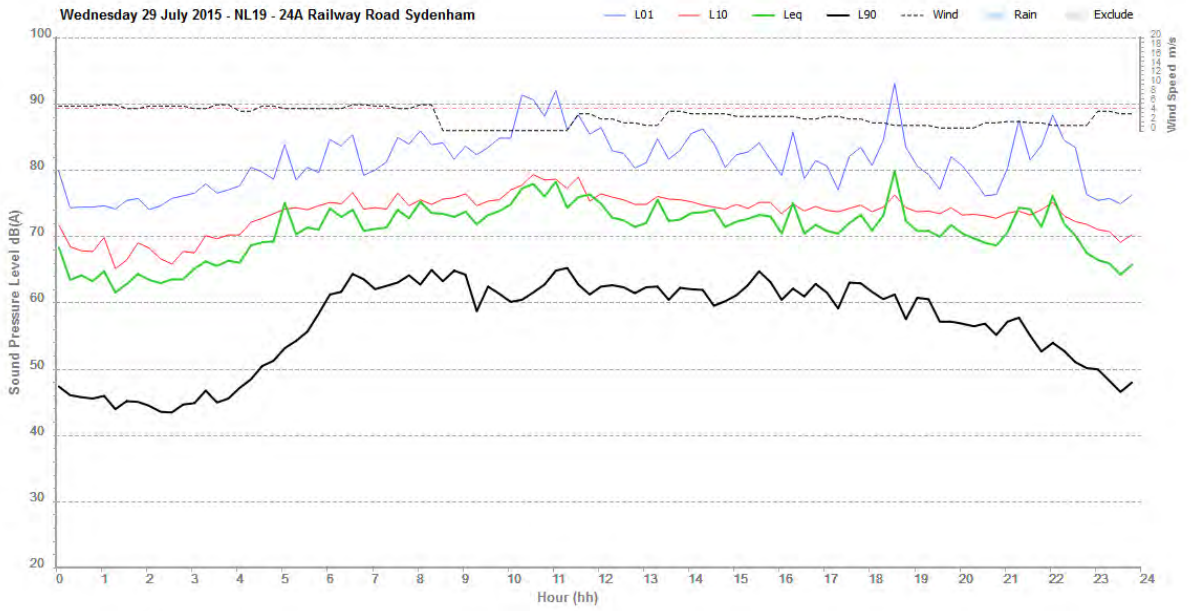
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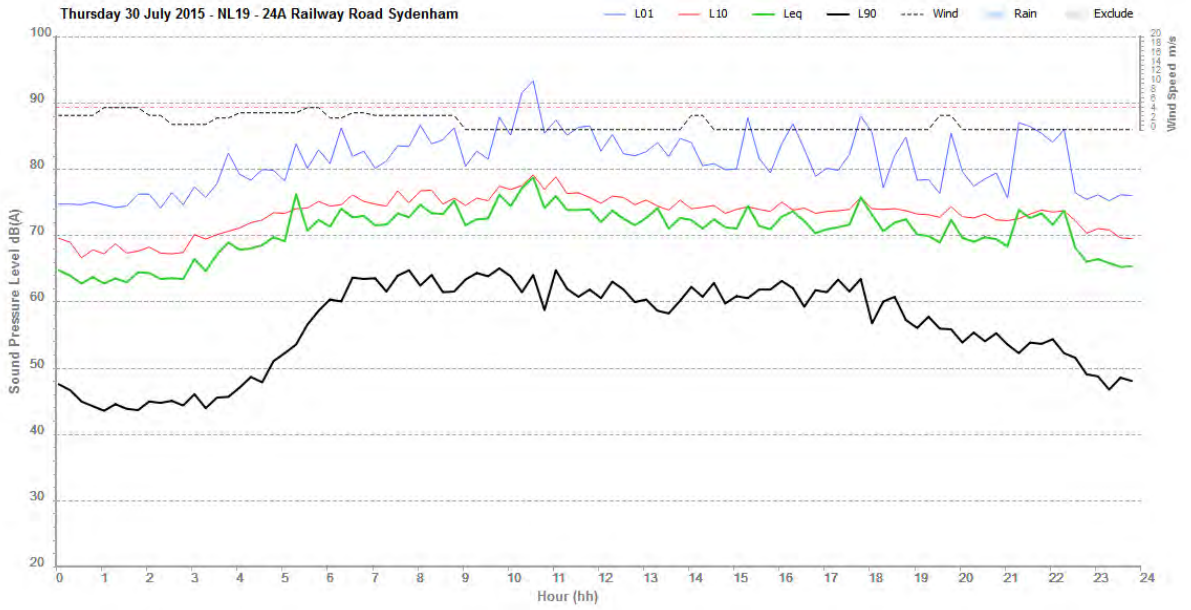
SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

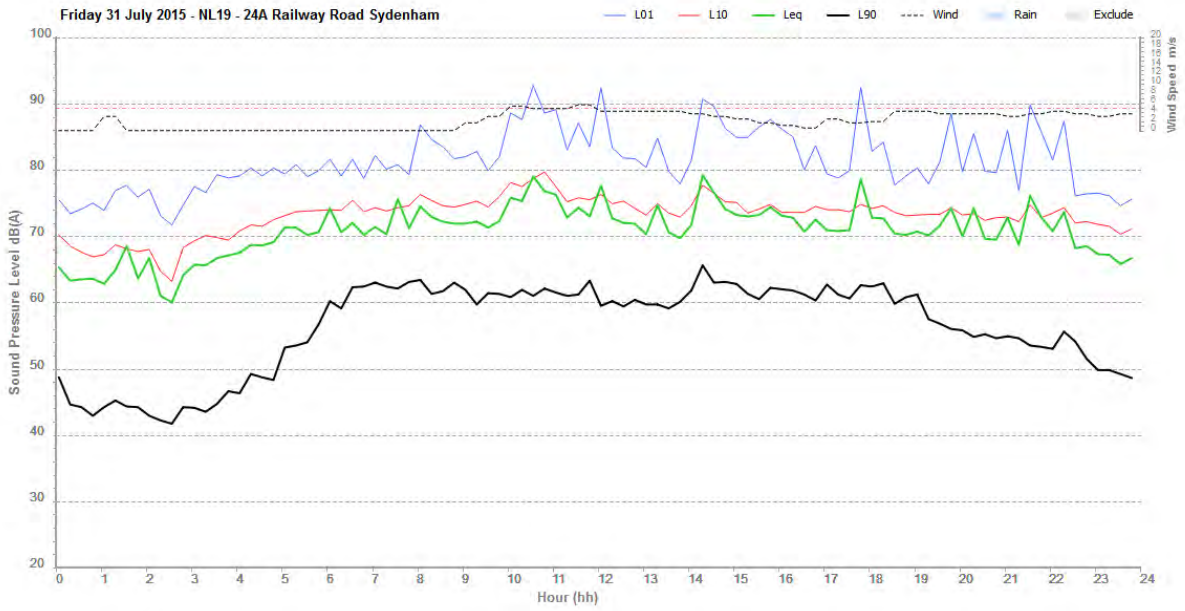
NL19 – 24A Railway Road, Sydenham – Rion NL21 00765701

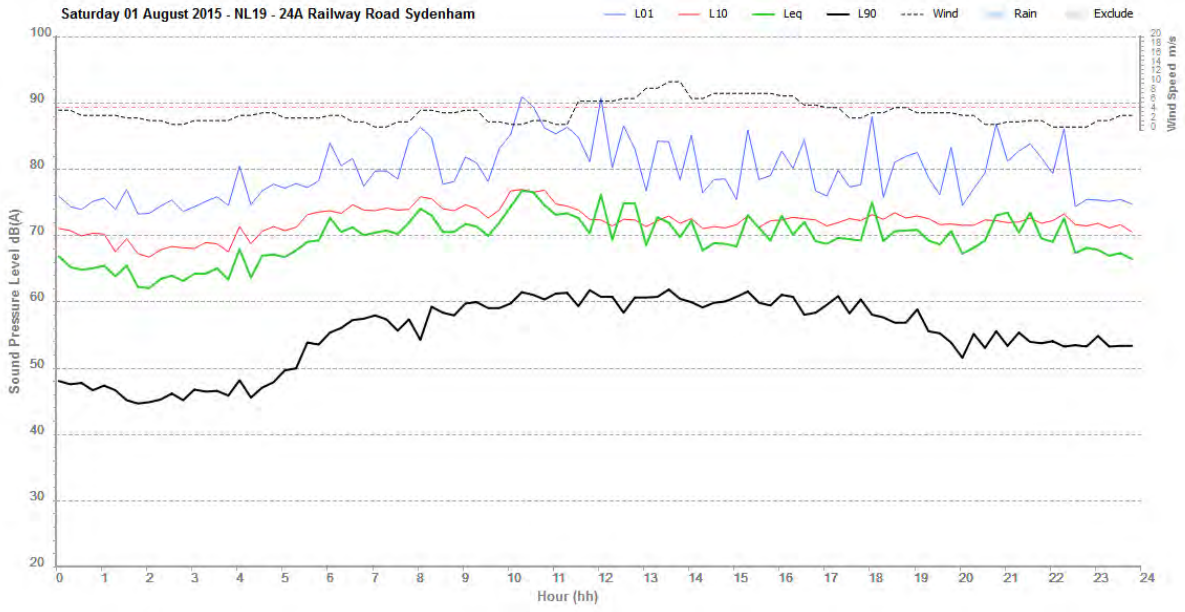


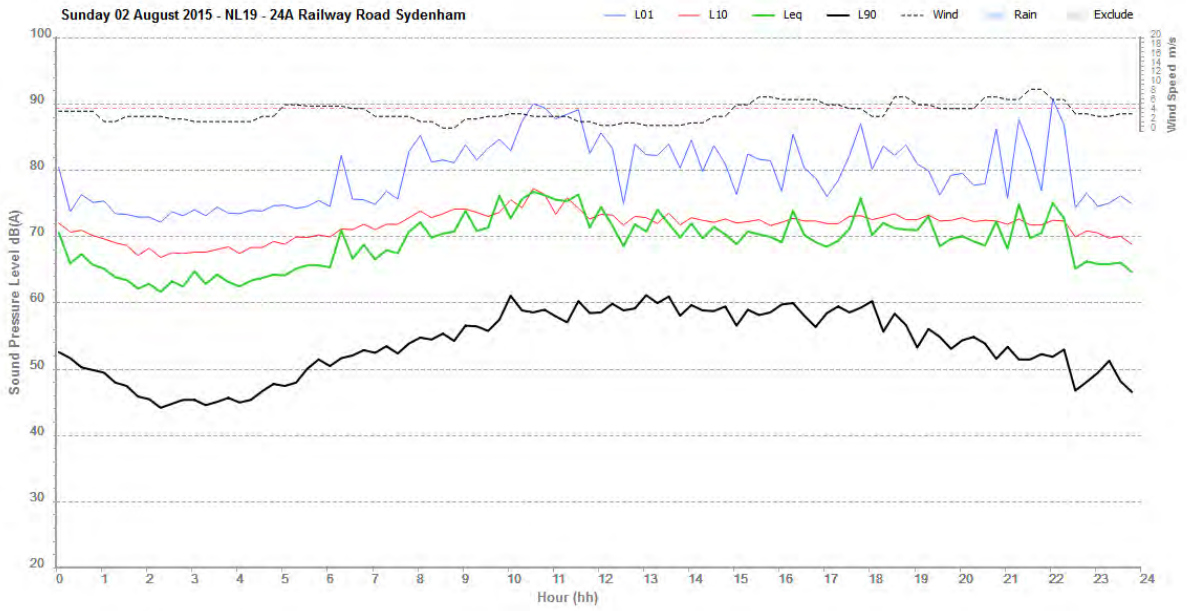


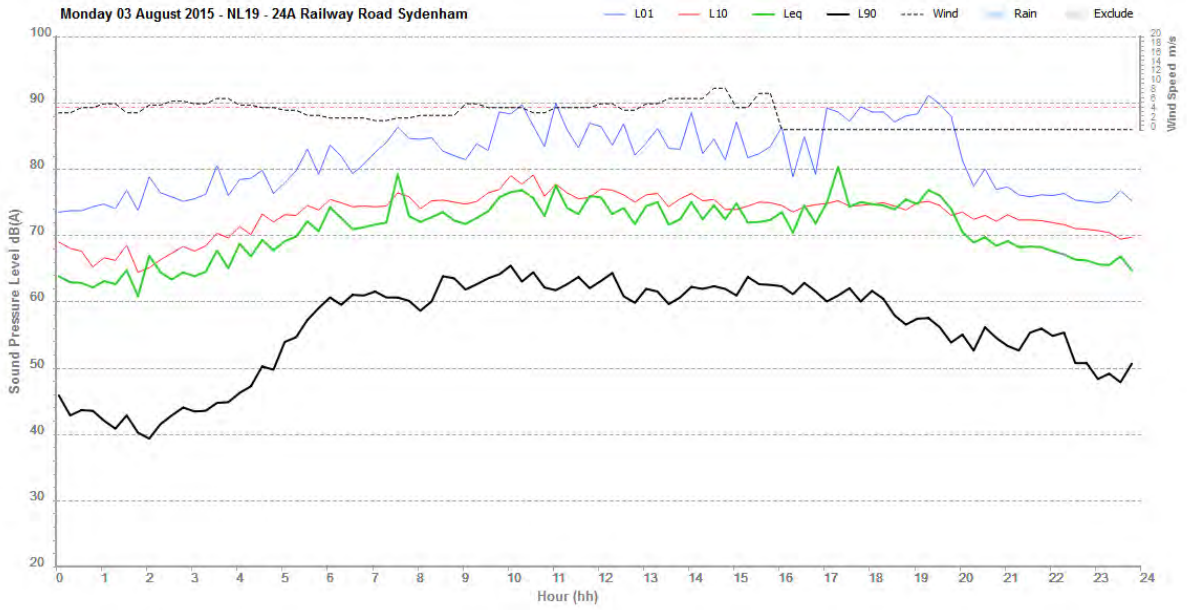

Wednesday 29 July 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

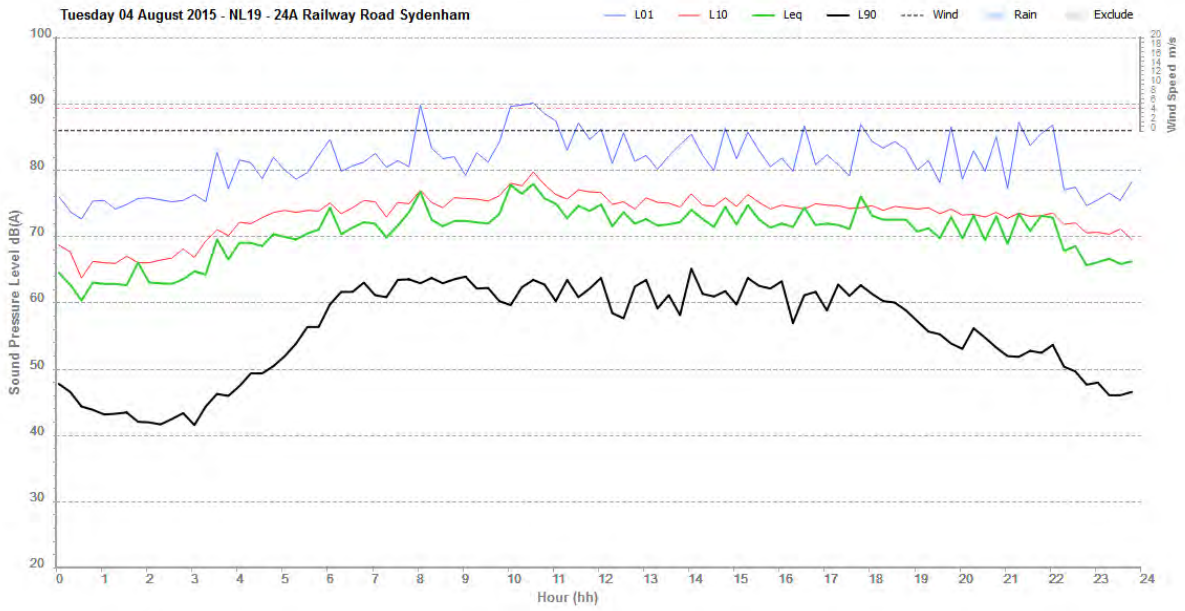

Thursday 30 July 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

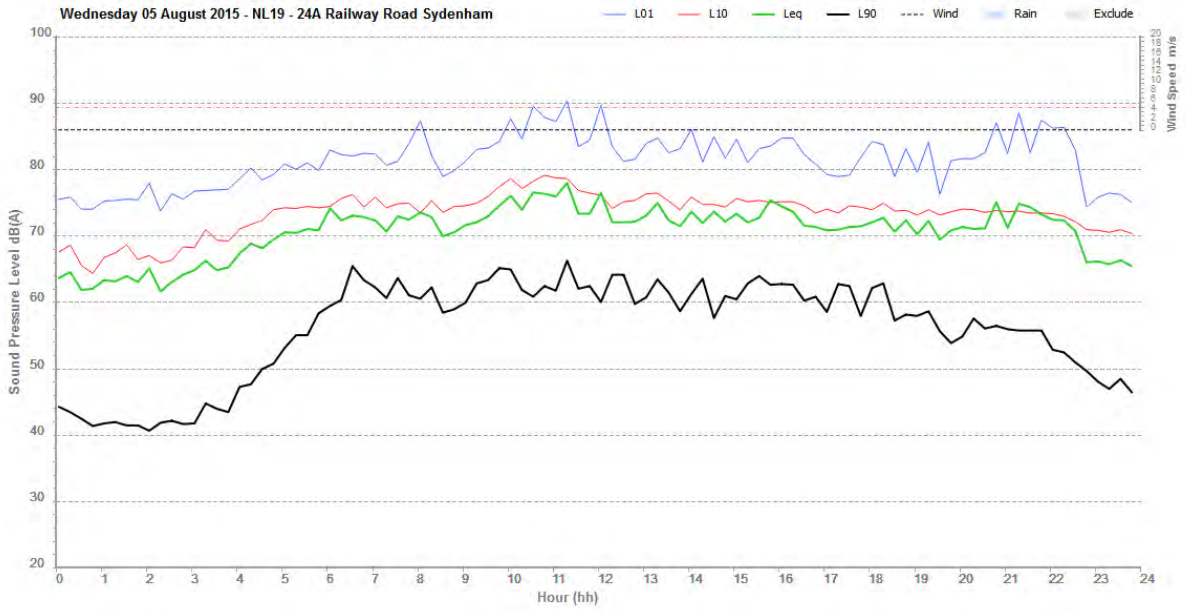

Friday 31 July 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

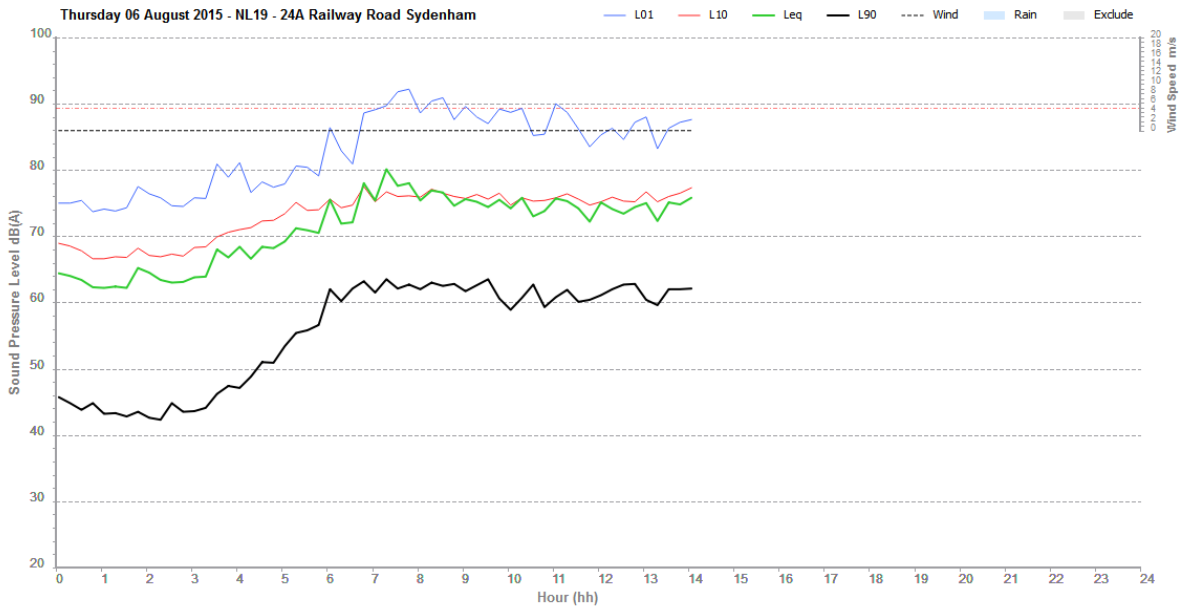

Saturday 01 August 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 02 August 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 03 August 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

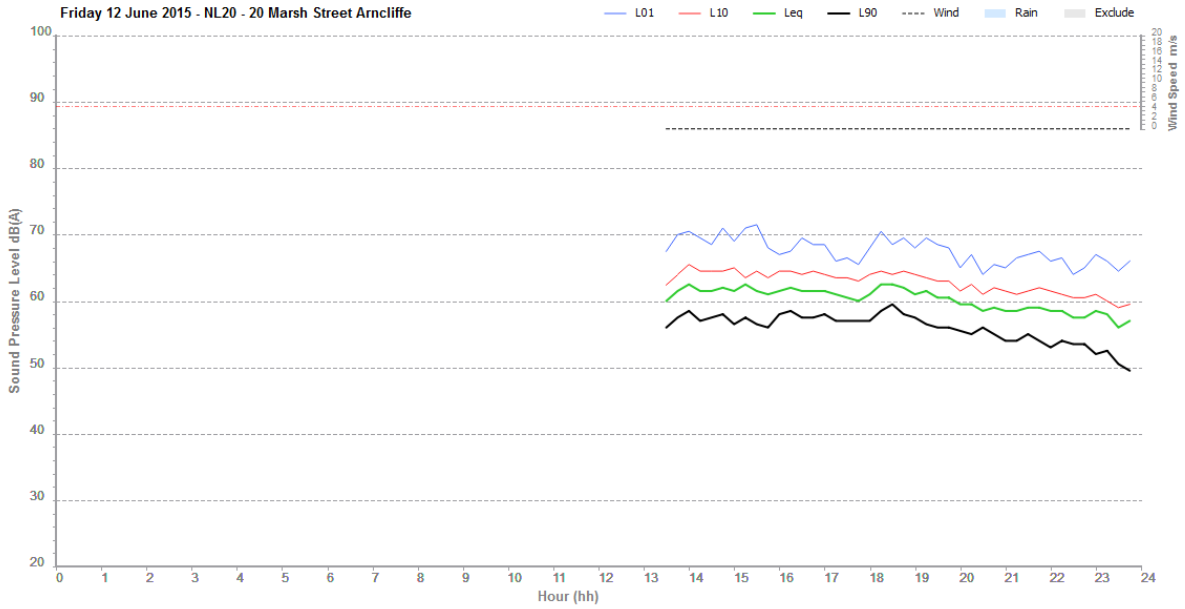

Tuesday 04 August 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

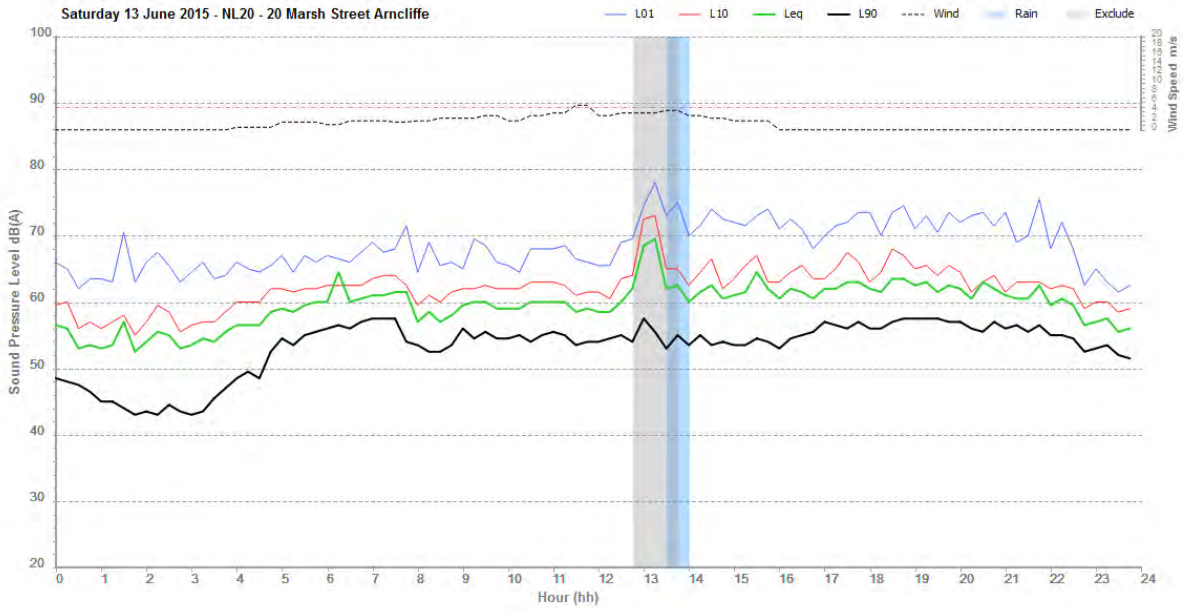

Wednesday 05 August 2015 - NL19 - 24A Railway Road Sydenham
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

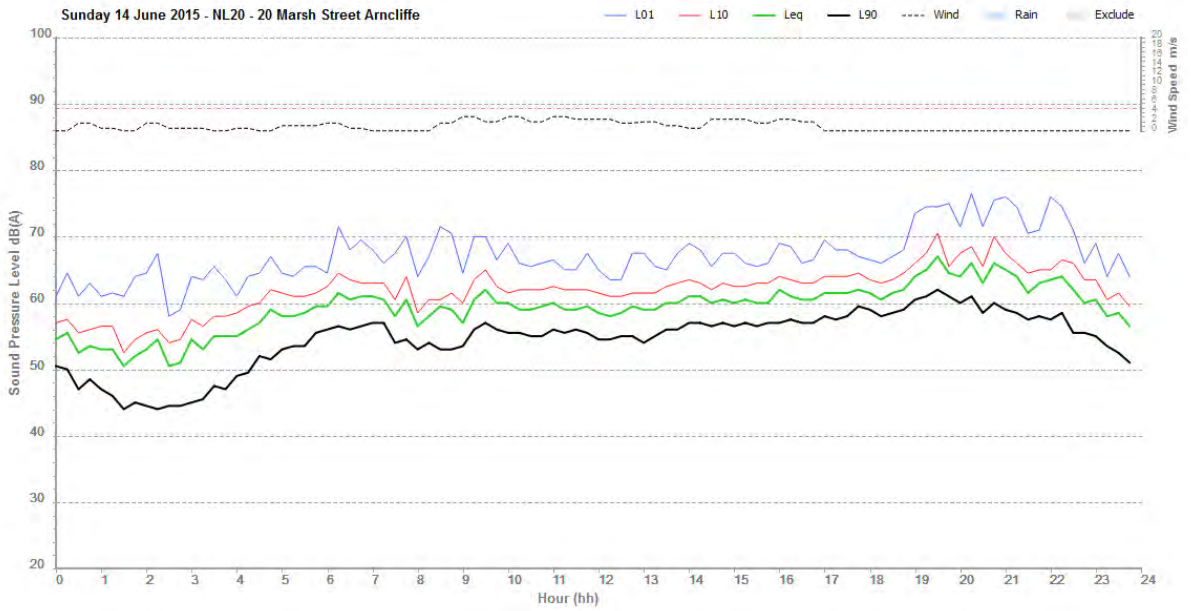


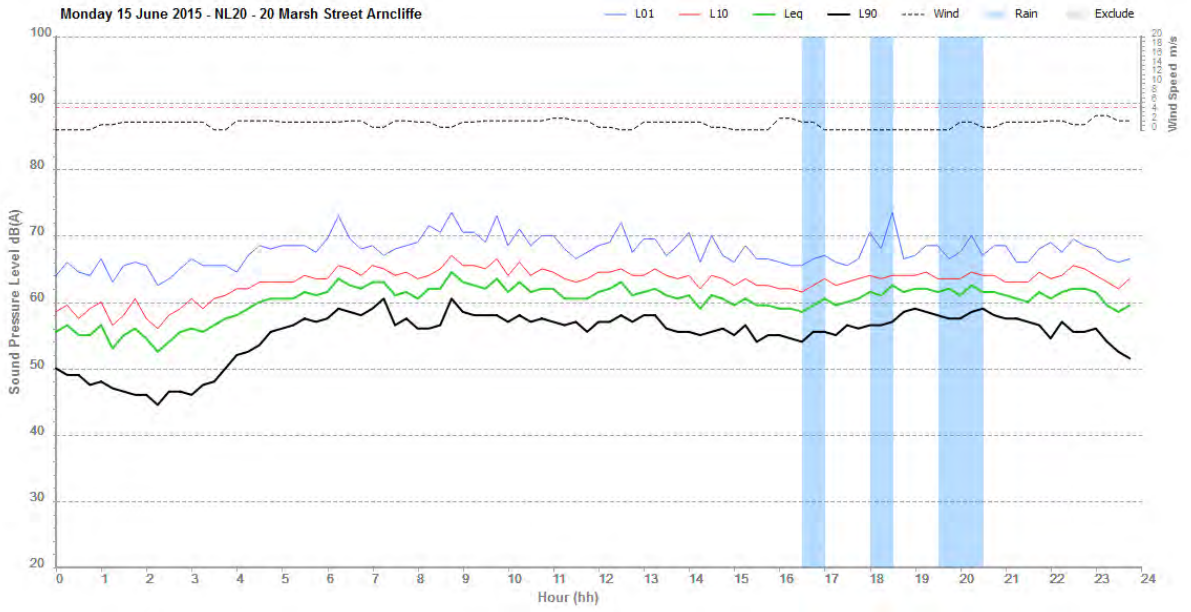
NL20 – 20 Marsh Street, Arncliffe – ARL 215 194531

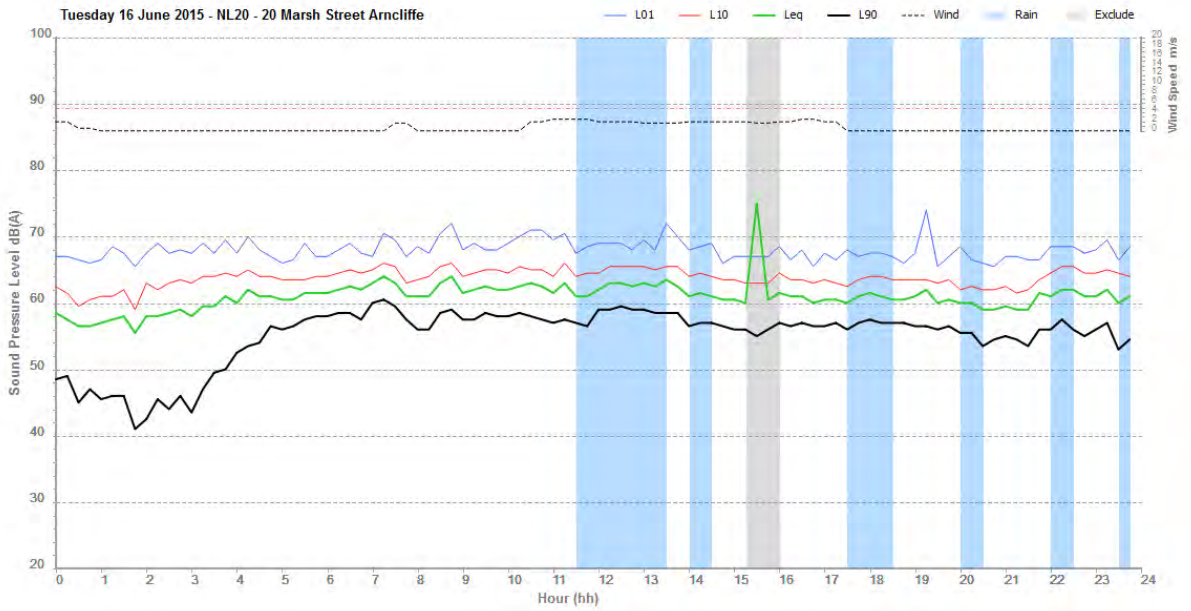


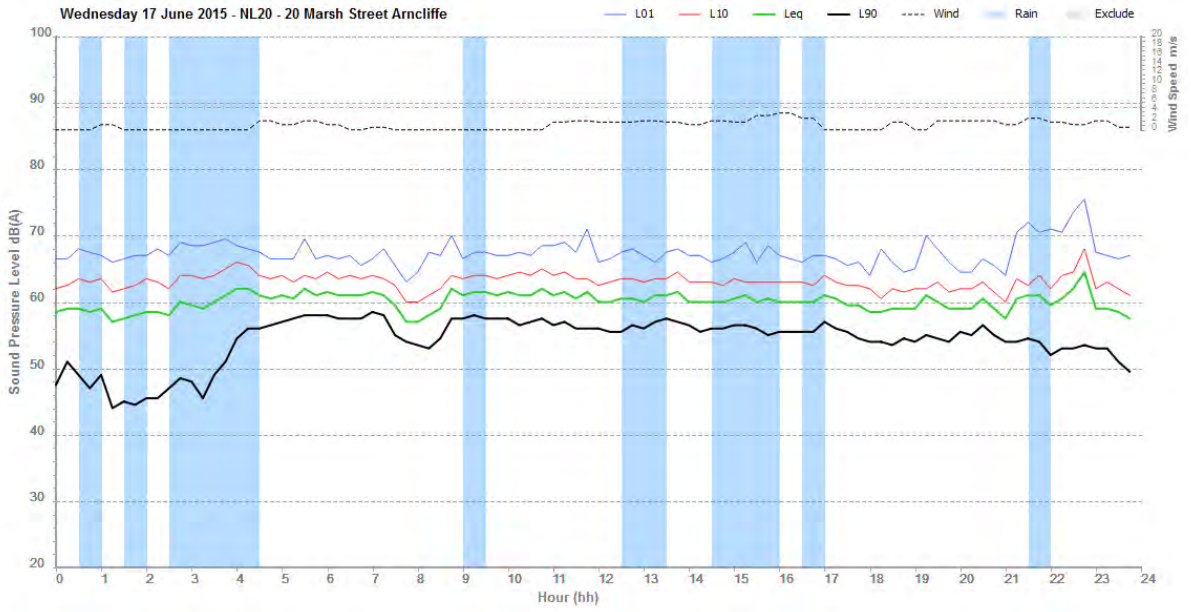

Friday 12 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

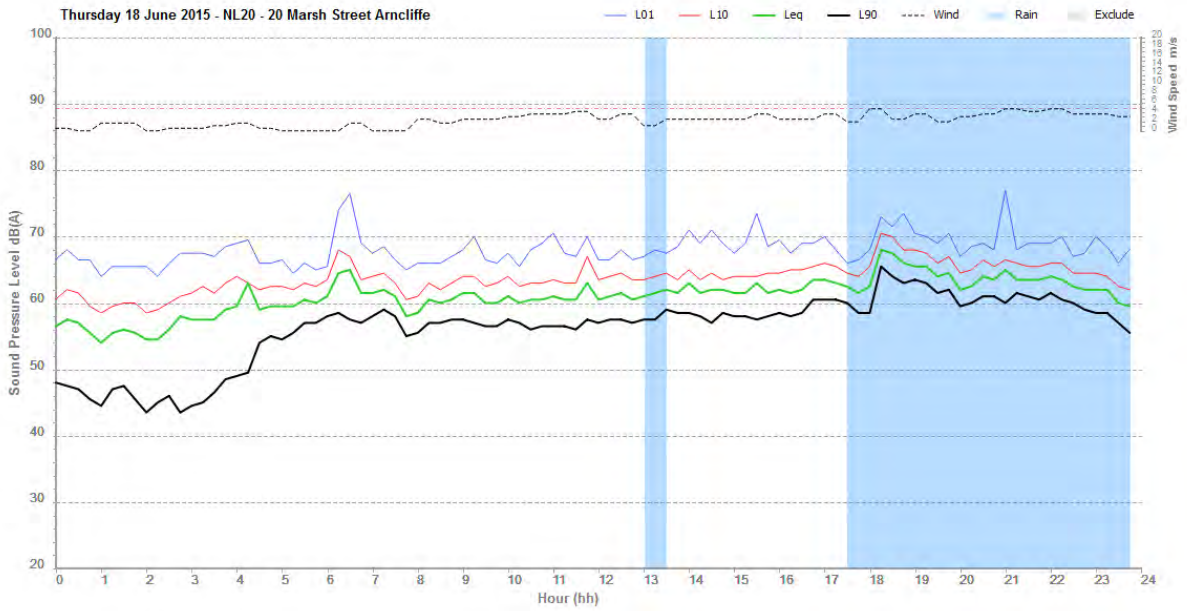

Saturday 13 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

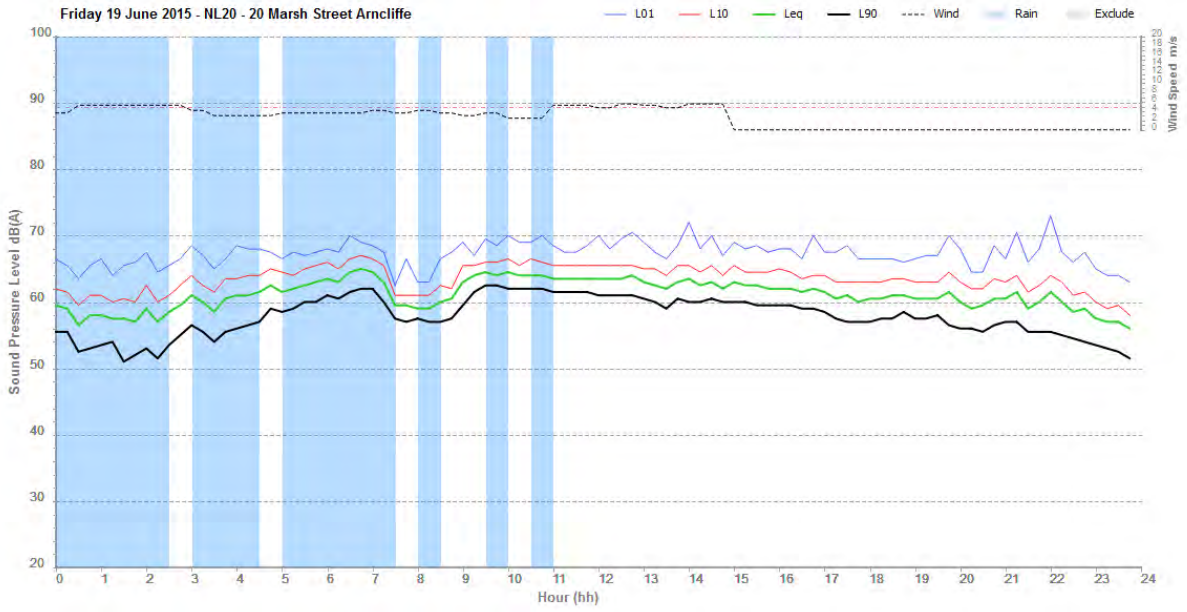

Sunday 14 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

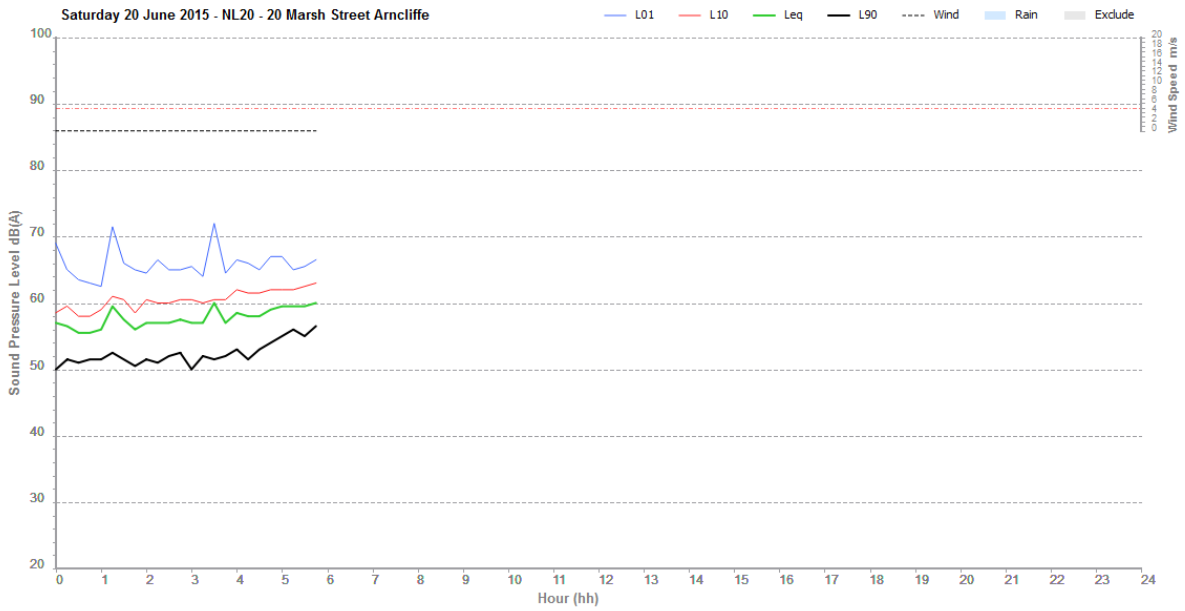

Monday 15 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Wednesday 17 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

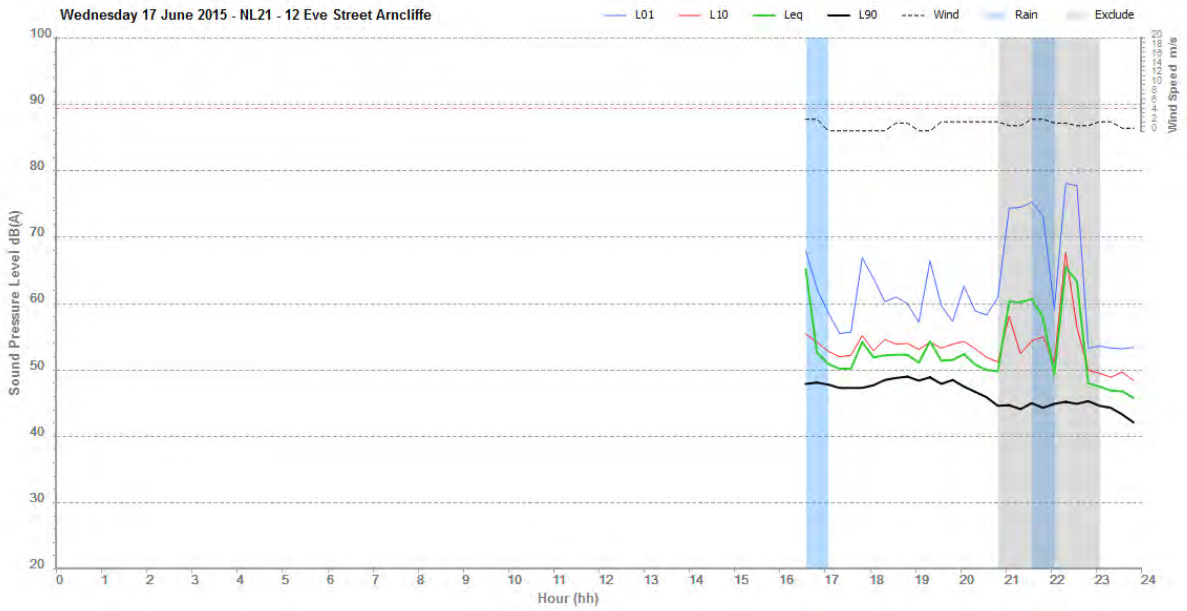

Thursday 18 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

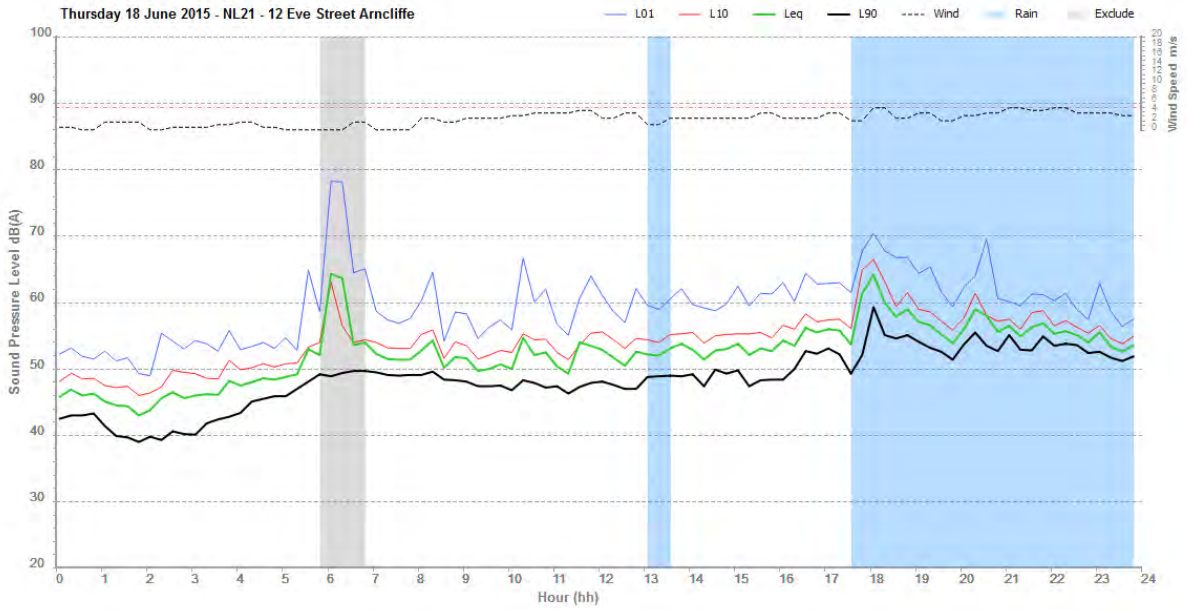

Friday 19 June 2015 - NL20 - 20 Marsh Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

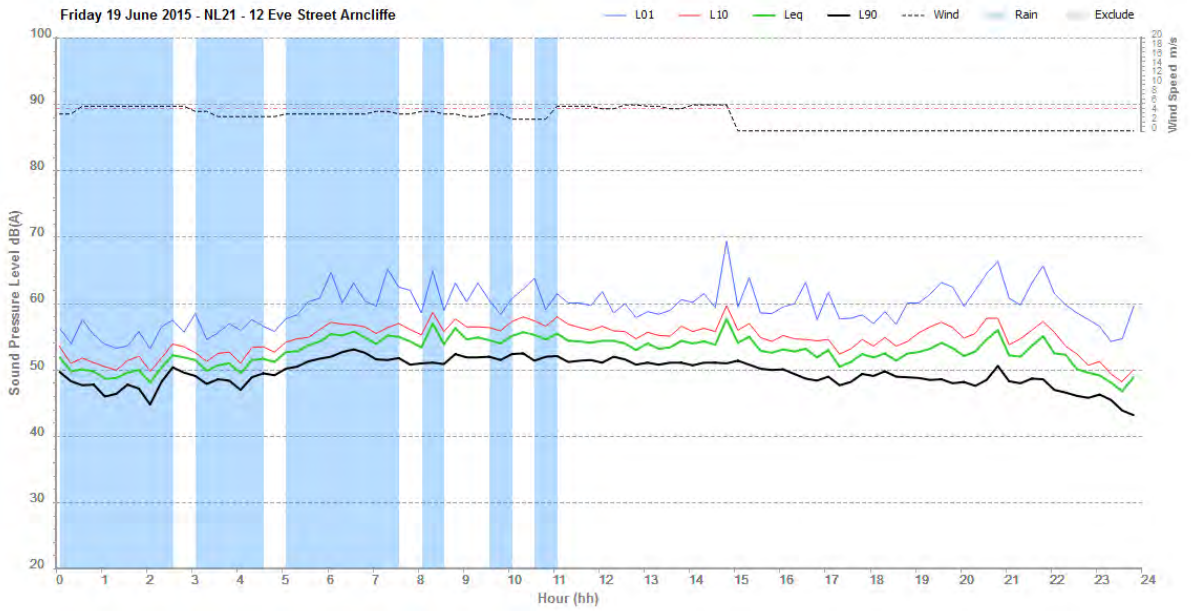


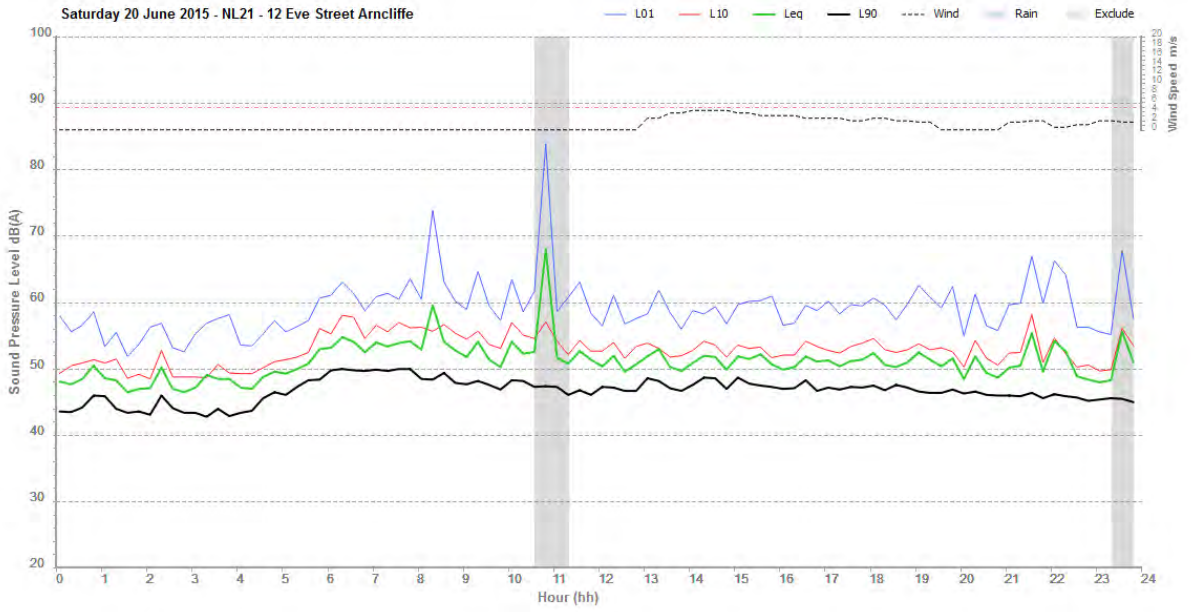
NL21 – 12 Eve Street, Arncliffe – Rion NL21 00765699

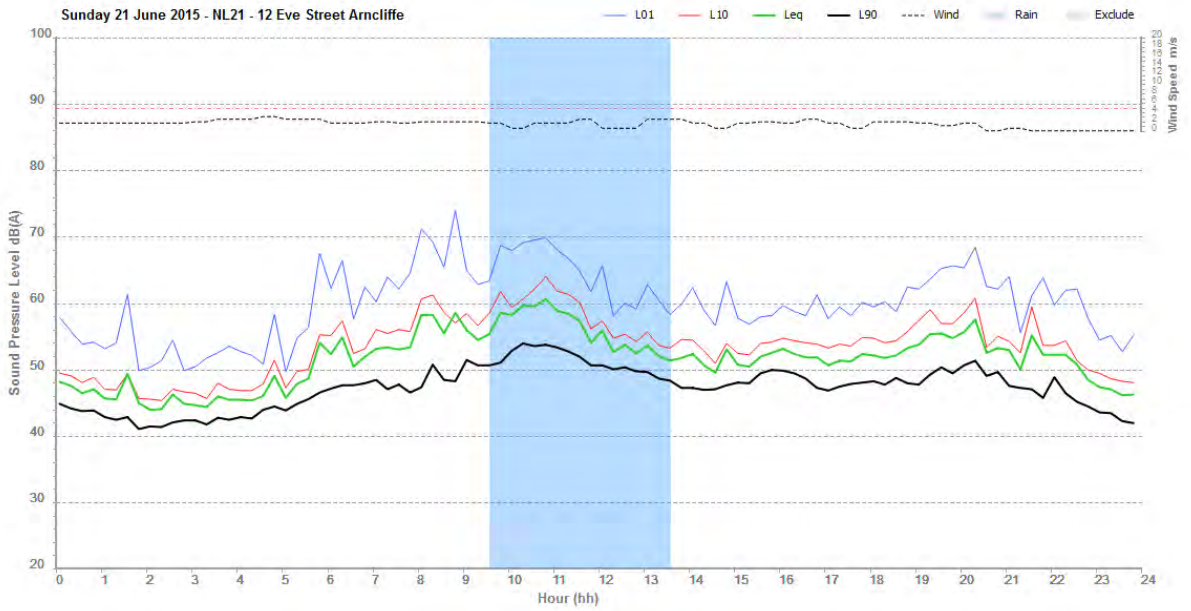


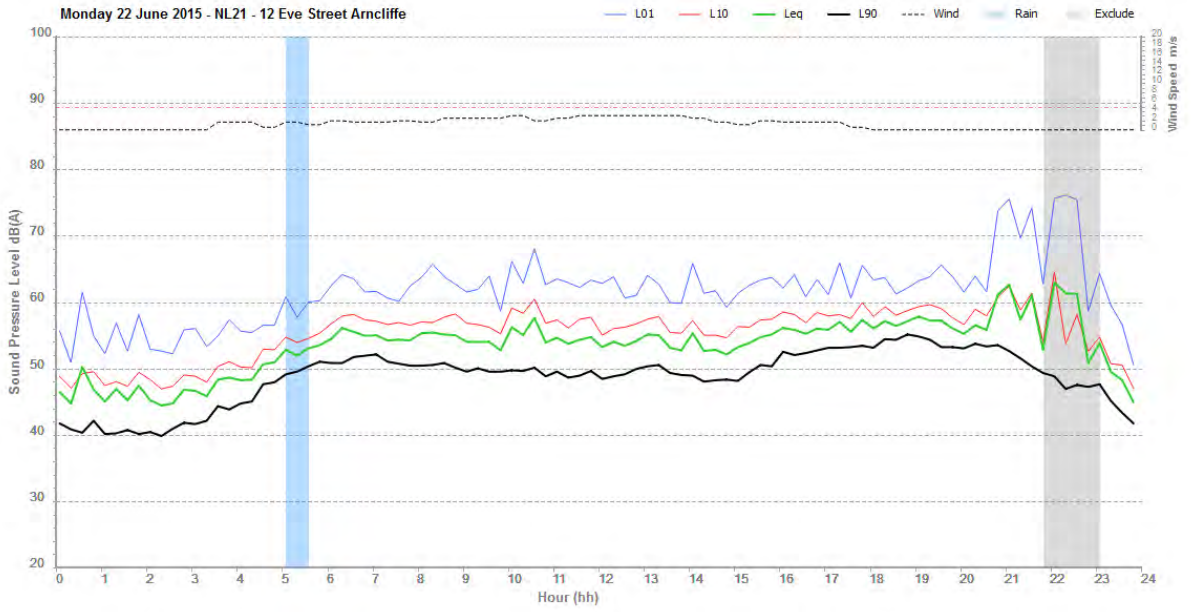

Wednesday 17 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

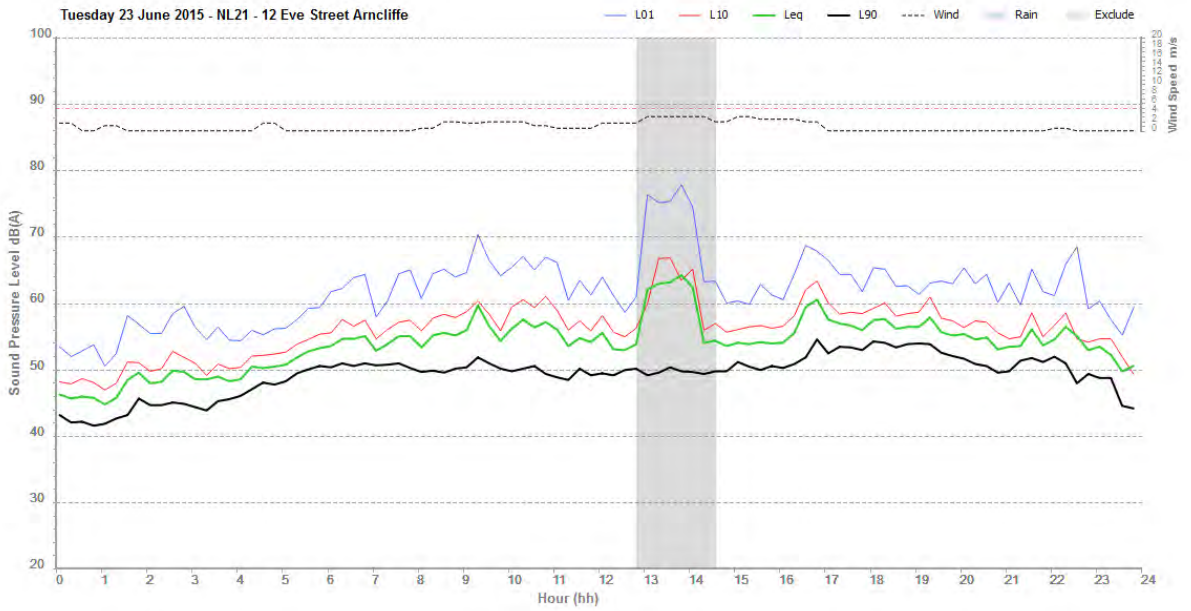

Thursday 18 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

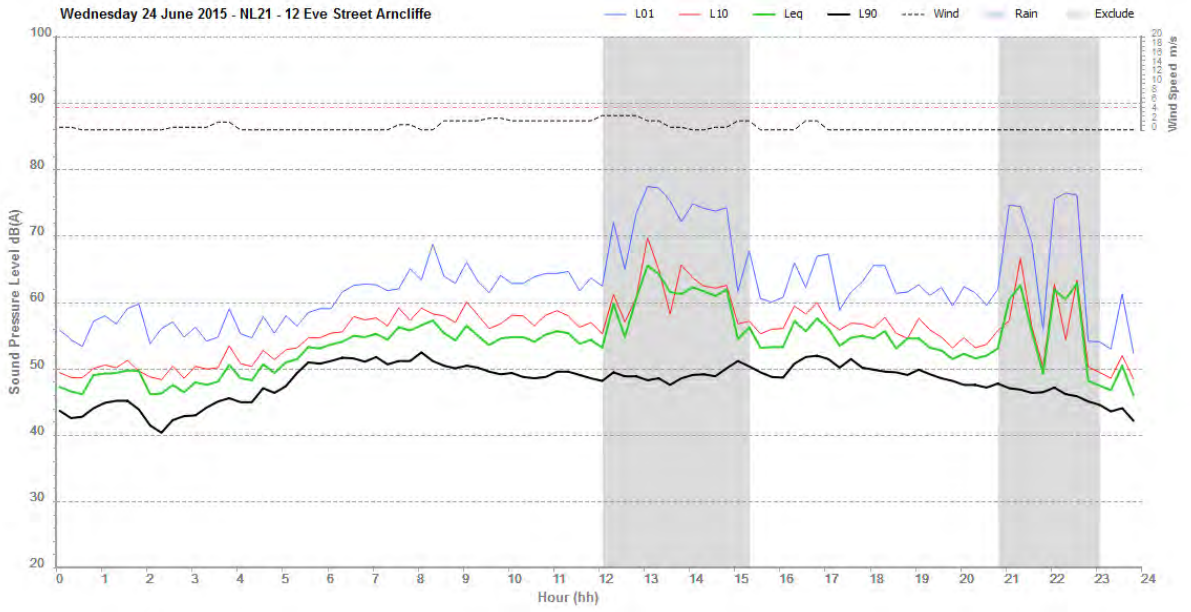

Friday 19 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

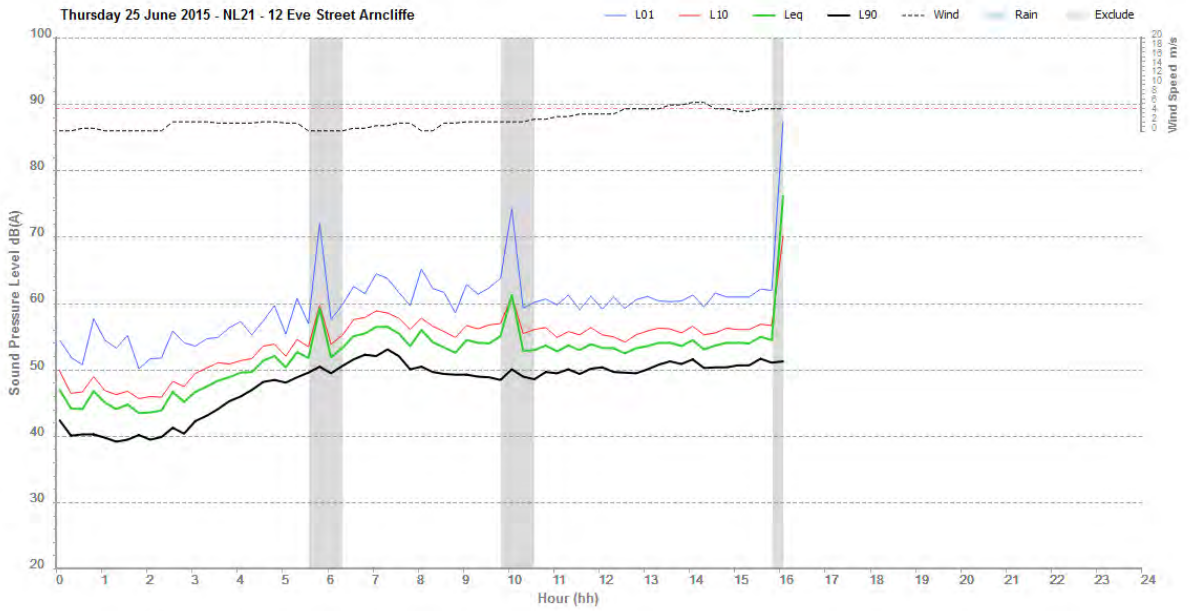

Saturday 20 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 21 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 22 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

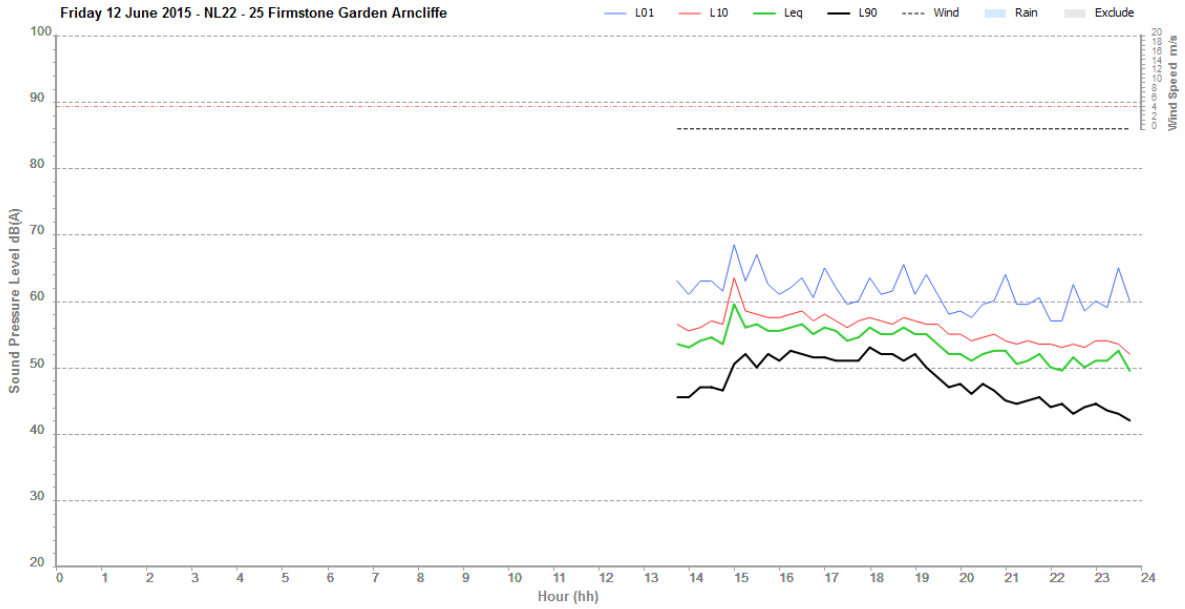

Tuesday 23 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

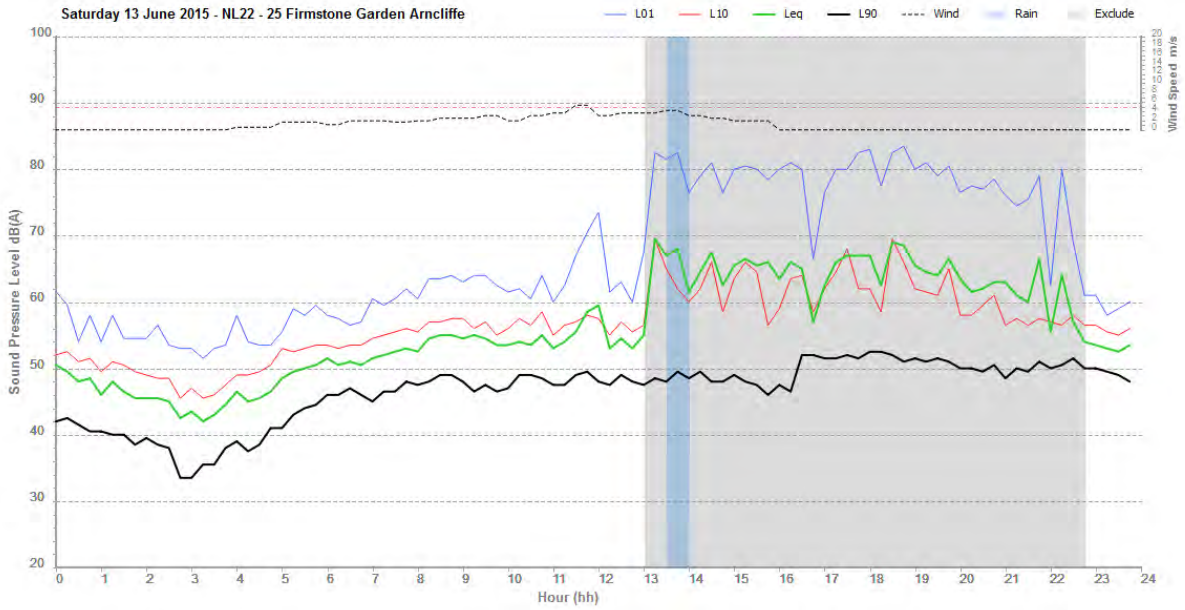

Wednesday 24 June 2015 - NL21 - 12 Eve Street Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

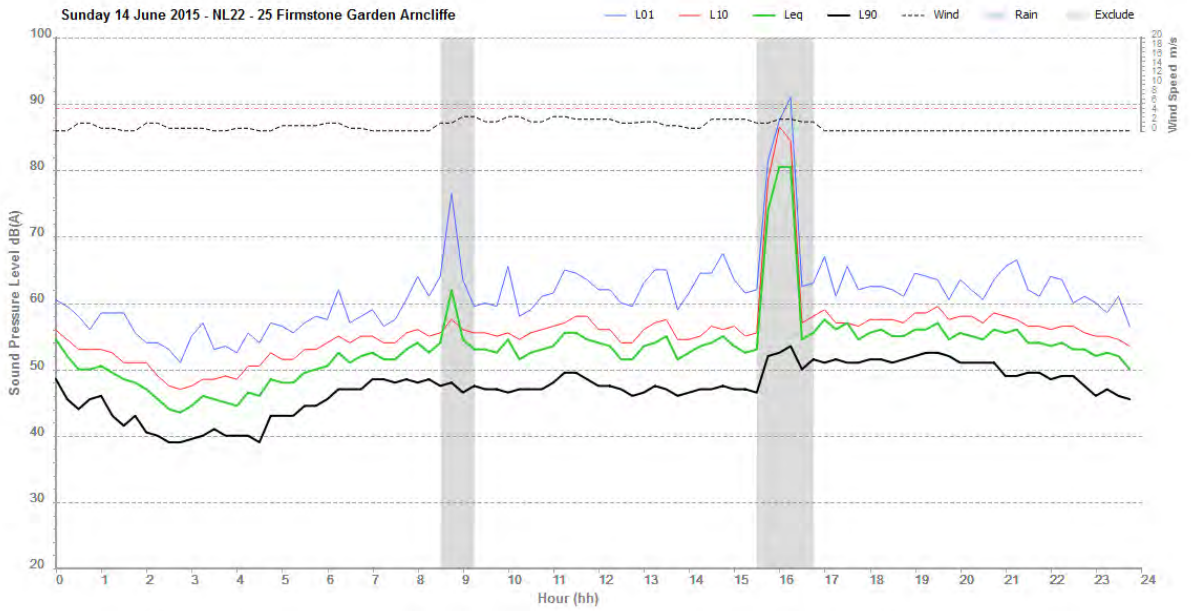


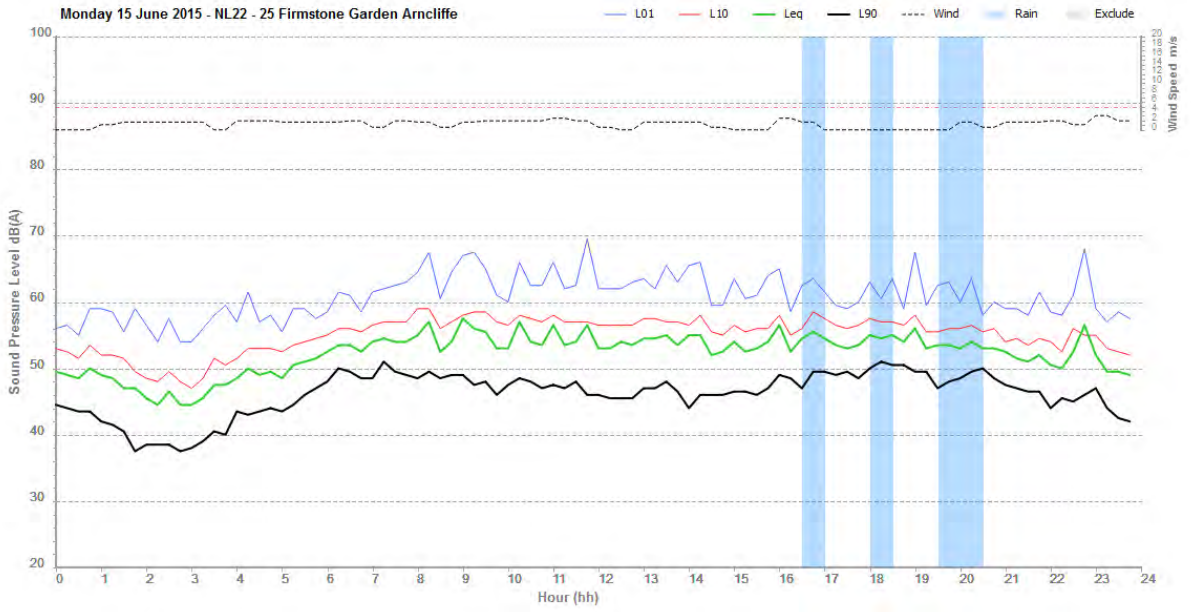
NL22 – 25 Firmstone Garden, Arncliffe – ARL 215 194803

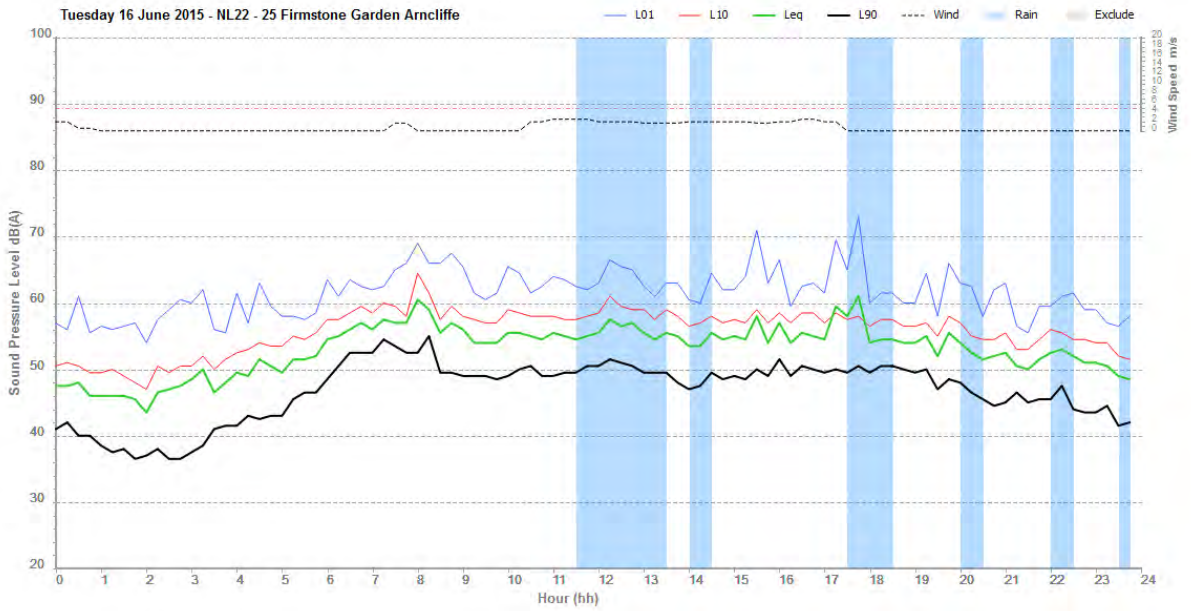


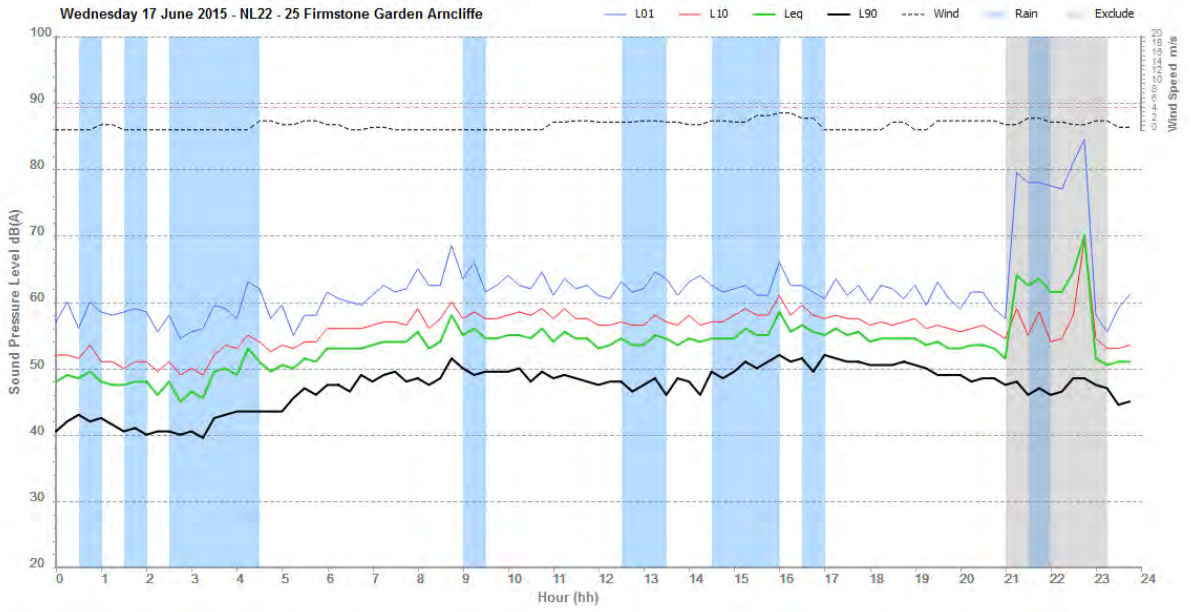

Friday 12 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

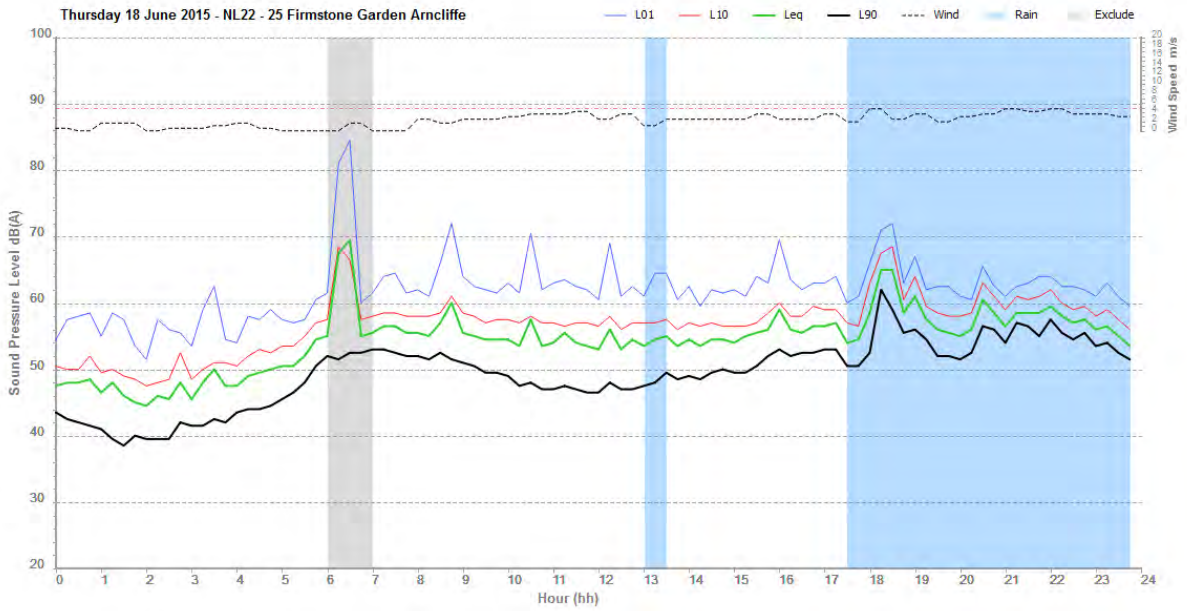

Saturday 13 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

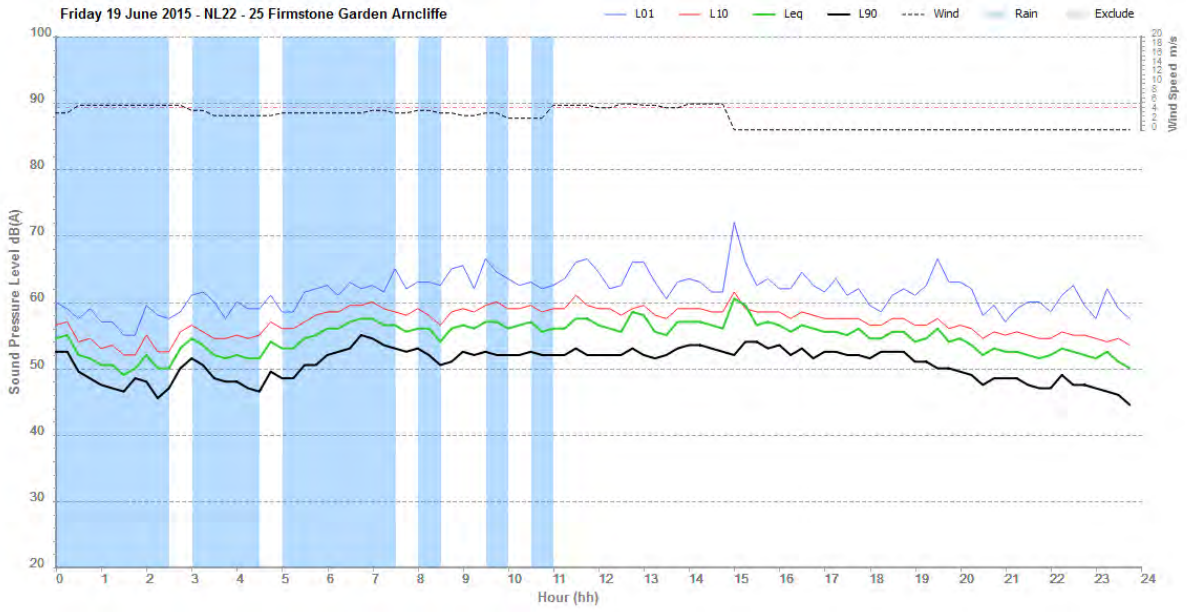

Sunday 14 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

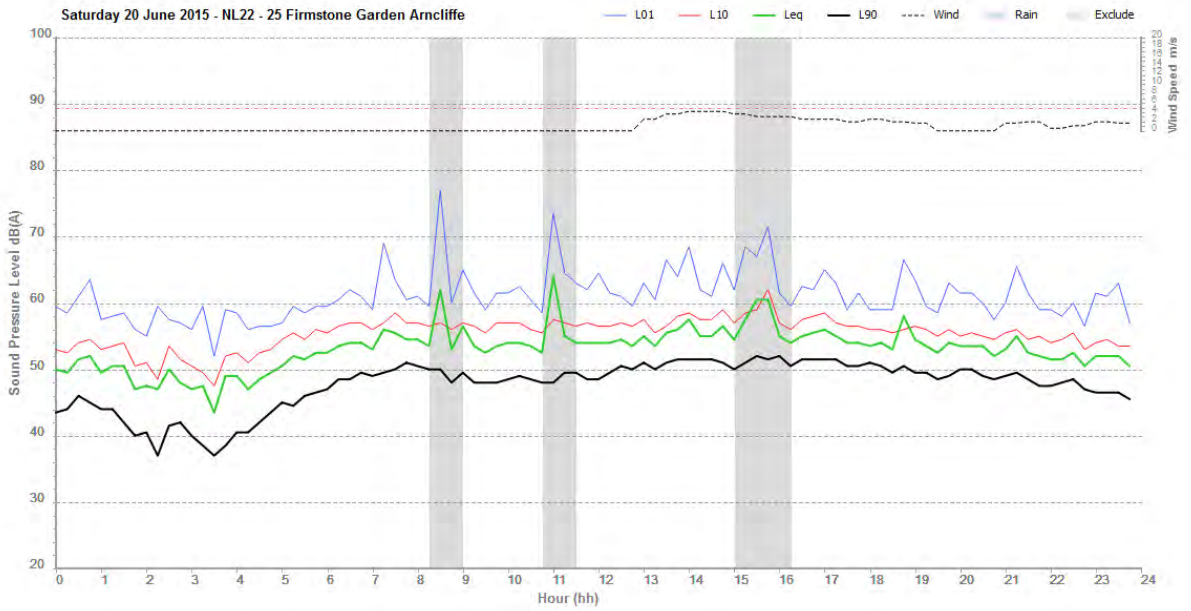

Monday 15 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

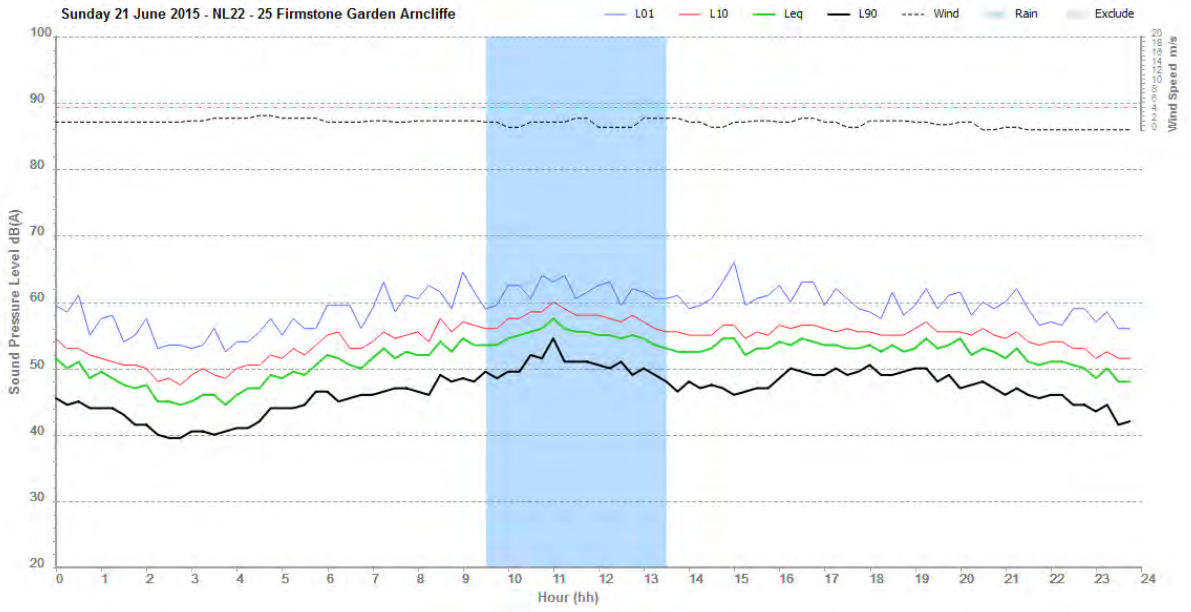

Tuesday 16 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

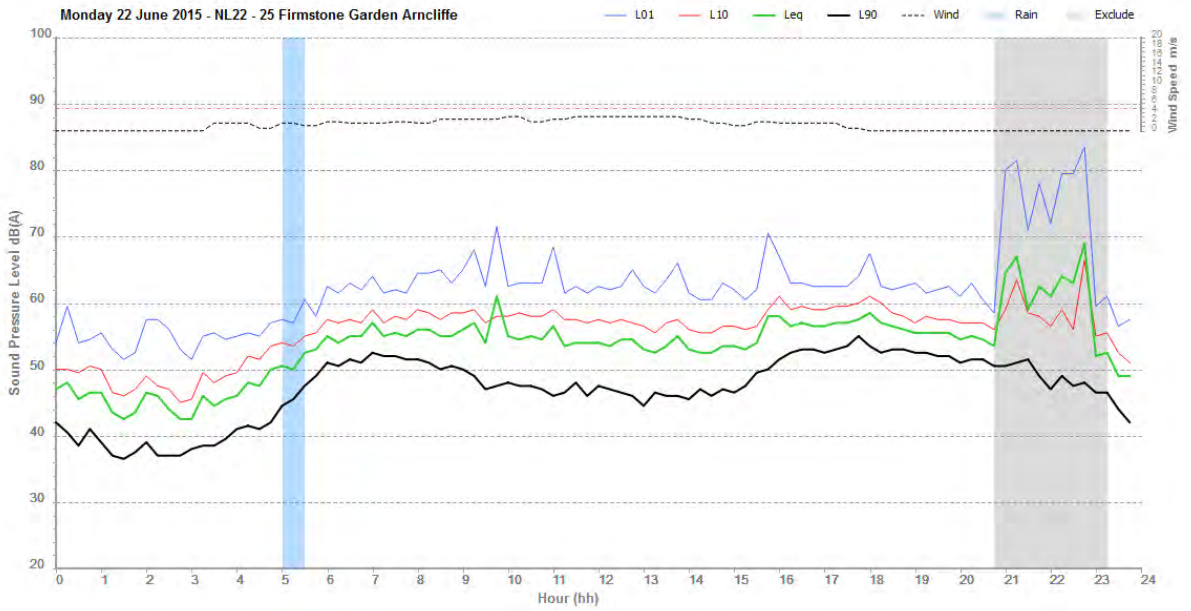

Wednesday 17 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

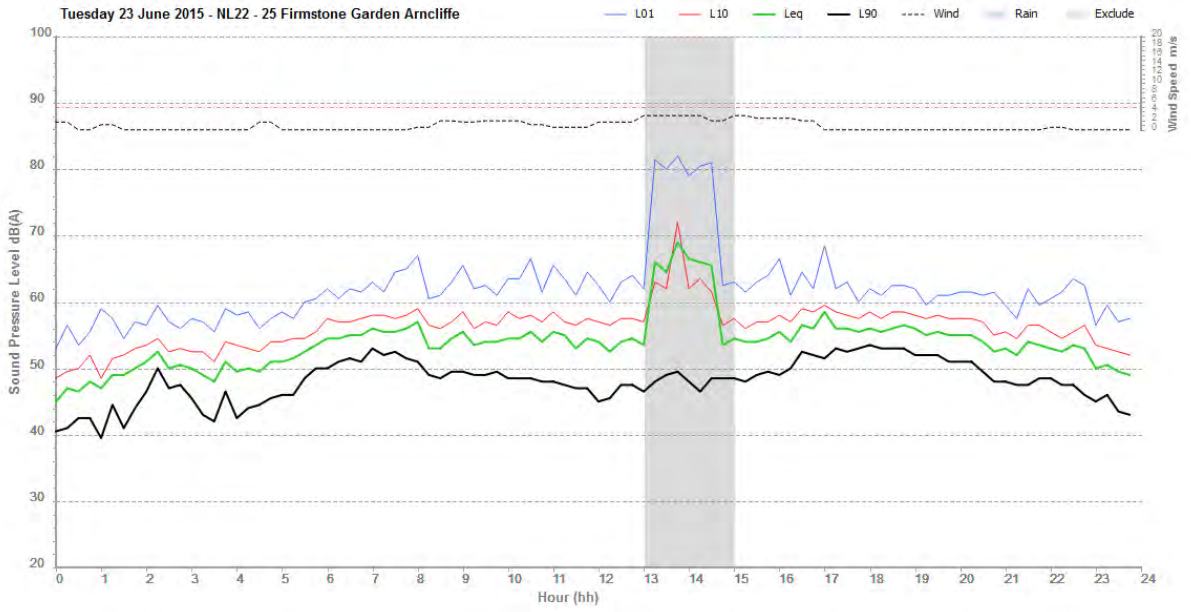

Thursday 18 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

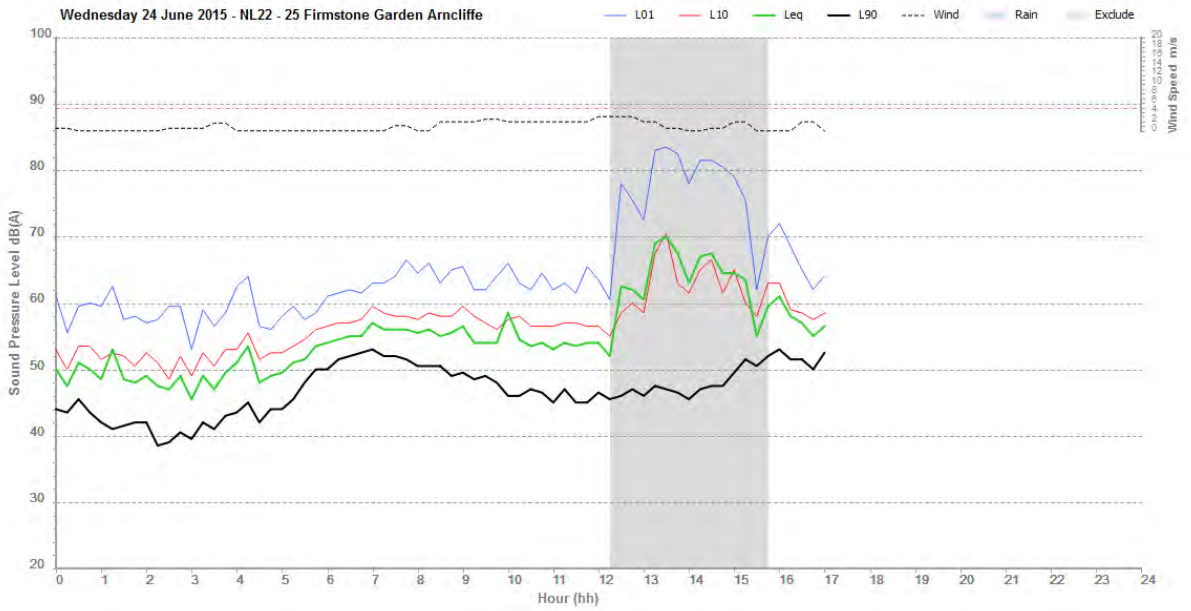

Friday 19 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Saturday 20 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 21 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

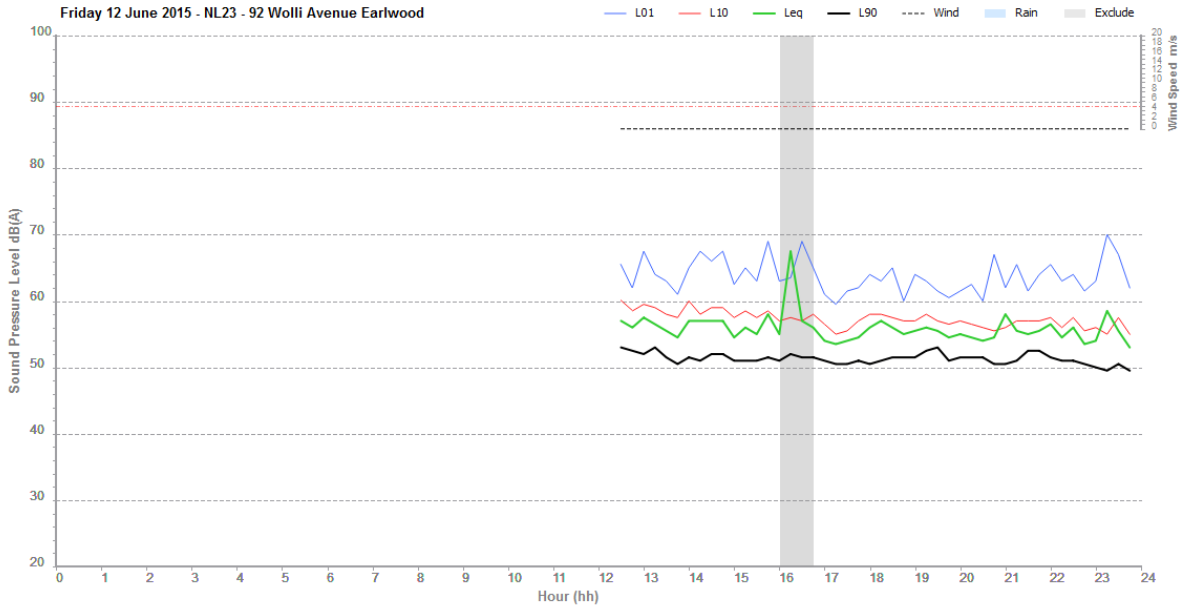

Monday 22 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

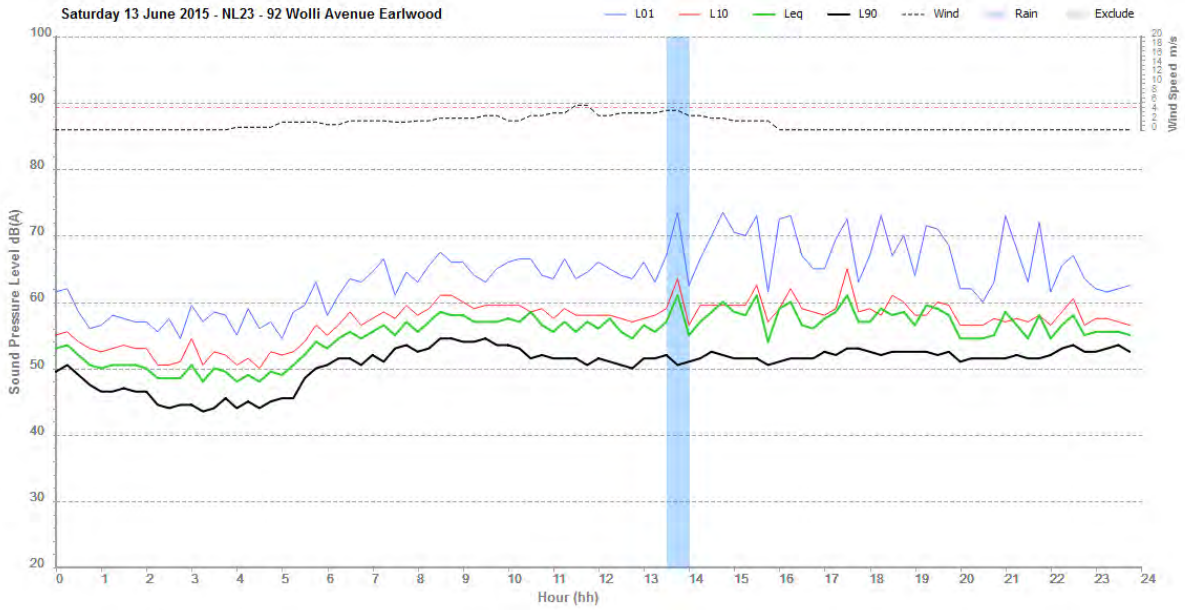

Tuesday 23 June 2015 - NL22 - 25 Firmstone Garden Arncliffe
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

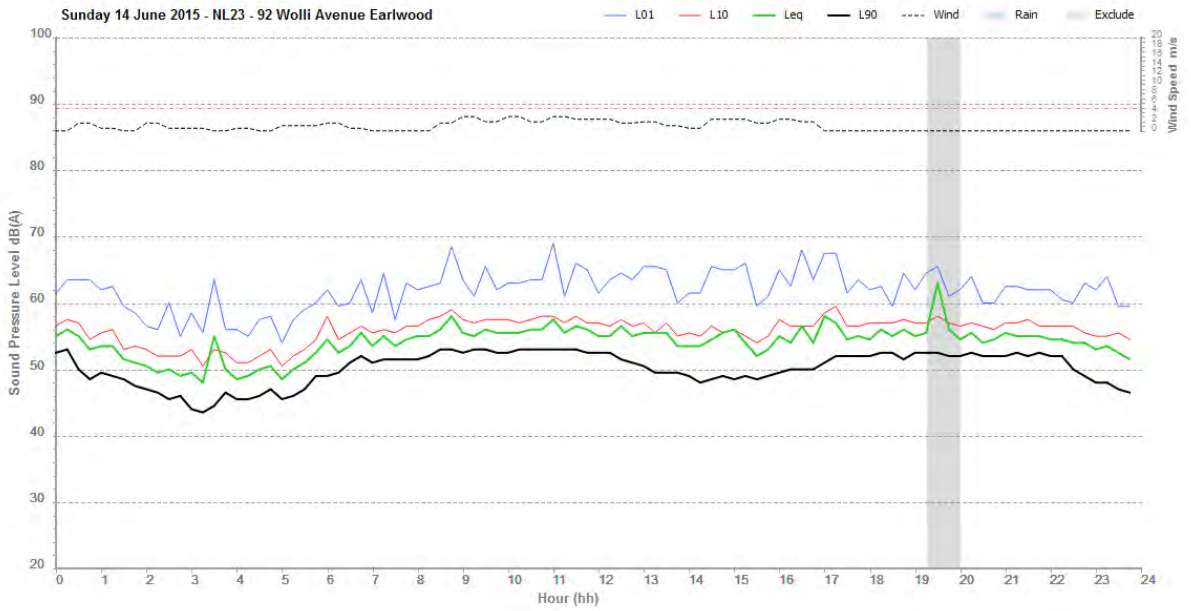


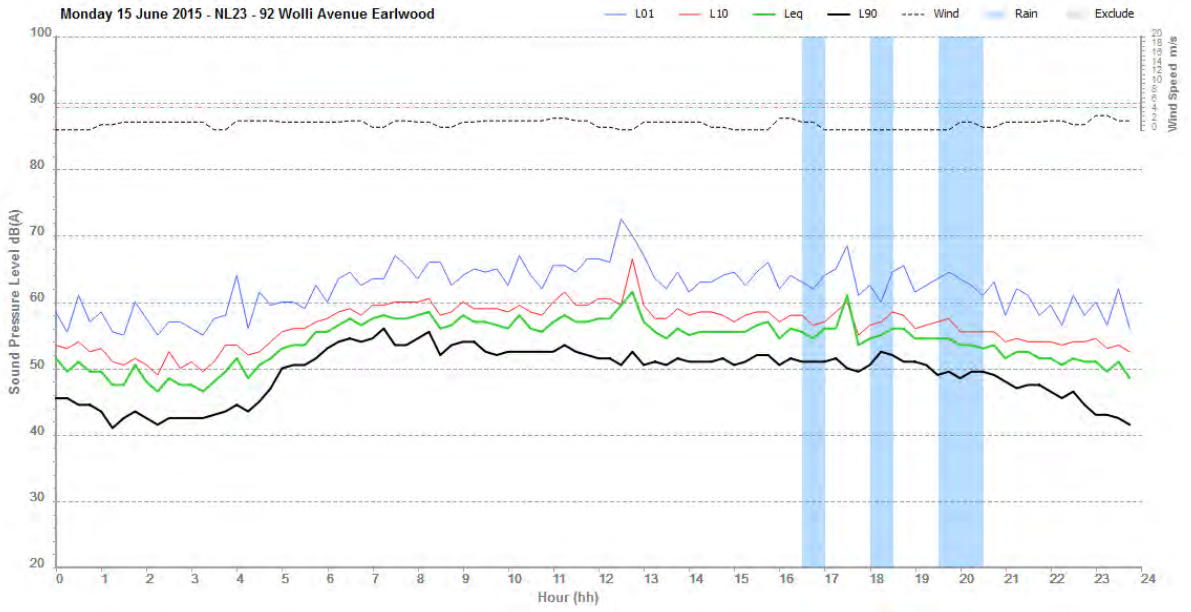
NL23 – 92 Wolli Avenue, Earlwood – ARL 215 194449

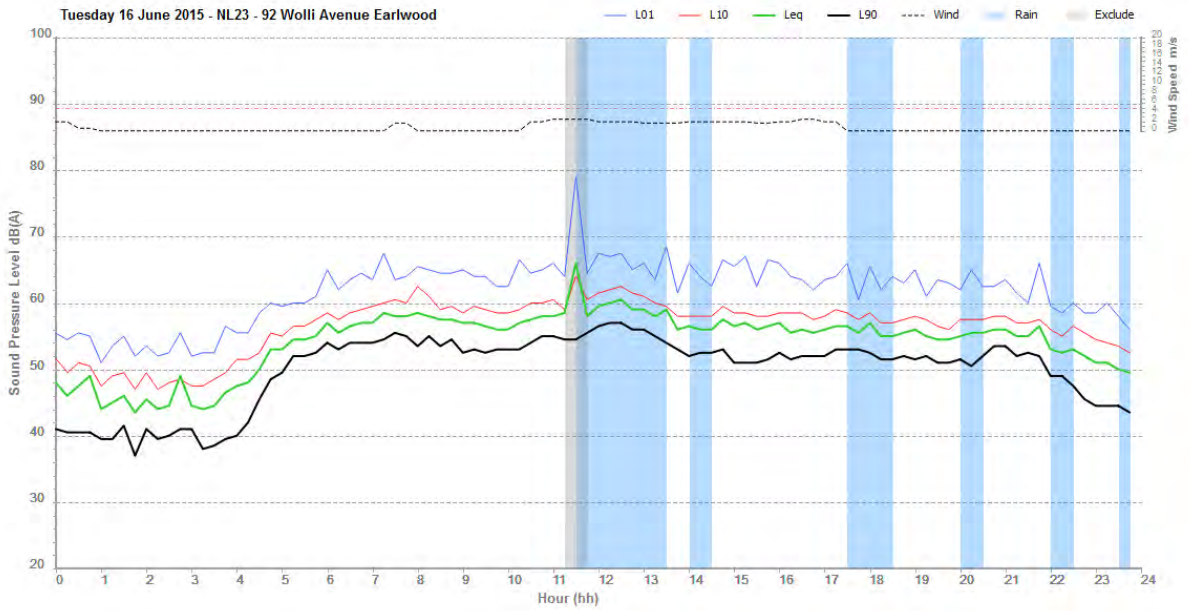


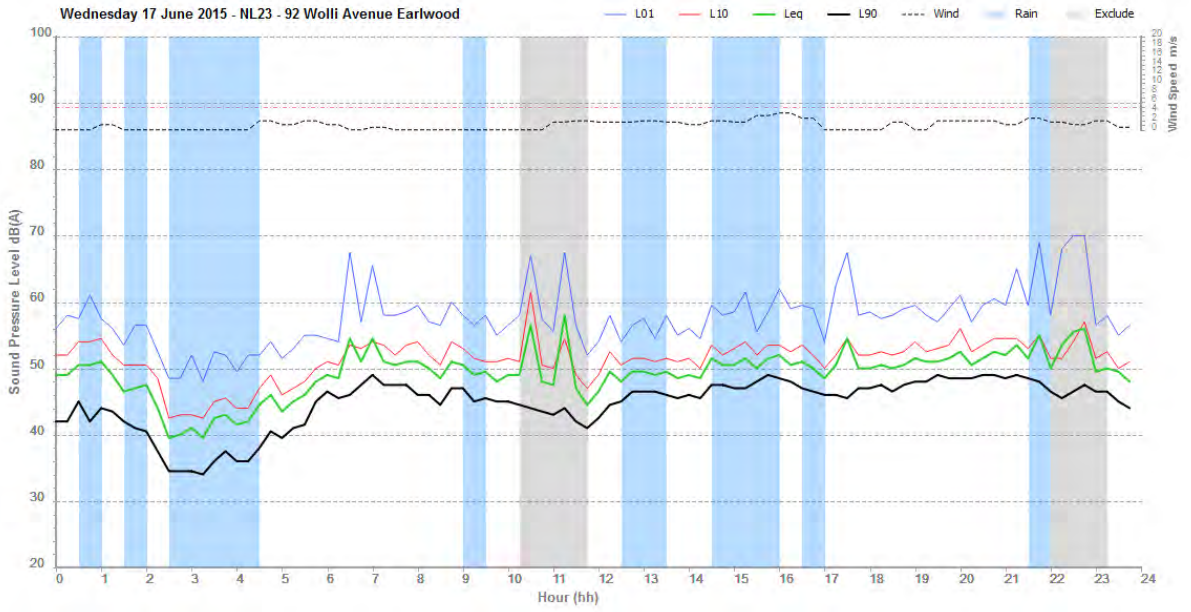

Friday 12 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

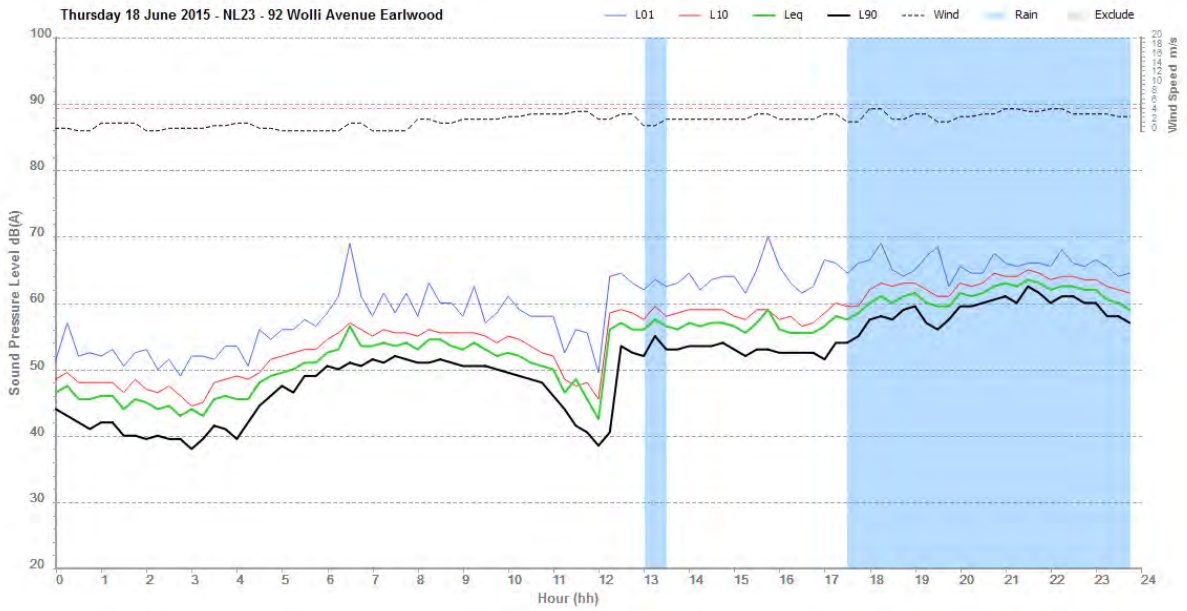

Saturday 13 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

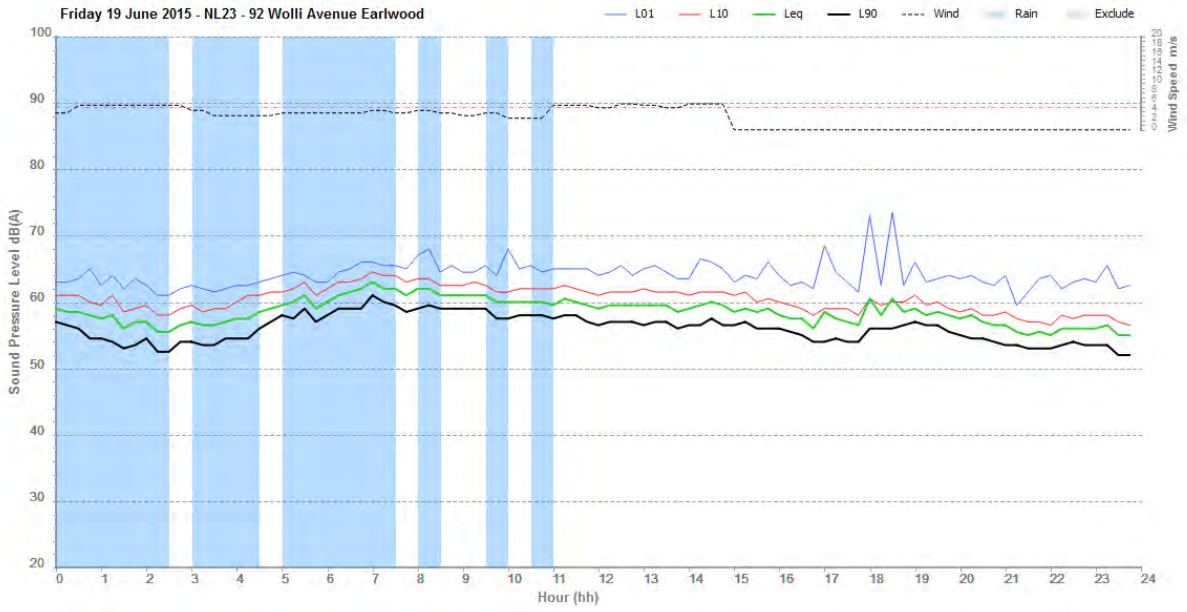

Sunday 14 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

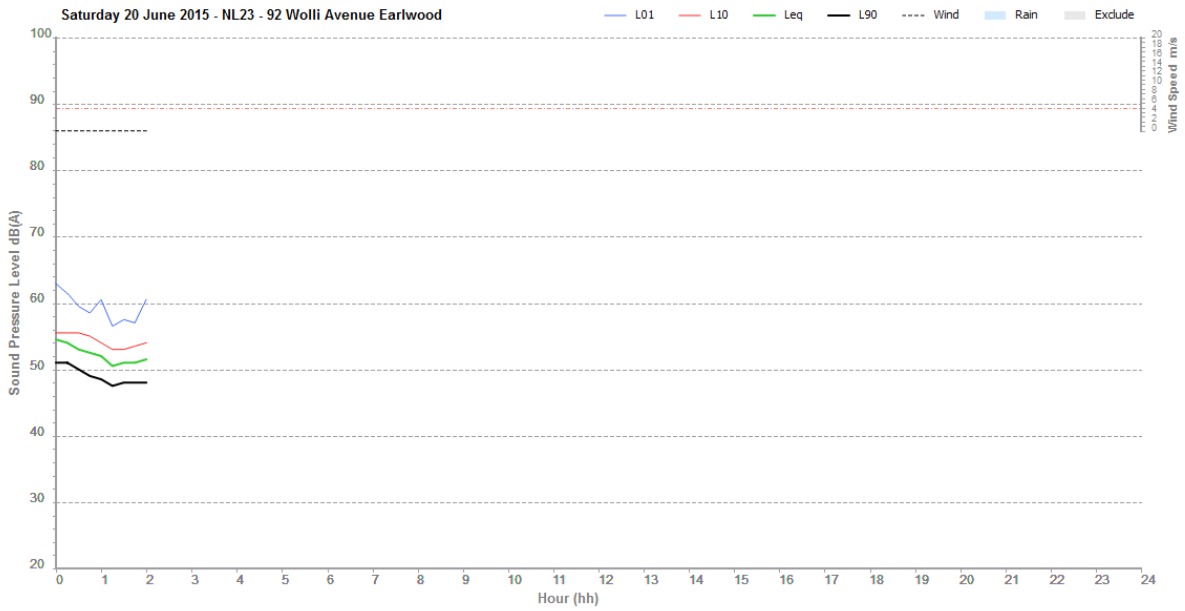

Monday 15 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 16 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Wednesday 17 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

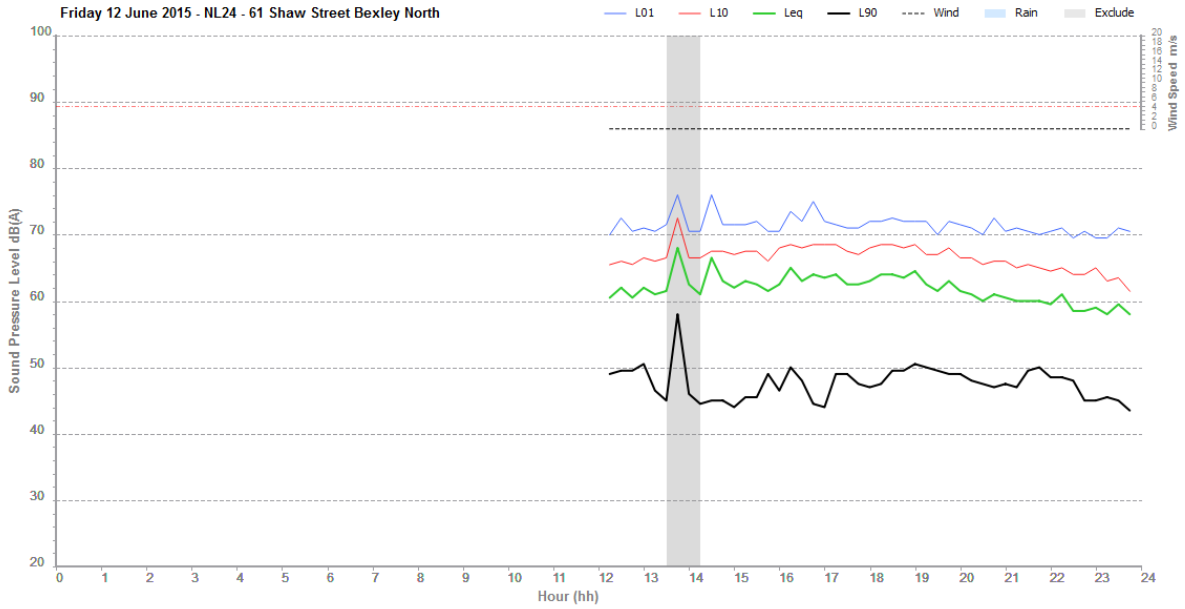

Thursday 18 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

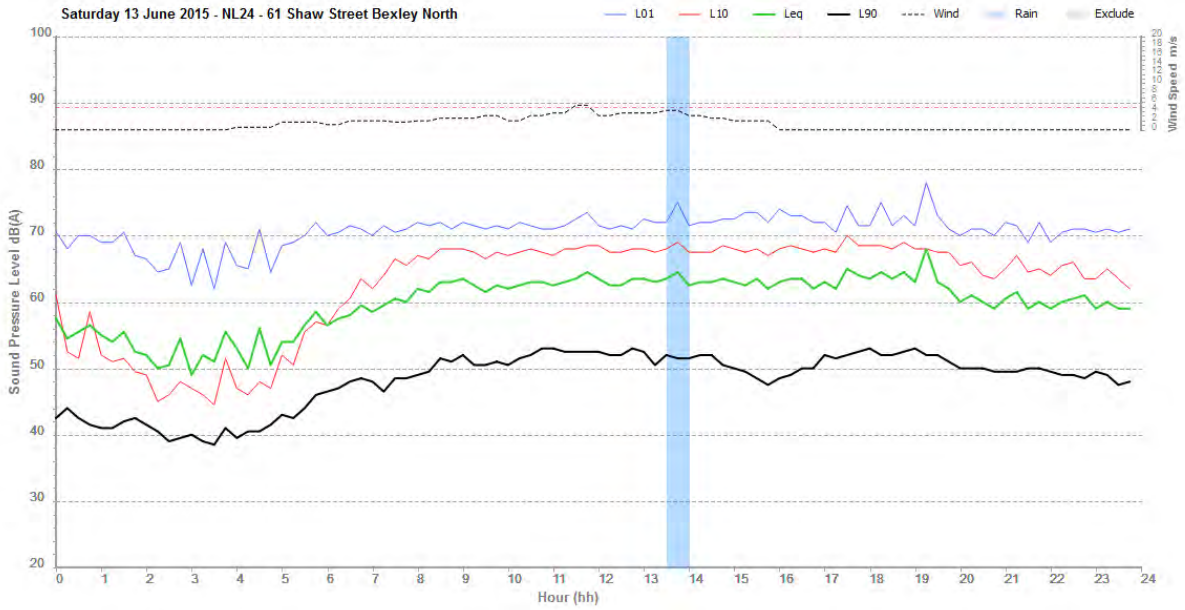

Friday 19 June 2015 - NL23 - 92 Wolli Avenue Earlwood
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

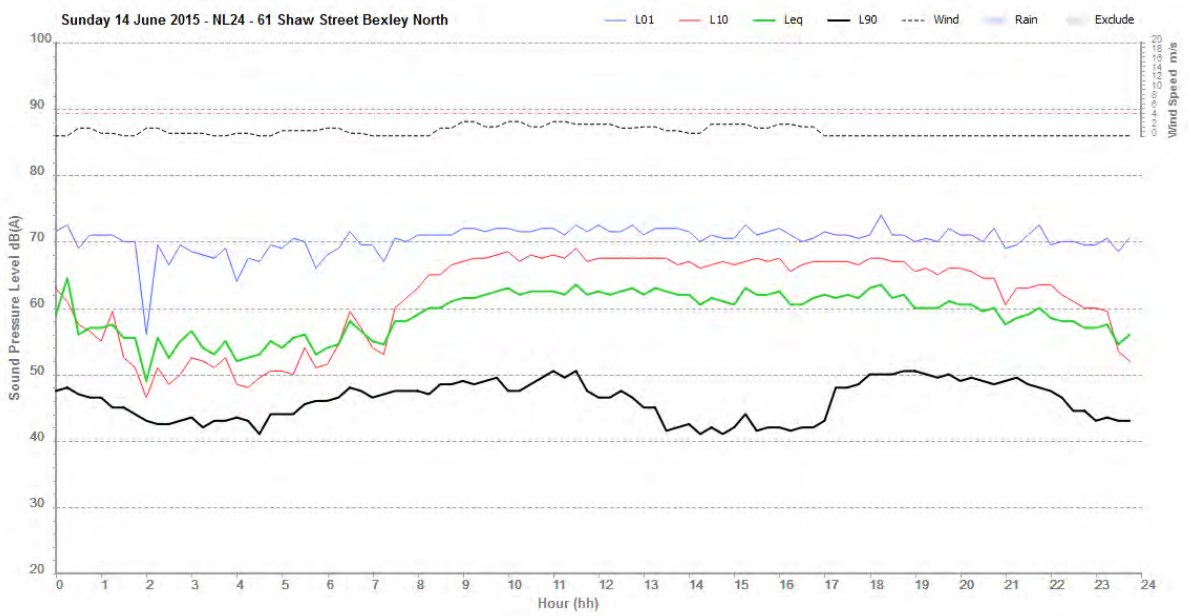


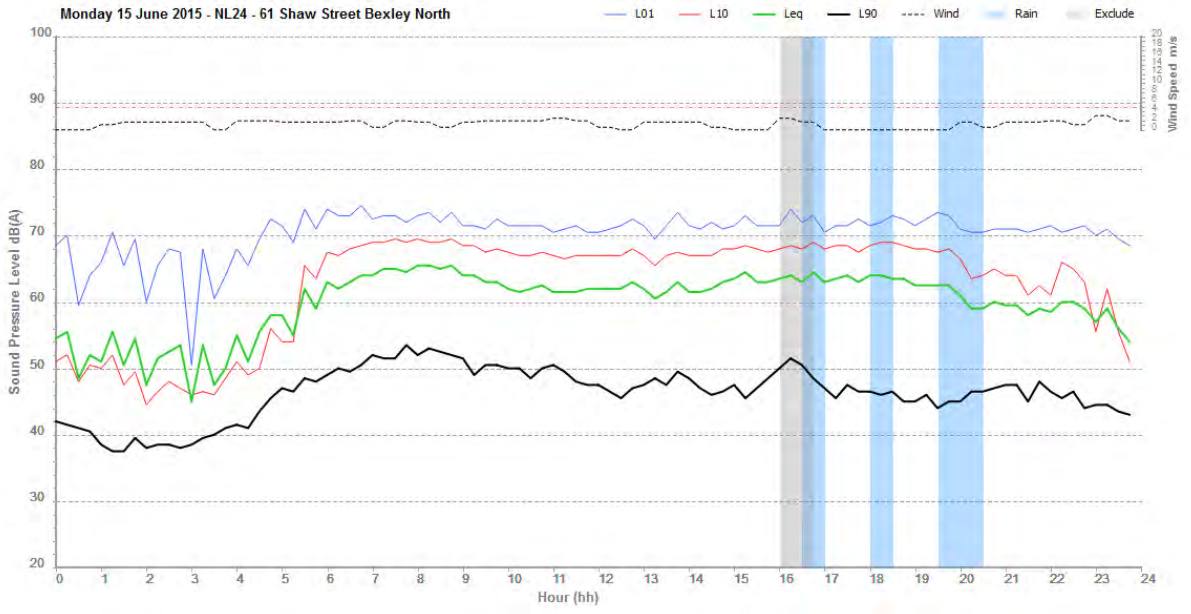
NL24 – 61 Shaw Street, Bexley North – ARL 215 194688

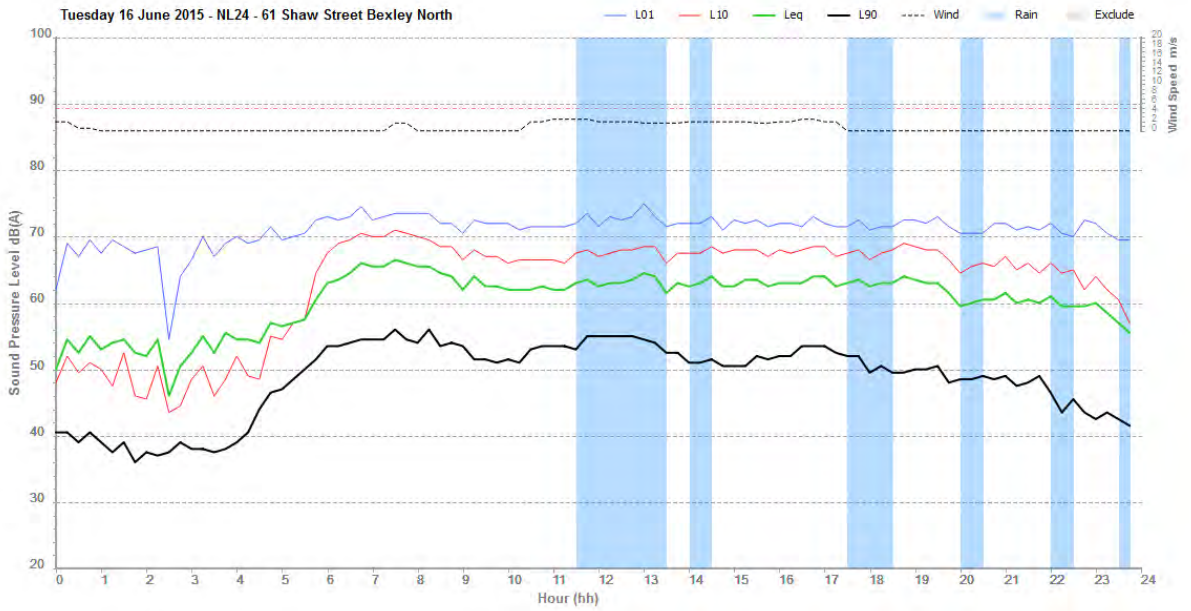


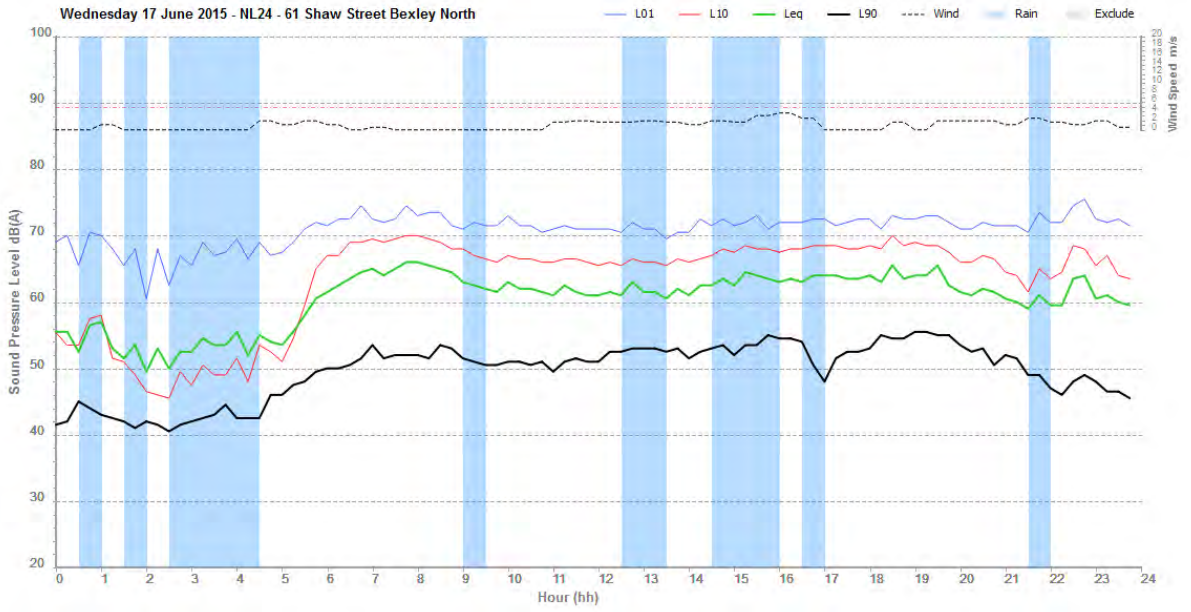

Friday 12 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

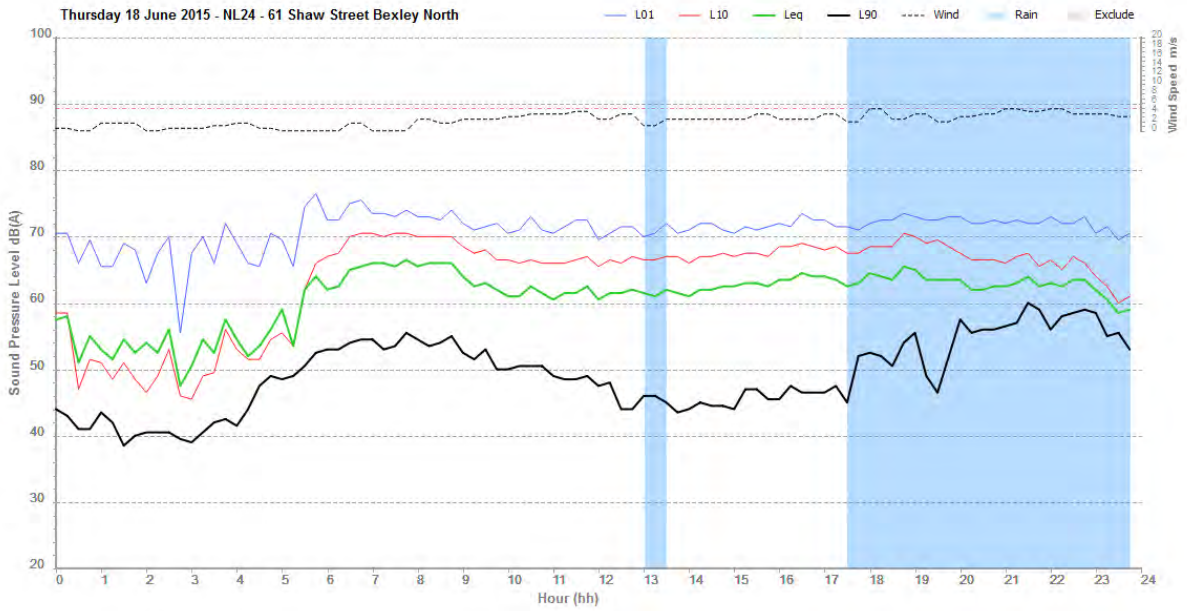

Saturday 13 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

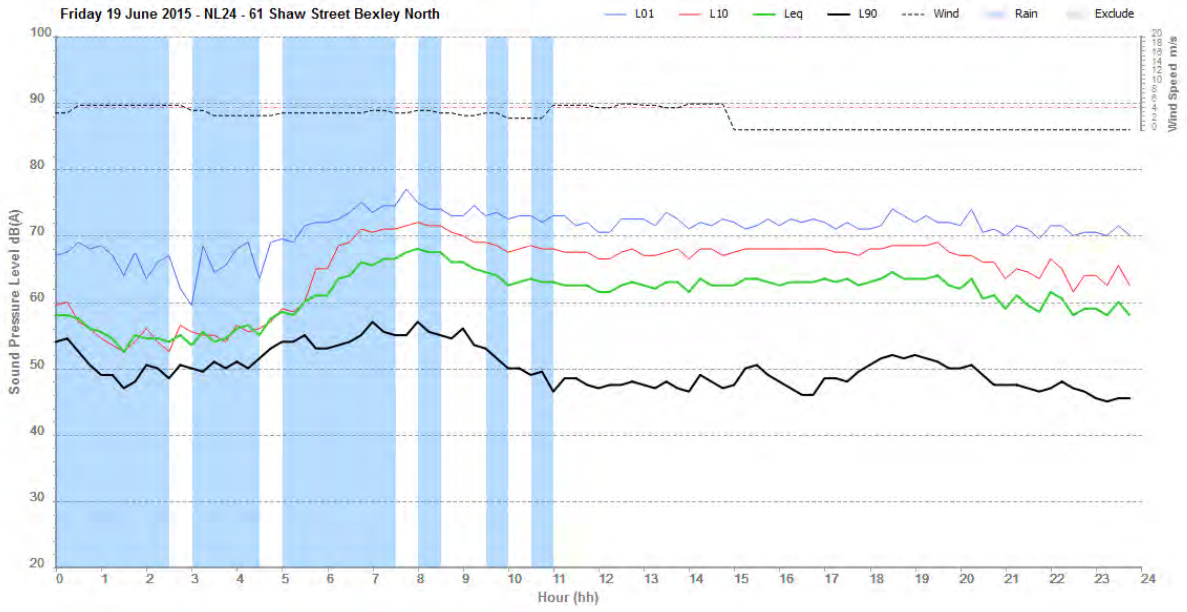

Sunday 14 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

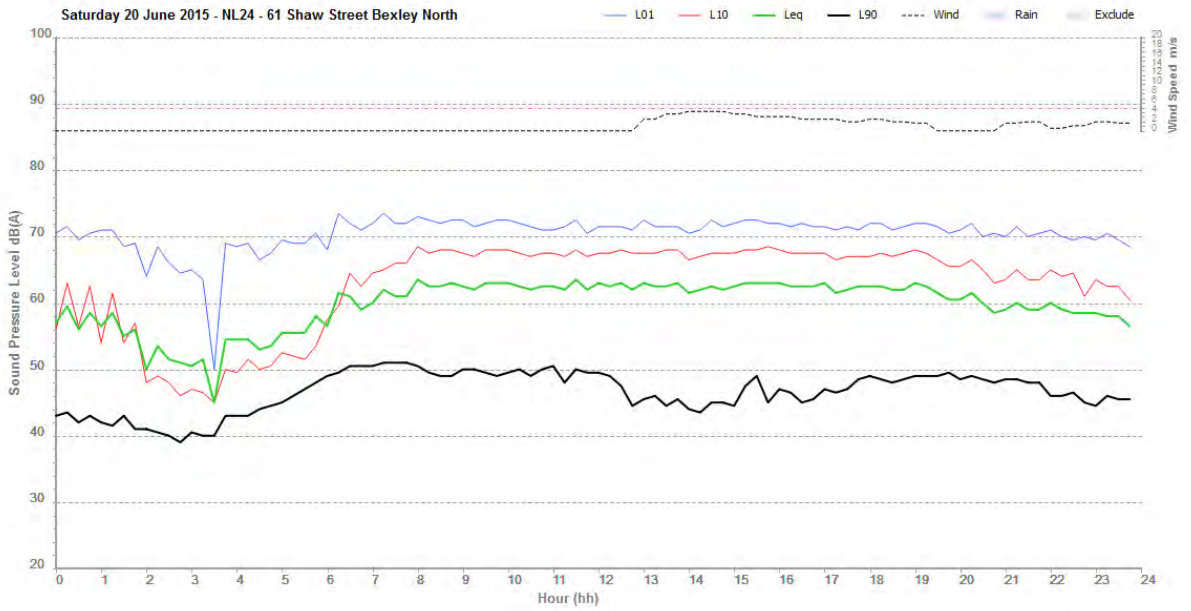

Monday 15 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

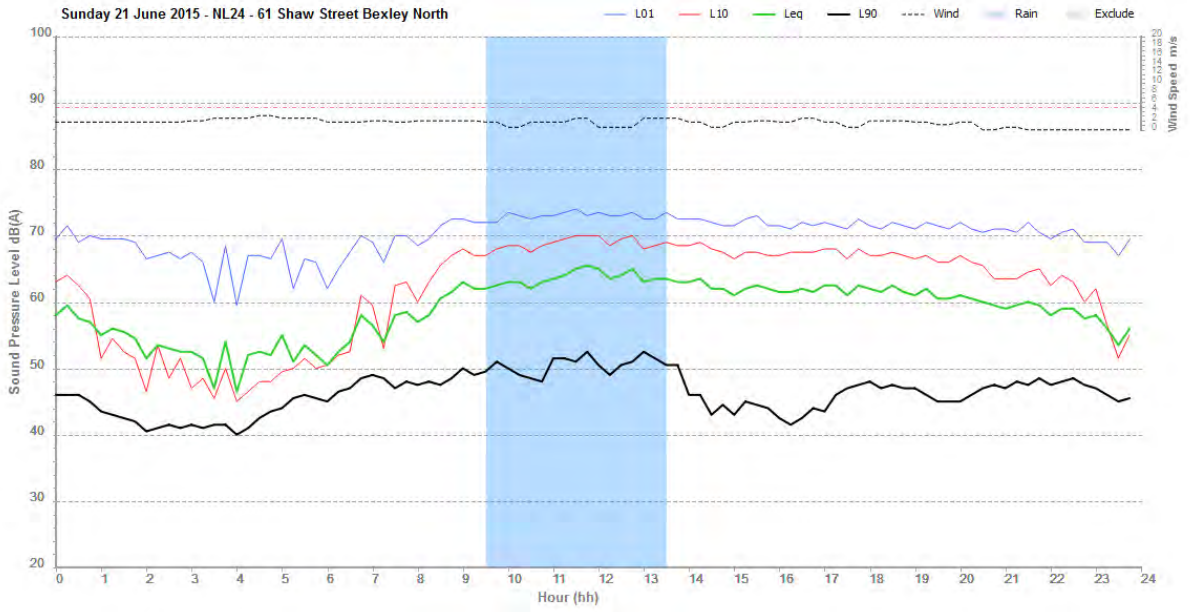

Tuesday 16 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

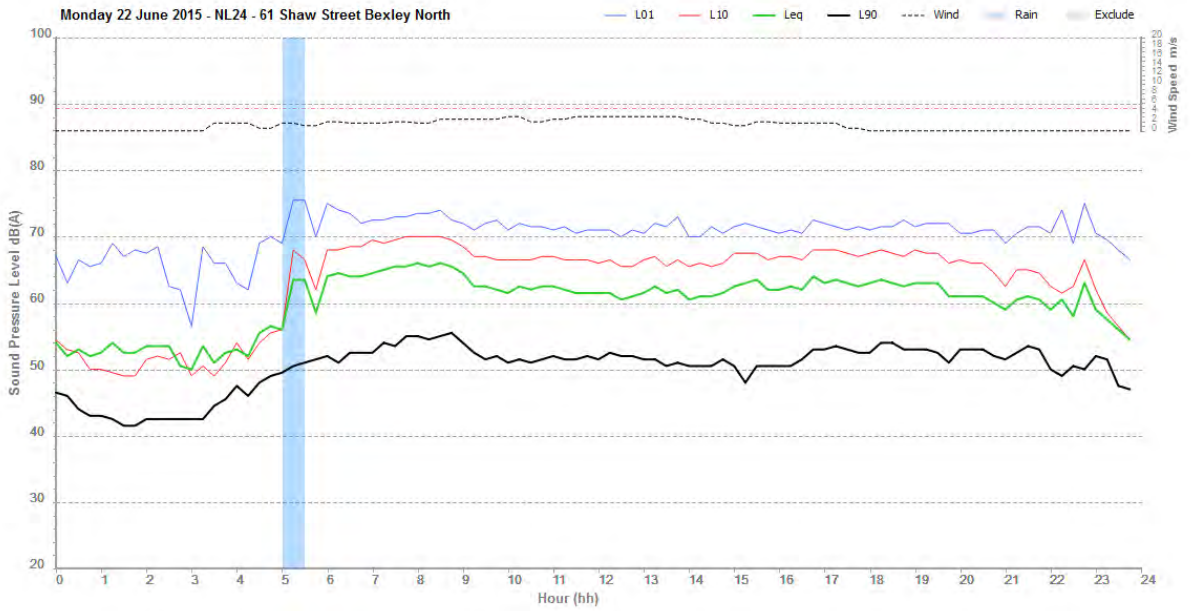

Wednesday 17 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

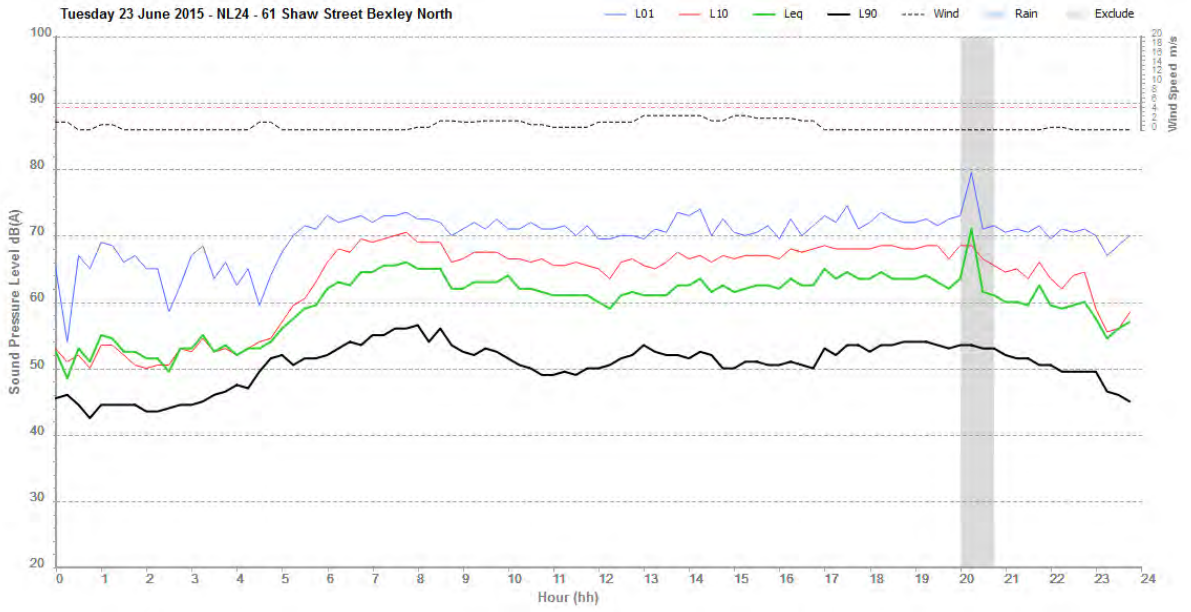

Thursday 18 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

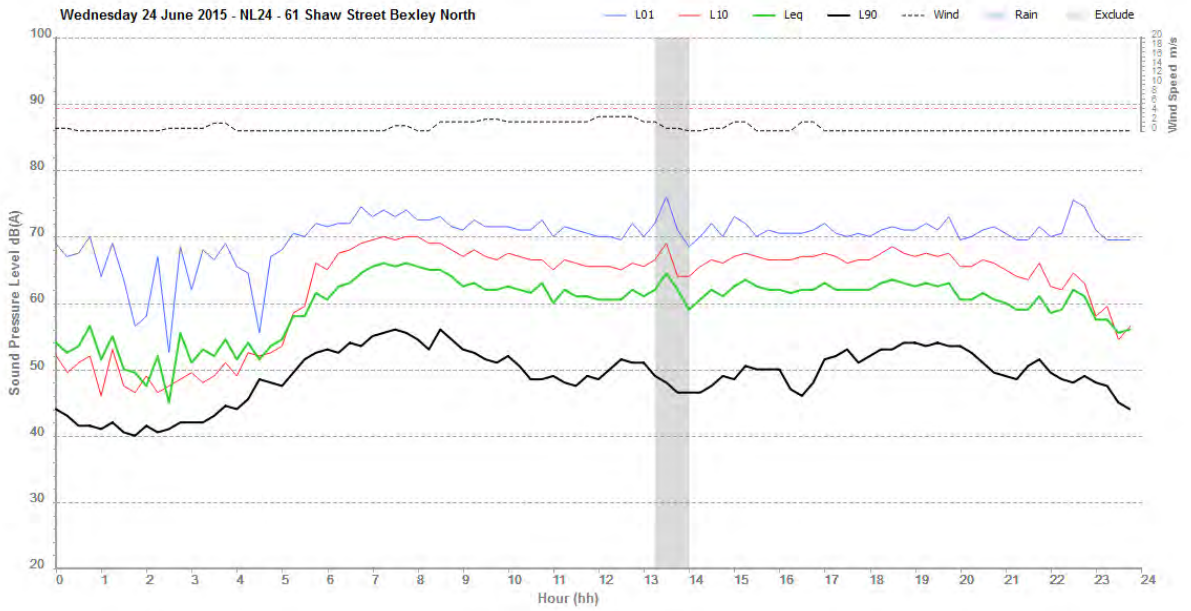

Friday 19 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)

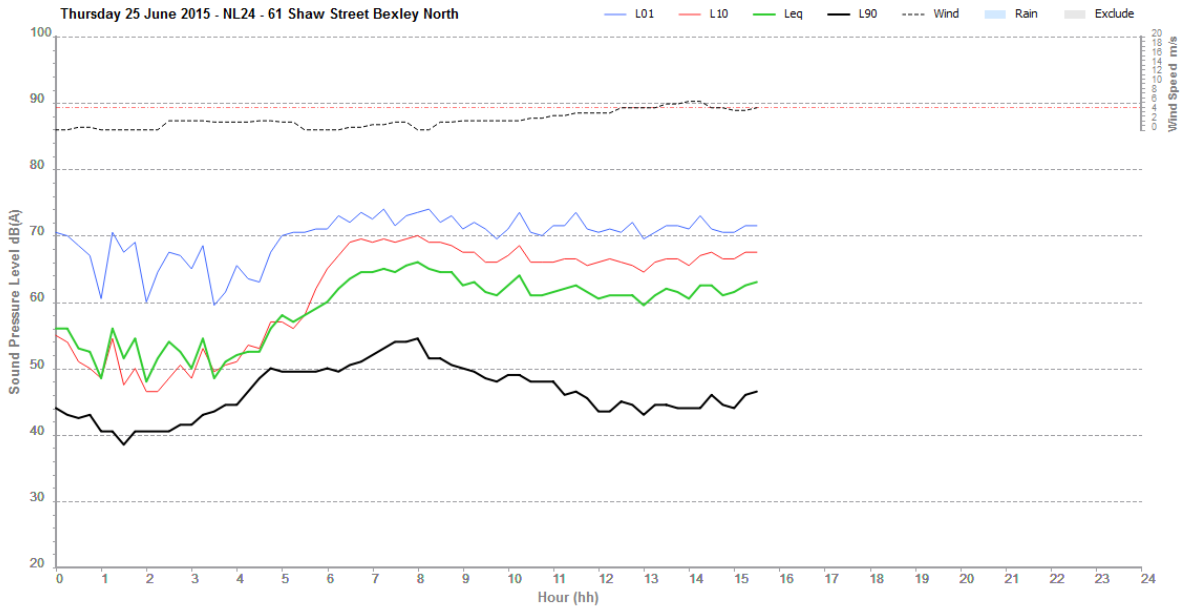

Saturday 20 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Sunday 21 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Monday 22 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)


Tuesday 23 June 2015 - NL24 - 61 Shaw Street Bexley North
L01
L10
Leq
L90
Wind
Rain
Exclude
Sound Pressure Level dB(A)
Wind Speed m/s
Hour (hh)





NL25 –311 King Georges Road, Beverly Hills – SVAN 957 23293

Refer to:

SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

NL26 – 15 Rosetta Lane, Beverly Hills – SVAN 957 20669

Refer to:

SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

NL27 – 6 Grove Avenue, Narwee – SVAN 957 20670

Refer to:

SLR. (2014, October 1). *Construction and Operational Road Traffic Noise and Vibration Impact Assessment.* Retrieved September 21, 2015, from WestConnex New M5 King Georges Road Interchange Upgrade: https://majorprojects.affinitylive.com/public/77d1b51a69806365c96fb576a3b8bdfd/09_Appendix_F_Noise%20and%20vibration_Part2.pdf

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Appendix E

Traffic figures

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Appendix E Traffic figures

Locations	Direction	Year 2021 – No Build							Year 2021 – Build						
		Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT			Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT		
		Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
St Peters Interchange															
Campbell Road	WB	6748	196	841	36	7589	232	7821	4296	85	1101	78	5397	163	5560
	EB	3948	322	1978	11	5926	333	6259	7946	524	117	8	8063	532	8595
Campbell Road W of Euston Road	EB	1709	170	438	9	2147	179	2326	23451	906	6316	278	29767	1184	30951
	WB	2627	256	154	15	2781	271	3052	29695	1242	5644	195	35339	1437	36776
Campbell Street	EB	1372	324	205	10	1577	334	1911	9282	1141	2494	271	11776	1412	13188
	WB	1346	185	198	33	1544	218	1762	9356	207	2202	167	11558	374	11932
Euston Road	NB	4260	318	1713	9	5973	327	6300	26152	1556	6588	424	32740	1980	34720
	SB	4140	108	861	28	5001	136	5137	28760	1358	5724	246	34484	1604	36088
Princes Highway South of Campbell	NB	14476	235	3568	8	18044	243	18287	15975	286	4088	12	20063	298	20361
	SB	23101	439	4002	64	27103	503	27606	22836	627	4285	44	27121	671	27792
Princes Highway North of Campbell	NB	11917	228	1794	8	13711	236	13947	5099	1060	221	1	5320	1061	6381
	SB	19696	428	3360	61	23056	489	23545	5791	130	797	12	6588	142	6730
Sydney Park Road	EB	24255	610	5045	120	29300	730	30030	12059	346	2567	33	14626	379	15005
	WB	22261	850	4160	86	26421	936	27357	5351	405	854	56	6205	461	6666
Euston Road N of Sydney Park Rd	NB	12090	865	1775	111	13865	976	14841	20474	1088	3270	249	23744	1337	25081
	SB	10467	755	2941	103	13408	858	14266	18809	1194	5251	180	24060	1374	25434
Gardeners W of Kent Road	EB	-	-	-	-	-	-	-	3047	1316	605	176	3652	1492	5144
	WB	-	-	-	-	-	-	-	3224	923	232	57	3456	980	4436
Gardeners E of Kent Road	EB	14419	1183	1615	129	16034	1312	17346	10840	1295	528	42	11368	1337	12705
	WB	14185	1650	4324	282	18509	1932	20441	8782	1980	2338	345	11120	2325	13445

Locations	Year 2021 – No Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT			Year 2021 – Build Daytime 7 am – 10 pm		Night-time 10 pm – 7 am		AADT		
	Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
St Peters Interchange														
1 NB from Gardeners Road	-	-	-	-	-	-	-	3047	1316	605	176	3652	1492	5144
2 WB to NB on-ramp from Euston Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 WB through from Euston	-	-	-	-	-	-	-	7725	695	1506	103	9231	798	10029
4 NB from 1 to 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 EB from 1 to WB Tunnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6 NB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 NB from 4 and 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8 EB through to Euston	-	-	-	-	-	-	-	7740	763	1073	150	8813	913	9726
9 From 8 to 13 and 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 From SB through to Euston Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 From SB to Gardeners Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12 SB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13 EB to Gardeners Rd from 9	-	-	-	-	-	-	-	3224	923	232	57	3456	980	4436
14 From 9 to SB Tunnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Locations	Direction	Year 2021 – No Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT			Year 2021 – Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT		
		Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
Kingsgrove															
Existing M5	EB	37683	9946	7582	2553	45265	12499	57764	25154	6233	3056	971	28210	7204	35414
	WB	35427	10884	9625	2185	45052	13069	58121	21676	5911	3705	833	25381	6744	32125
New M5 Tunnel	EB	-	-	-	-	-	-	-	10472	1587	1245	193	11717	1780	13497
	WB	-	-	-	-	-	-	-	10242	1901	2019	255	12261	2156	14417

Locations	Direction	Year 2031 – No Build							Year 2031 – Build						
		Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT			Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT		
		Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
St Peters Interchange															
Campbell Road	WB	4430	324	2102	6	6532	330	6862	8819	193	1962	34	10781	227	11008
	EB	5341	195	735	37	6076	232	6308	3685	273	1104	104	4789	377	5166
Campbell Road W of Euston Road	EB	2289	150	968	12	3257	162	3419	17756	849	5347	206	23103	1055	24158
	WB	3011	303	651	14	3662	317	3979	26407	987	5671	171	32078	1158	33236
Campbell Street	EB	1984	350	195	6	2179	356	2535	9332	897	2487	197	11819	1094	12913
	WB	1496	187	263	35	1759	222	1981	9314	176	2192	143	11506	319	11825
Euston Road	NB	4357	357	1885	6	6242	363	6605	26101	1225	3997	248	30098	1473	31571
	SB	4544	74	836	34	5380	108	5488	23346	1229	6328	223	29674	1452	31126
Princes Highway South of Campbell	NB	16251	305	3744	8	19995	313	20308	15581	216	4012	27	19593	243	19836
	SB	26696	576	4985	79	31681	655	32336	24070	444	4563	51	28633	495	29128
Princes Highway North of Campbell	NB	13805	329	1838	8	15643	337	15980	9014	720	1010	2	10024	722	10746
	SB	22852	569	4513	77	27365	646	28011	8833	90	947	6	9780	96	9876
Sydney Park Road	EB	13852	569	3221	133	17073	702	17775	12803	243	2967	43	15770	286	16056
	WB	16316	1155	3478	107	19794	1262	21056	5699	274	869	22	6568	296	6864
Euston Road N of Sydney Park Rd	NB	13062	881	1916	117	14978	998	15976	24475	1030	4096	195	28571	1225	29796
	SB	11950	844	3468	135	15418	979	16397	21123	1059	6231	180	27354	1239	28593
Gardeners W of Kent Road	EB	-	-	-	-	-	-	-	6114	1292	473	151	6587	1443	8030
	WB	-	-	-	-	-	-	-	6016	1696	945	246	6961	1942	8903
Gardeners E of Kent Road	EB	16450	1531	1978	172	18428	1703	20131	16426	1788	755	167	17181	1955	19136
	WB	16683	1992	4928	337	21611	2329	23940	13247	2014	2574	288	15821	2302	18123

Locations	Direction	Year 2031 – No Build							Year 2031 – Build						
		Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT			Daytime 7am - 10 pm		Night-time 10pm - 7am		AADT		
		Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
St Peters Interchange															
Campbell Road	WB	4430	324	2102	6	6532	330	6862	26427	929	5666	171	32093	1100	33193
	EB	5341	195	735	37	6076	232	6308	19108	863	5470	219	24578	1082	25660
Campbell Road W of Euston Road	EB	2289	150	968	12	3257	162	3419	6213	282	1476	133	7689	415	8104
	WB	3011	303	651	14	3662	317	3979	5169	183	1531	26	6700	209	6909
Campbell Street	EB	1984	350	195	6	2179	356	2535	9441	889	2508	200	11949	1089	13038
	WB	1496	187	263	35	1759	222	1981	9188	296	2195	143	11383	439	11822
Euston Road	NB	4357	357	1885	6	6242	363	6605	27121	1175	4260	250	31381	1425	32806
	SB	4544	74	836	34	5380	108	5488	23308	1197	6332	220	29640	1417	31057
Princes Highway South of Campbell	NB	16251	305	3744	8	19995	313	20308	15217	203	3951	29	19168	232	19400
	SB	26696	576	4985	79	31681	655	32336	23656	408	4623	49	28279	457	28736
Princes Highway North of Campbell	NB	13805	329	1838	8	15643	337	15980	7020	534	854	3	7874	537	8411
	SB	22852	569	4513	77	27365	646	28011	7883	81	1017	13	8900	94	8994
Sydney Park Road	EB	13852	569	3221	133	17073	702	17775	8167	117	1403	26	9570	143	9713
	WB	16316	1155	3478	107	19794	1262	21056	9200	288	1571	22	10771	310	11081
Euston Road N of Sydney Park Rd	NB	13062	881	1916	117	14978	998	15976	24946	967	4229	194	29175	1161	30336
	SB	11950	844	3468	135	15418	979	16397	21078	1063	6239	185	27317	1248	28565
Gardeners W of Kent Road	EB	-	-	-	-	-	-	-	6242	1312	472	165	6714	1477	8191
	WB	-	-	-	-	-	-	-	6020	1697	945	247	6965	1944	8909
Gardeners E of Kent Road	EB	16450	1531	1978	172	18428	1703	20131	16758	1807	803	182	17561	1989	19550
	WB	16683	1992	4928	337	21611	2329	23940	13287	2027	2562	289	15849	2316	18165

Locations	Year 2031 – No Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT			Year 2031 – Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT		
	Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
St Peters Interchange														
1 NB from Gardeners Road	-	-	-	-	-	-	-	6016	1696	945	246	6961	1942	8903
2 WB to NB on-ramp from Euston Road	-	-	-	-	-	-	-	1672	443	386	75	2058	518	2576
3 WB through from Euston	-	-	-	-	-	-	-	17139	542	2529	68	19668	610	20278
4 NB from 1 to 7	-	-	-	-	-	-	-	2895	727	445	106	3340	833	4173
5 EB from 1 to WB Tunnel	-	-	-	-	-	-	-	3123	970	500	140	3623	1110	4733
6 NB through	-	-	-	-	-	-	-	25224	5463	4662	957	29886	6420	36306
7 NB from 4 and 2	-	-	-	-	-	-	-	4568	1170	831	182	5399	1352	6751
8 EB through to Euston	-	-	-	-	-	-	-	22920	1405	3915	187	26835	1592	28427
9 From 8 to 13 and 14	-	-	-	-	-	-	-	5017	833	525	89	5542	922	6464
10 From SB through to Euston Road	-	-	-	-	-	-	-	3866	670	520	74	4386	744	5130
11 From SB to Gardeners Rd	-	-	-	-	-	-	-	3746	709	296	84	4042	793	4835
12 SB through	-	-	-	-	-	-	-	27894	5252	4761	1041	32655	6293	38948
13 EB to Gardeners Rd from 9	-	-	-	-	-	-	-	2366	583	178	66	2544	649	3193
14 From 9 to SB Tunnel	-	-	-	-	-	-	-	2651	249	348	23	2999	272	3271

Locations	Direction	Year 2031 – No Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT			Year 2031 – Build Daytime 7 am - 10 pm		Night-time 10 pm – 7 am		AADT		
		Light	Heavy	Light	Heavy	Light	Heavy	Total	Light	Heavy	Light	Heavy	Light	Heavy	Total
Kingsgrove															
Existing M5	EB	37577	11084	7420	3392	44997	14476	59473	25323	5842	2633	969	27956	6811	34767
	WB	34717	12249	9374	2833	44091	15082	59173	17151	4954	2905	730	20056	5684	25740
New M5 Tunnel	EB	-	-	-	-	-	-	-	8549	1385	982	226	9631	1611	11242
	WB	-	-	-	-	-	-	-	13173	2439	2472	282	15645	2721	18366

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Appendix F

St Peters interchange study area

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Project Impact

- Project contributes 2.0 dB or less to noise levels
- Project contributes more than 2.0 dB to noise levels

- HighlyUrban
- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Highly urban noise impacts

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **1**



Project Impact

- Project contributes 2.0 dB or less to noise levels
- Project contributes more than 2.0 dB to noise levels

- HighlyUrban
- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Highly urban noise impacts

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **2**



Project Impact

- Project contributes 2.0 dB or less to noise levels
- Project contributes more than 2.0 dB to noise levels

- HighlyUrban
- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Highly urban noise impacts

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **3**



Project Impact

- Project contributes 2.0 dB or less to noise levels
- Project contributes more than 2.0 dB to noise levels

- HighlyUrban
- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Highly urban noise impacts

Source: SKM2014

0 50 100 200 m

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Fig. **4**



Project Impact

- Project contributes 2.0 dB or less to noise levels
- Project contributes more than 2.0 dB to noise levels

- HighlyUrban
- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Highly urban noise impacts

Source: SKM2014

0 50 100 200 m

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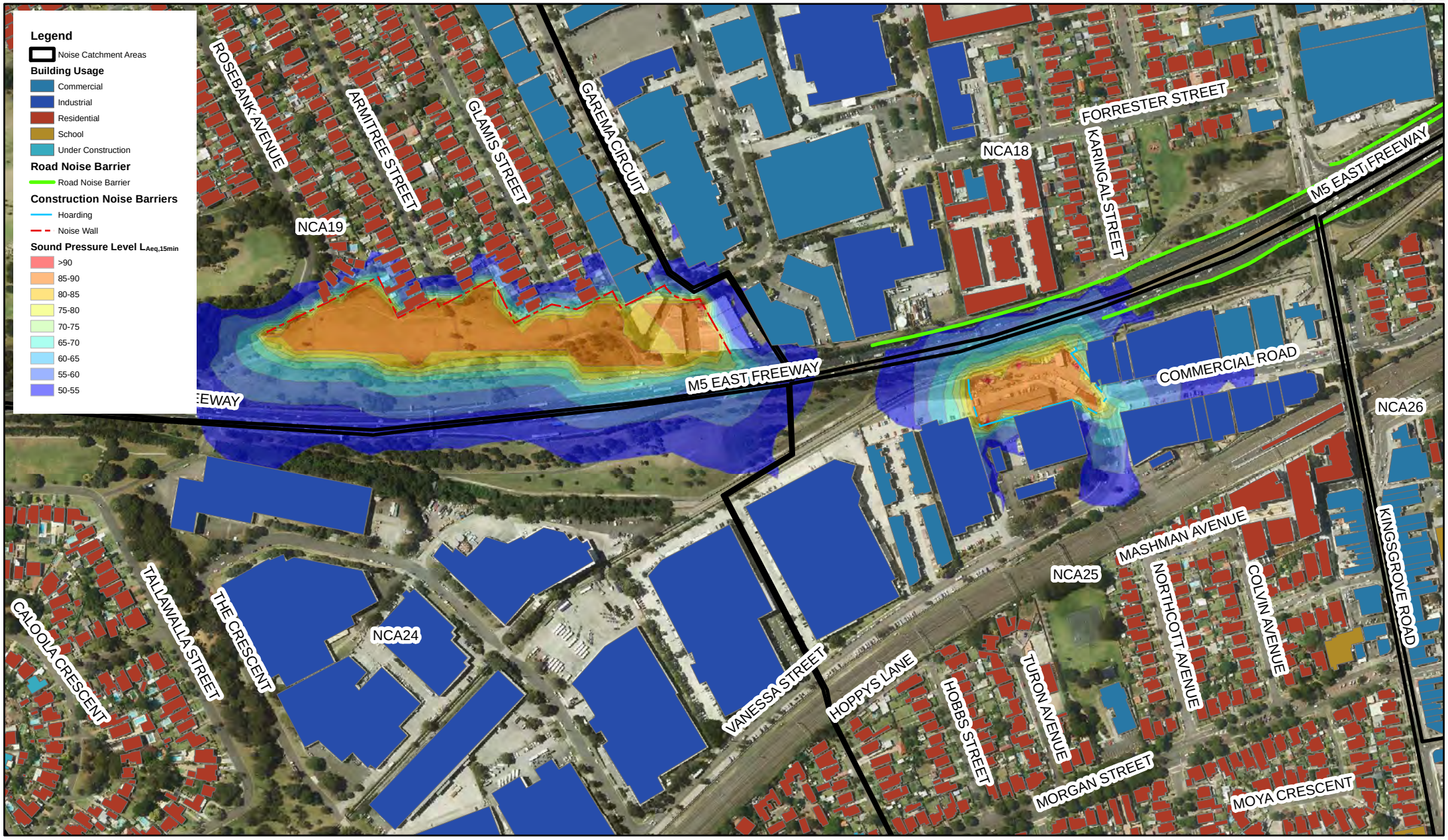
Fig. **5**

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Appendix G

Construction airborne noise L_{Aeq} maps

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WestConnex Stage 2 - Construction Noise Assessment
Surface works - Site establishment - Power Generator - Day

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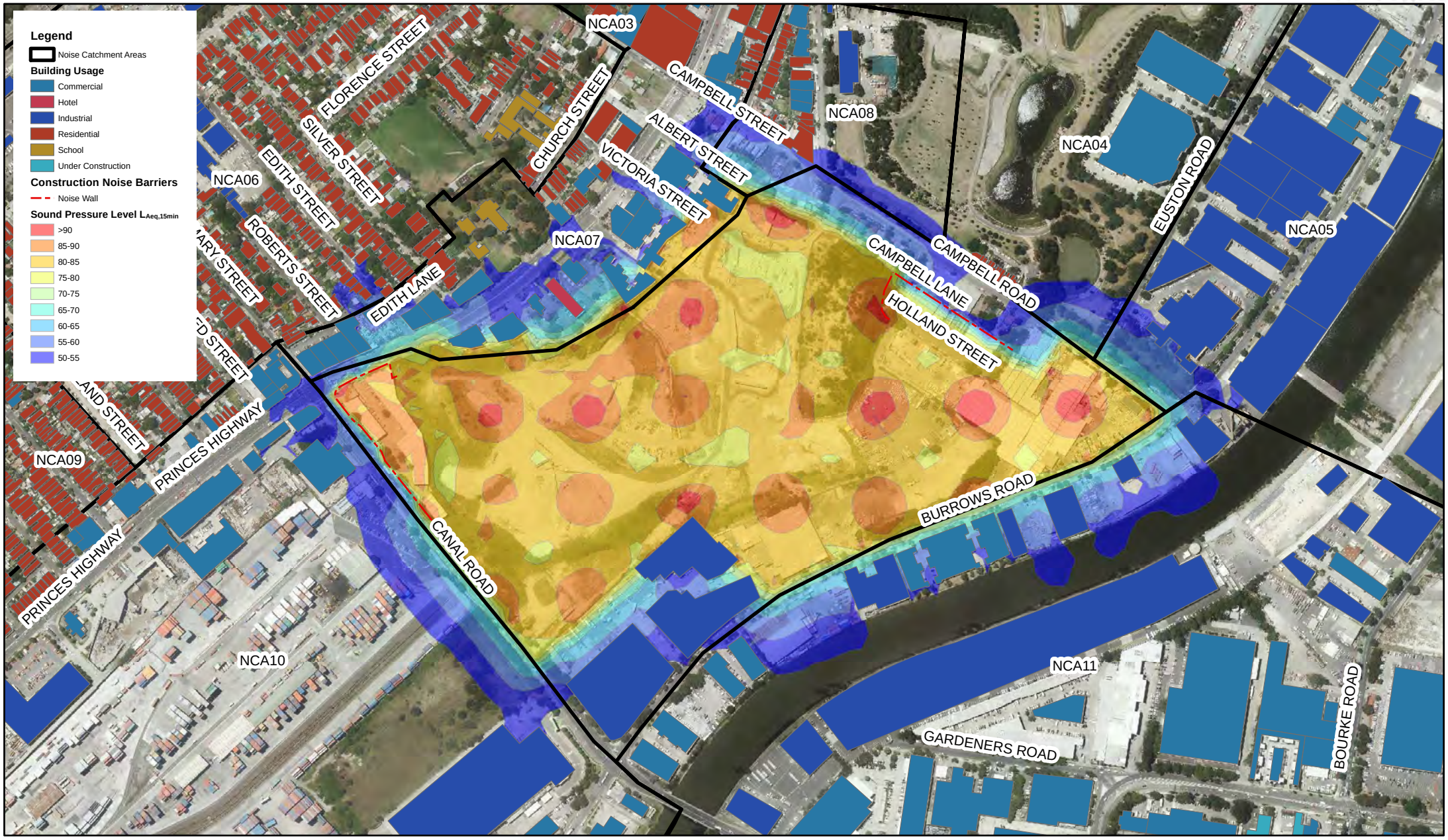
Source: SKM2014

N

0 25 50 100 m

Fig.
01_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Site establishment - Power Generator - Day

OCT 2015
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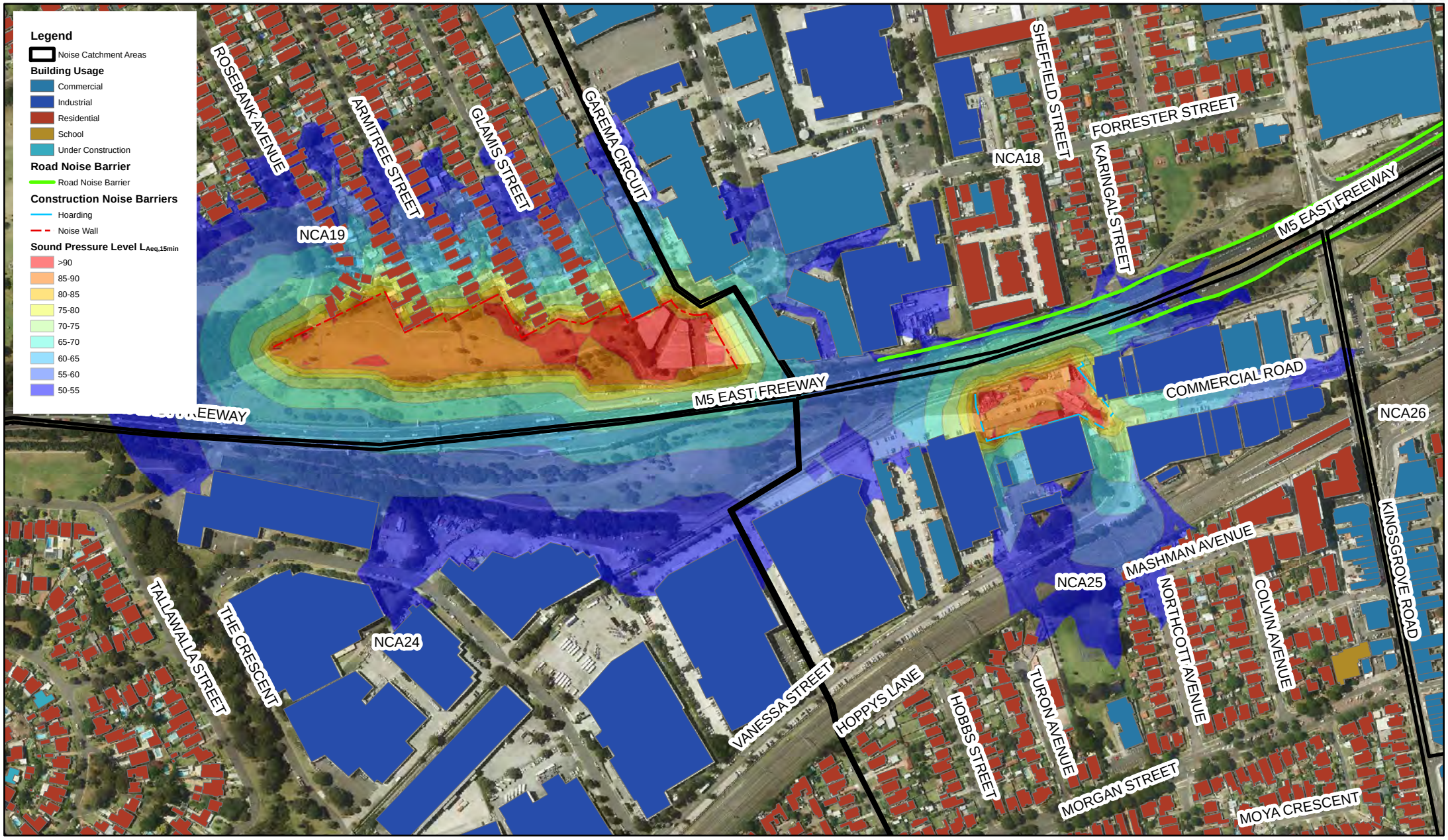
Source: SKM2014

N

0 30 60 120 m

Fig.
01_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Installment of environmental controls - Day

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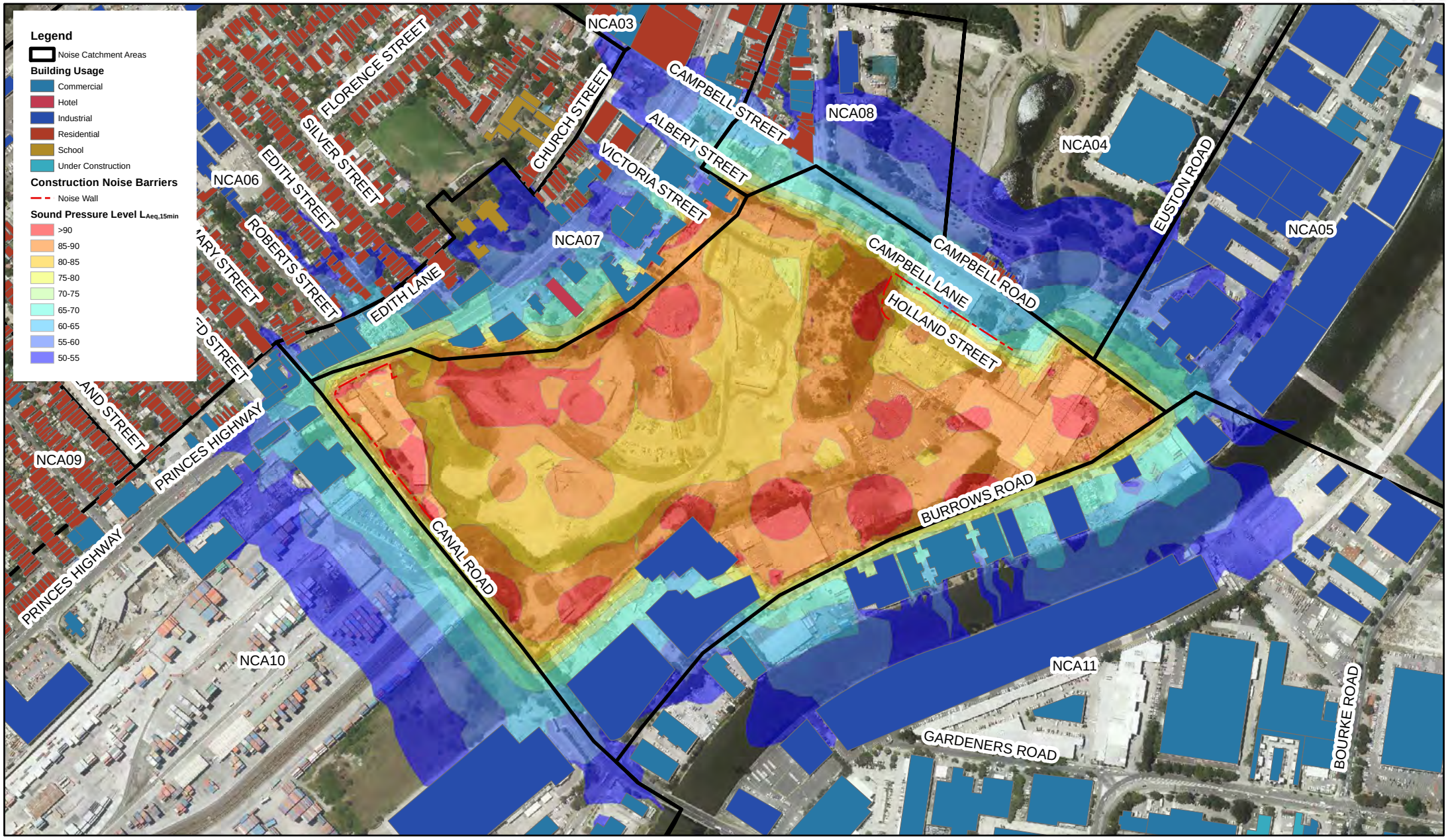
Source: SKM2014

Fig. **01_02**

0 25 50 100 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Installment of environmental controls - Day

OCT 2015

60327128

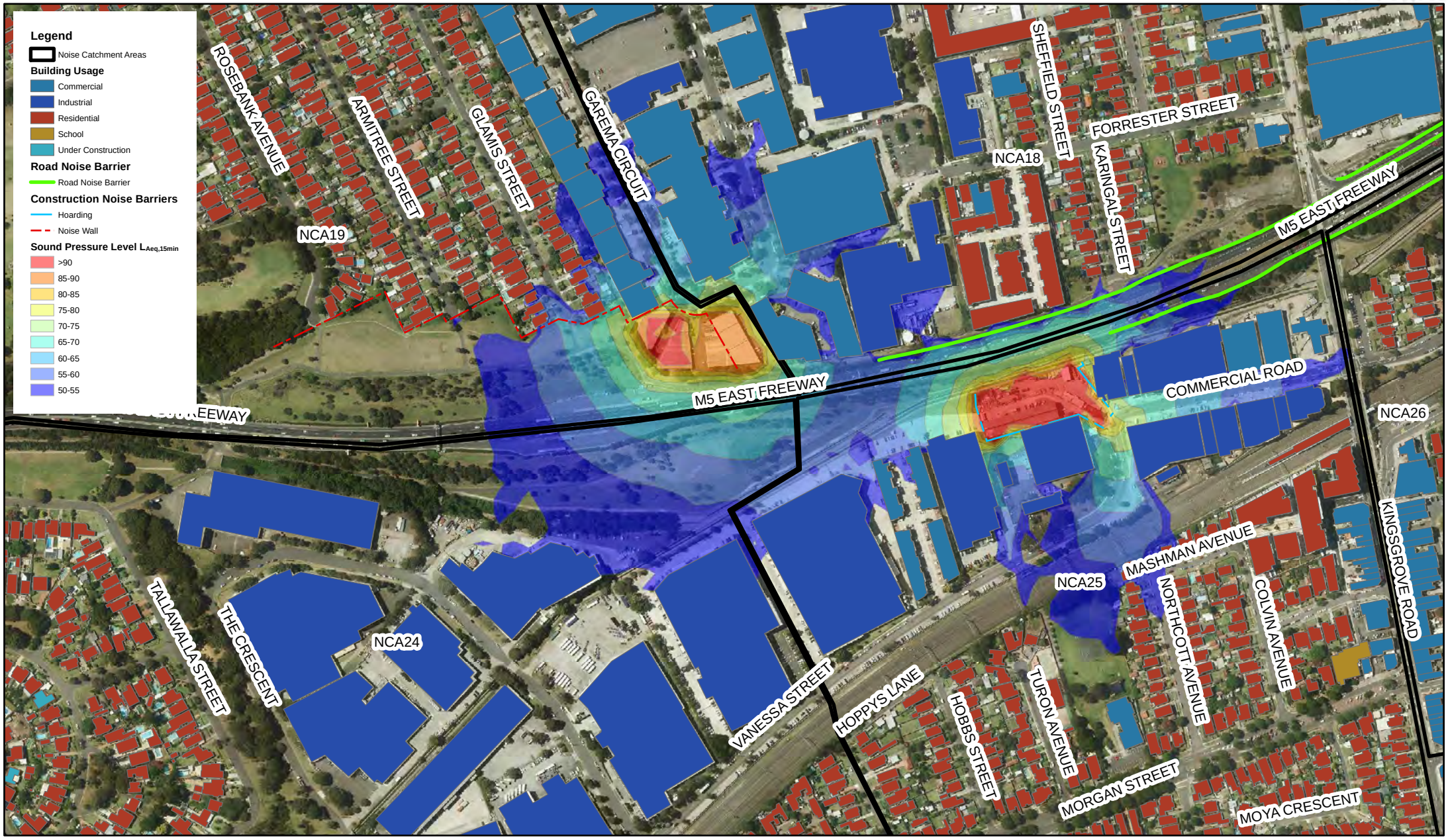
Source: SKM2014

Fig. **01_02**

0 30 60 120 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Demolition of existing structures (No rock hammering) - Day

OCT 2015

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Source: SKM2014

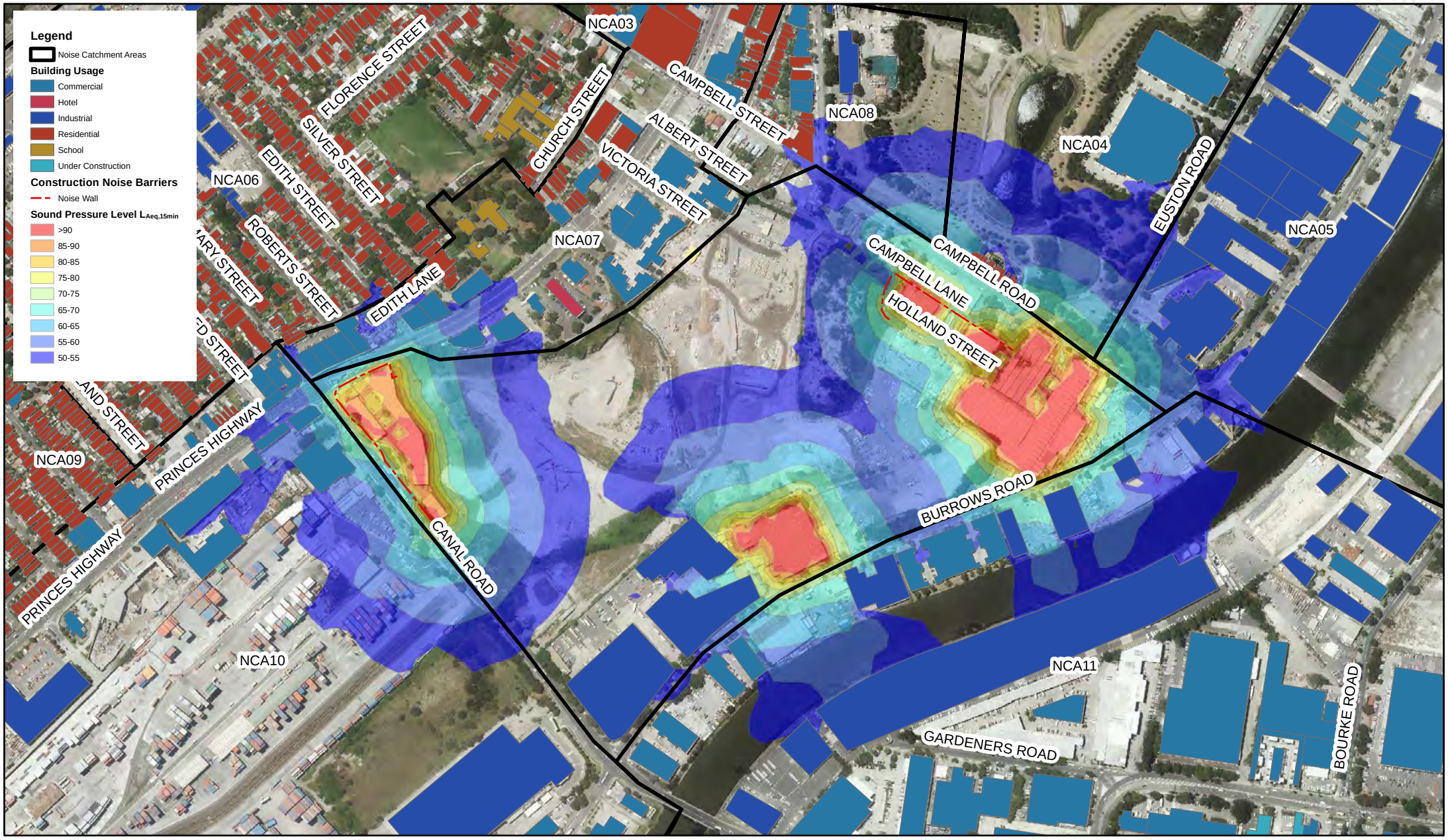
N

0 25 50 100 m

Fig.

01_03a

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Demolition of existing structures (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

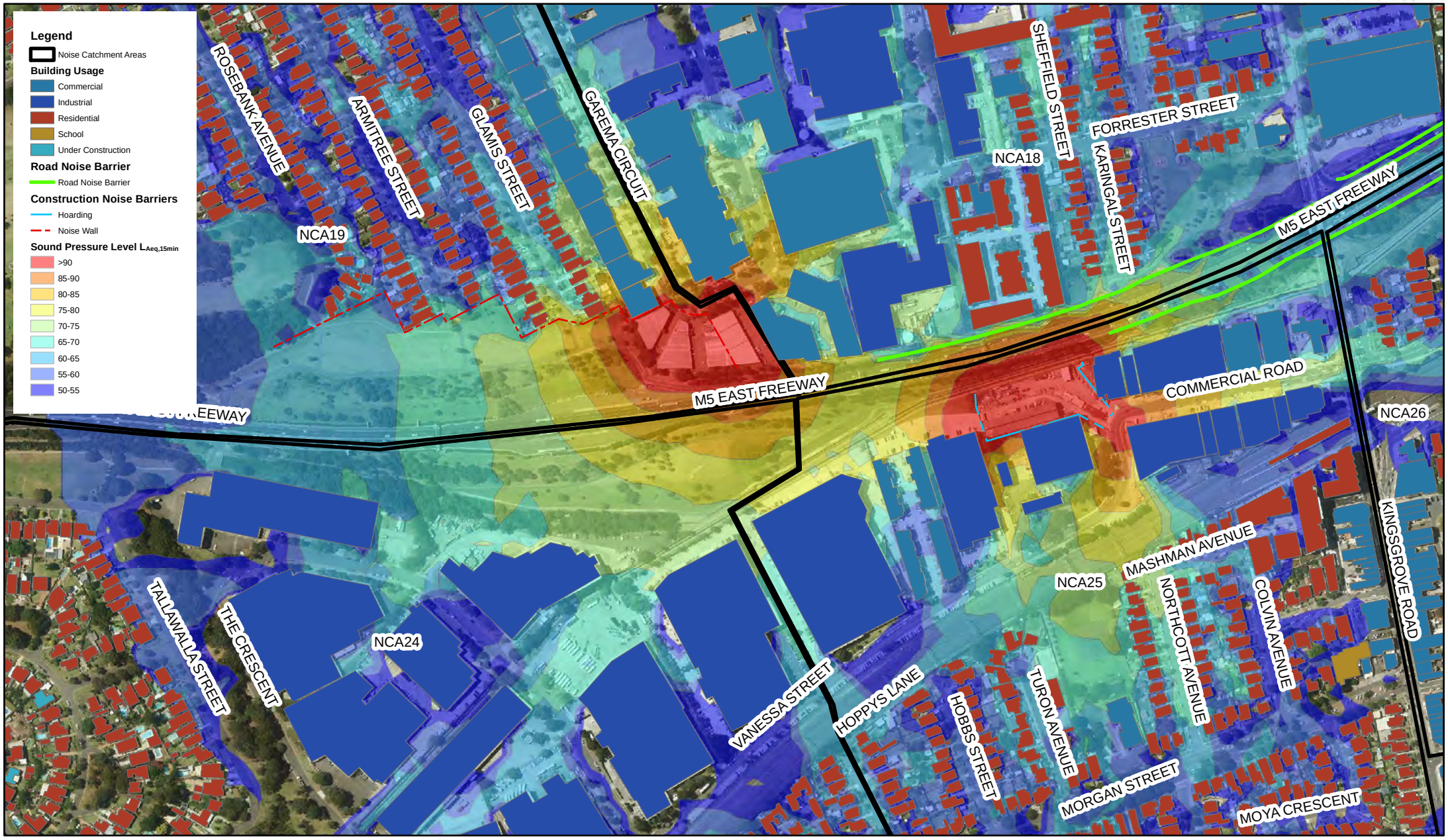
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

N

0 30 60 120 m

Fig.

01_03a



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

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Source: SKM2014

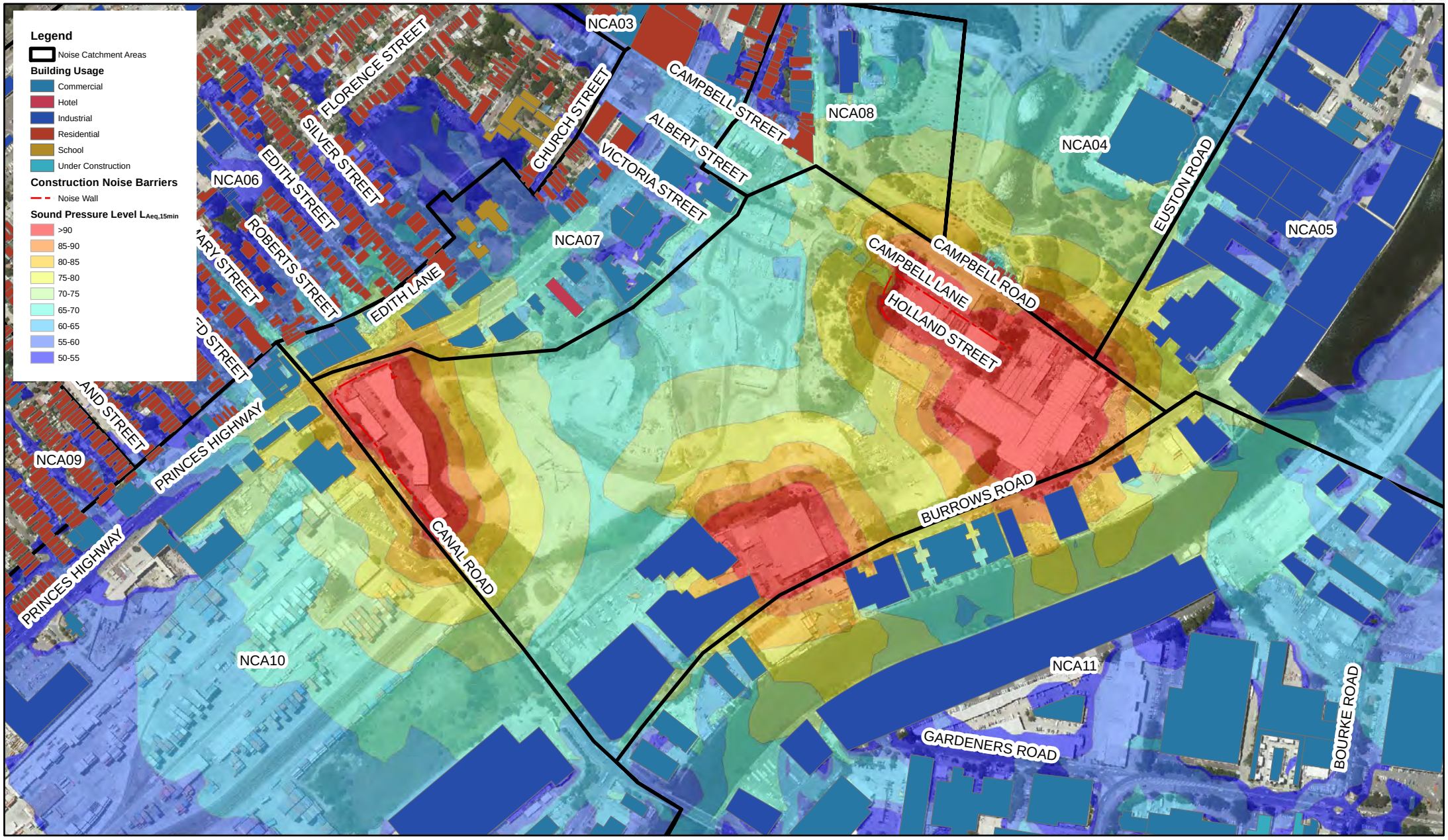
N

0 25 50 100 m

Fig.

01_03b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

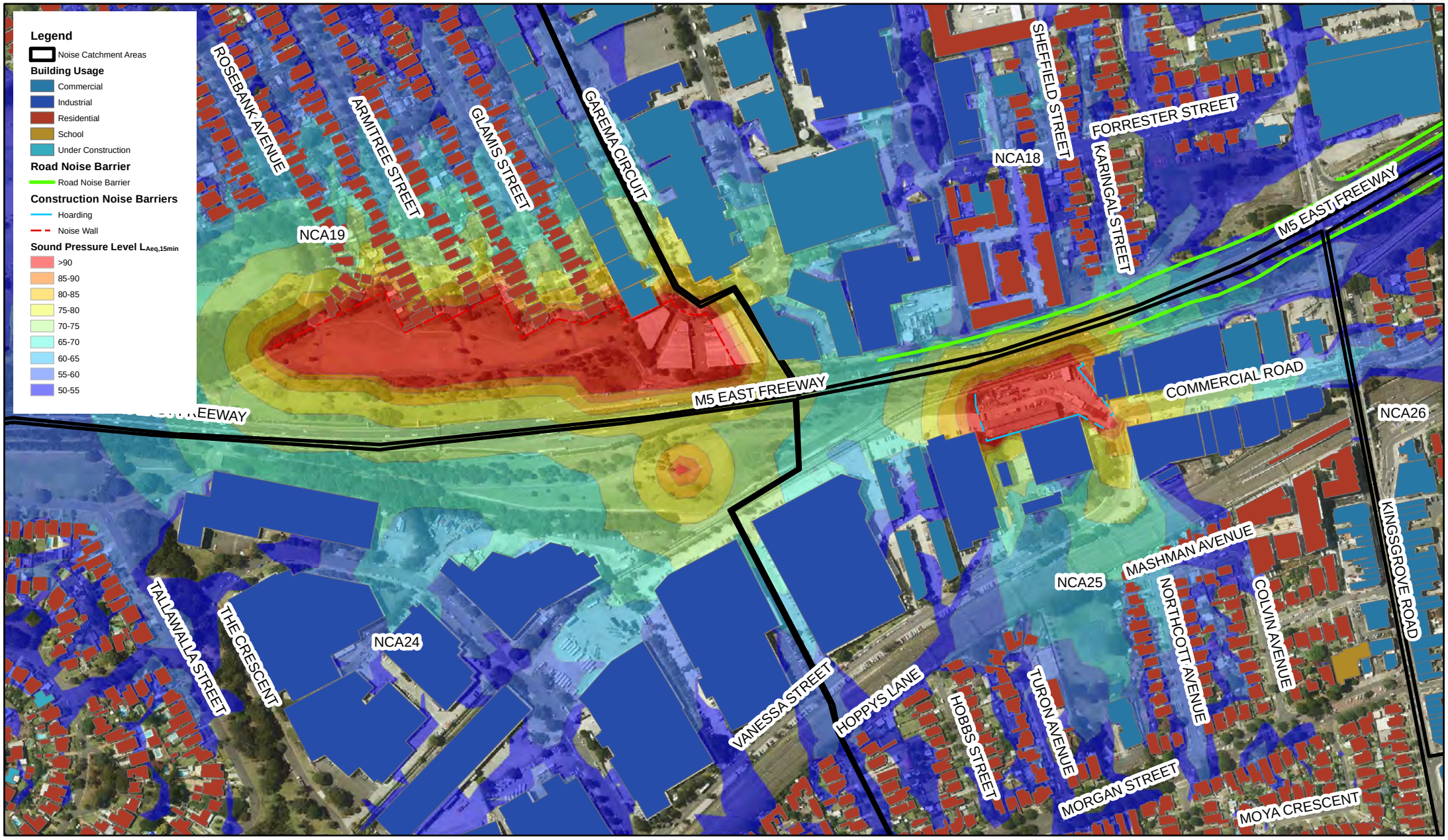
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

01_03b



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Crushing and screening - Day

OCT 2015

60327128

Source: SKM2014

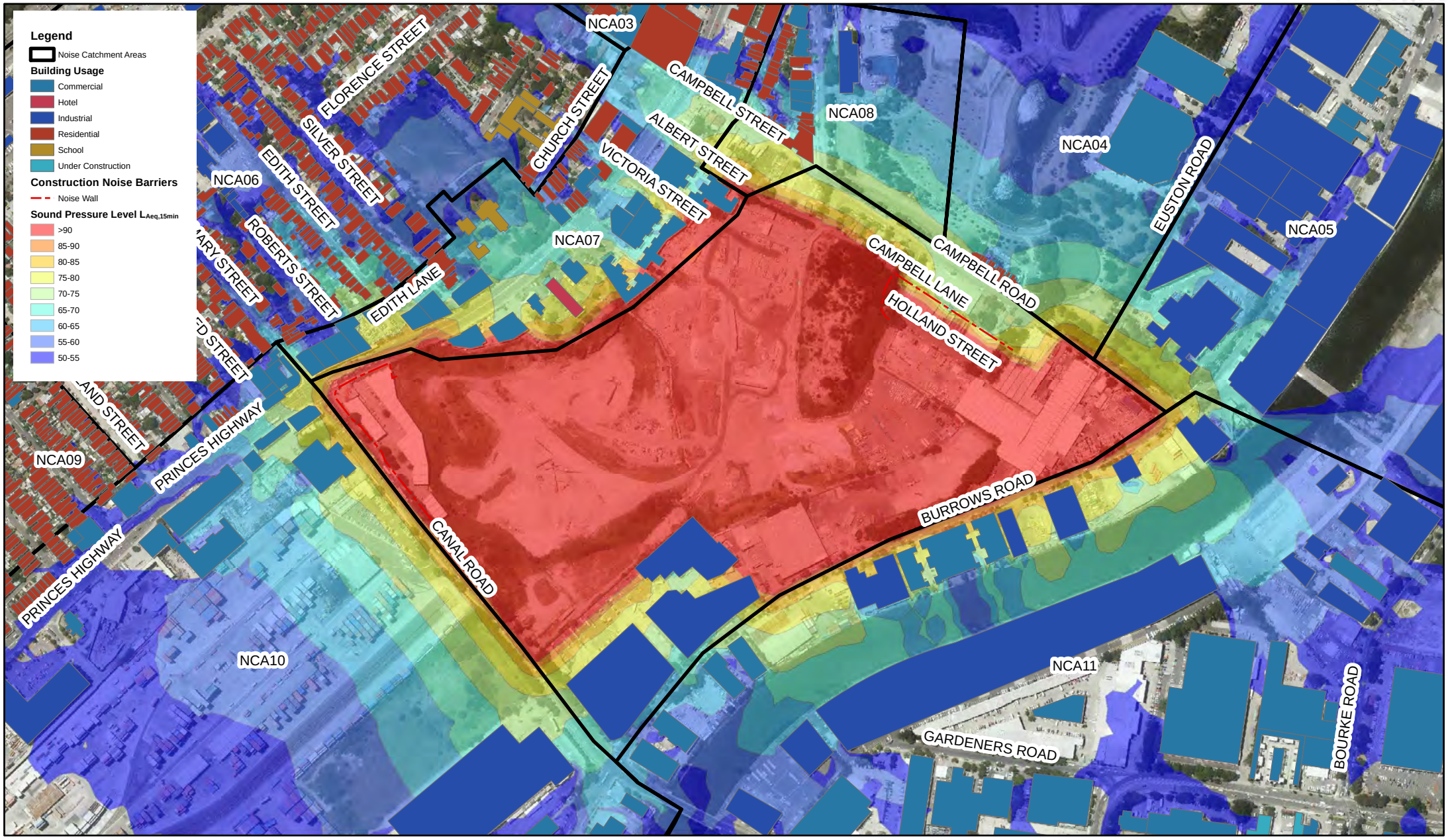
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

01_04



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Crushing and screening - Day

OCT 2015

60327128

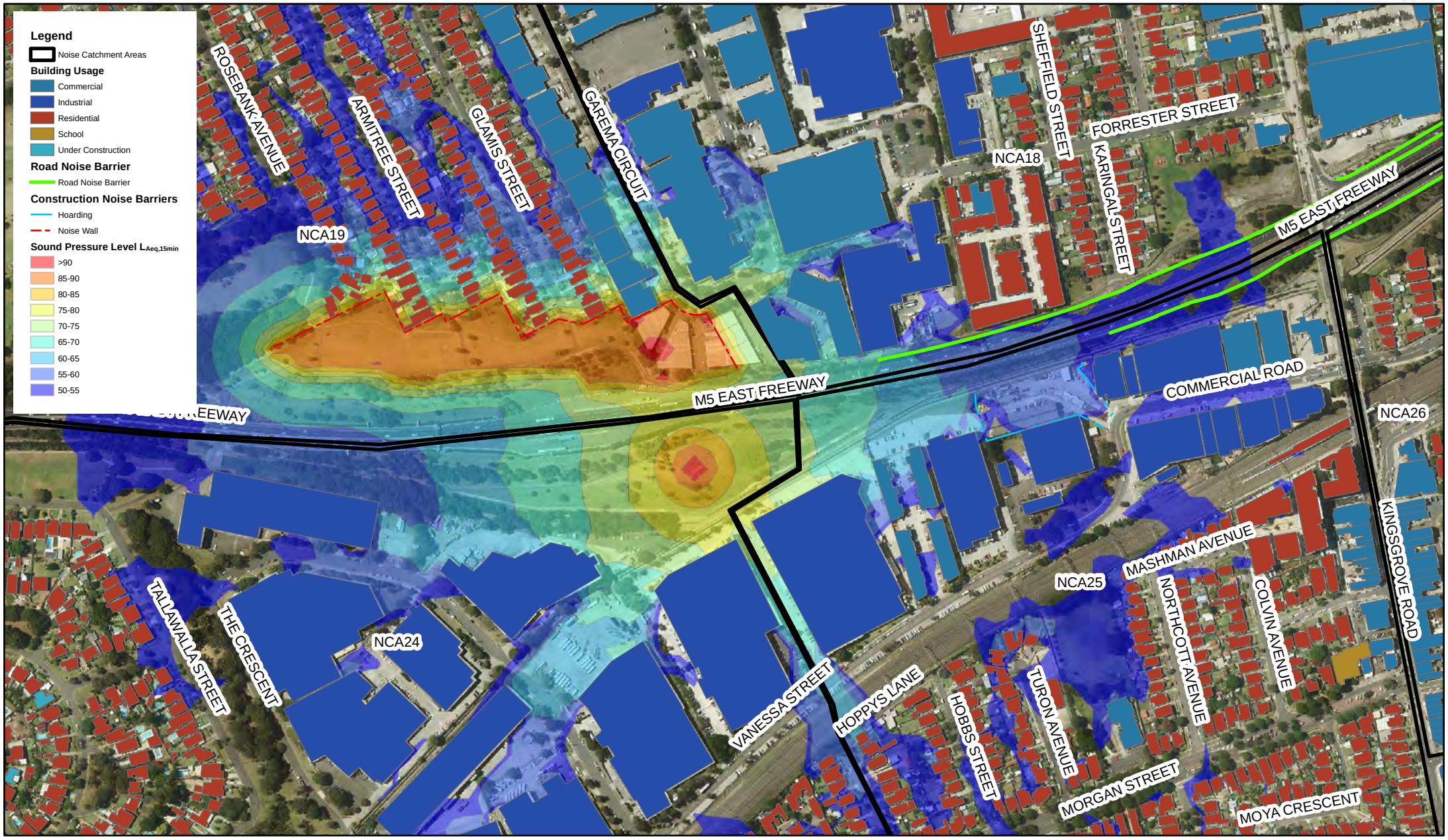
Source: SKM2014

N

0 30 60 120 m

Fig. **01_04**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Vegetation clearing - Day

OCT 2015

60327128

Source: SKM2014

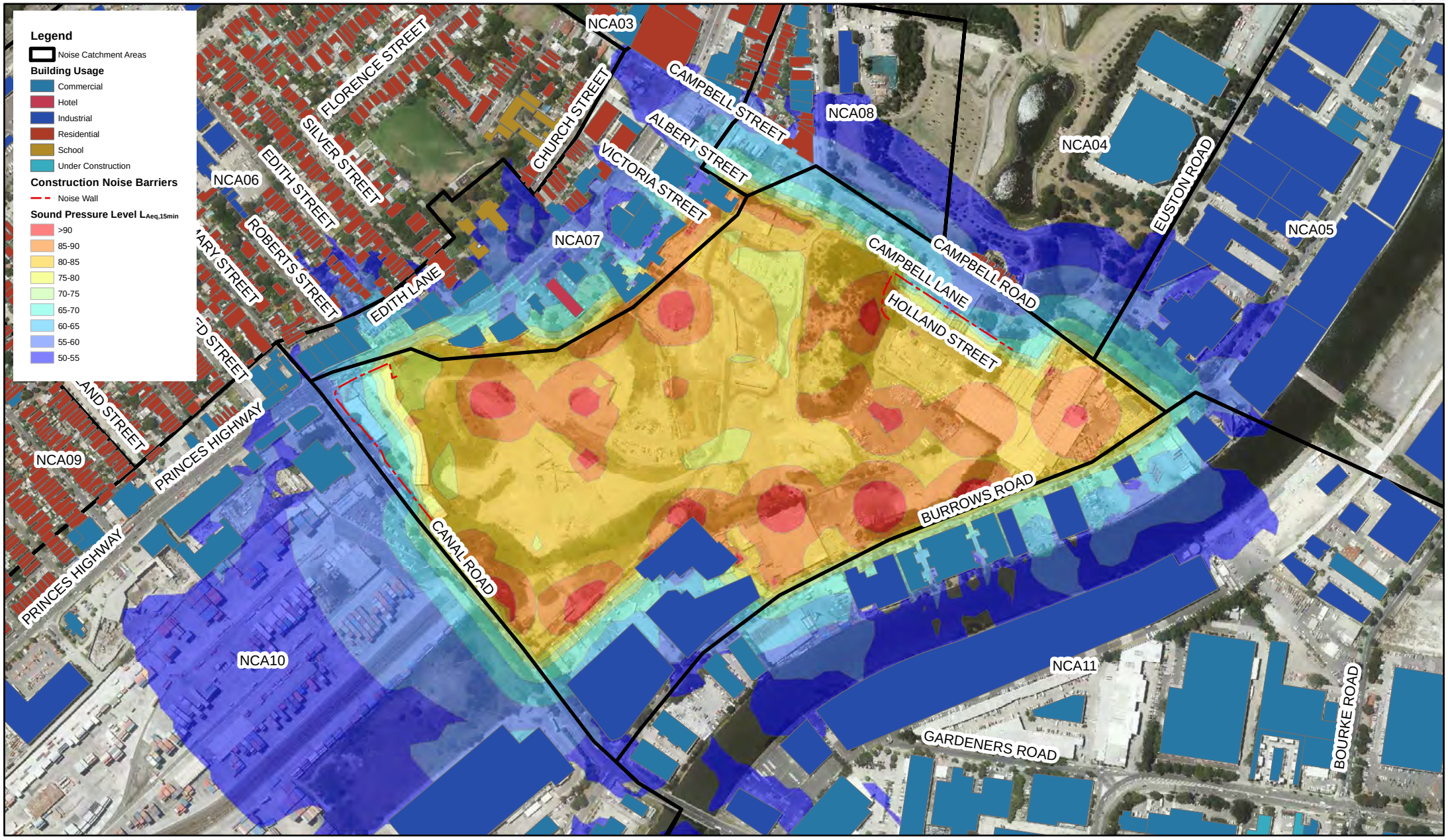
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

01_05



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Site establishment - Vegetation clearing - Day

OCT 2015
60327128

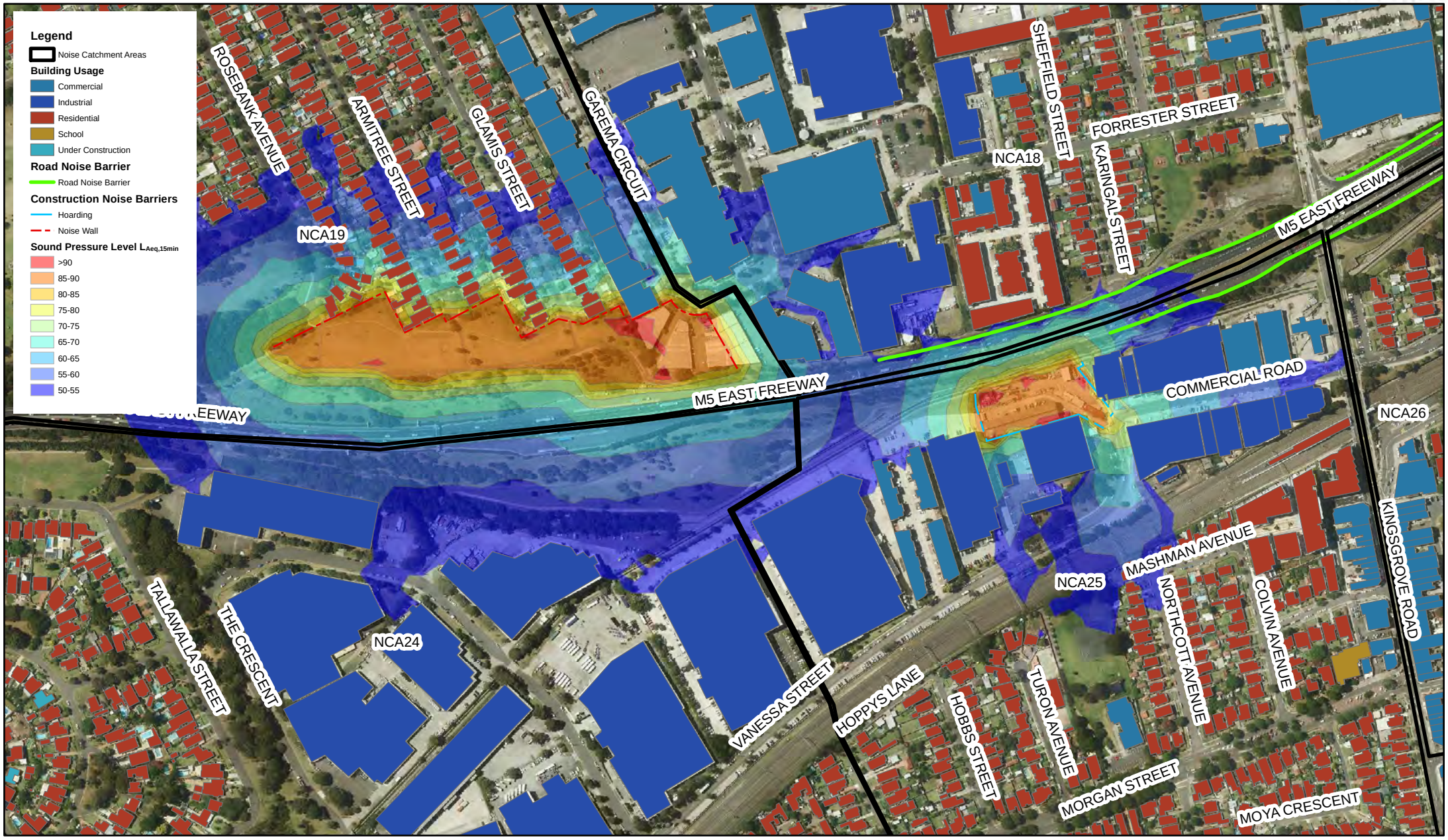
Source: SKM2014

N

0 30 60 120 m

Fig.
01_05

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

Source: SKM2014

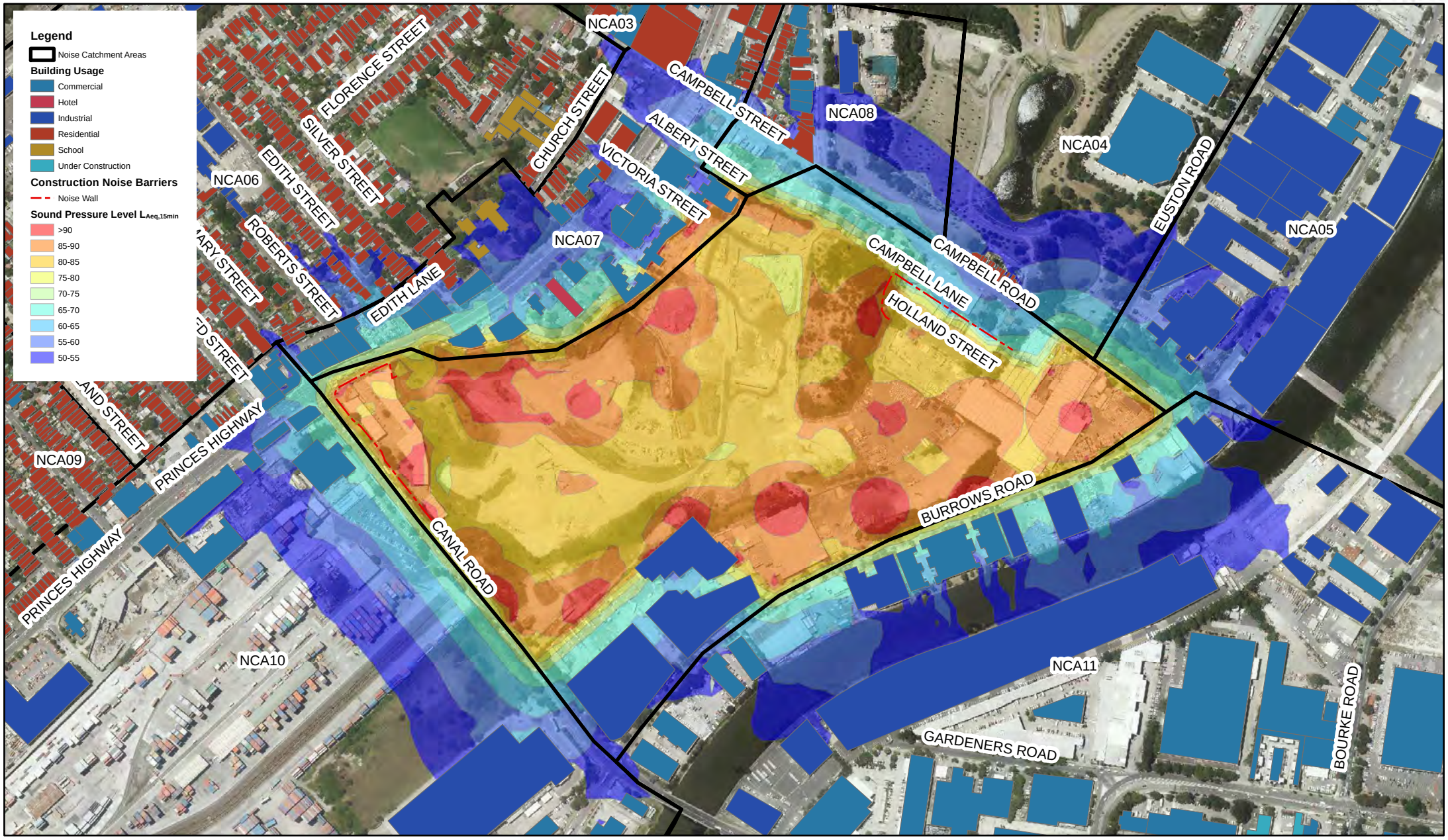
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

01_06



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

Source: SKM2014

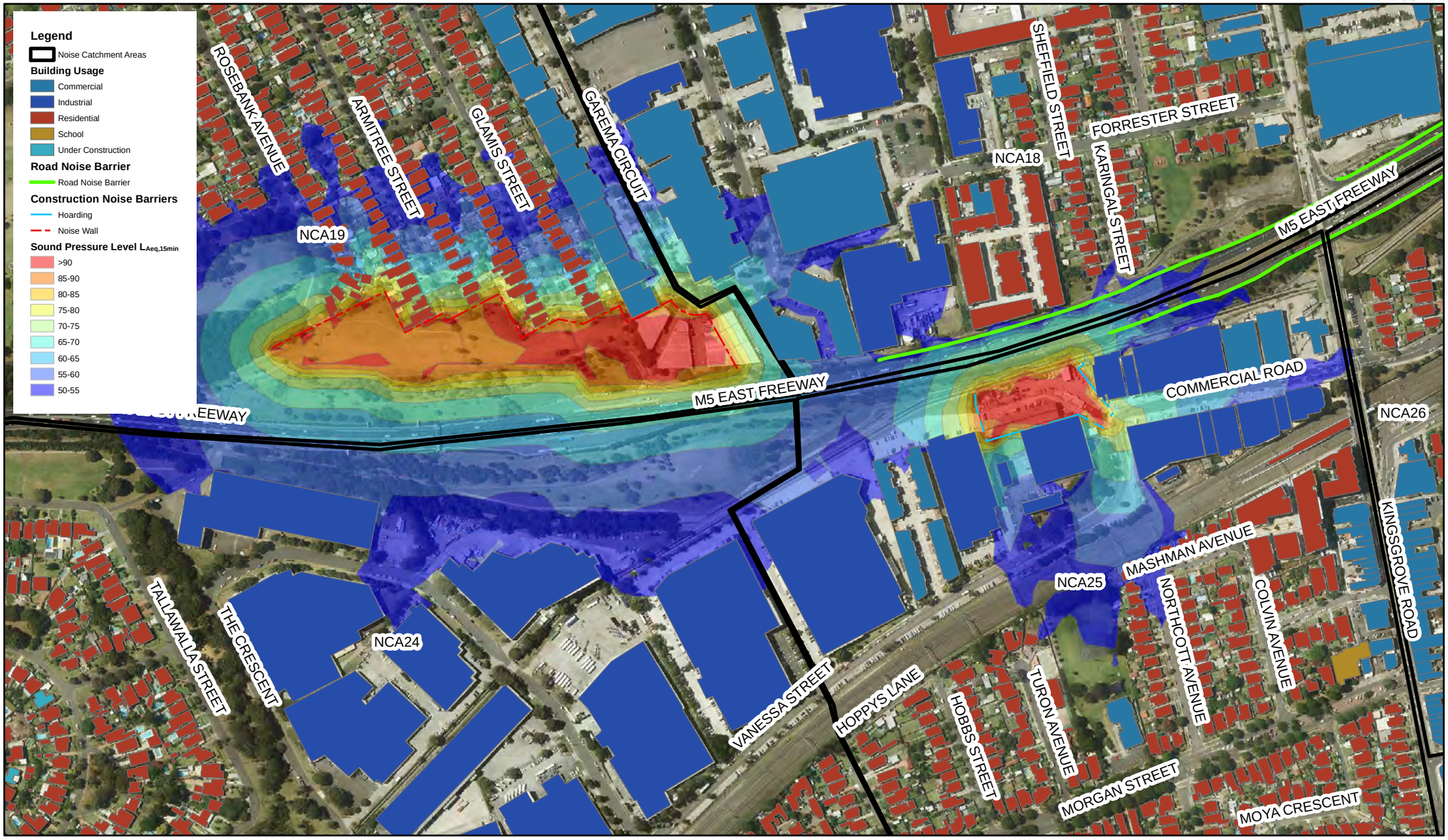
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

01_06



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

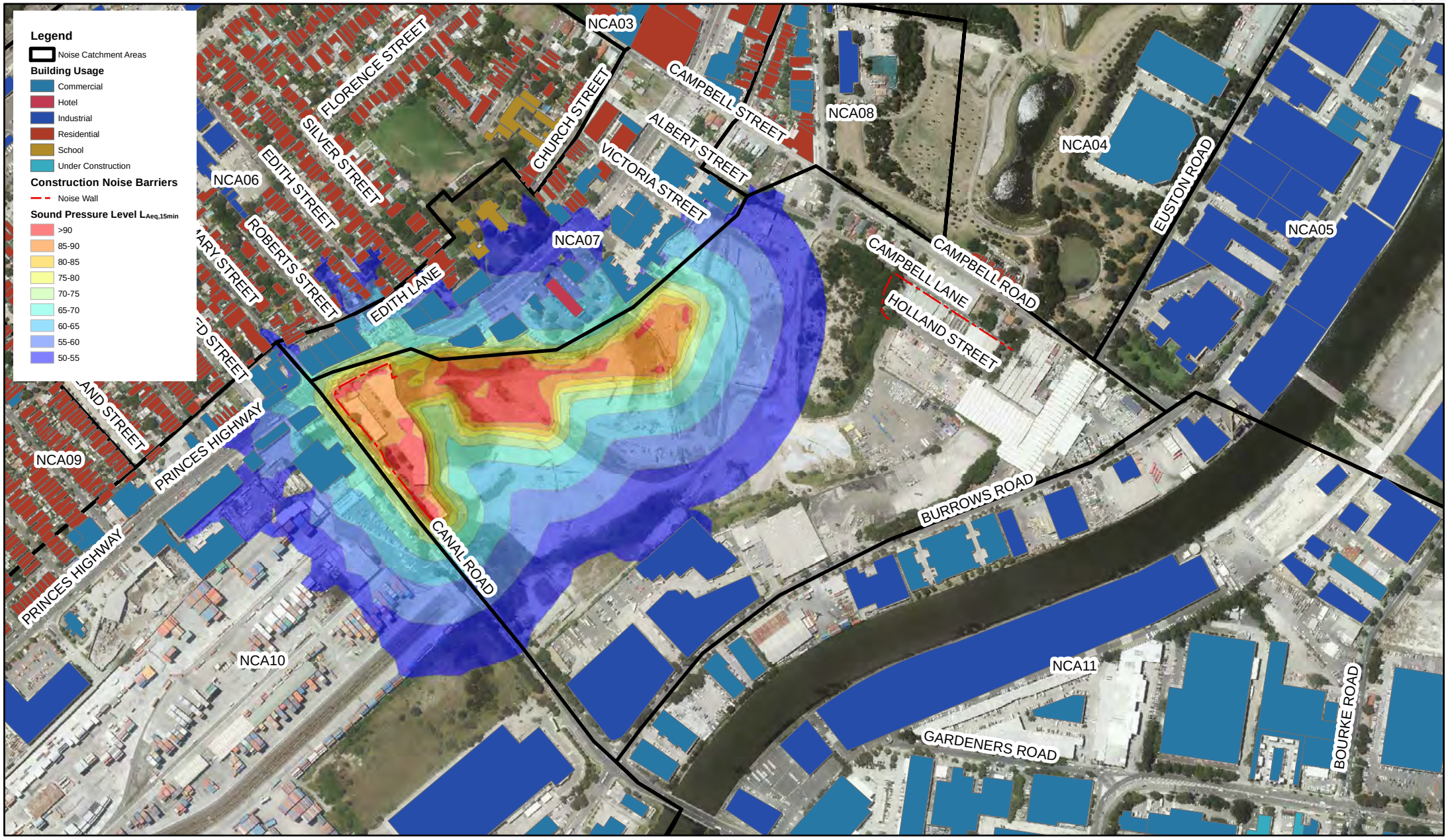
Source: SKM2014

N

0 25 50 100 m

Fig. **01_07**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

Source: SKM2014

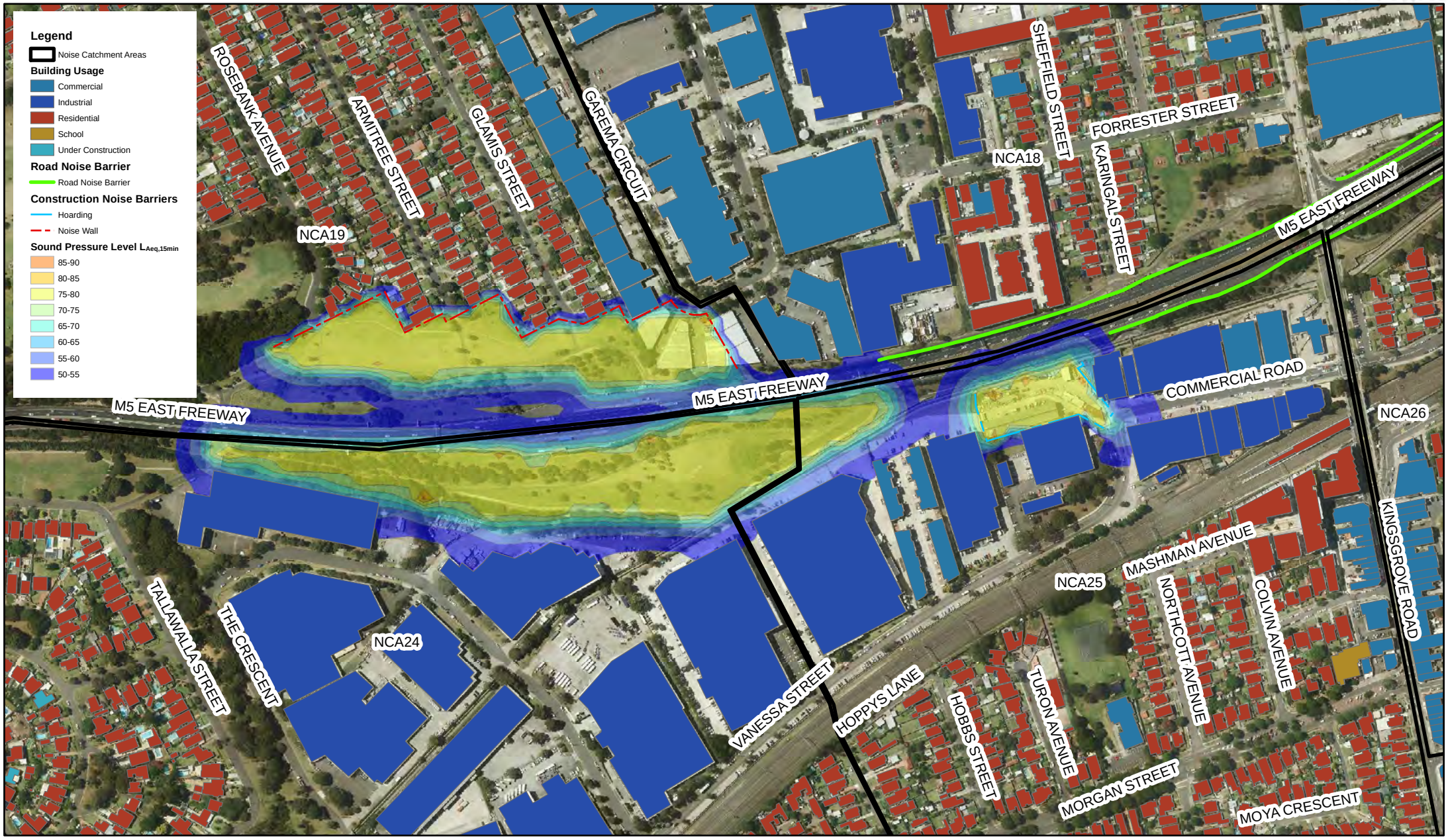
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

01_07



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - General worksite and car parking - Day

OCT 2015

60327128

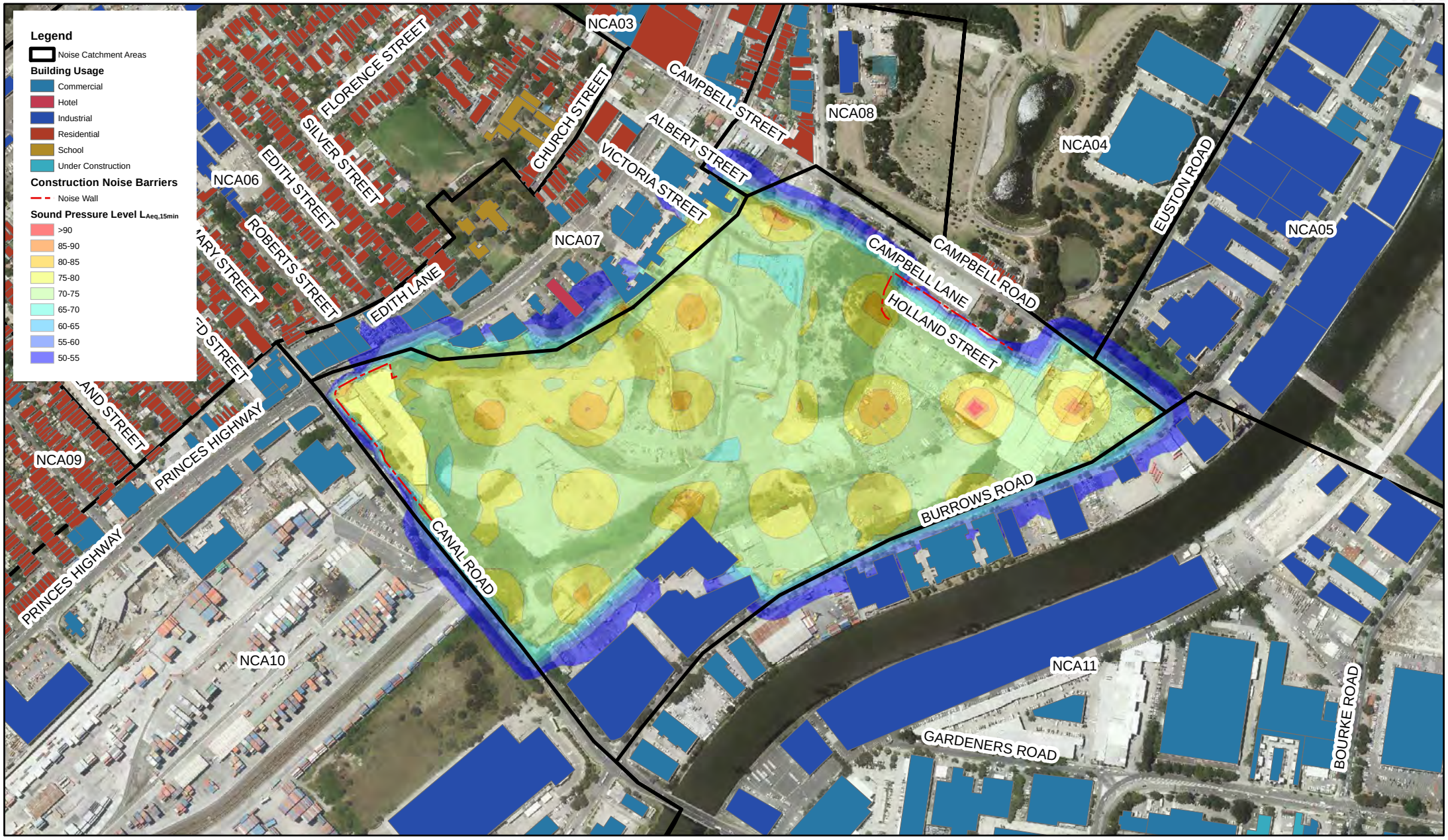
Source: SKM2014

N

0 25 50 100 m

Fig. **02_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

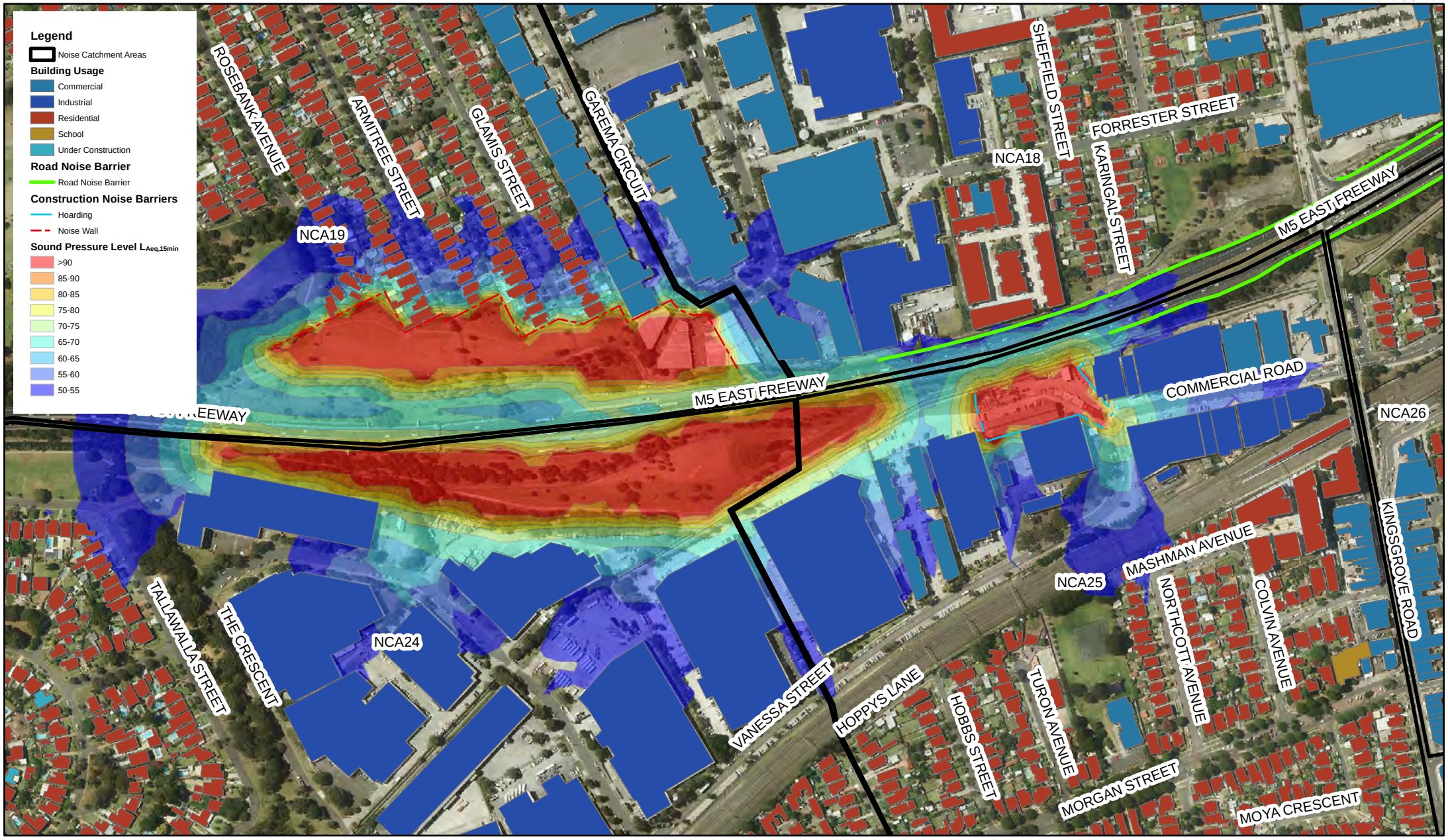
N

0 30 60 120 m

Fig.

02_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - Workshop; Deliveries; Maintenance Storage - Day

OCT 2015

60327128

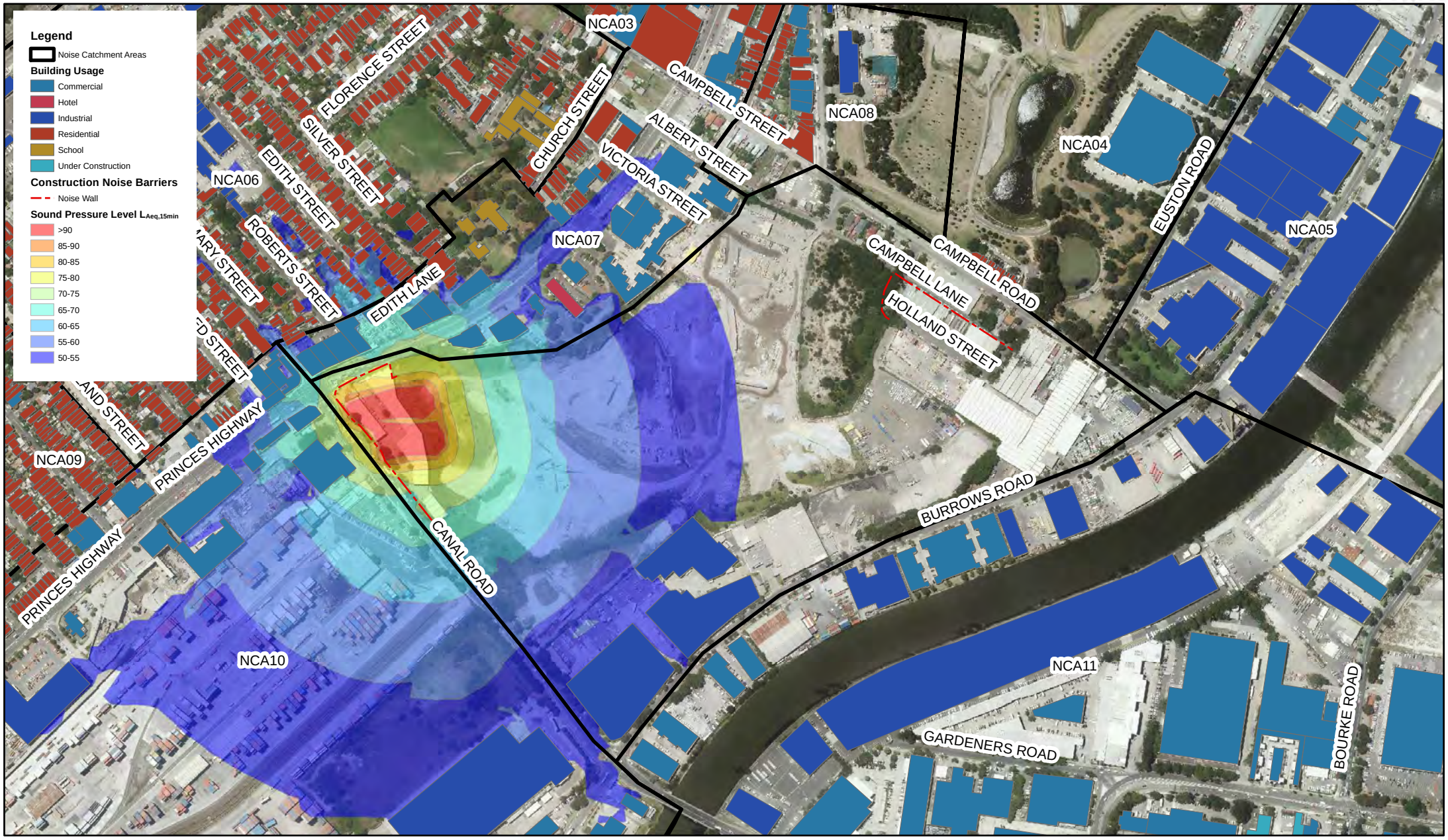
Source: SKM2014

N

0 25 50 100 m

Fig. **02_02**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Piling; excavation of decline - Day

OCT 2015

60327128

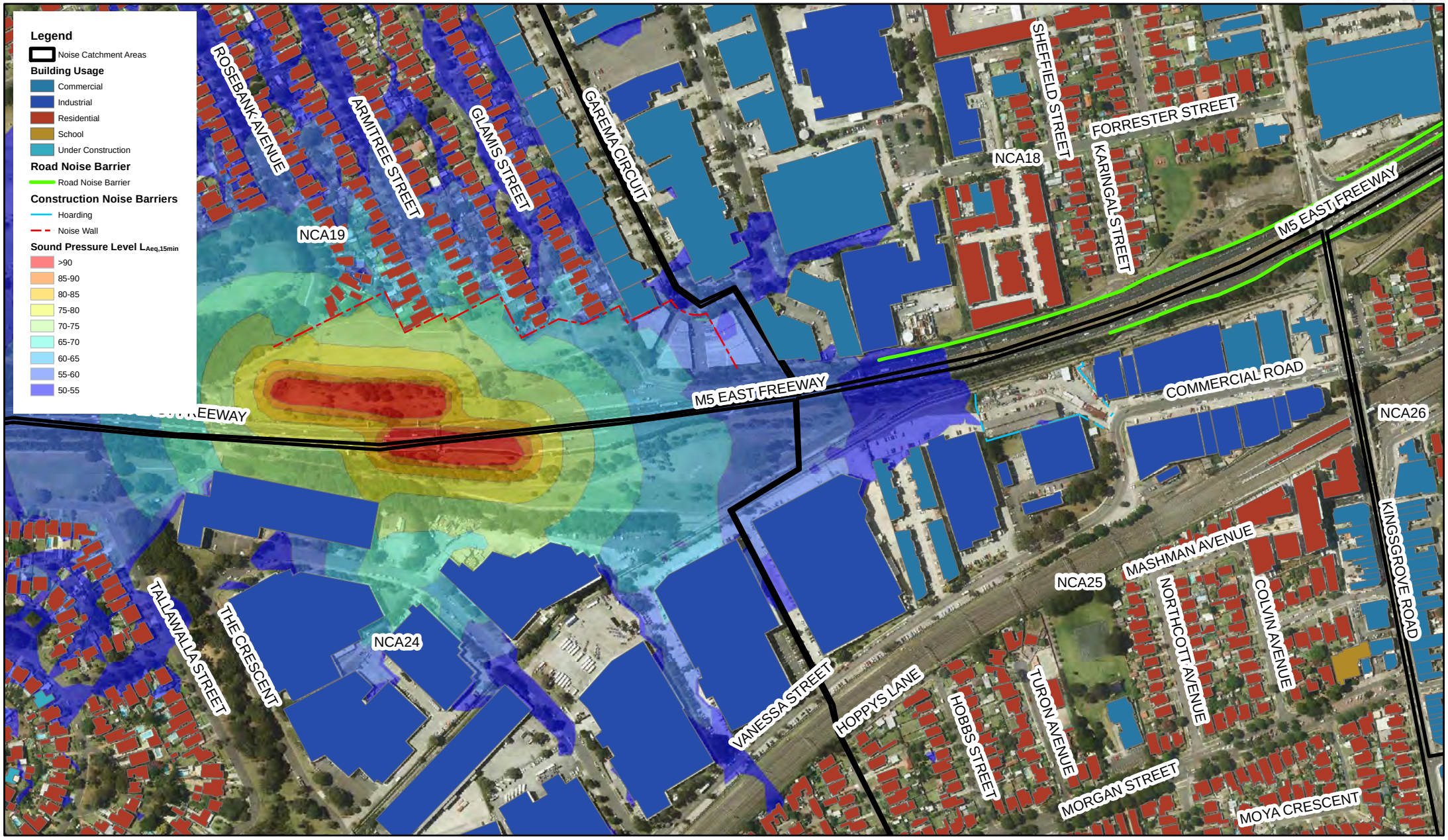
Source: SKM2014

N

0 30 60 120 m

Fig. **03_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Piling; excavation of decline - Day

OCT 2015

60327128

Source: SKM2014

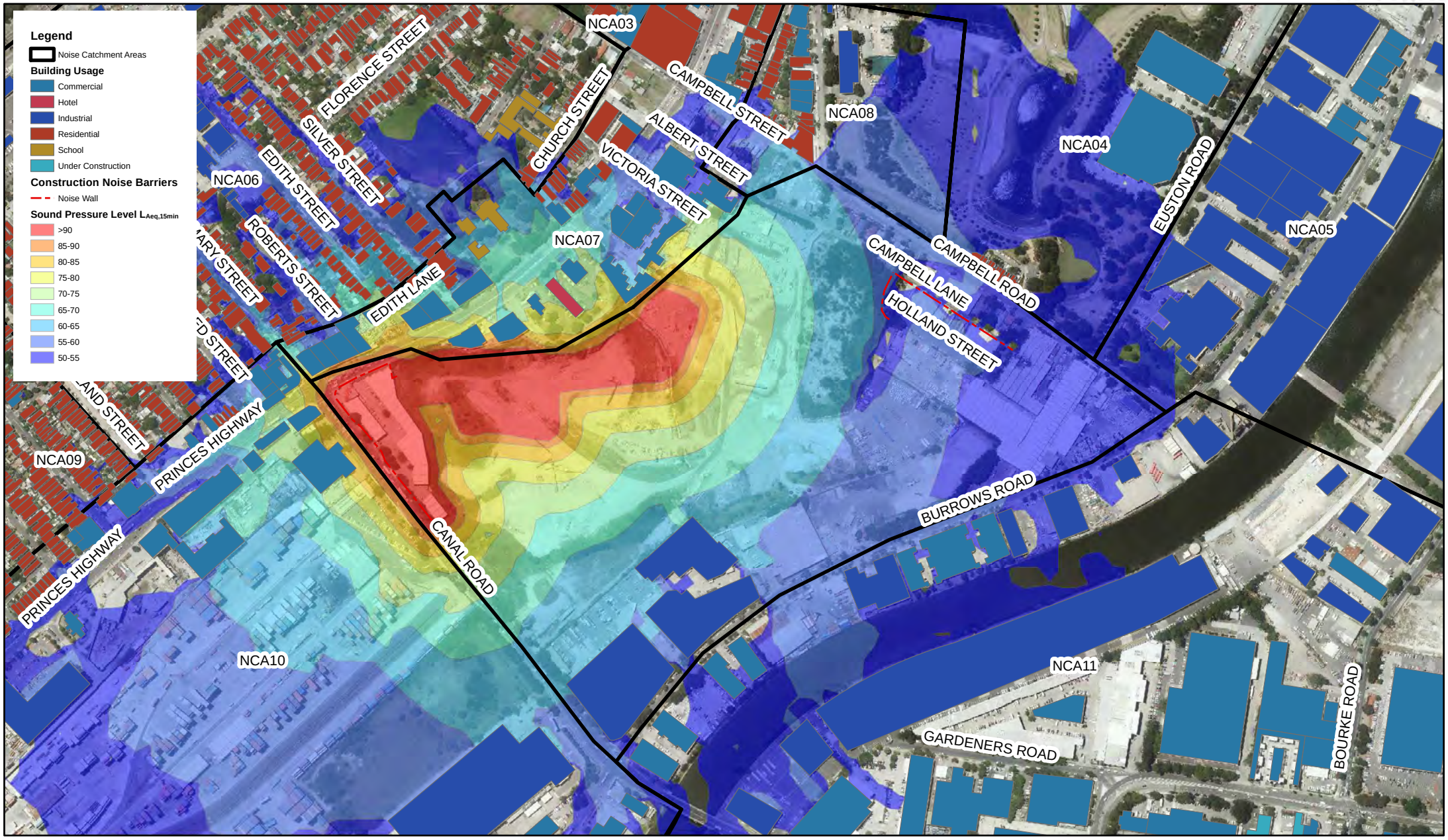
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

03_01



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

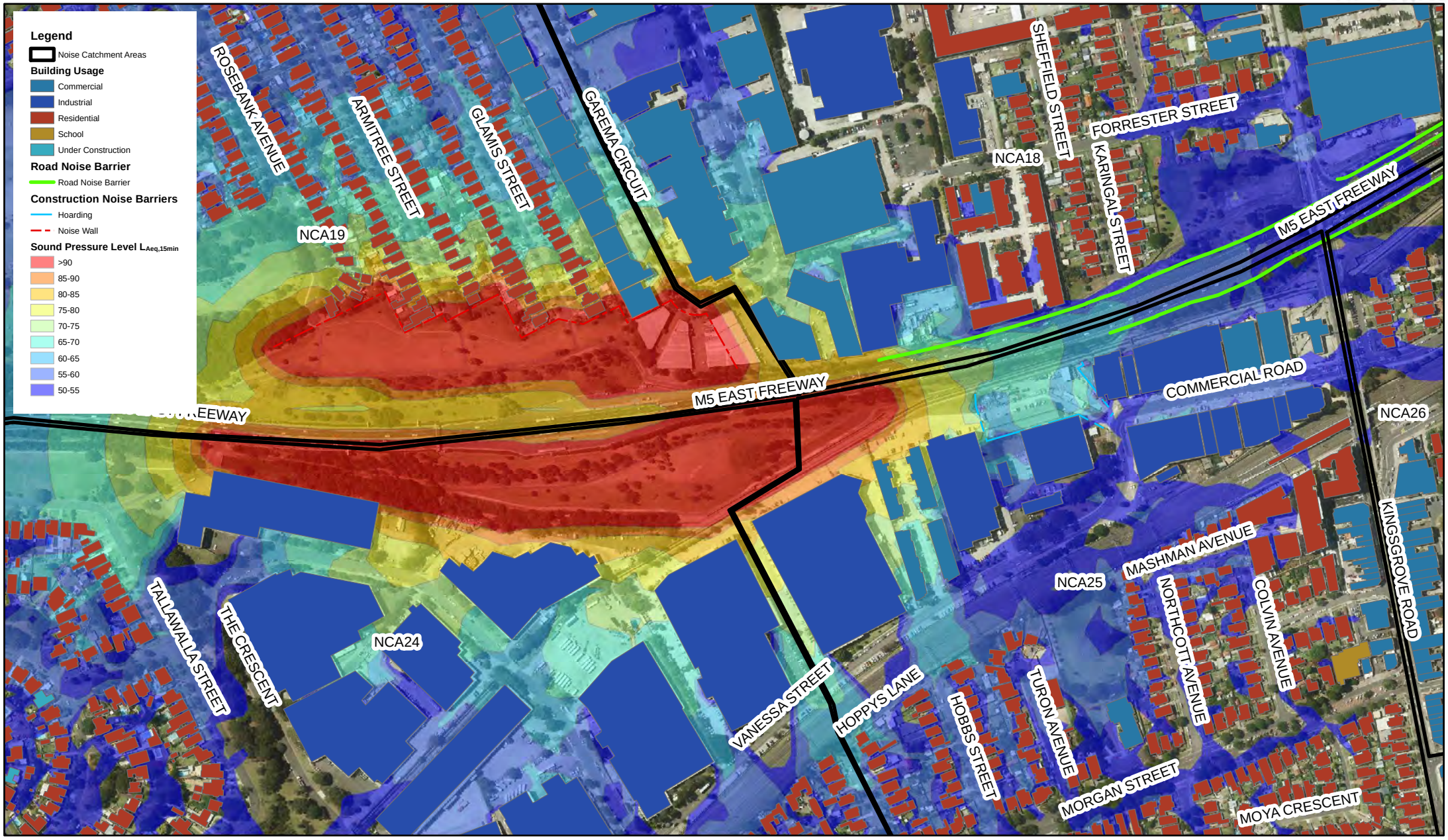
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

03_02



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Earthworks - Day

OCT 2015

60327128

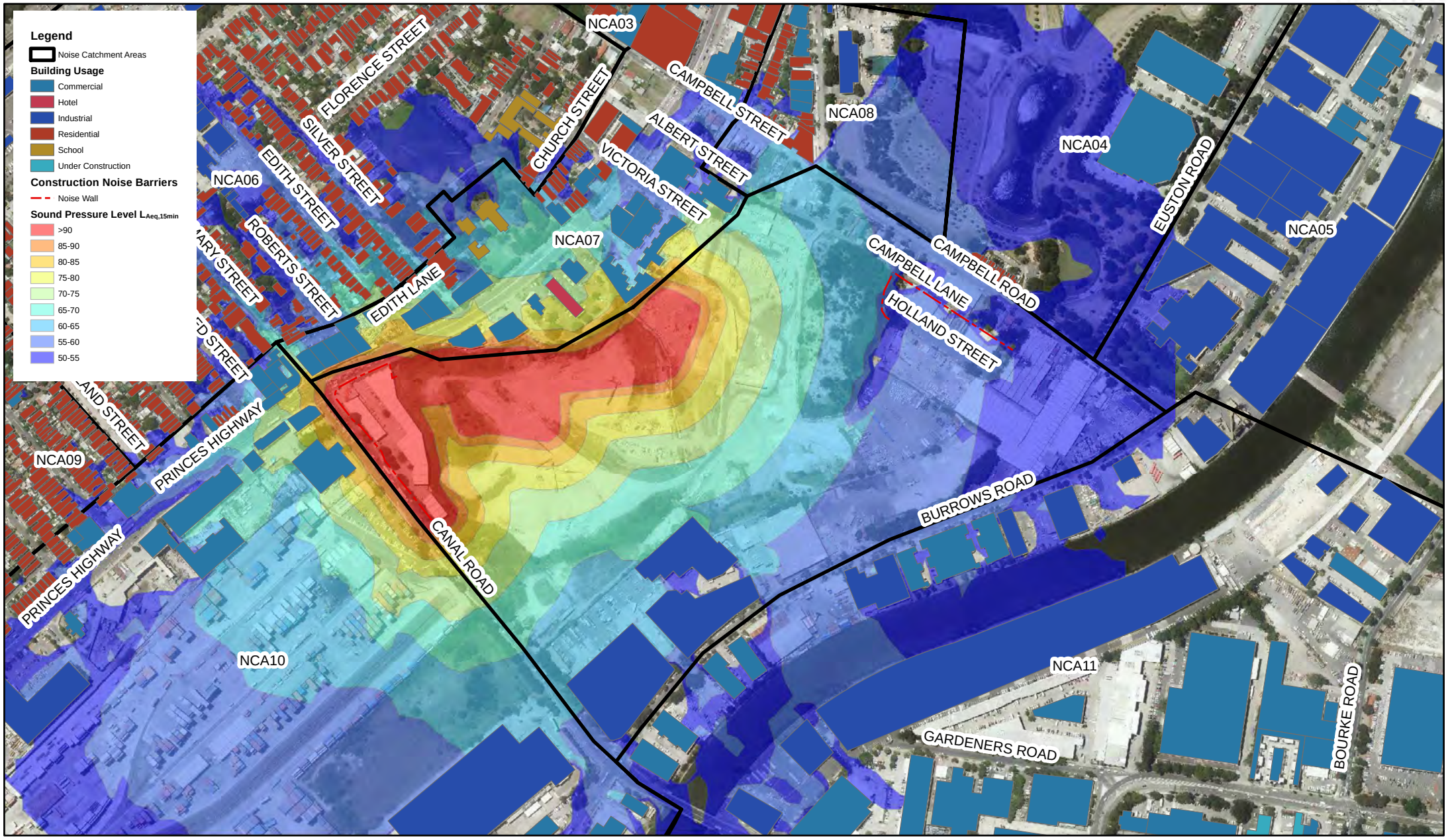
Source: SKM2014

N

0 25 50 100 m

Fig. **03_02**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Road tie-in works - Day

OCT 2015

60327128

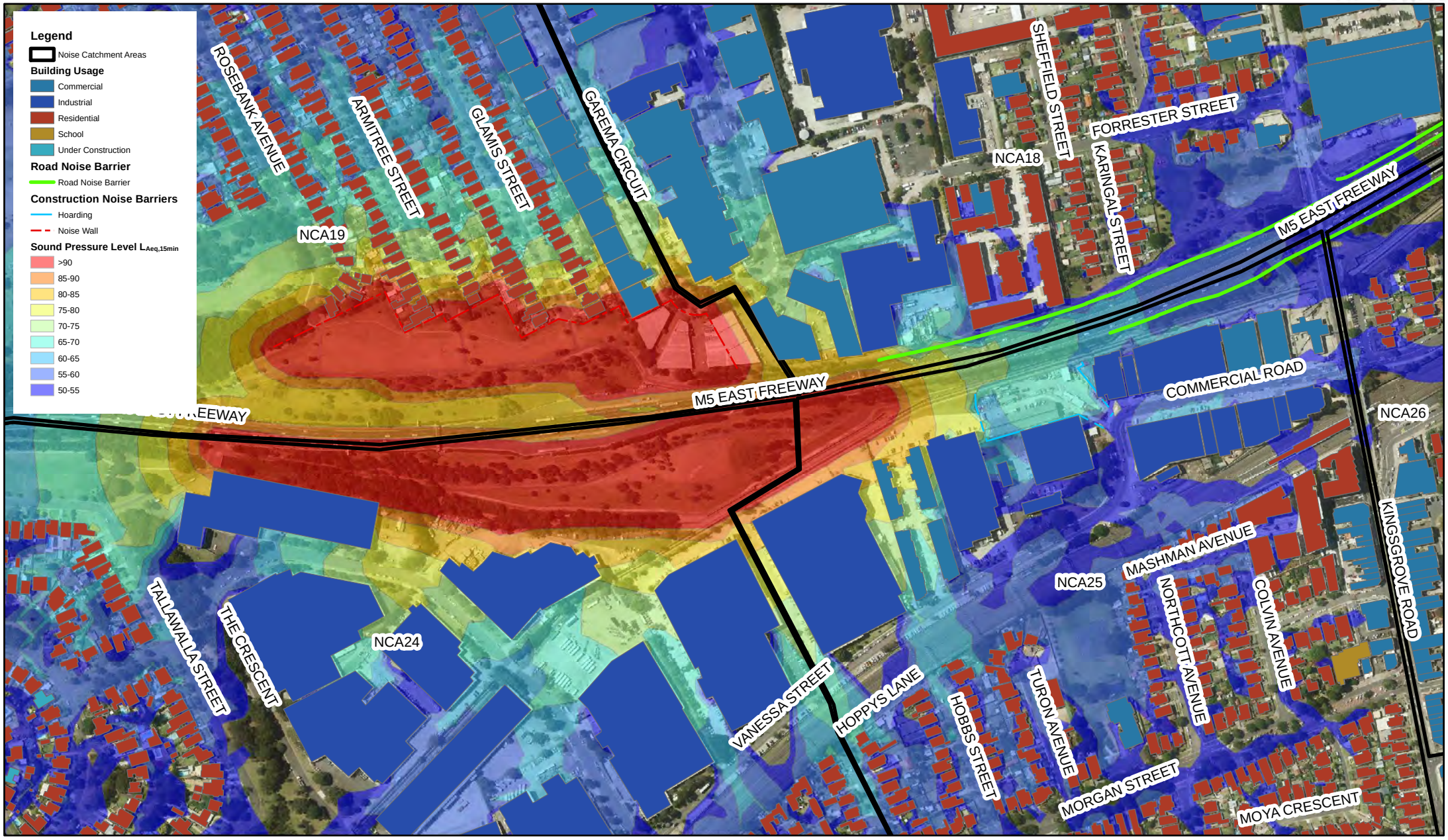
Source: SKM2014

N

0 30 60 120 m

Fig. **03_03**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of portals (cut and cover tunnel) - Road tie-in works - Day

OCT 2015

60327128

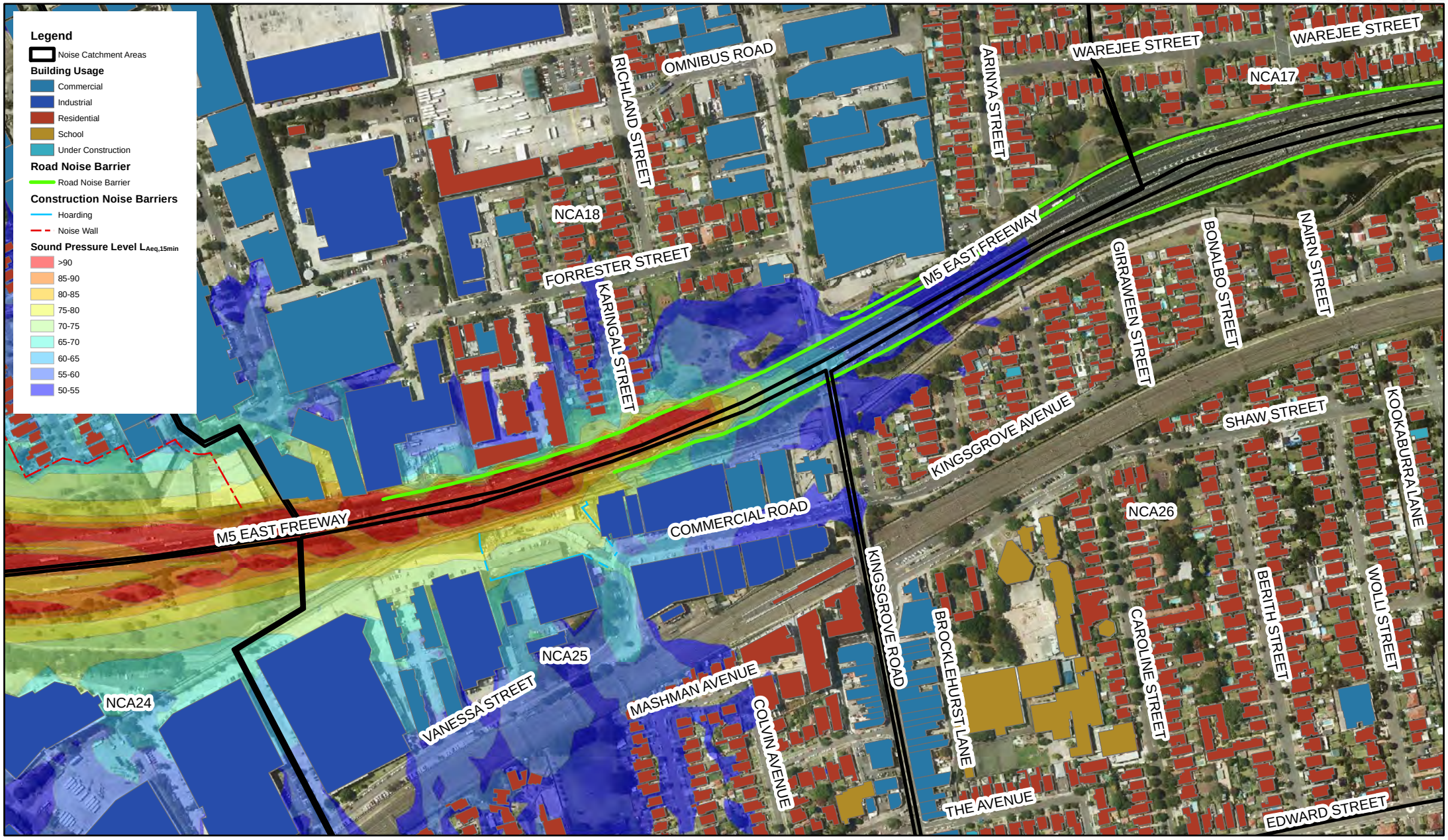
Source: SKM2014

N

0 25 50 100 m

Fig. **03_03**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (No rock hammering) - Earthworks - Day

OCT 2015

60327128

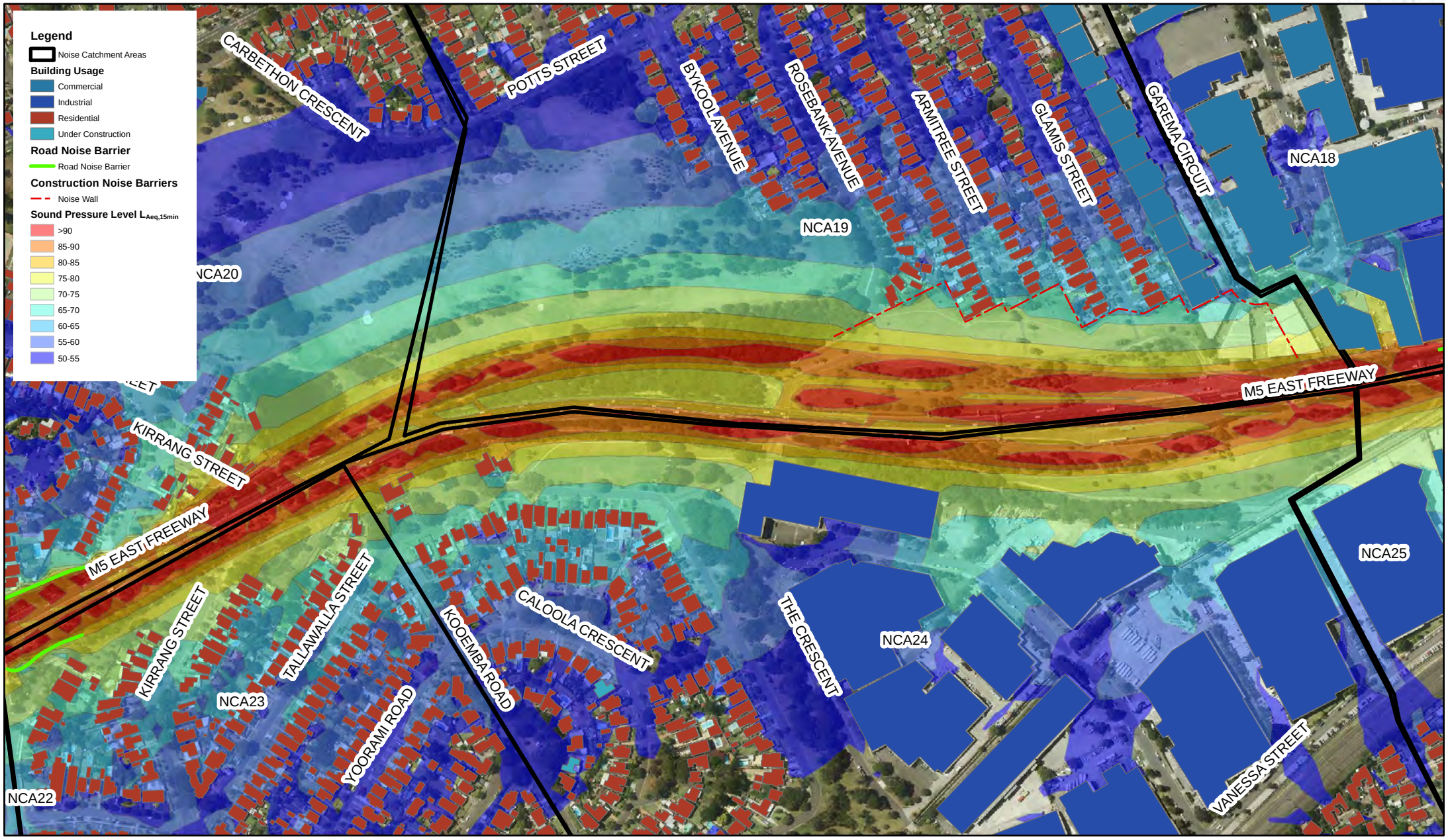
Source: SKM2014

N

0 25 50 100 m

Fig. **04_01a**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (No rock hammering) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

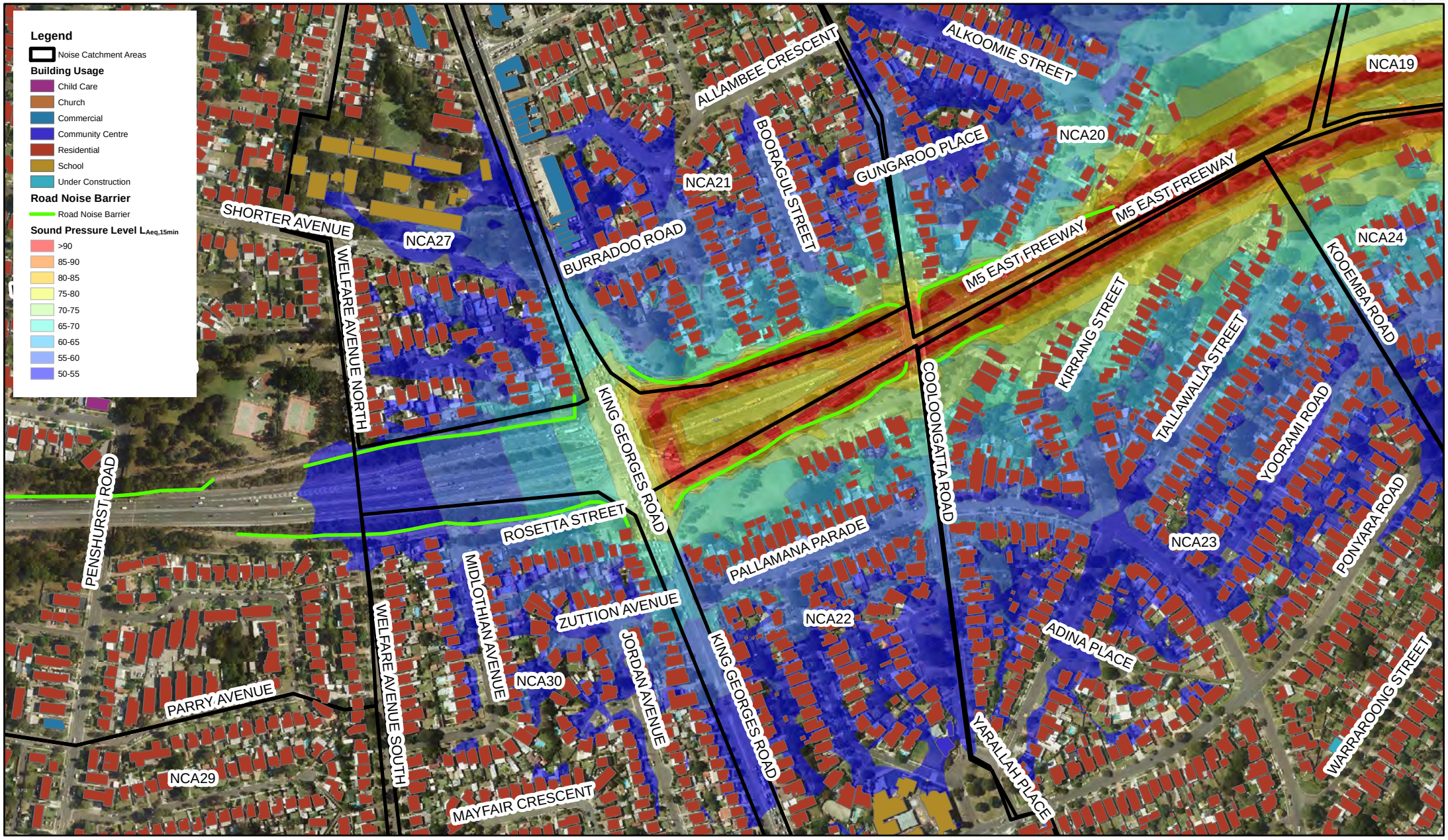
N

0 25 50 100 m

Fig.

04_01a

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (No rock hammering) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

N

0 25 50 100 m

Fig. **04_01a**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (No rock hammering) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

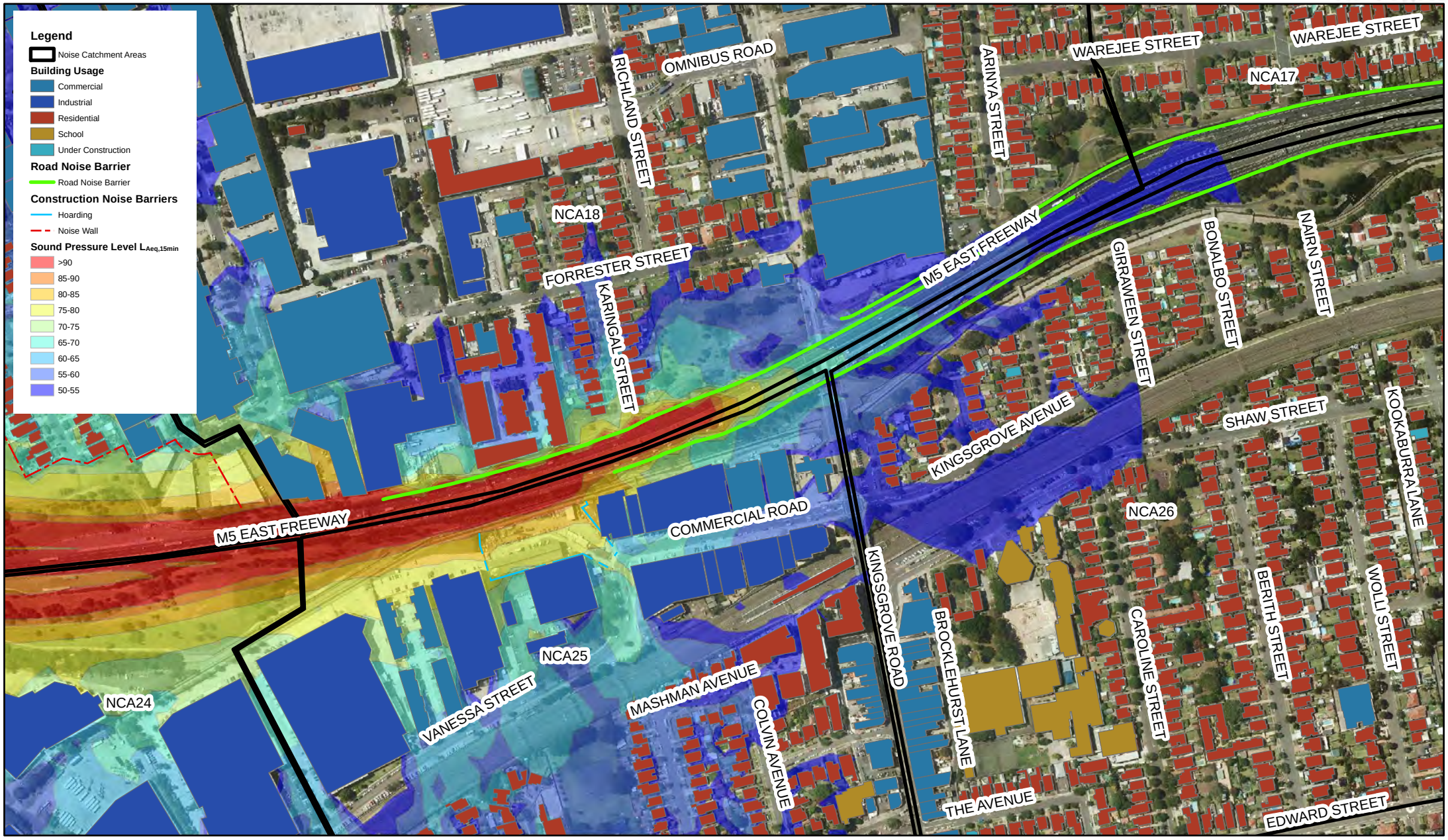
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

04_01a



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (Rock hammering only) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

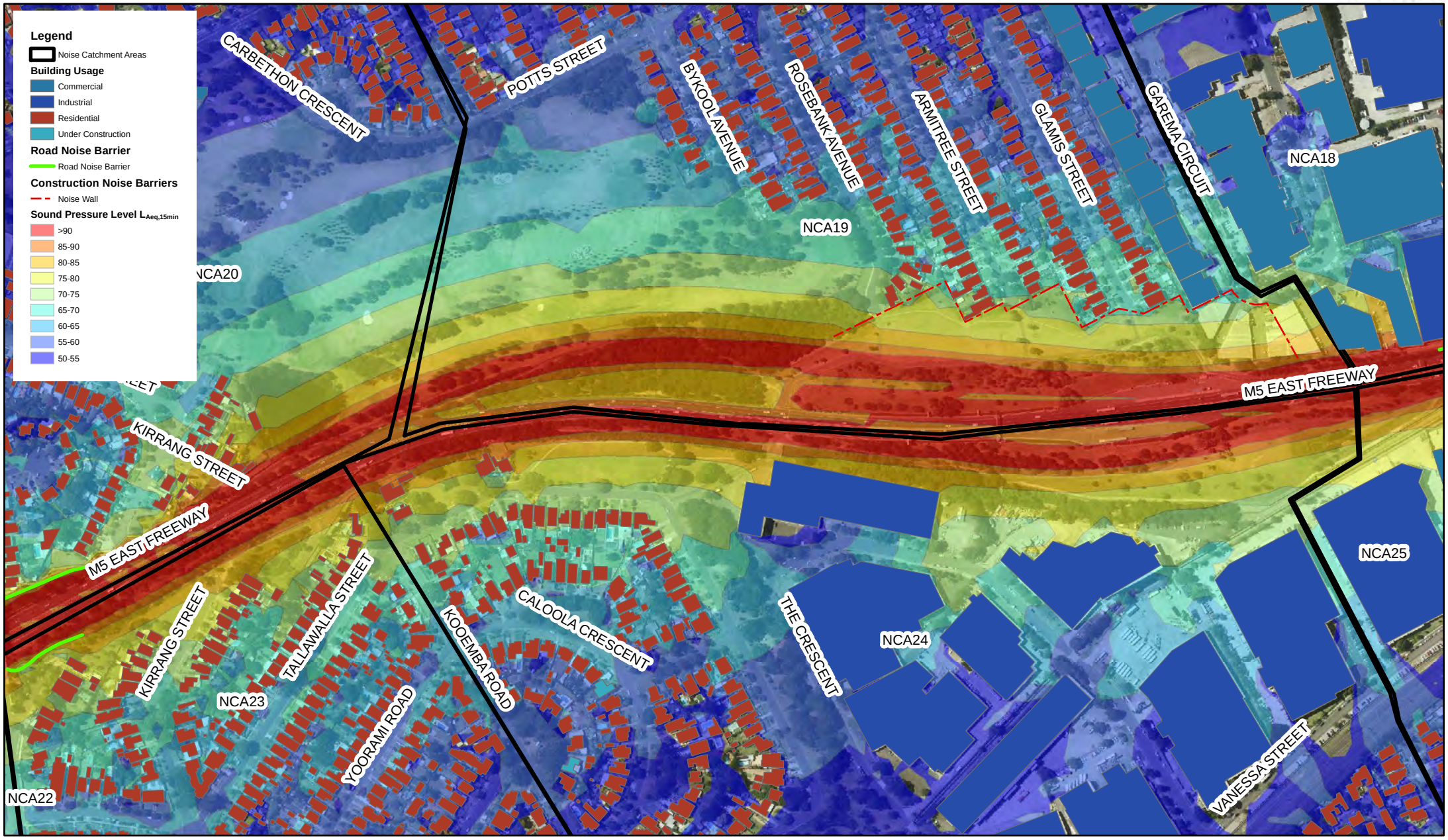
N

0 25 50 100 m

Fig.

04_01b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (Rock hammering only) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

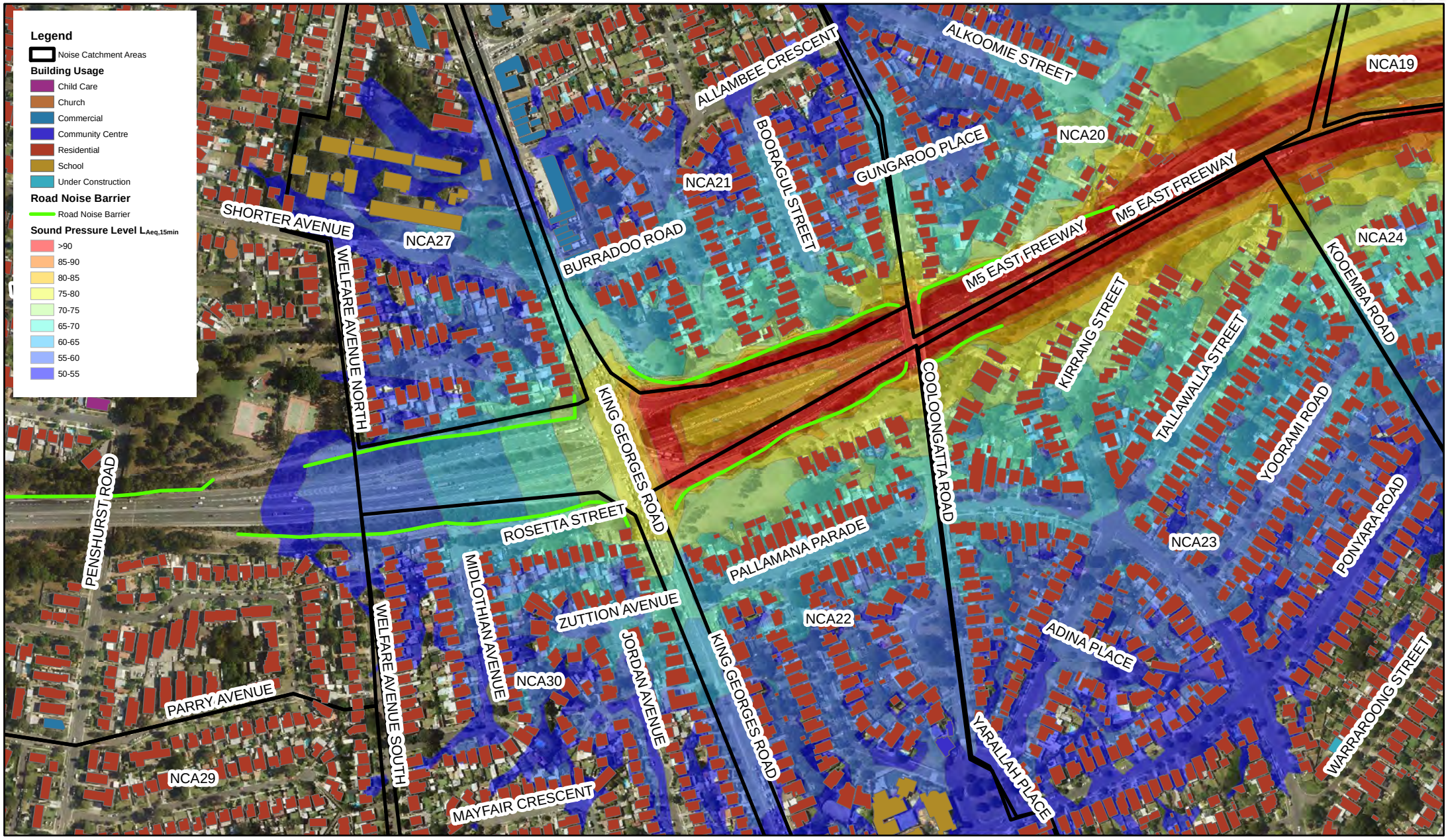
N

0 25 50 100 m

Fig.

04_01b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (Rock hammering only) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

N

0 25 50 100 m

Fig.

04_01b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment (Rock hammering only) - Earthworks - Day

OCT 2015

60327128

Source: SKM2014

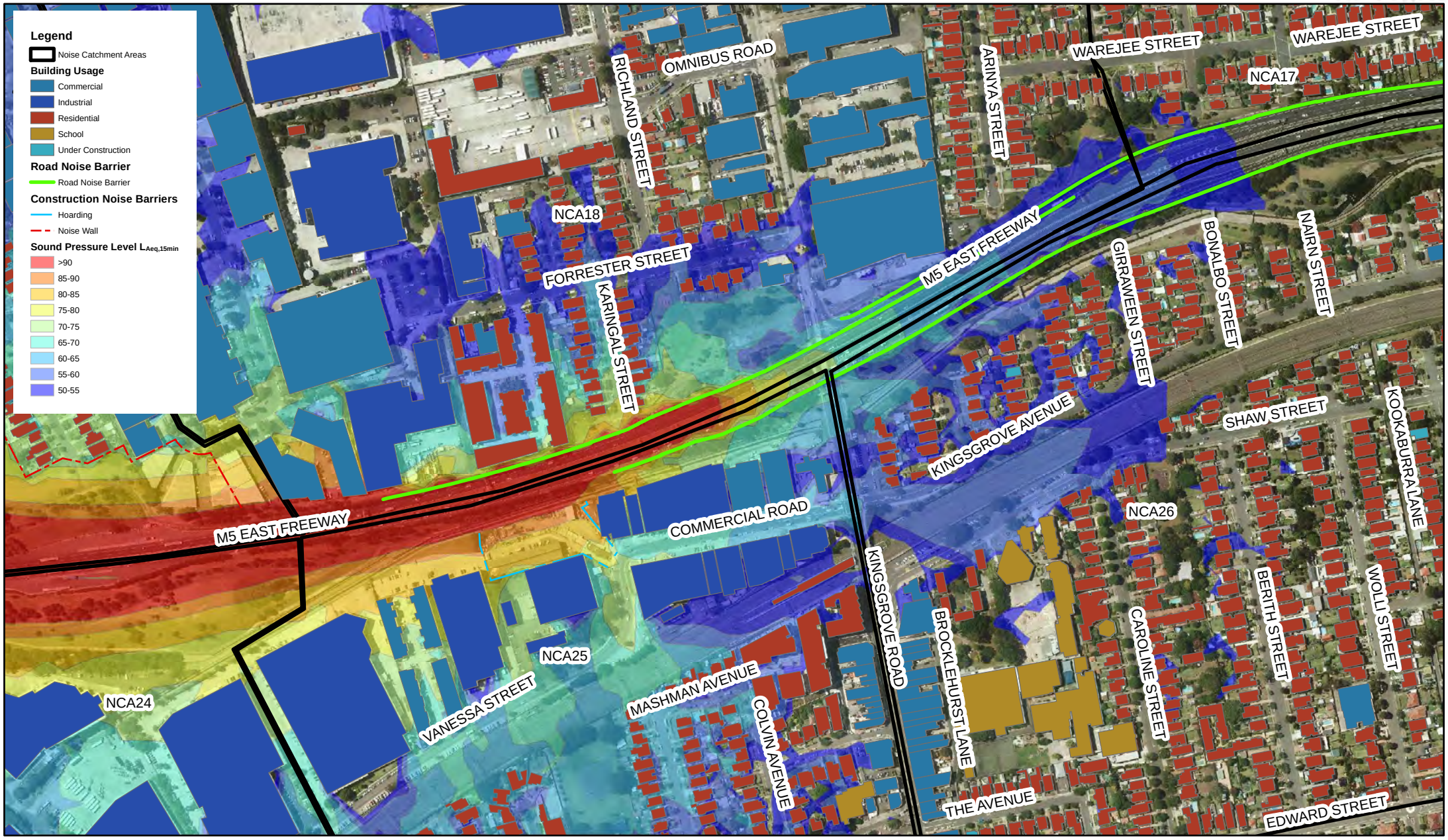
N

0 25 50 100 m

Fig.

04_01b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment - Road tie-in works - Day

OCT 2015

60327128

Source: SKM2014

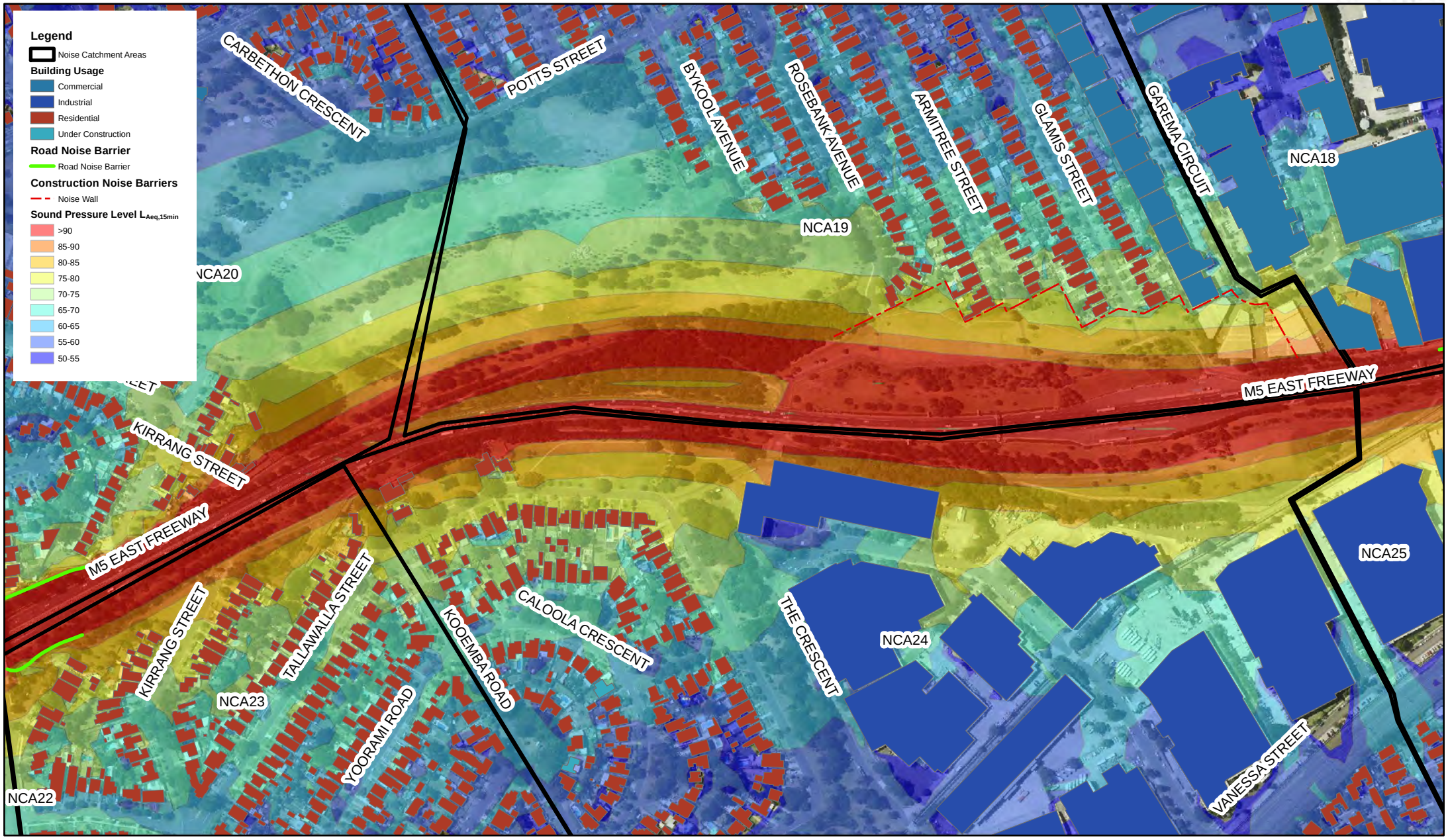
N

0 25 50 100 m

Fig.

04_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment - Road tie-in works - Day

OCT 2015

60327128

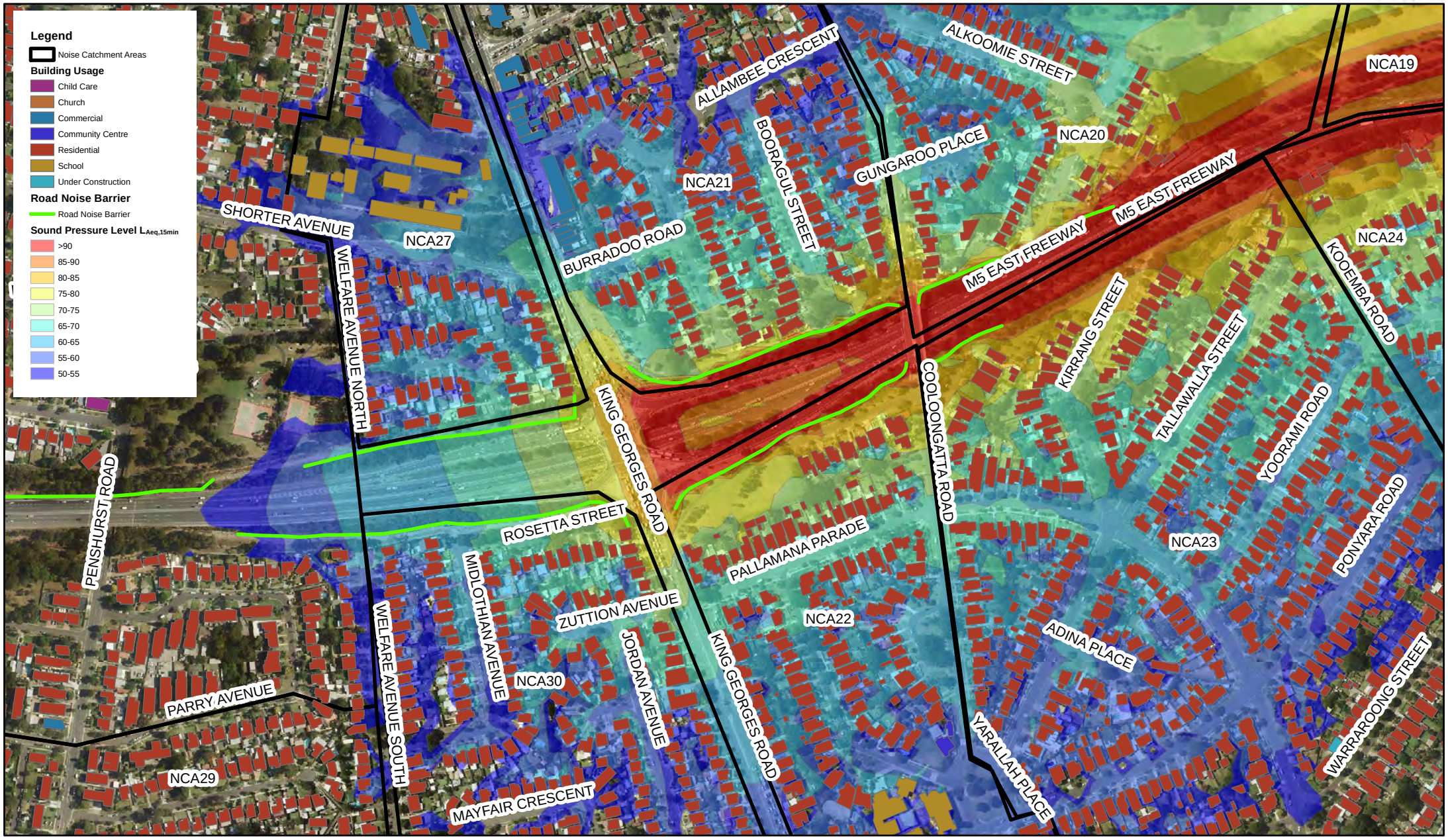
Source: SKM2014

N

0 25 50 100 m

Fig. **04_02**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment - Road tie-in works - Day

OCT 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

04_02



WestConnex Stage 2 - Construction Noise Assessment

Surface works - M5 East Motorway road widening and realignment - Road tie-in works - Day

OCT 2015

60327128

Source: SKM2014

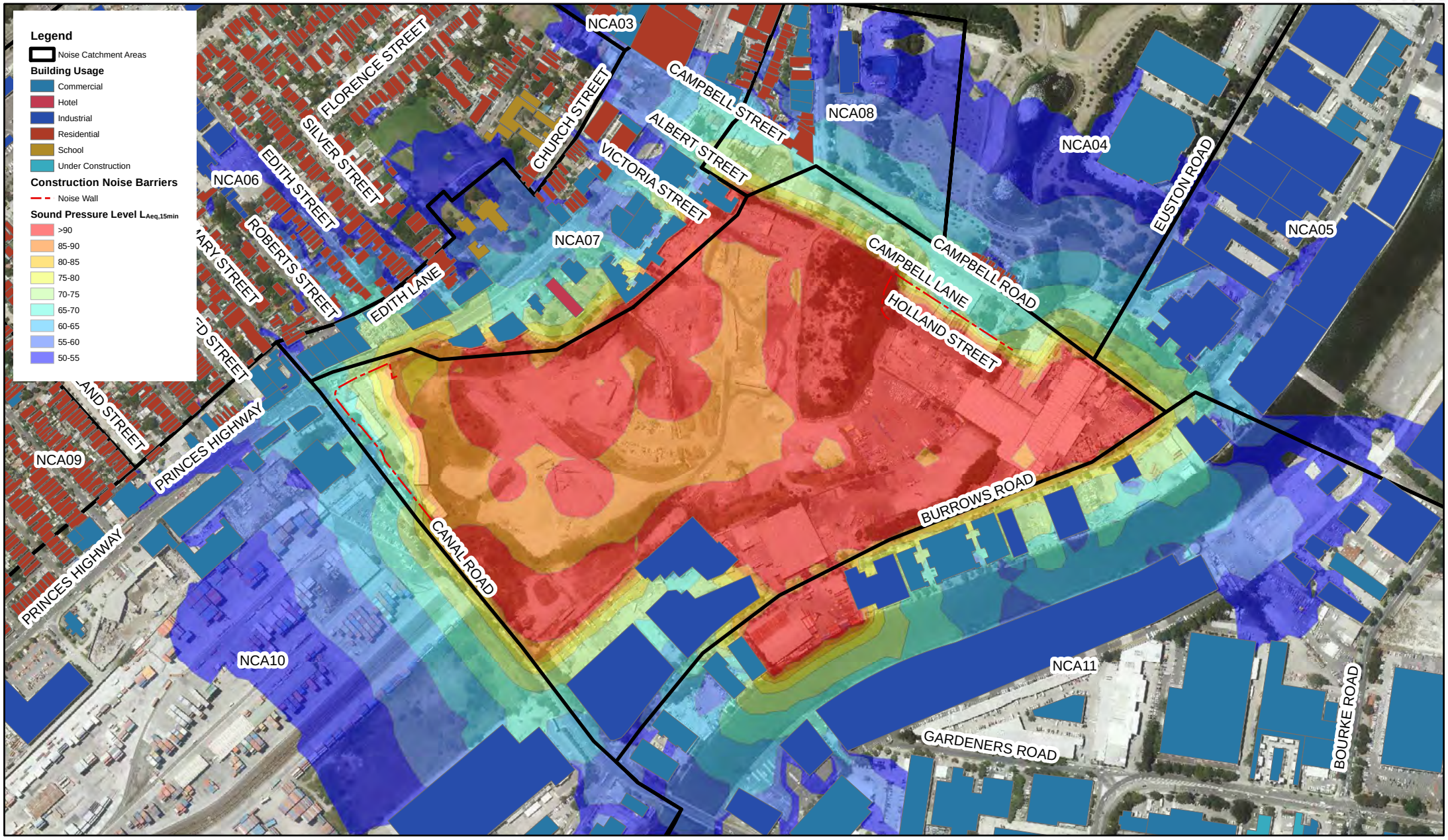
N

0 25 50 100 m

Fig.

04_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of SPI - Piling; ground improvement - Day

OCT 2015

60327128

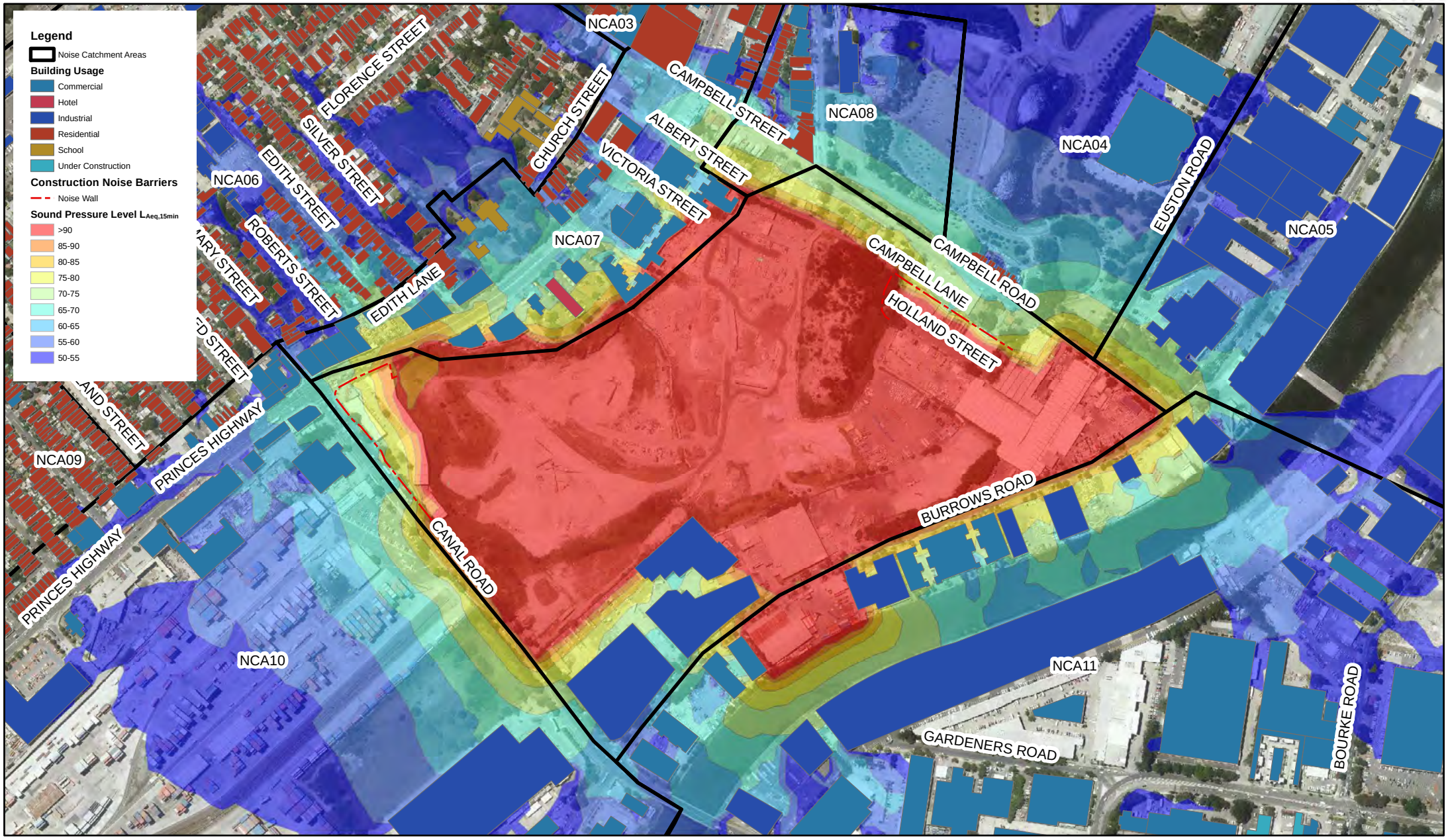
Source: SKM2014

N

0 30 60 120 m

Fig. **05_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of SPI - Earthworks (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

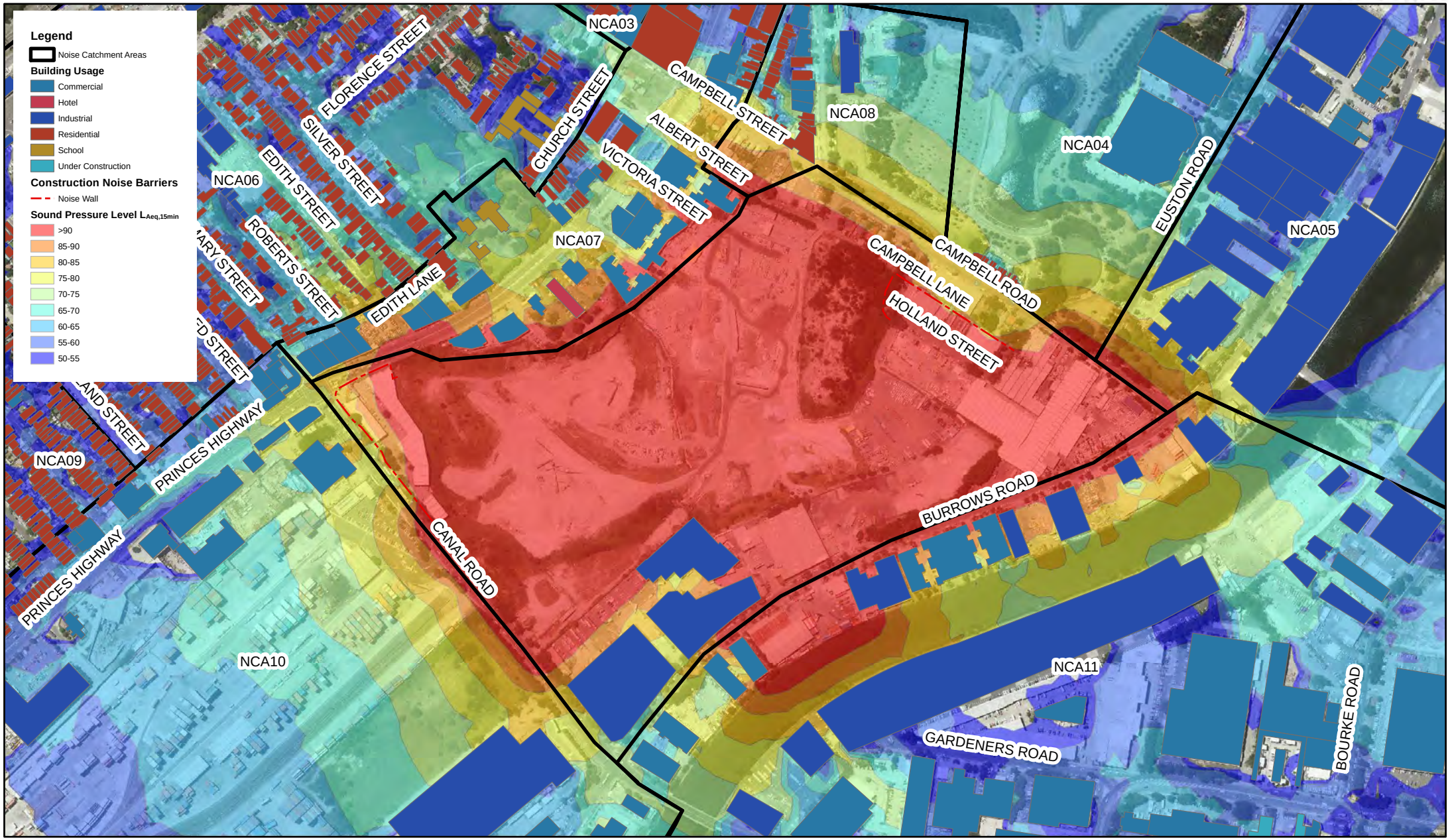
N

0 30 60 120 m

Fig.

05_02a

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of SPI - Earthworks (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

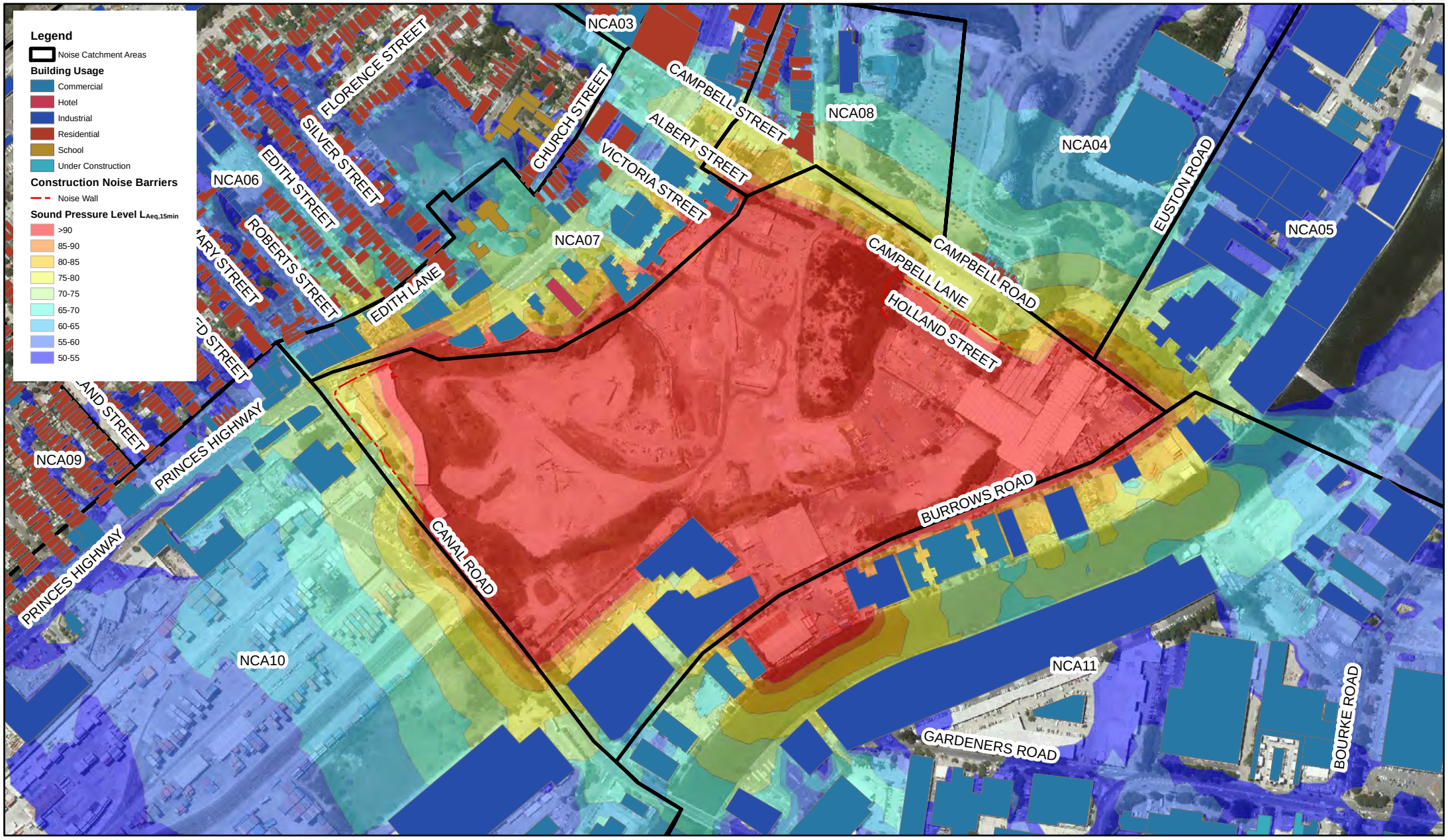
N

0 30 60 120 m

Fig.

05_02b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Construction of SPI - Road tie-in works - Day

OCT 2015
60327128

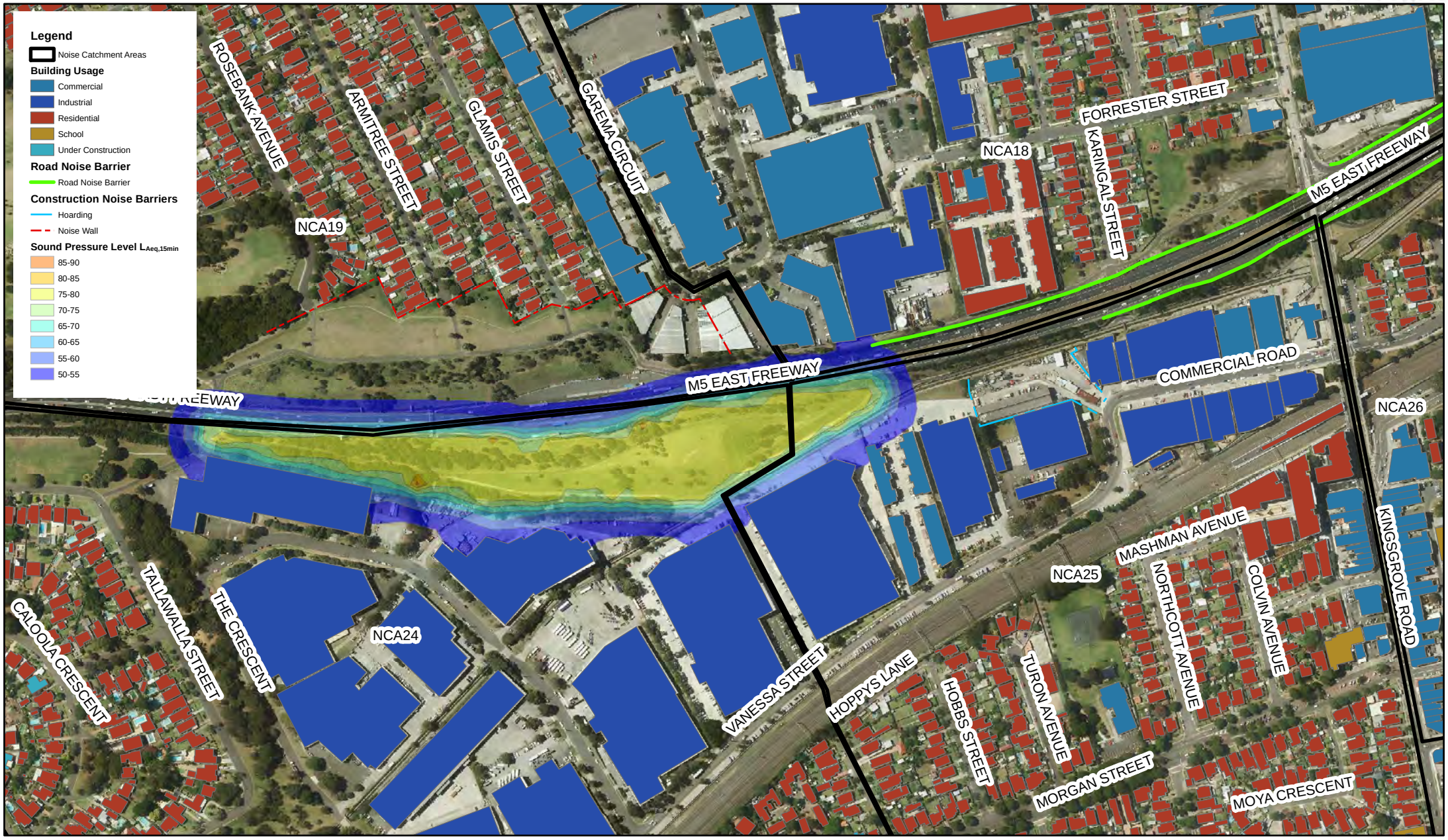
Source: SKM2014

N

0 30 60 120 m

Fig.
05_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

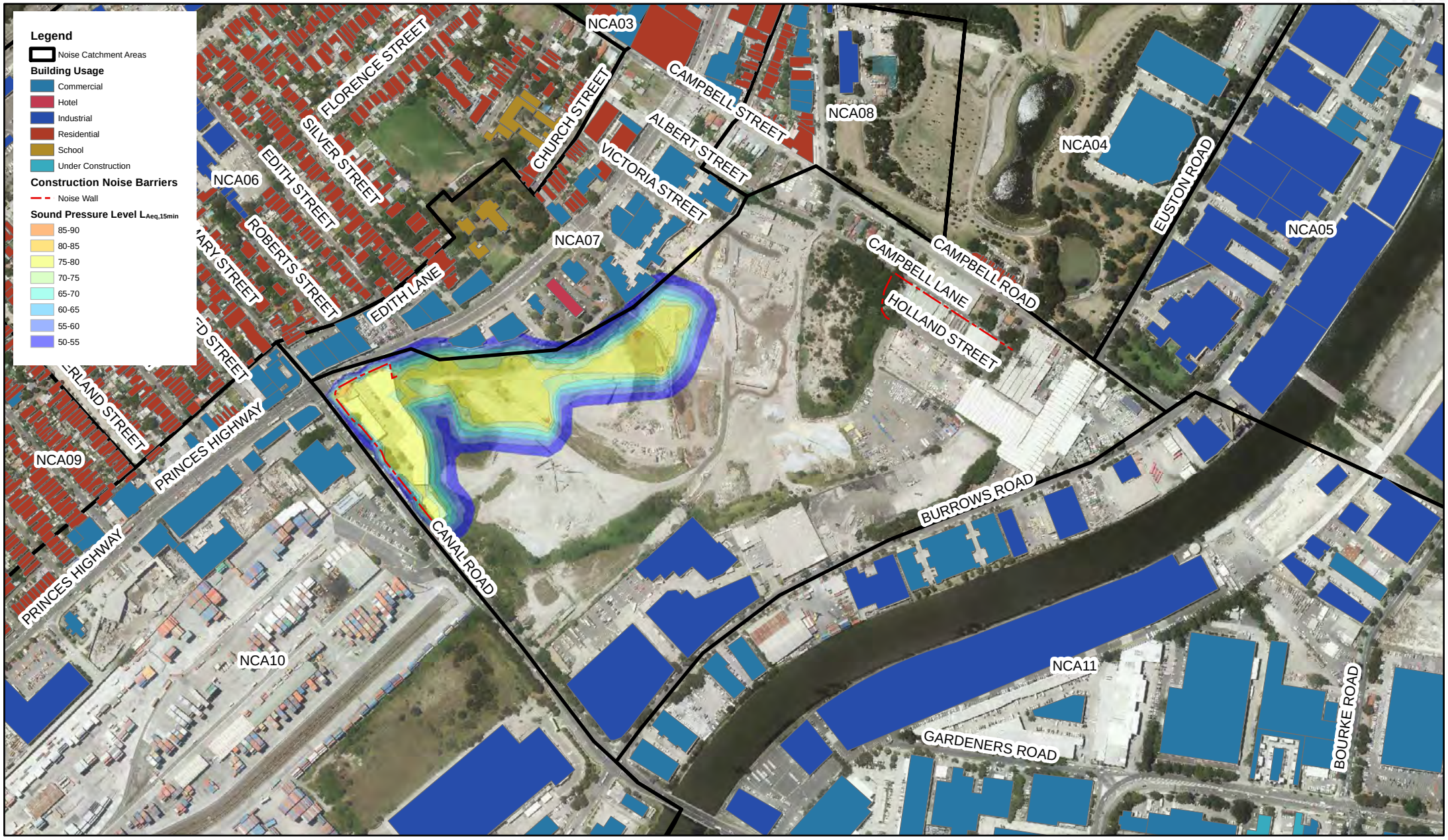
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

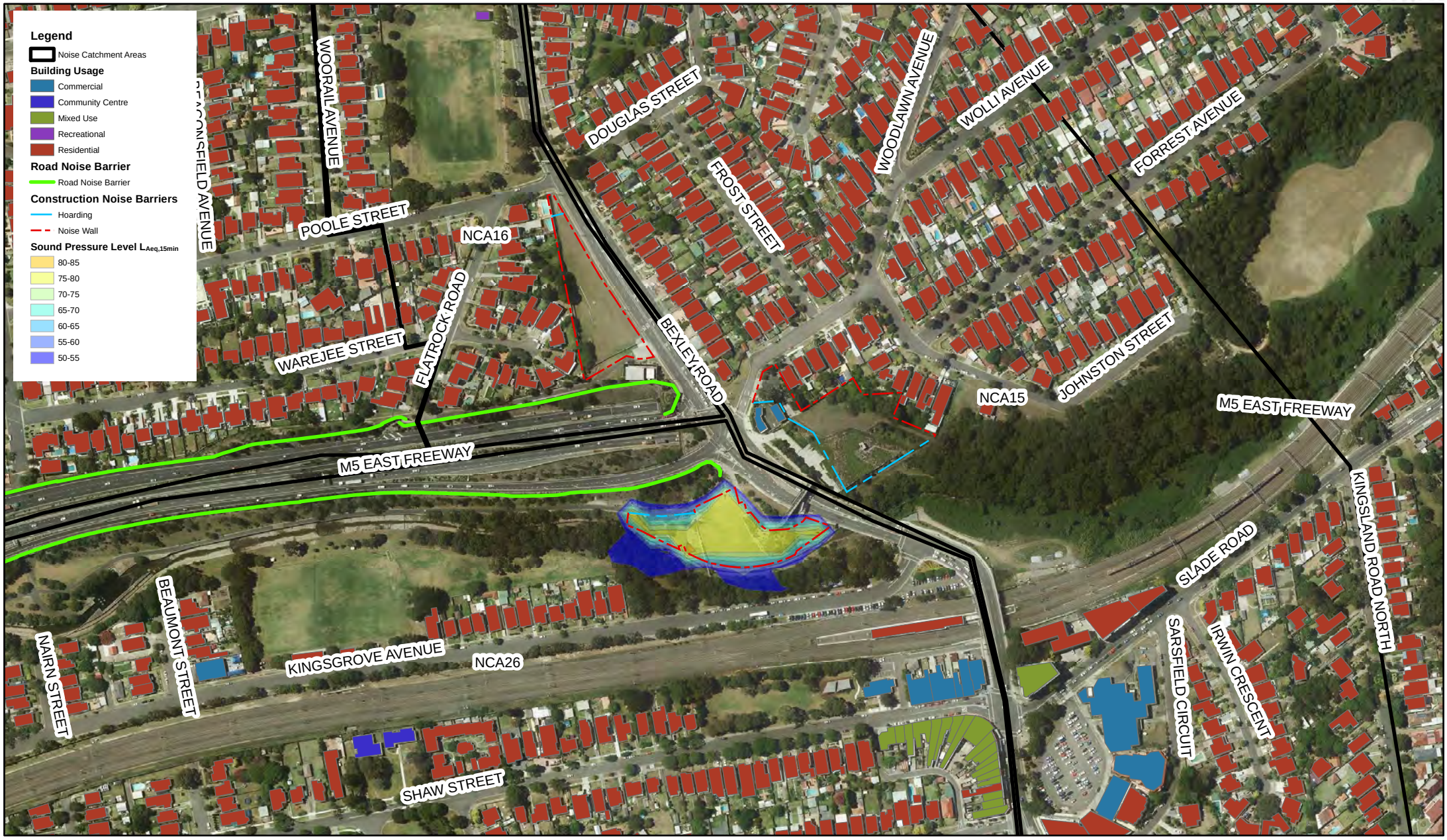
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

N

0 30 60 120 m

Fig.

06_01



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

N

0 20 40 80 m

Fig. **06_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

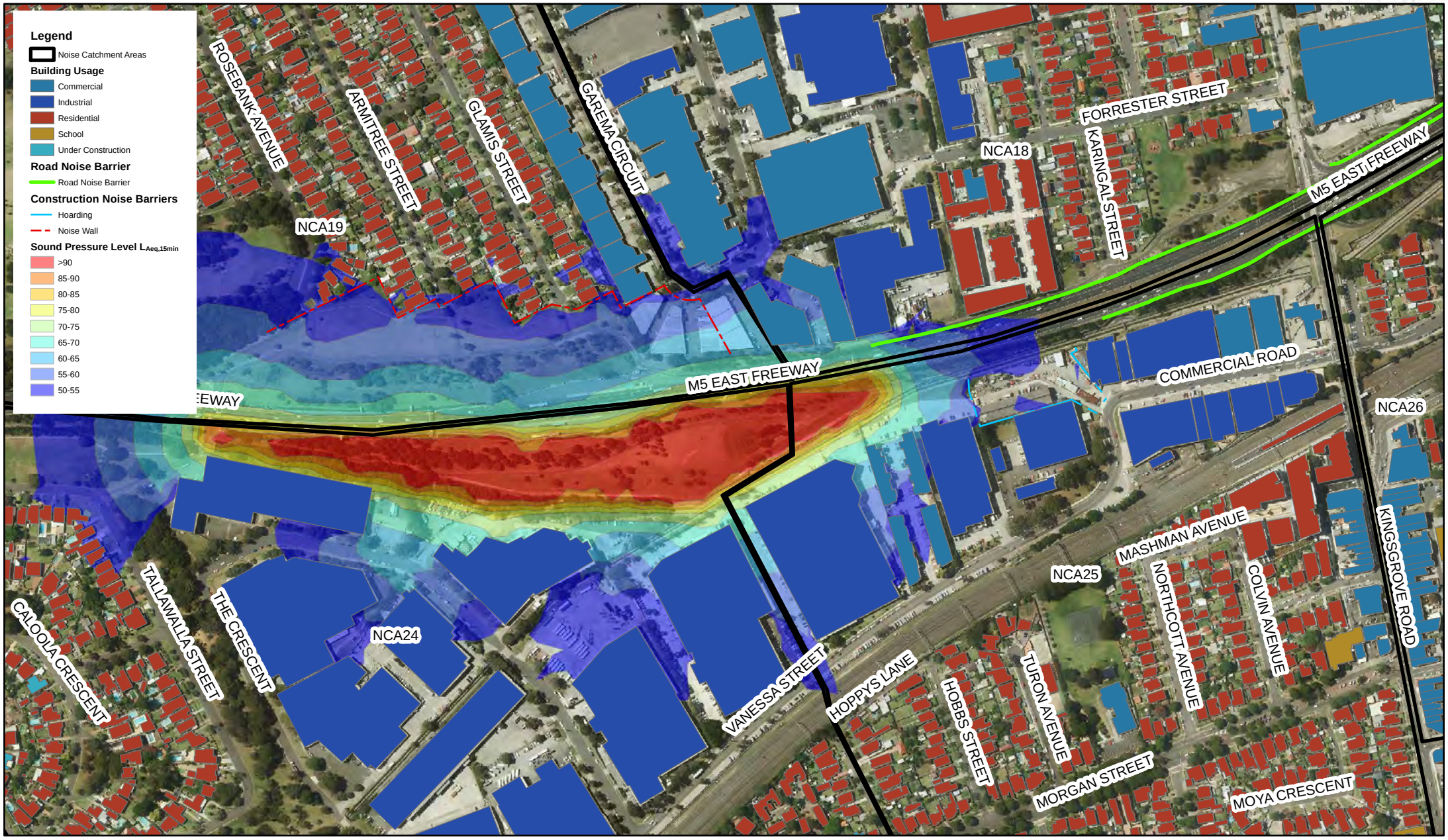
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and delivelies - Day

OCT 2015

60327128

Source: SKM2014

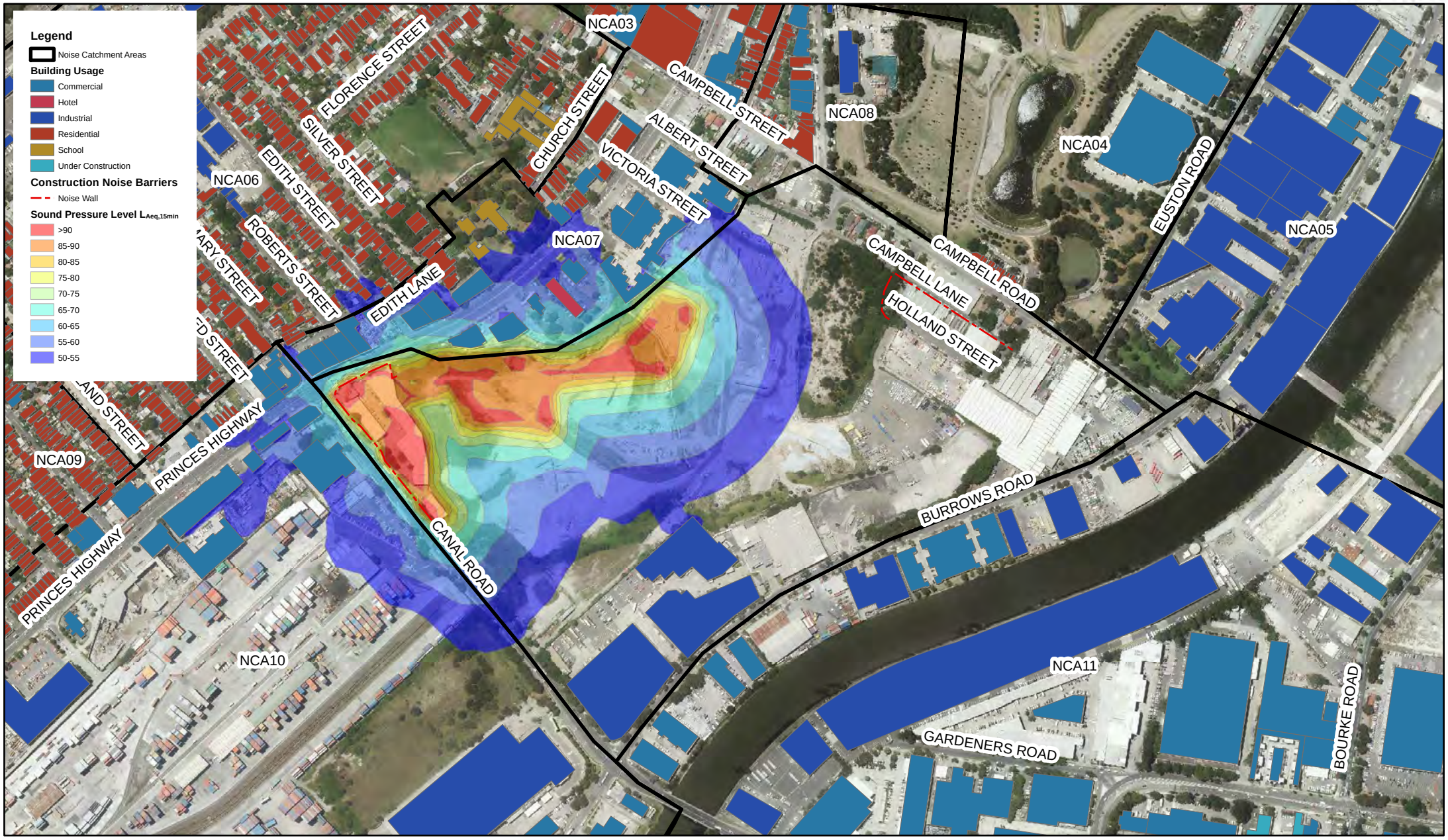
N

0 25 50 100 m

Fig.

06_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

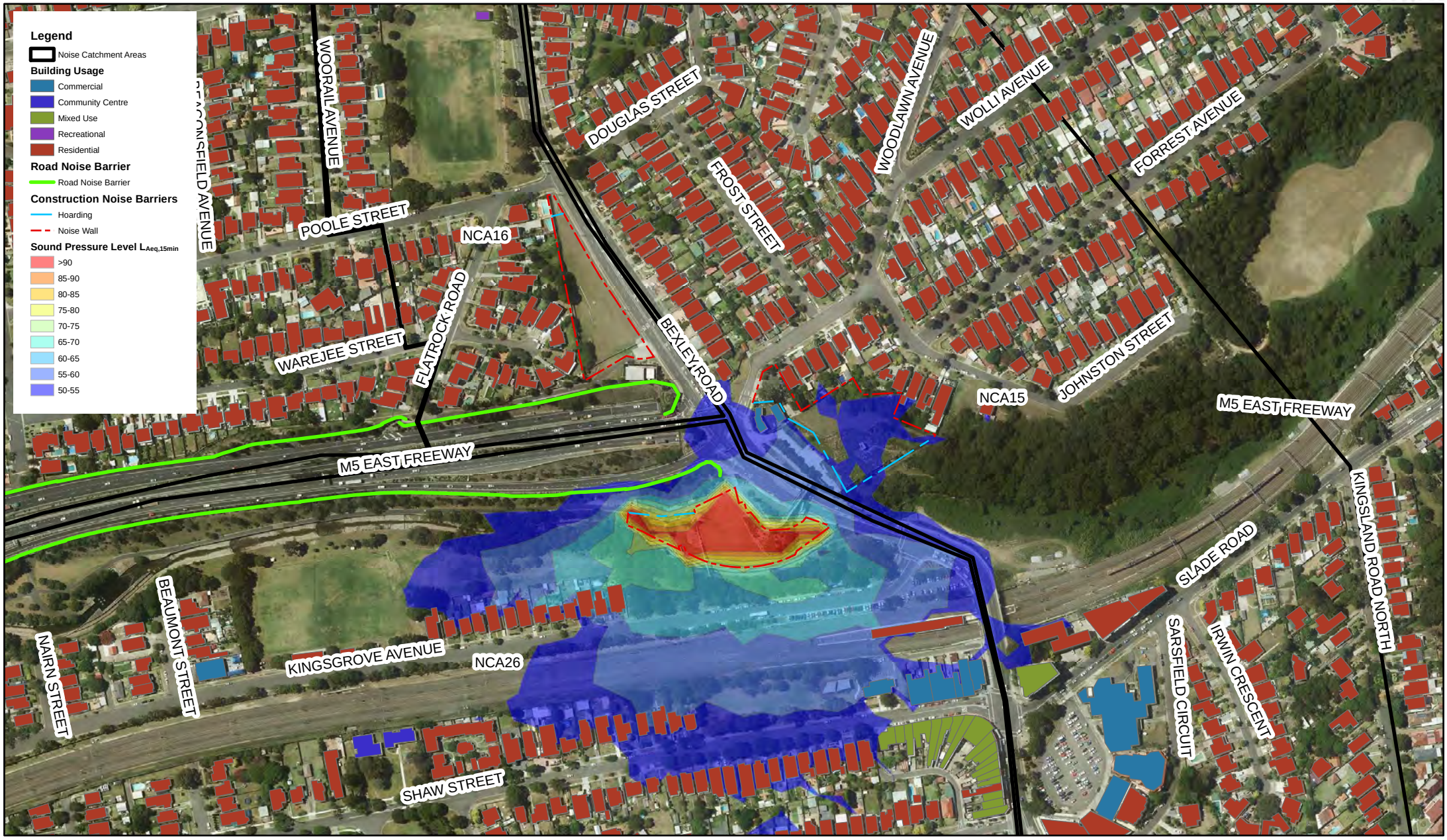
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

N

0 30 60 120 m

Fig.

06_02



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

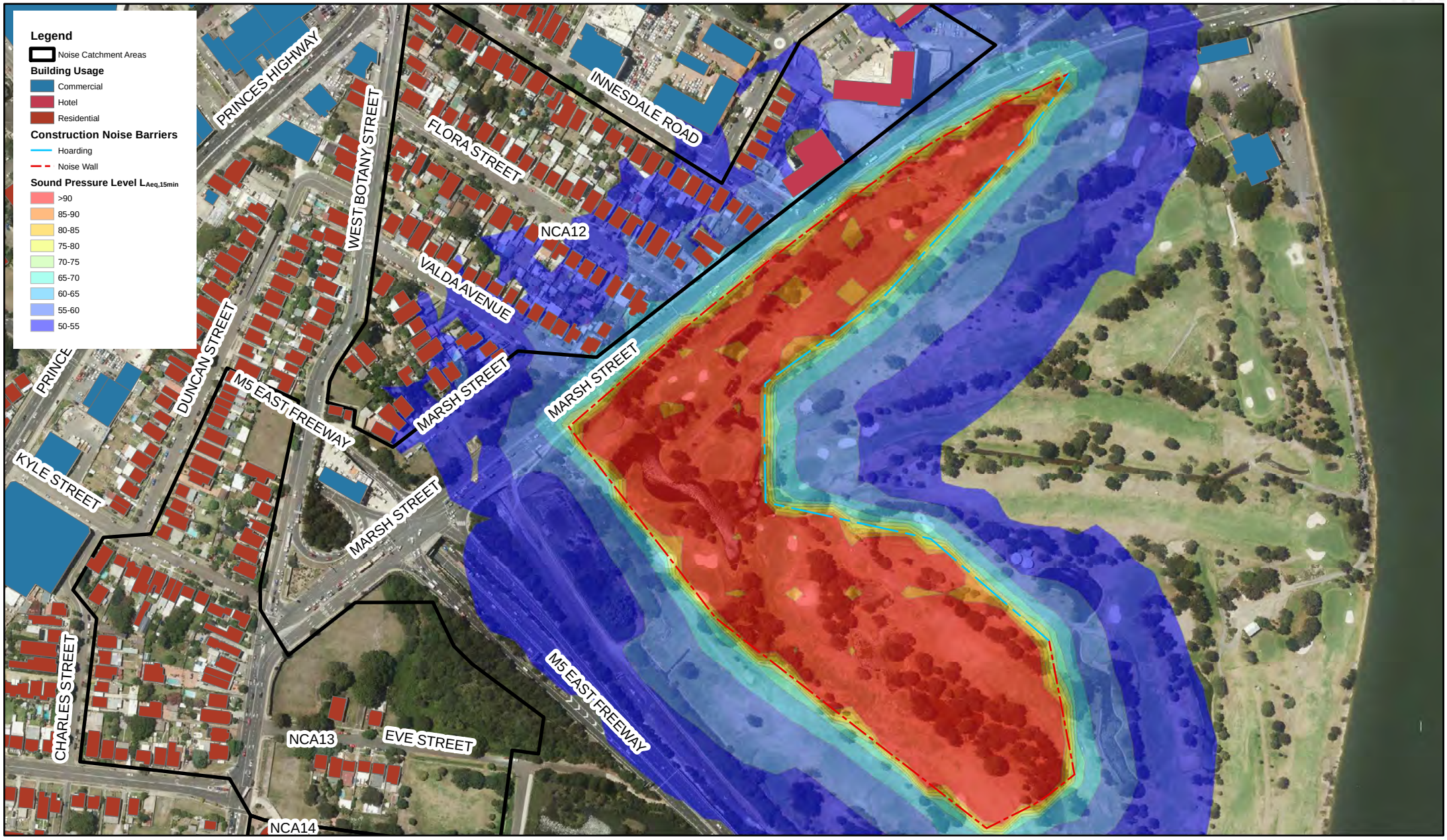
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_02



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

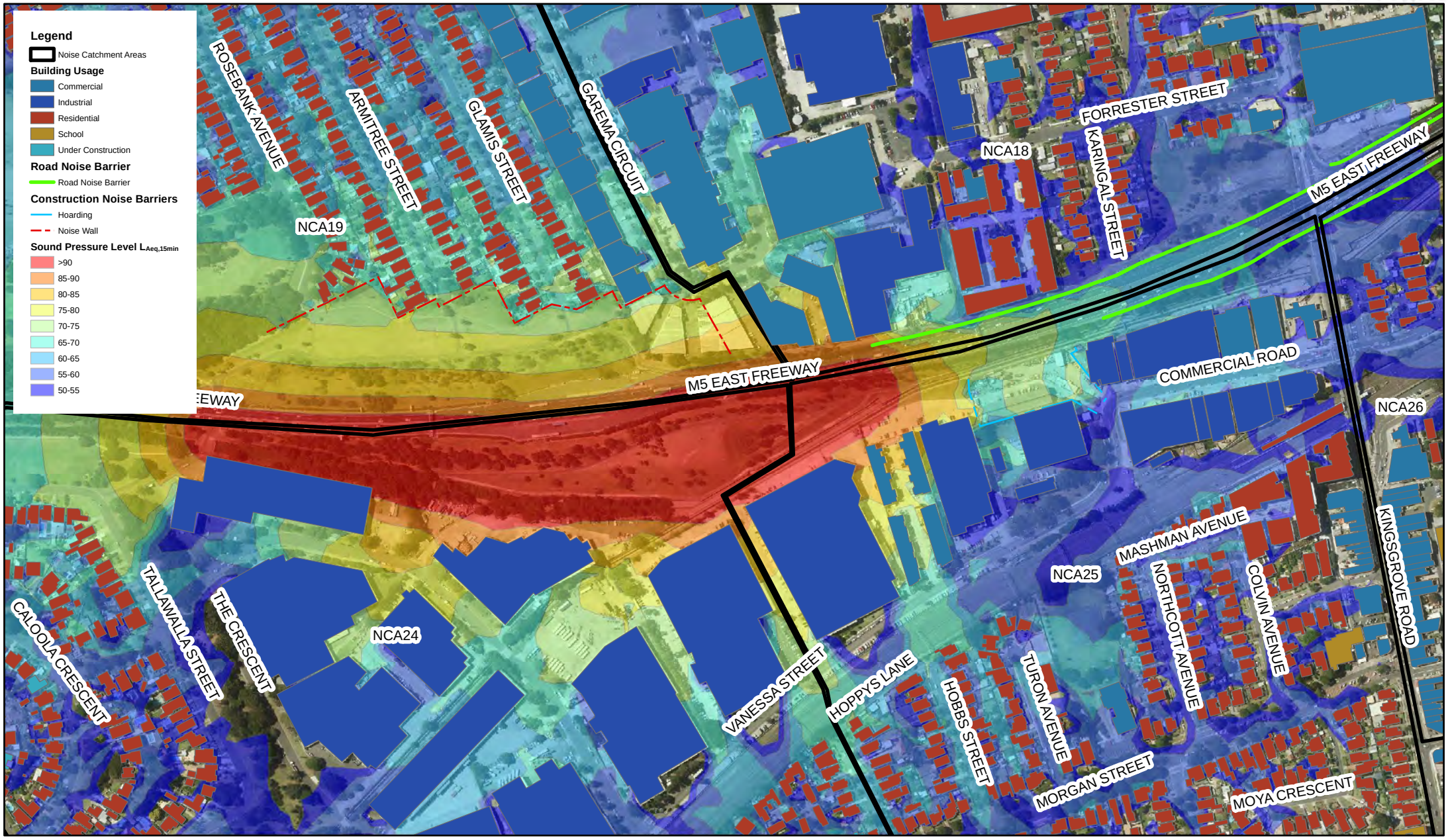
N

0 20 40 80 m

Fig.

06_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

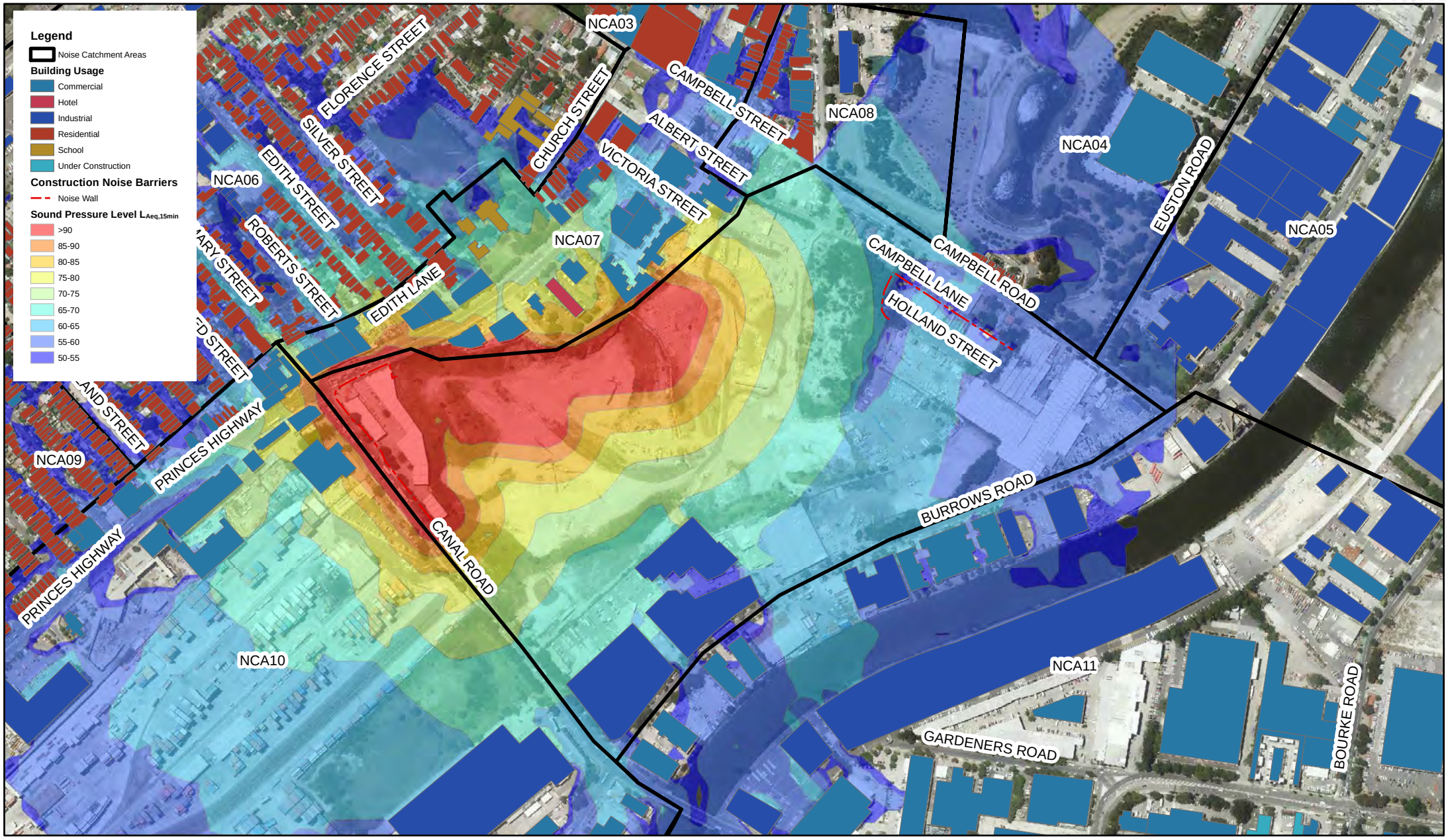
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

06_03



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

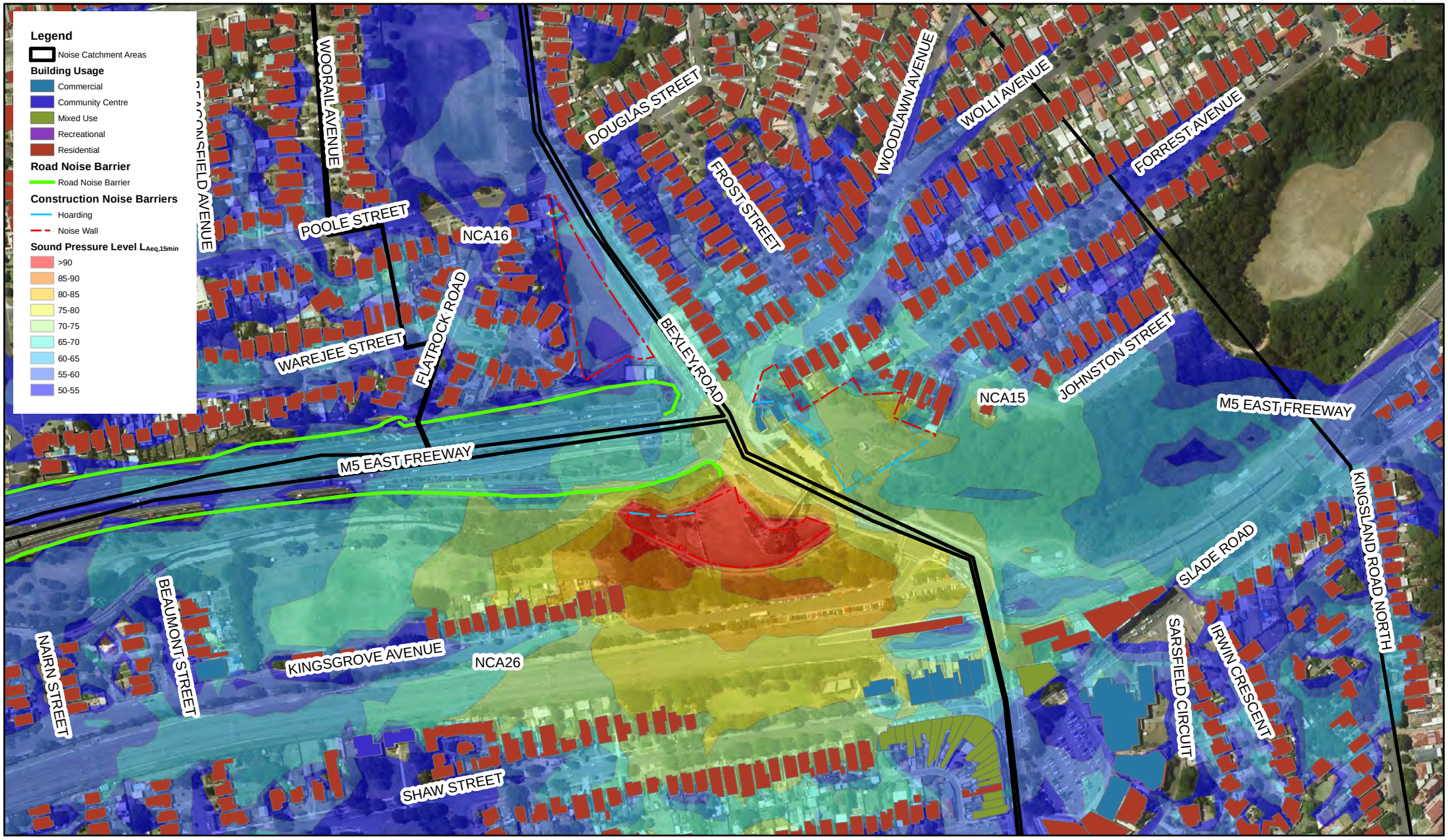
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

06_03



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

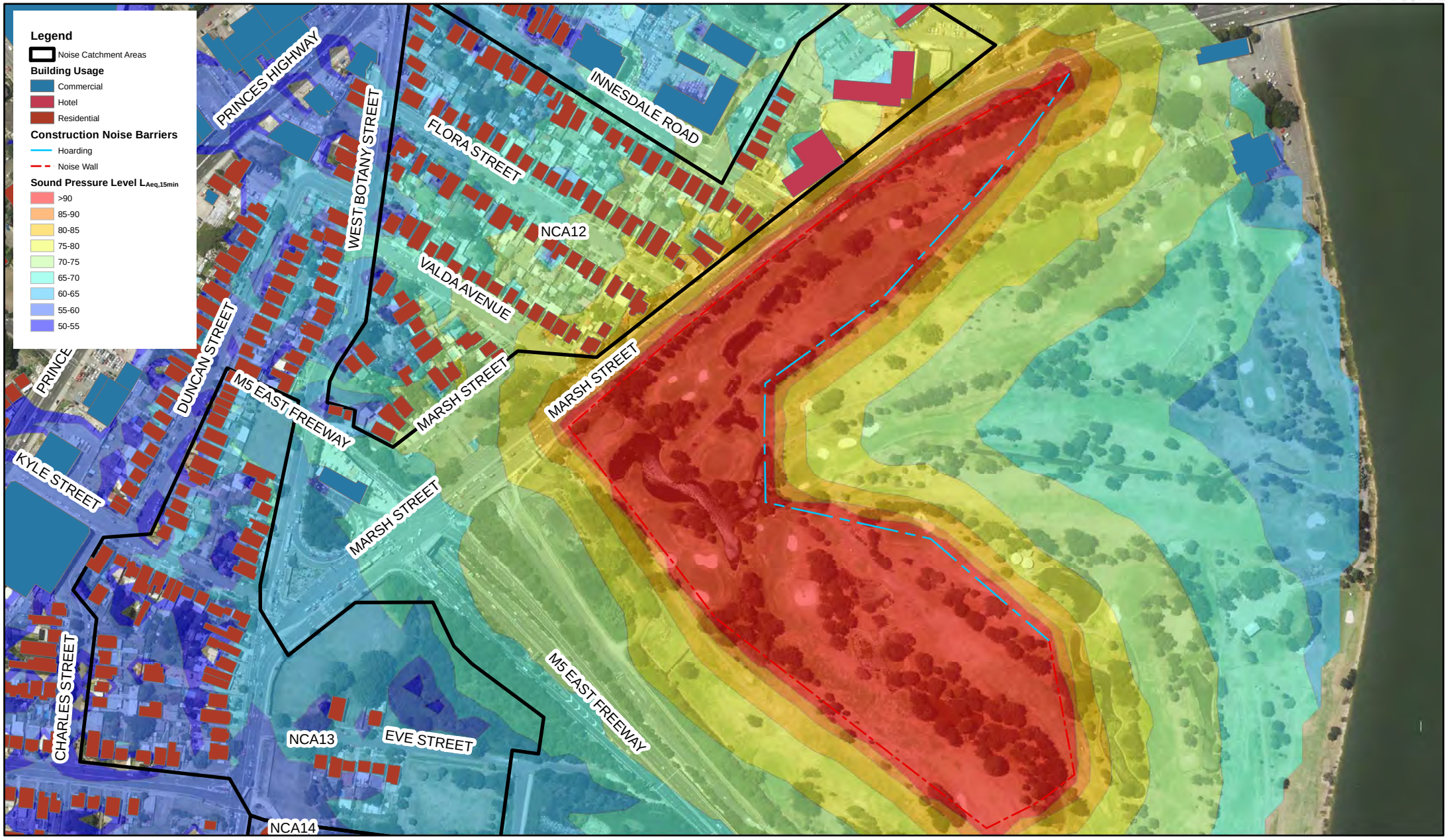
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

N

0 20 40 80 m

Fig.

06_03



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Construction of ventilation stations - Workshop and deliveries - Day

OCT 2015

60327128

Source: SKM2014

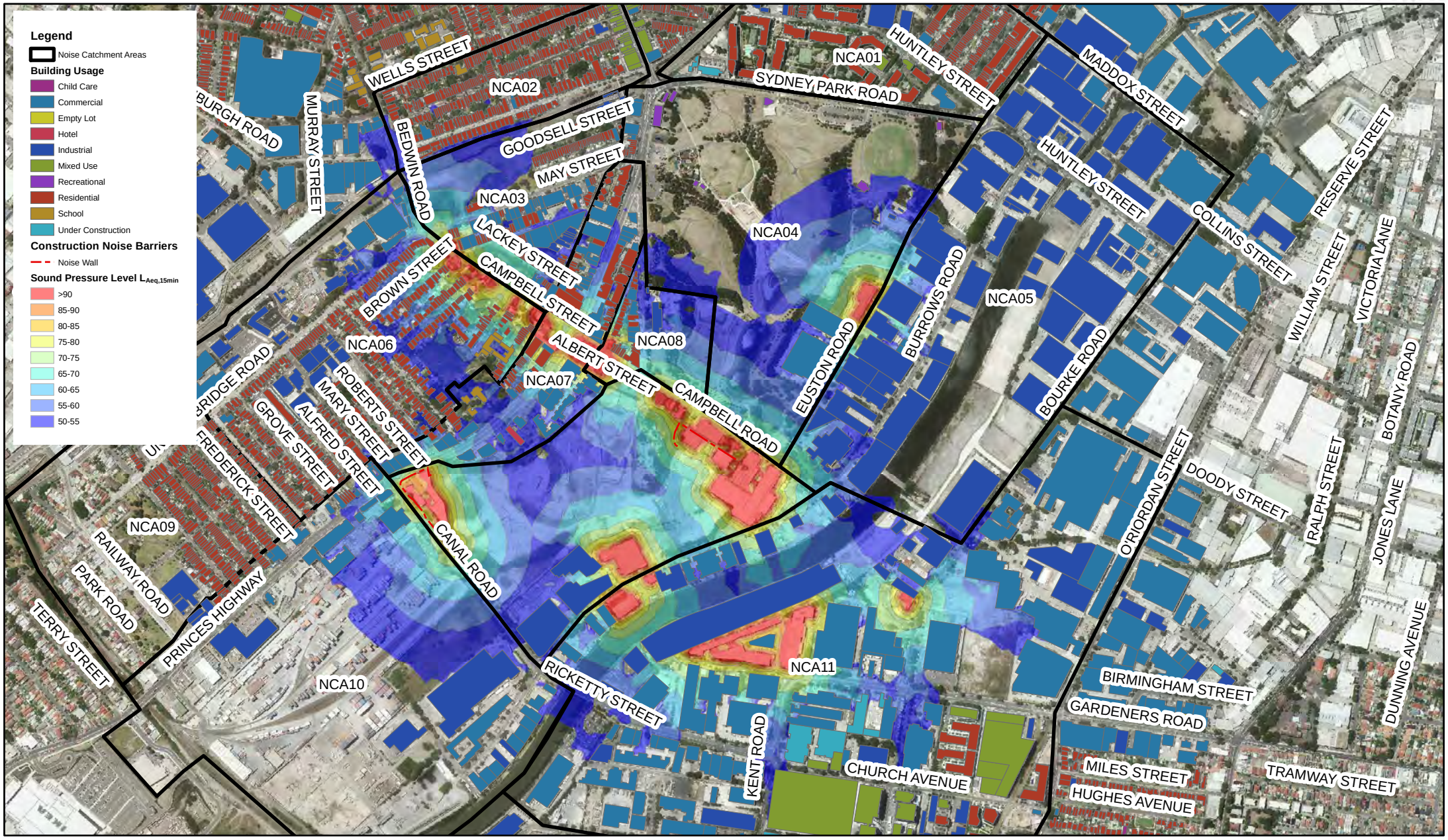
N

0 20 40 80 m

Fig.

06_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Demolition of existing structures (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

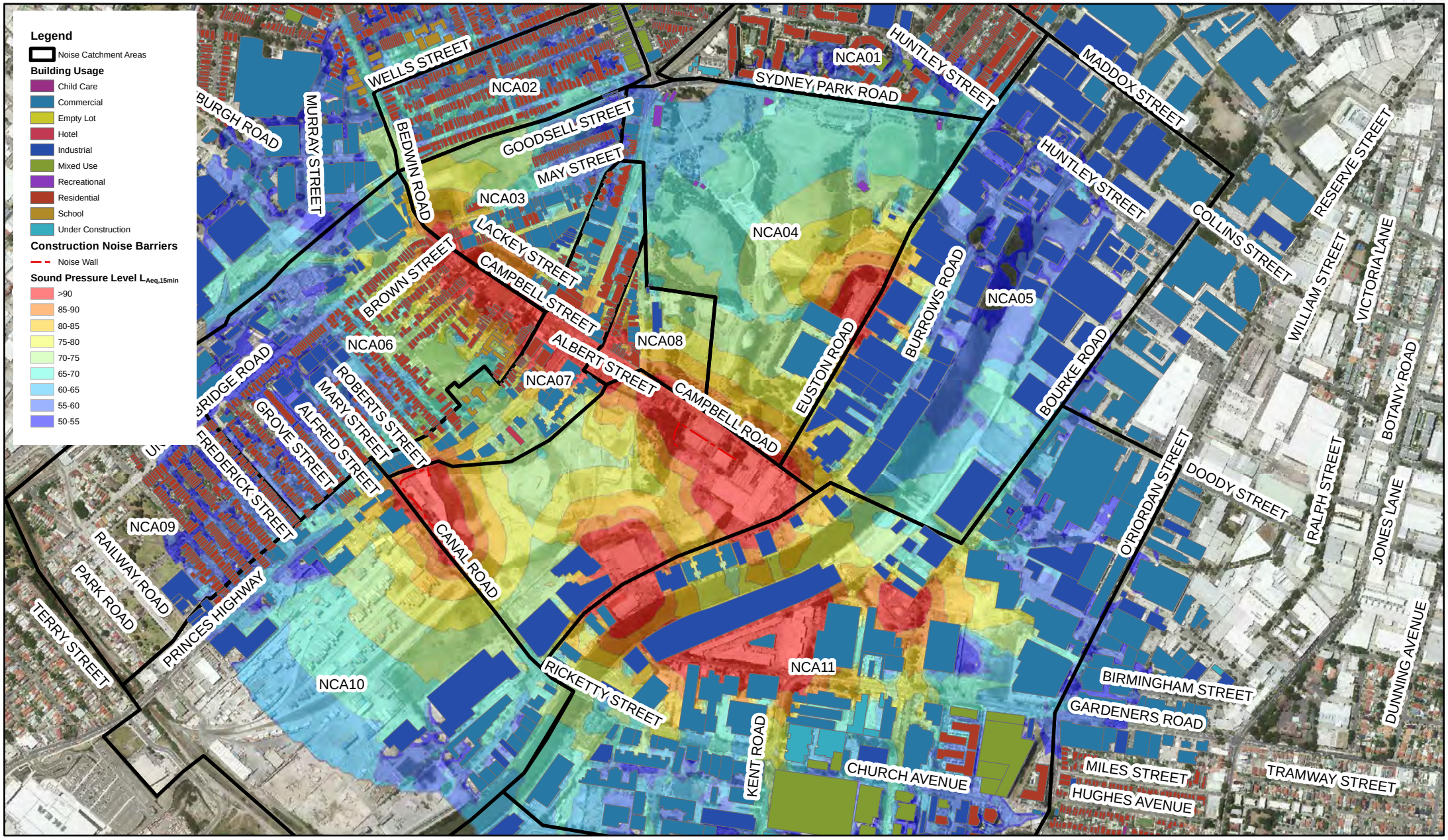
N

0 60 120 240 m

Fig.

07_01a

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

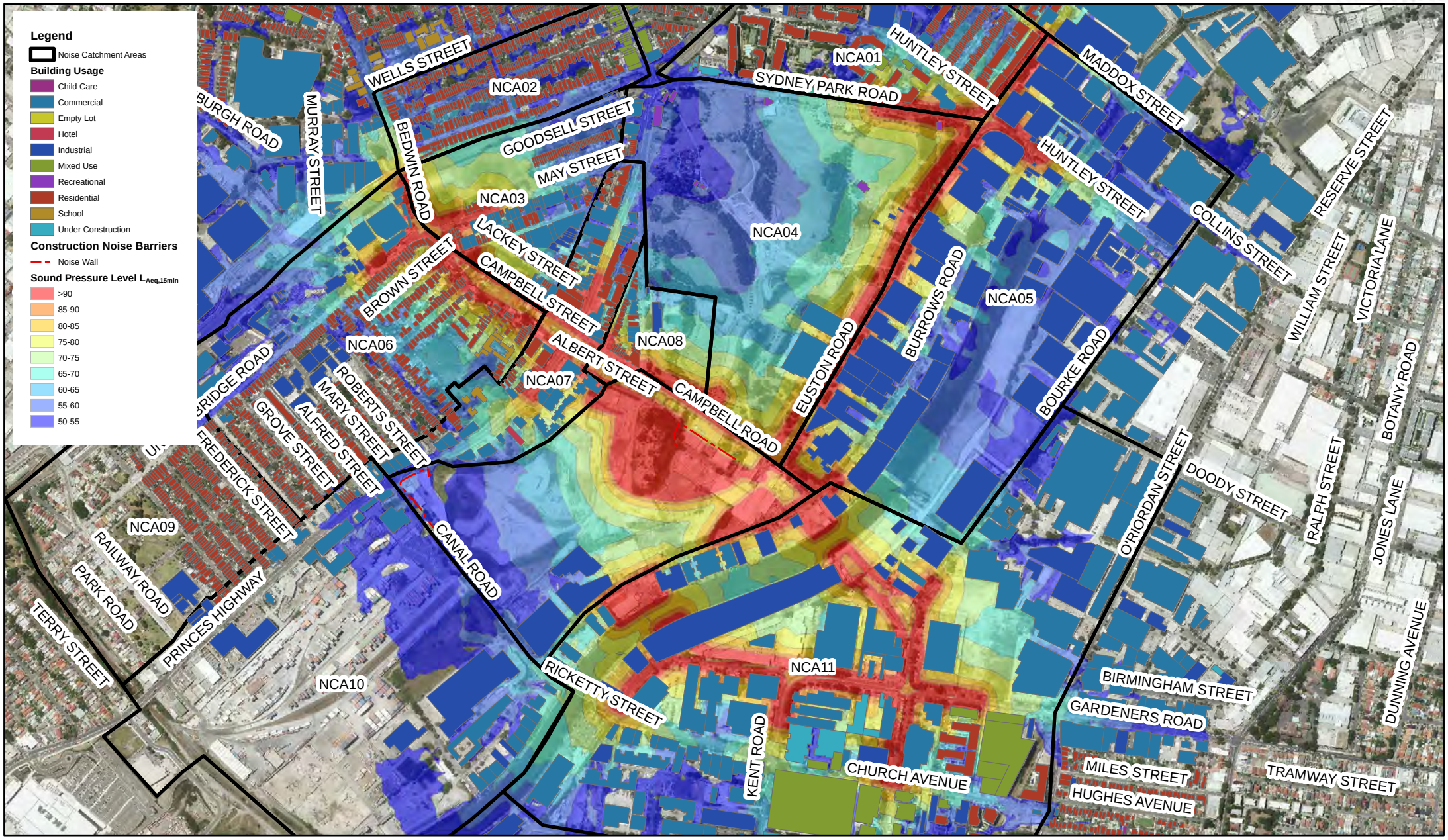
N

0 60 120 240 m

Fig.

07_01b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Earthworks (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

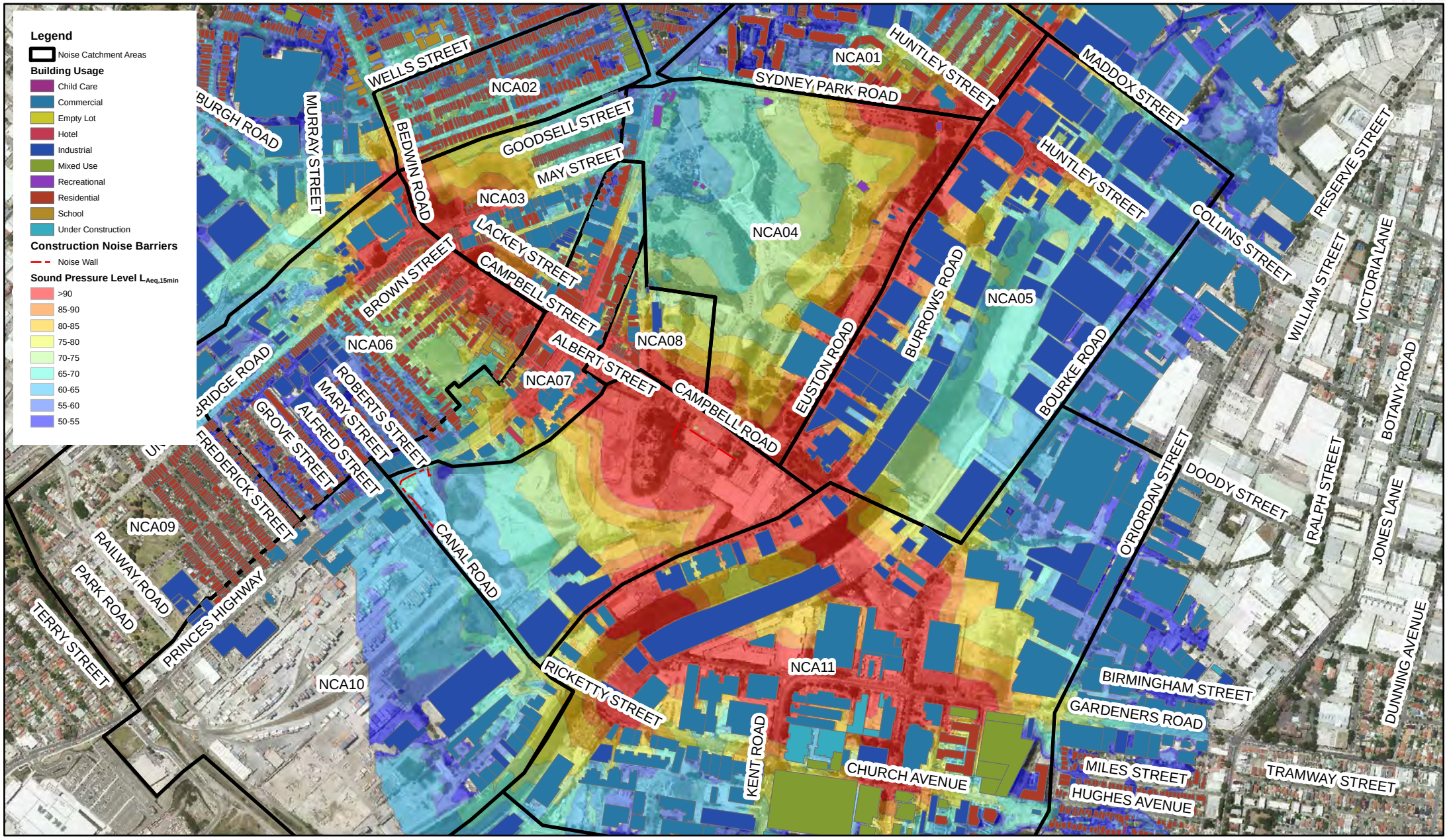
N

0 60 120 240 m

Fig.

07_02a

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Earthworks (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

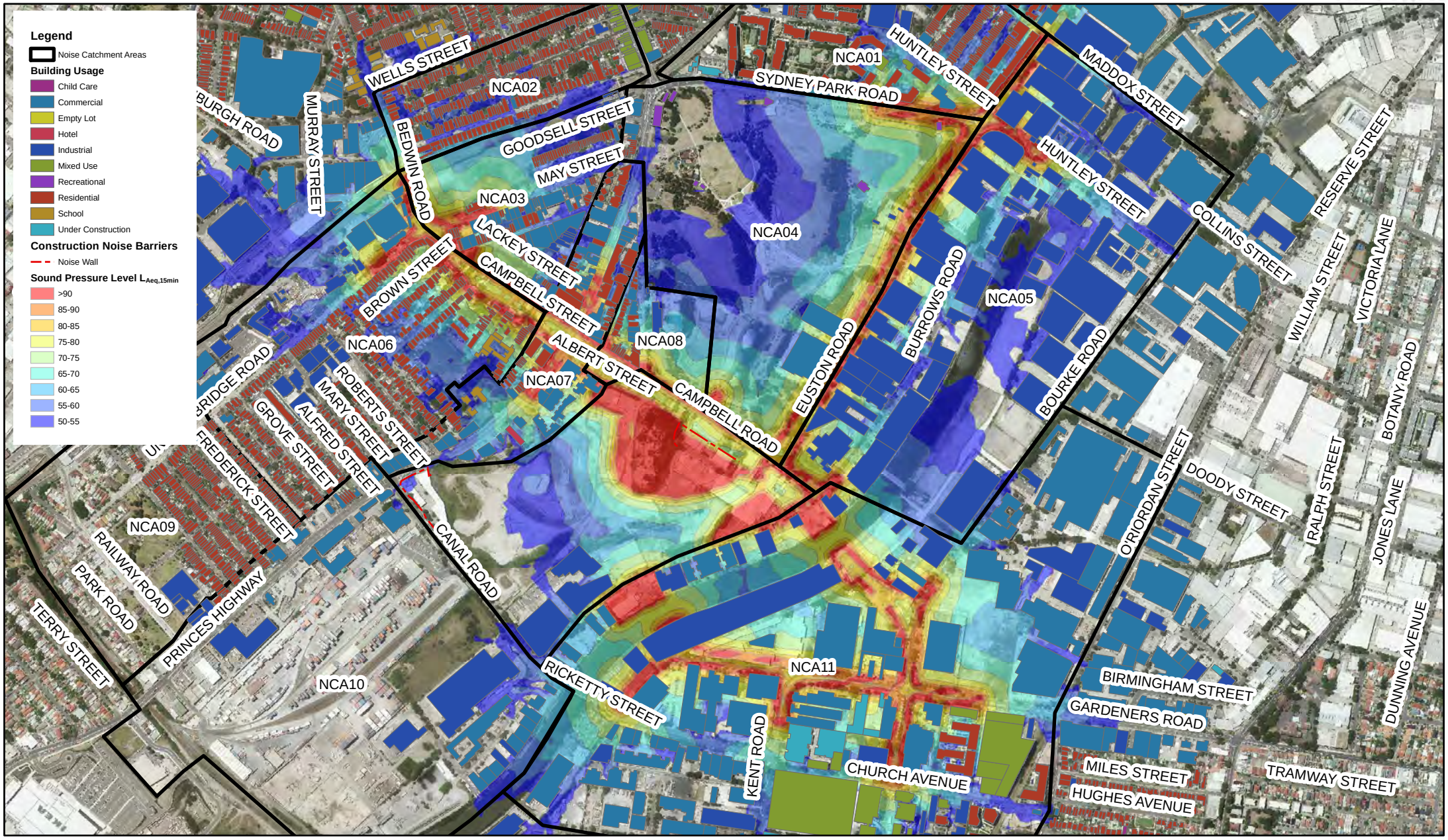
N

0 60 120 240 m

Fig.

07_02b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



AECOM

WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Road tie-in works - Day

OCT 2015

60327128

Source: SKM2014

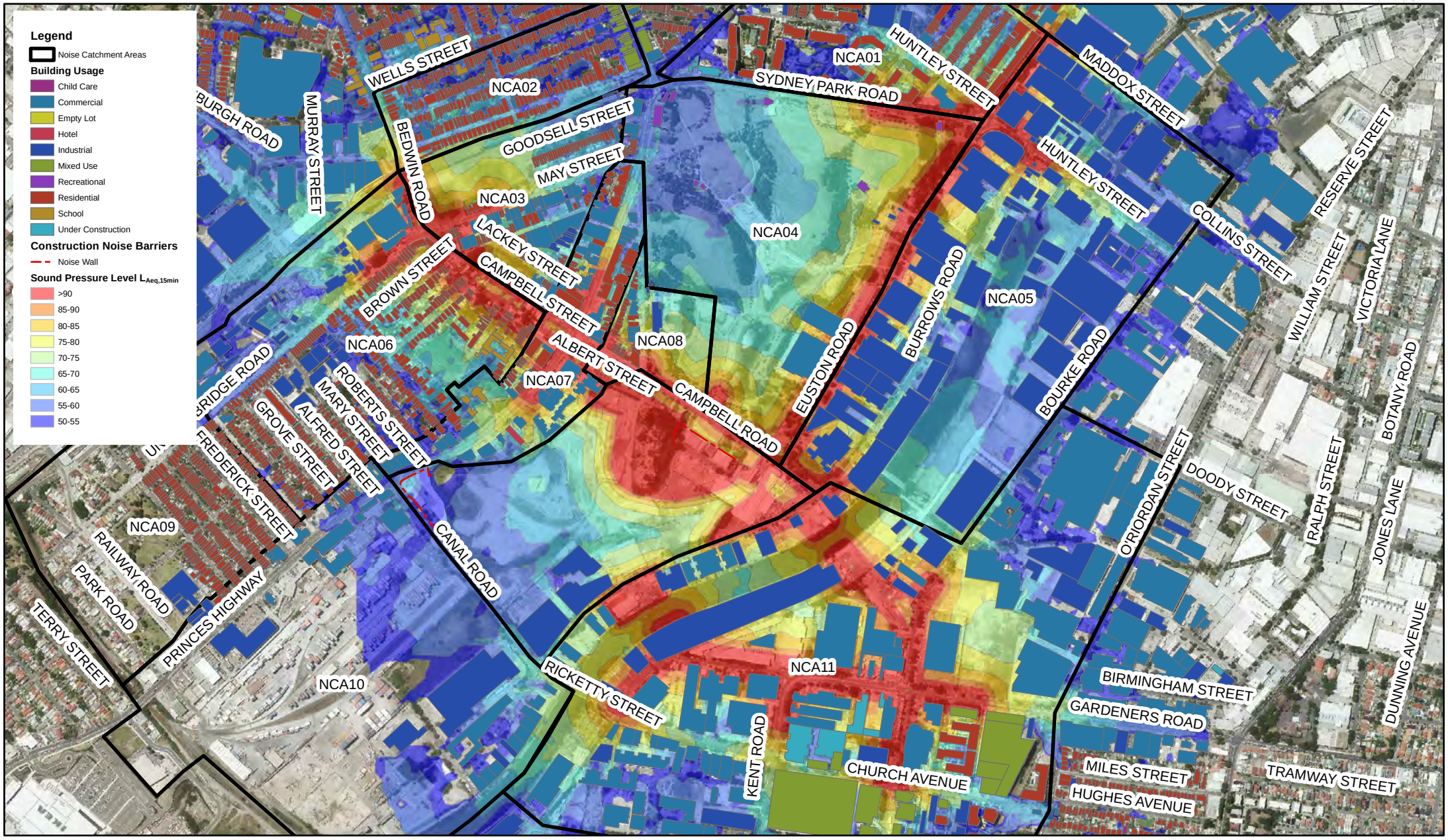
N

0 60 120 240 m

Fig.

07_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Kerbing and drainage - Day

OCT 2015

60327128

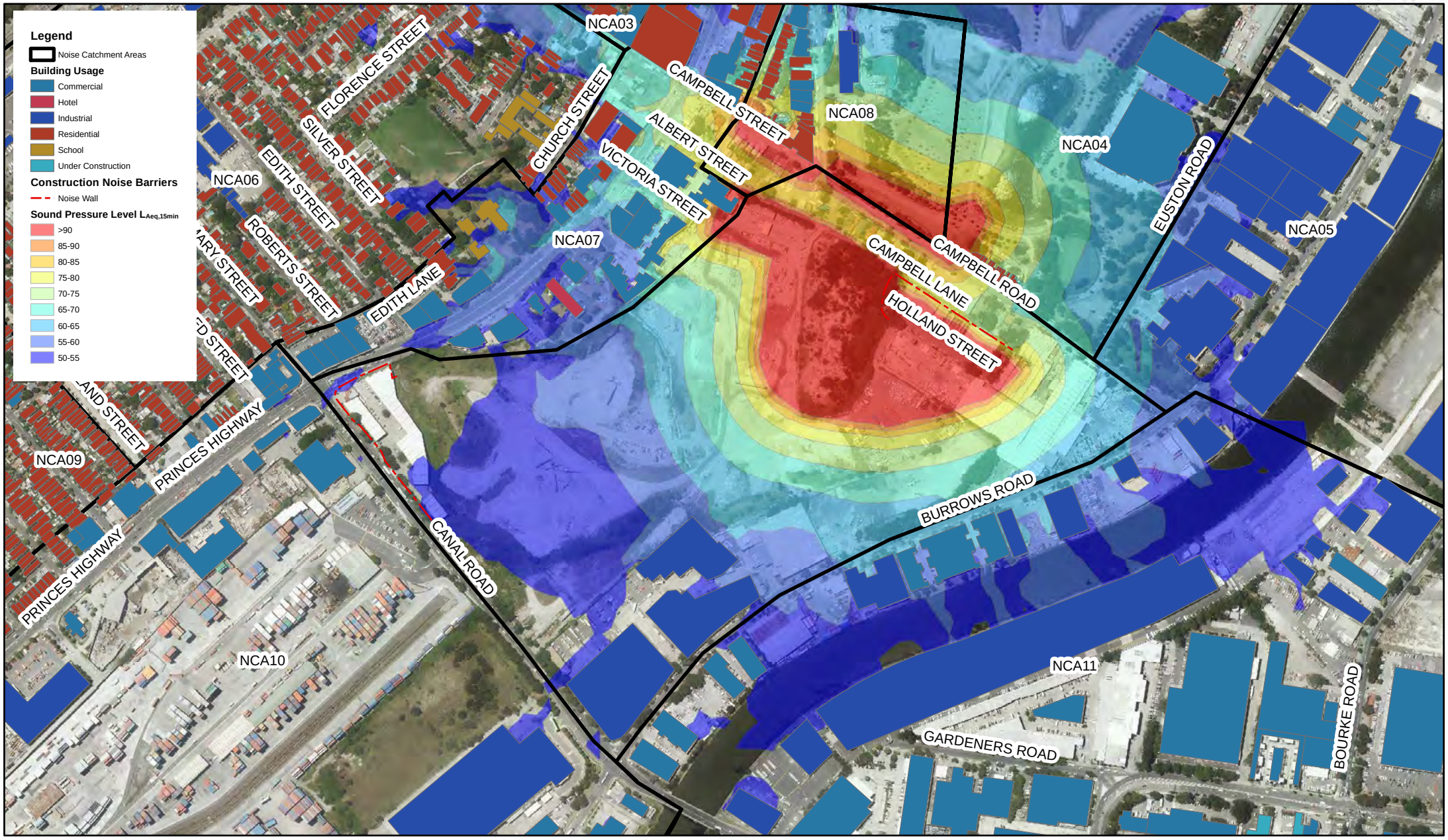
Source: SKM2014

N

0 60 120 240 m

Fig. **07_04**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Pedestrian bridges to Campbell Rd - Day

OCT 2015

60327128

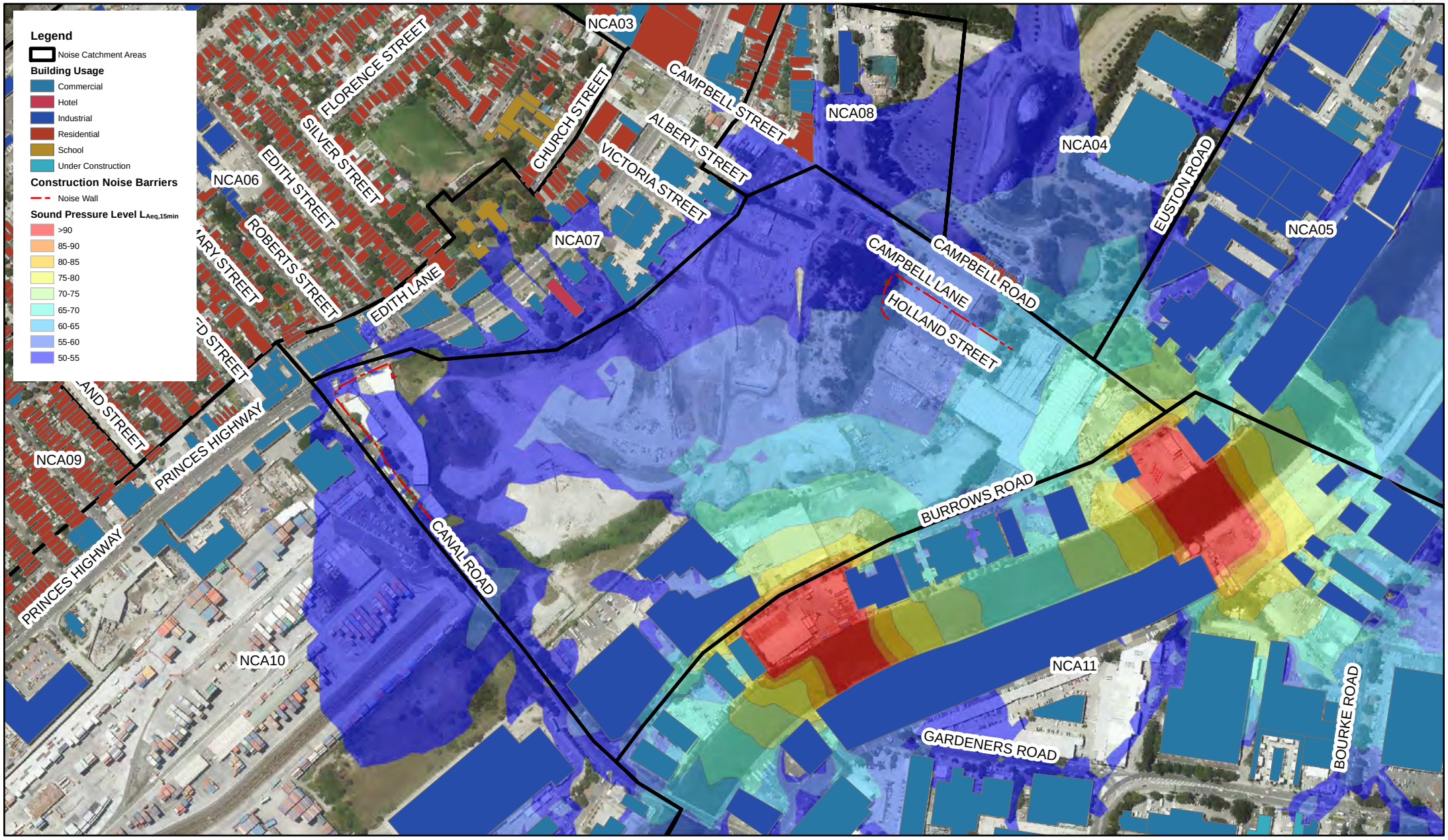
Source: SKM2014

N

0 30 60 120 m

Fig. **07_05**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Alexandra Canal Bridge - Day

OCT 2015

60327128

Source: SKM2014

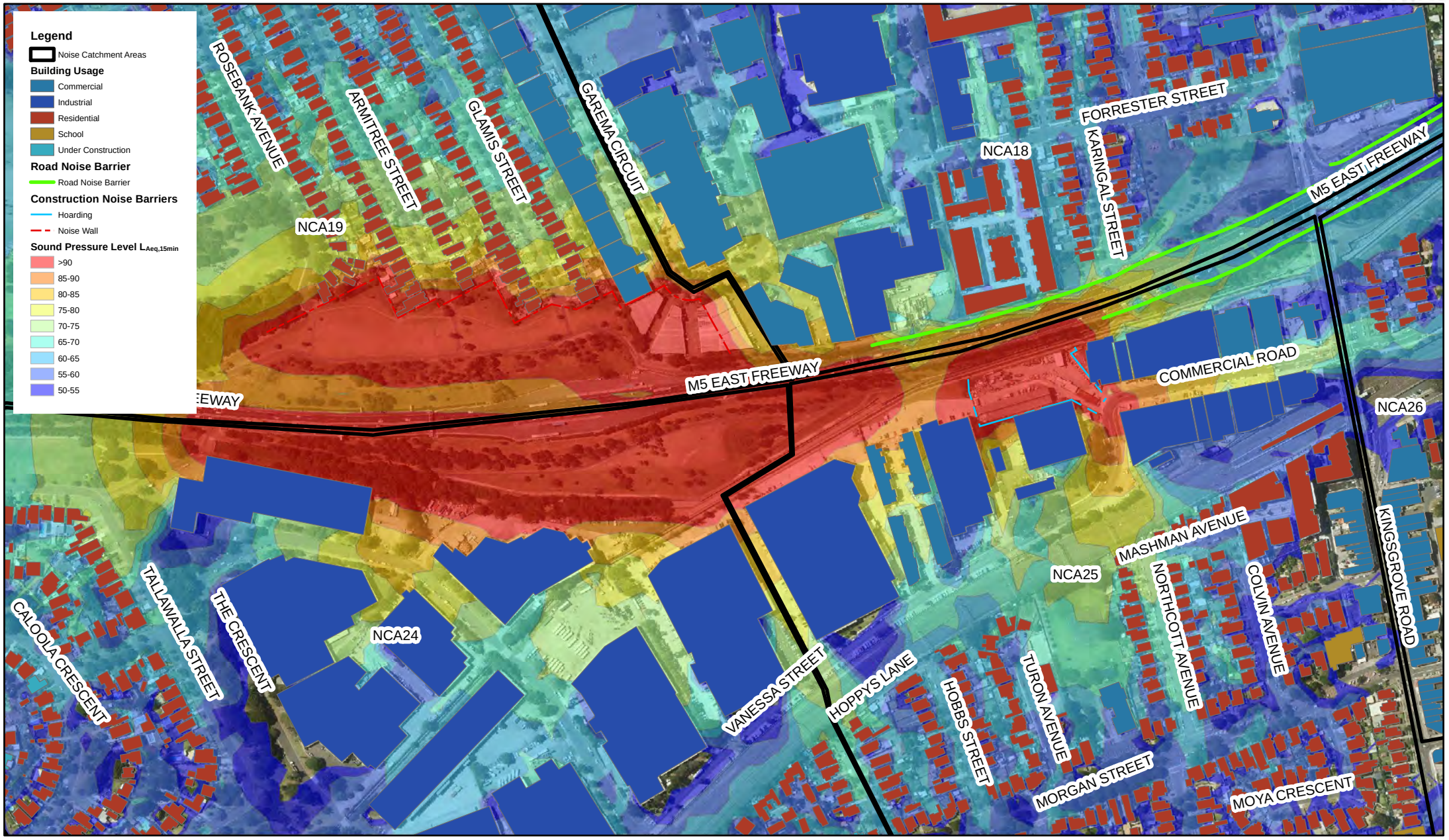
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

07_06



WestConnex Stage 2 - Construction Noise Assessment

Surface works - General utility installation and relocation - Service installation and relocation - Day

OCT 2015

60327128

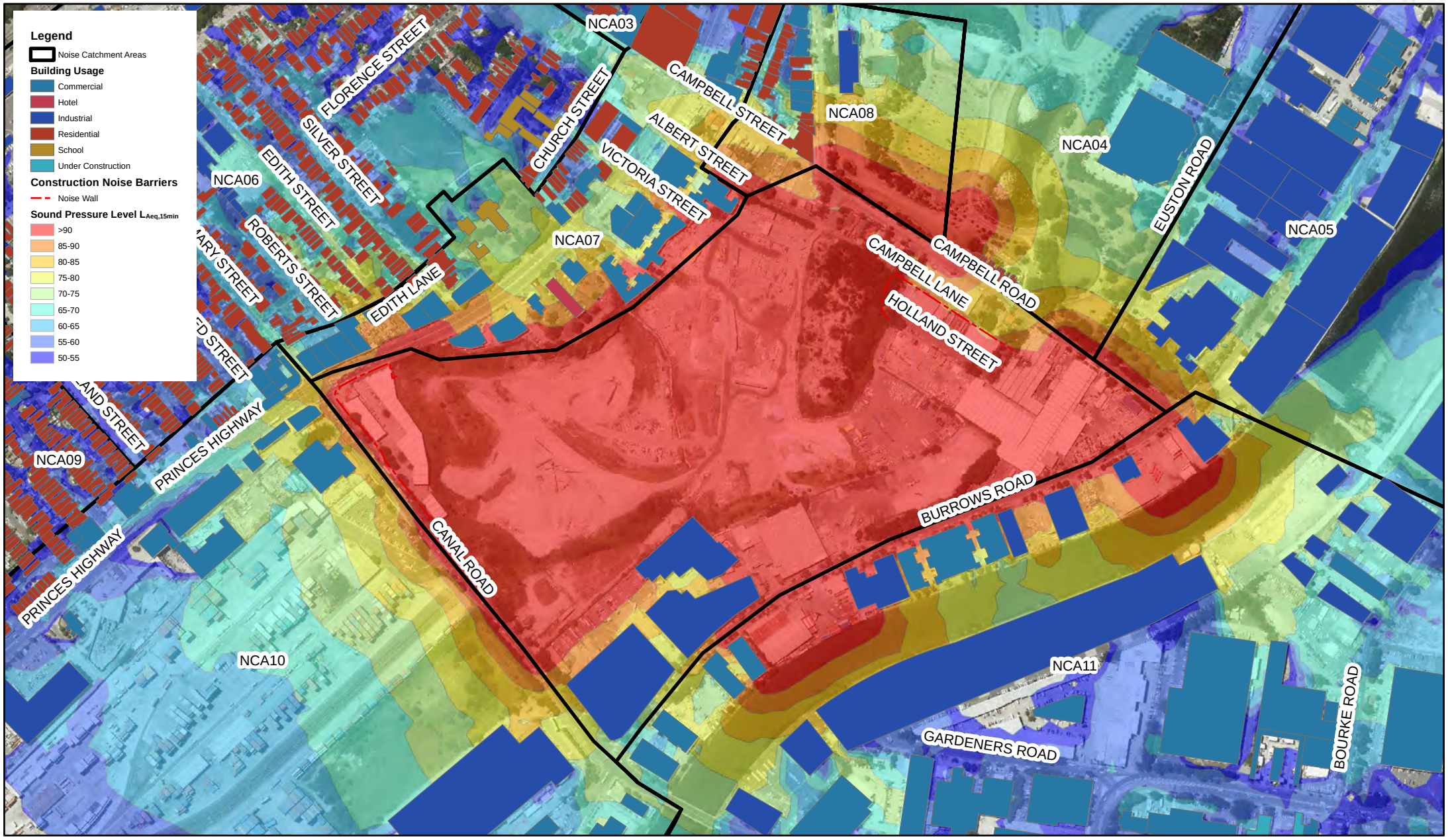
Source: SKM2014

N

0 25 50 100 m

Fig. **08_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - General utility installation and relocation - Service installation and relocation - Day

OCT 2015

60327128

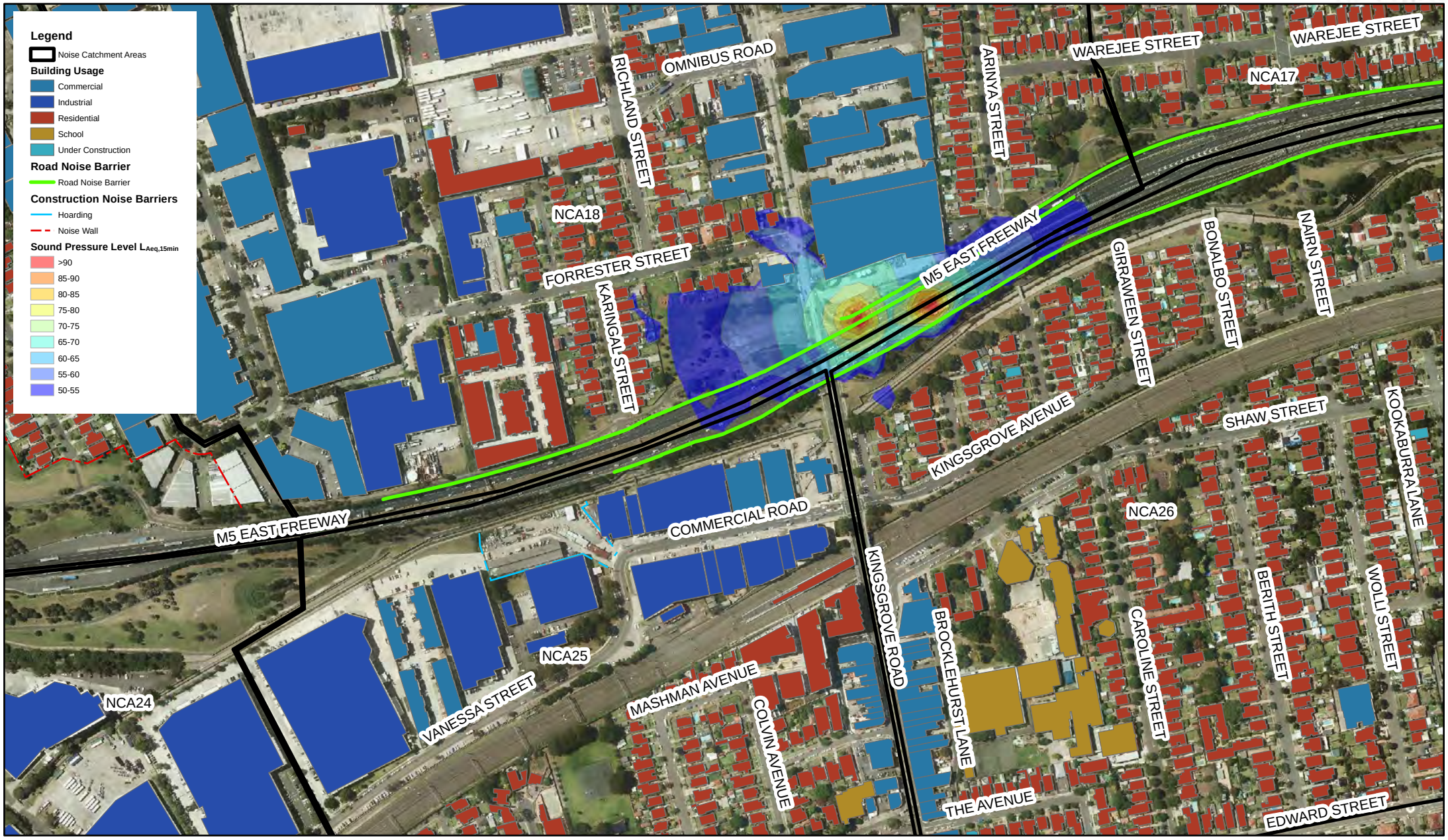
Source: SKM2014

N

0 30 60 120 m

Fig. **08_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Tolling infrastructure - Site establishment - Day

OCT 2015

60327128

Source: SKM2014

N

0 25 50 100 m

Fig. **09_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Tolling infrastructure - Site establishment - Day

OCT 2015
60327128

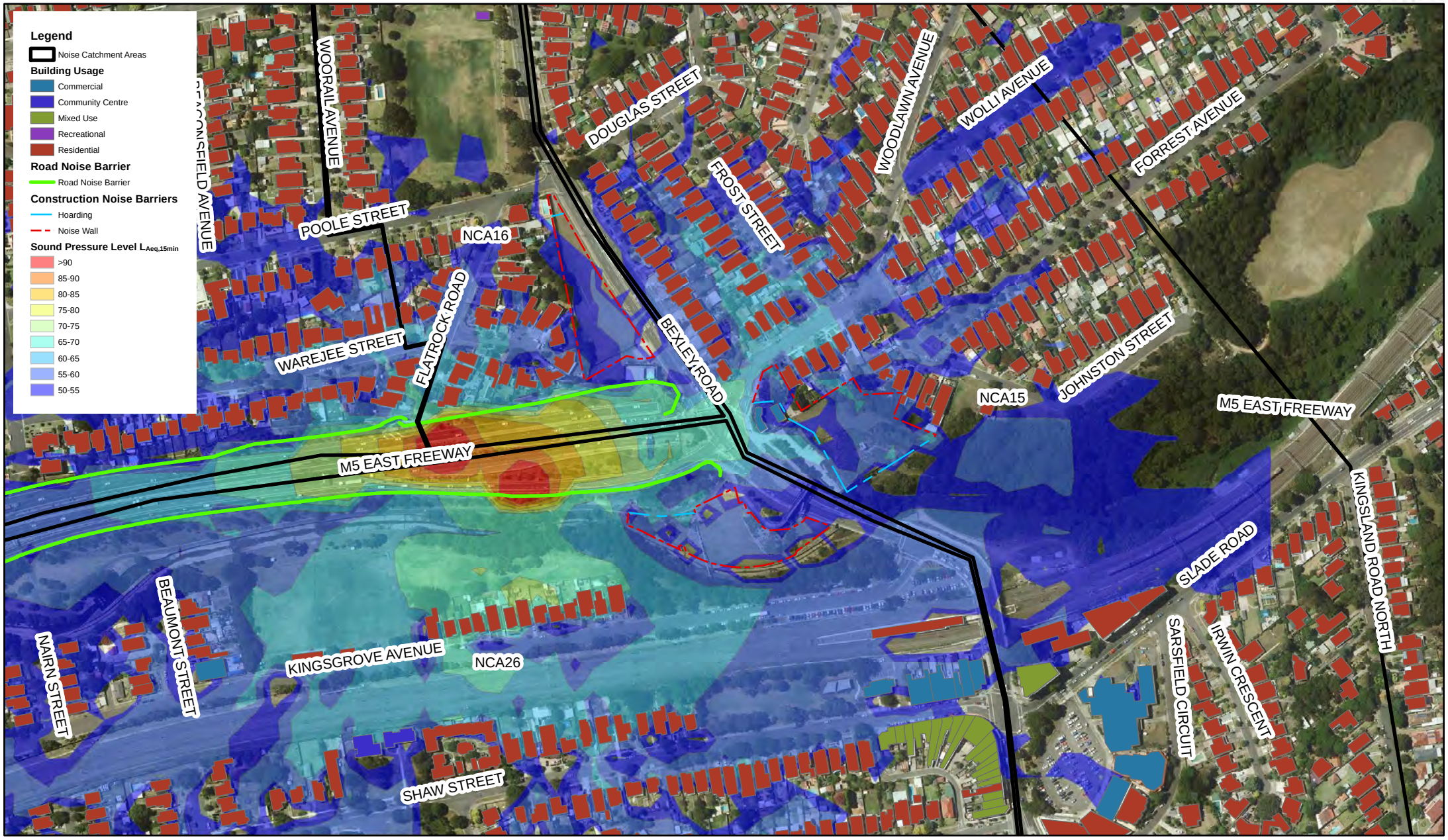
Source: SKM2014

N

0 20 40 80 m

Fig.
09_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Tolling infrastructure - Road works - Day

OCT 2015
60327128

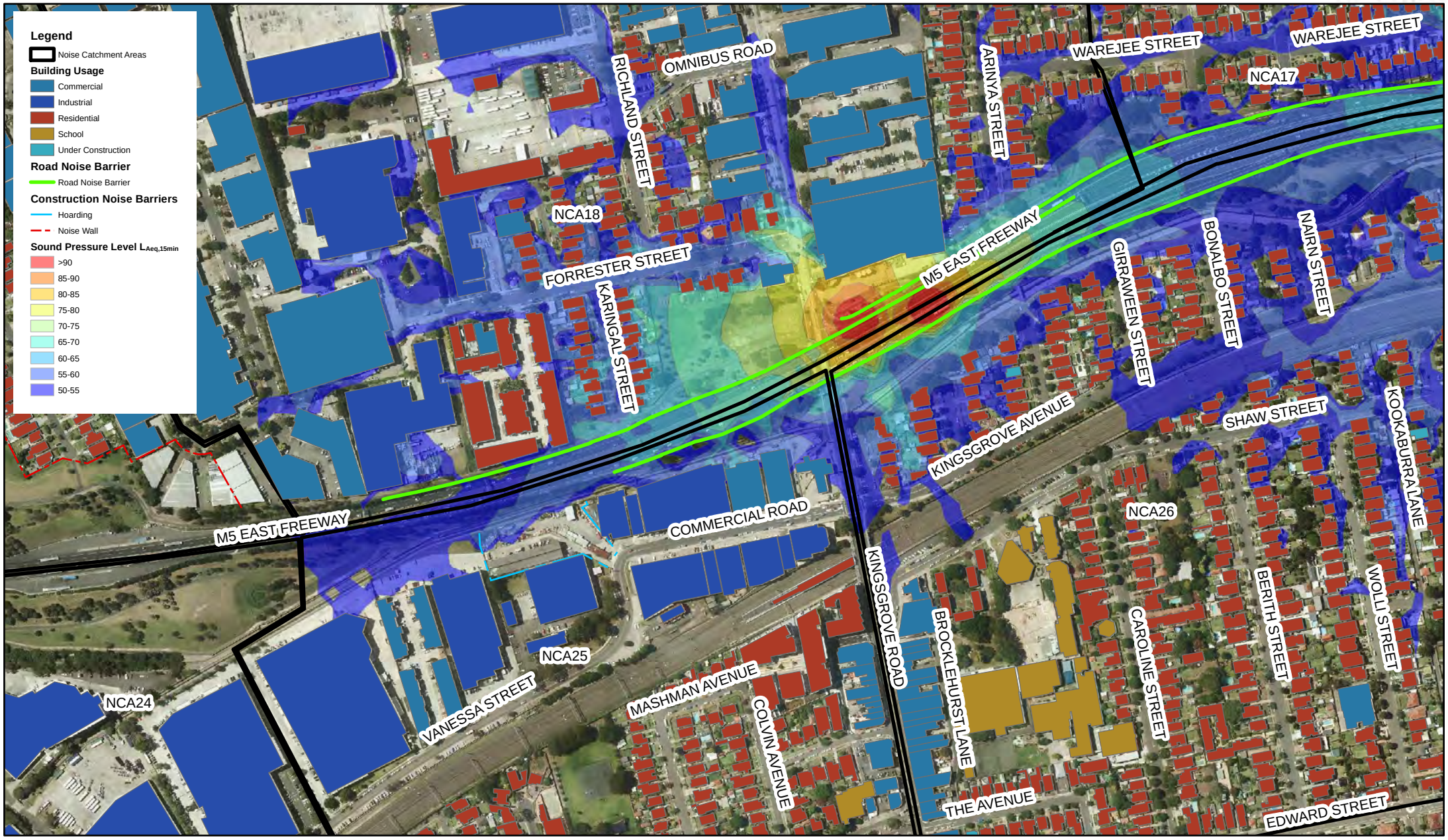
Source: SKM2014

N

0 20 40 80 m

Fig.
09_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Tolling infrastructure - Road works - Day

OCT 2015
60327128

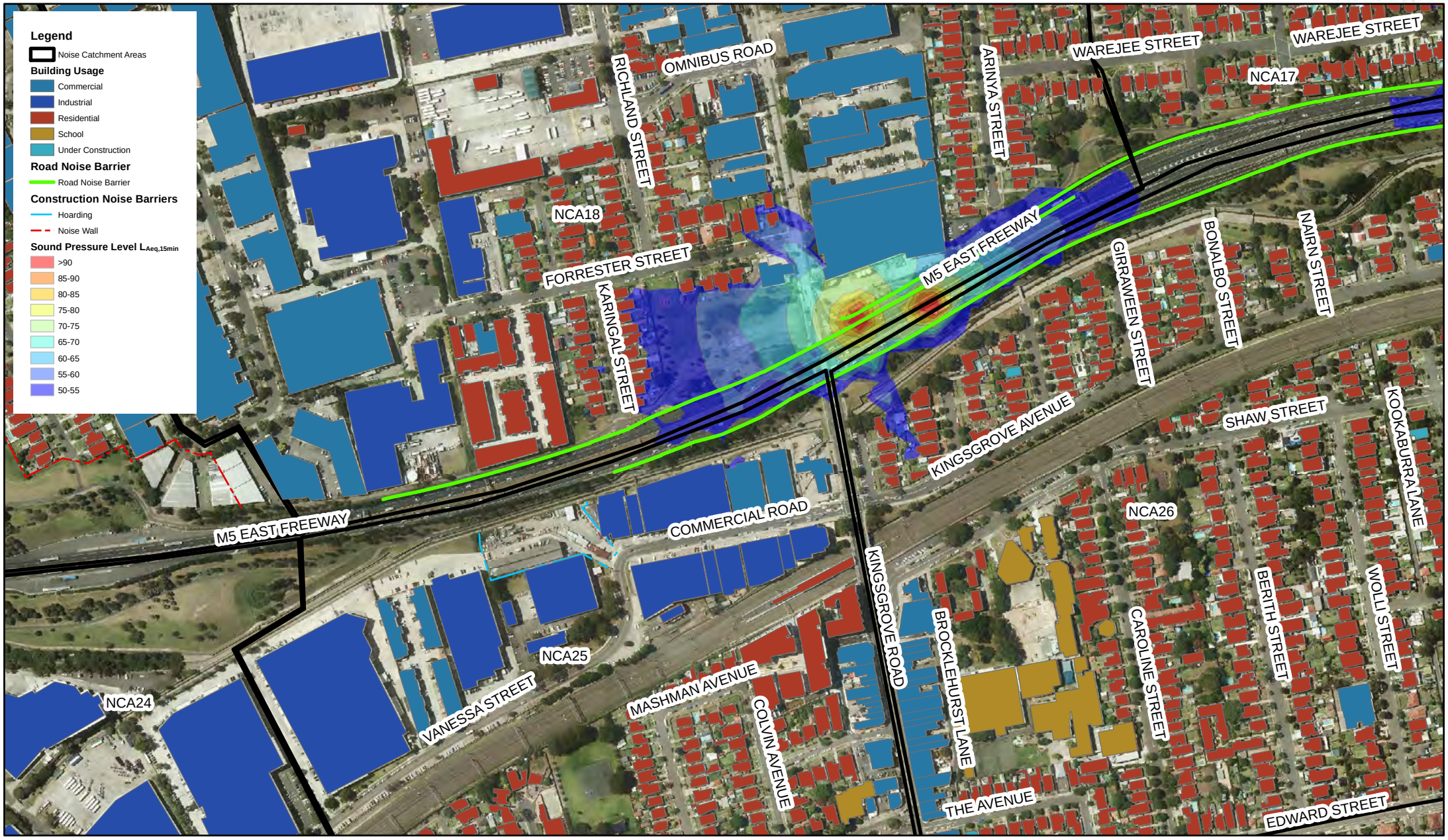
Source: SKM2014

N

0 25 50 100 m

Fig.
09_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Tolling infrastructure - Construction of toll gantries - Day

OCT 2015

60327128

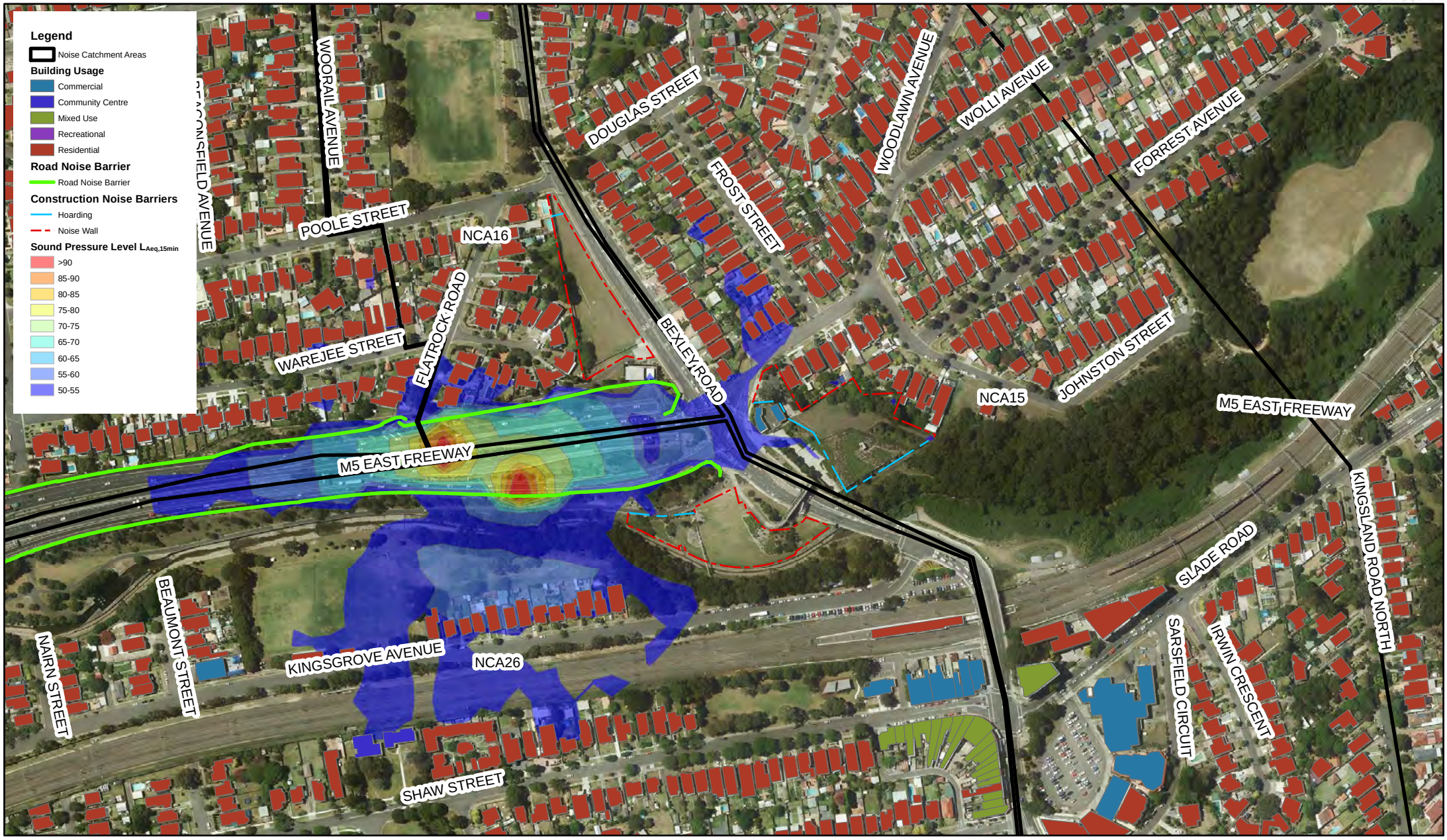
Source: SKM2014

N

0 25 50 100 m

Fig. **09_03**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Surface works - Tolling infrastructure - Construction of toll gantries - Day

OCT 2015

60327128

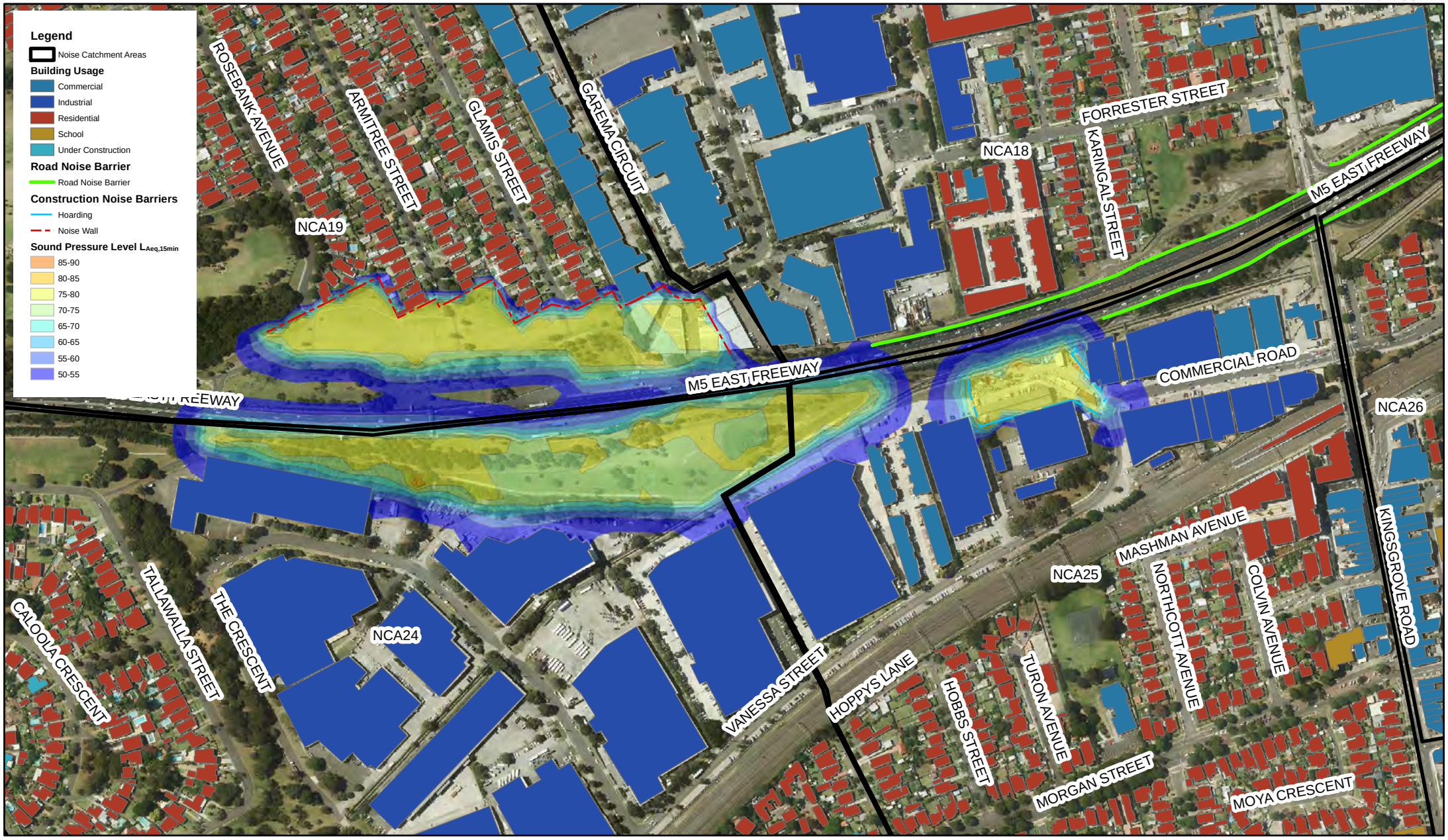
Source: SKM2014

N

0 20 40 80 m

Fig. **09_03**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Site establishment - Power Generator - Day

OCT 2015
60327128

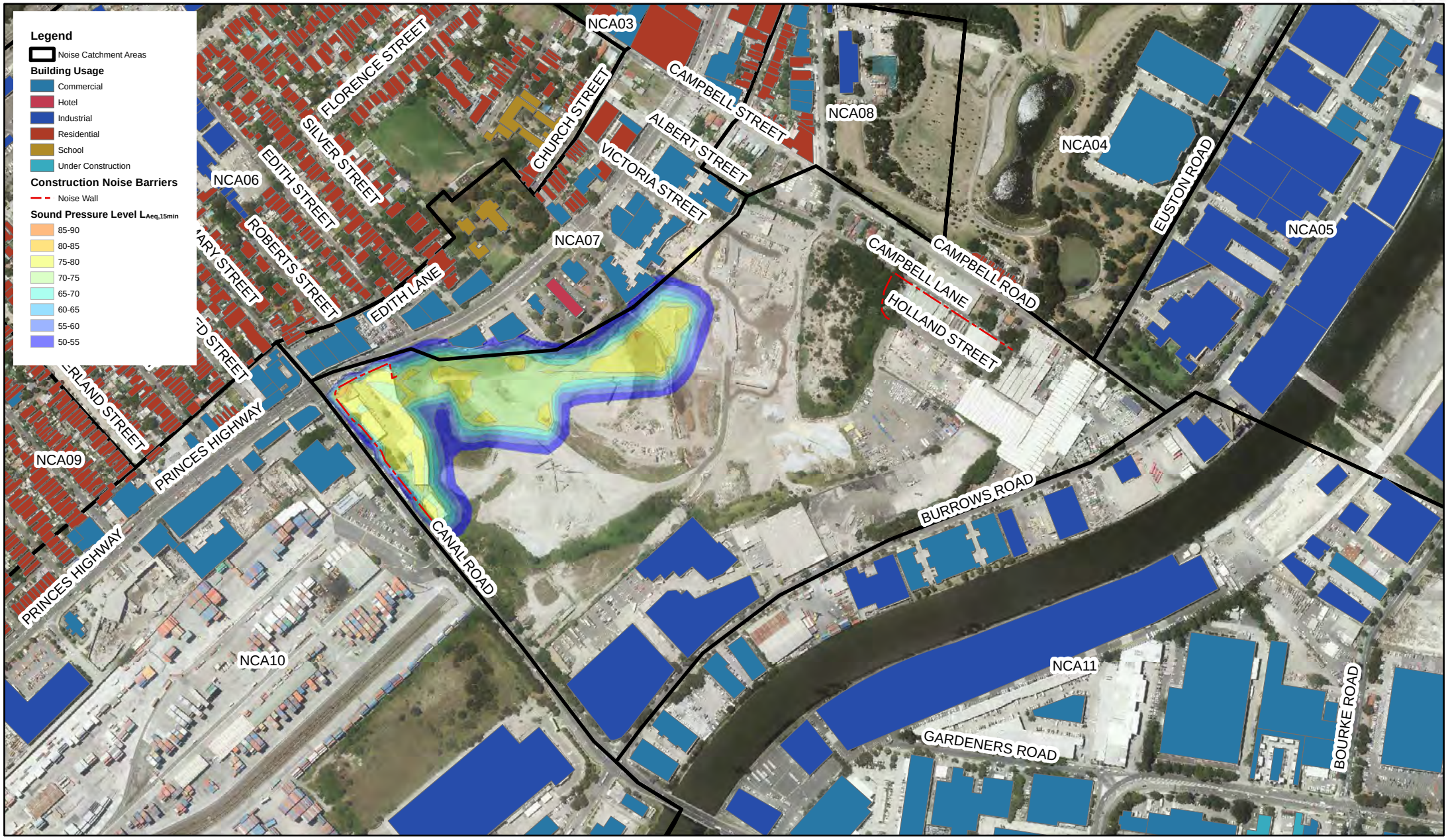
Source: SKM2014

N

0 25 50 100 m

Fig.
10_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Site establishment - Power Generator - Day

OCT 2015
60327128

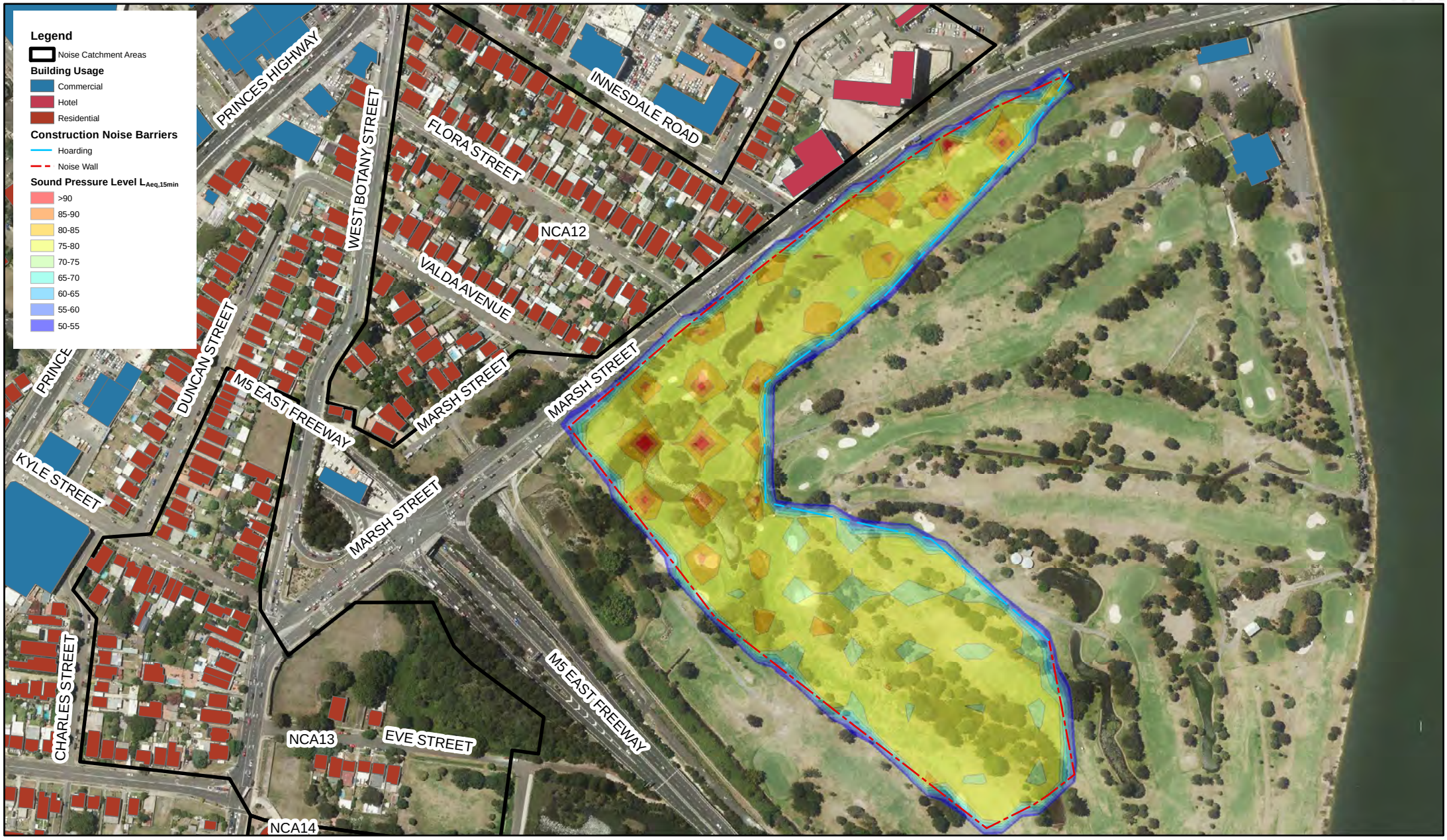
Source: SKM2014

N

0 30 60 120 m

Fig.
10_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Site establishment - Power Generator - Day

OCT 2015
60327128

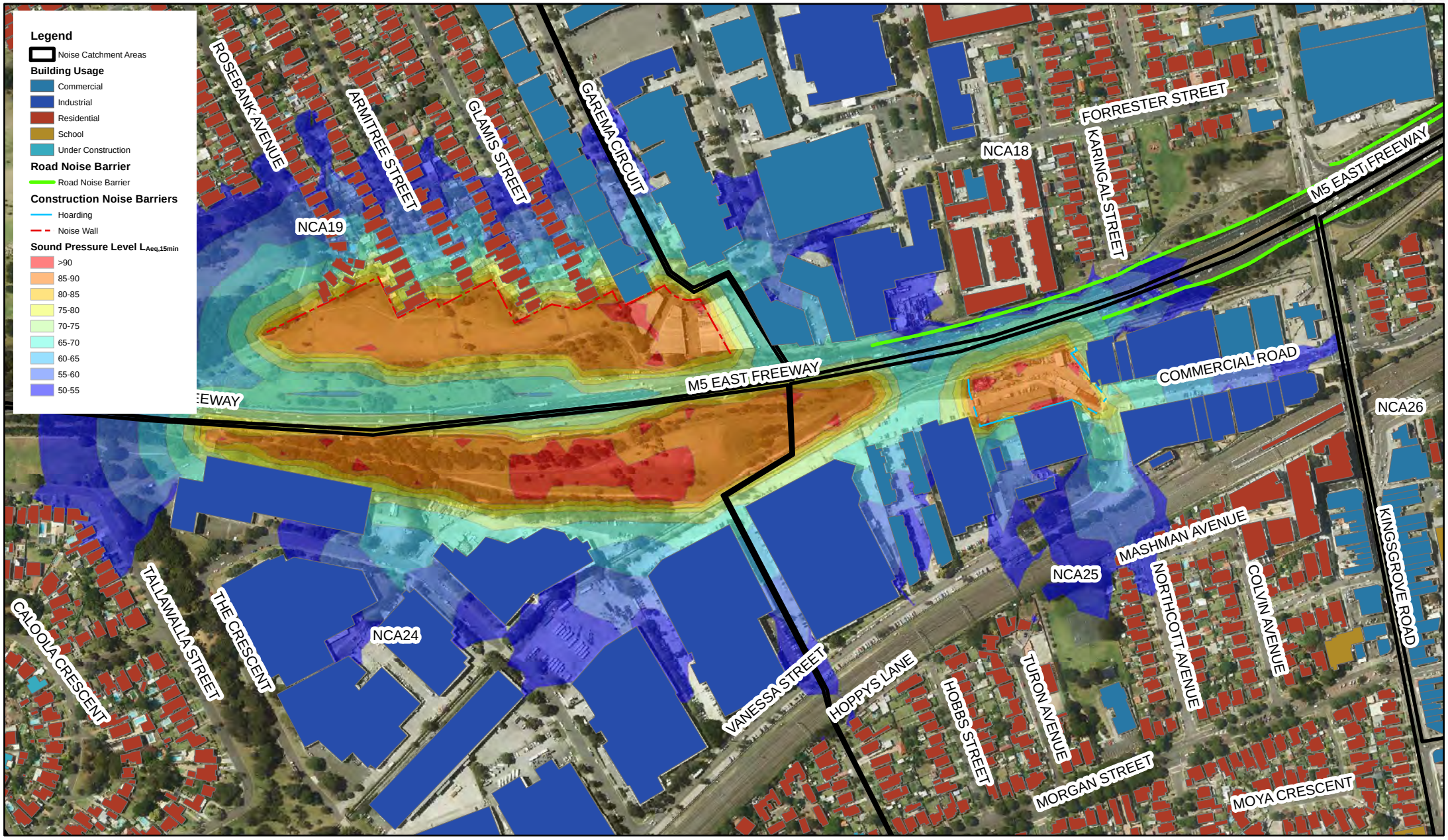
Source: SKM2014

N

0 20 40 80 m

Fig.
10_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Installment of environmental controls - Day

OCT 2015

60327128

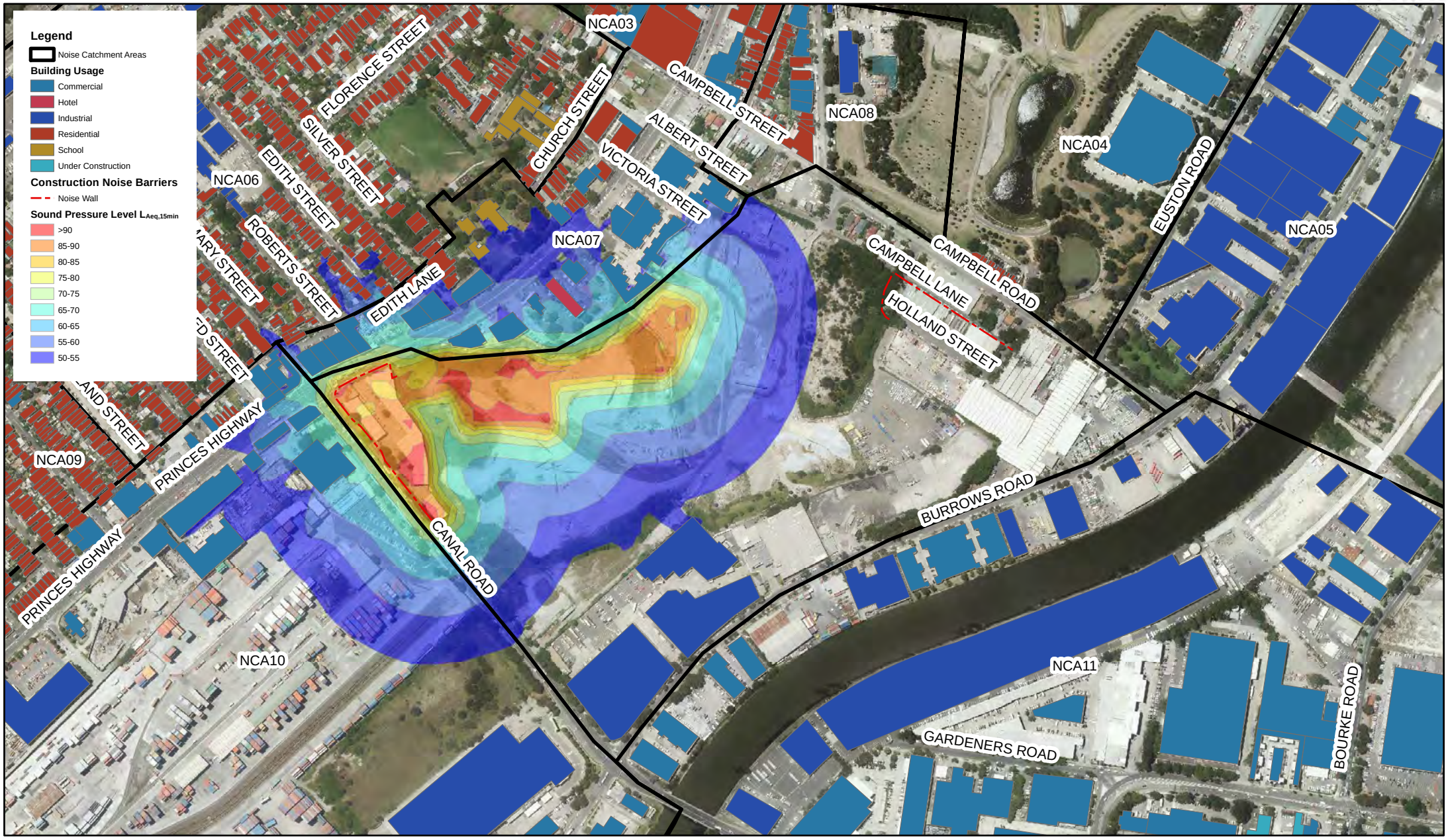
Source: SKM2014

Fig. **10_02**

0 25 50 100 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Installment of environmental controls - Day

OCT 2015

60327128

Source: SKM2014

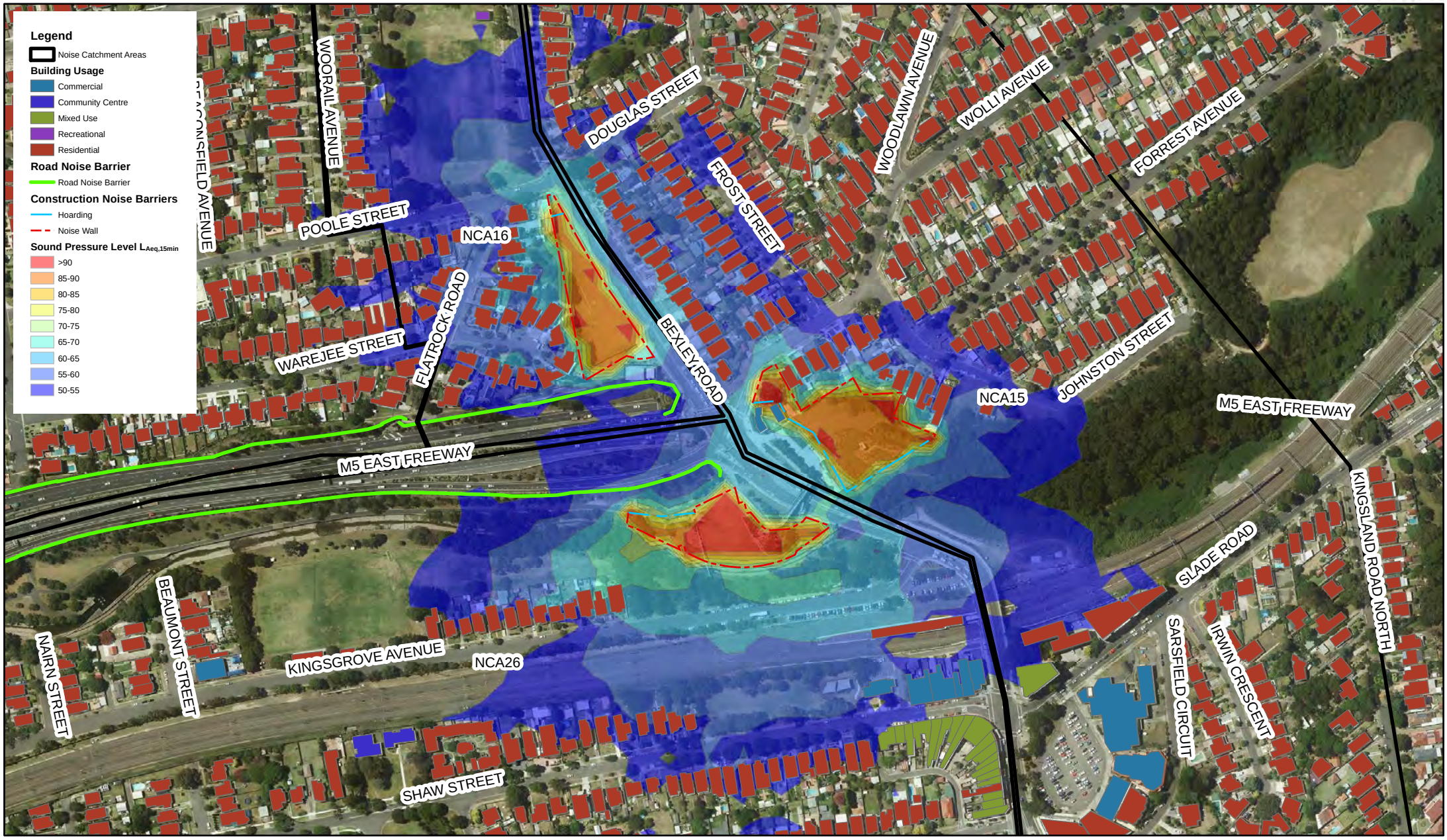
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

N

0 30 60 120 m

Fig.

10_02



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Installment of environmental controls - Day

OCT 2015

60327128

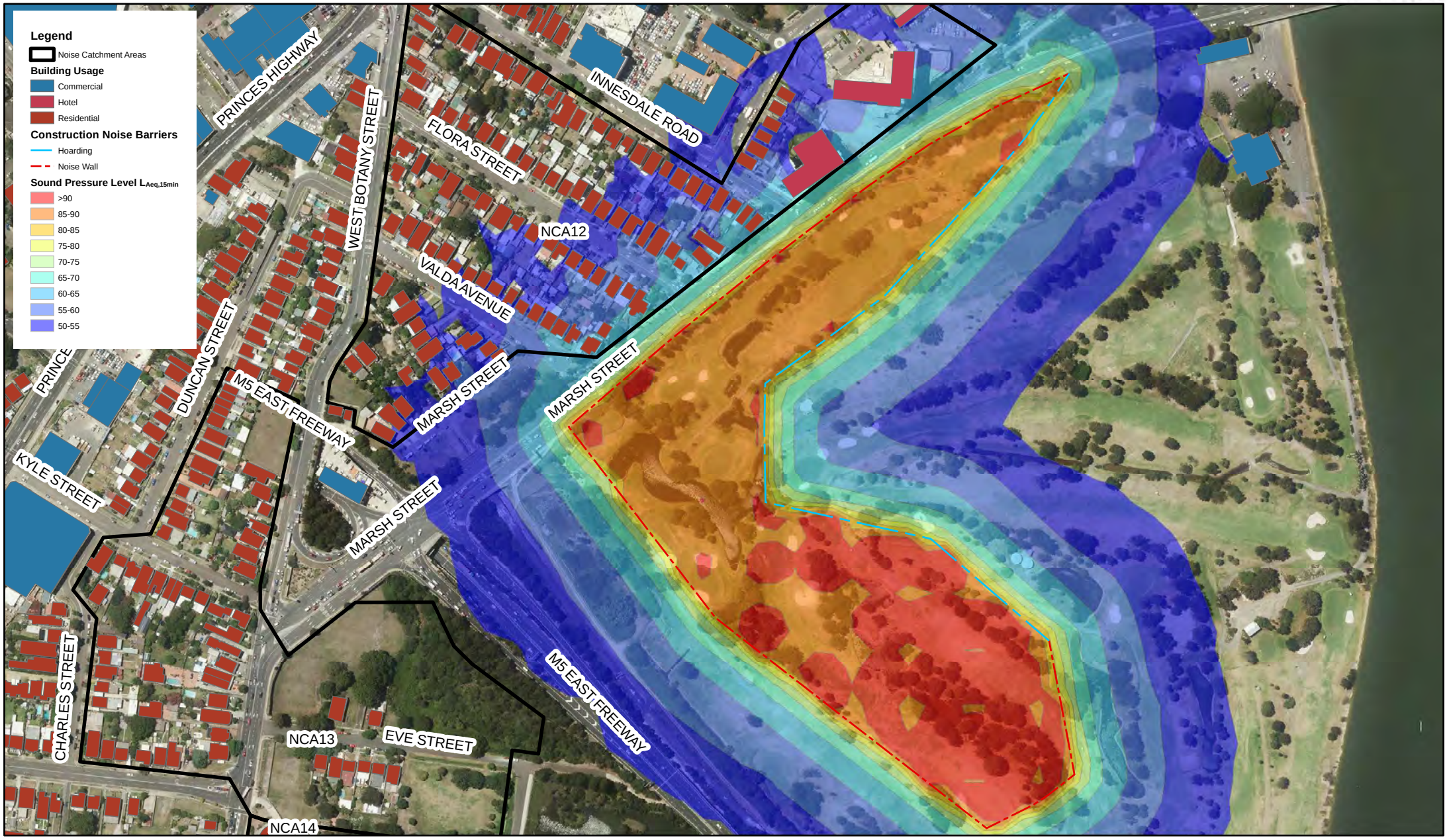
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig. **10_02**



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Installment of environmental controls - Day

OCT 2015

60327128

Source: SKM2014

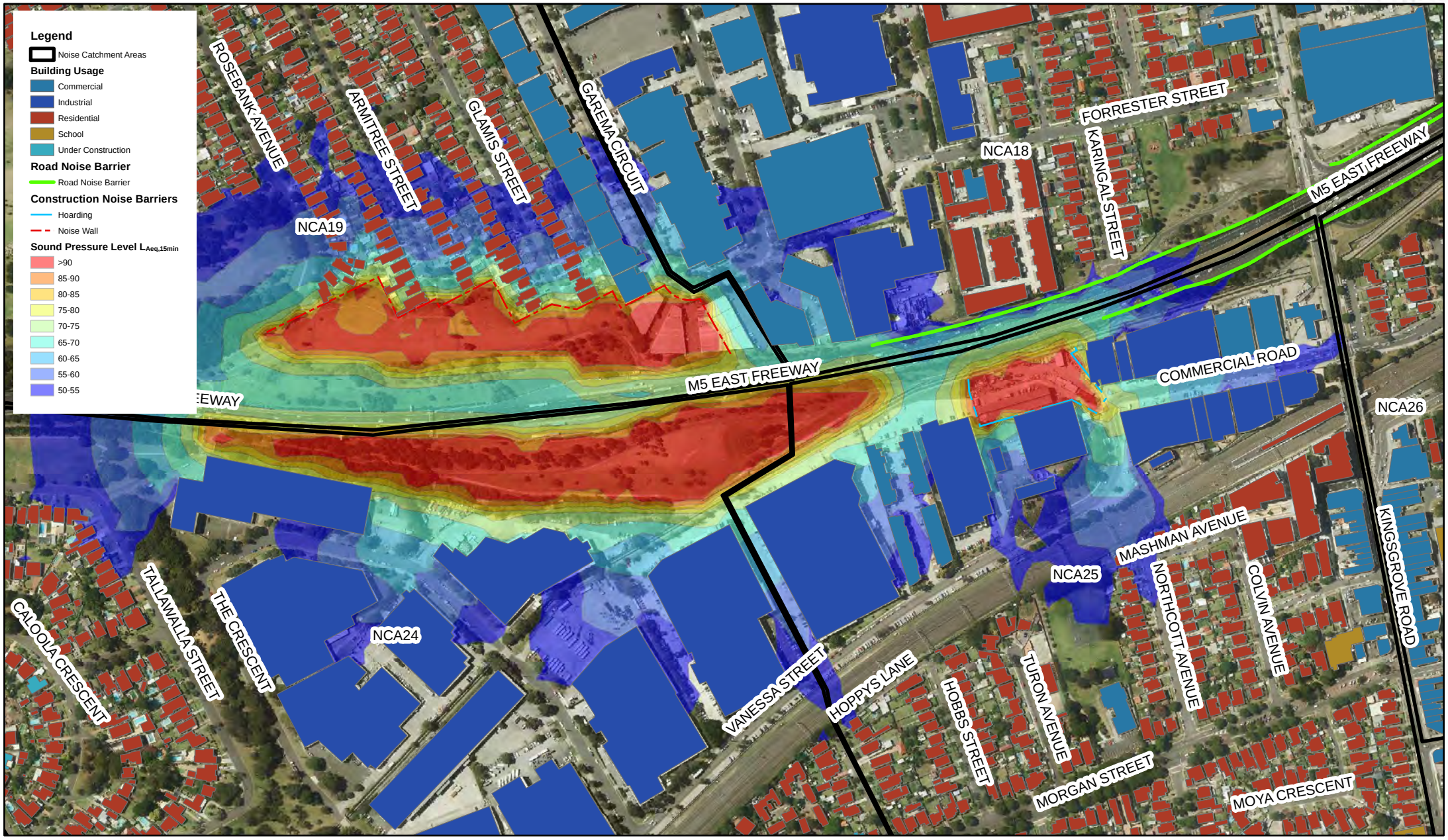
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

10_02



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

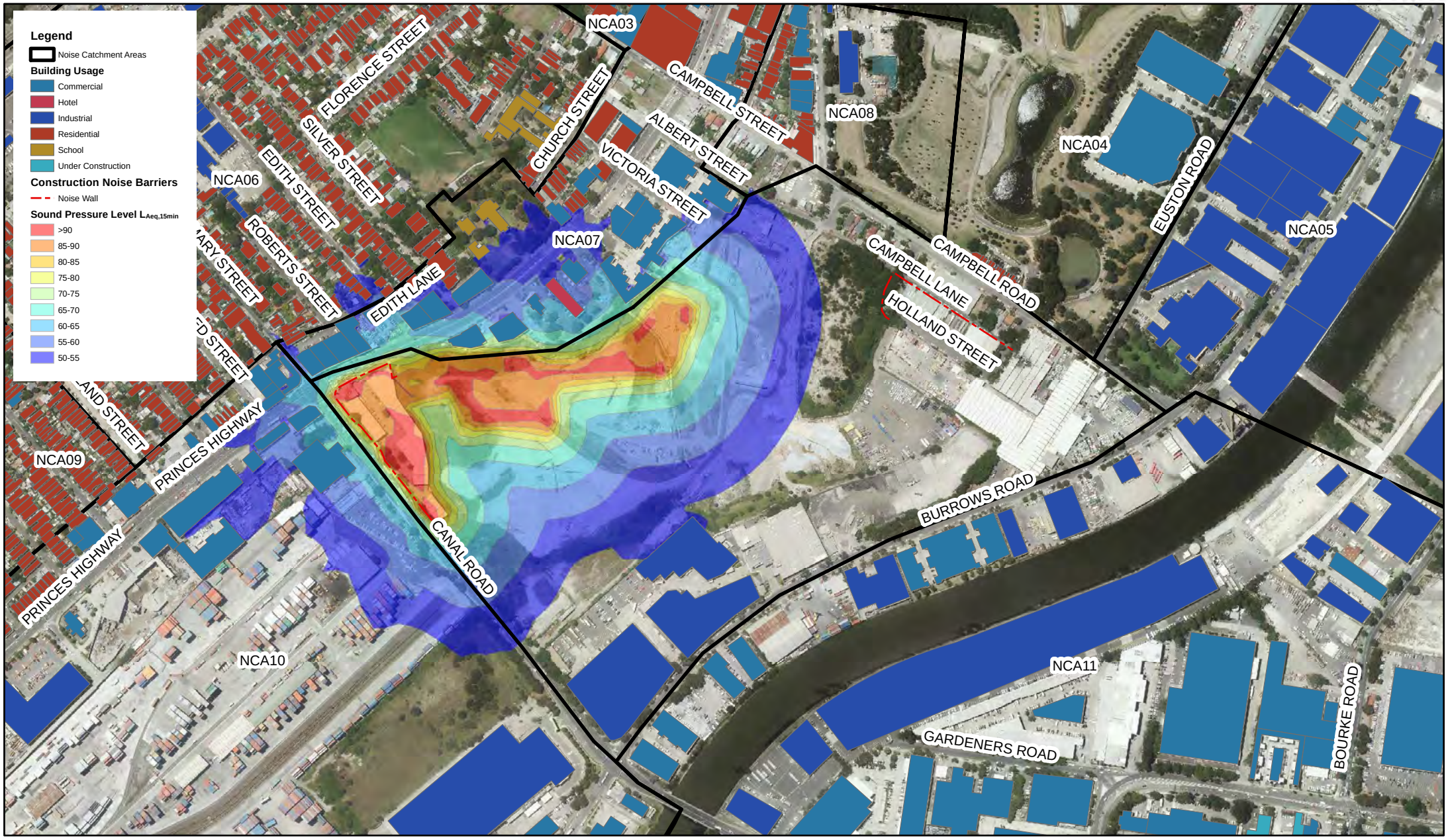
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

10_03a



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

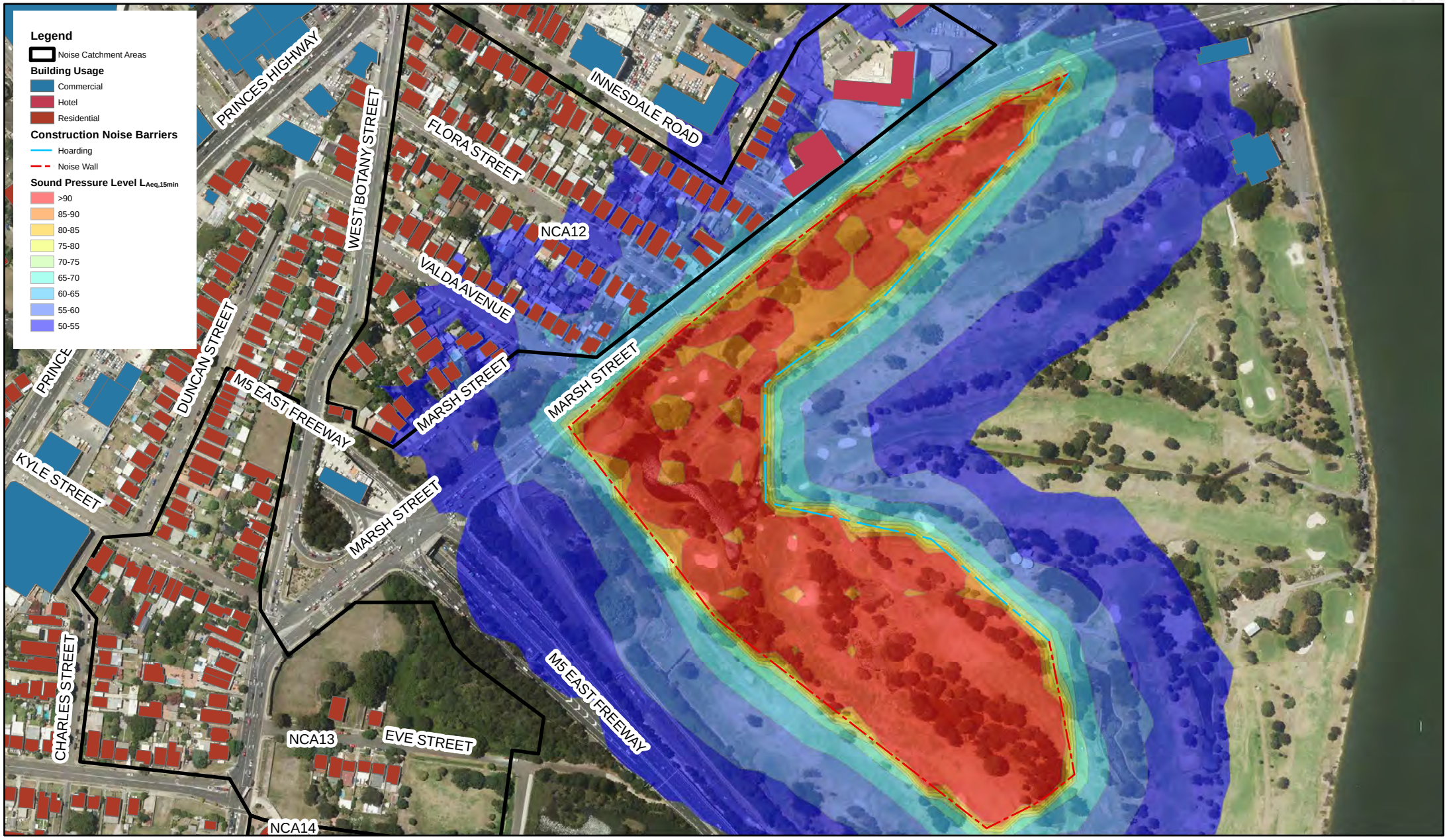
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

10_03a



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (No rock hammering) - Day

OCT 2015

60327128

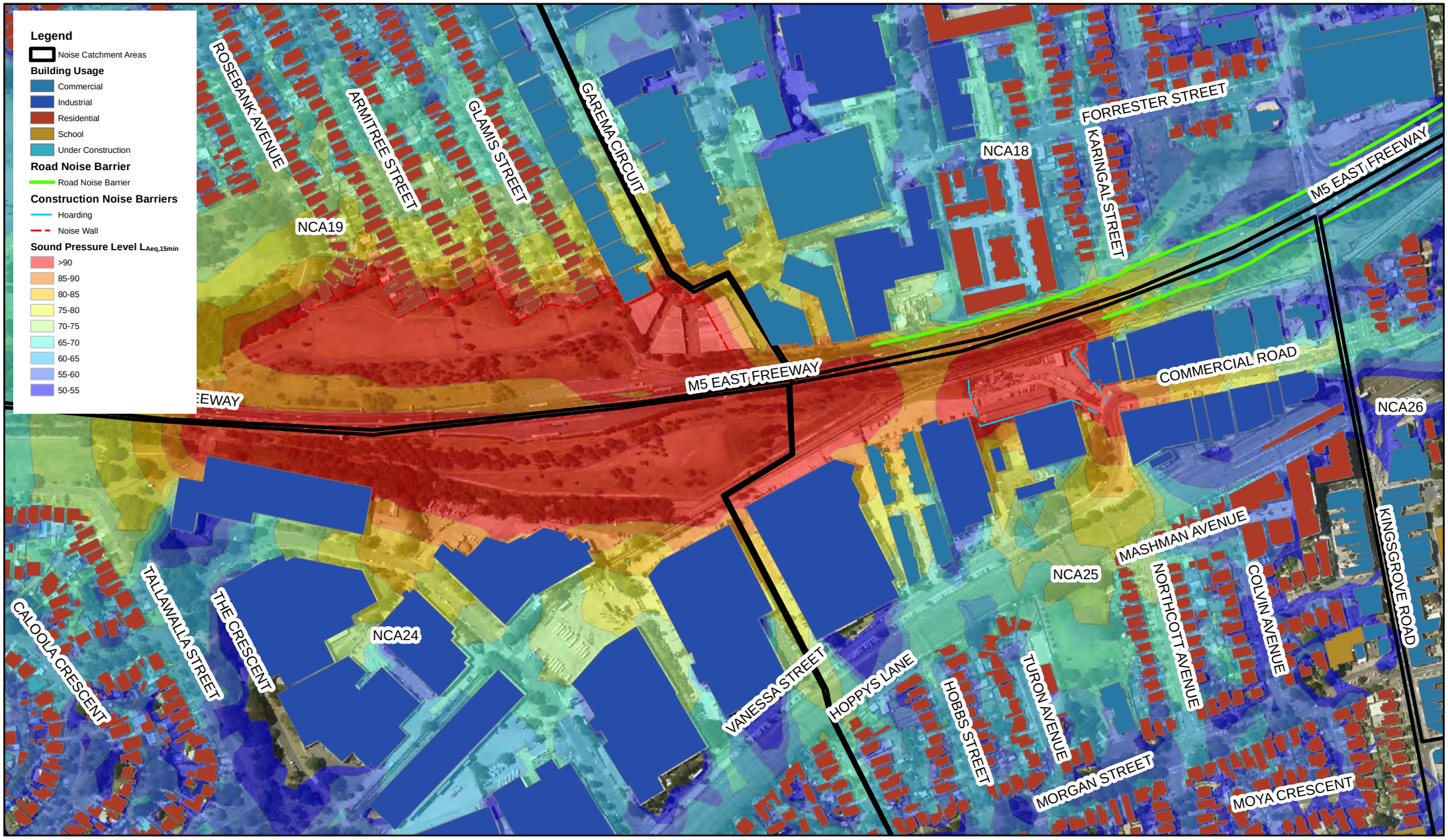
Source: SKM2014

N

0 20 40 80 m

Fig. **10_03a**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

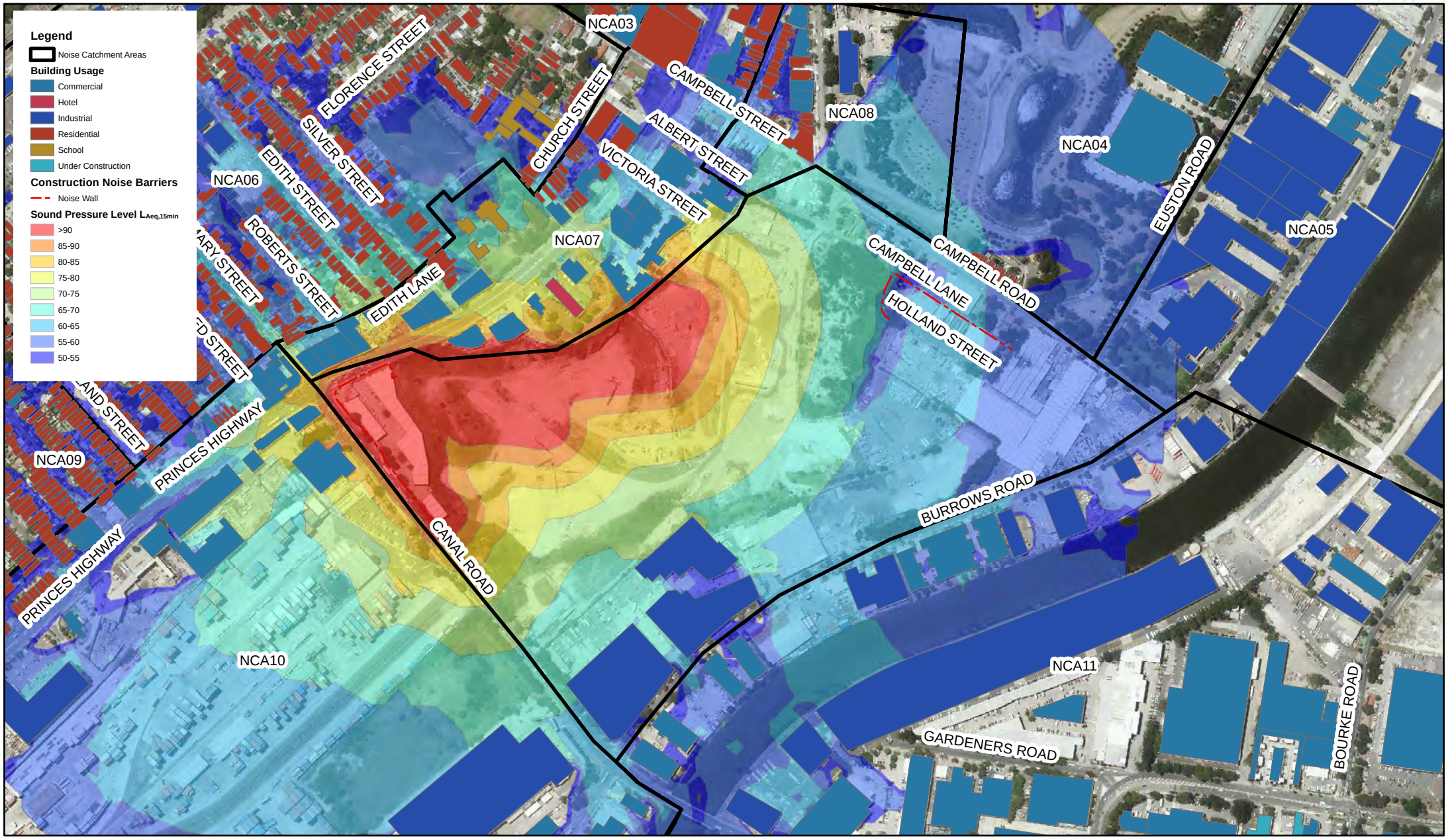
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

10_03b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

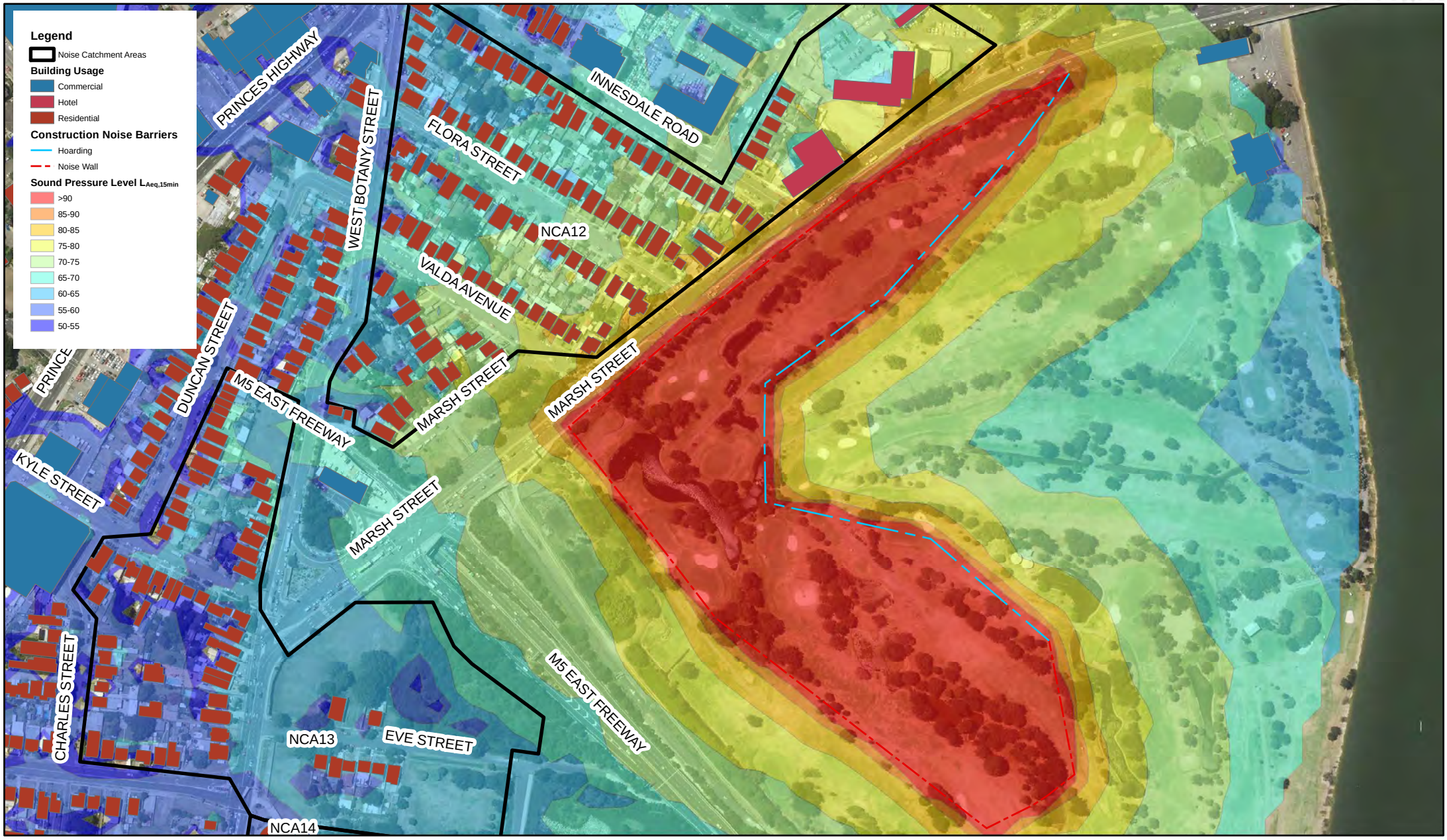
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

10_03b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Demolition of existing structures (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

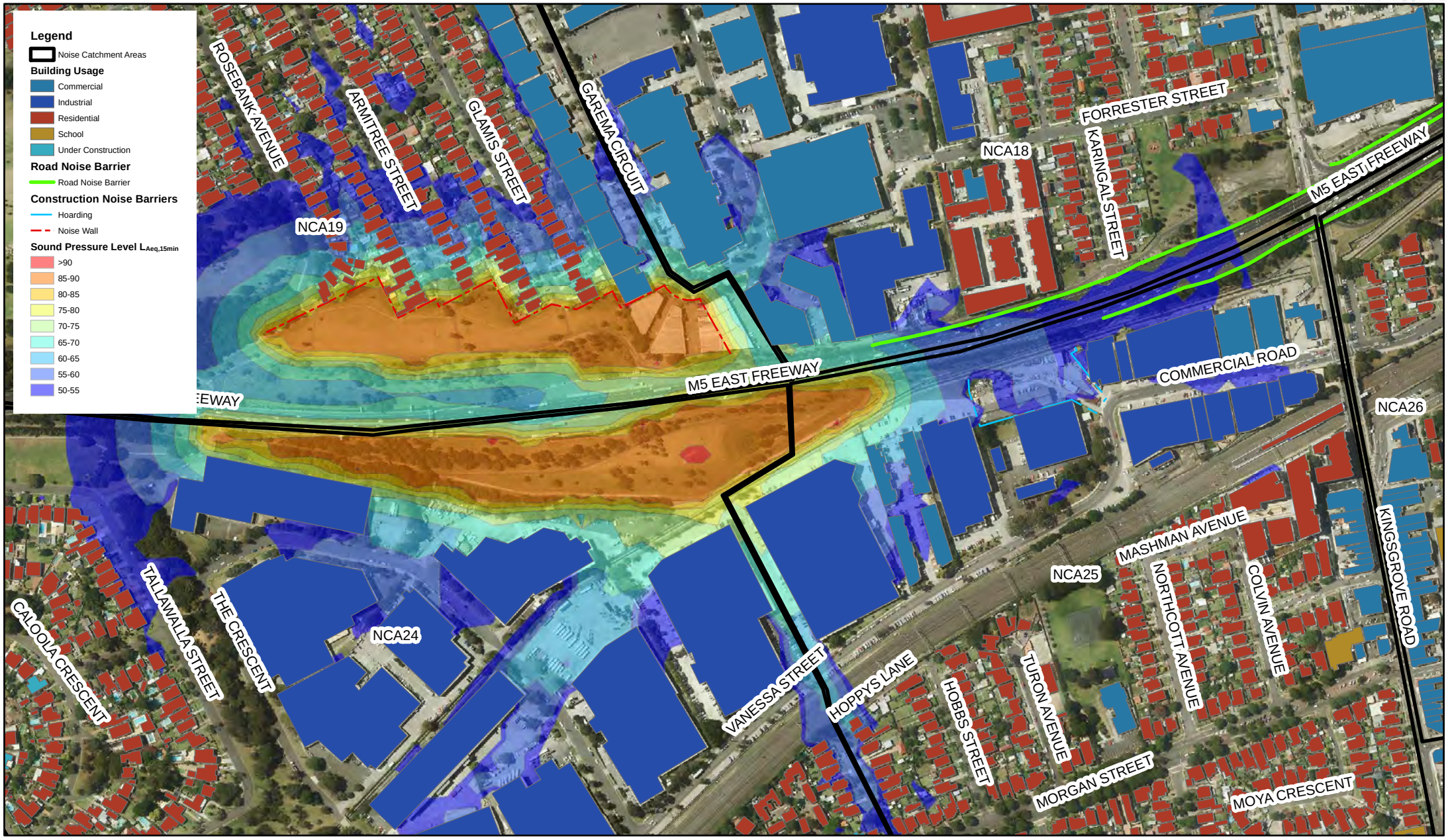
N

0 20 40 80 m

Fig.

10_03b

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Vegetation clearing - Day

OCT 2015

60327128

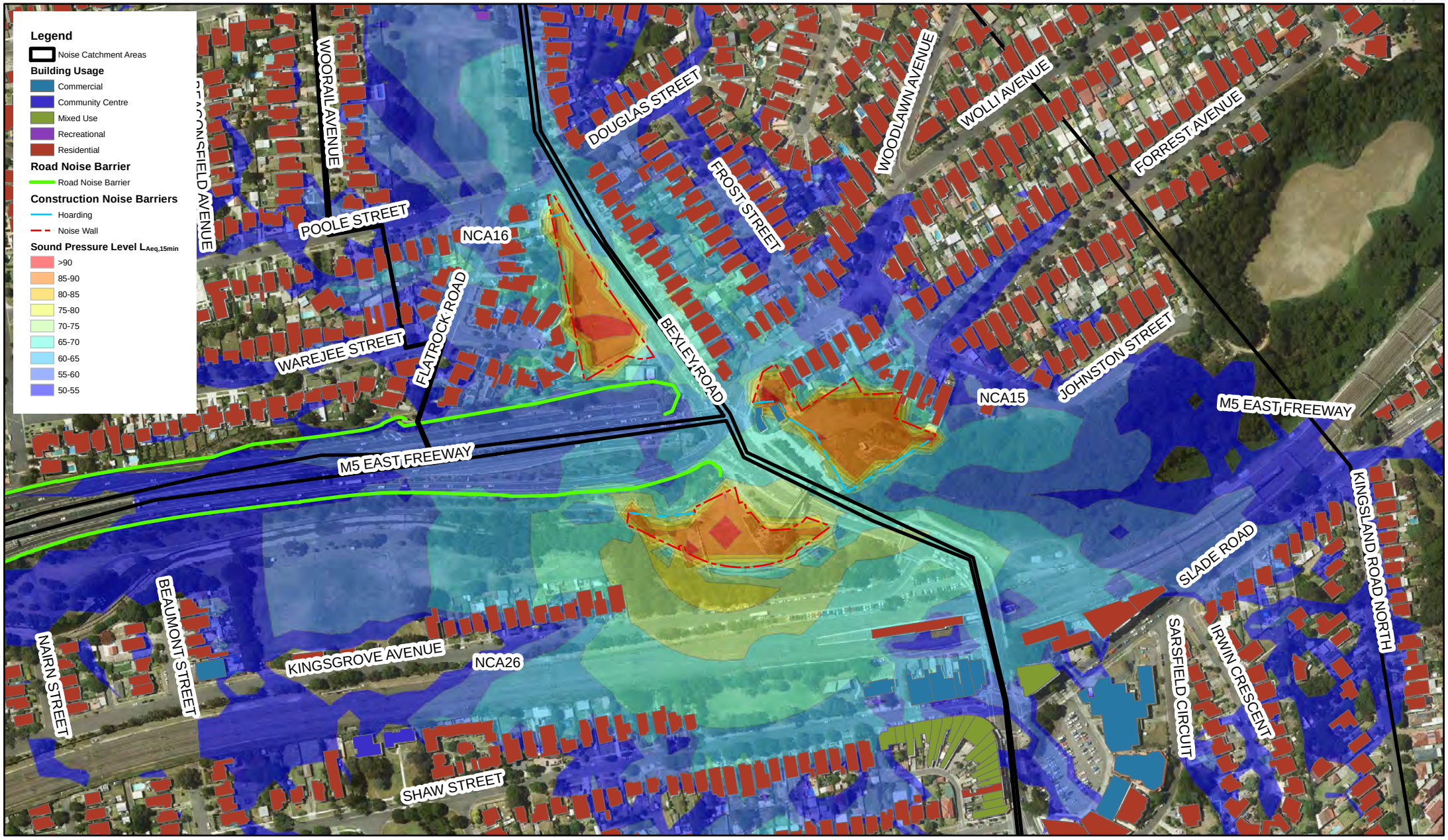
Source: SKM2014

N

0 25 50 100 m

Fig. **10_04**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Site establishment - Vegetation clearing - Day

OCT 2015
60327128

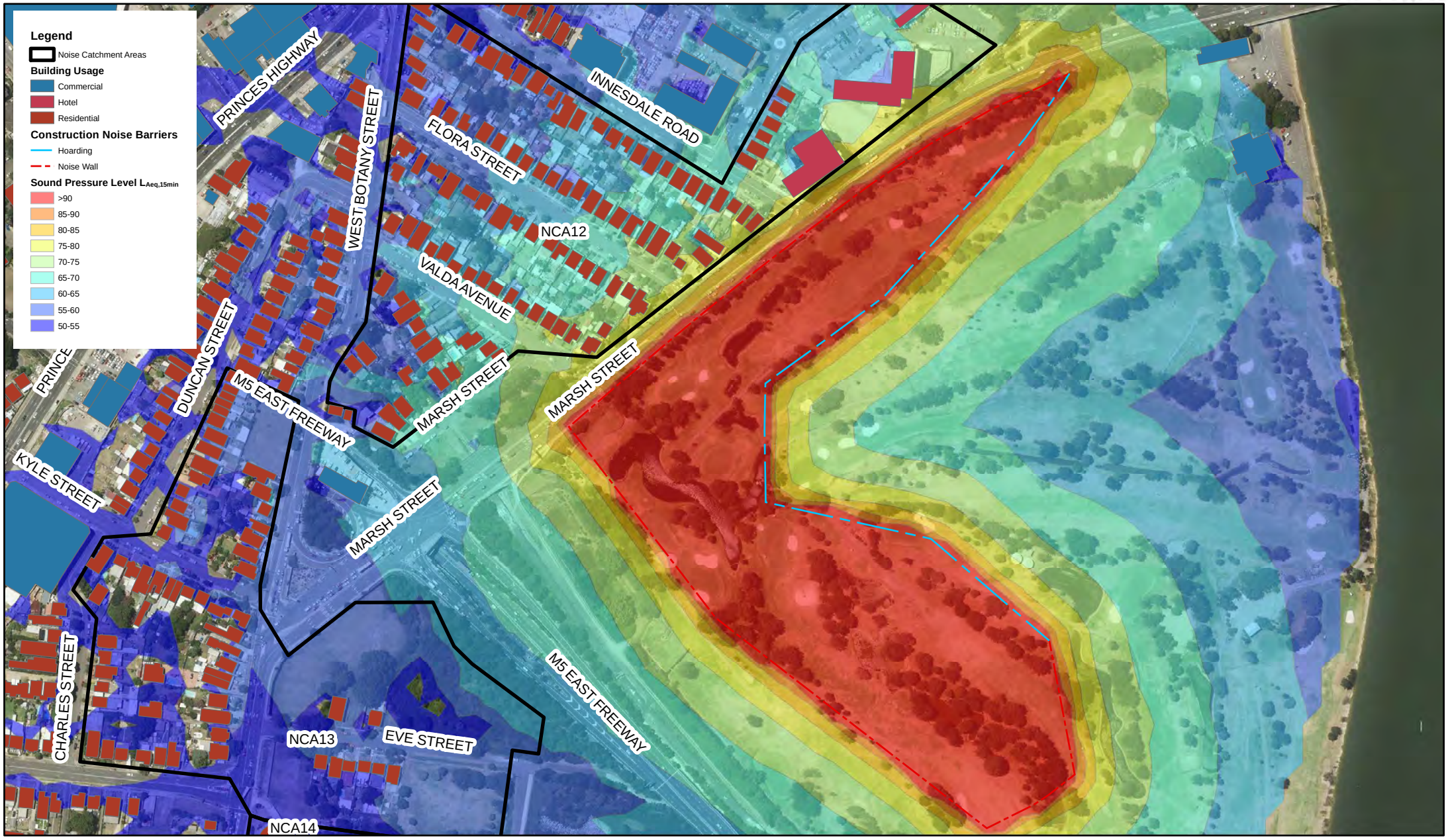
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
10_04



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Vegetation clearing - Day

OCT 2015

60327128

Source: SKM2014

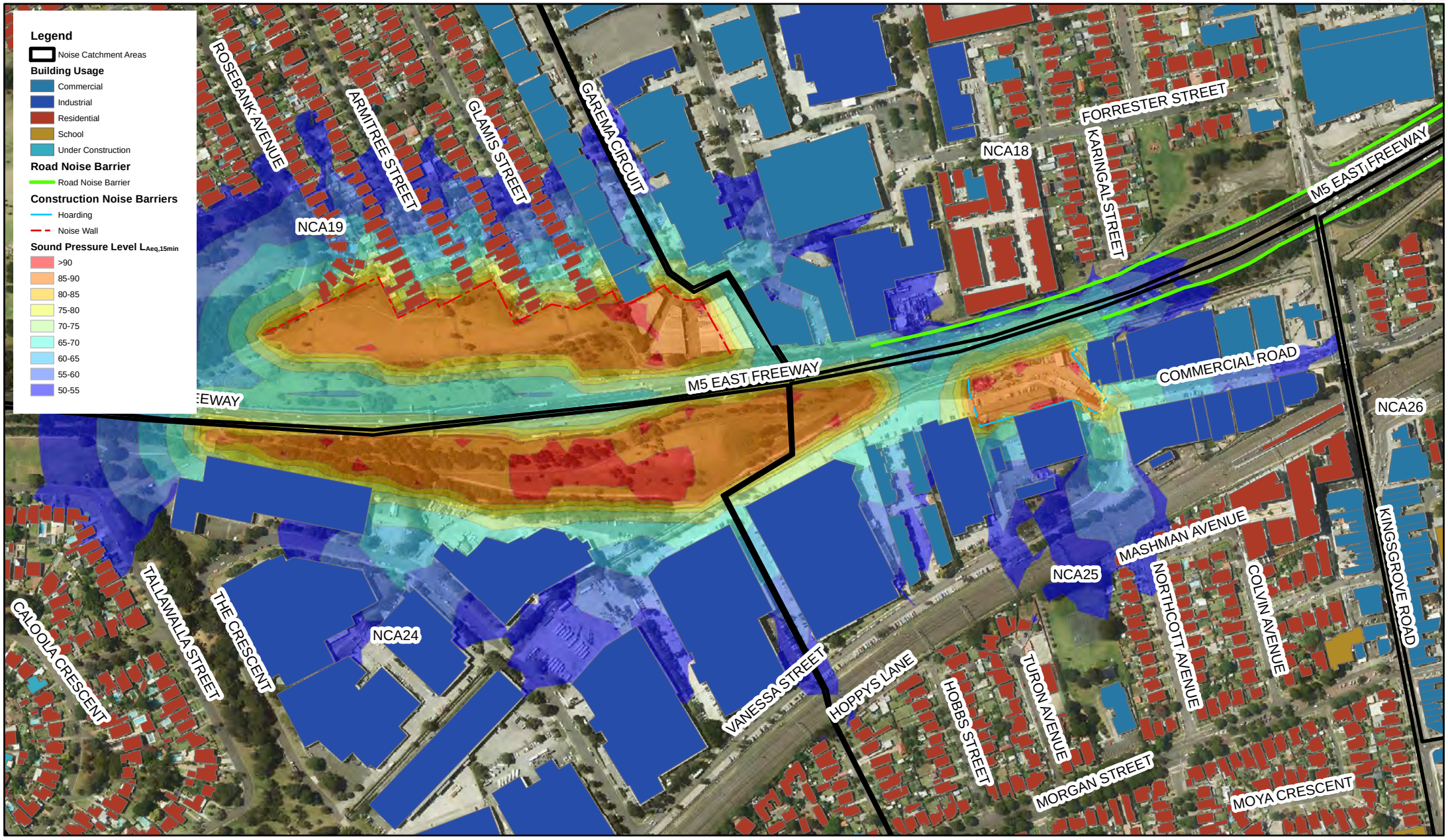
N

0 20 40 80 m

Fig.

10_04

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

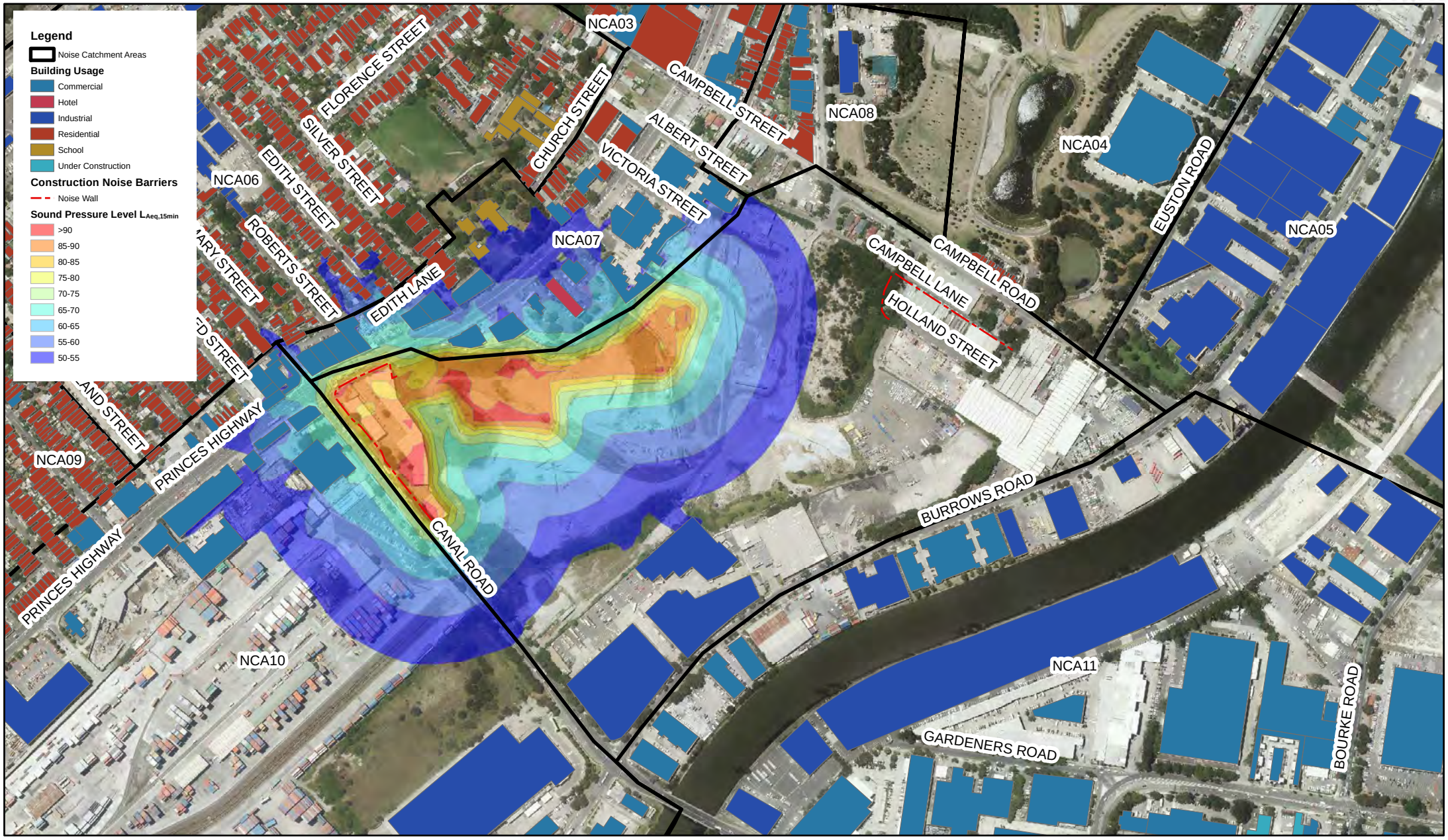
Source: SKM2014

Fig. **10_05**

0 25 50 100 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

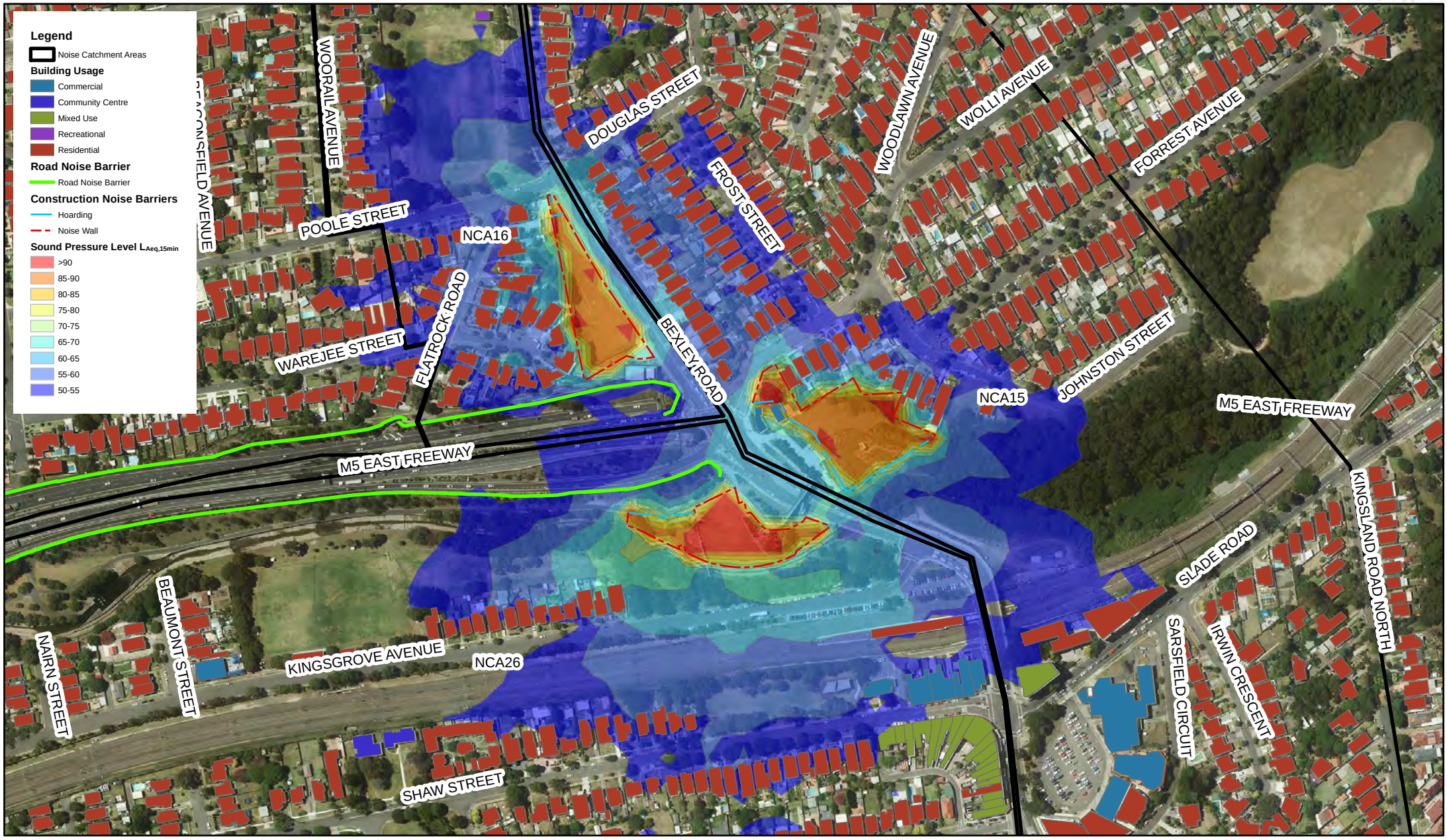
Source: SKM2014

N

0 30 60 120 m

Fig. **10_05**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

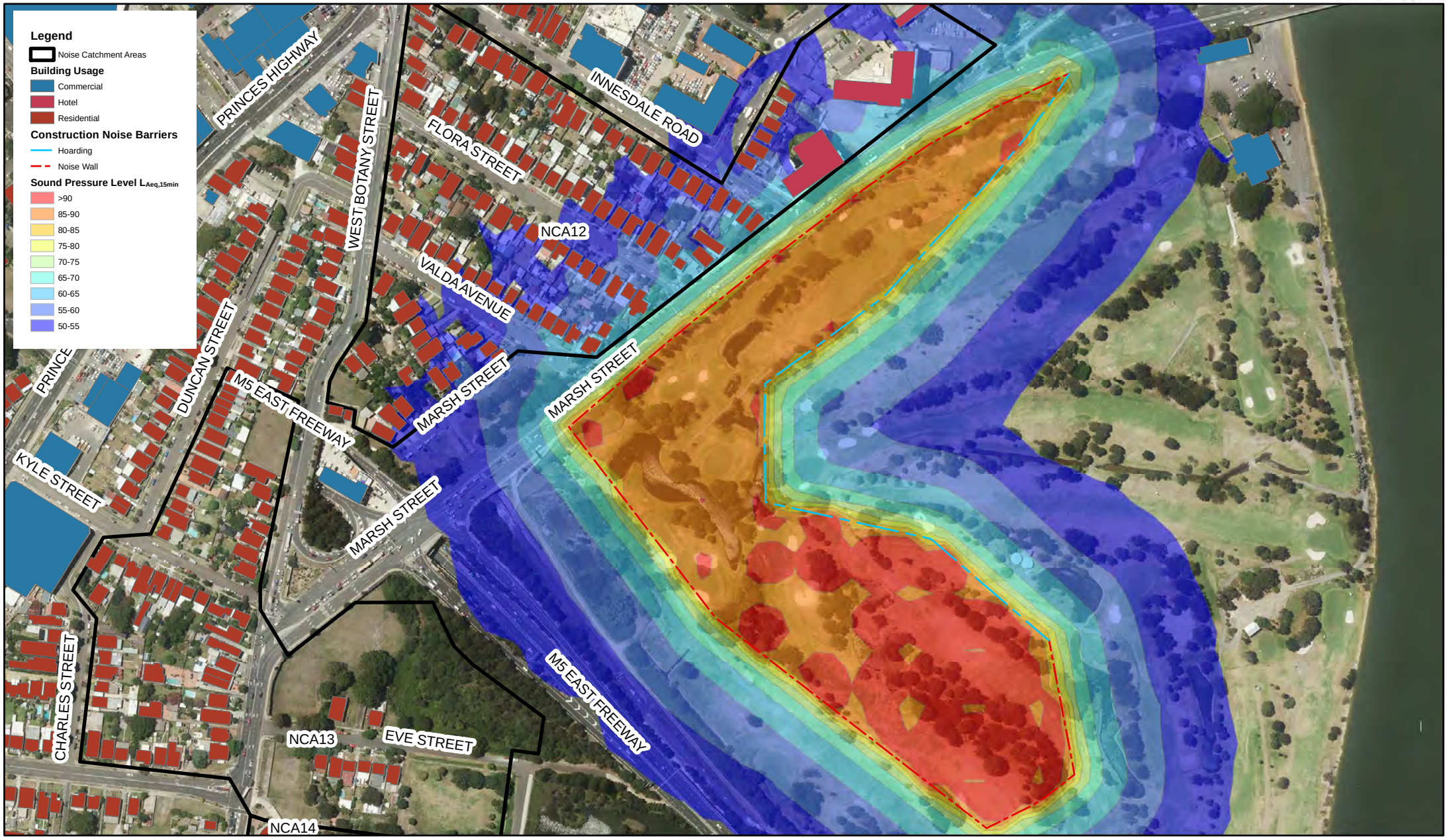
Source: SKM2014

N

0 20 40 80 m

Fig. **10_05**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Establishment of construction facilities - Day

OCT 2015

60327128

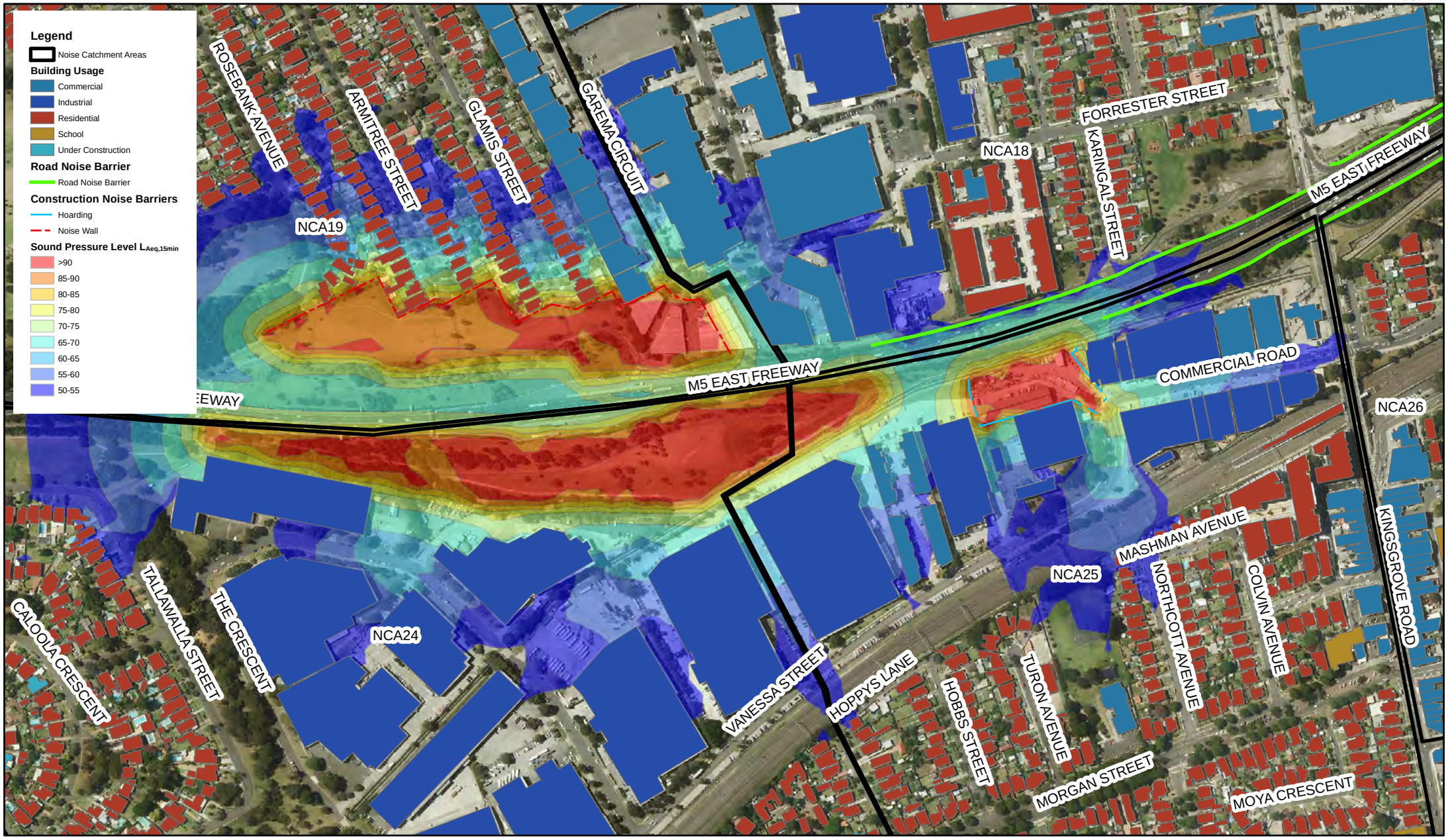
Source: SKM2014

N

0 20 40 80 m

Fig. **10_05**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

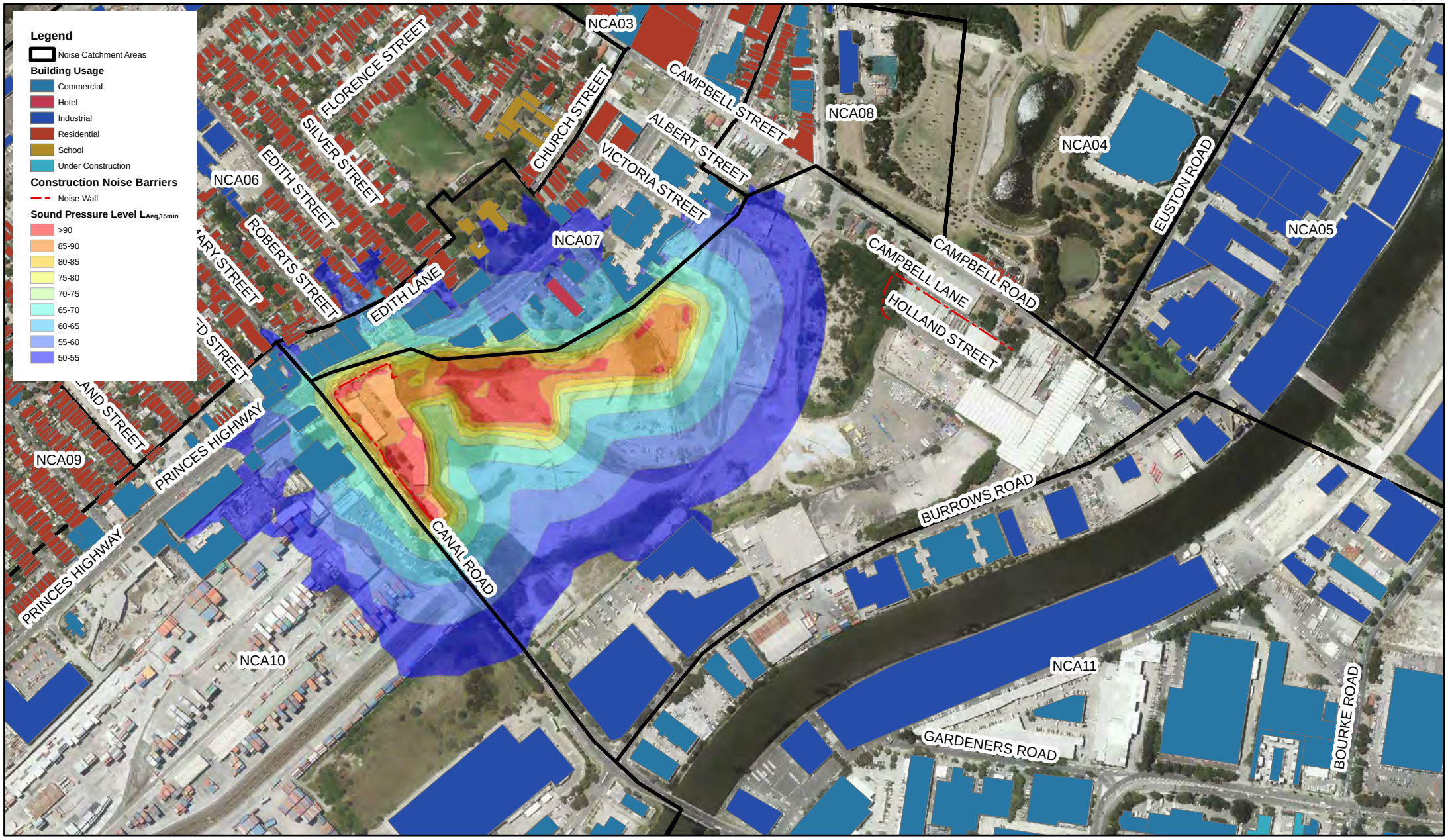
Source: SKM2014

N

0 25 50 100 m

Fig. **10_06**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

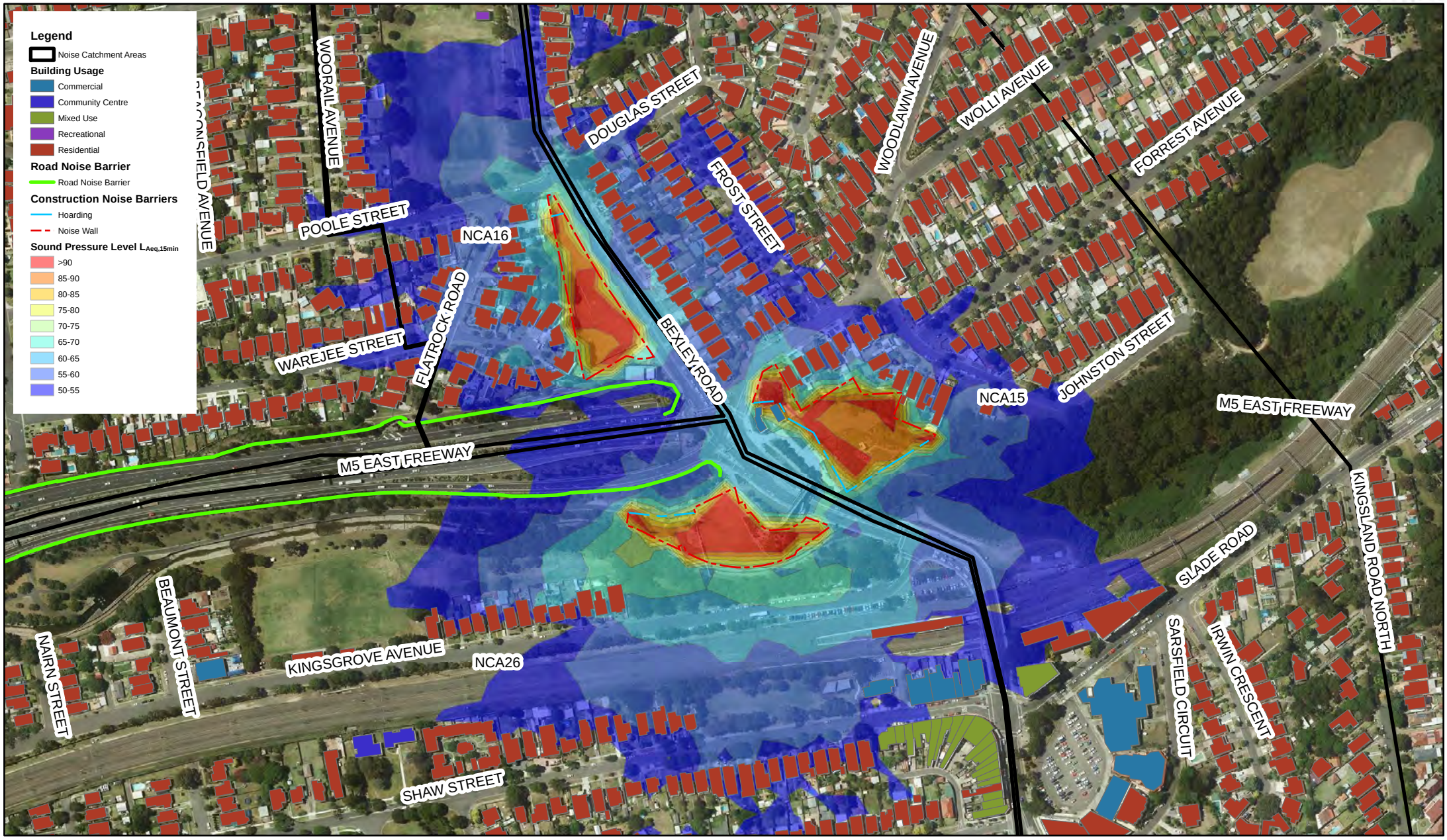
Source: SKM2014

N

0 30 60 120 m

Fig. **10_06**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

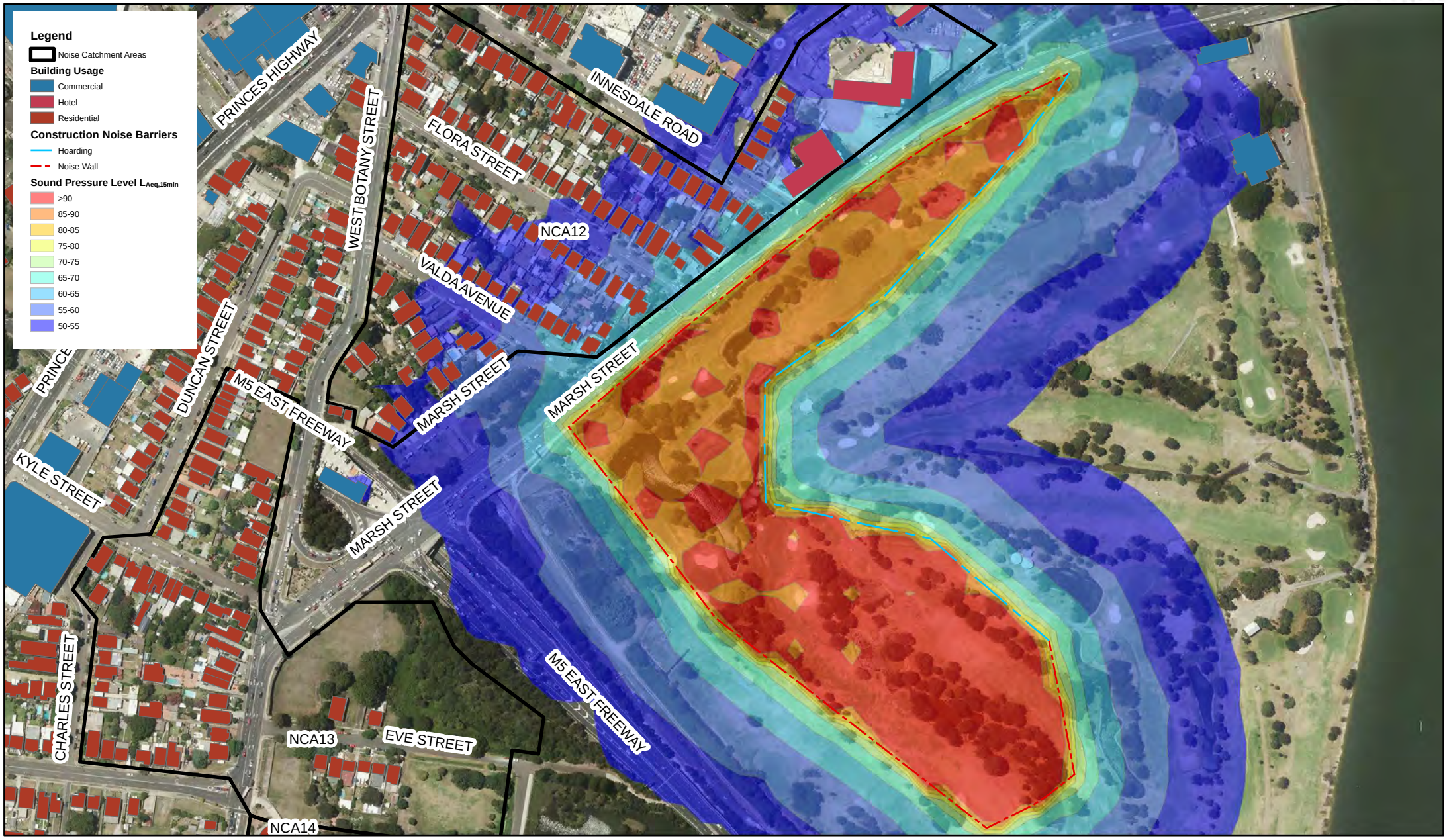
Source: SKM2014

N

0 20 40 80 m

Fig. **10_06**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Site establishment - Road and intersection modifications and installation of traffic controls - Day

OCT 2015

60327128

Source: SKM2014

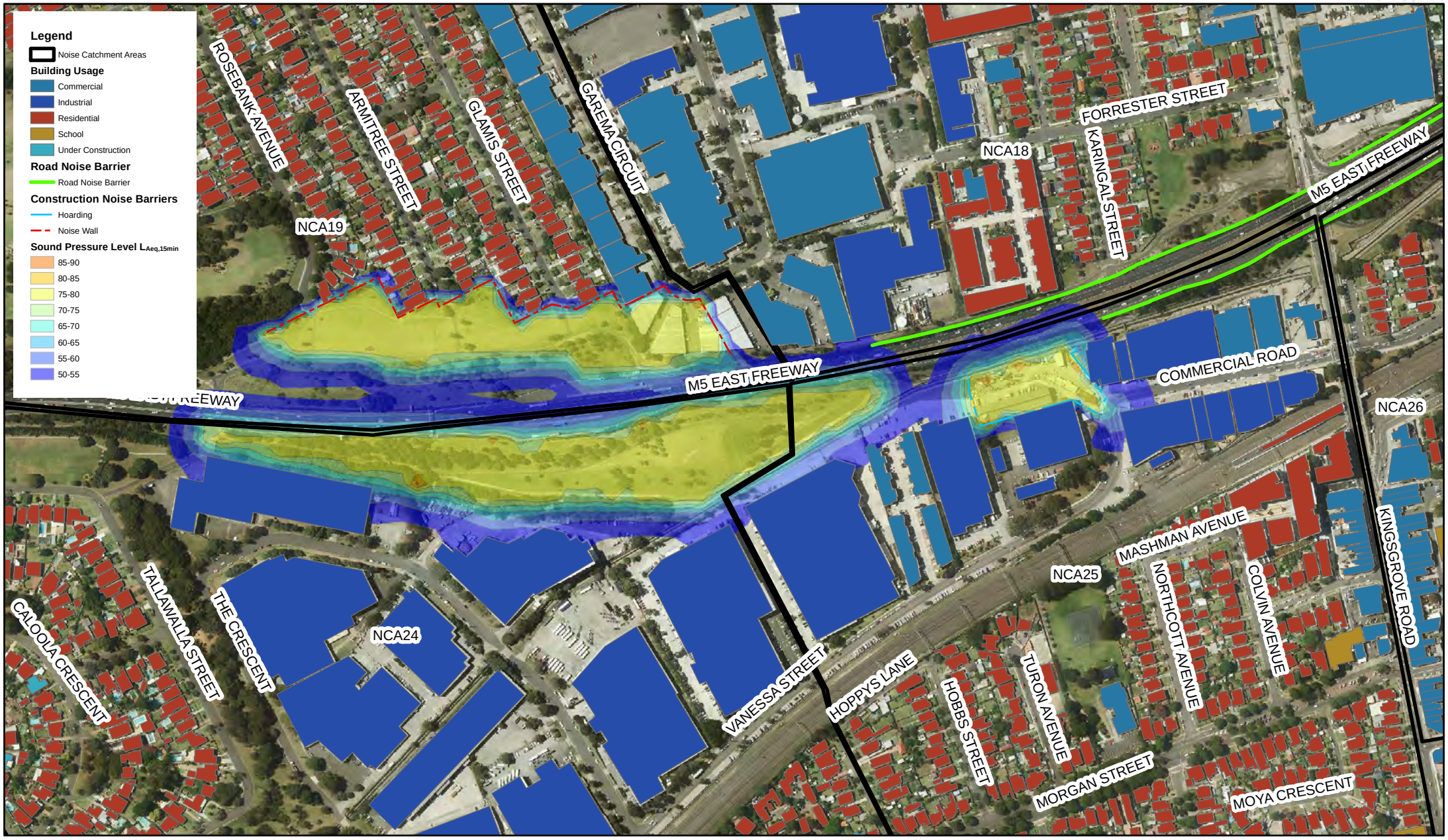
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

10_06



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Day

OCT 2015

60327128

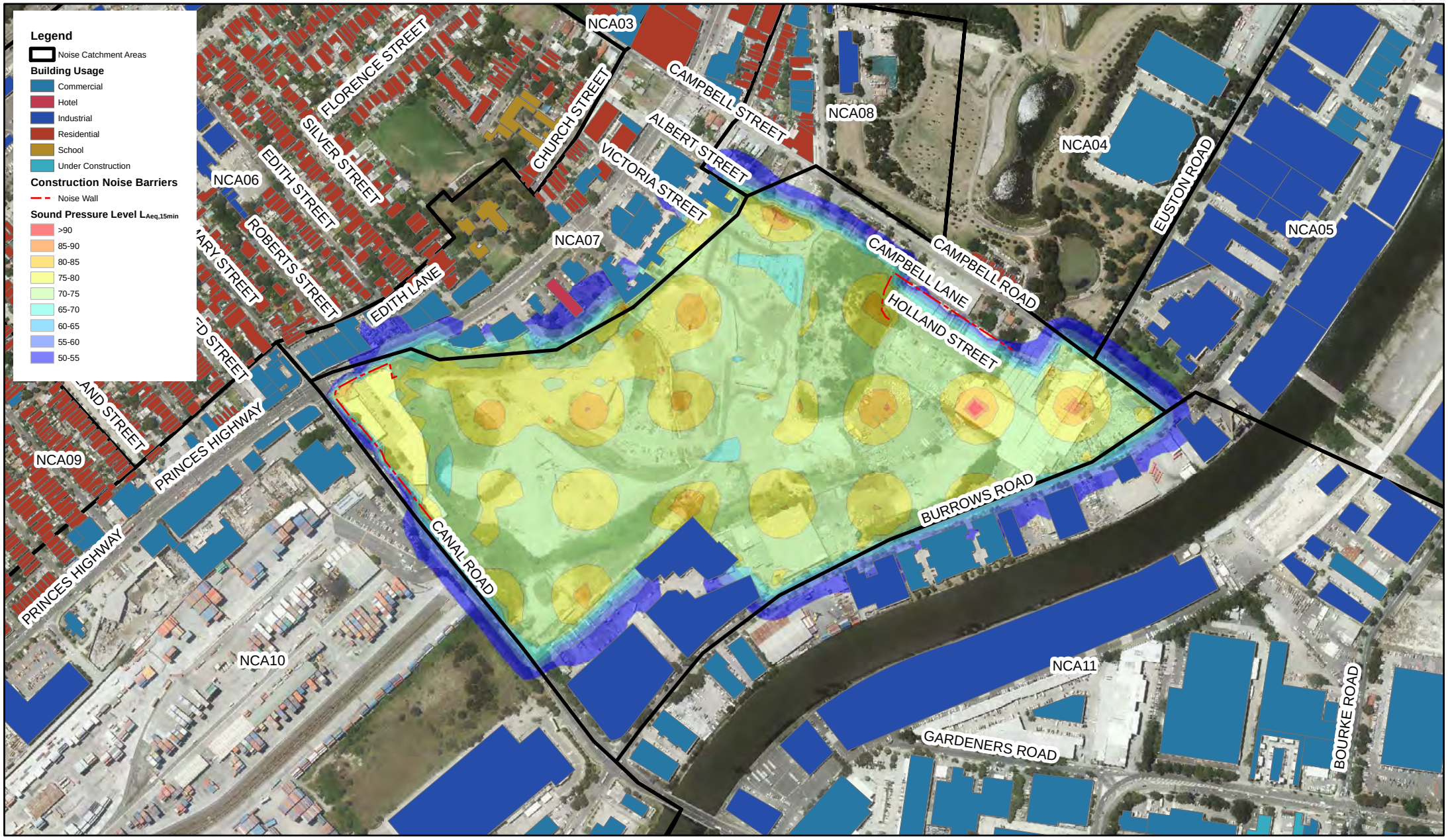
Source: SKM2014

N

0 25 50 100 m

Fig. **11_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig. **11_01**



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Day

OCT 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_01



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Day

OCT 2015

60327128

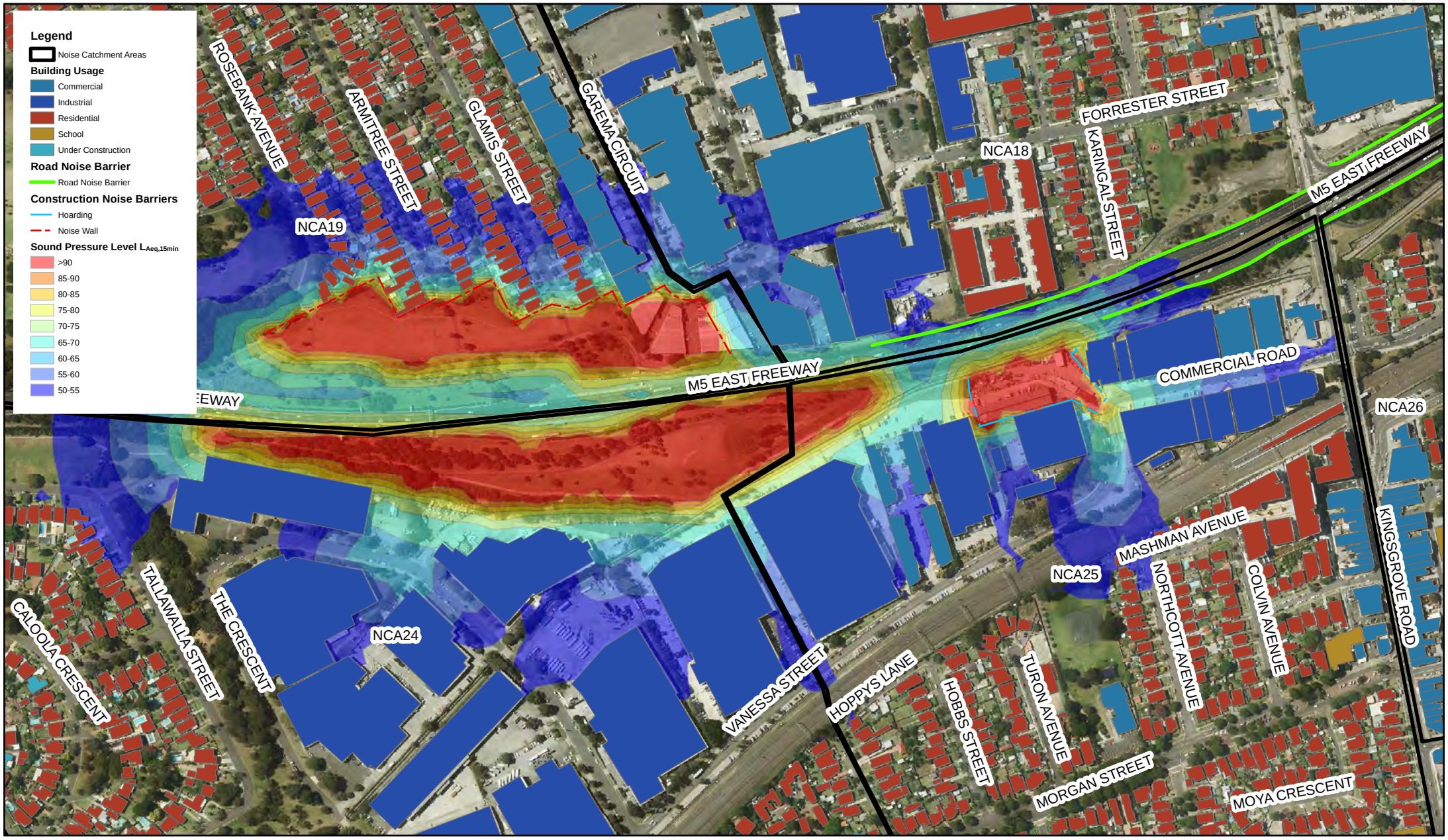
Source: SKM2014

Fig. **11_01**

0 20 40 80 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Day

OCT 2015

60327128

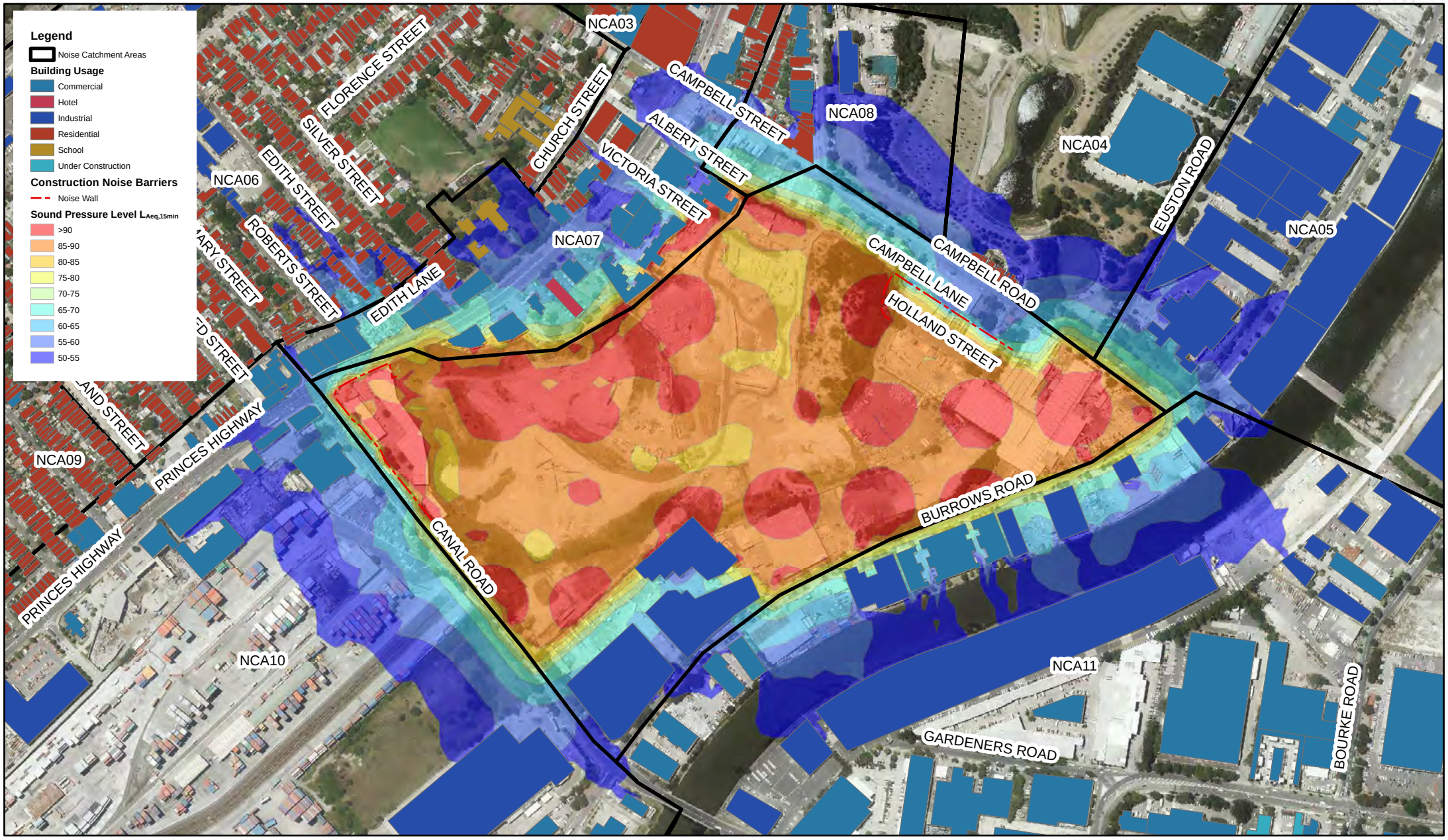
Source: SKM2014

N

0 25 50 100 m

Fig. **11_02**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Day

OCT 2015

60327128

Source: SKM2014

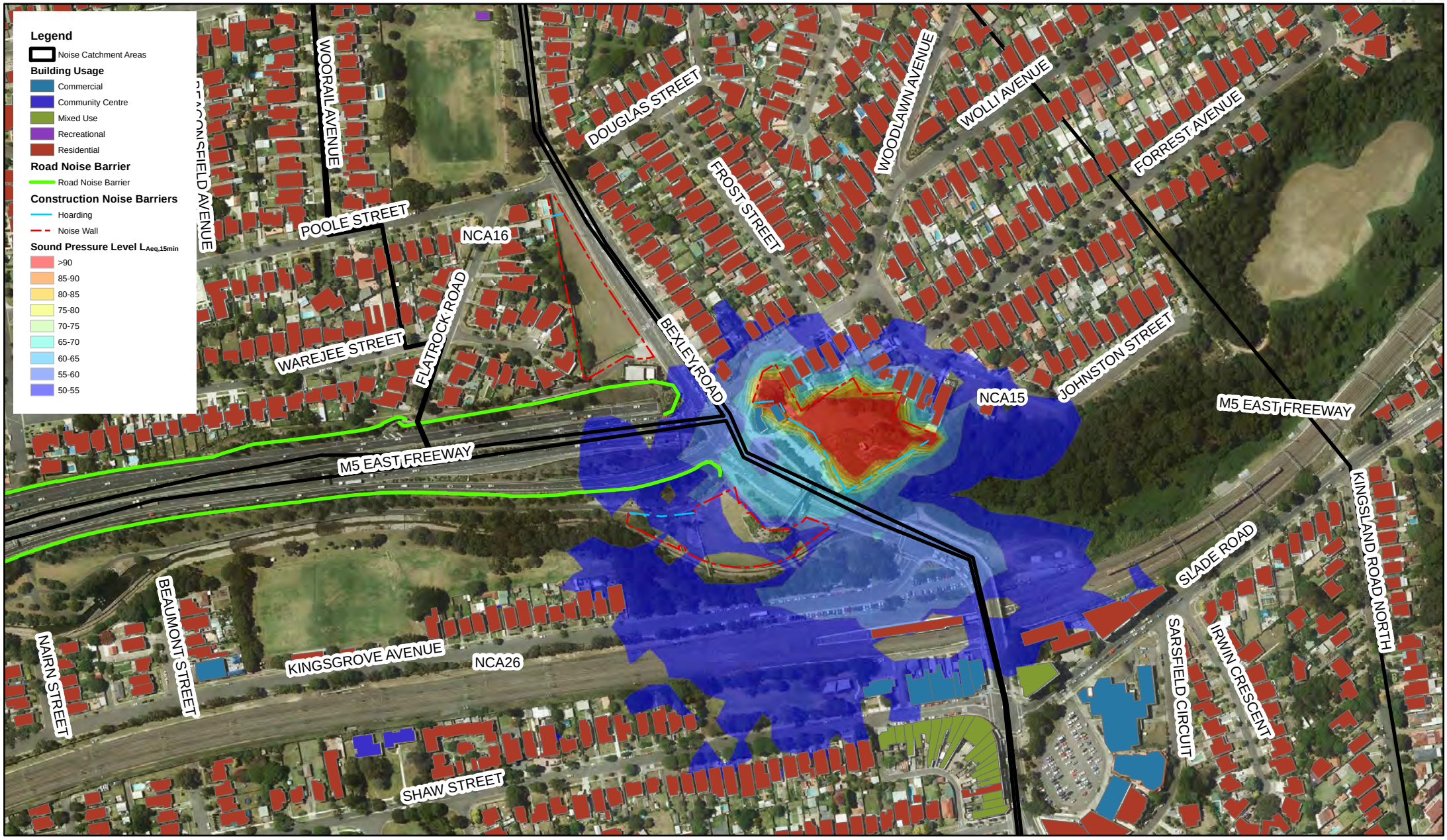
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

11_02



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Day

OCT 2015

60327128

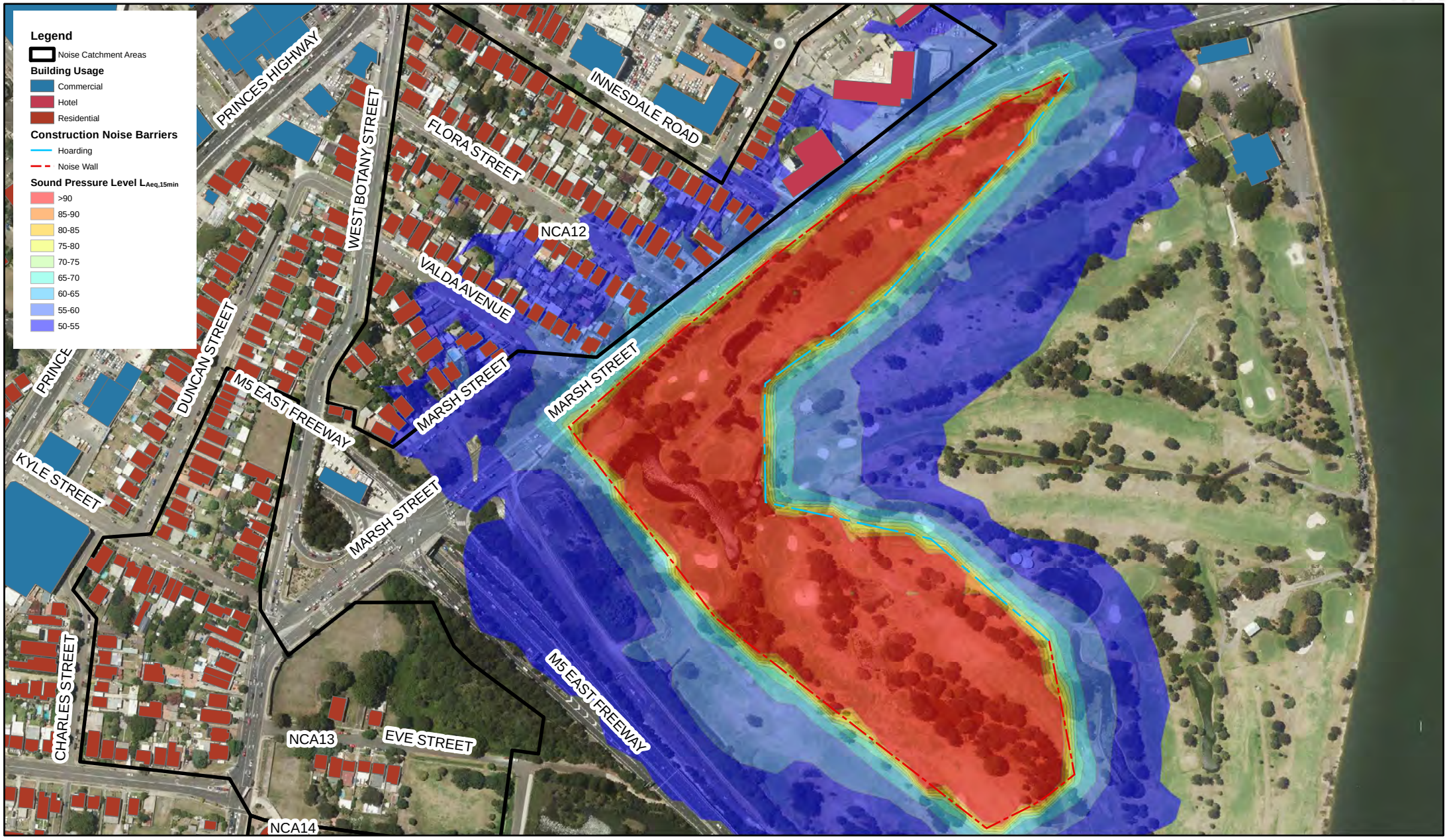
Source: SKM2014

N

0 20 40 80 m

Fig. **11_02**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Day

OCT 2015

60327128

Source: SKM2014

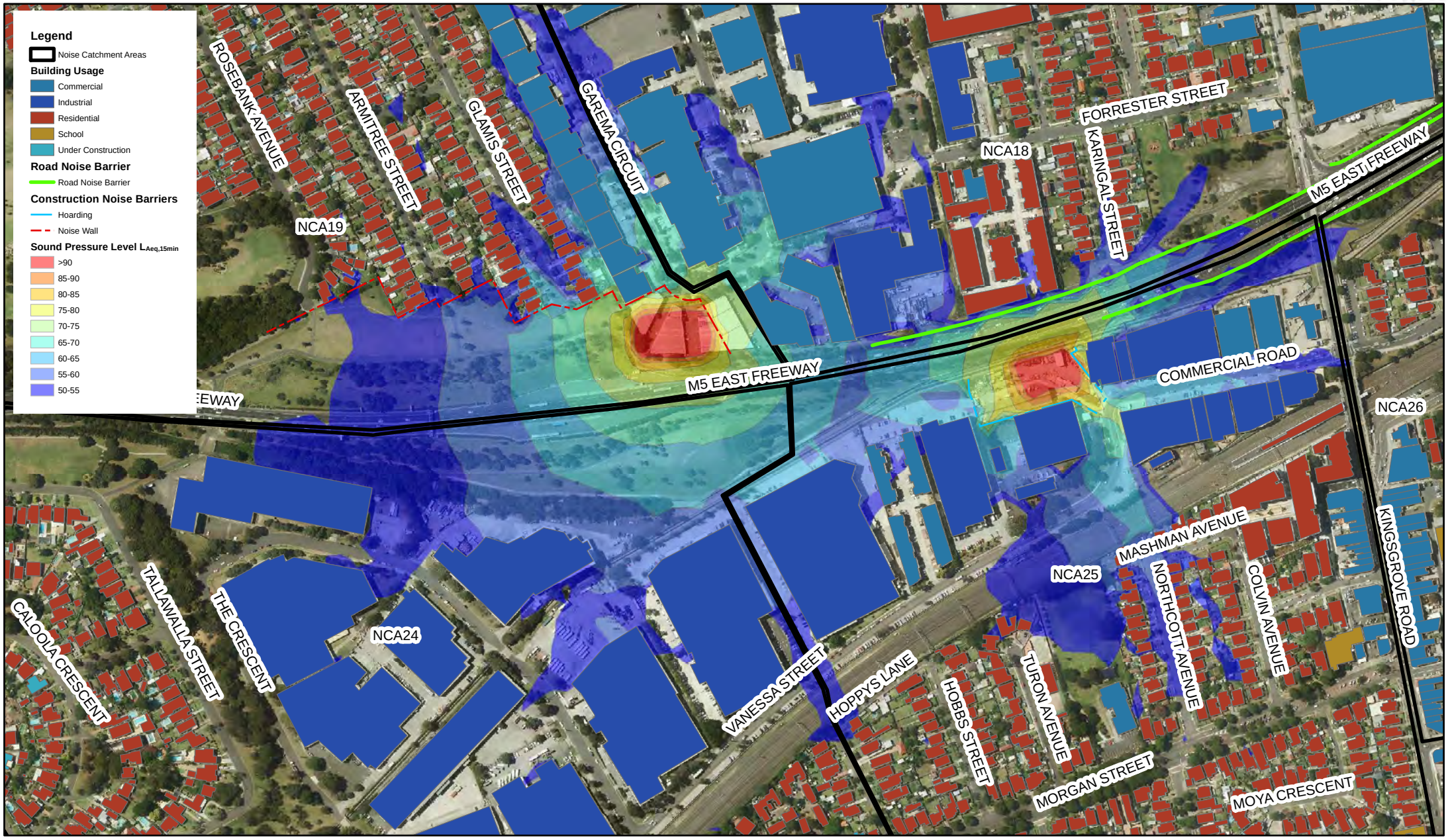
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_02



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Day

OCT 2015

60327128

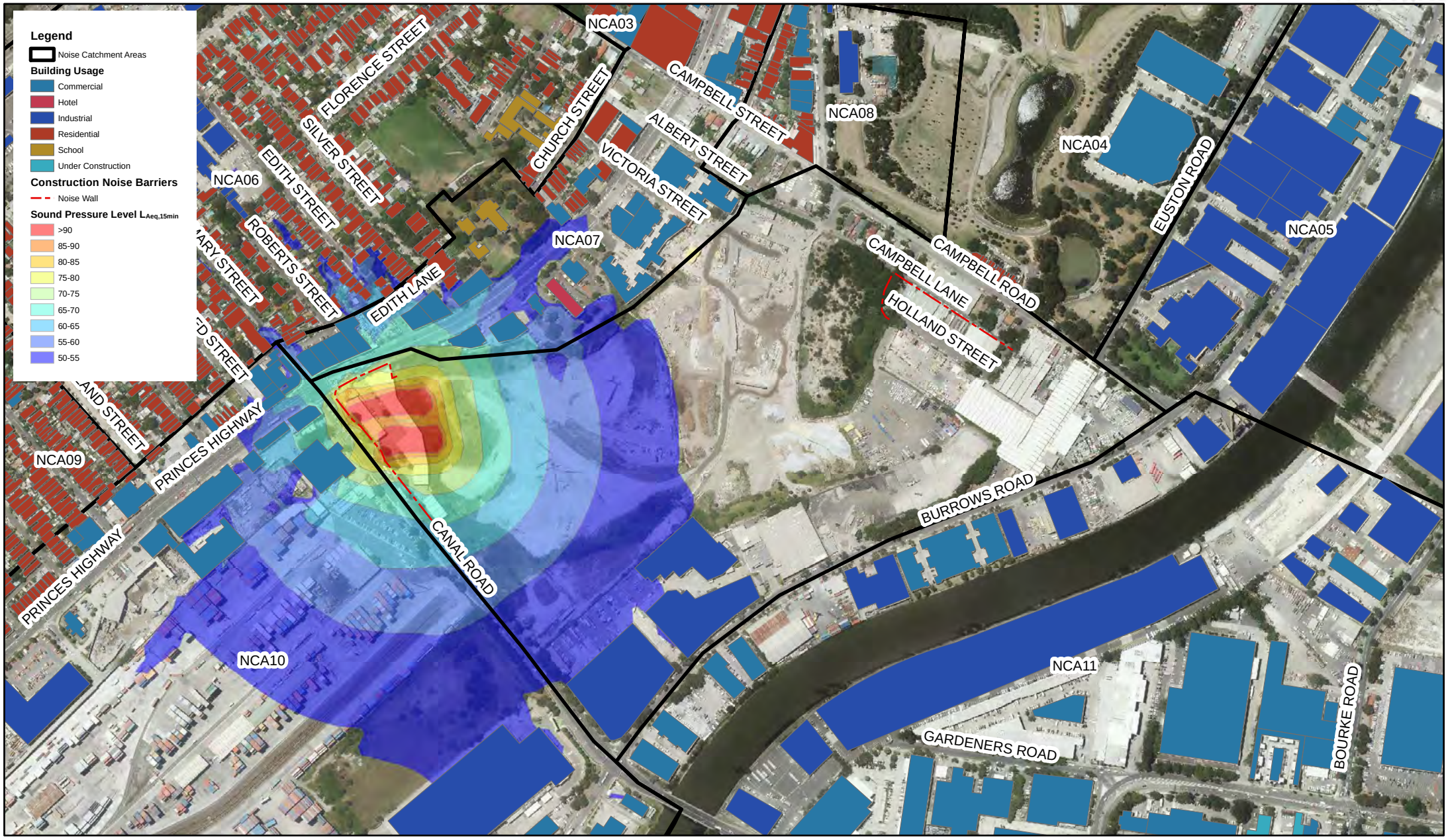
Source: SKM2014

N

0 25 50 100 m

Fig. **12_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Day

OCT 2015

60327128

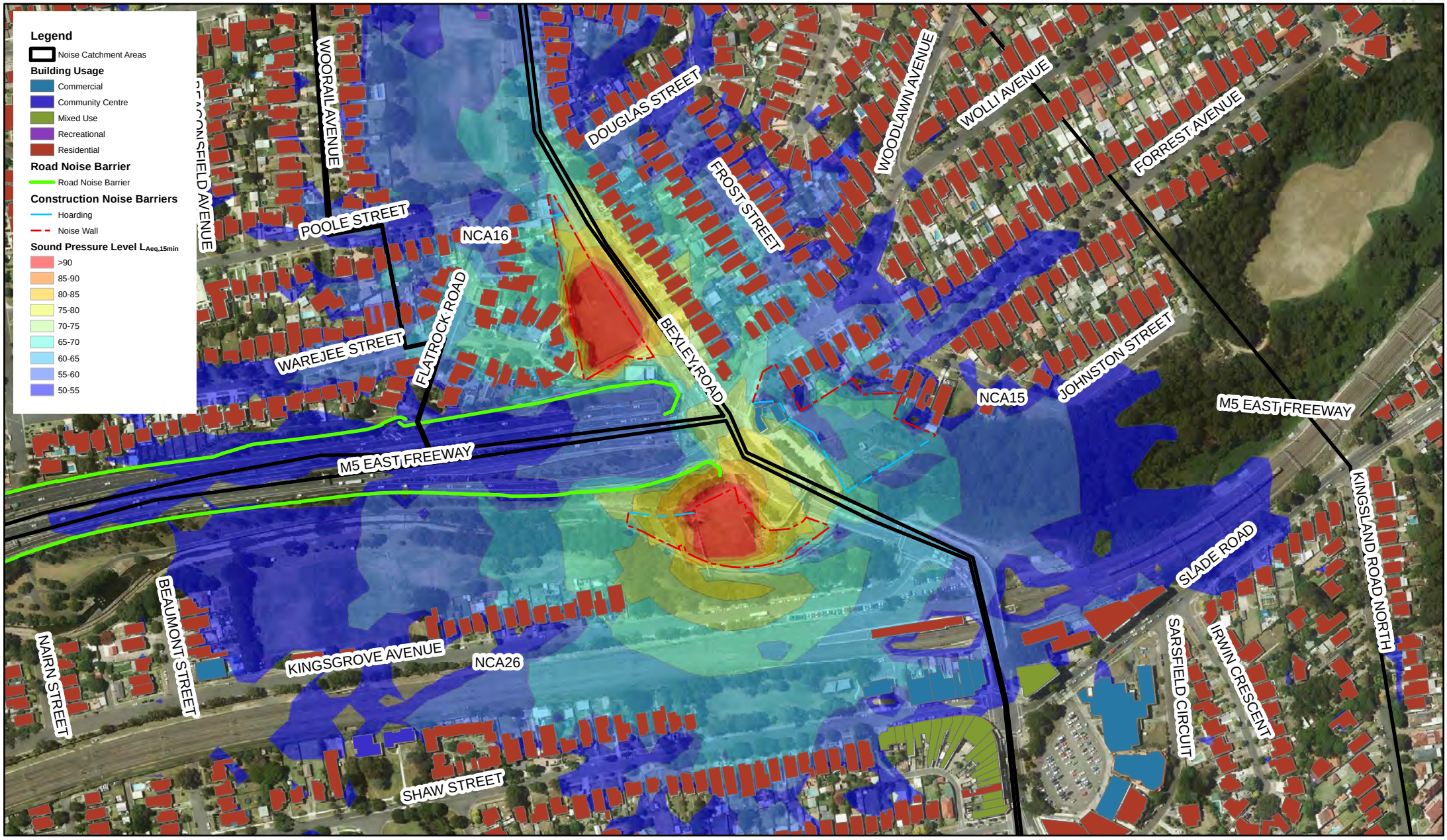
Source: SKM2014

N

0 30 60 120 m

Fig. **12_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Day

OCT 2015

60327128

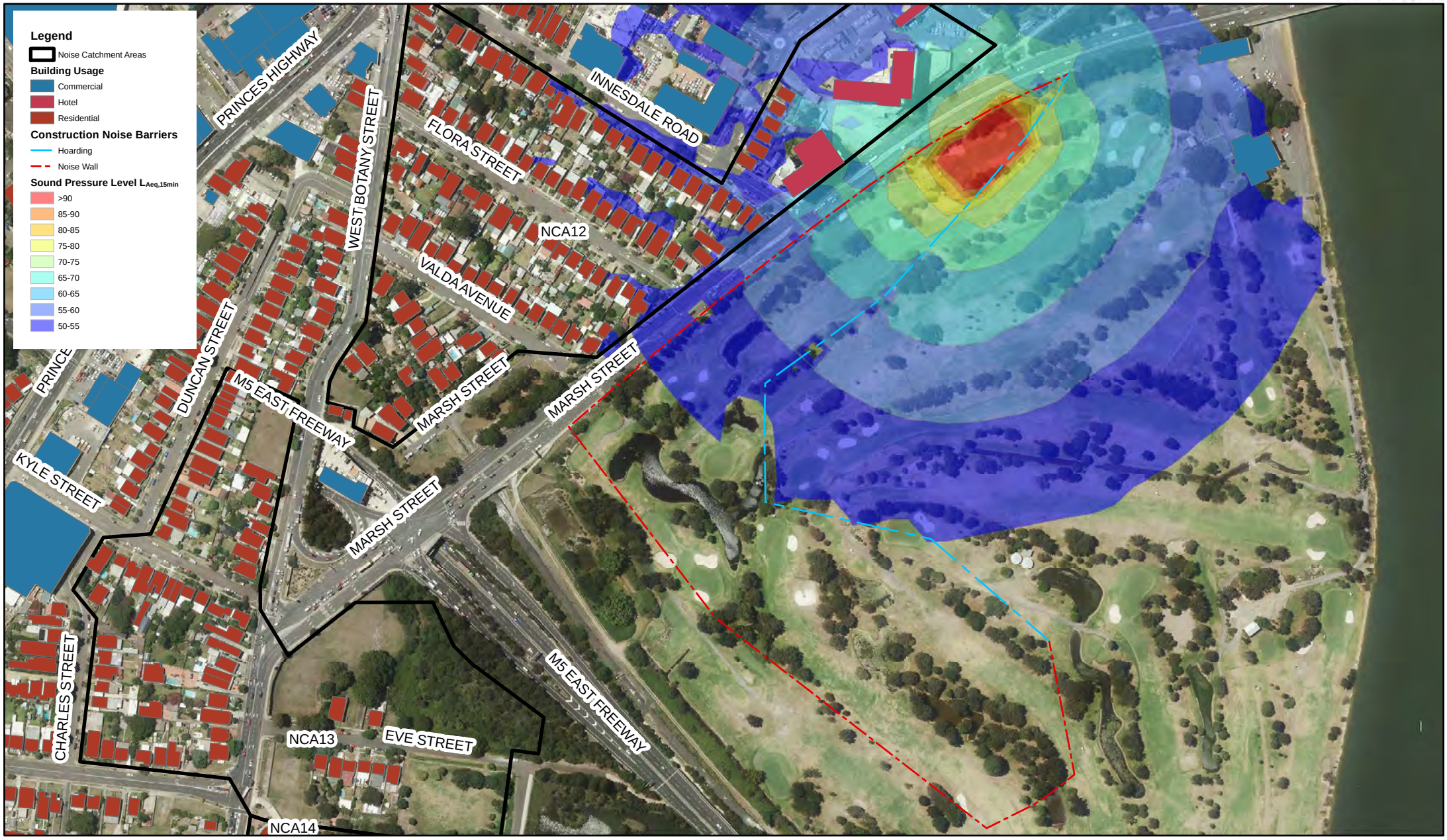
Source: SKM2014

N

0 20 40 80 m

Fig. **12_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Day

OCT 2015

60327128

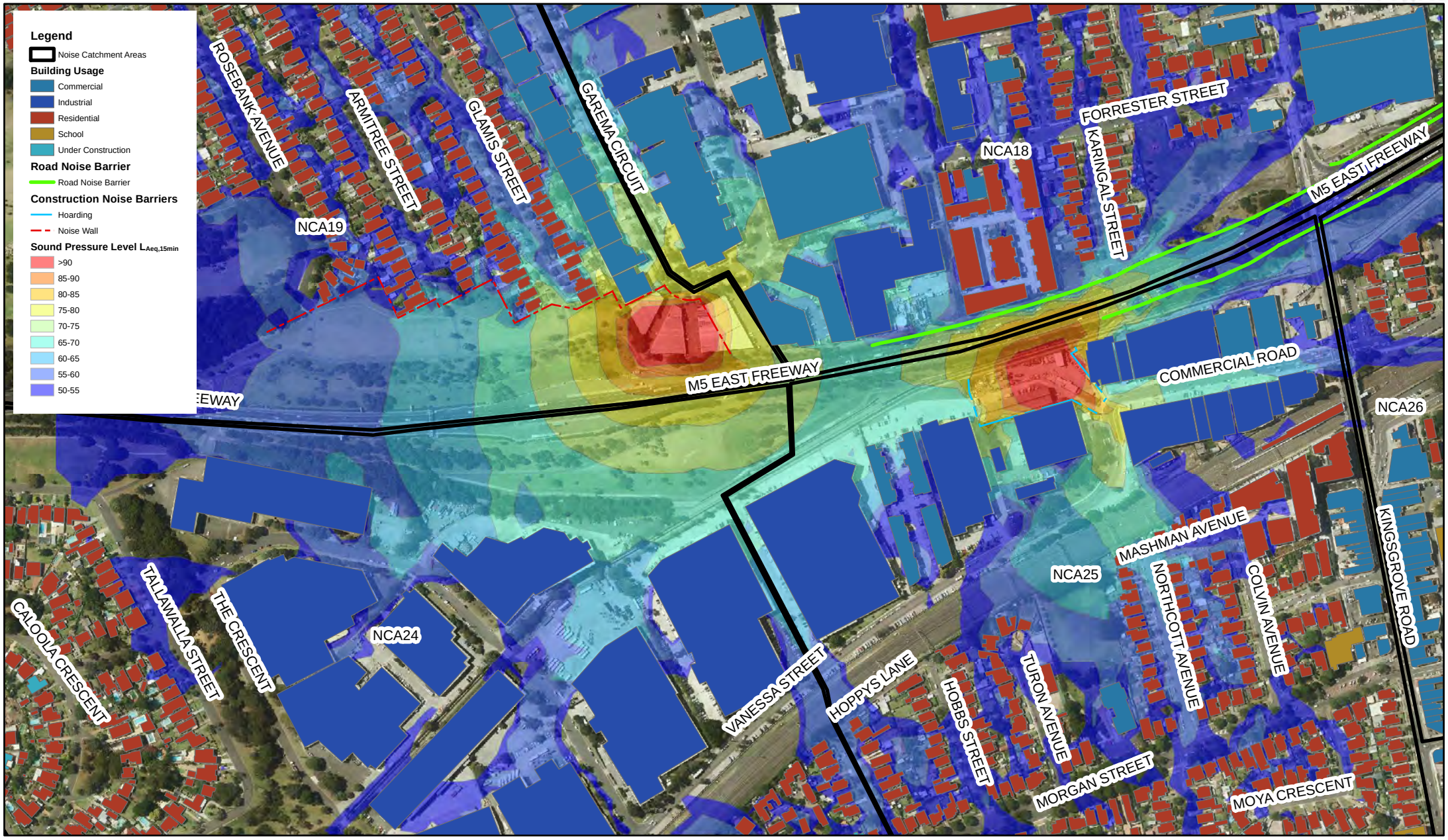
Source: SKM2014

N

0 20 40 80 m

Fig. **12_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

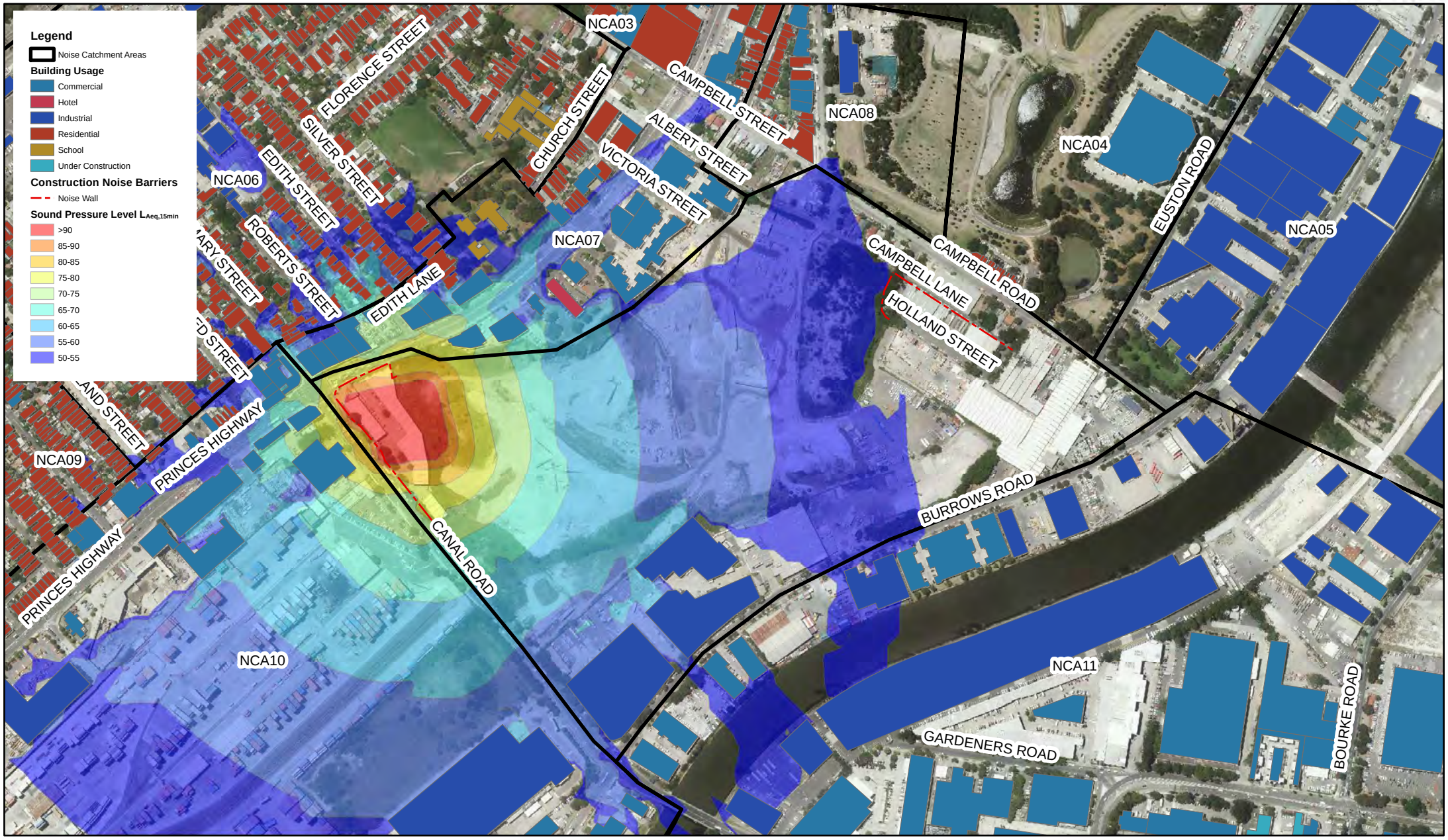
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

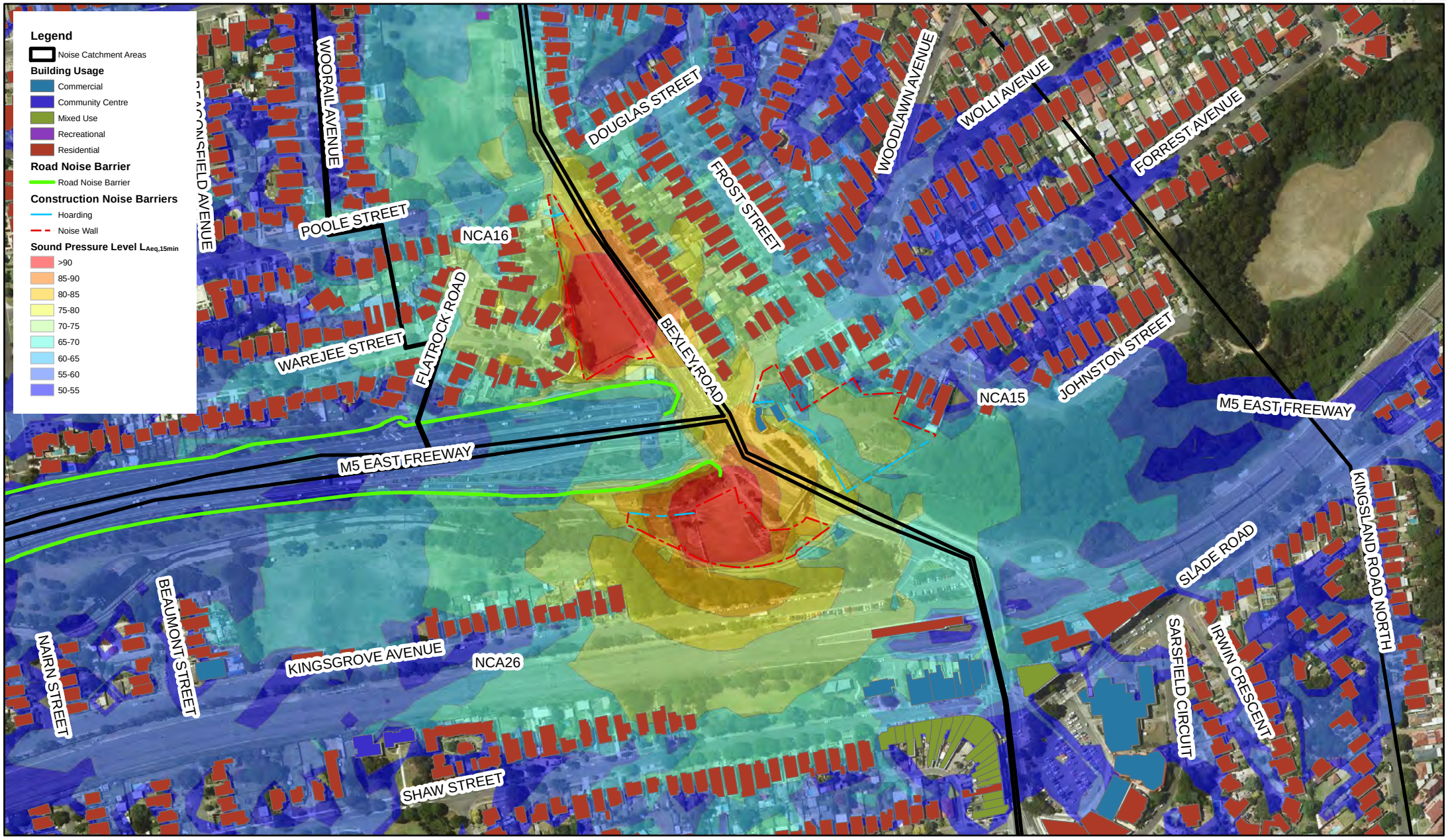
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Day

OCT 2015

60327128

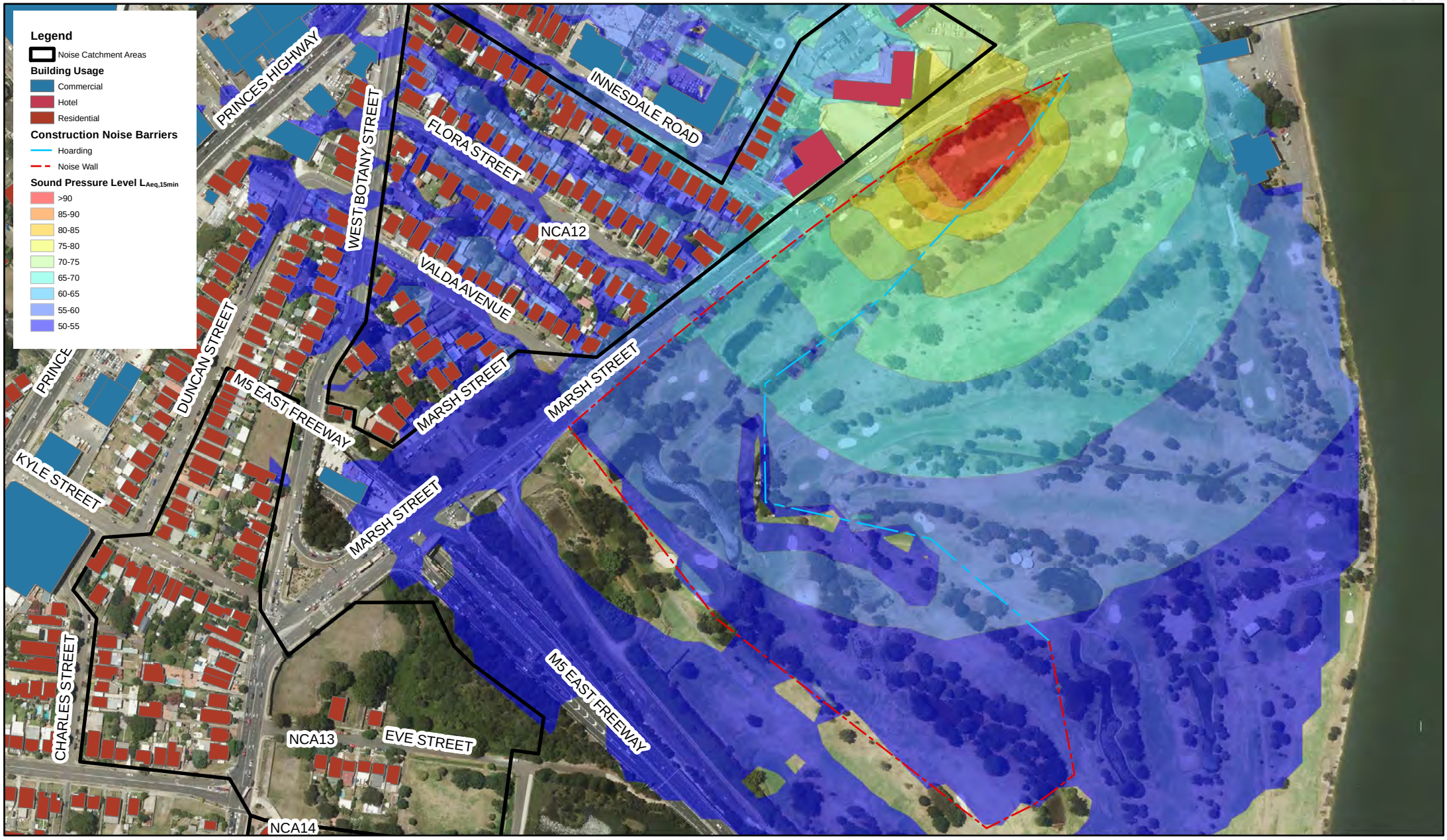
Source: SKM2014

N

0 20 40 80 m

Fig. **12_02a**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Day

OCT 2015

60327128

Source: SKM2014

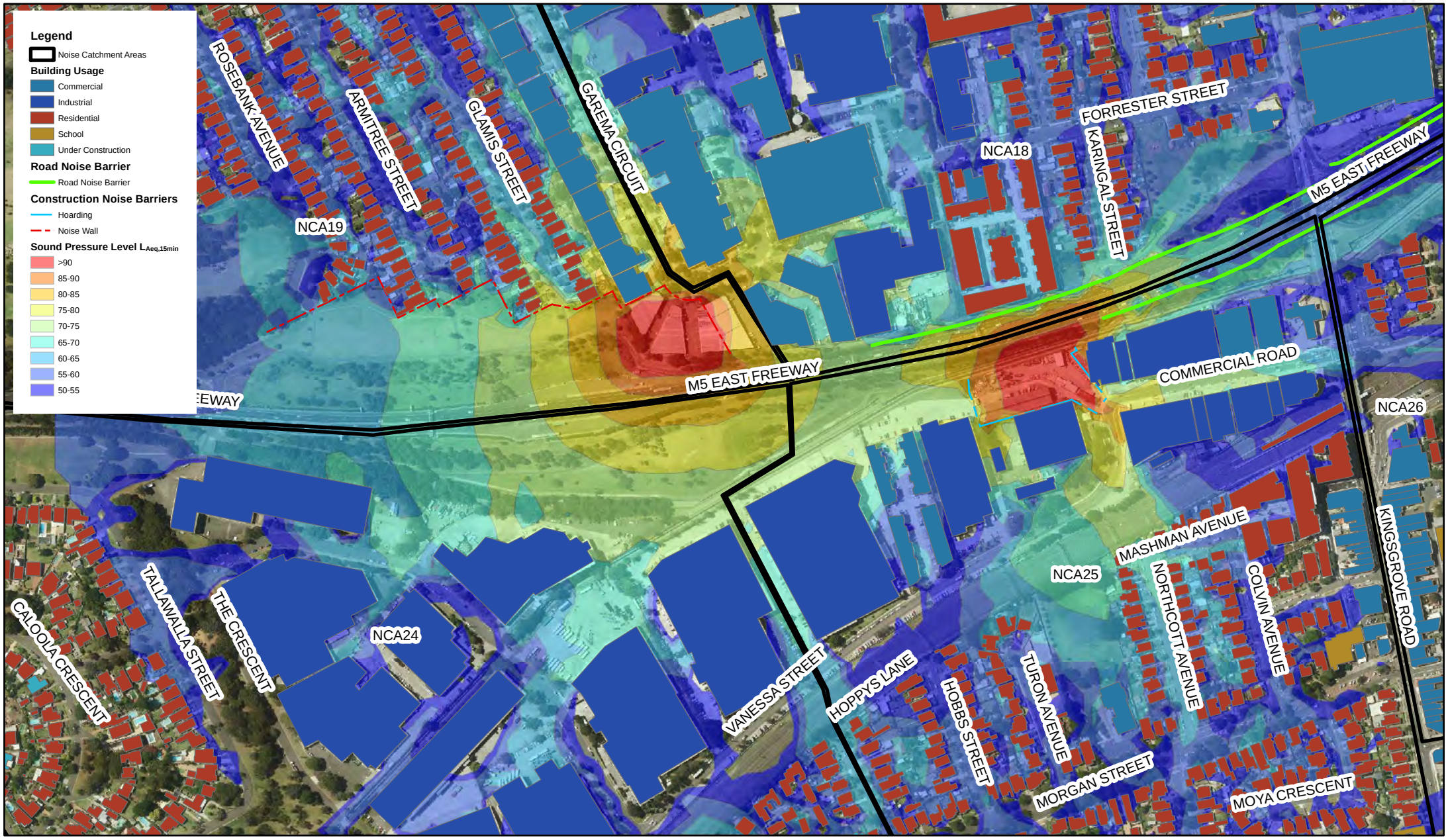
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

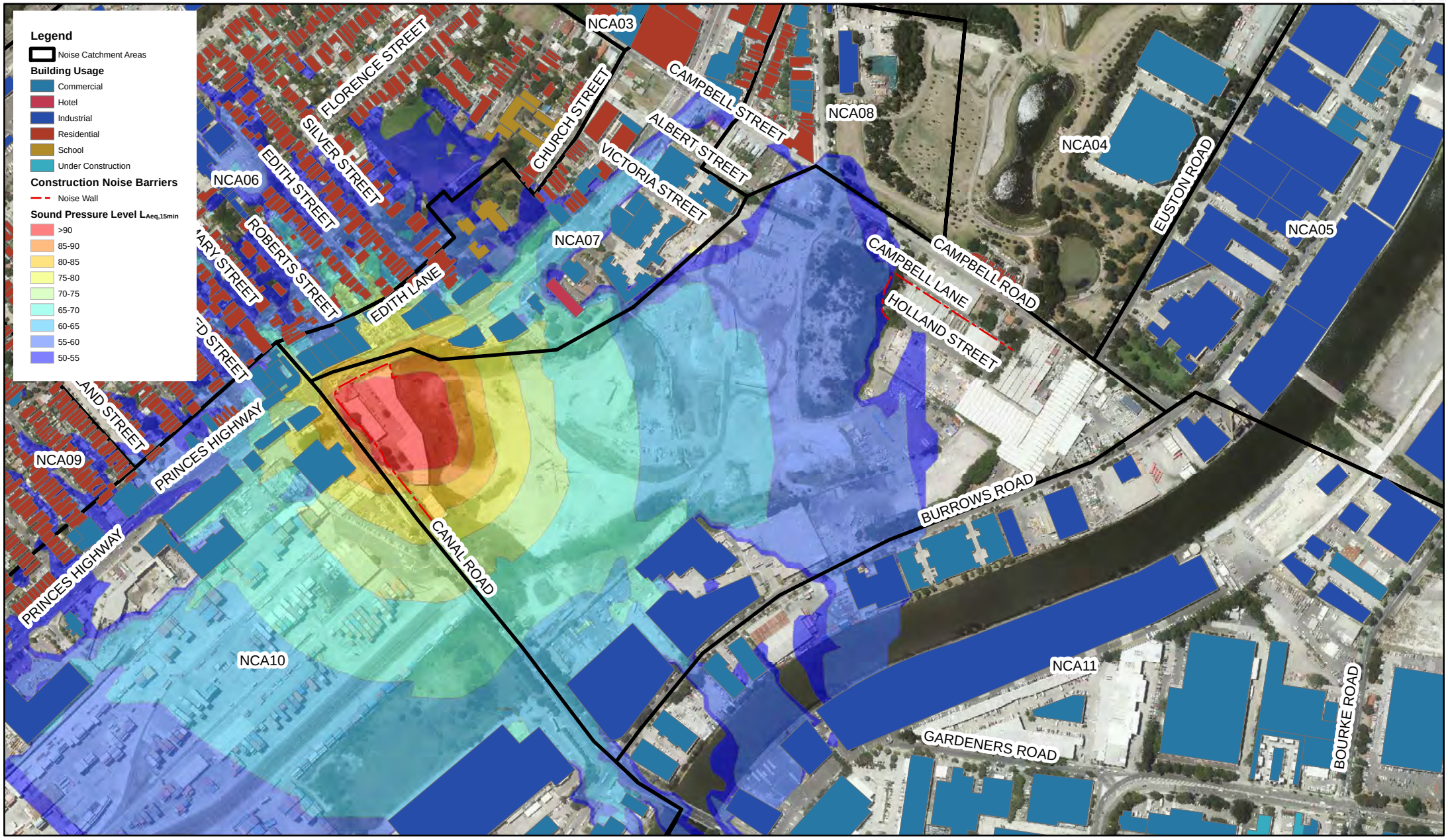
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 25 50 100 m

N

Fig.

12_02b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

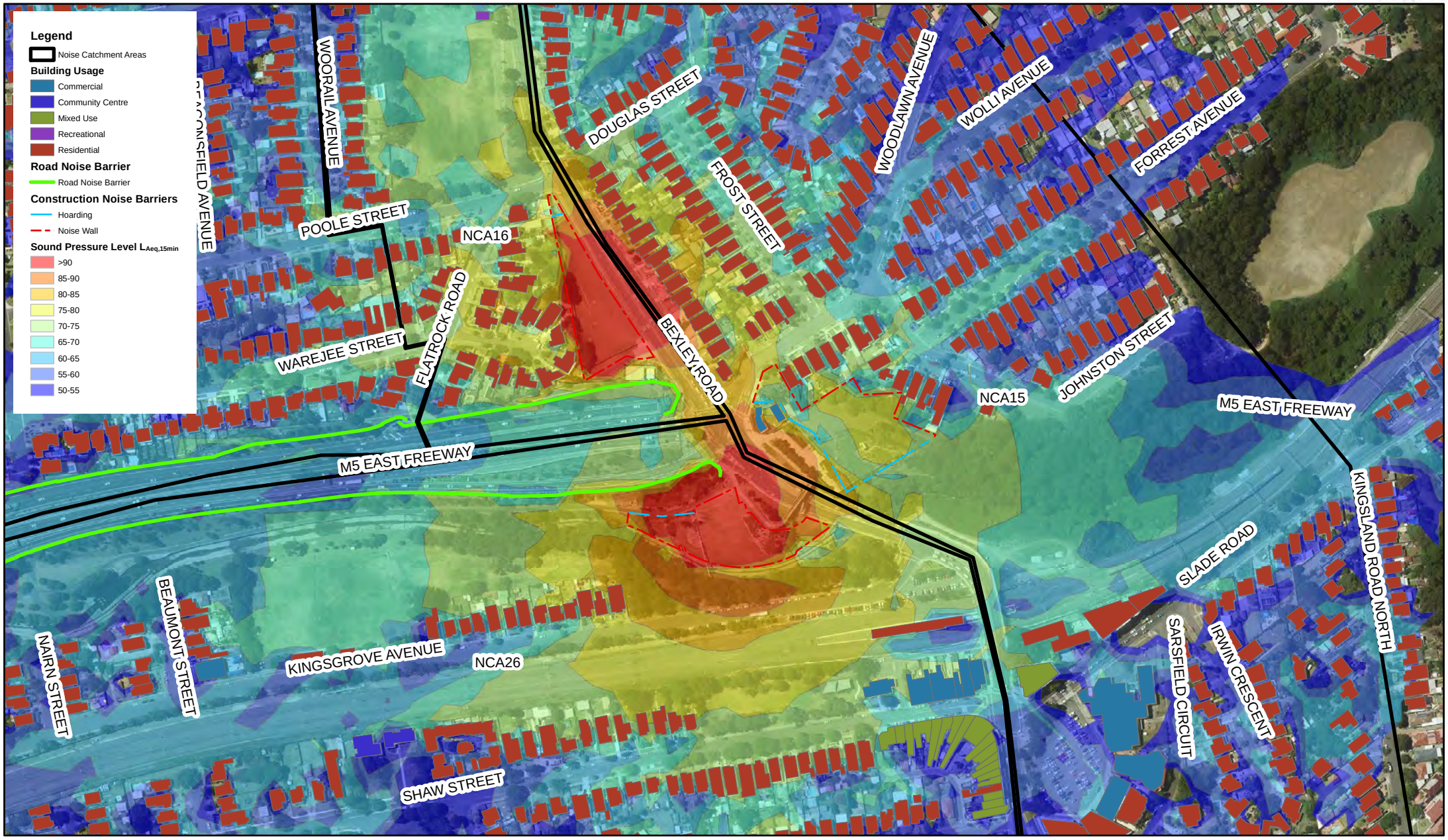
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

12_02b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

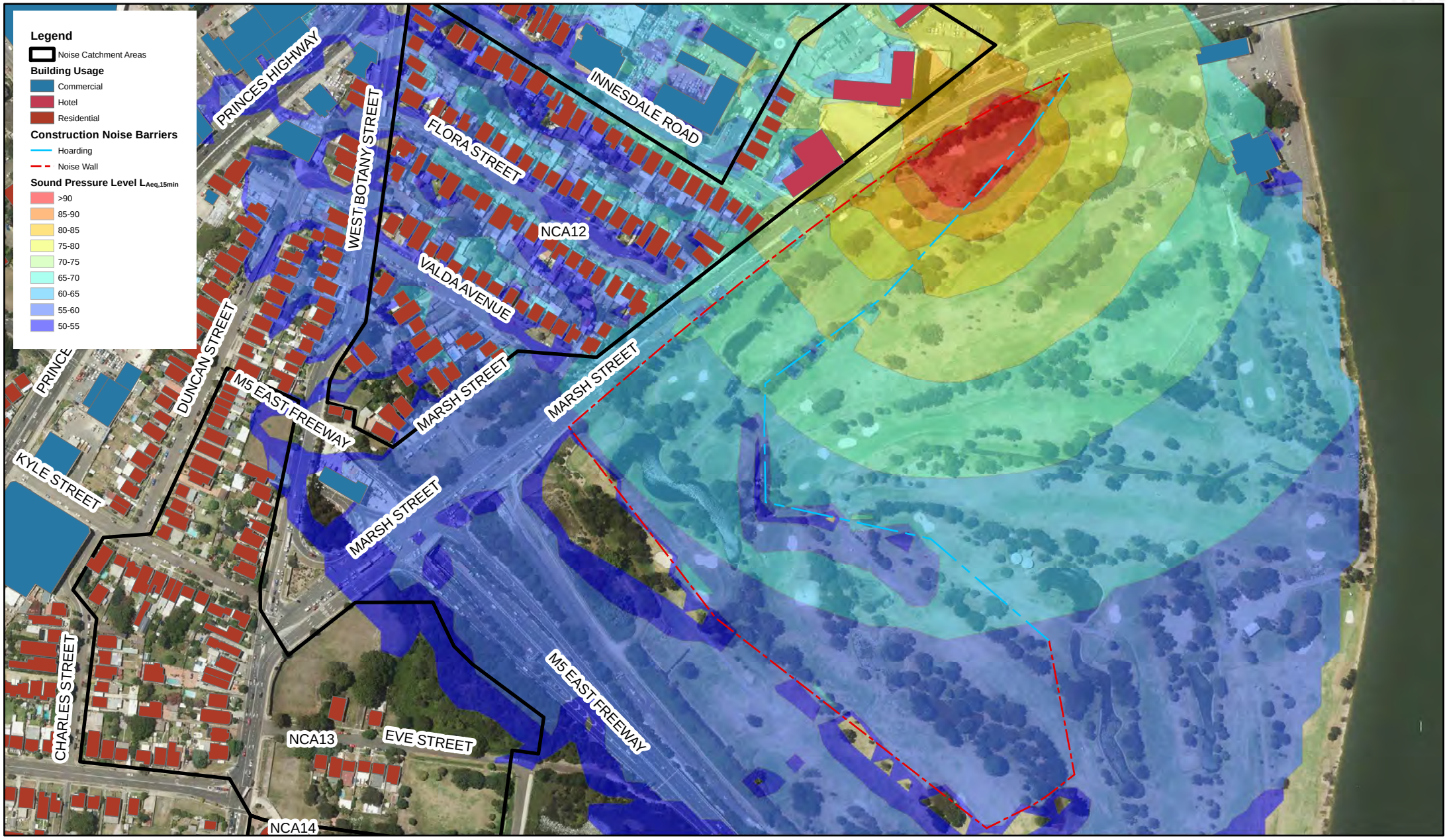
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (Rock hammering only) - Day

OCT 2015

60327128

Source: SKM2014

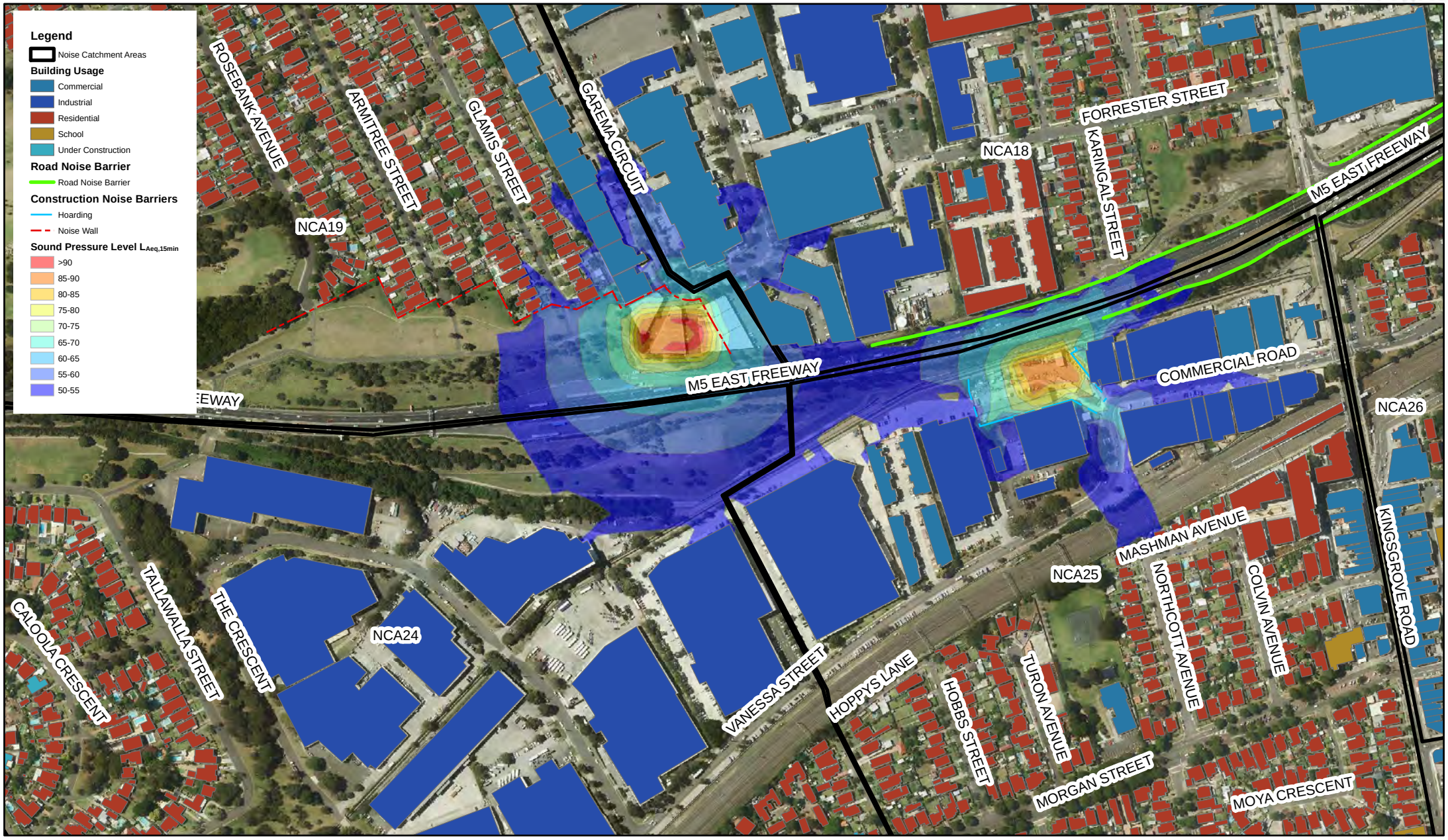
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02b



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support site - Tunneling and support - Day

OCT 2015

60327128

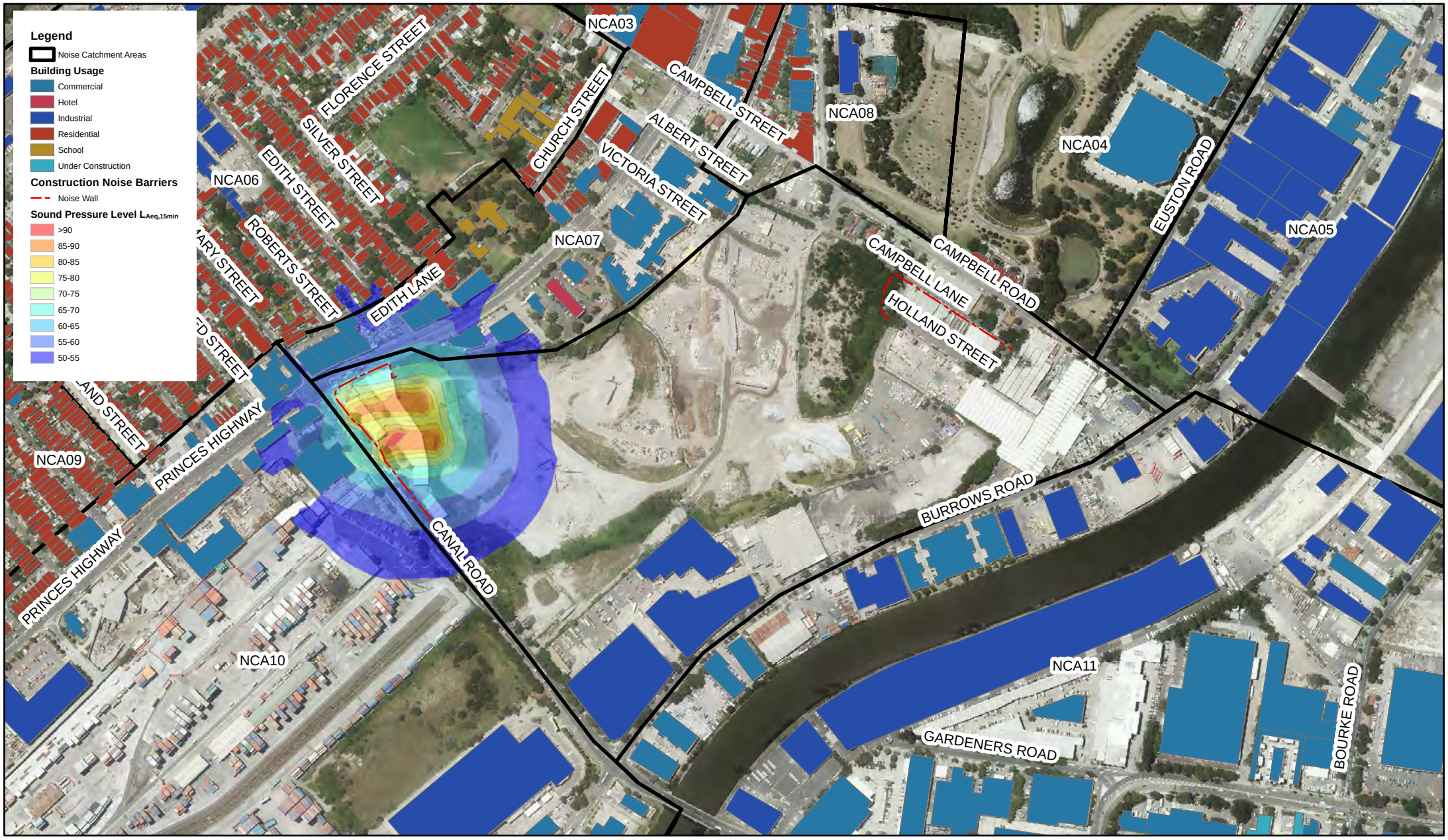
Source: SKM2014

N

0 25 50 100 m

Fig. **13_01**

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support site - Tunneling and support - Day

OCT 2015

60327128

Source: SKM2014

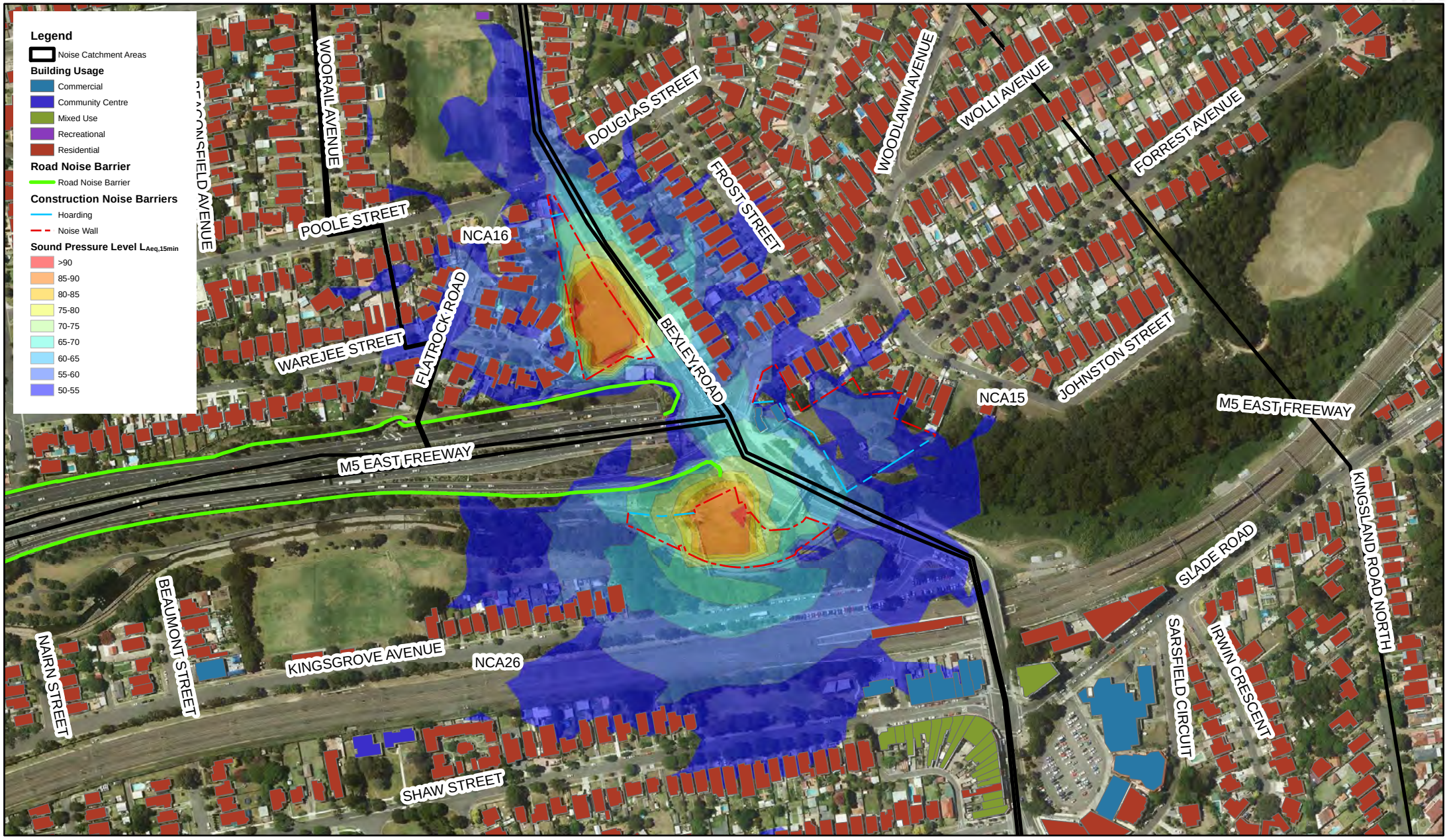
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.

13_01



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support site - Tunneling and support - Day

OCT 2015

60327128

Source: SKM2014

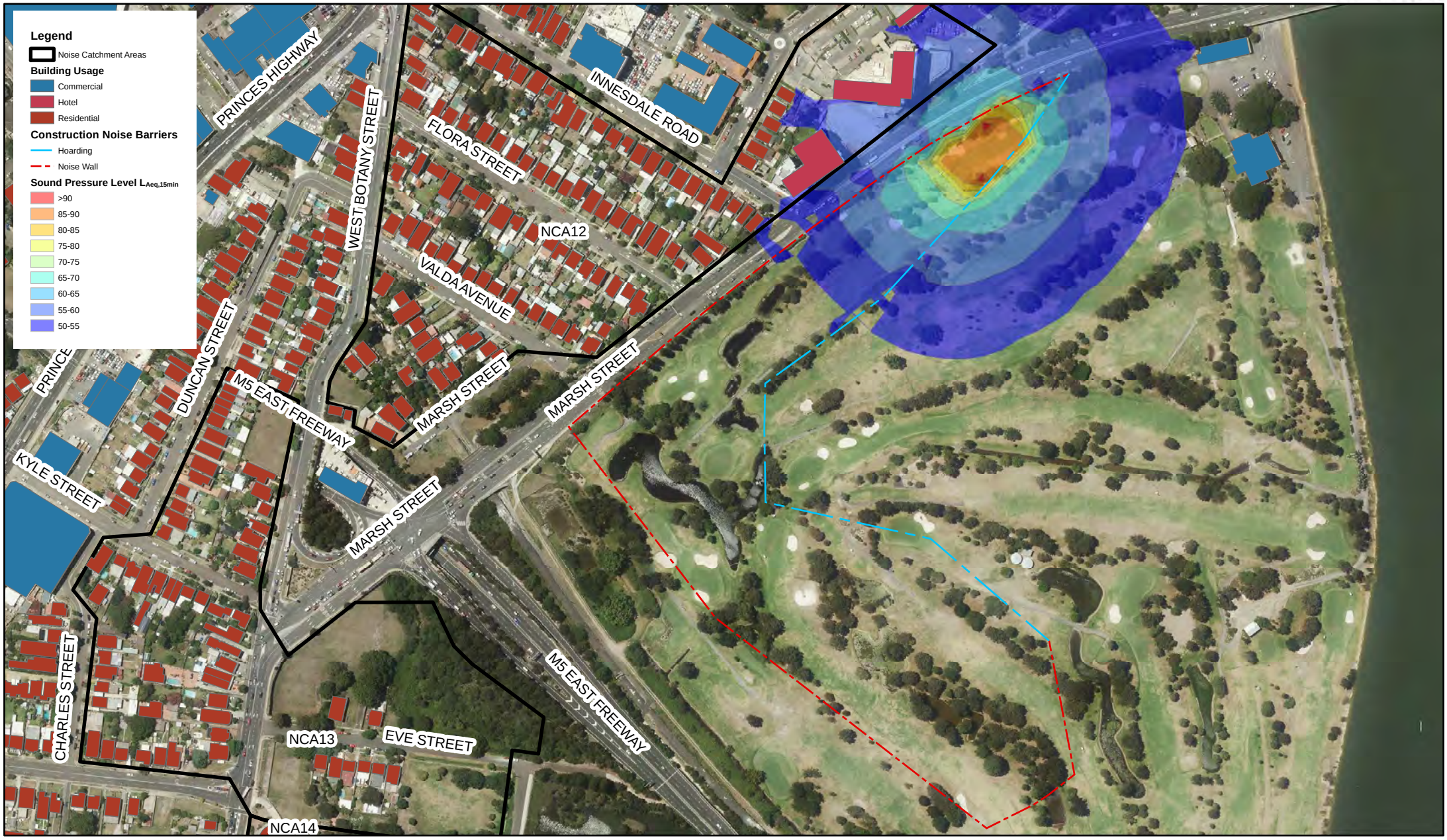
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

13_01



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support site - Tunneling and support - Day

OCT 2015

60327128

Source: SKM2014

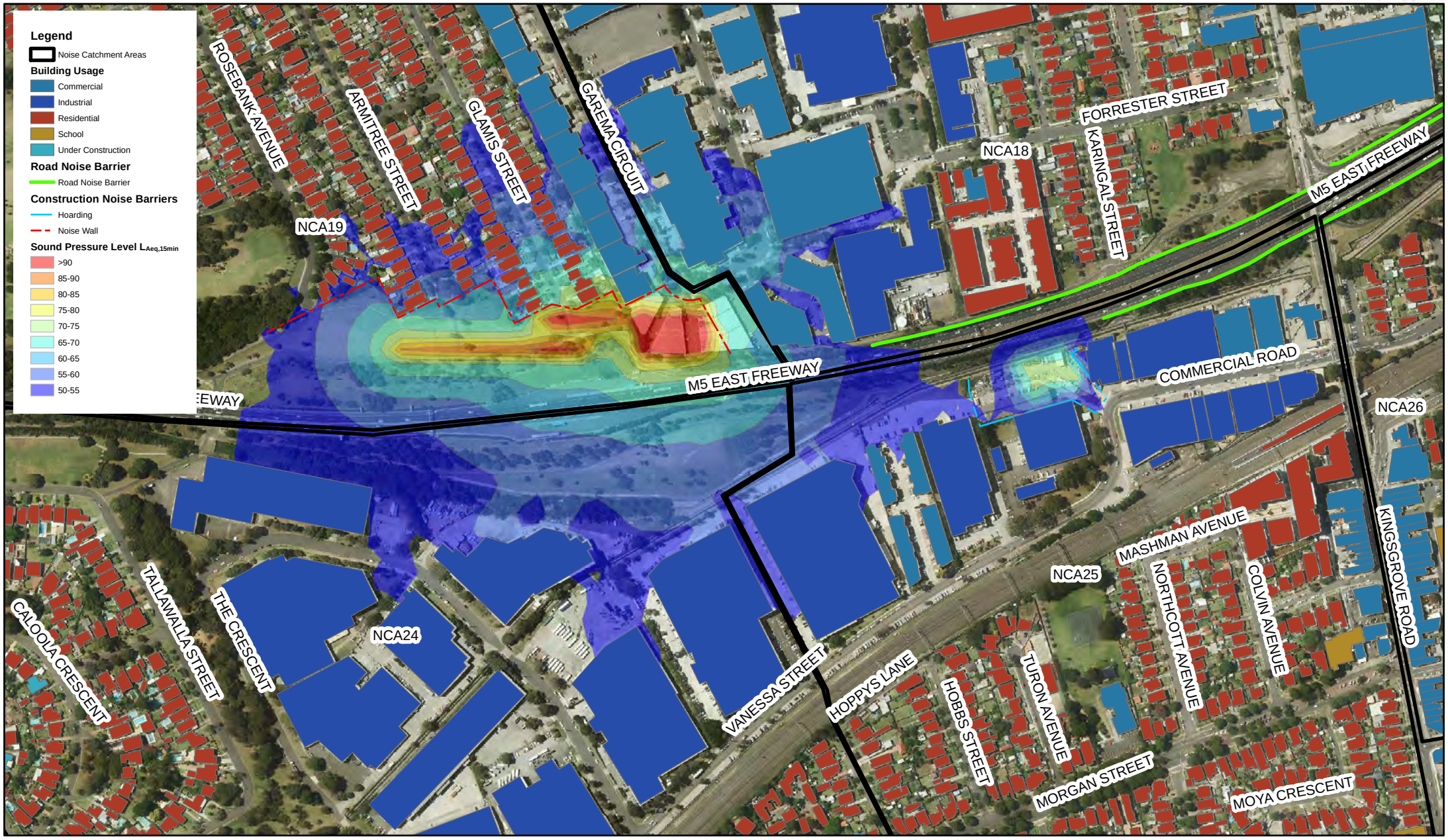
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

13_01



WestConnex Stage 2 - Construction Noise Assessment

Tunnelling works - Tunnelling support site - Spoil handling - Day

OCT 2015

60327128

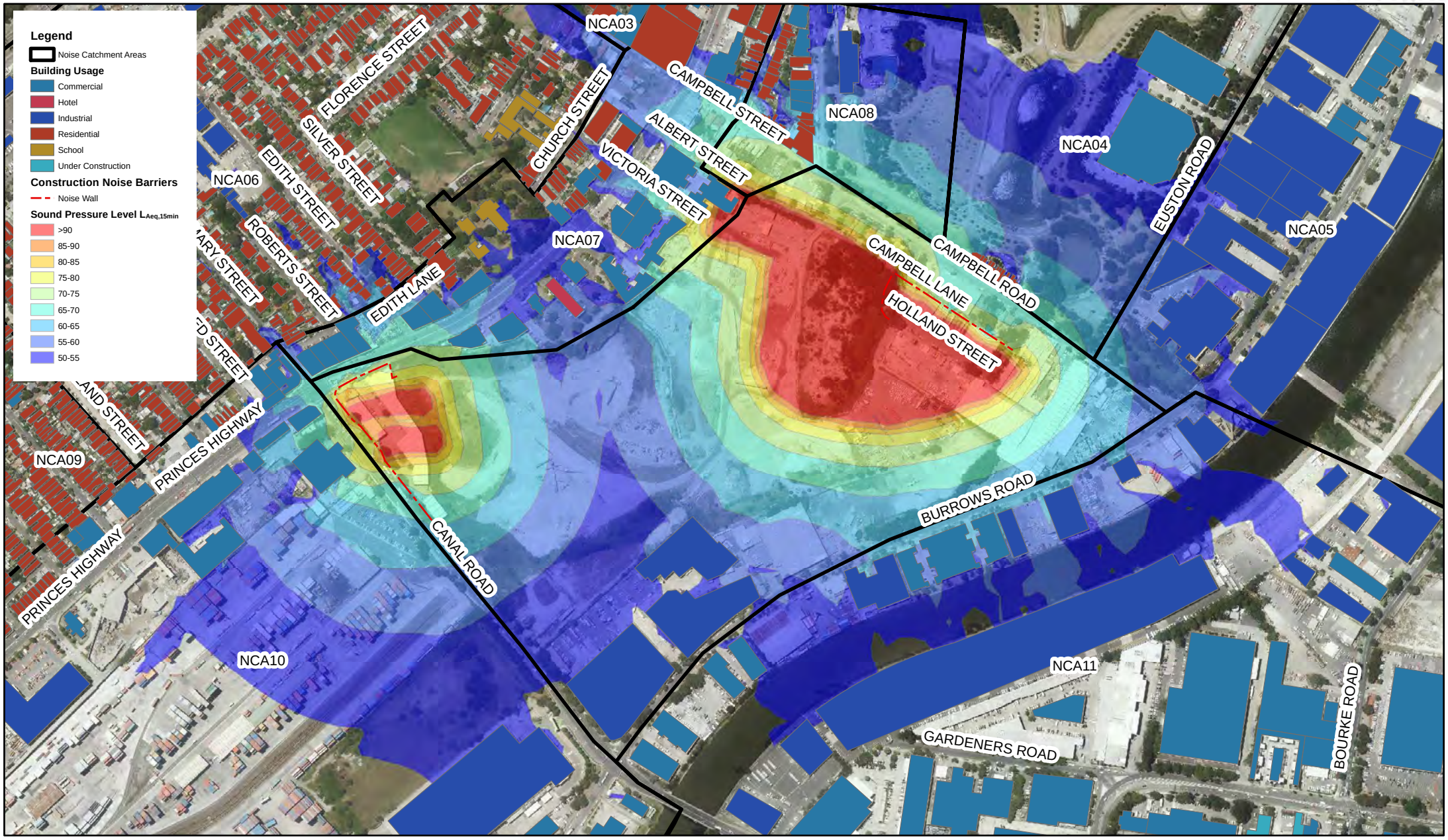
Source: SKM2014

Fig. **13_02**

0 25 50 100 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Day

OCT 2015
60327128

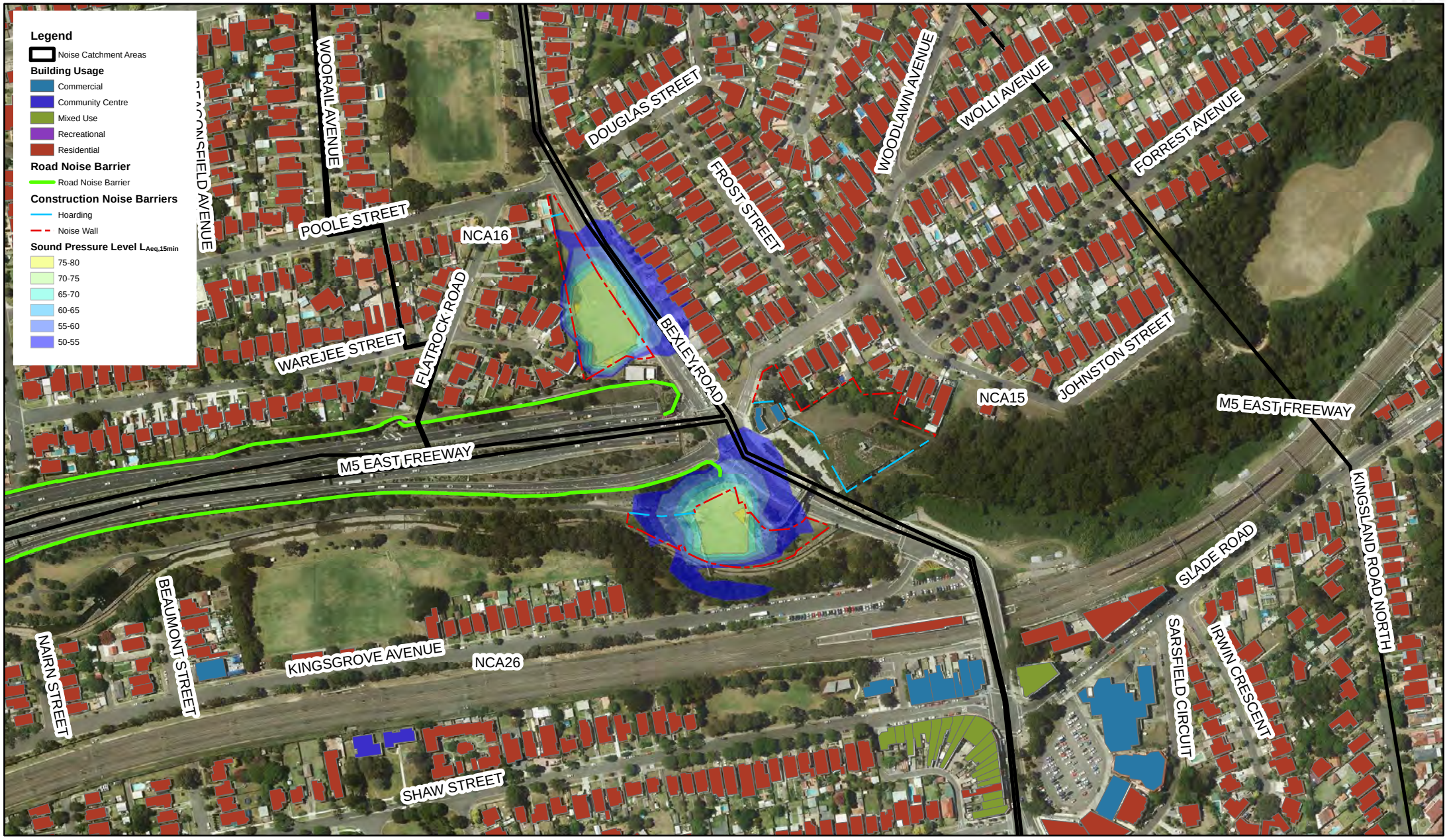
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 30 60 120 m

N

Fig.
13_02



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Day

OCT 2015
60327128

Source: SKM2014

N

0 20 40 80 m

Fig.
13_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Day

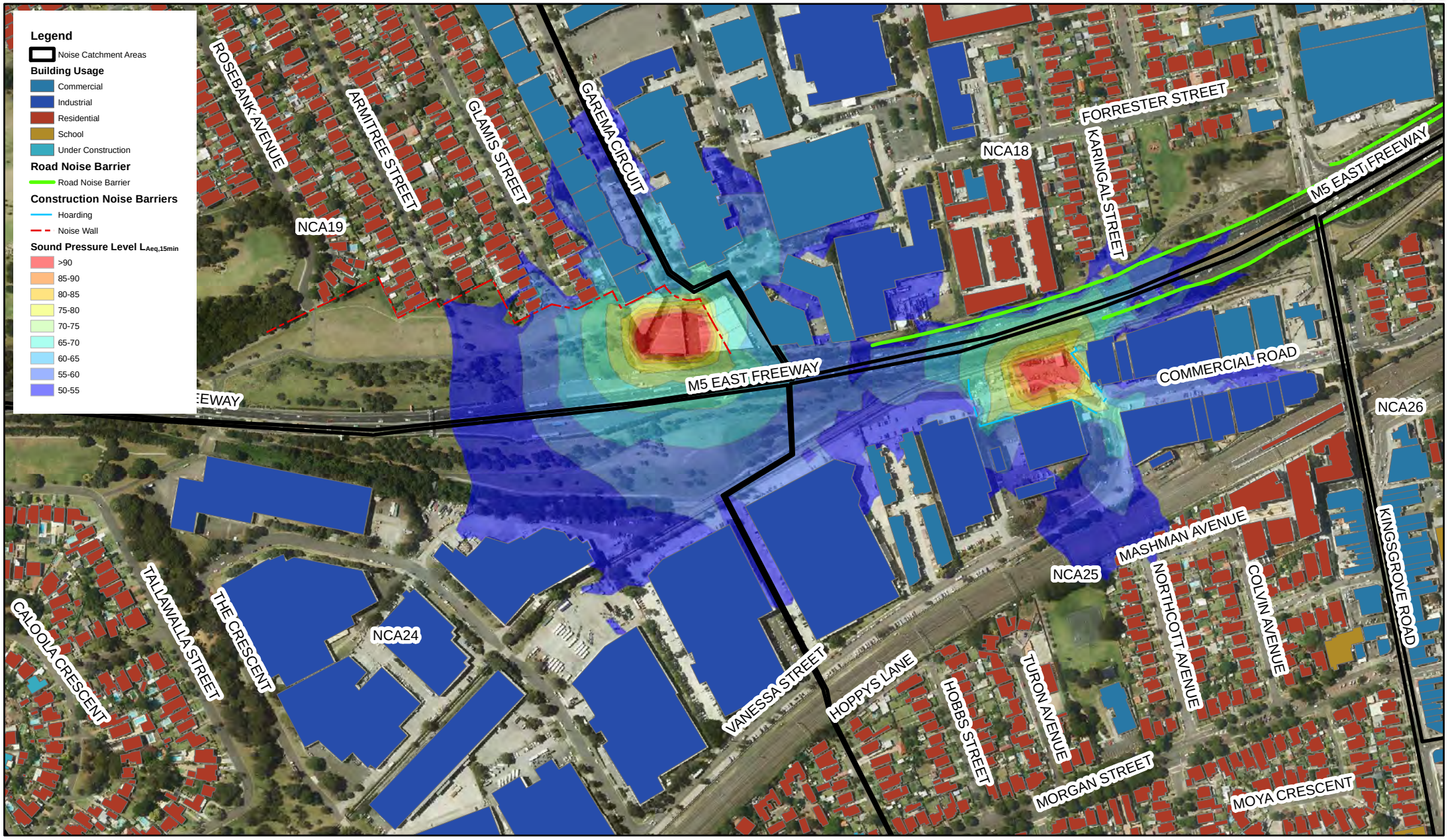
OCT 2015
60327128

Source: SKM2014

Fig. **13_02**

0 20 40 80 m

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Day

OCT 2015
60327128

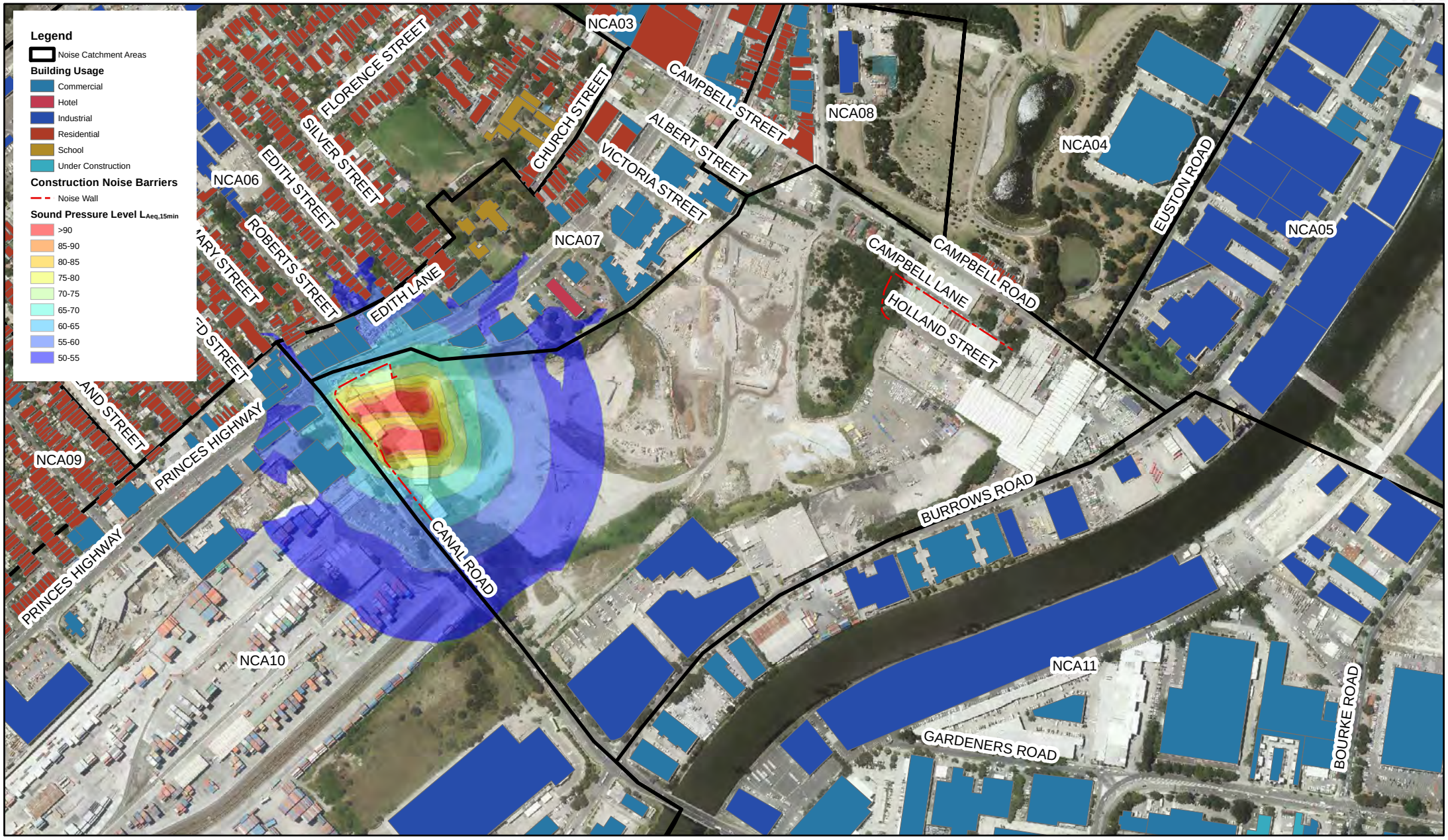
Source: SKM2014

N

0 25 50 100 m

Fig.
13_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Day

OCT 2015
60327128

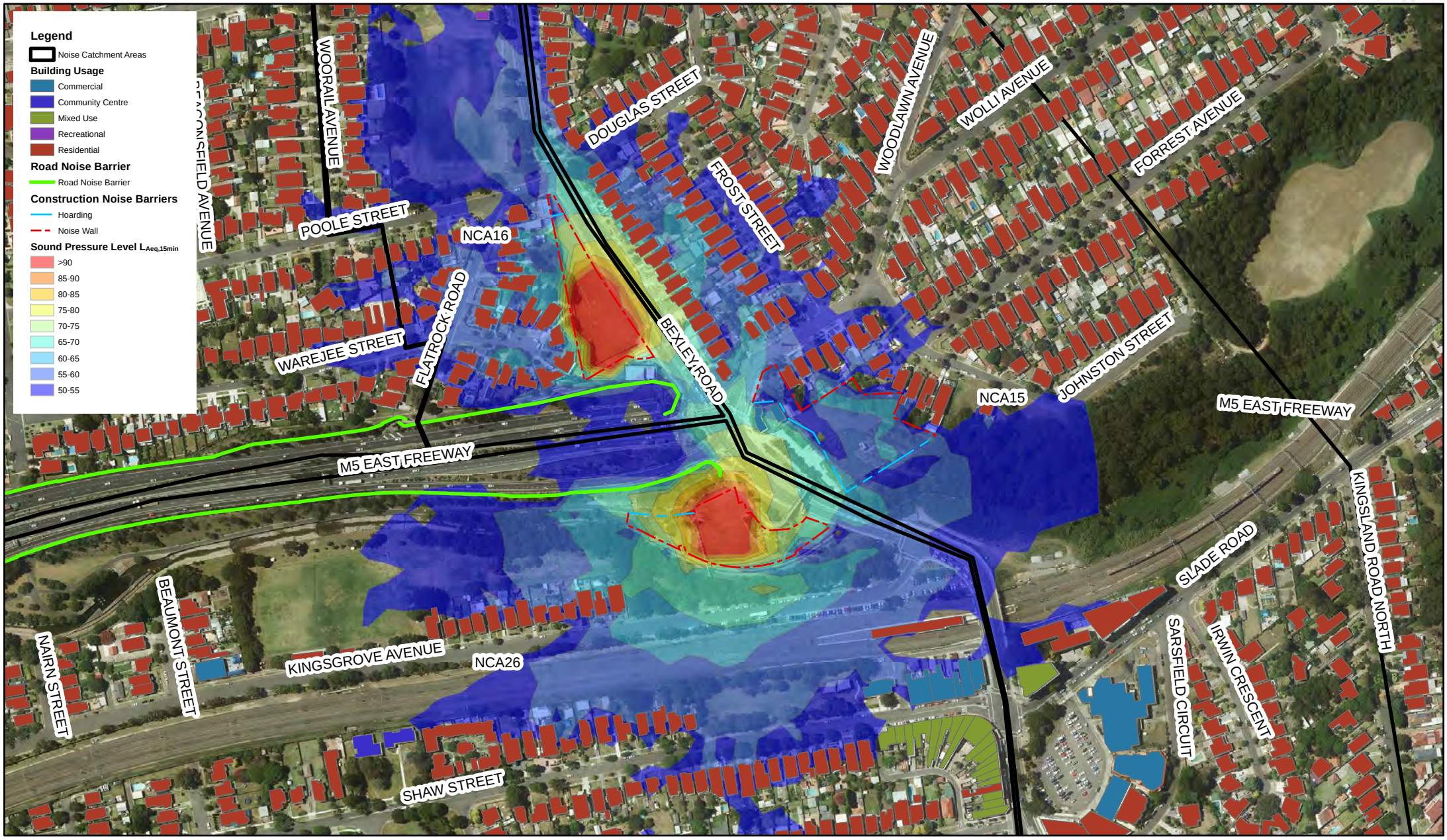
Source: SKM2014

N

0 30 60 120 m

Fig.
13_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Day

OCT 2015
60327128

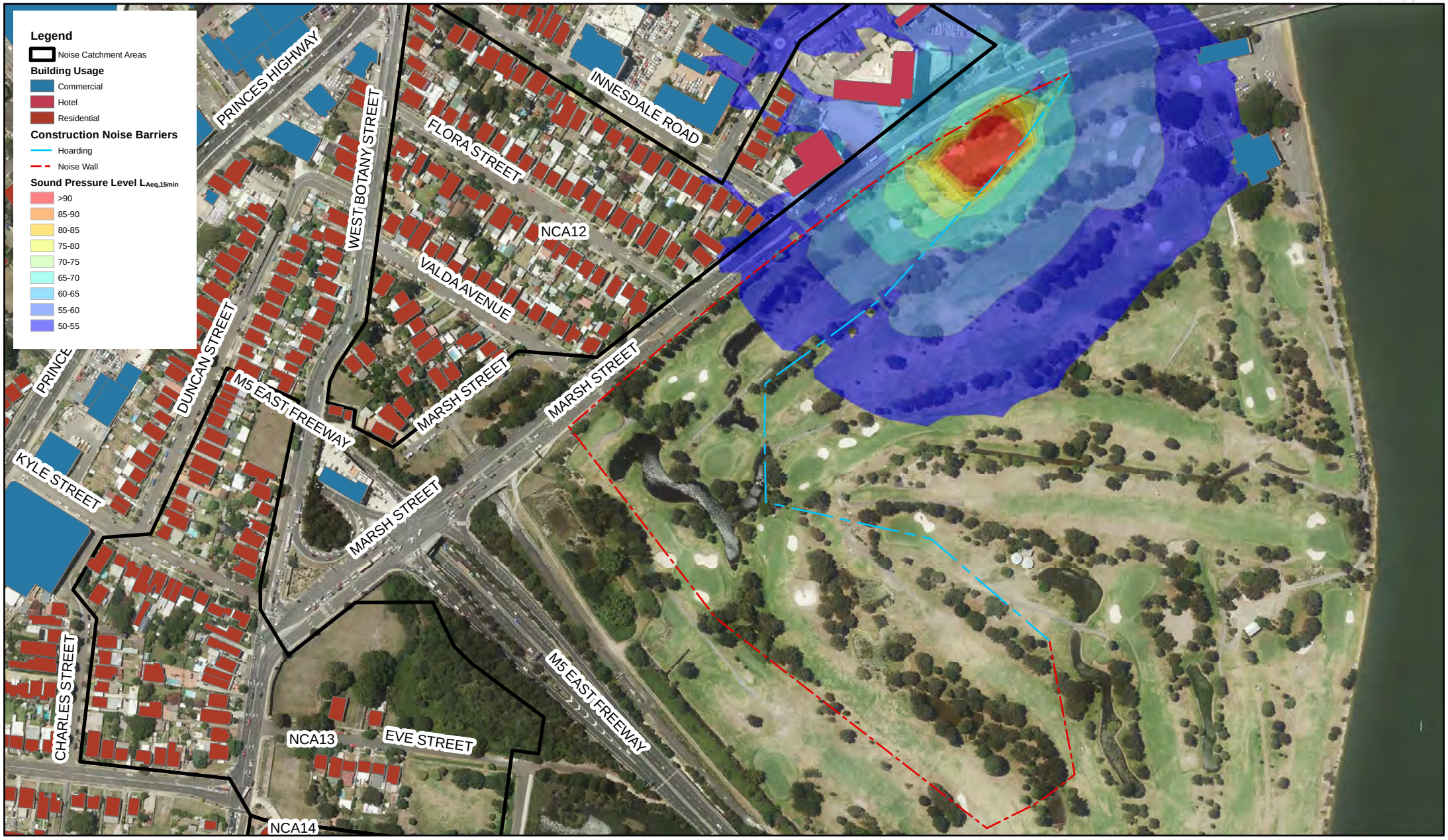
Source: SKM2014

N

0 20 40 80 m

Fig.
13_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Day

OCT 2015
60327128

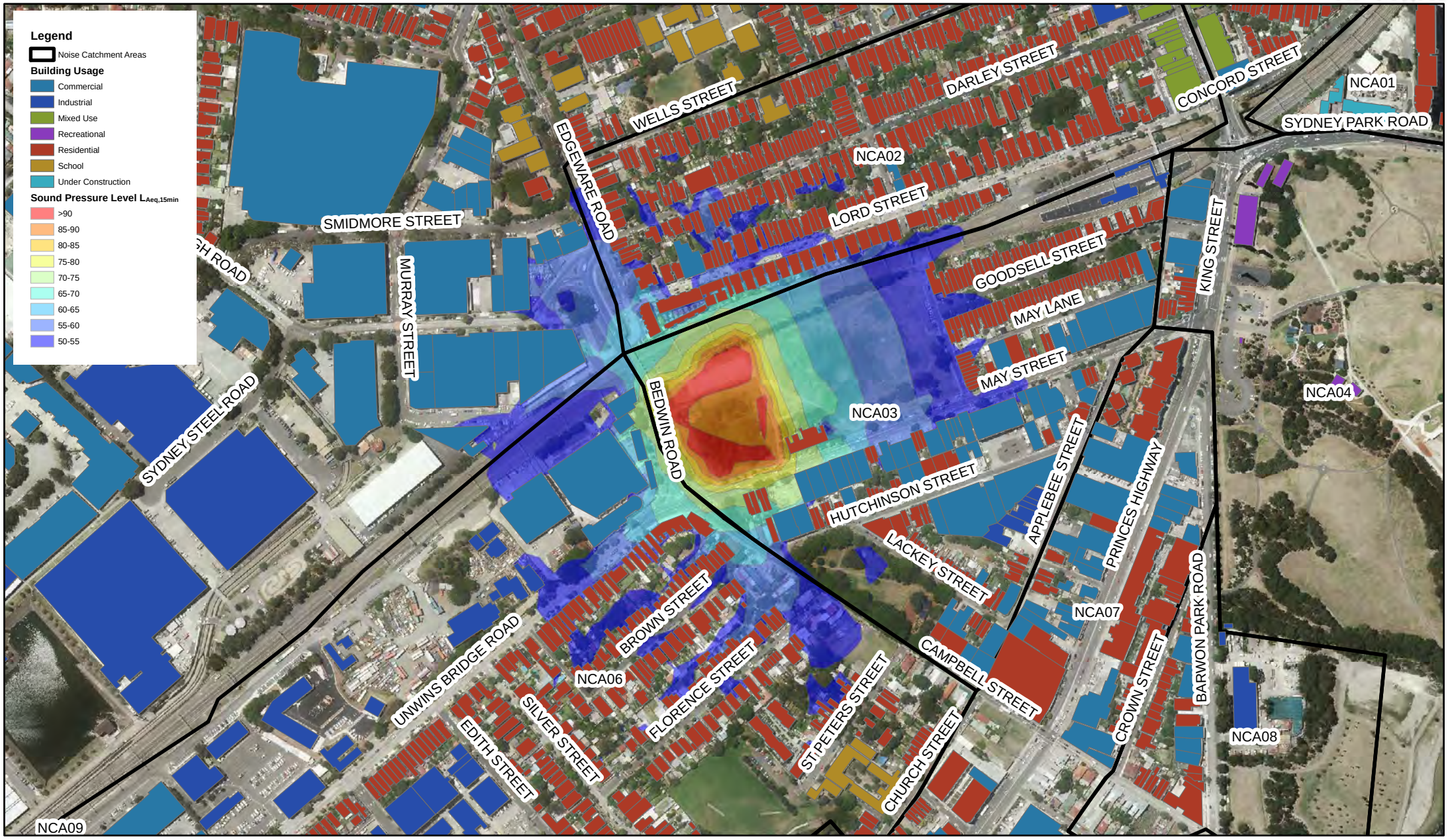
Source: SKM2014

Fig.
13_03

0 20 40 80 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Assessment
Surface works - Camdenville Basin Works - Day

OCT 2015
60327128

Source: SKM2014

N

0 25 50 100 m

Fig.
14_01

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

Appendix H

Construction airborne noise - other sensitive receivers results tables

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Appendix H Construction airborne noise - other sensitive receivers results tables

Surface works - Site establishment

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Installation of environmental controls				
187 Princes Highway St Peters	Church	55	57	2
Demolition of existing structures (Rock hammering only)				
187 Princes Highway St Peters	Church	55	62	7
Crushing and screening				
187 Princes Highway St Peters	Church	55	68	13
178 Princes Highway St Peters	Hotel	70	81	11
Vegetation clearing				
187 Princes Highway St Peters	Church	55	68	13
178 Princes Highway St Peters	Hotel	70	81	11
Establishment of construction facilities				
187 Princes Highway St Peters	Church	55	56	1

Surface works - Construction compound and car park generation operations (C1-C11)

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Workshop; Deliveries; Maintenance Storage				
187 Princes Highway St Peters	Church	55	56	1

Surface works - Construction of portals (cut and cover tunnel)

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Earthworks				
187 Princes Highway St Peters	Church	55	64	9
178 Princes Highway St Peters	Hotel	70	75	5
Road tie-in works				
187 Princes Highway St Peters	Church	55	65	10
178 Princes Highway St Peters	Hotel	70	76	6

Surface works - M5 East Motorway road widening and realignment

Address	Receiver Type	Criteria, L_{Aeq} dB(A)	Noise Level, L_{Aeq} dB(A)	Exceedance, dB(A)
Earthworks (No rock hammering)				
89 Shaw Street Kingsgrove	School	55	56	1
2 Yarallah Place Beverly Hills	Community Centre	55	57	2
70 Ponyara Road Beverly Hills	School	55	59	4
405 King Georges Road Beverly Hills	School	55	57	2
3 Shorter Avenue Beverly Hills	School	55	63	8
Earthworks (Rock hammering only)				
4 Morgan Street Kingsgrove	School	55	67	12
89 Shaw Street Kingsgrove	School	55	68	13
70 Ponyara Road Beverly Hills	School	55	71	16
2 Yarallah Place Beverly Hills	Community Centre	55	70	15
19 Warrawee Place Beverly Hills	School	55	67	12

Address	Receiver Type	Criteria, L_{Aeq} dB(A)	Noise Level, L_{Aeq} dB(A)	Exceedance, dB(A)
9-11 Warrawee Place Beverly Hills	Church	55	61	6
405 King Georges Road Beverly Hills	School	55	70	15
85 Penshurst Road Narwee	Child Care	55	85	30
3 Shorter Avenue Beverly Hills	School	55	77	22
34 Shorter Avenue Narwee	Church	55	77	22
Road tie-in works				
70 Ponyara Road Beverly Hills	School	55	56	1
3 Shorter Avenue Beverly Hills	School	55	60	5

Surface works - Construction of SPI

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Piling; ground improvement				
Church Street St Peters	School	55	56	1
187 Princes Highway St Peters	Church	55	62	7
178 Princes Highway St Peters	Hotel	70	75	5
Earthworks (No Rock hammering)				
Church Street St Peters	School	55	59	4
187 Princes Highway St Peters	Church	55	65	10
178 Princes Highway St Peters	Hotel	70	79	9
Earthworks (Rock hammering only)				
Church Street St Peters	School	55	70	15
187 Princes Highway St Peters	Church	55	76	21
178 Princes Highway St Peters	Hotel	70	90	20
Road tie-in works				
Church Street St Peters	School	55	65	10
187 Princes Highway St Peters	Church	55	72	17
178 Princes Highway St Peters	Hotel	70	85	15

Surface works - Construction of ventilation facilities

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Construction of ventilation facilitys				
187 Princes Highway St Peters	Church	55	72	17
178 Princes Highway St Peters	Hotel	70	80	10
26 Marsh Street Wolli Creek	Hotel	70	83	13

Surface works - Local road works including construction of the Alexandra Canal Bridge

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Demolition of existing structures (No Rock hammering)				
Church Street St Peters	School	55	64	9
Demolition of existing structures (Rock hammering only)				
Church Street St Peters	School	55	84	29
187 Princes Highway St Peters	Church	55	69	14
Earthworks (No Rock hammering)				
Church Street St Peters	School	55	77	22
187 Princes Highway St Peters	Church	55	60	5

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Earthworks (Rock hammering only)				
Church Street St Peters	School	55	87	32
187 Princes Highway St Peters	Church	55	70	15
Road tie-in works				
178 Princes Highway St Peters	Hotel	70	92	22
Church Street St Peters	School	55	72	17
187 Princes Highway St Peters	Church	55	78	23
Kerbing and drainage				
408 Sydney Park Road Alexandria	Recreational	60	73	13
178 Princes Highway St Peters	Hotel	70	75	5
Church Street St Peters	School	55	82	27
187 Princes Highway St Peters	Church	55	71	16
Pedestrian bridges to Campbell Rd				
187 Princes Highway St Peters	Church	55	62	7

Surface works - General utility installation and relocation

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Service installation and relocation				
178 Princes Highway St Peters	Hotel	70	85	15
Church Street St Peters	School	55	65	10
187 Princes Highway St Peters	Church	55	71	16

Tunnelling works - Site establishment

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Demolition of existing structures (Rock hammering only)				
187 Princes Highway St Peters	Church	55	73	18
178 Princes Highway St Peters	Hotel	70	81	11
26 Marsh Street Wolli Creek	Hotel	70	83	13

Tunnelling works - Construction compound and car park generation operations

Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Maintenance storage; Workshop deliveries				
187 Princes Highway St Peters	Church	55	57	2

Tunnelling works - Tunnelling support establishment

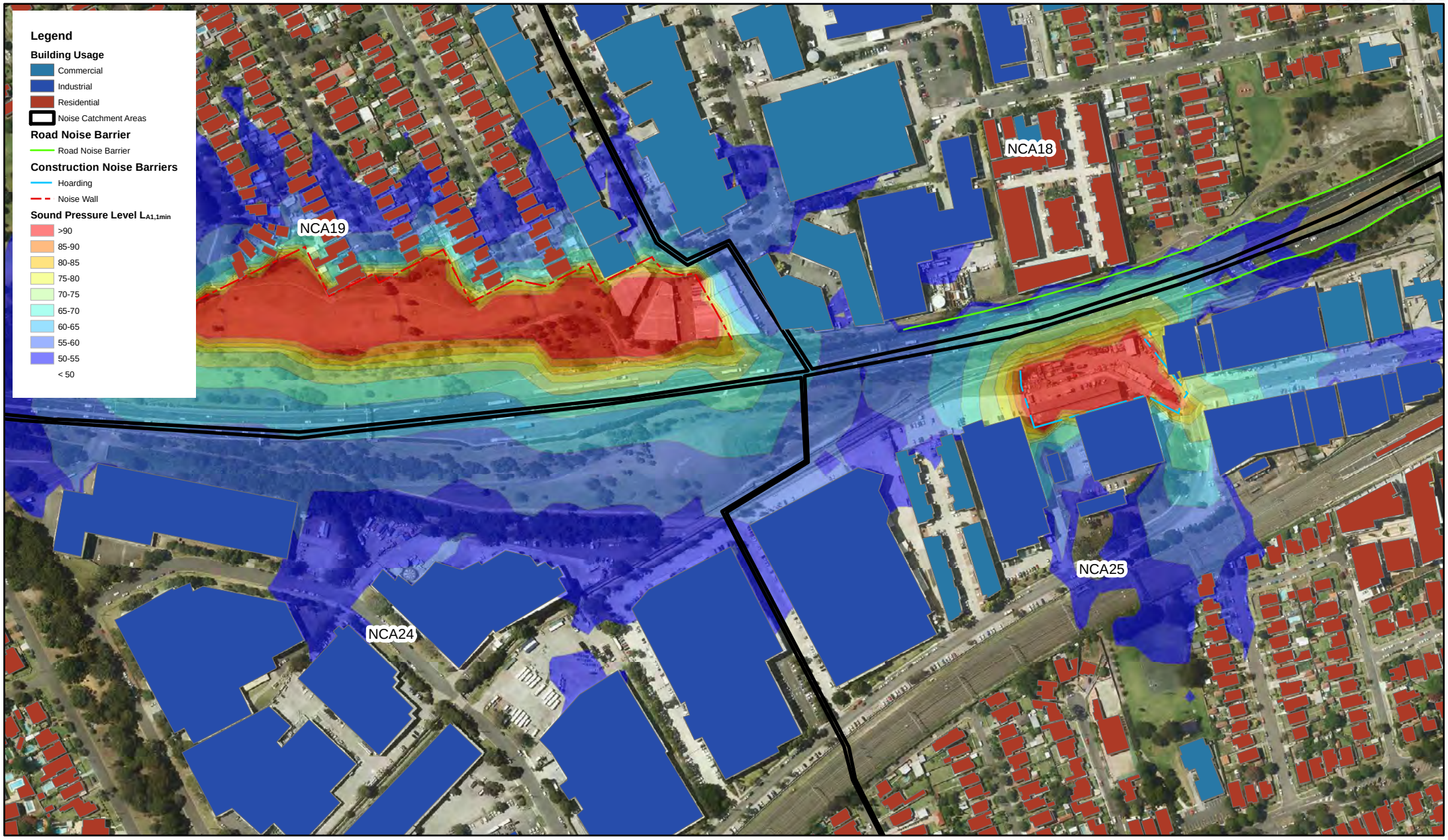
Address	Receiver Type	Criteria, dB(A)	Noise Level, dB(A)	Exceedance
Decline excavation and construction (No rock hammering)				
26 Marsh Street Wolli Creek	Hotel	70	73	3
Decline excavation and construction (Rock hammering only)				
187 Princes Highway St Peters	Church	55	58	3
26 Marsh Street Wolli Creek	Hotel	70	78	8

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Appendix I

Construction airborne noise L_{A1} maps

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WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Site establishment - Power Generator - Night

SEP 2015

60327128

Source: SKM2014

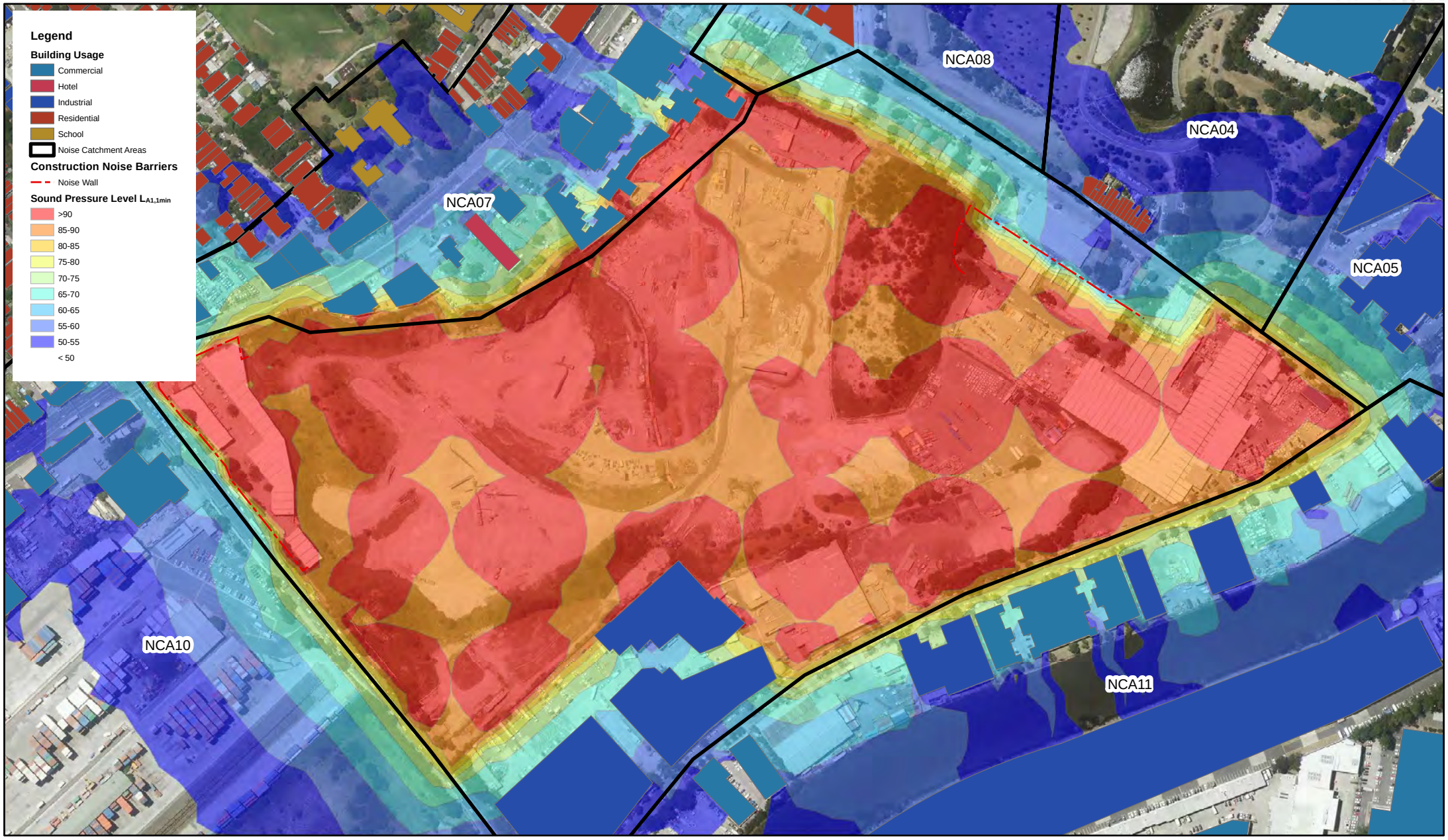
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

01_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Site establishment - Power Generator - Night

SEP 2015
60327128

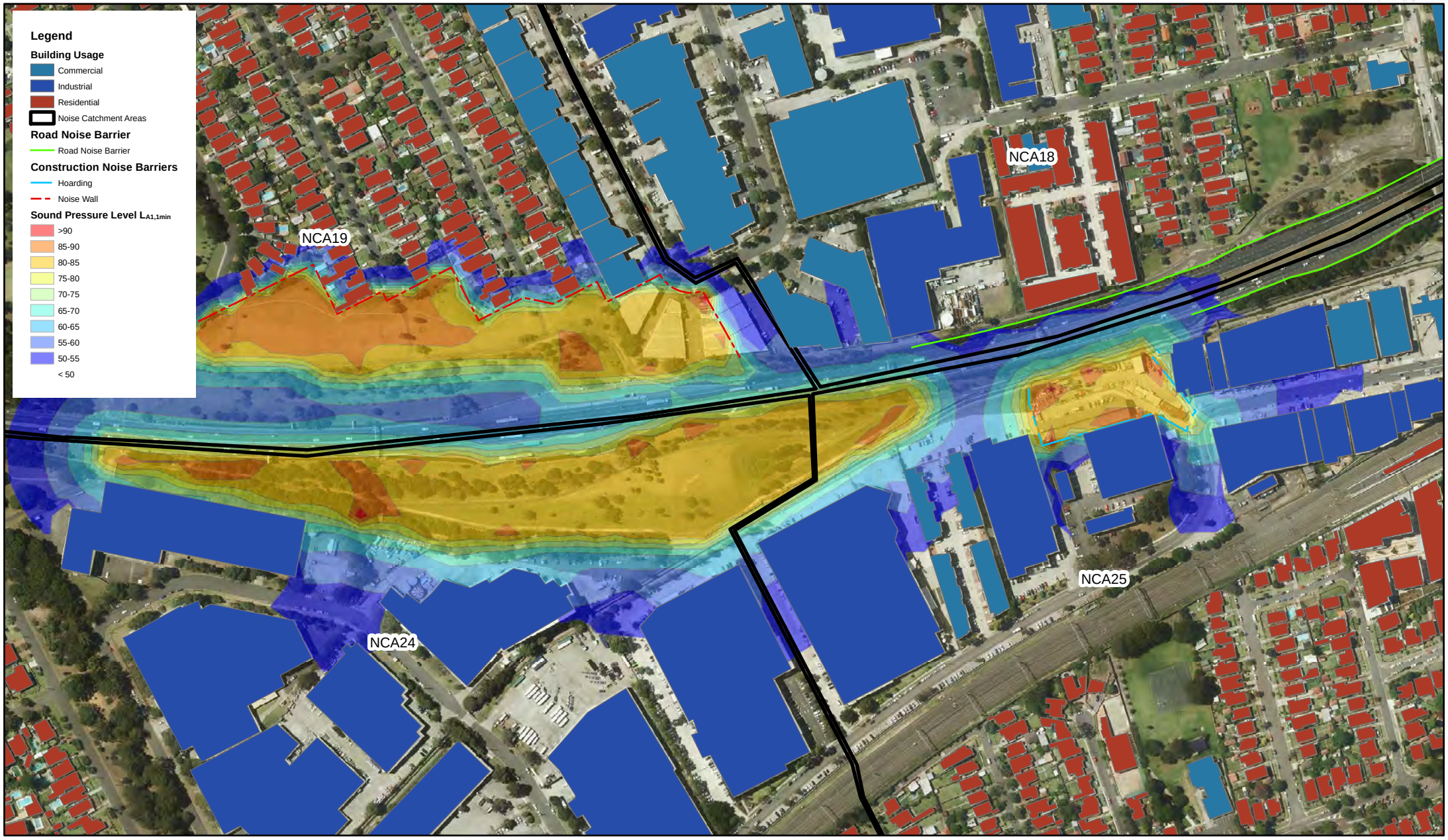
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
01_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

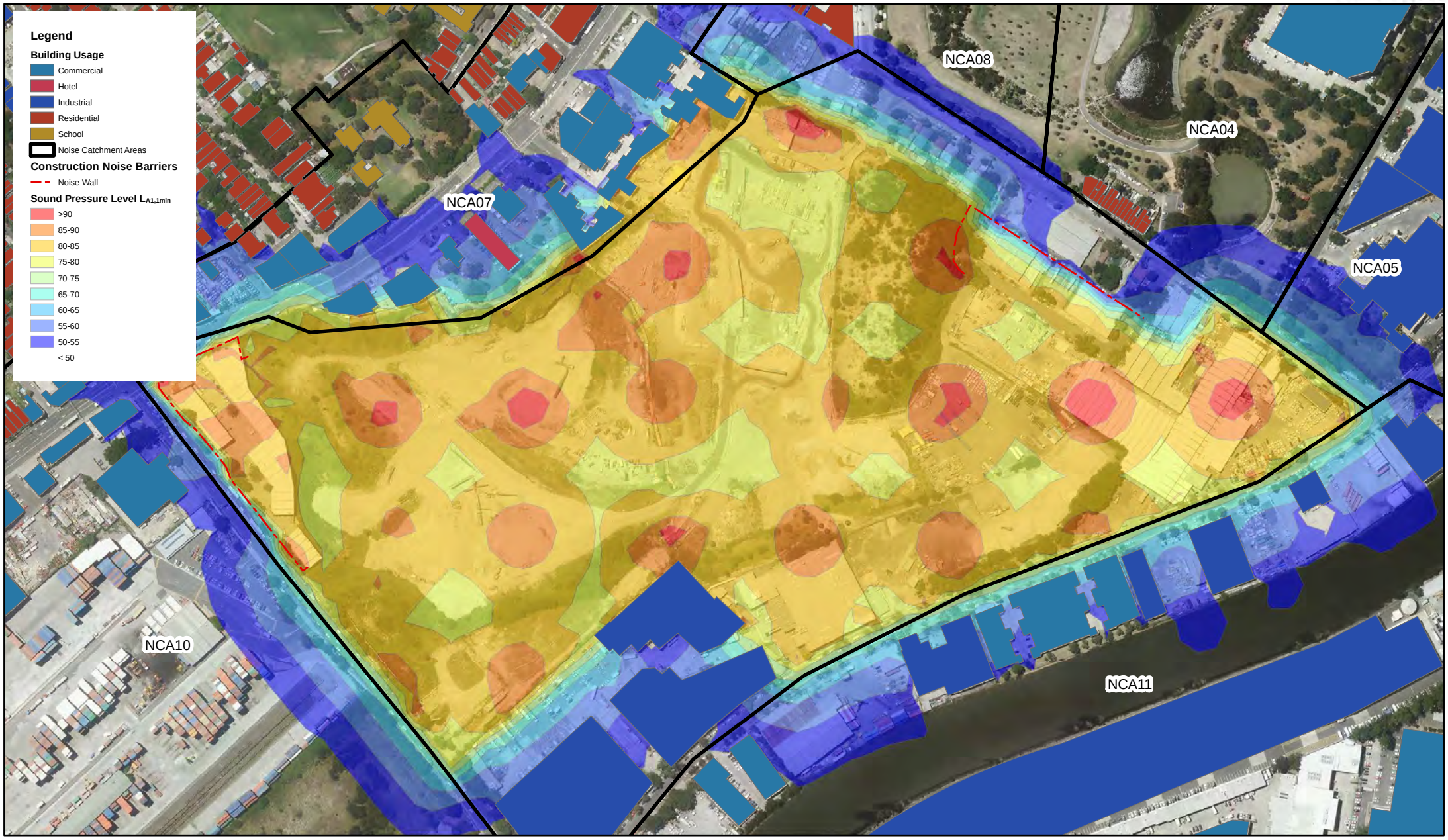
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

02_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

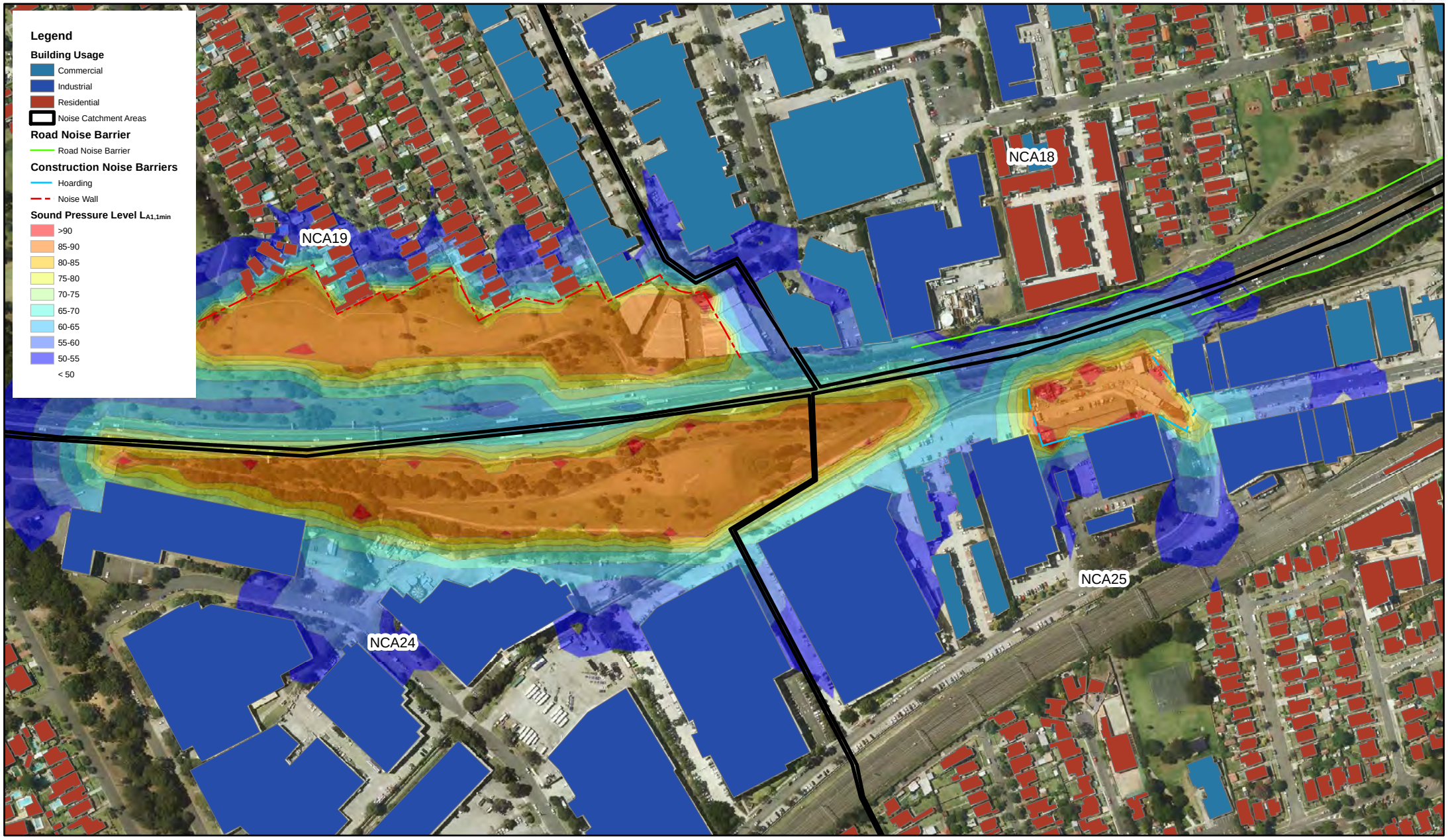
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

02_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction compound and car park generation operations (C1-C11) - Workshop; Deliveries; Maintenance Storage - Night

SEP 2015

60327128

Source: SKM2014

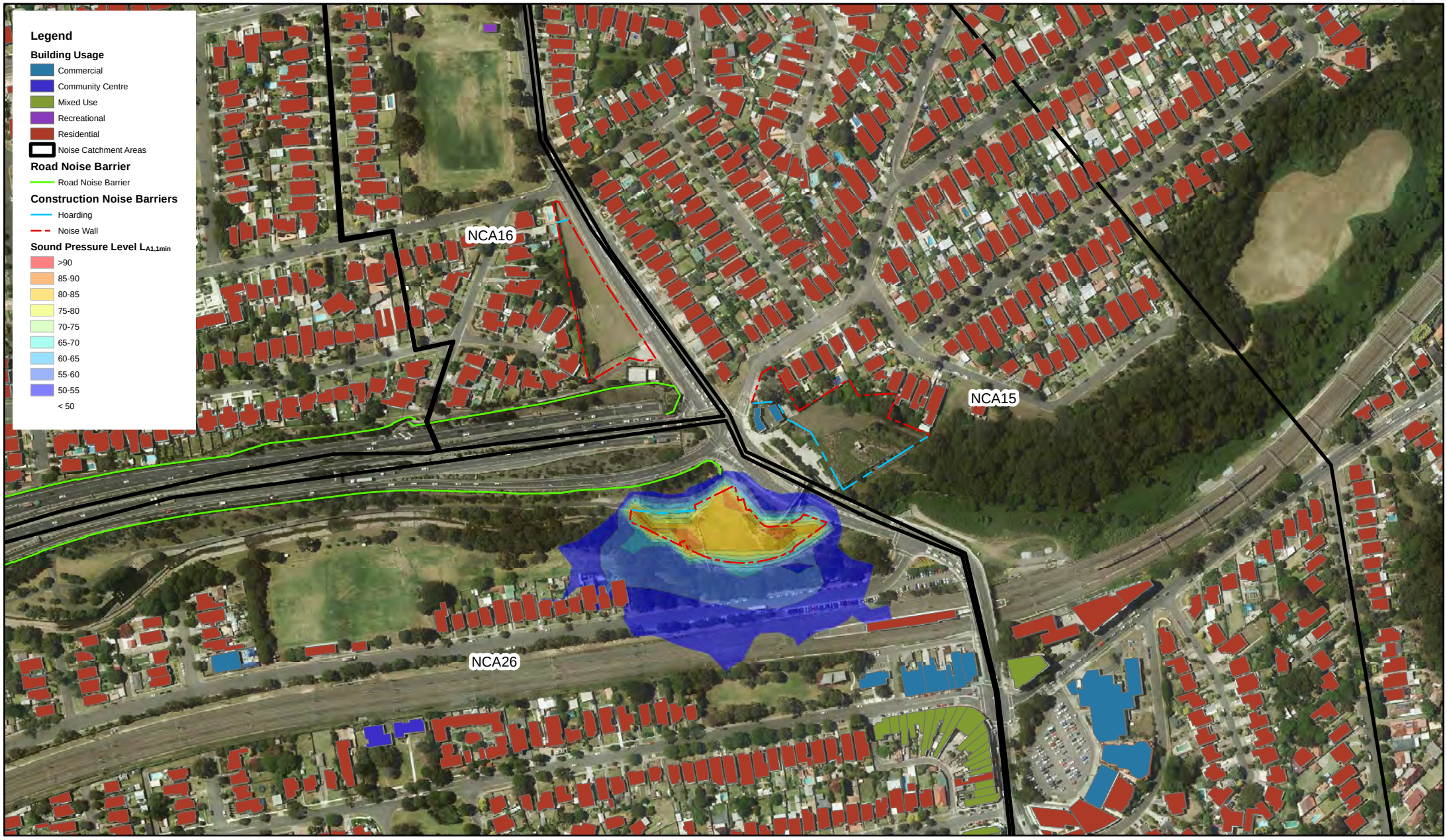
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

02_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

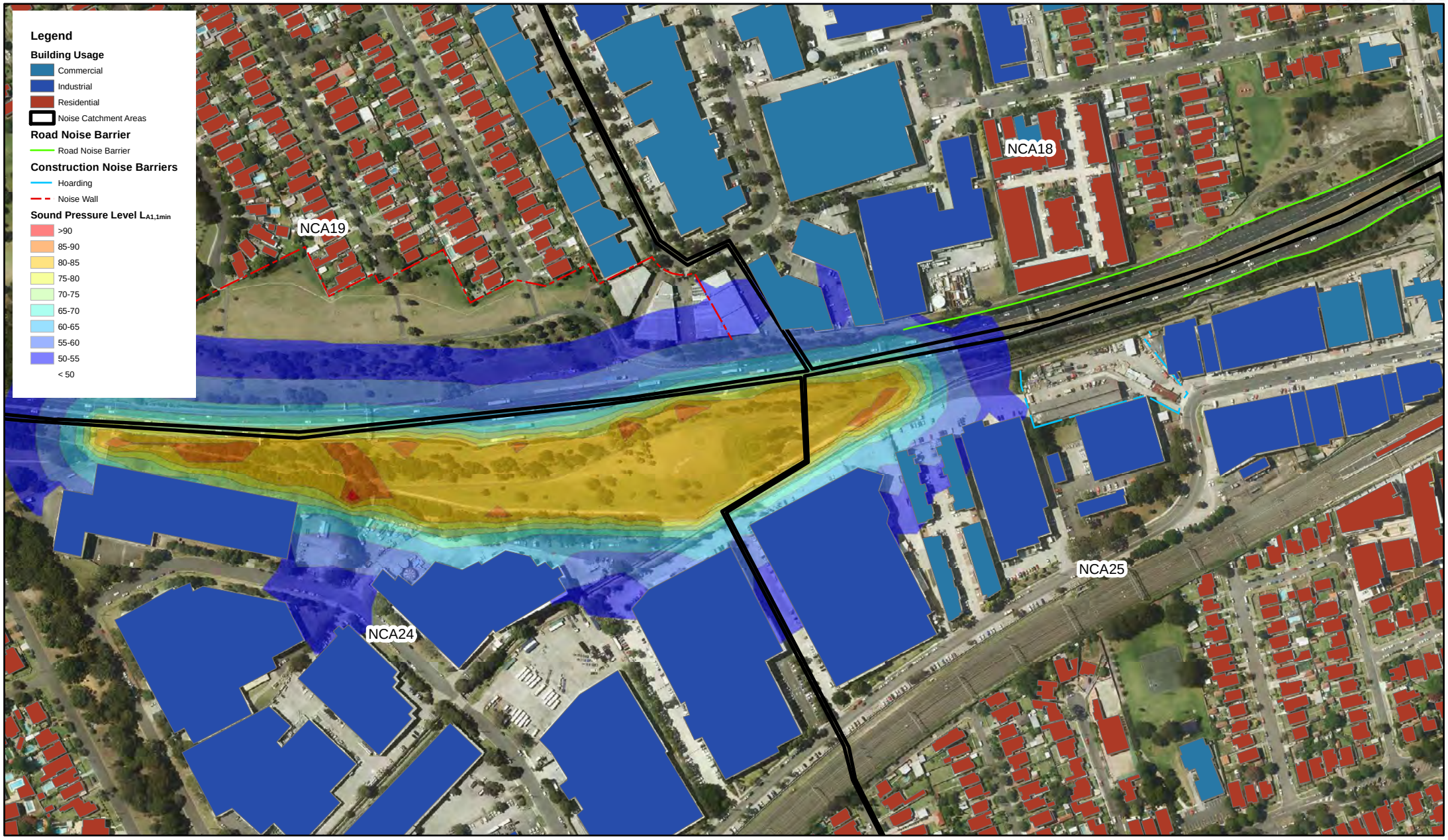
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

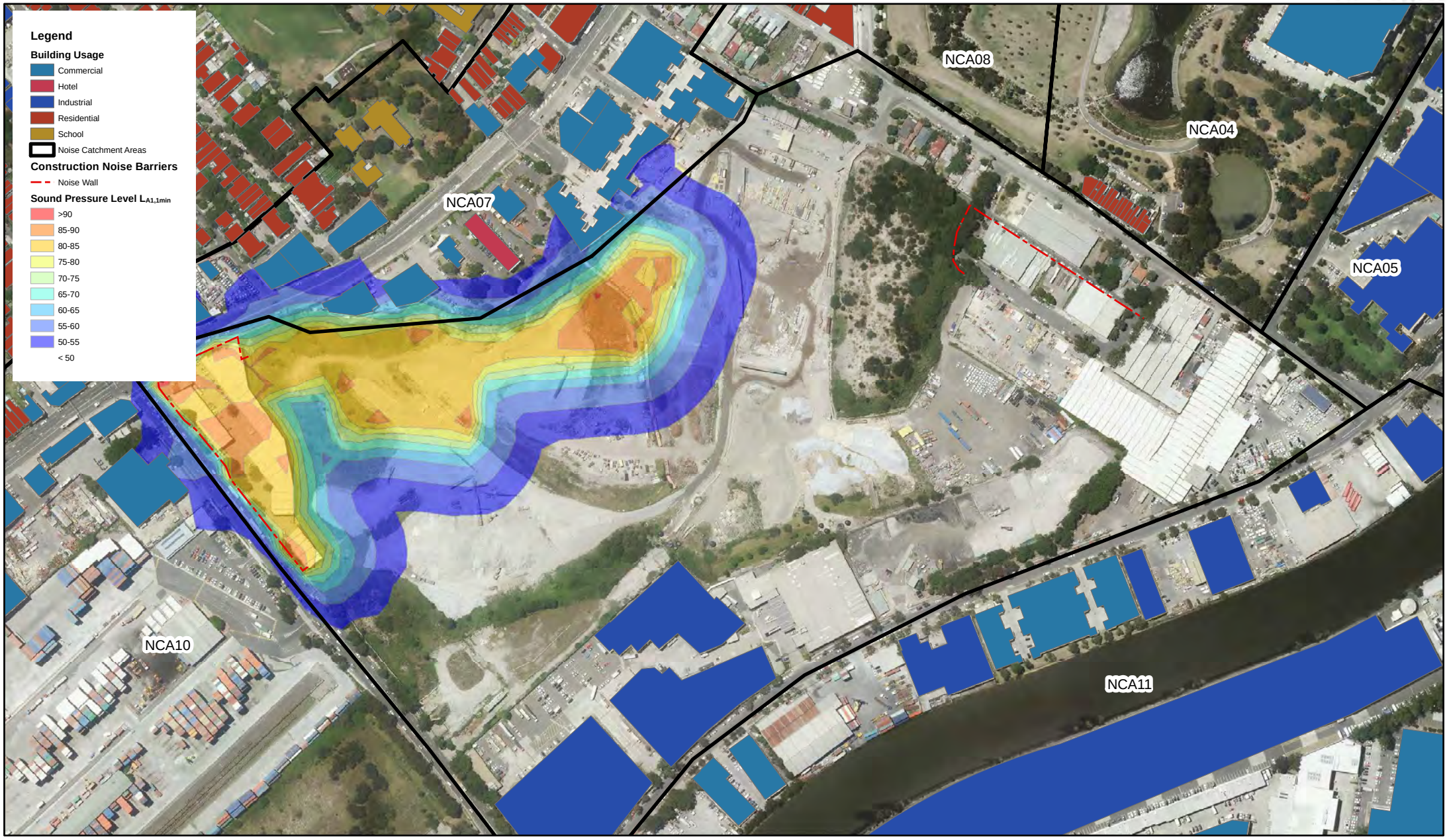
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Construction of ventilation stations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

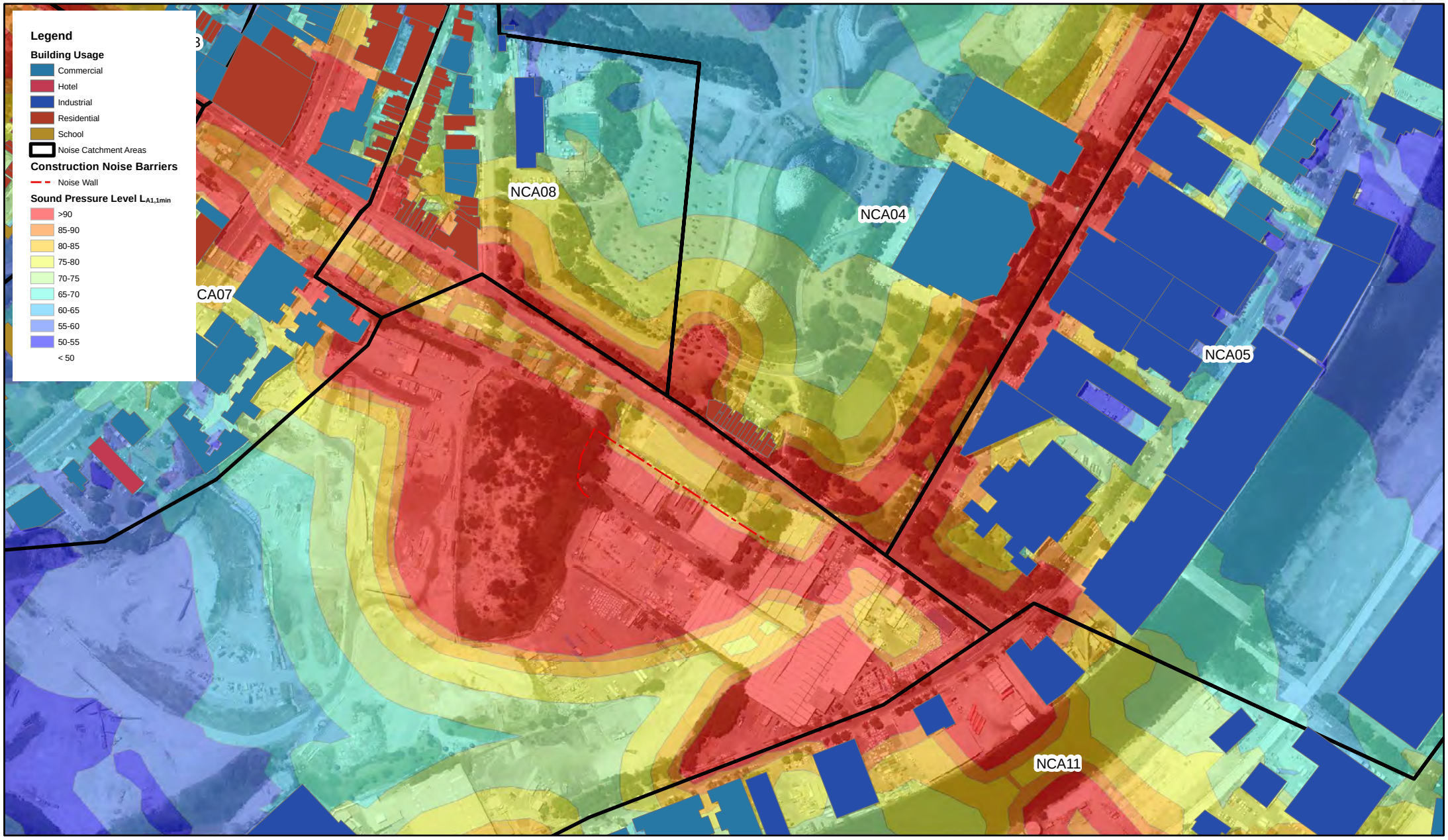
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

06_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Road tie-in works - Night

SEP 2015

60327128

Source: SKM2014

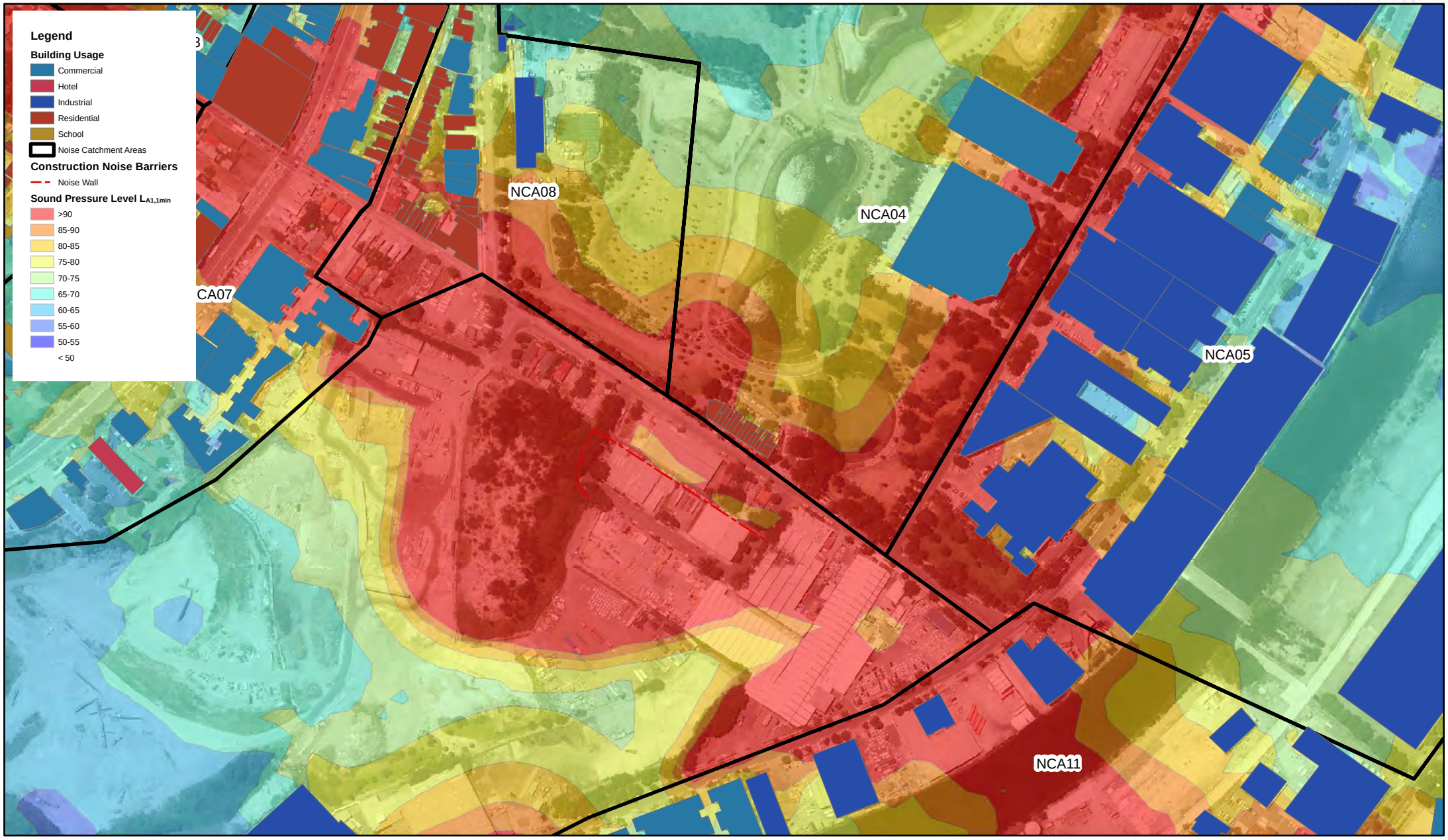
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

07_03



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Kerbing and drainage - Night

SEP 2015

60327128

Source: SKM2014

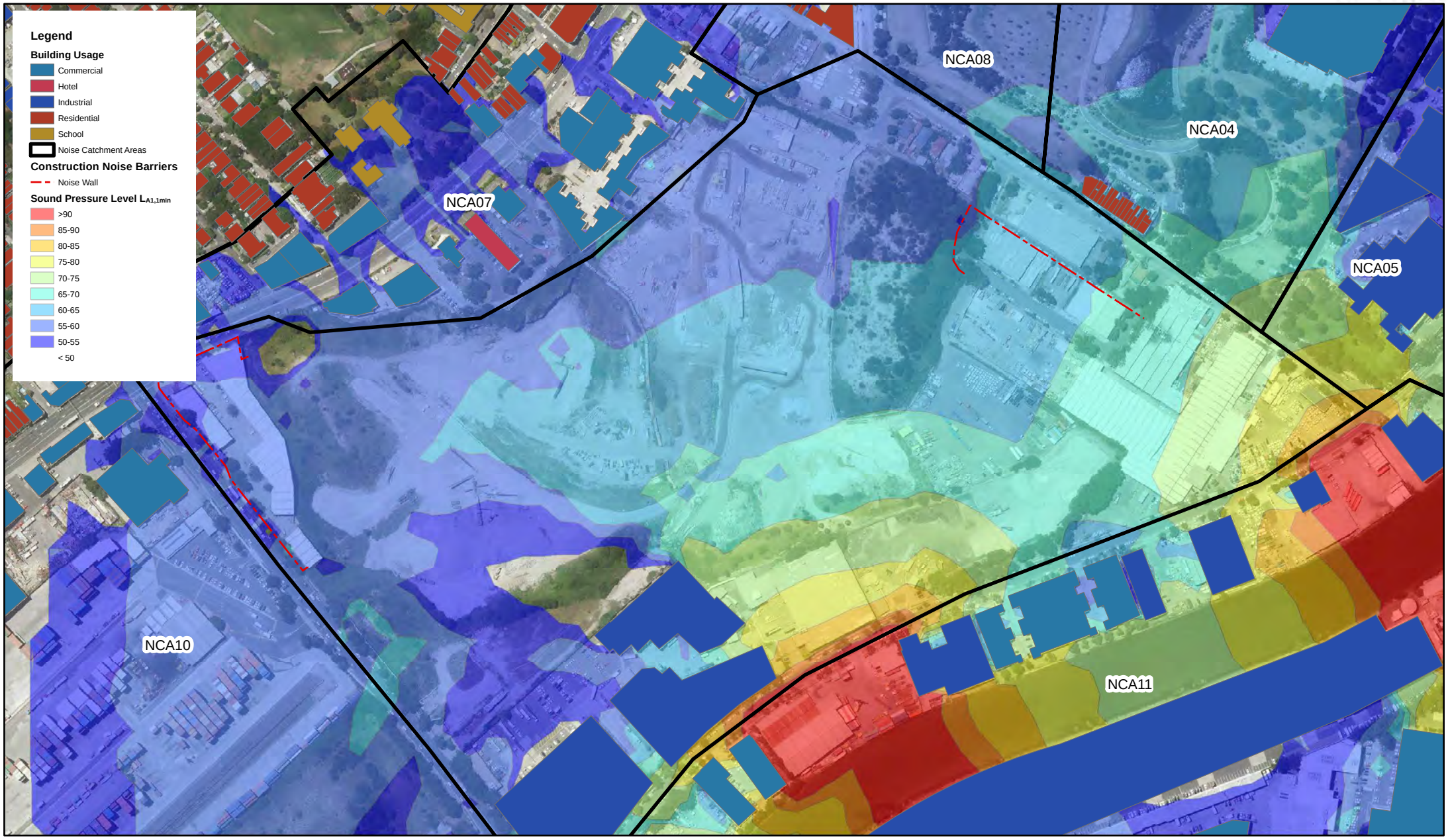
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

07_04



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Alexandra Canal Bridge - Night

SEP 2015

60327128

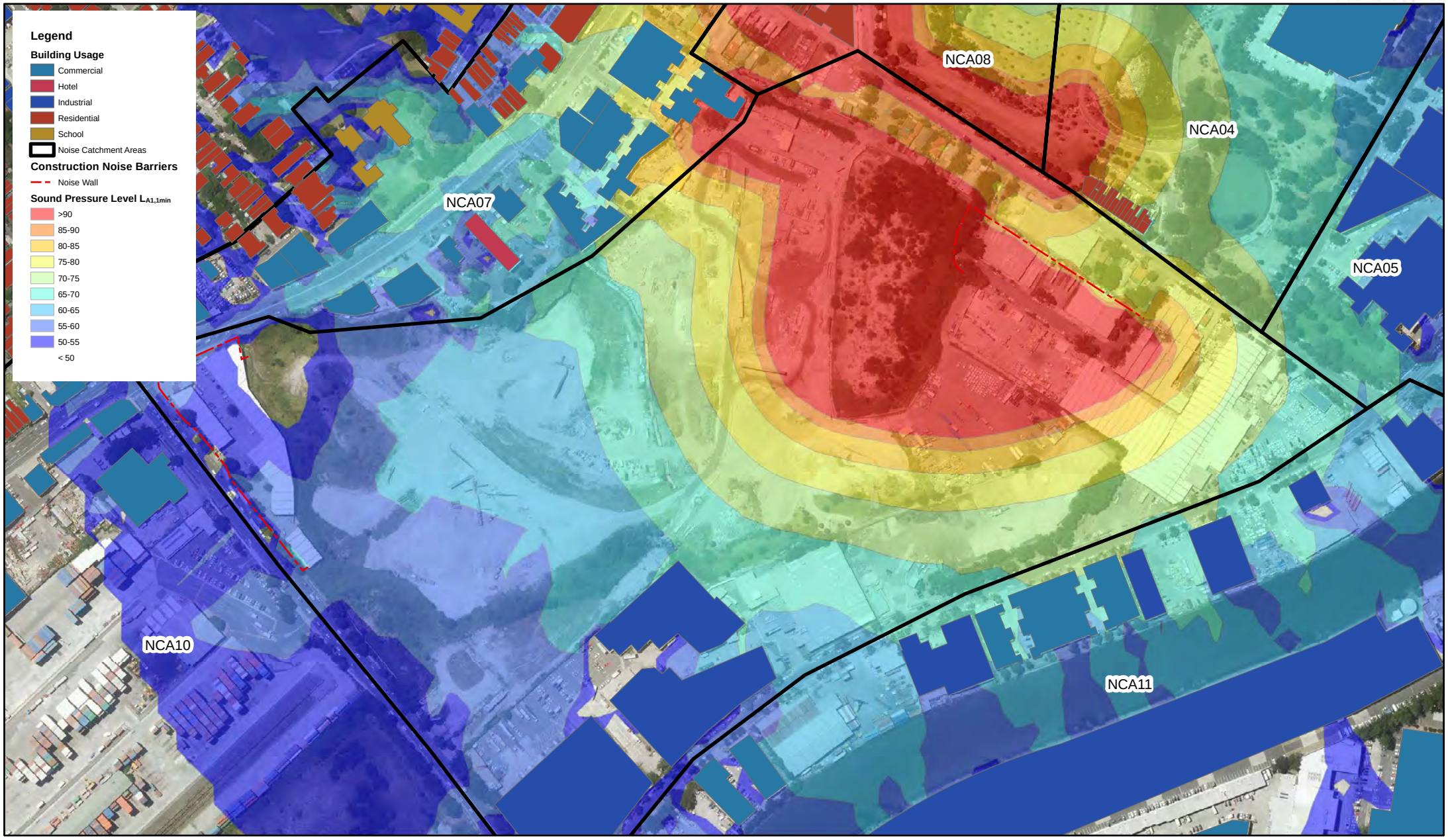
Source: SKM2014

Fig. **07_06**

0 20 40 80 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - Local road works including construction of the Alexandra Canal Bridge - Pedestrian bridges to Campbell Rd - Night

SEP 2015

60327128

Source: SKM2014

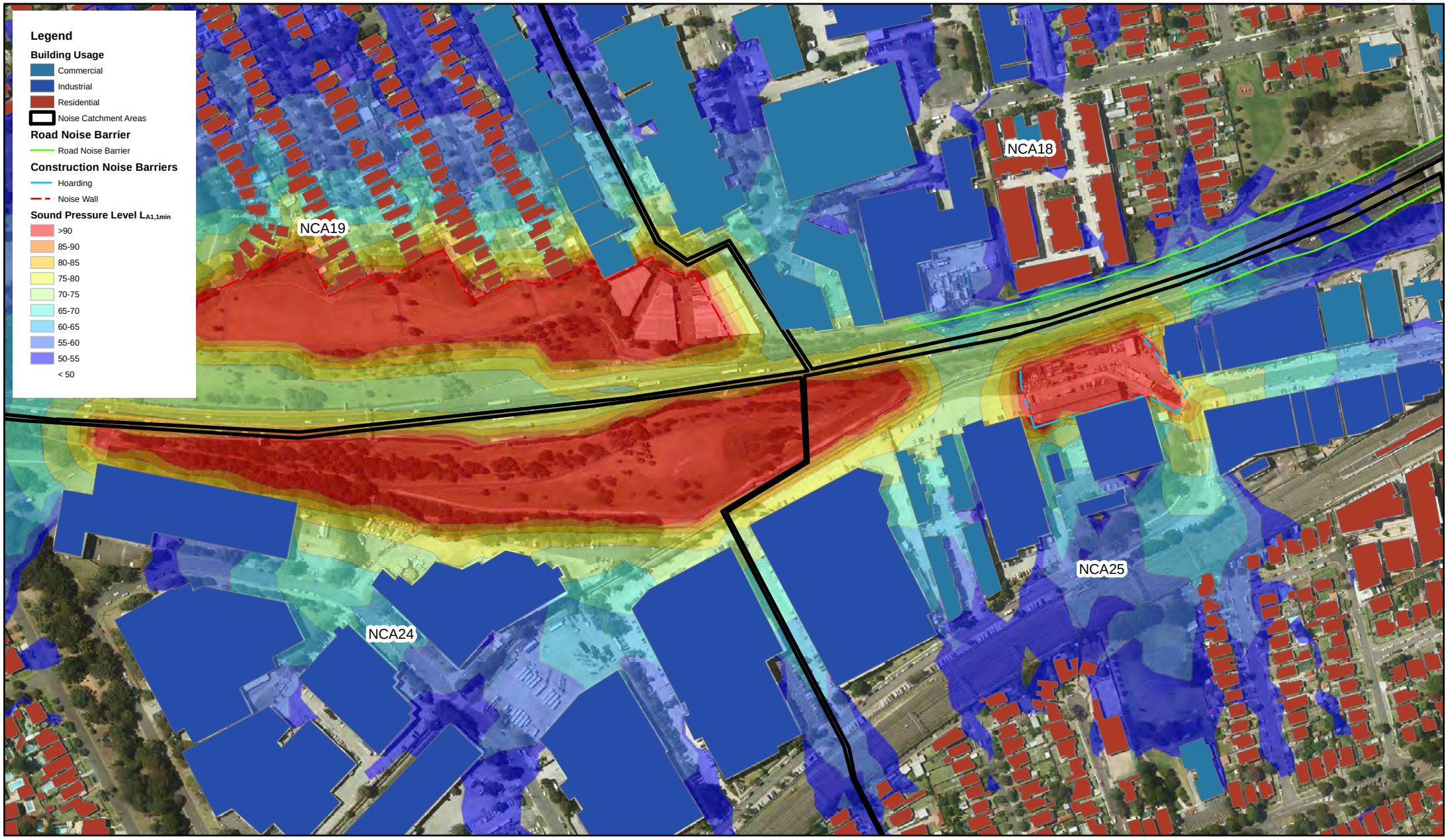
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

07_05



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - General utility installation and relocation - Service installation and relocation - Night

SEP 2015

60327128

Source: SKM2014

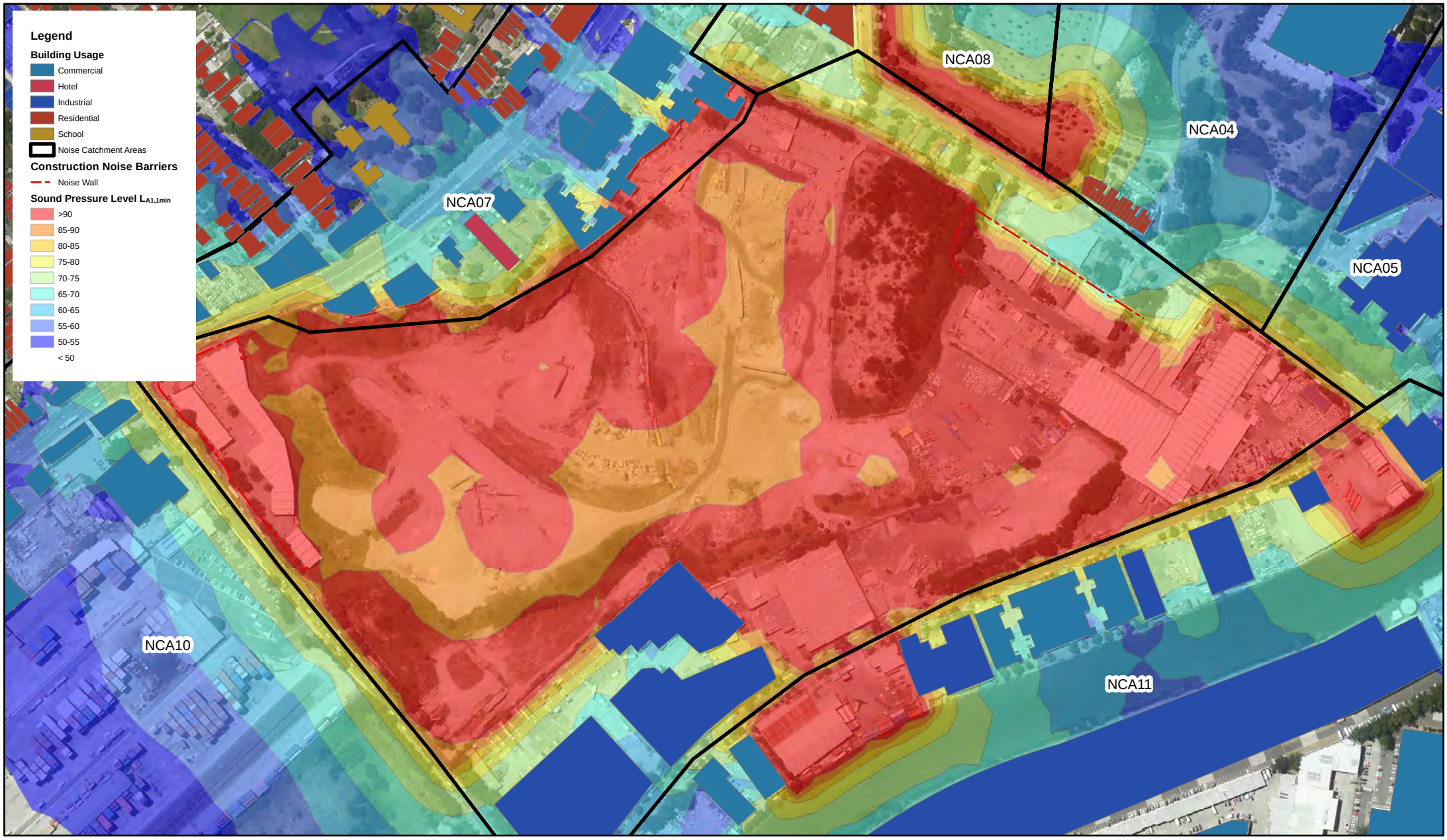
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

08_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Surface works - General utility installation and relocation - Service installation and relocation - Night

SEP 2015

60327128

Source: SKM2014

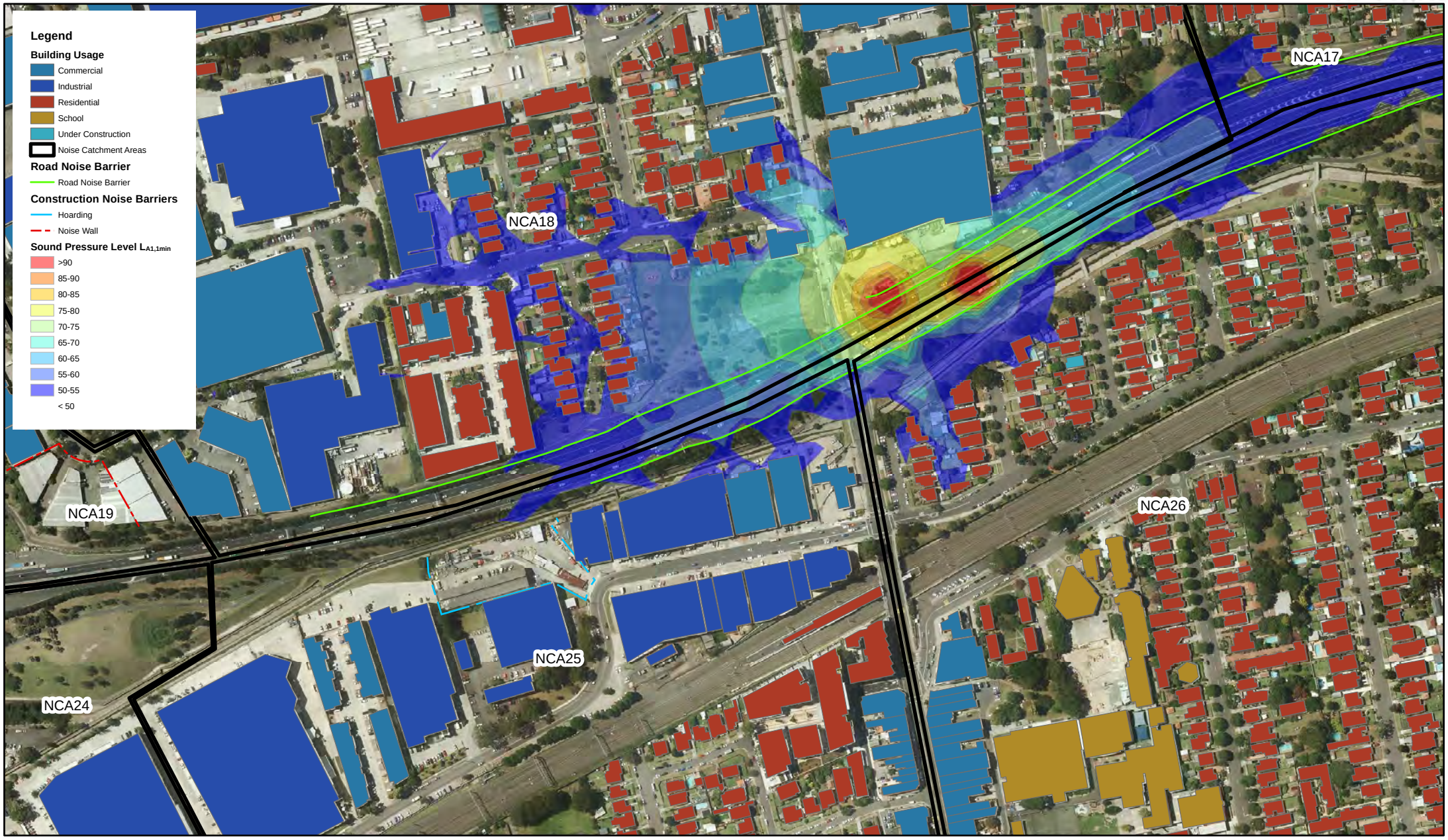
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

08_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Site establishment - Night

SEP 2015
60327128

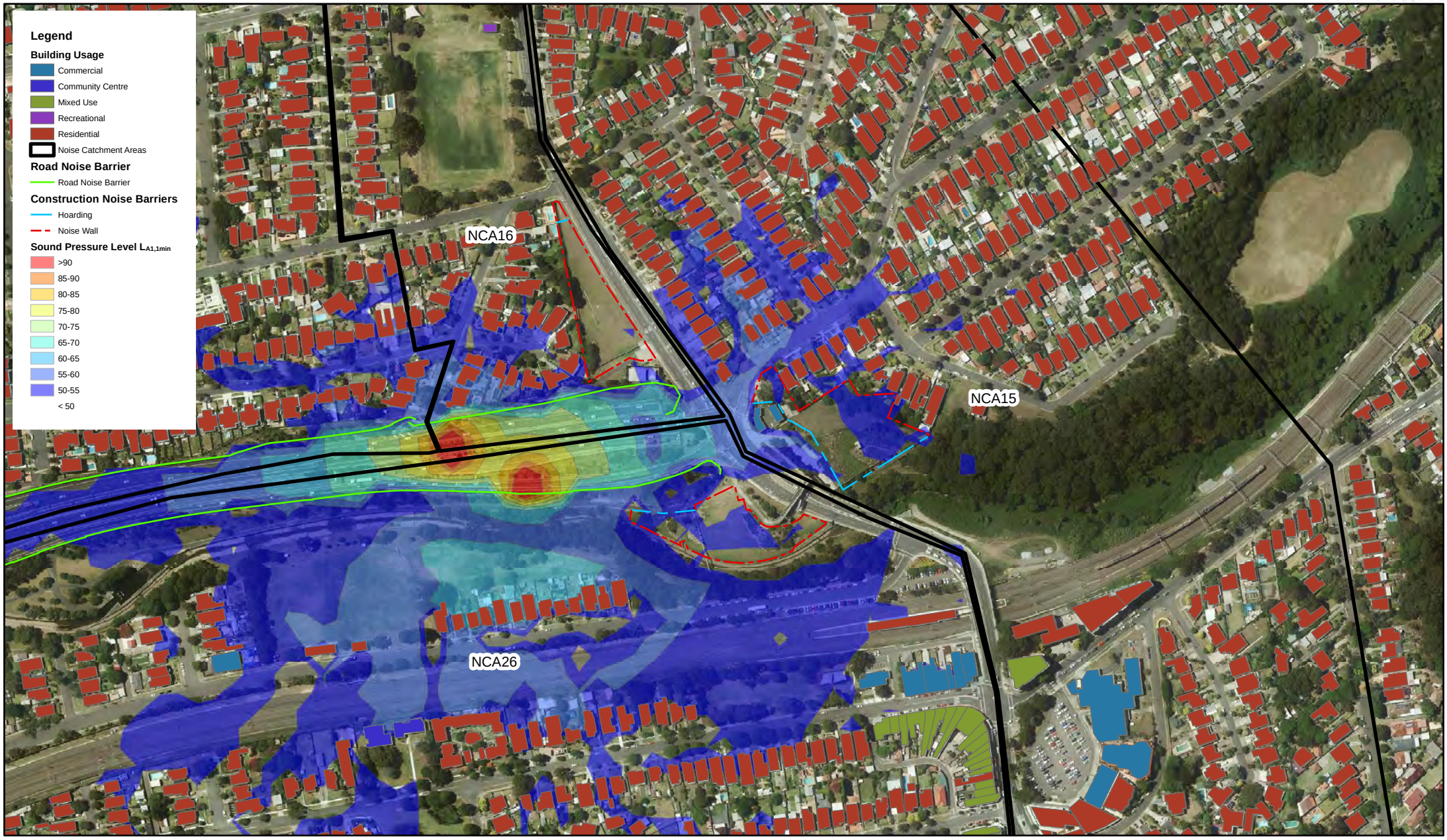
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Site establishment - Night

SEP 2015
60327128

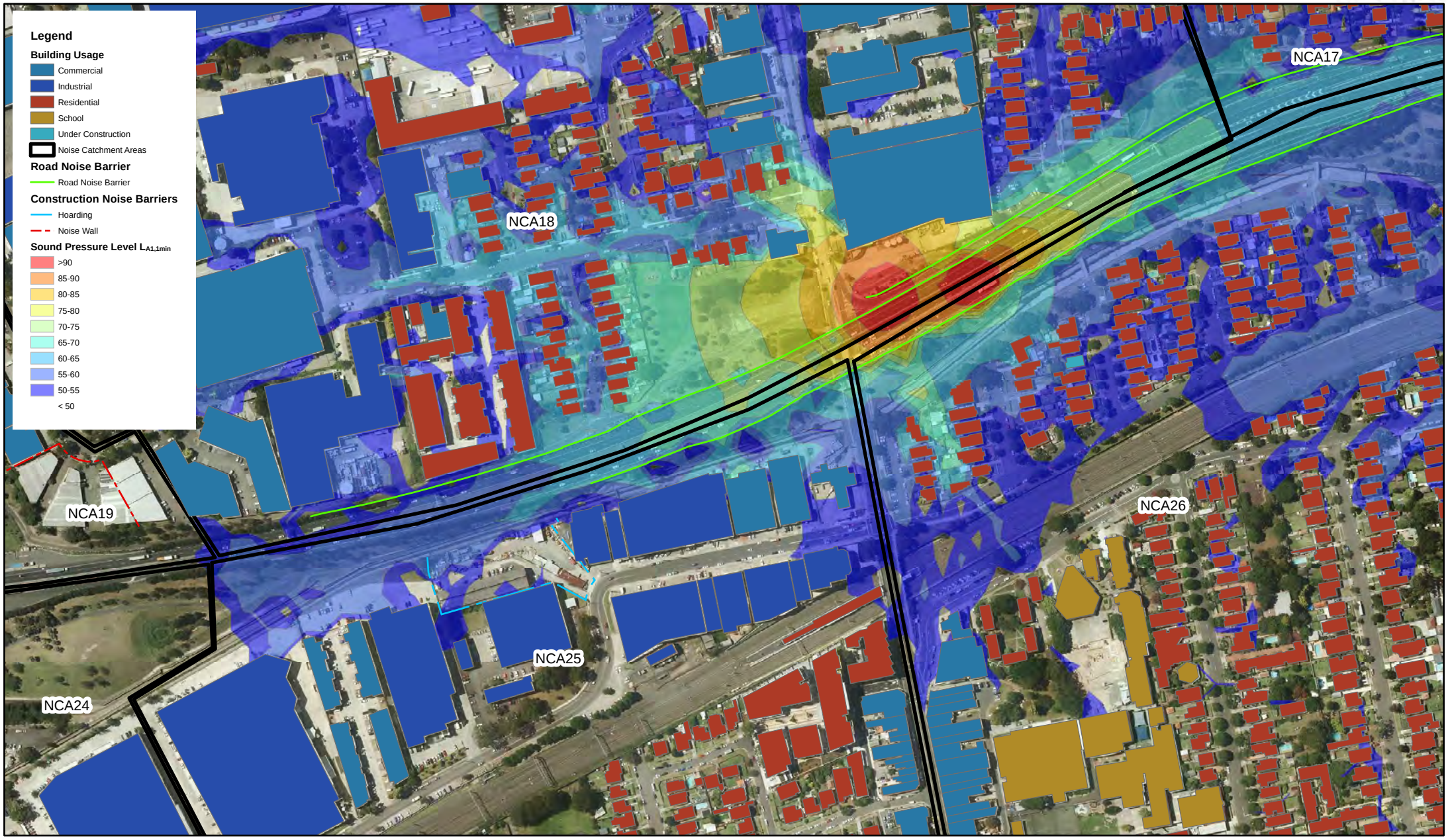
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Road works - Night

SEP 2015
60327128

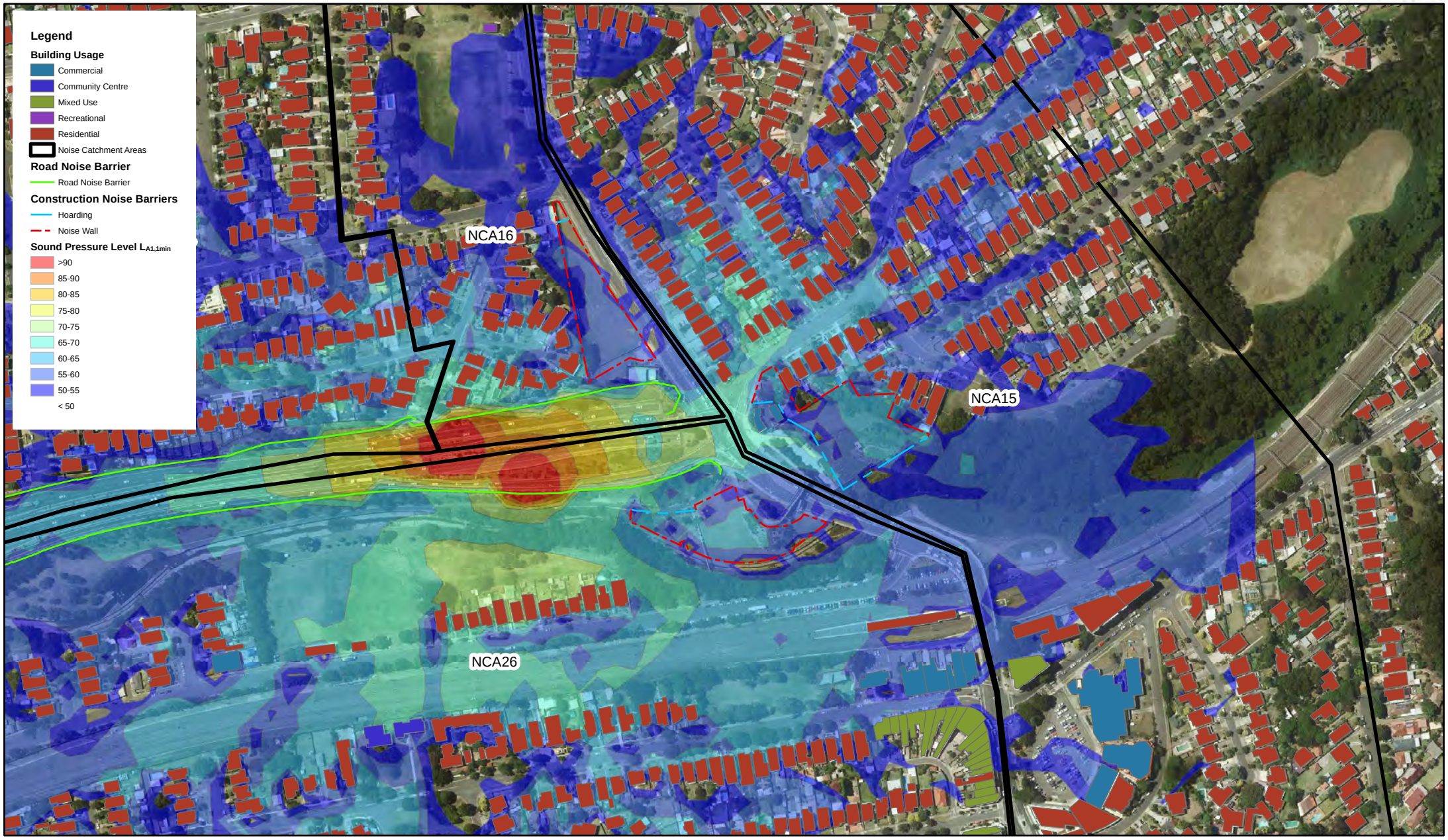
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Road works - Night

SEP 2015
60327128

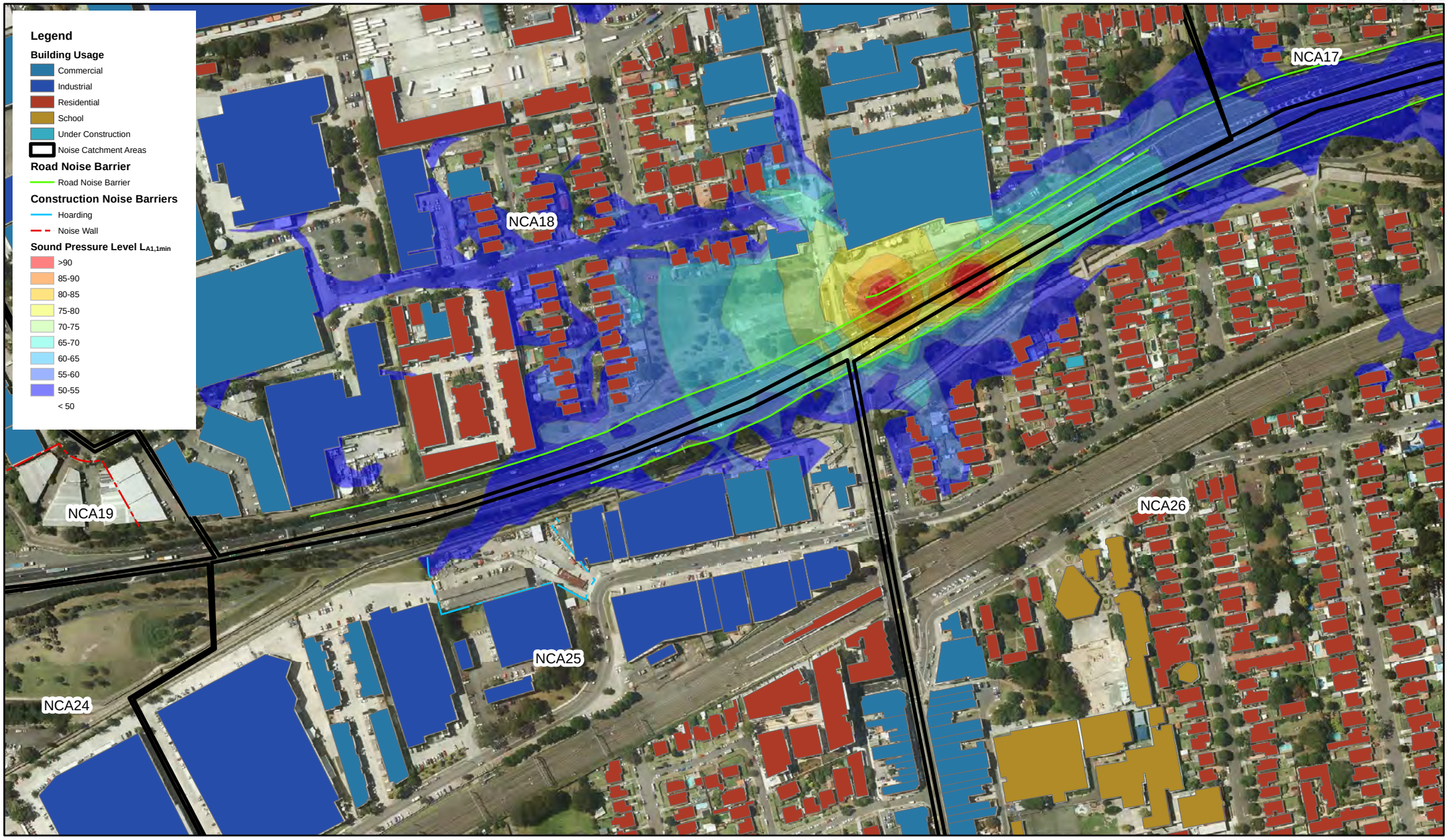
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Construction of toll gantries - Night

SEP 2015
60327128

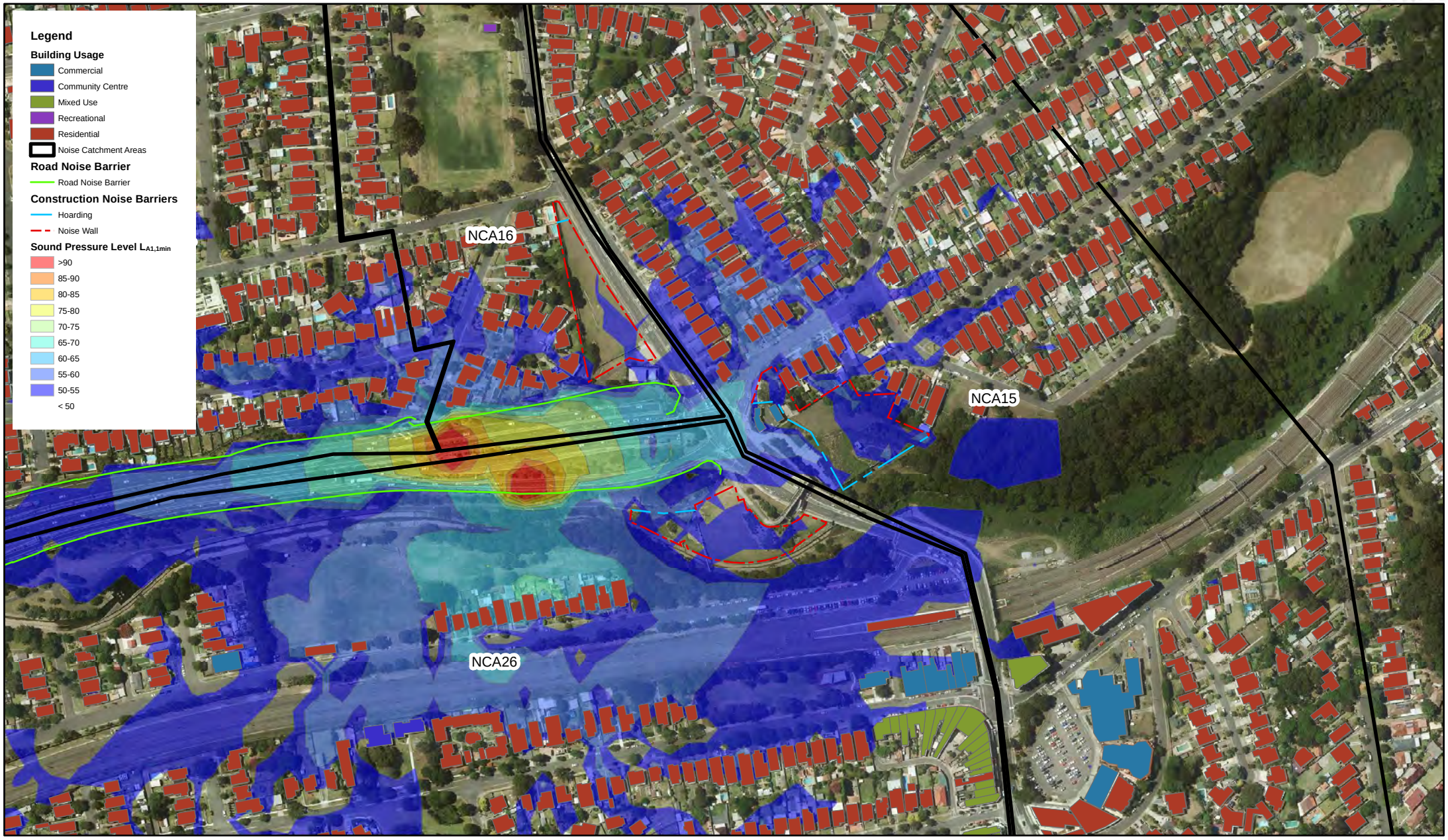
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_03



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Surface works - Tolling infrastructure - Construction of toll gantries - Night

SEP 2015
60327128

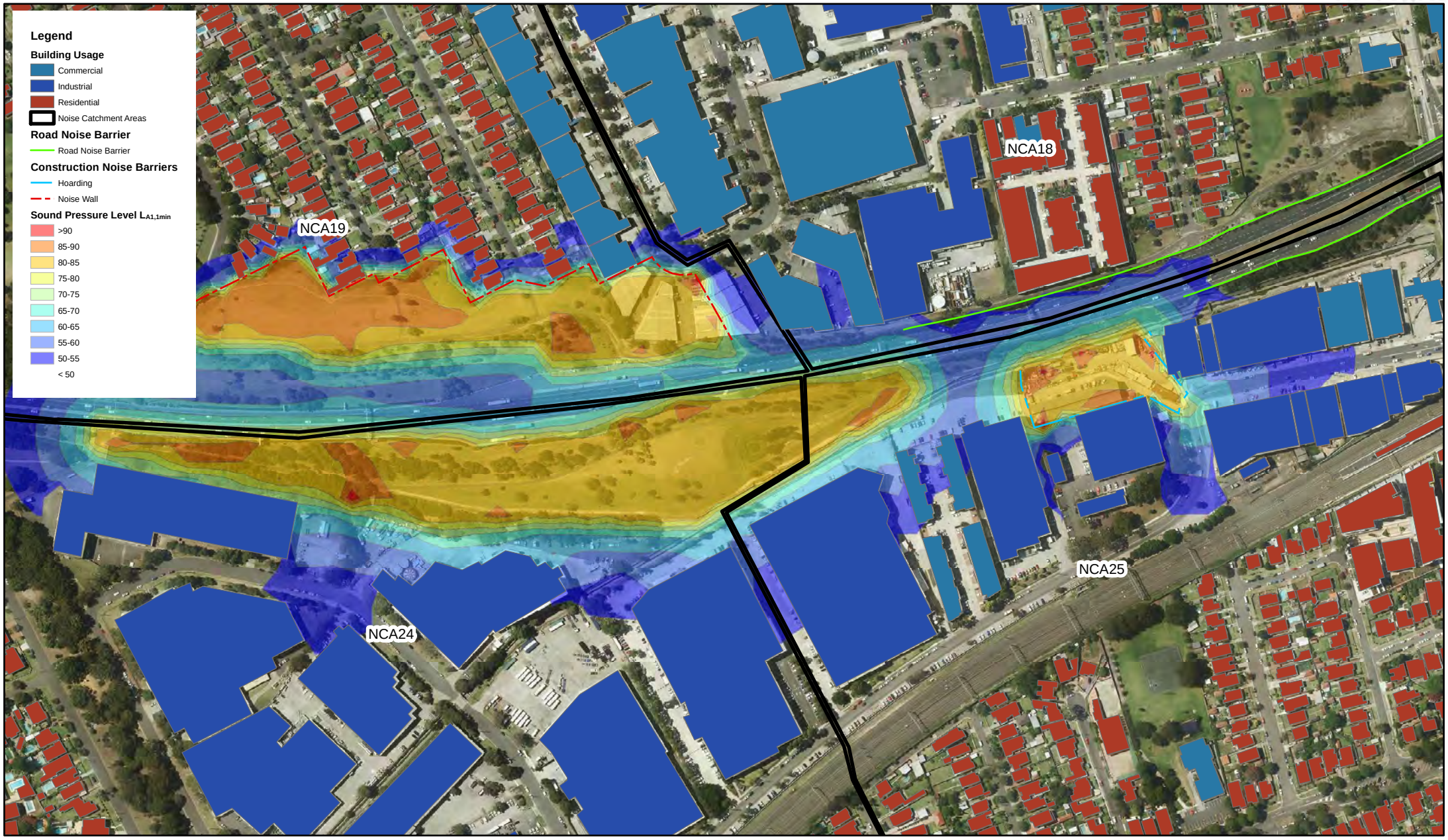
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
09_03



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

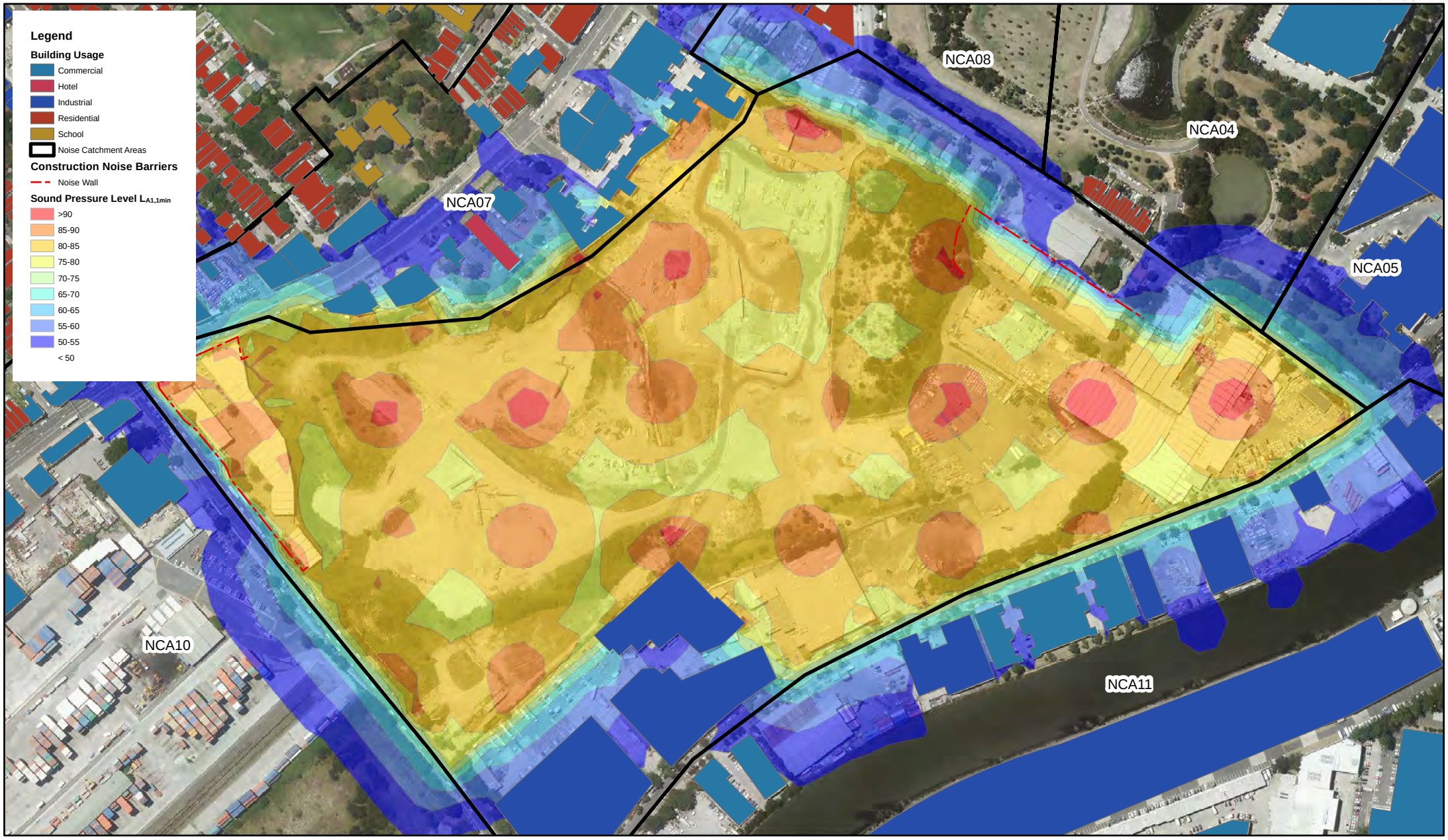
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																												
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Night

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

Source: SKM2014

0 20 40 80 m

N

SEP 2015

60327128

Fig.

11_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - General worksite and car parking - Night

SEP 2015

60327128

Source: SKM2014

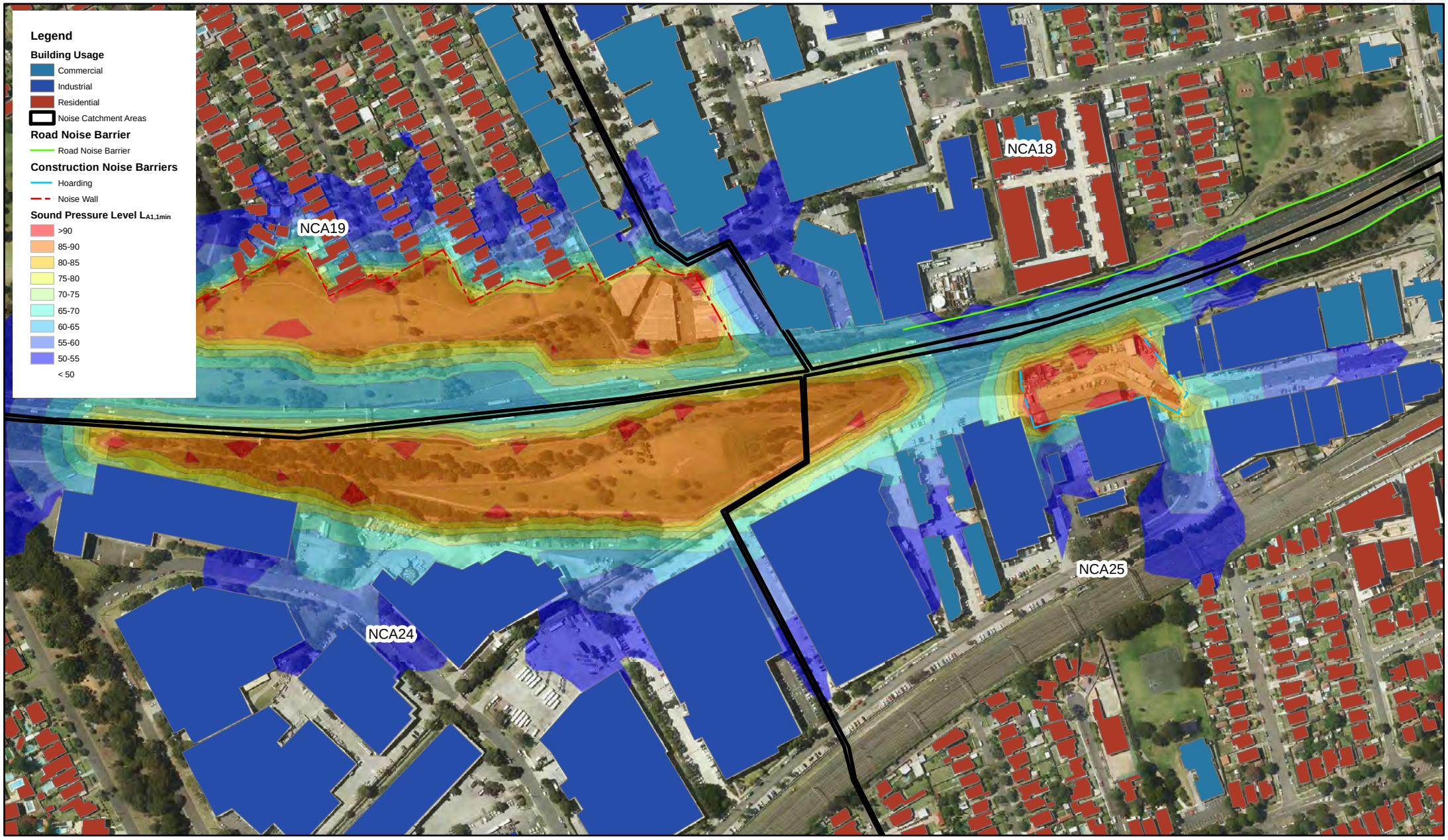
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Night

SEP 2015

60327128

Source: SKM2014

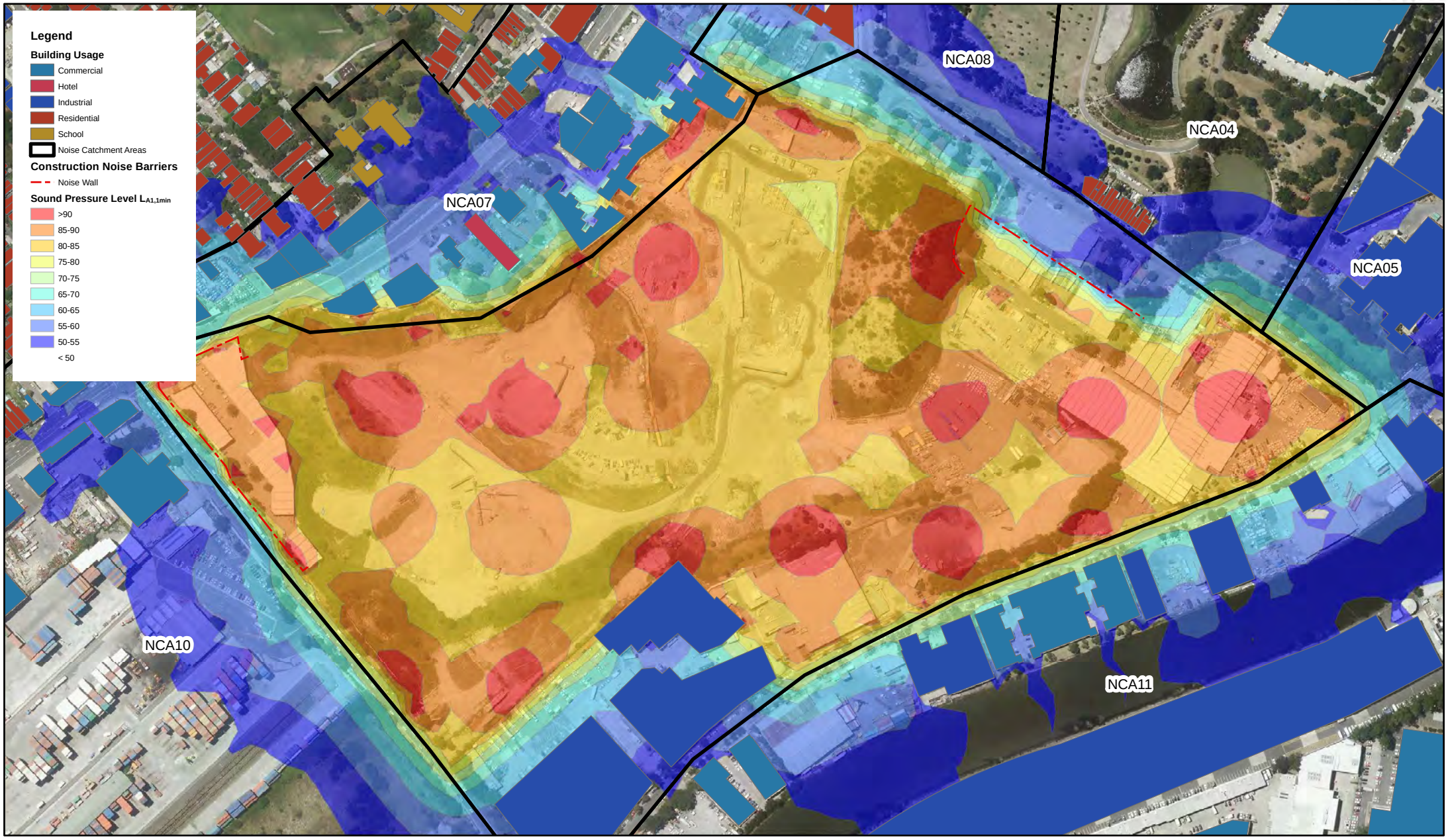
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Night

SEP 2015

60327128

Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Night

SEP 2015

60327128

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

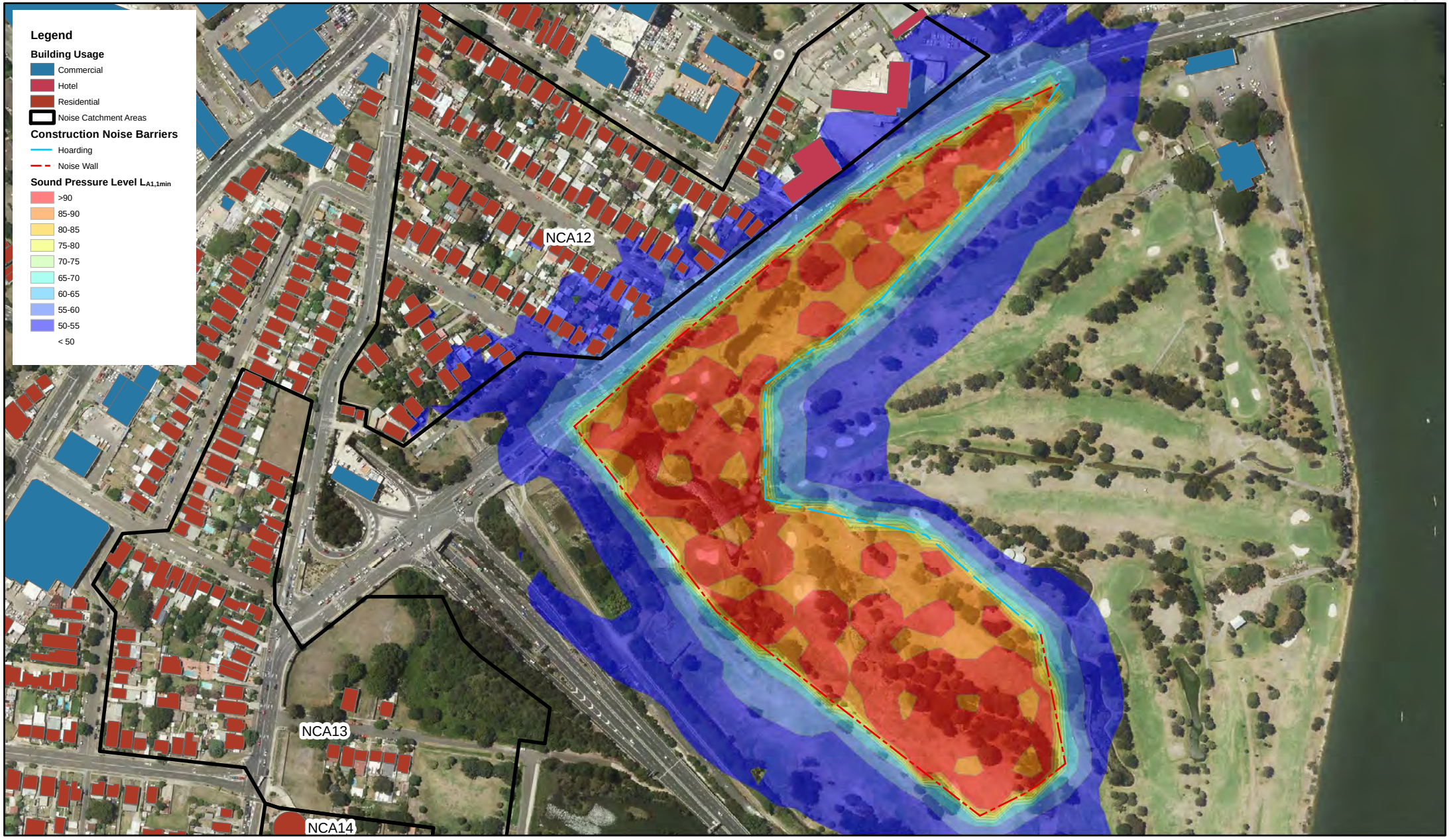
Source: SKM2014

N

0 20 40 80 m

Fig.

11_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Construction compound and car park generation operations - Maintenance storage; Workshop deliveries - Night

SEP 2015

60327128

Source: SKM2014

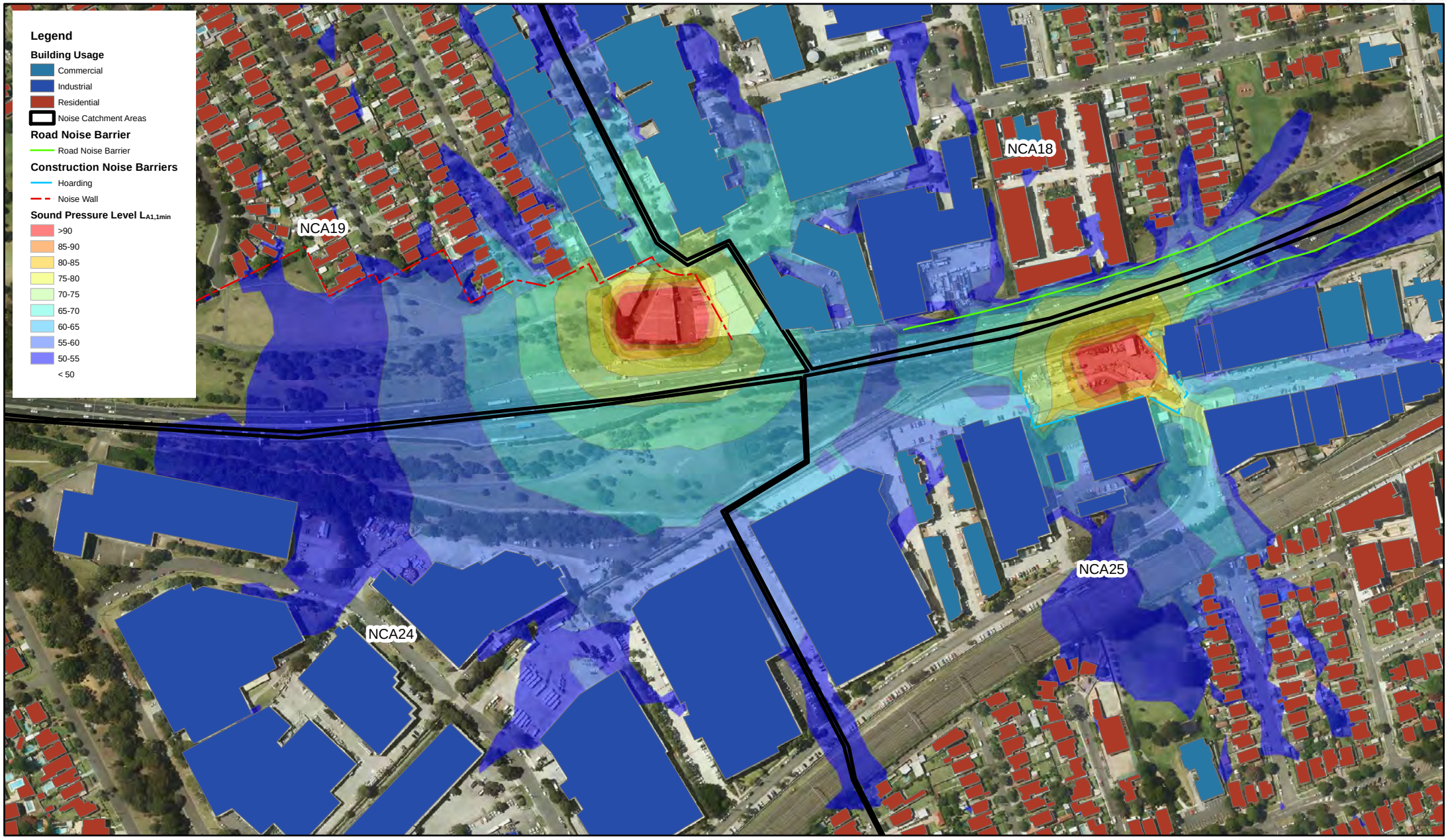
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

11_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Night

SEP 2015

60327128

Source: SKM2014

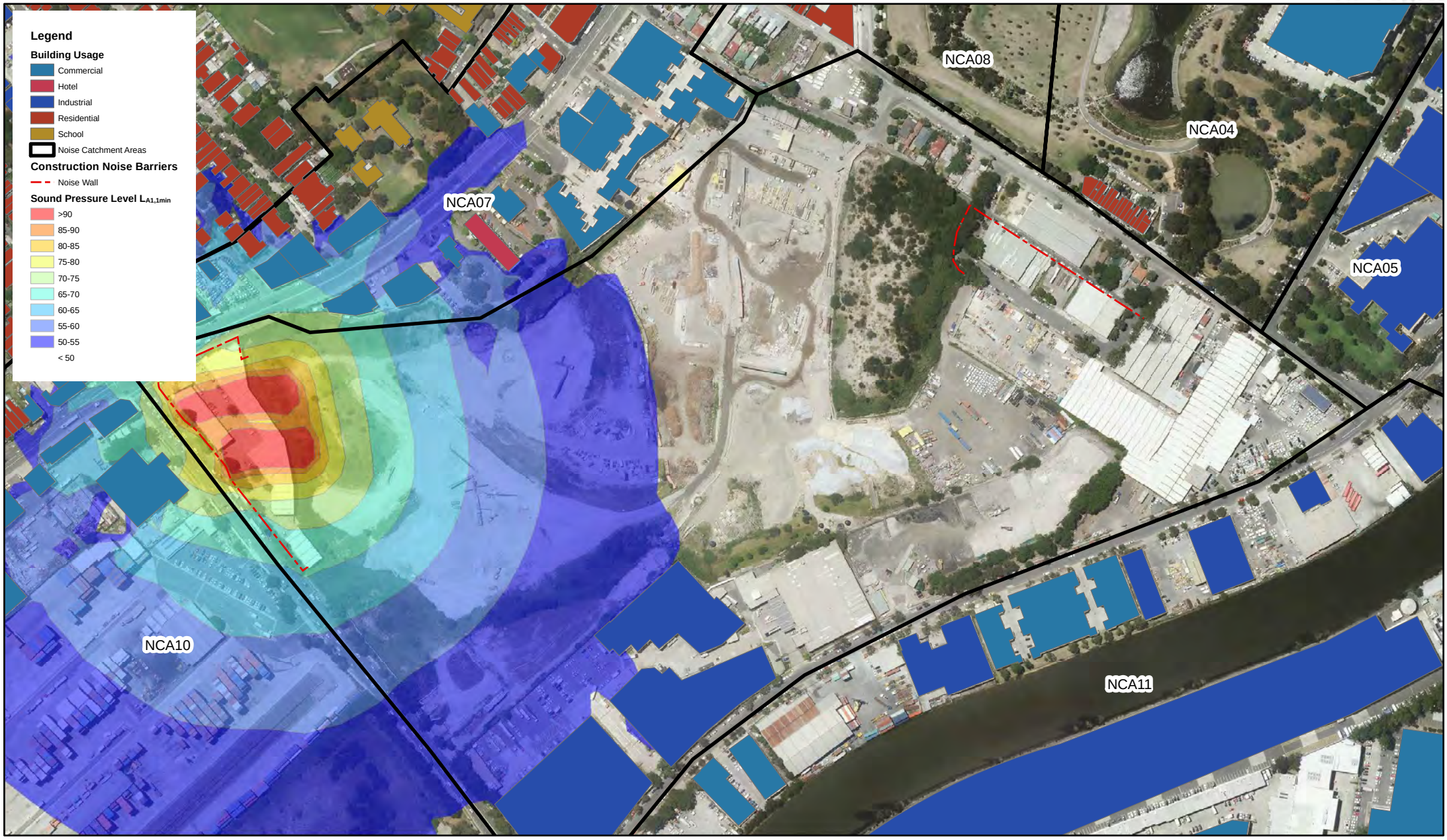
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Night

SEP 2015

60327128

Source: SKM2014

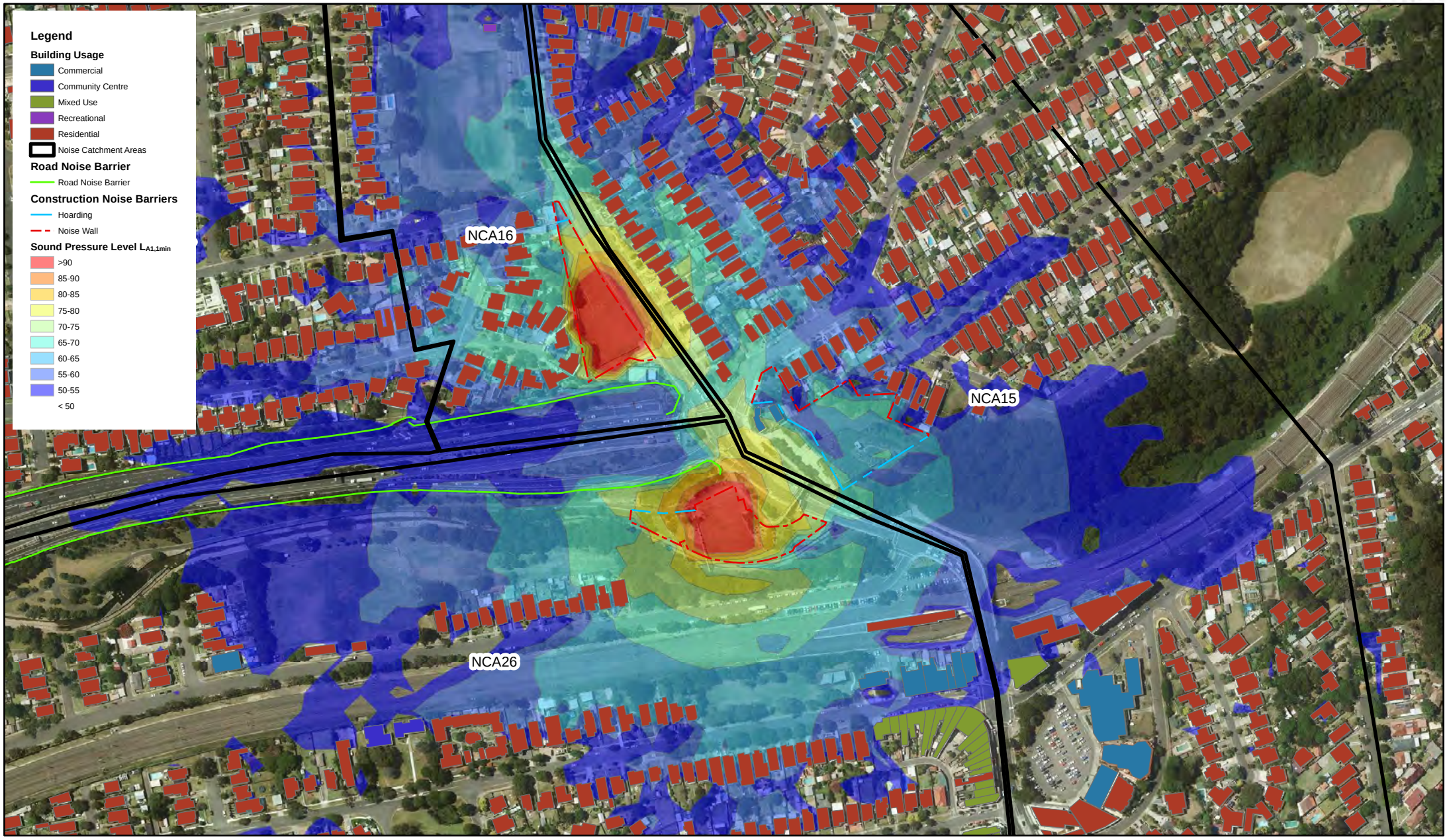
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Night

SEP 2015

60327128

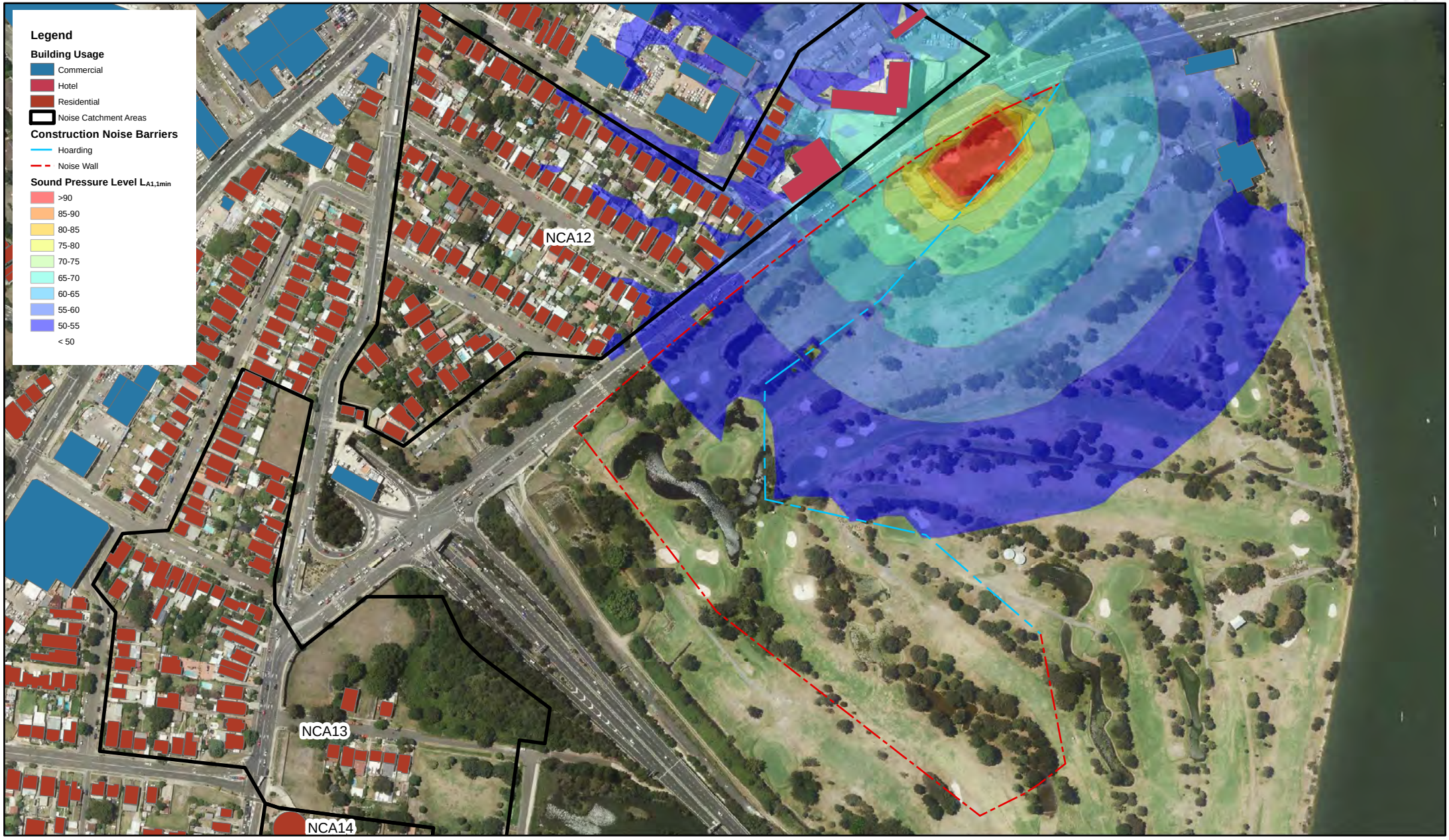
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig. **12_01**



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Piling; excavation of decline - Night

SEP 2015

60327128

Source: SKM2014

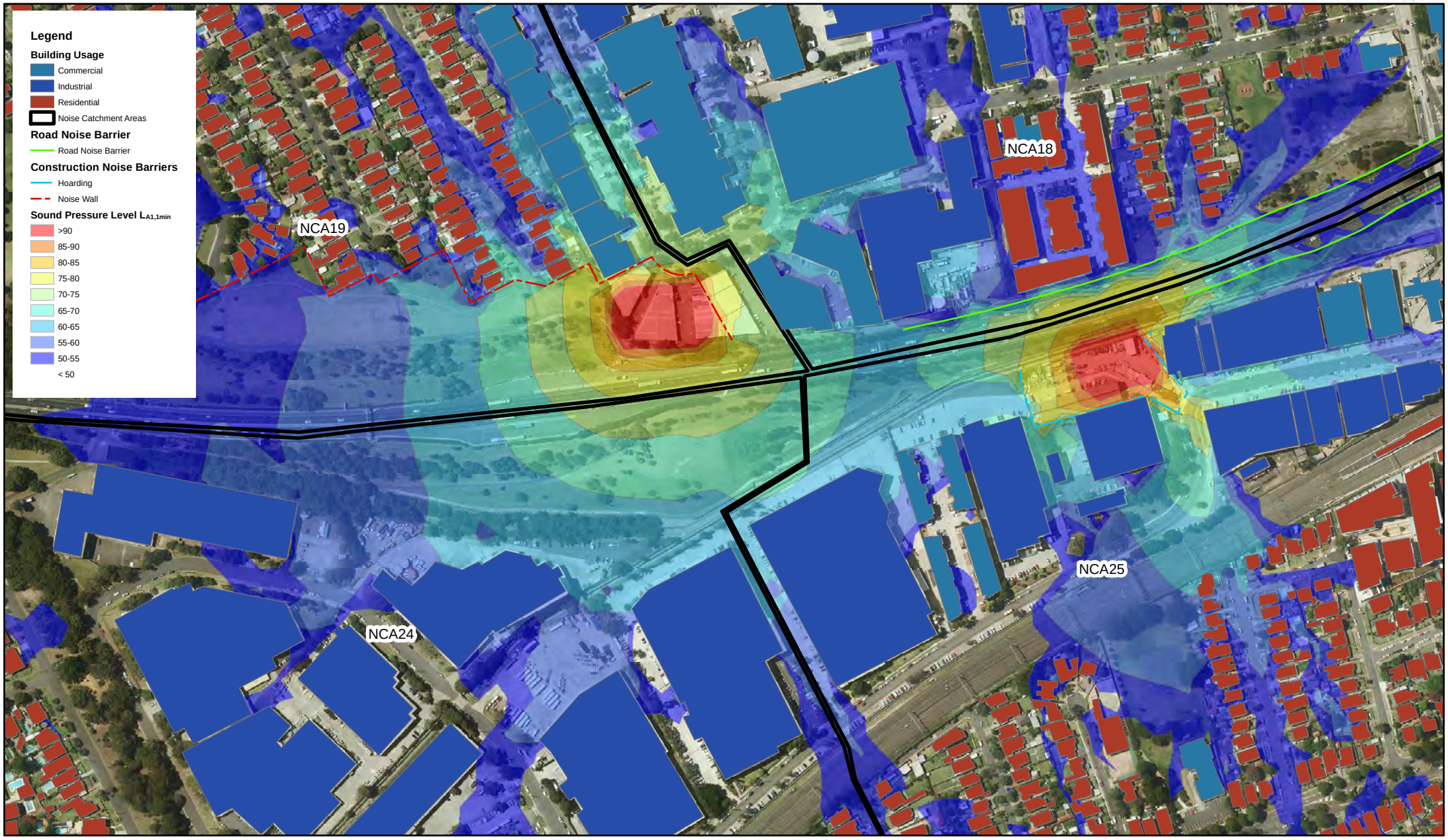
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Night

SEP 2015

60327128

Source: SKM2014

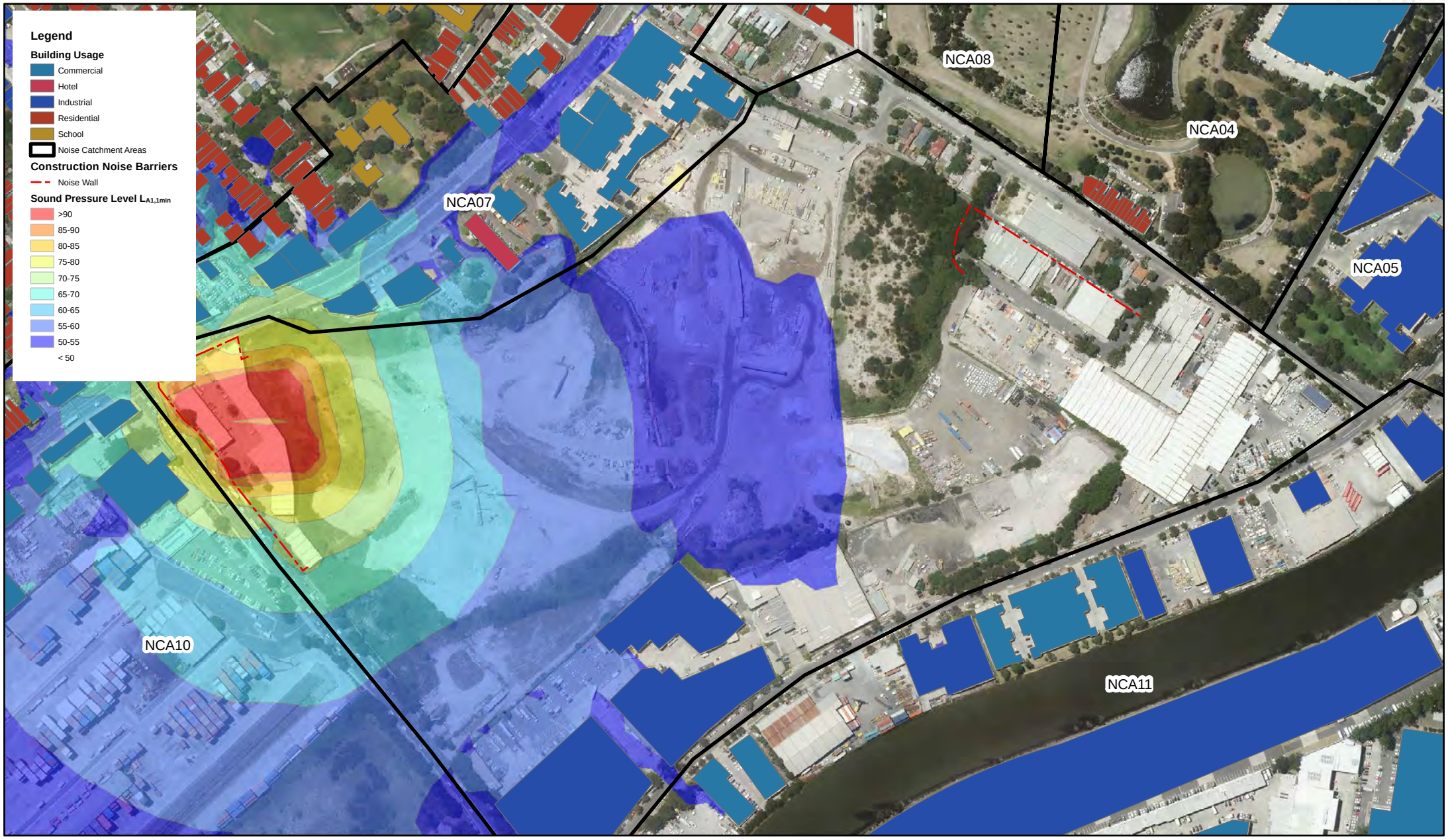
Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Night

SEP 2015

60327128

Source: SKM2014

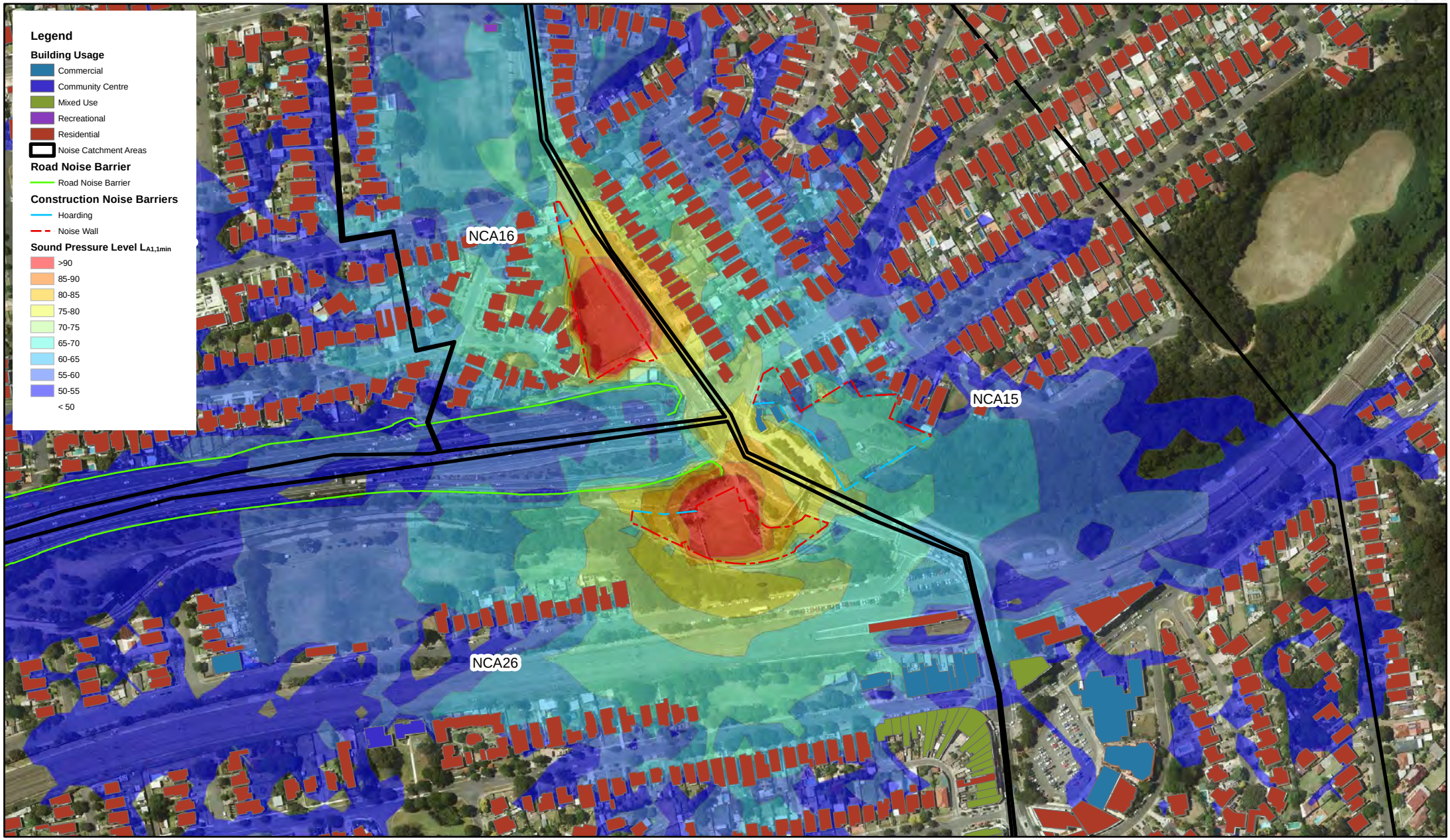
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Night

SEP 2015

60327128

Source: SKM2014

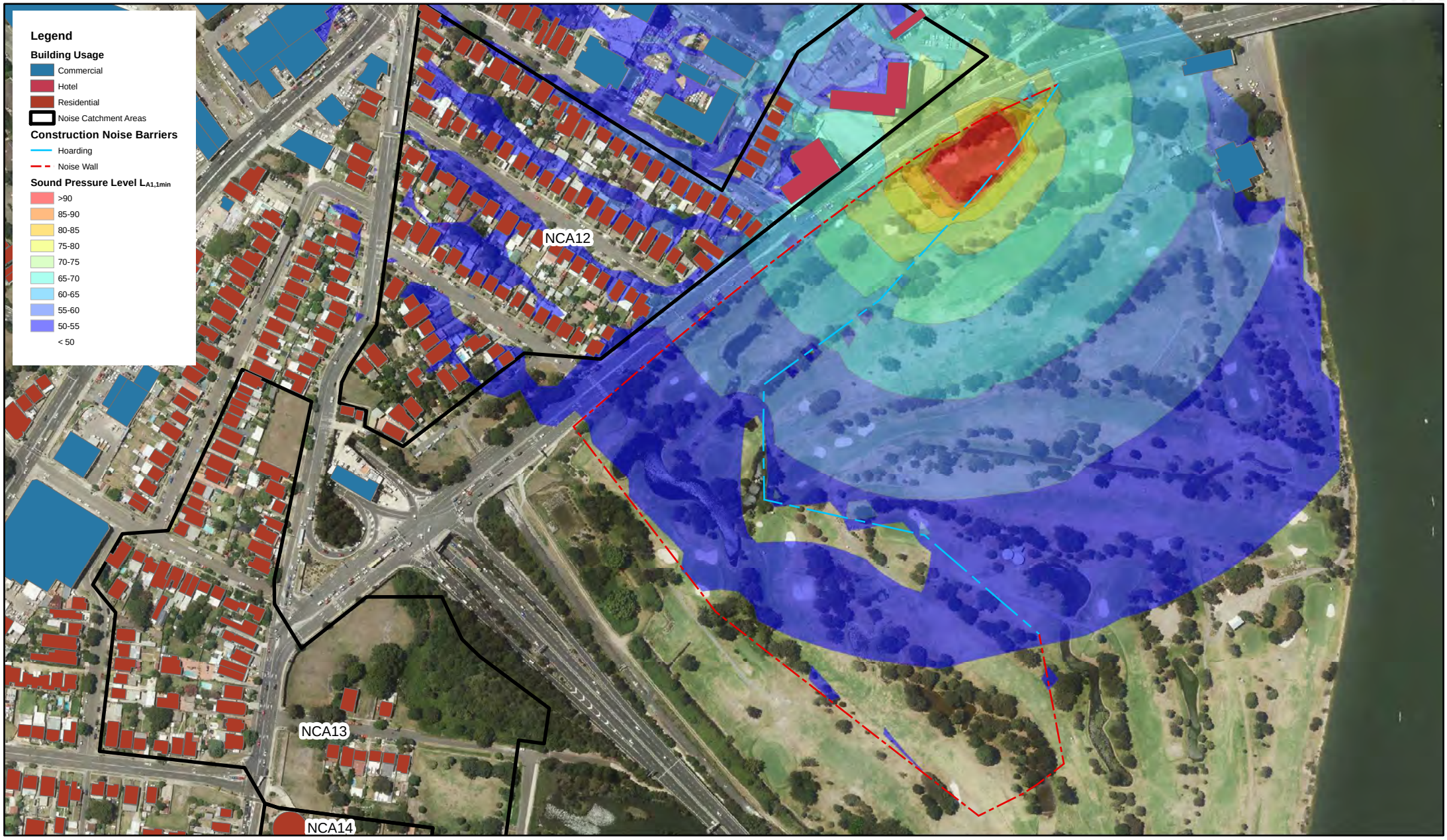
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment

Tunnelling works - Tunnelling support establishment - Decline excavation and construction (No rock hammering) - Night

SEP 2015

60327128

Source: SKM2014

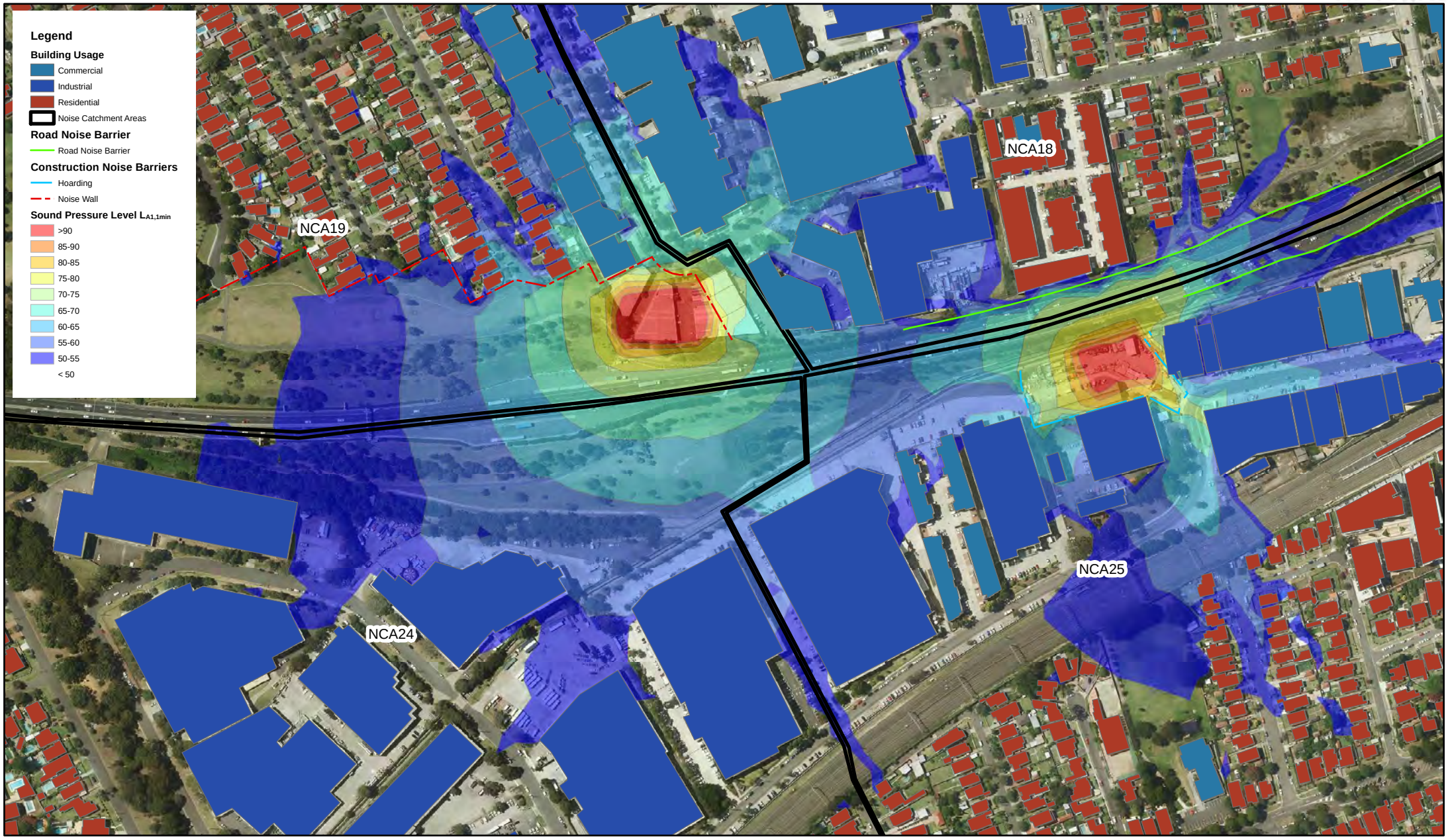
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.

12_02a



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunneling and support - Night

SEP 2015
60327128

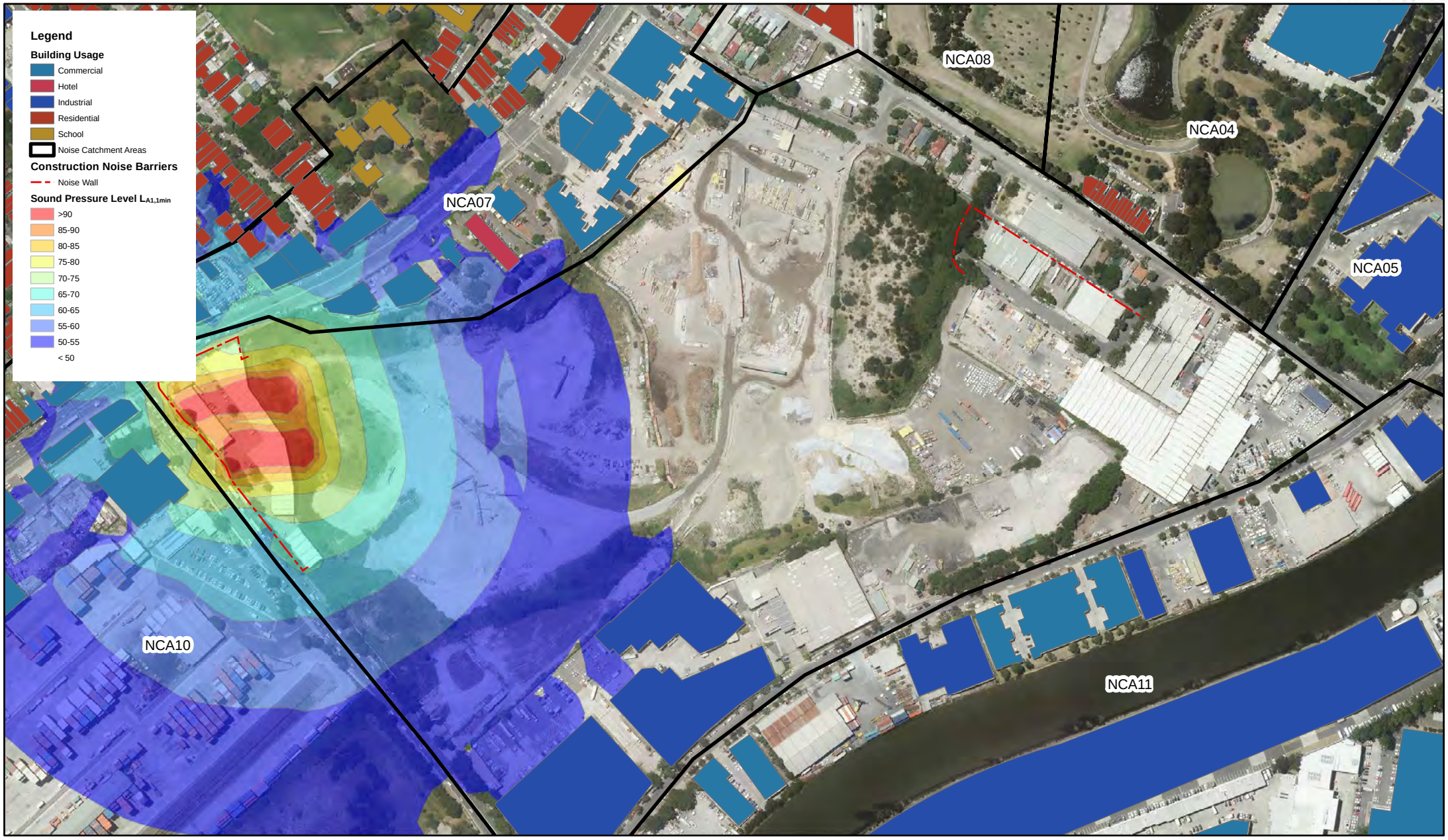
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunneling and support - Night

SEP 2015
60327128

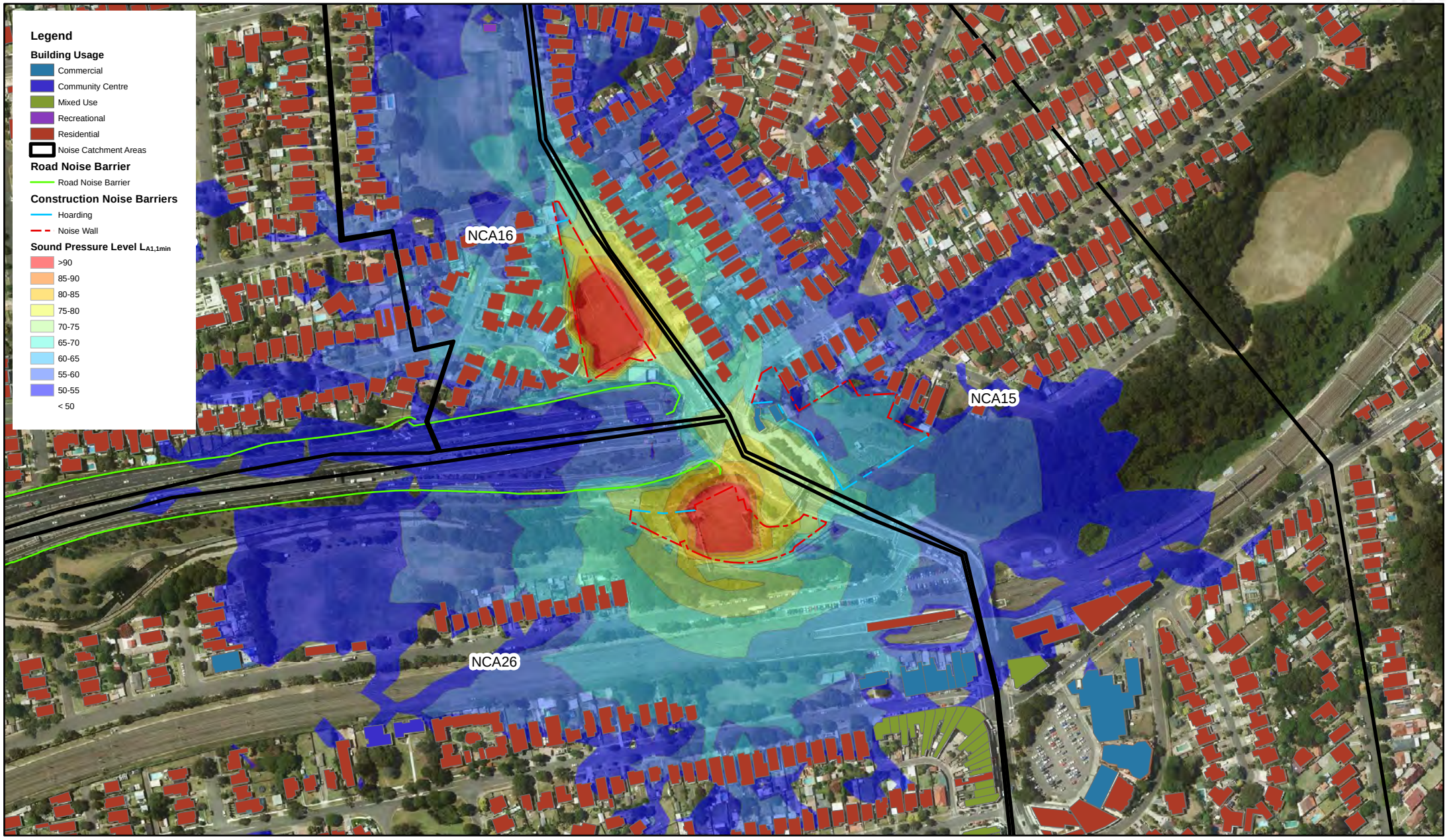
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunneling and support - Night

SEP 2015
60327128

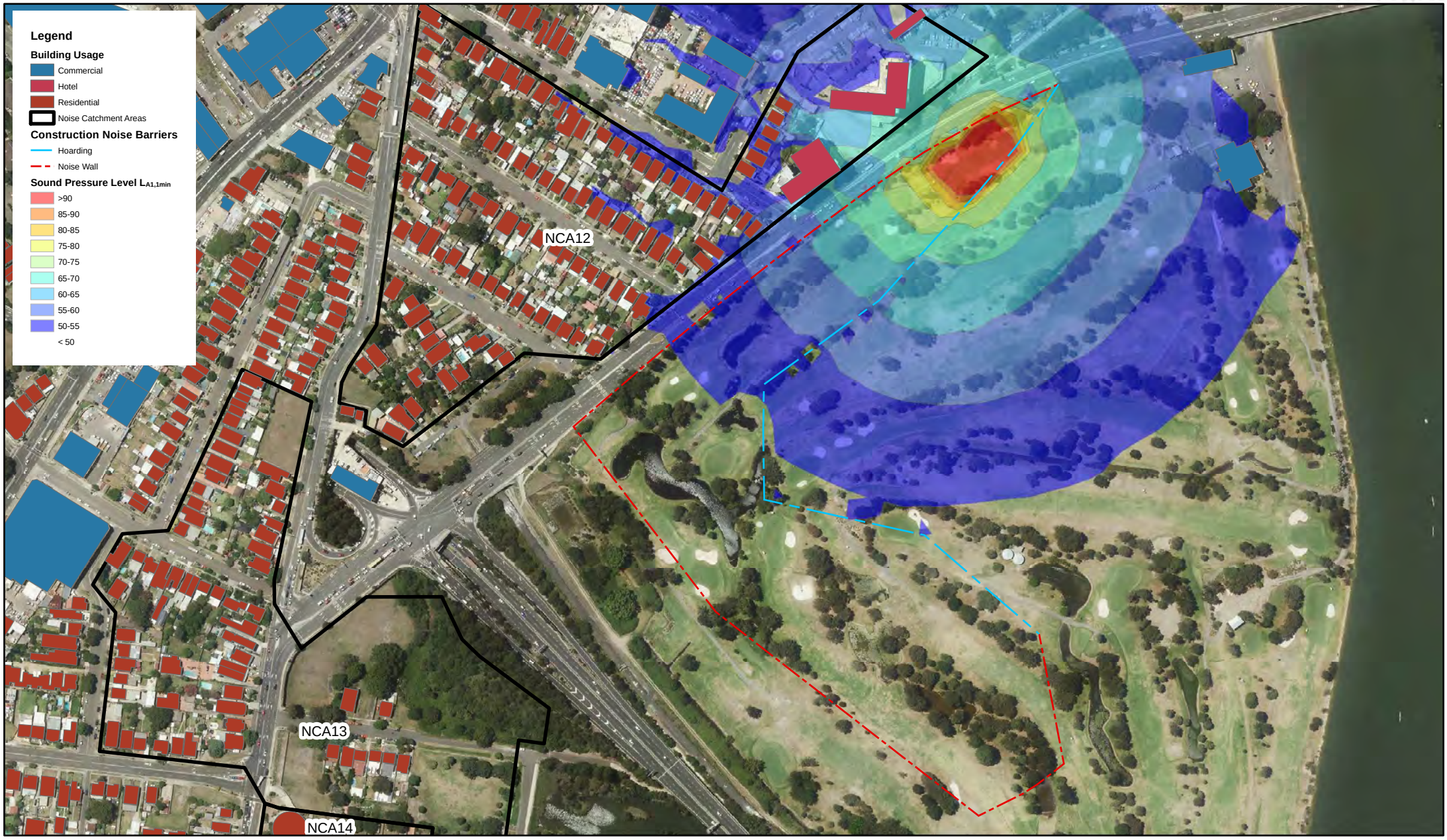
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Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunneling and support - Night

SEP 2015
60327128

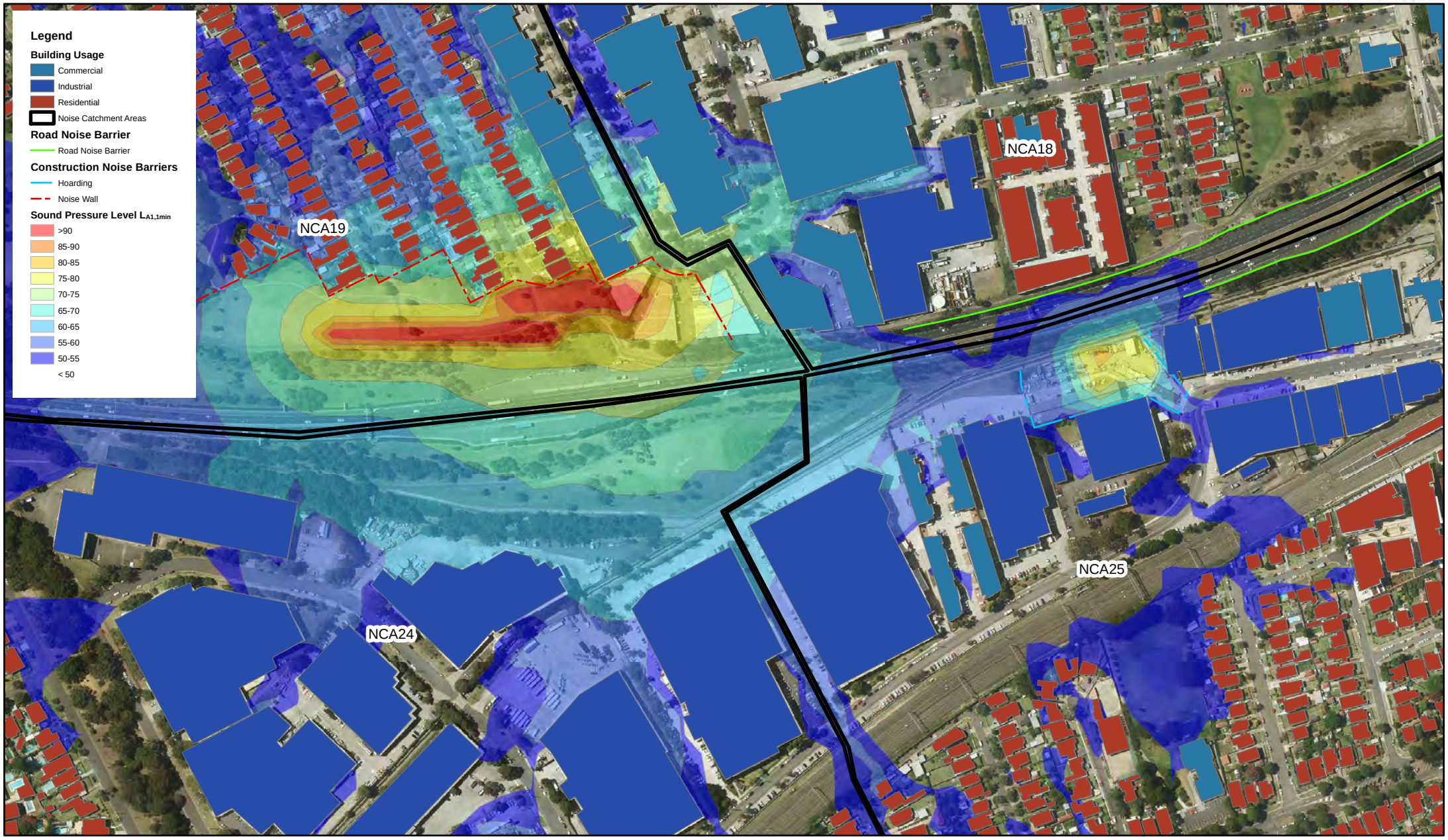
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Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_01



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Night

SEP 2015
60327128

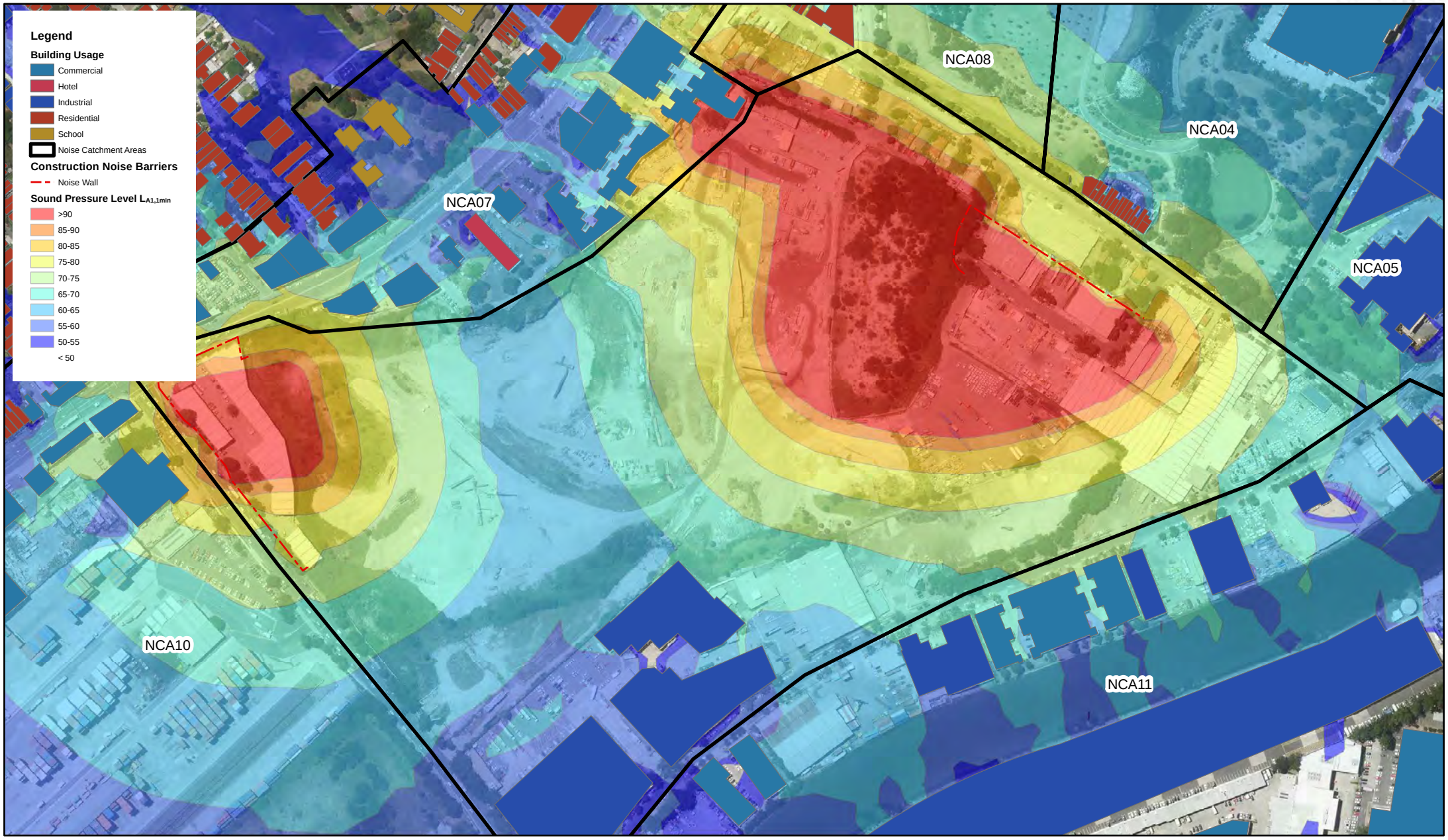
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Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																														
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Night

SEP 2015
60327128

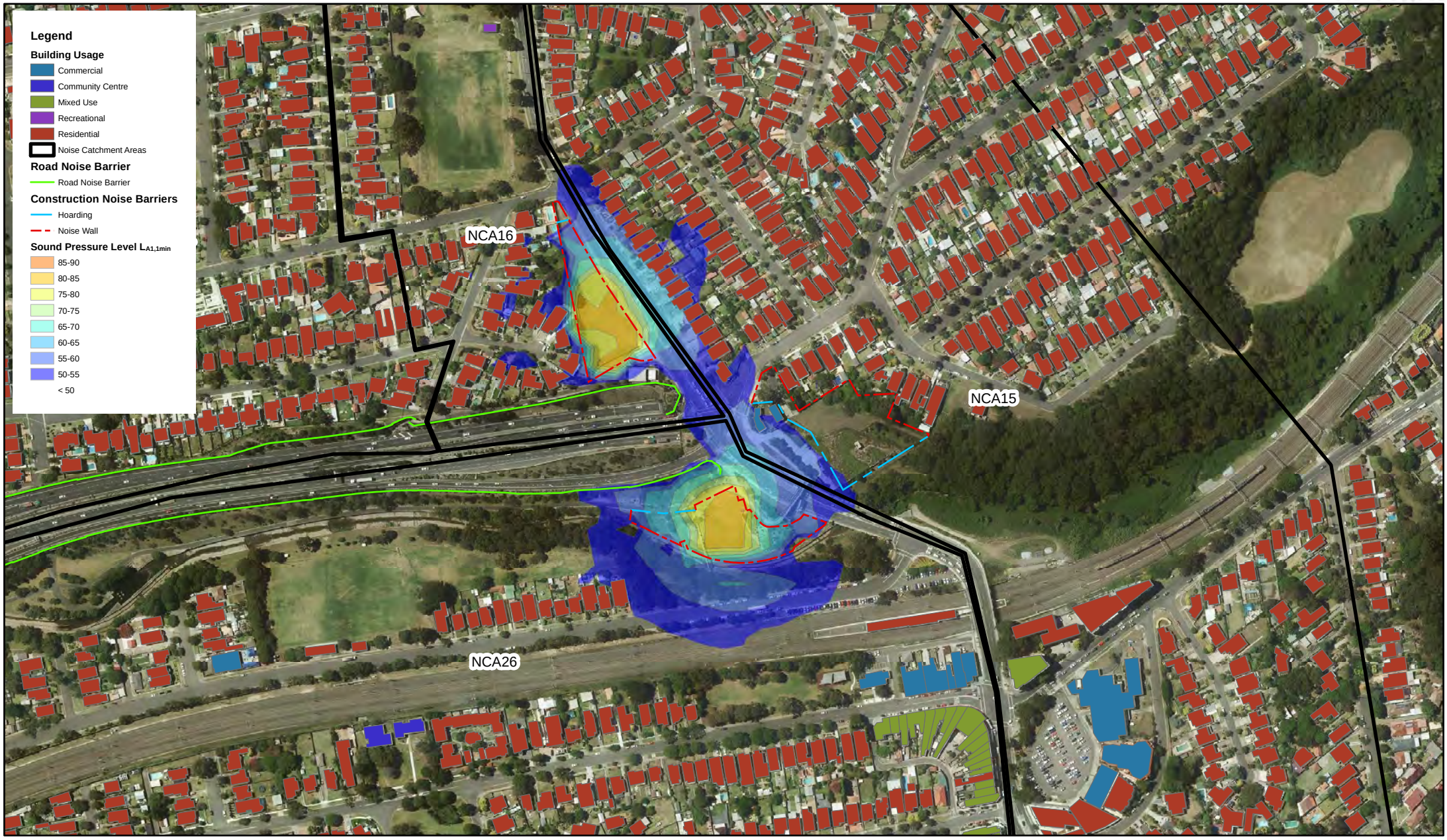
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Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_02



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Night

SEP 2015
60327128

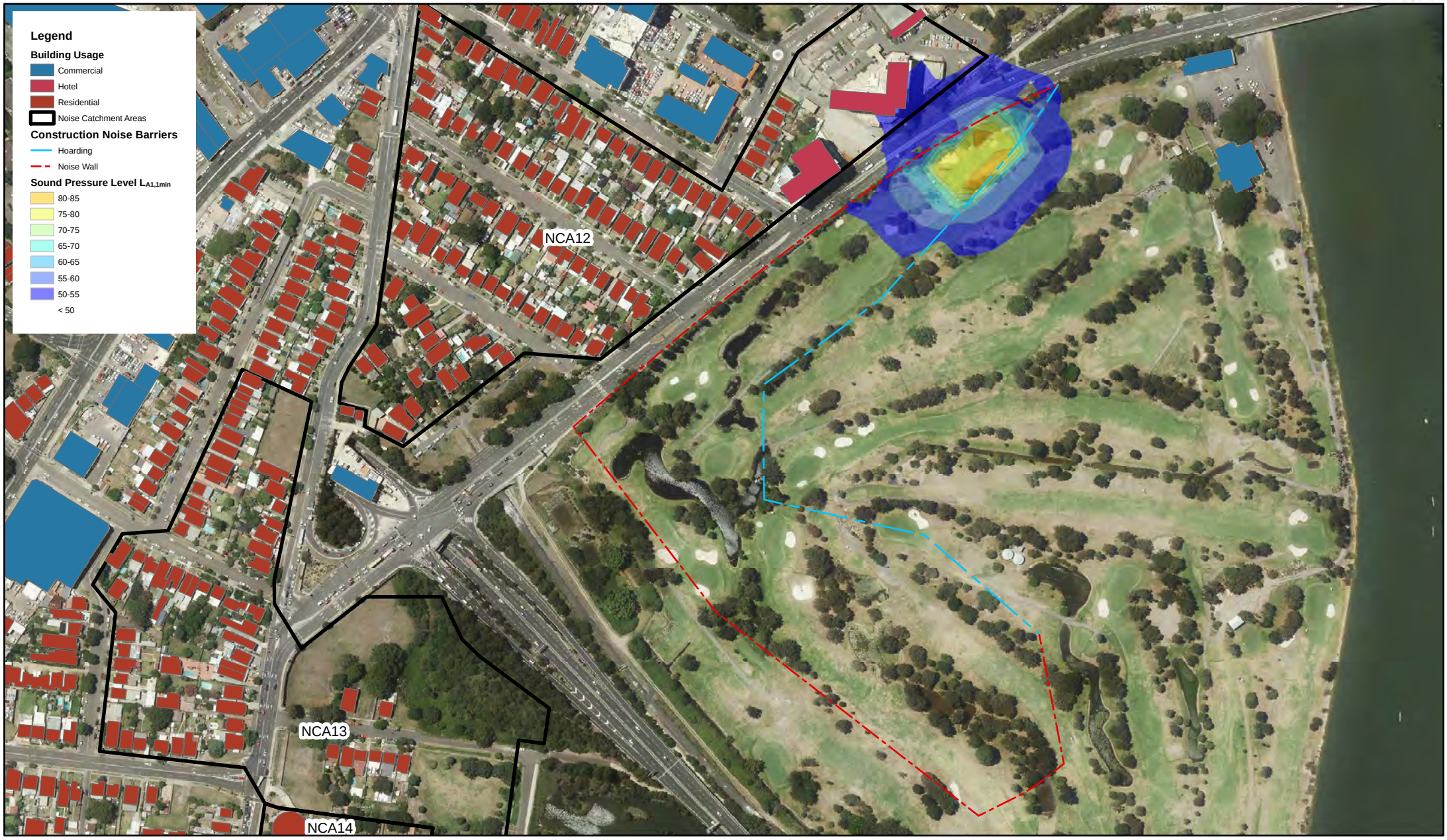
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
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Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_02



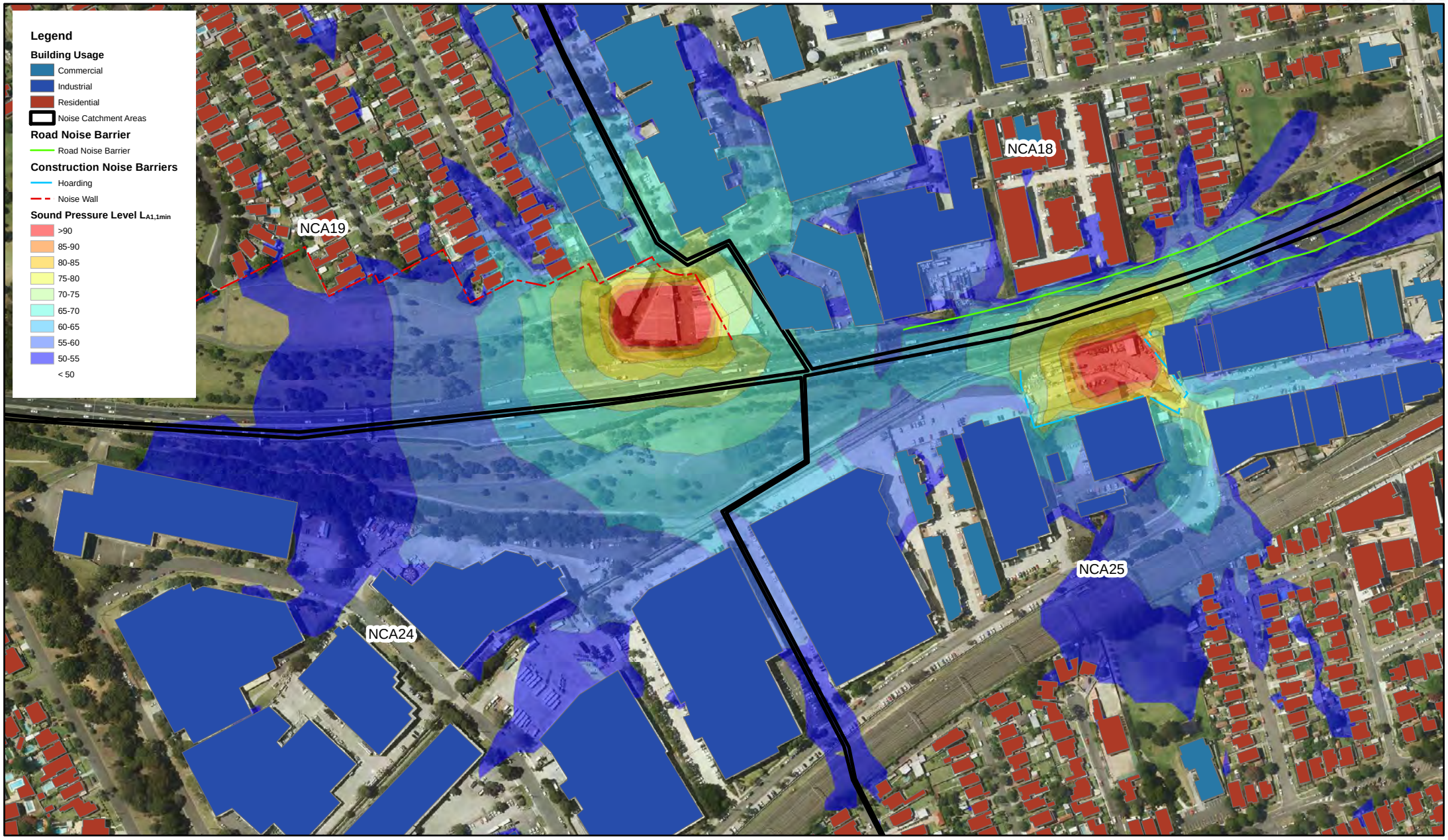
WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Spoil handling - Night

SEP 2015
60327128

Source: SKM2014

Fig.
13_02

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Night

SEP 2015
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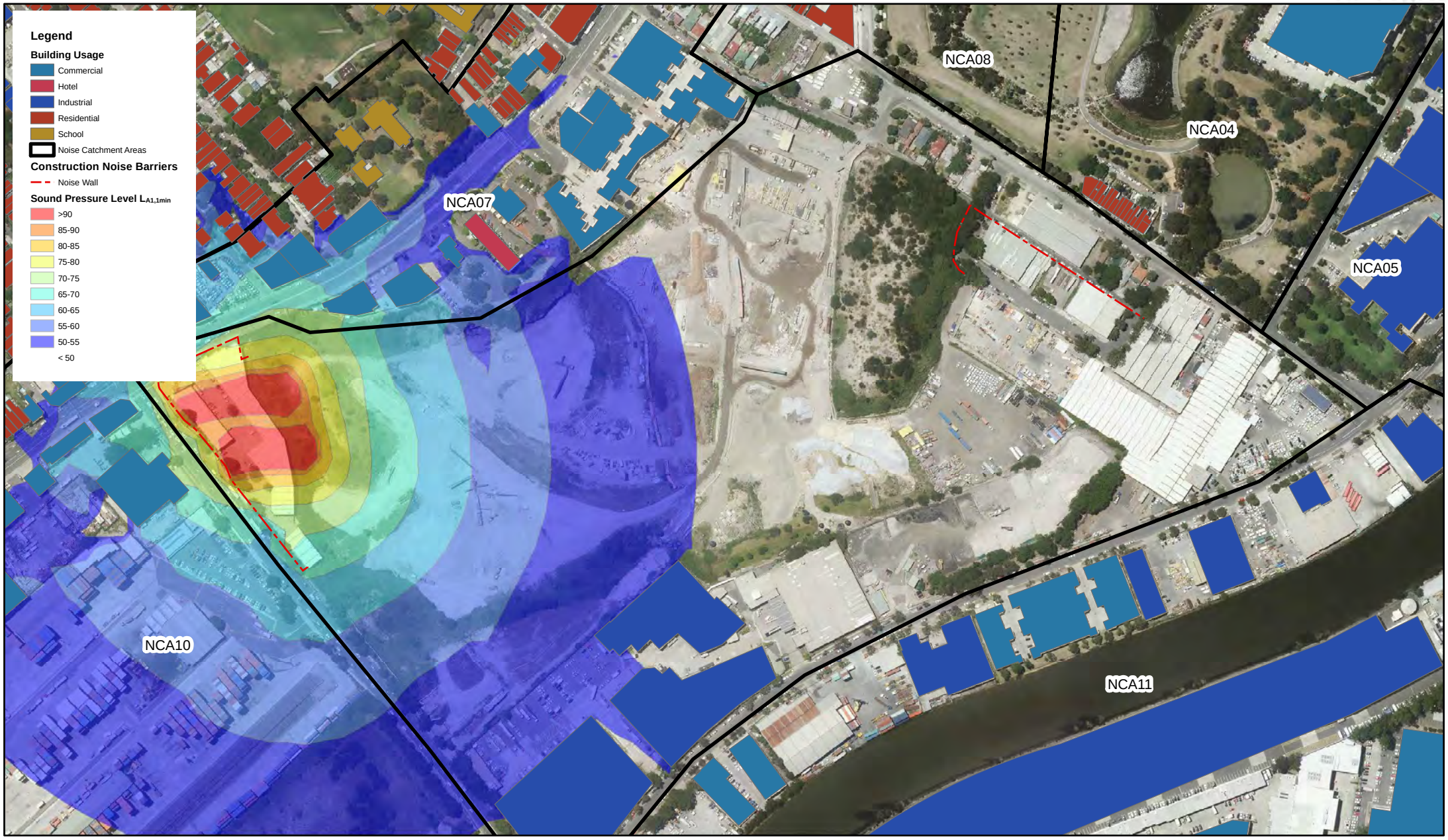
Source: SKM2014

Fig.
13_03

0 20 40 80 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Night

SEP 2015
60327128

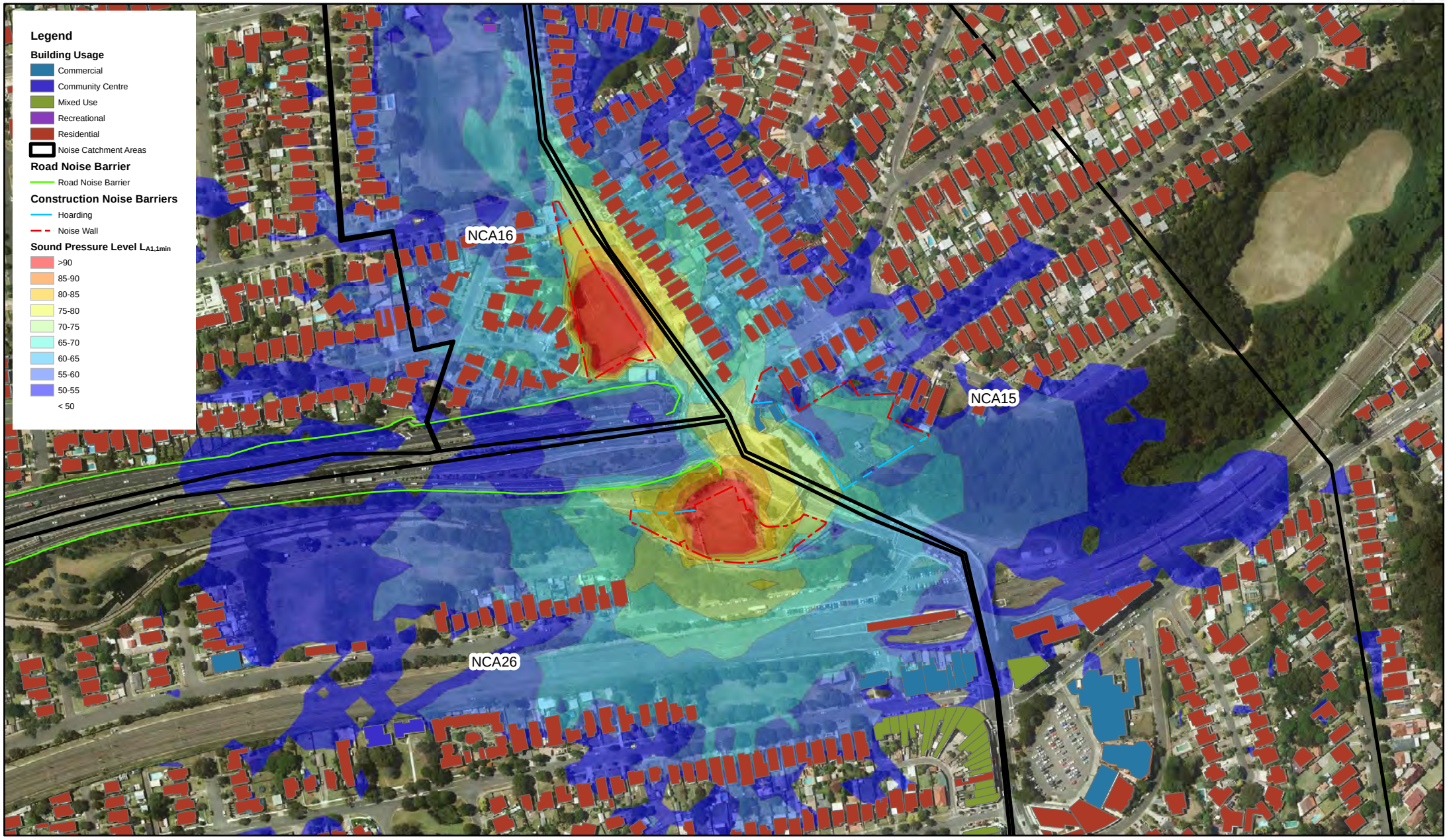
Source: SKM2014

Fig.
13_03

0 20 40 80 m

N

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Night

SEP 2015
60327128

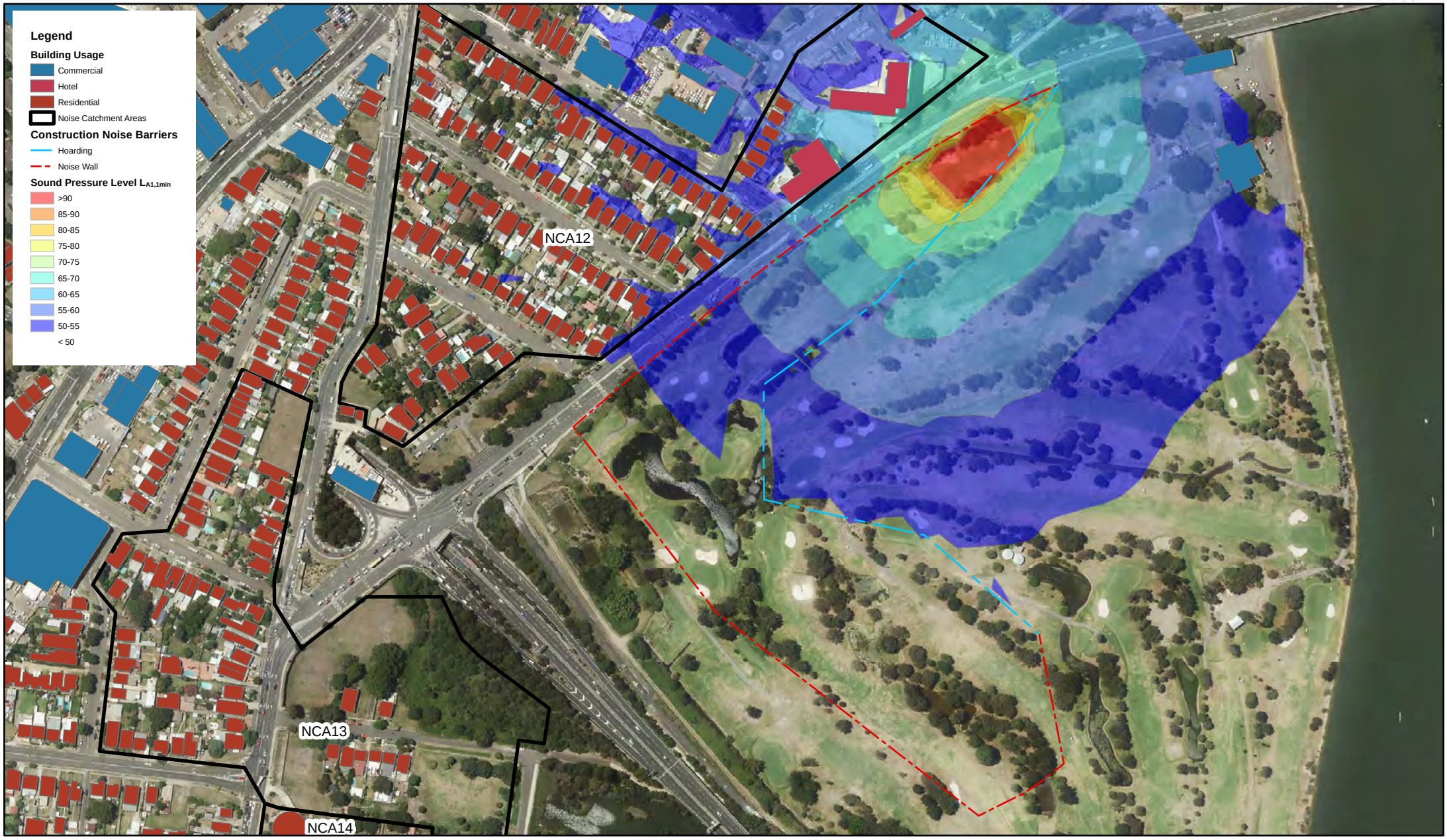
Source: SKM2014

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

0 20 40 80 m

N

Fig.
13_03



WestConnex Stage 2 - Construction Noise Sleep Disturbance Assessment
Tunnelling works - Tunnelling support site - Tunnel lining - Night

SEP 2015
60327128

Source: SKM2014

N

0 20 40 80 m

Fig.
13_03

Time	Descriptor	Sound Pressure Level, L_{Aeq} dB(A)																													
		NCA1	NCA2	NCA3	NCA4	NCA5	NCA6	NCA7	NCA8	NCA9	NCA10	NCA11	NCA12	NCA13	NCA14	NCA15	NCA16	NCA17	NCA18	NCA19	NCA20	NCA21	NCA22	NCA23	NCA24	NCA25	NCA26	NCA27	NCA28	NCA29	NCA30
Day	Background	57	45	45	57	57	45	52	54	60	58	58	55	49	47	51	54	48	48	45	50	47	47	49	50	47	47	60	52	47	53
	NML	67	55	55	67	67	55	62	64	70	68	68	65	59	57	61	64	58	58	55	60	57	57	59	60	57	57	70	62	57	63
Evening	Background	51	43	43	51	51	43	50	45	54	56	52	55	48	47	51	54	48	48	45	49	46	46	49	50	47	47	58	51	47	52
	NML	56	48	48	56	56	48	55	50	59	61	57	60	53	52	56	59	53	53	50	54	51	51	54	55	52	52	63	56	52	57
Night	Background	40	32	32	40	40	32	44	40	43	49	42	45	42	39	43	40	43	43	43	40	40	40	42	42	41	41	46	39	41	44
	NML	45	37	37	45	45	37	49	45	48	54	47	50	47	44	48	45	48	48	48	45	45	45	47	47	46	46	51	44	46	49

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Appendix J

Construction ground-borne noise L_{Aeq} maps

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Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55
- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **1**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **2**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **3**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **4**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **5**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **1**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **2**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **3**



Sound Pressure Level, L_{Aeq} dB(A)

- 35 (Night-time criteria)
- 40 (Evening criteria)
- 45
- 50
- 55

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne noise - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

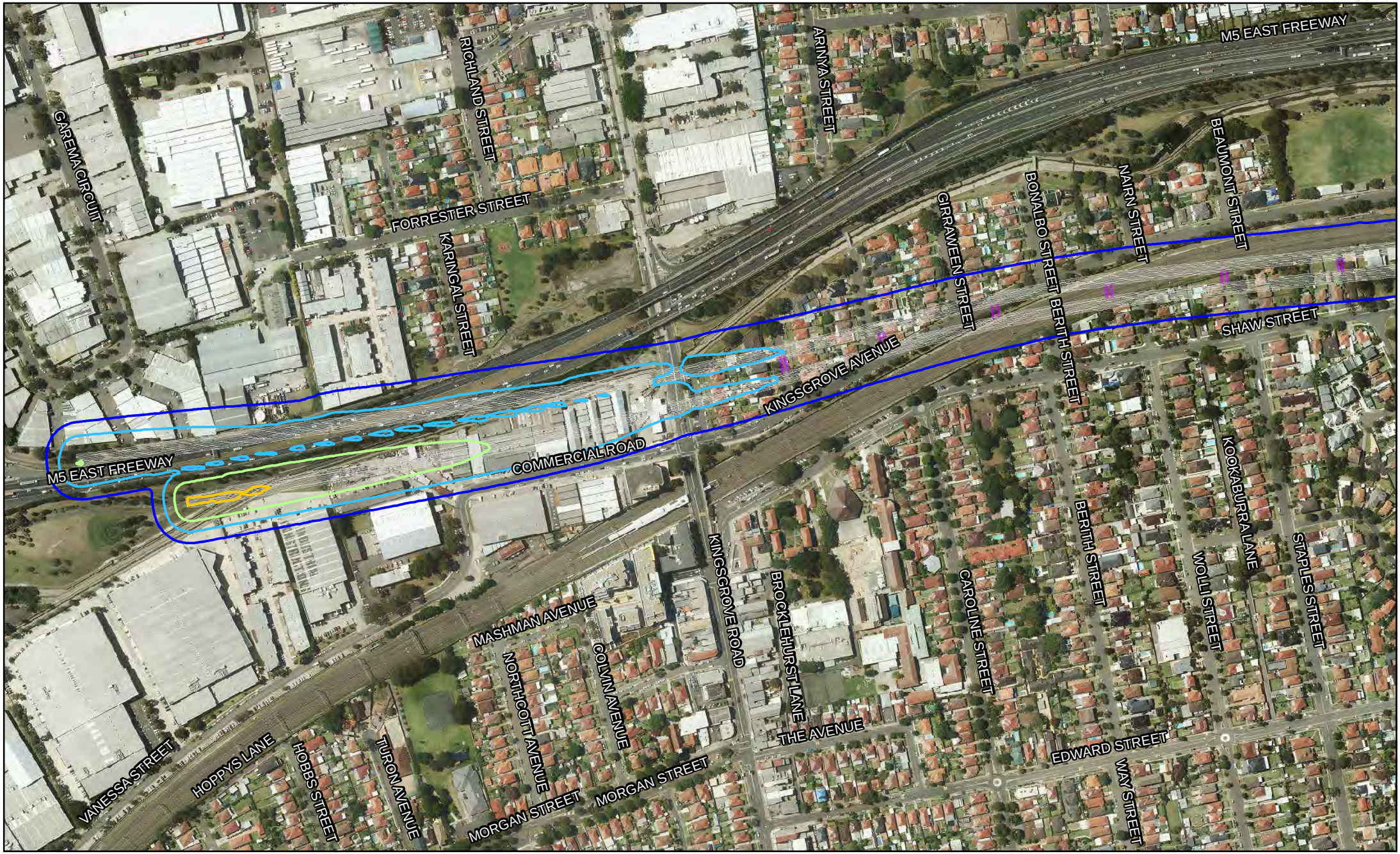
Fig. **4**

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Appendix K

Construction vibration maps

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Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)
- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **1**



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)
- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **2**



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **3**



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - tunnel

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **4**



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)
- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - cross passages

Source: SKM2014

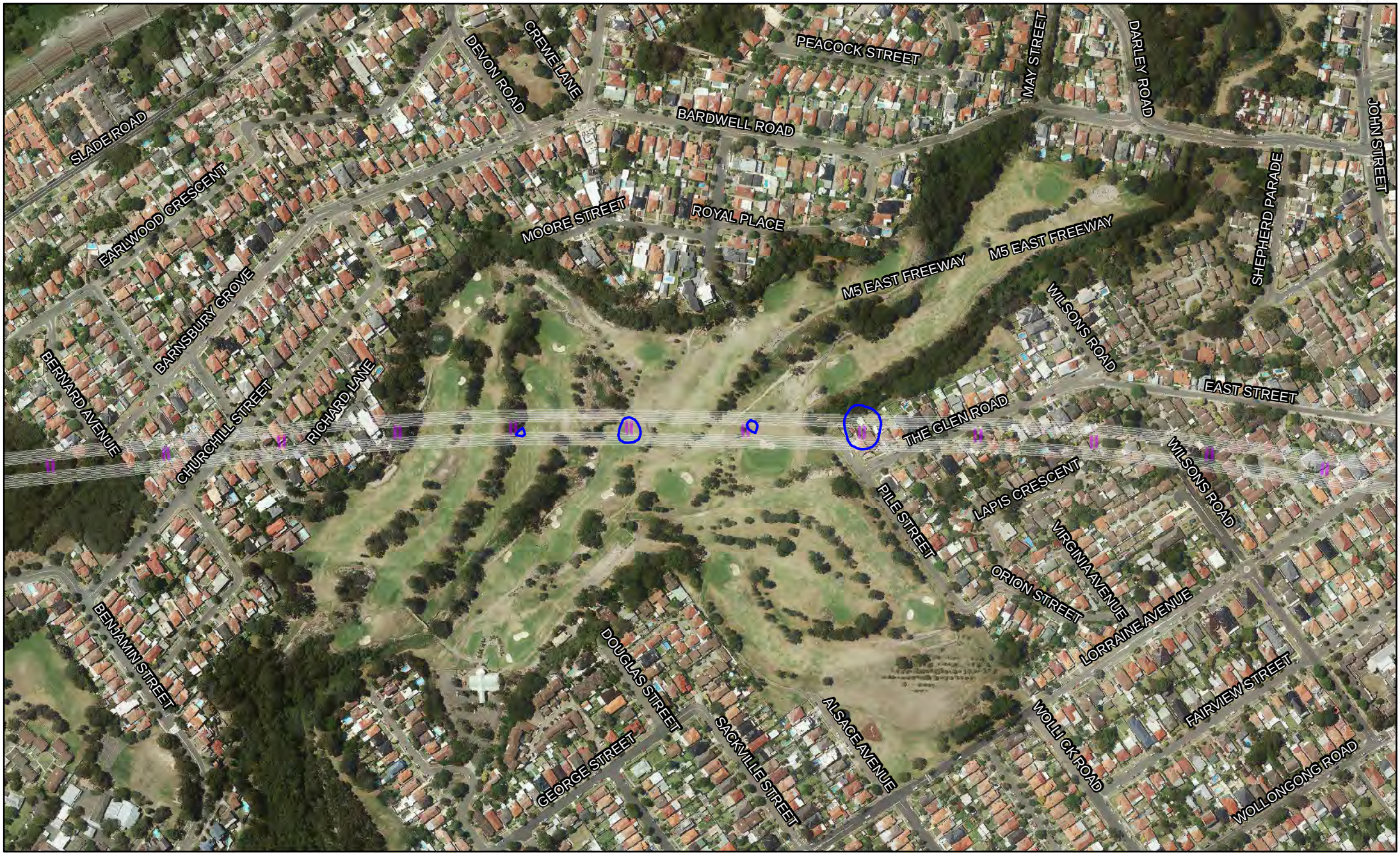
0 100 200 400 m

N

AUG 2015

60327128

Fig. **1**



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)
- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **2**

AECOM



Peak Particle Velocity, mm/s

- 0.20 (Night-time criteria)
- 0.22
- 0.24
- 0.26
- 0.28 (Day-time criteria)

- Cross Passages
- Tunnel Alignment

WestConnex Stage 2

Construction groundborne vibration - cross passages

Source: SKM2014

0 100 200 400 m

N

AUG 2015

60327128

Fig. **3**

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Appendix L

Operational noise results - road traffic maps

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Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **1**

AECOM



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55	56 - 58	58 - 60	60 - 62	62 - 64	64 - 65	>= 65

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime noise levels

Source:

0 100 200 400 m

N

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime noise levels

Source:

0 100 200 400 m

N

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

WestConnex Stage 2

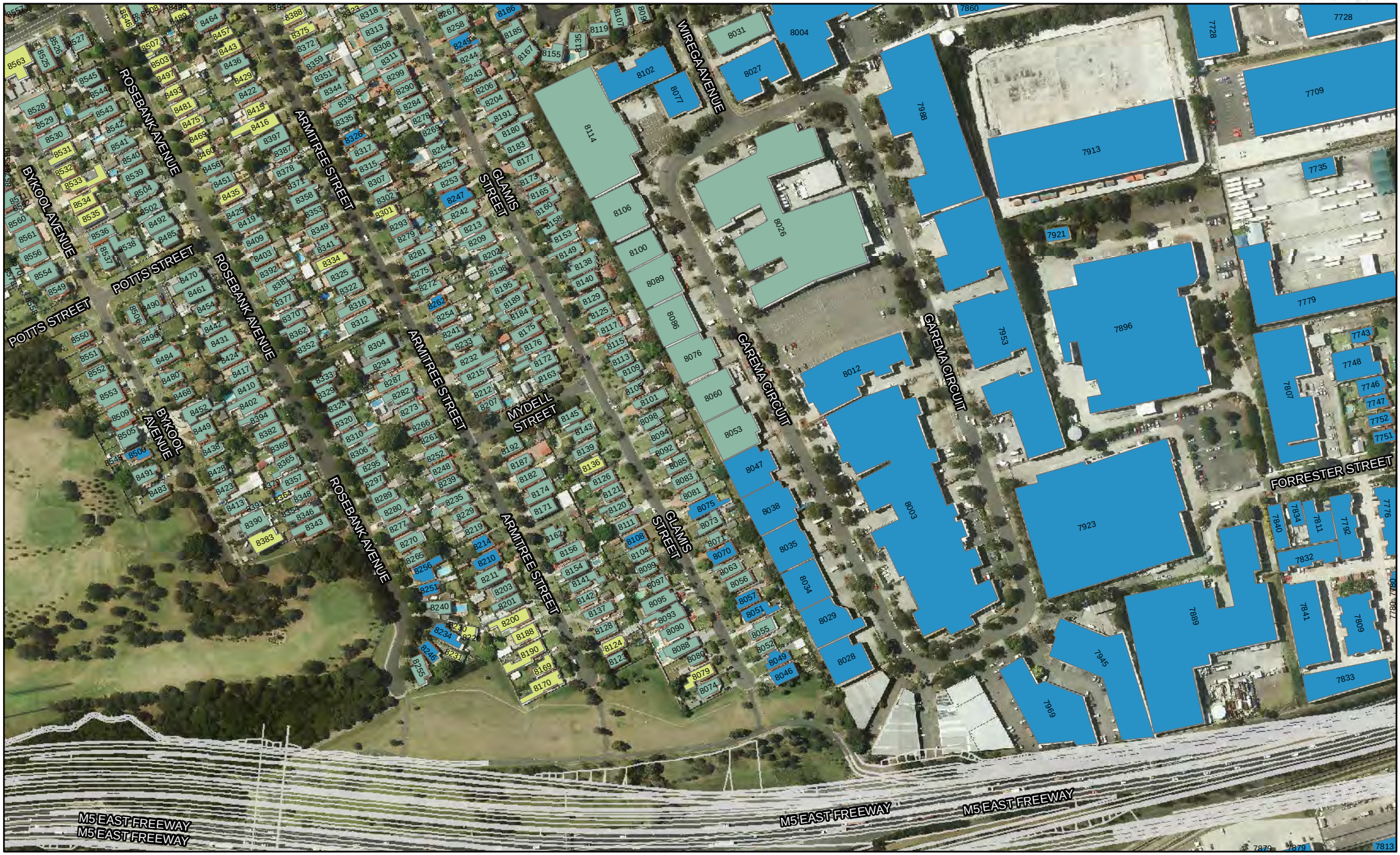
Western Surface Works - Year 2021 build daytime increase in noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime increase in noise levels

Source:

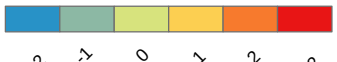
AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)



0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build daytime increase in noise levels

Source:

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)



WestConnex Stage 2

Western Surface Works - Year 2021 build daytime increase in noise levels

Source:

0 100 200 400 m

AUG 2015

60327128

Fig. **4**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **4**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)



0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time increase in noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time increase in noise levels

Source:

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

N

Source:

WestConnex Stage 2

Western Surface Works - Year 2021 build night-time increase in noise levels

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)



WestConnex Stage 2

Western Surface Works - Year 2021 build night-time increase in noise levels

Source:

0 100 200 400 m

AUG 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Noise Levels, dB(A)

<= 55 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime noise levels

Source:

AUG 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime increase in noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build daytime increase in noise levels

Source:

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)



WestConnex Stage 2

Western Surface Works - Year 2031 build daytime increase in noise levels

Source:

0 100 200 400 m

AUG 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)



WestConnex Stage 2

Western Surface Works - Year 2031 build daytime increase in noise levels

Source:

0 100 200 400 m

AUG 2015

60327128

Fig. **4**

AECOM



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build night-time noise levels

Source:

AUG 2015

60327128

Fig. **2**



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build night-time noise levels

Source:

AUG 2015

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Fig. **3**

AECOM



Predicted $L_{Aeq(9hour)}$ Noise Levels, dB(A)

<= 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

0 100 200 400 m

WestConnex Stage 2

Western Surface Works - Year 2031 build night-time noise levels

Source:

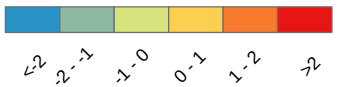
AUG 2015

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Fig. **4**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)



WestConnex Stage 2

Western Surface Works - Year 2031 build night-time increase in noise levels

Source:

0 100 200 400 m

AUG 2015

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Fig. **1**



AECOM

Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

WestConnex Stage 2

Western Surface Works - Year 2031 build night-time increase in noise levels

Source:

0 100 200 400 m

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AUG 2015

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Fig. **2**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

<-2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | >2

0 100 200 400 m

Source:

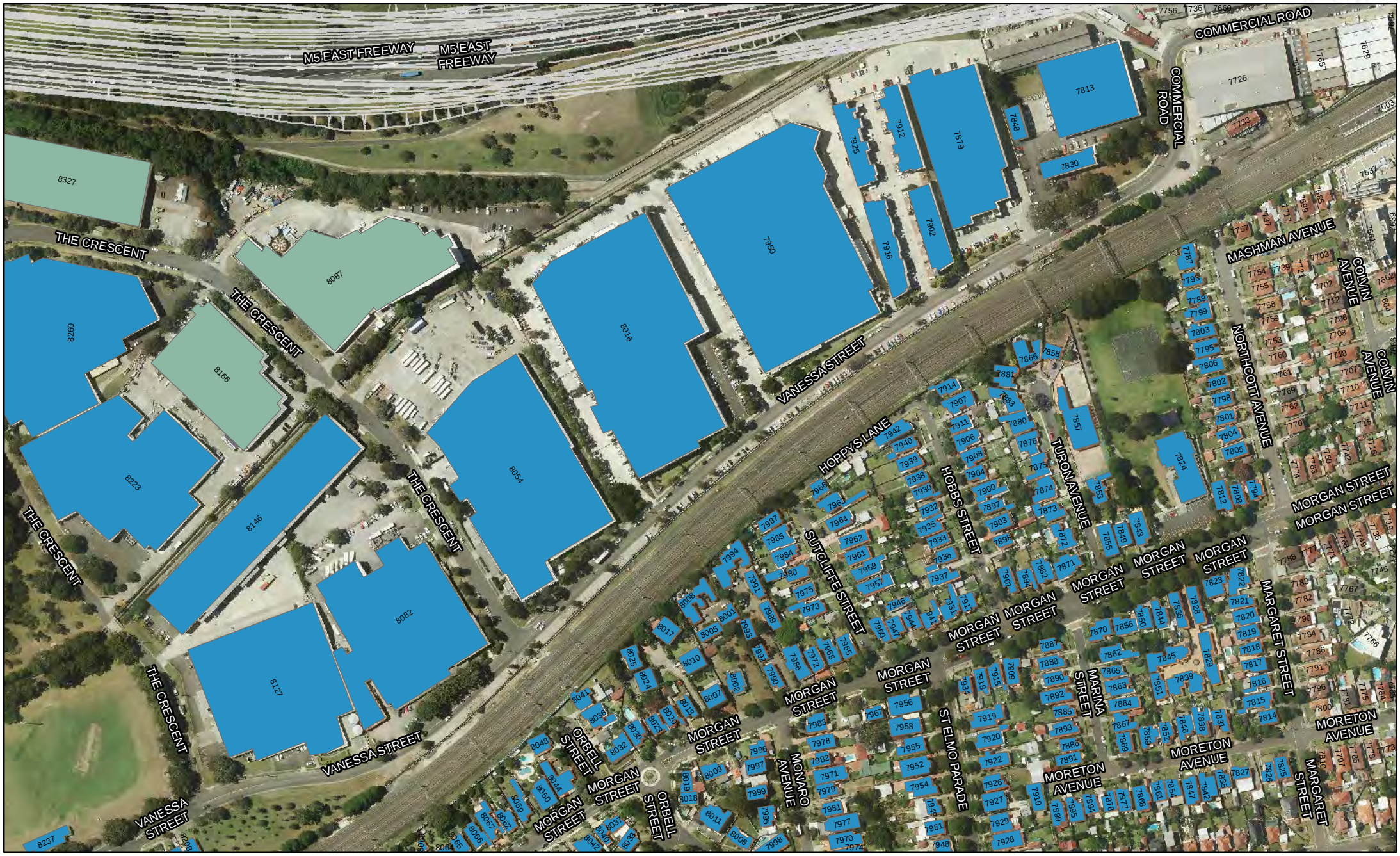
WestConnex Stage 2

Western Surface Works - Year 2031 build night-time increase in noise levels

AUG 2015

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Fig. **3**


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Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime noise levels

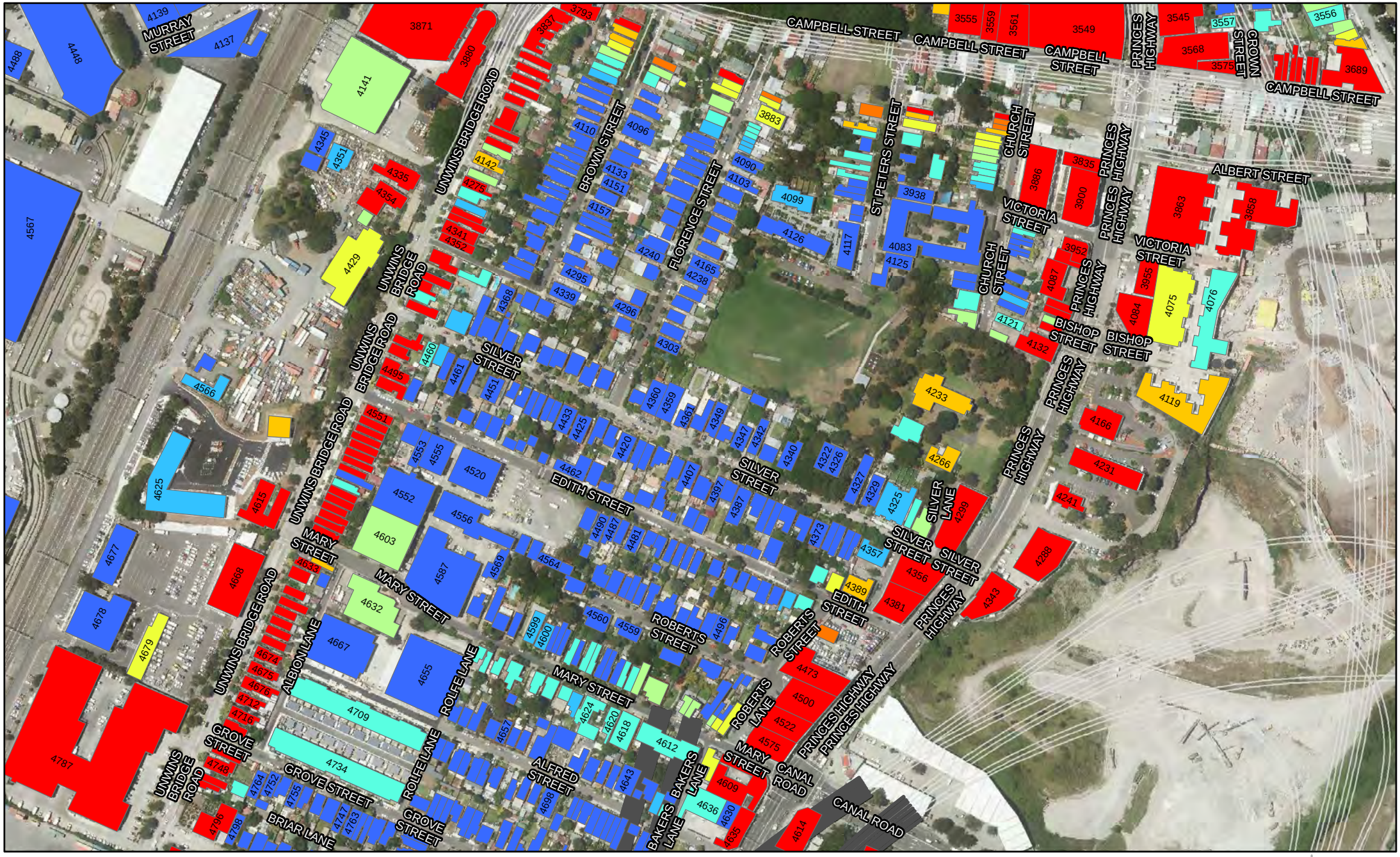
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime noise levels

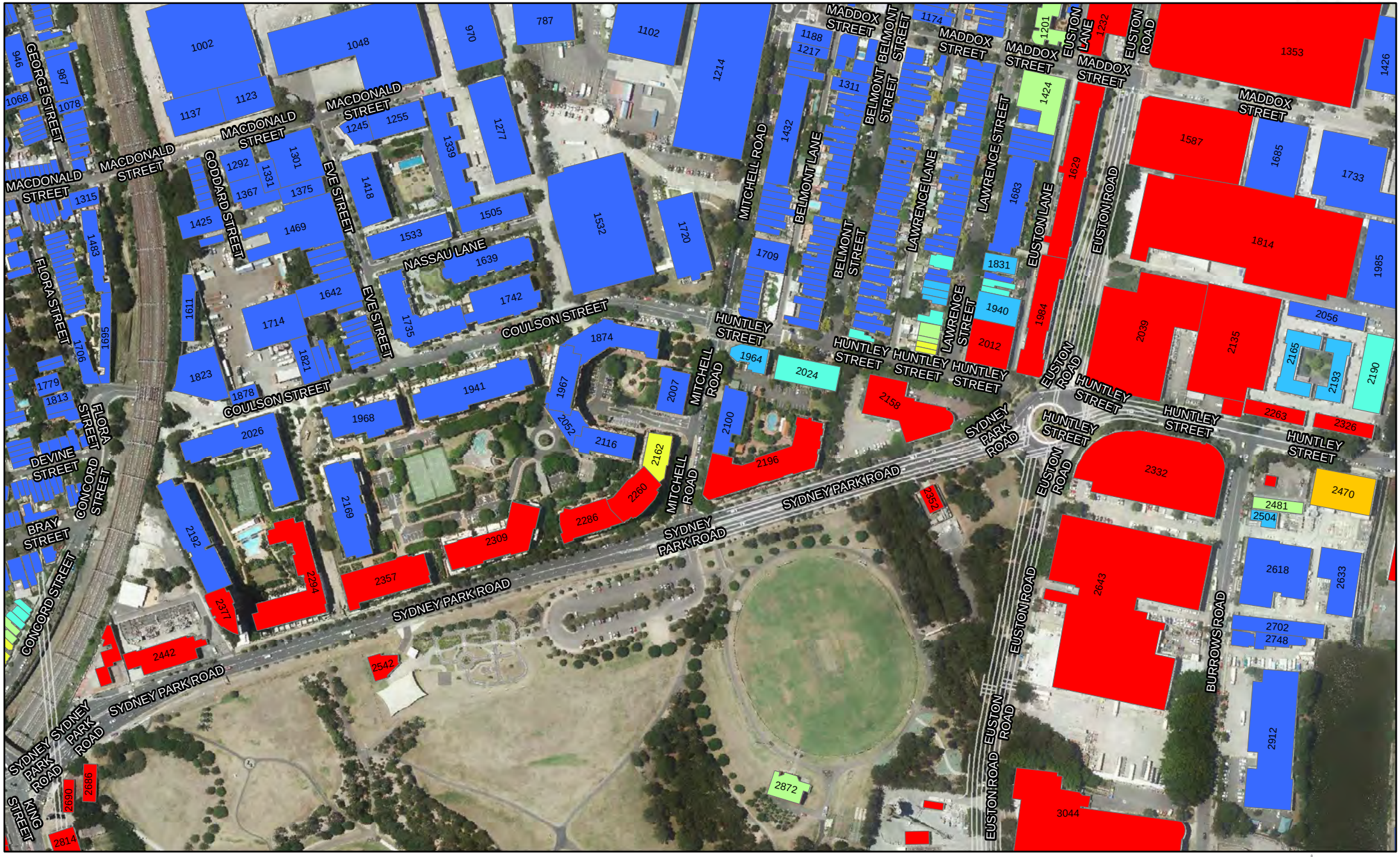
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime noise levels

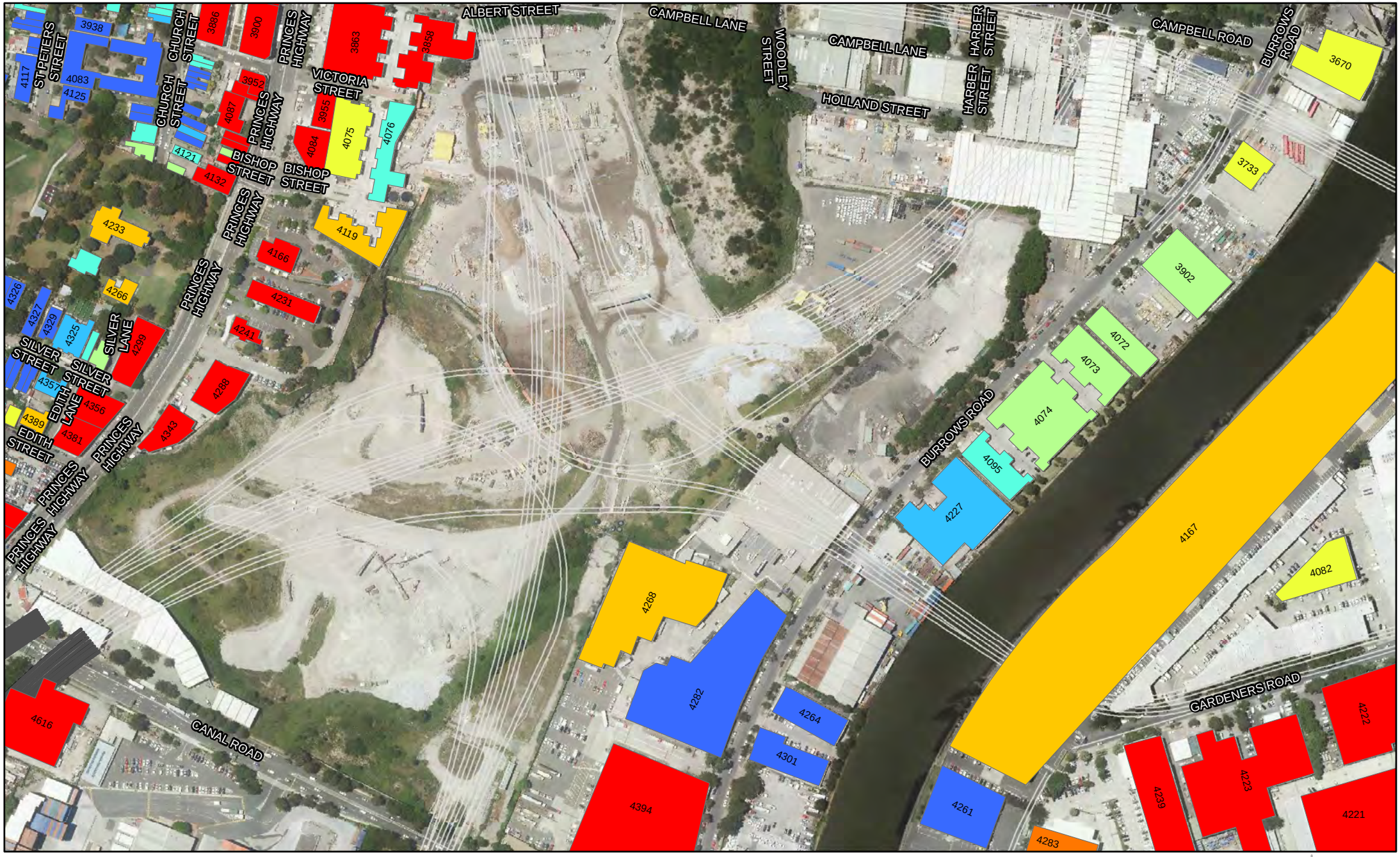
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime noise levels

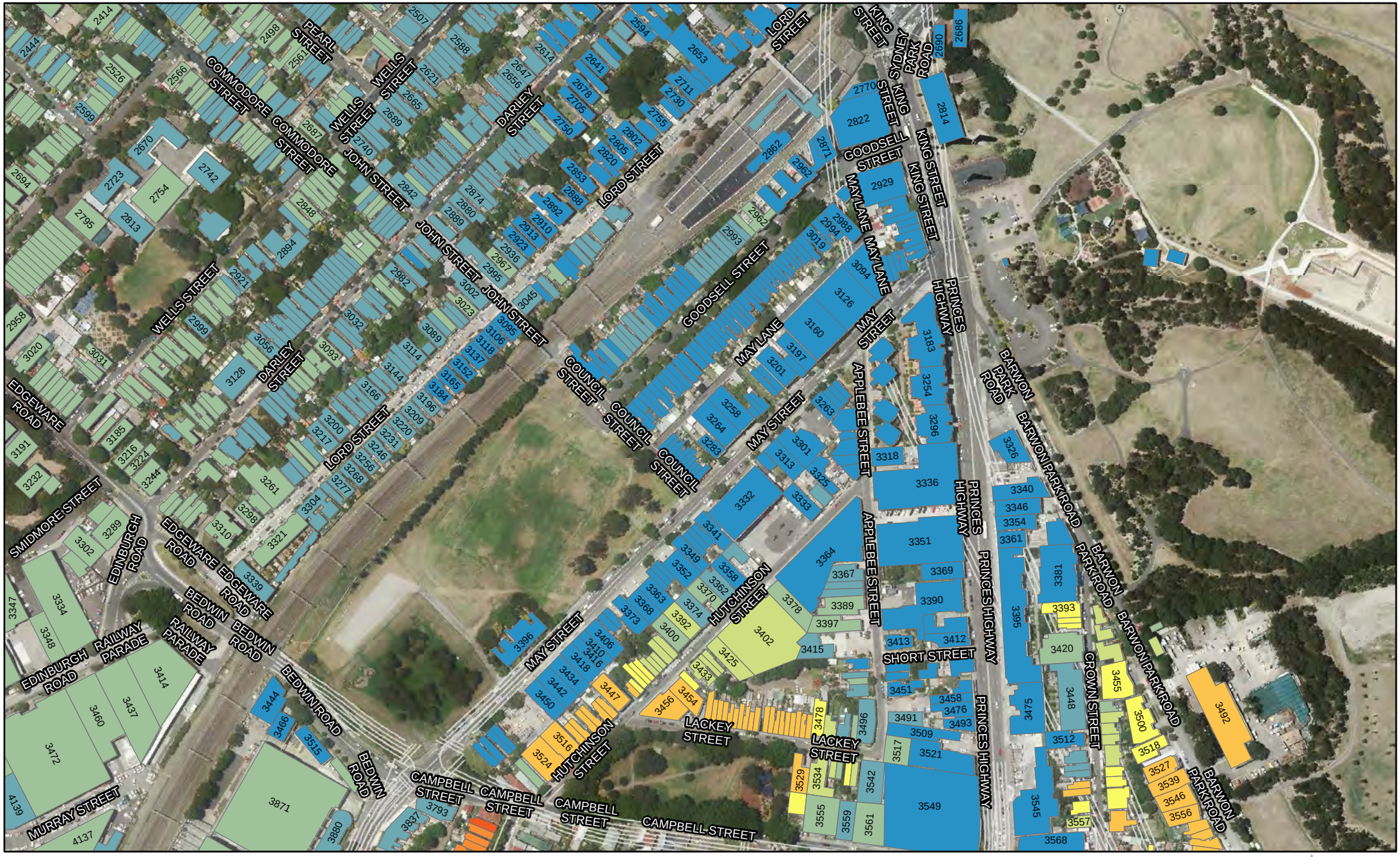
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime increase in noise levels

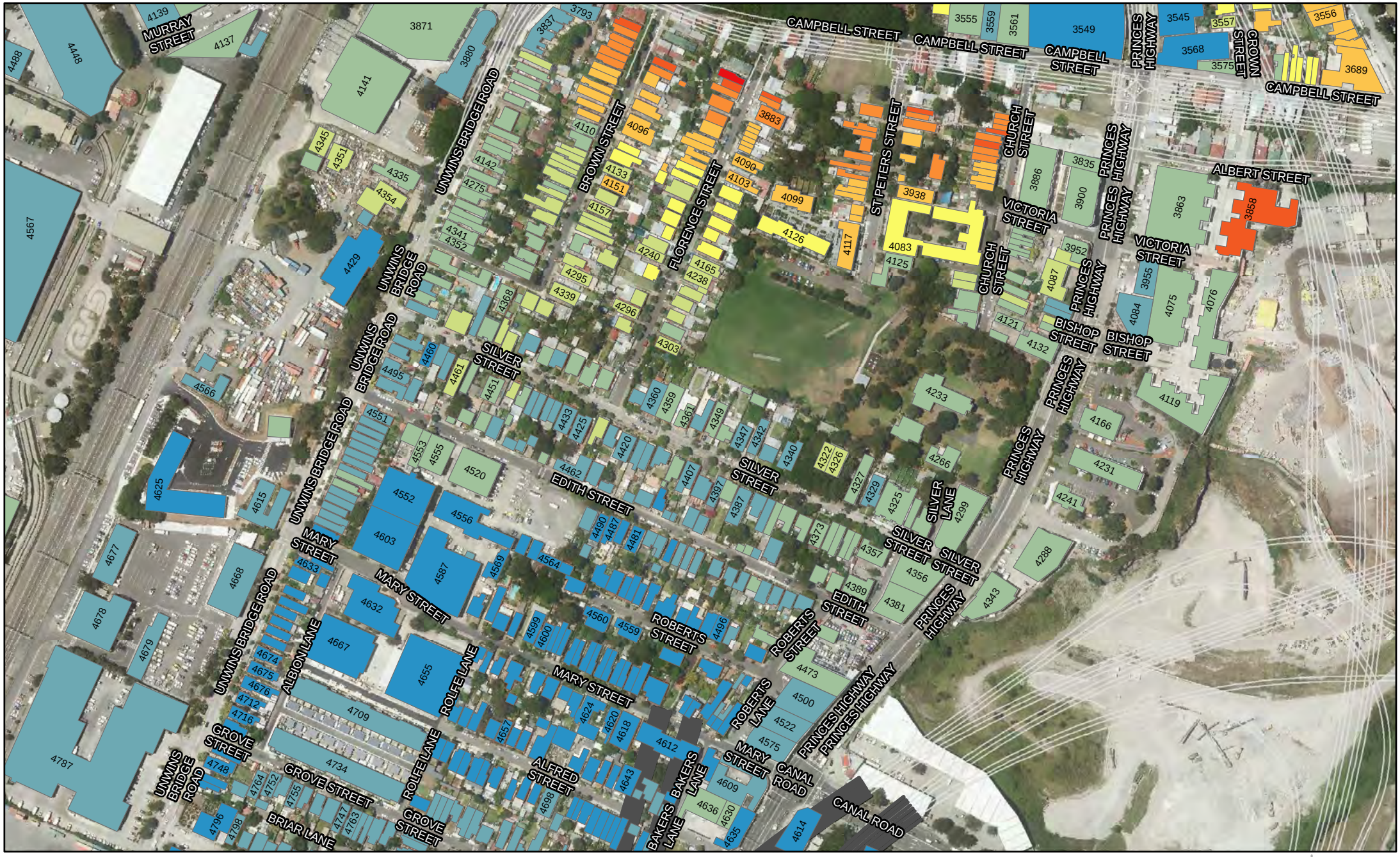
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **3**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

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Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime increase in noise levels

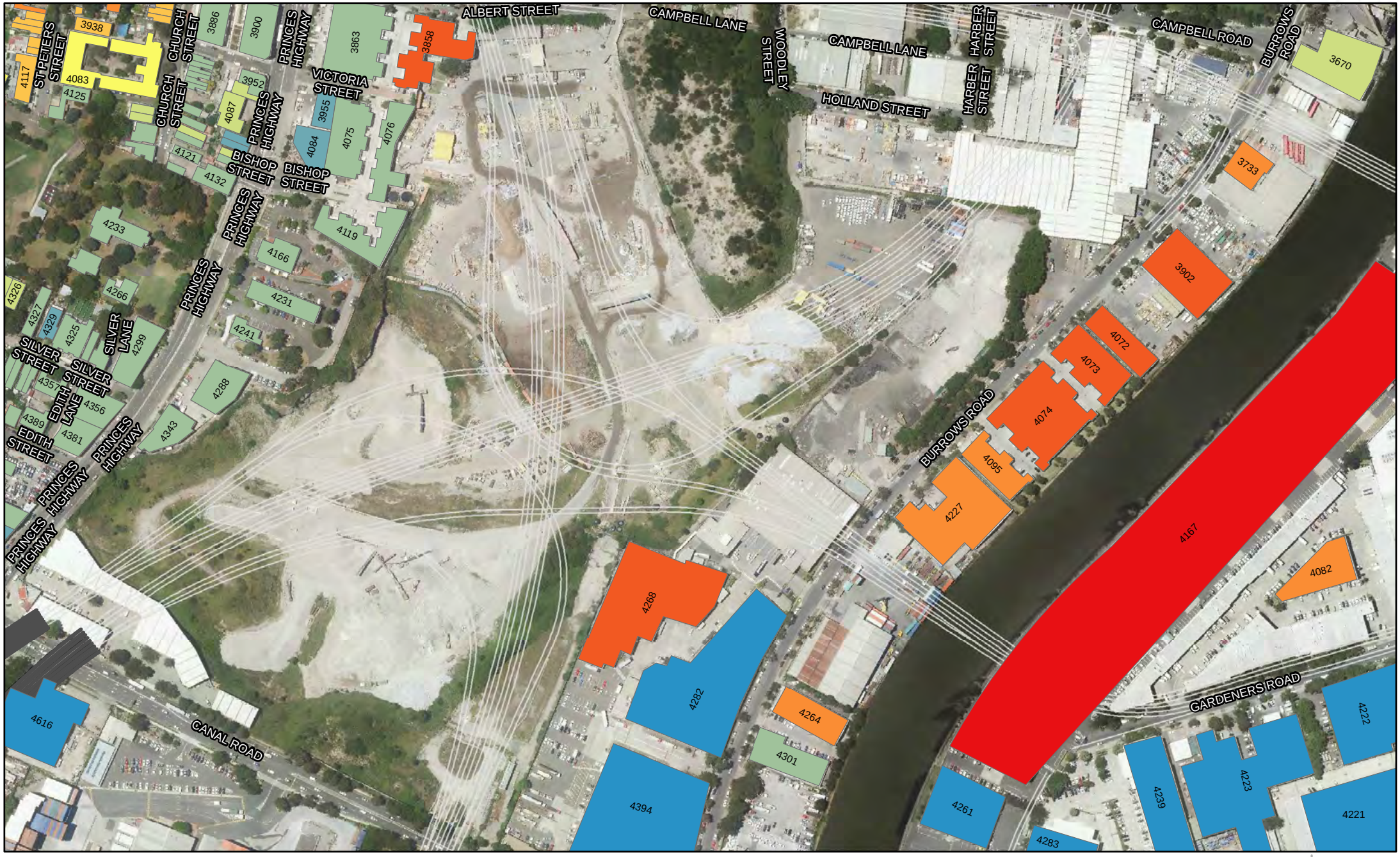
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

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Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time noise levels

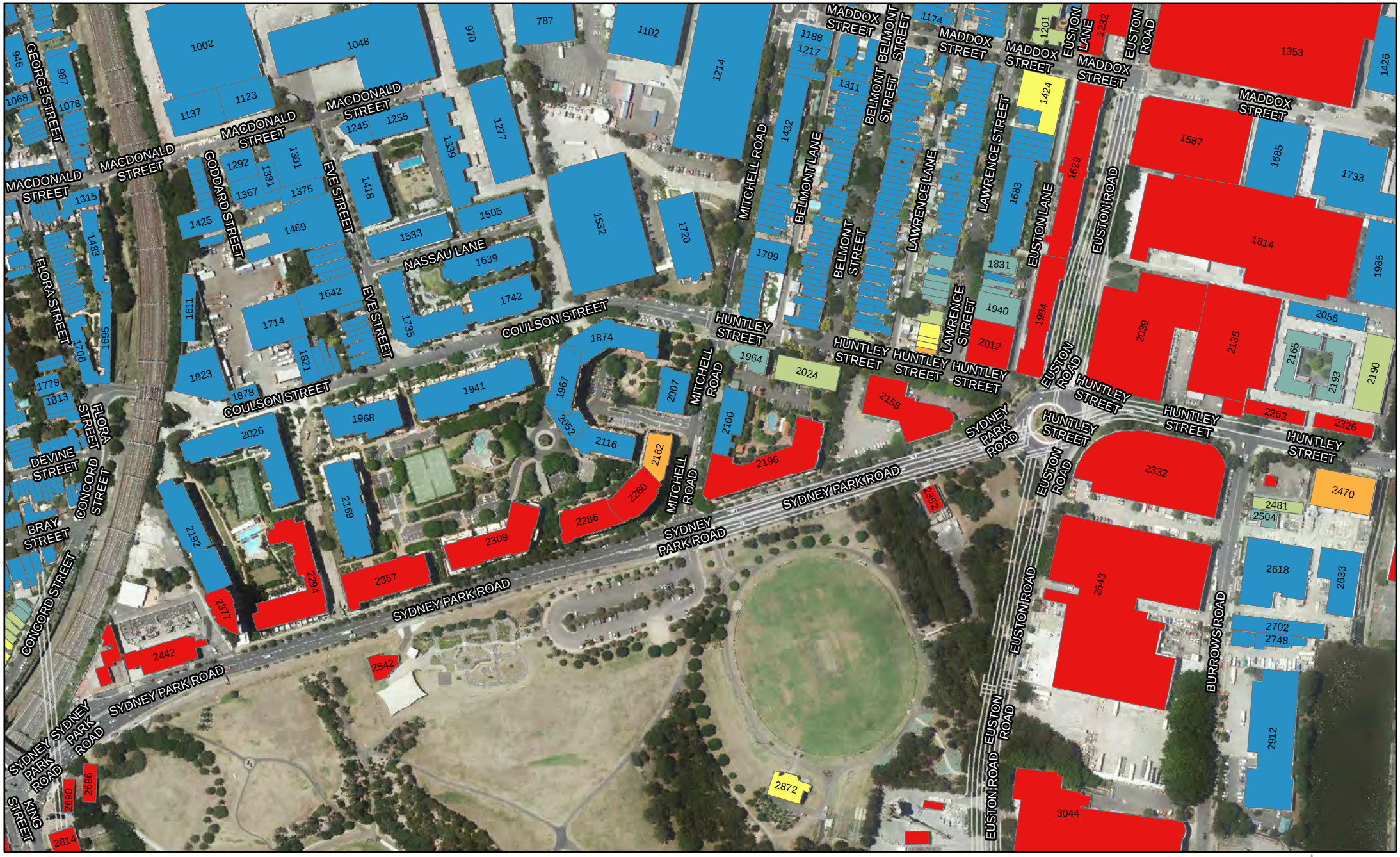
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **3**

AECOM



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

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Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time noise levels

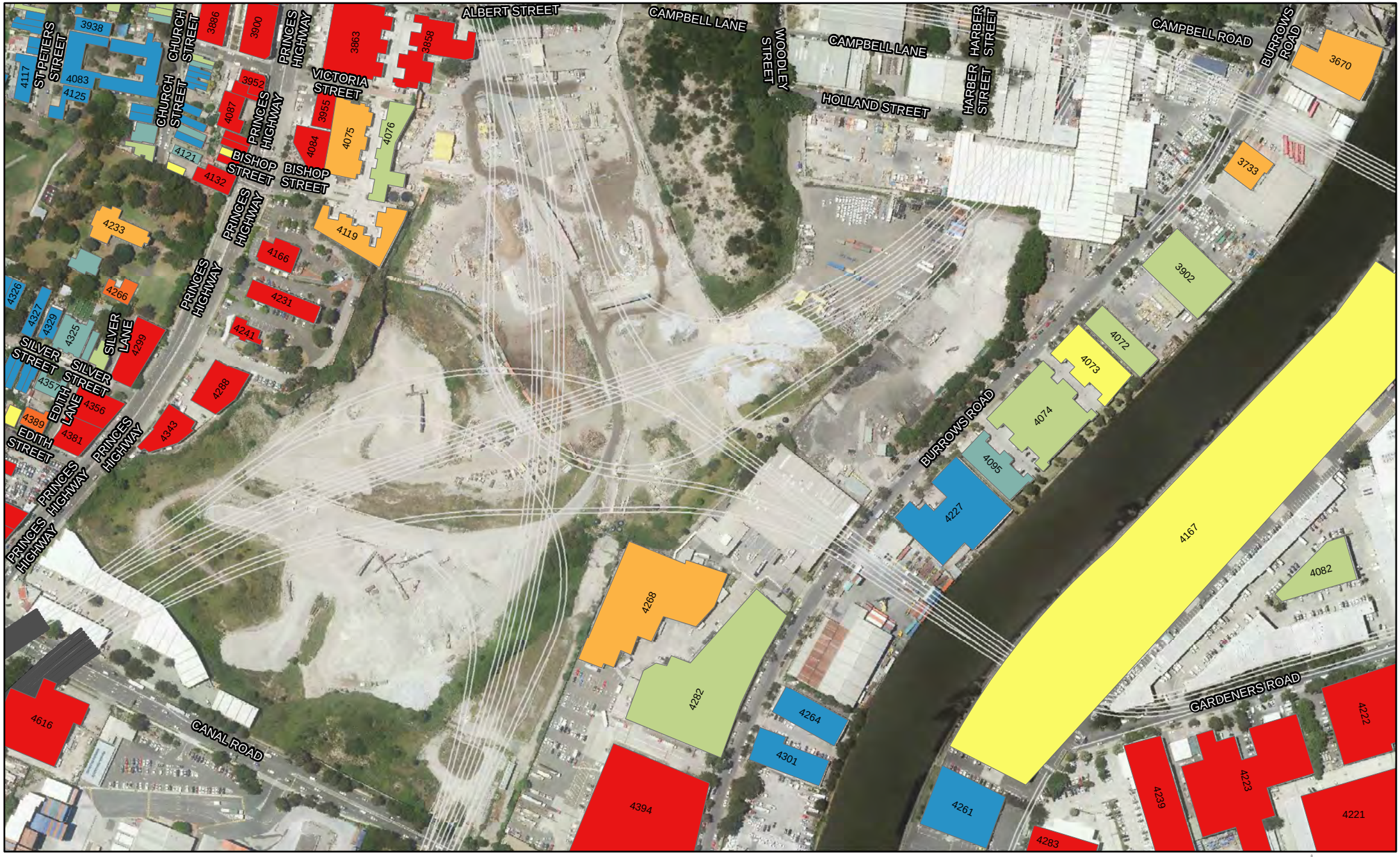
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **4**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

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Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time noise levels

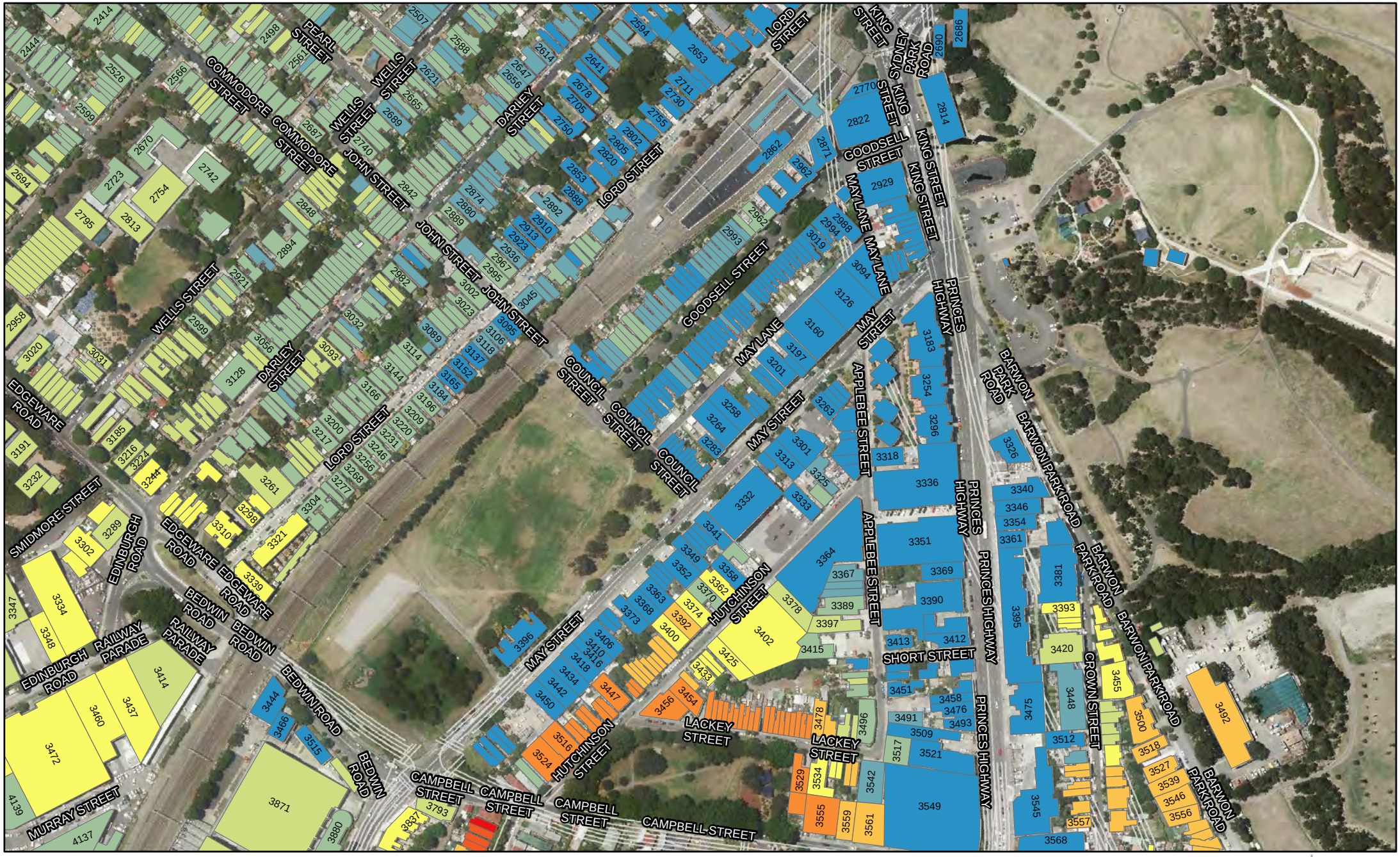
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **3**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time increase in noise levels

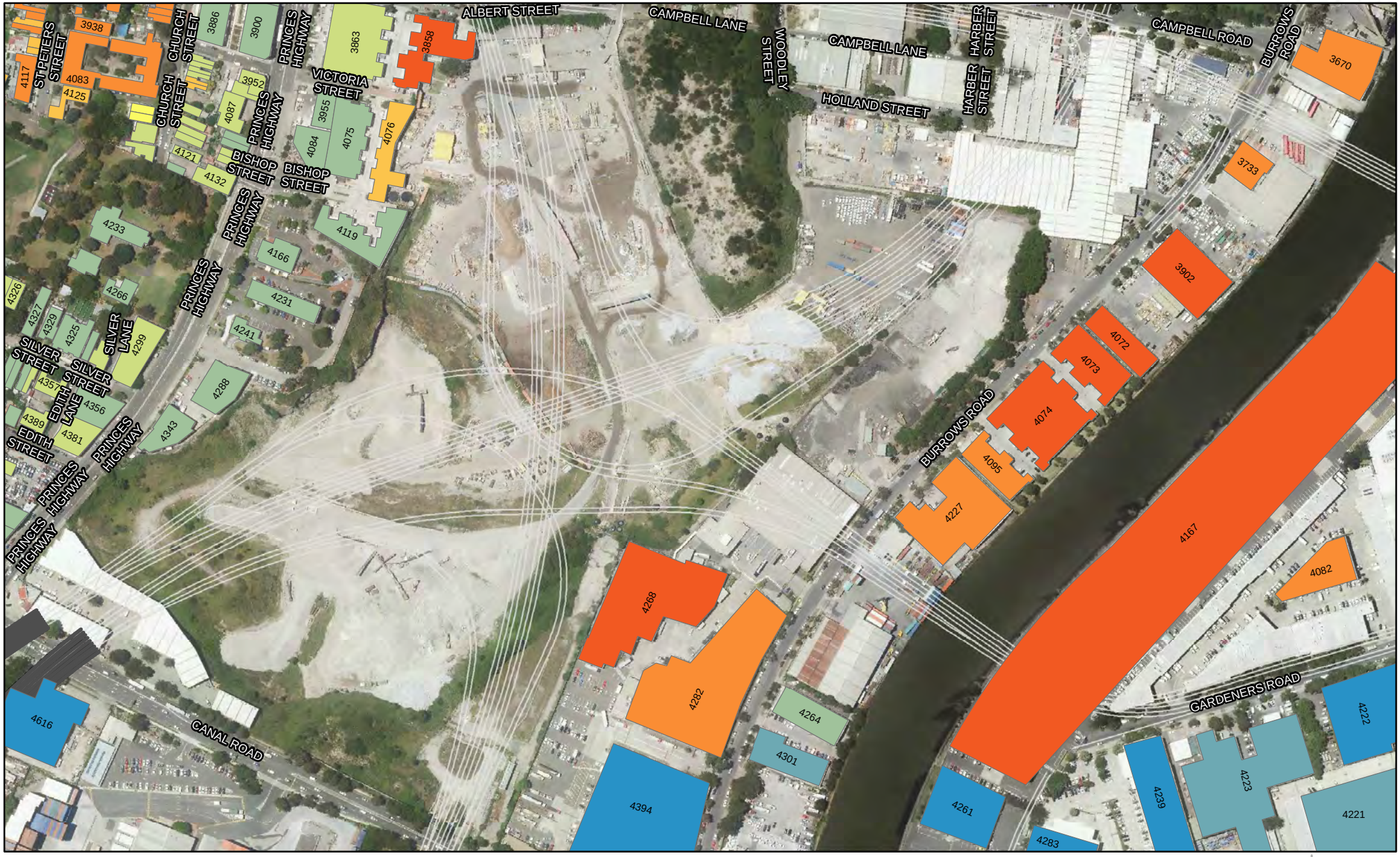
Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **4**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2021 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



AECOM

WestConnex Stage 2

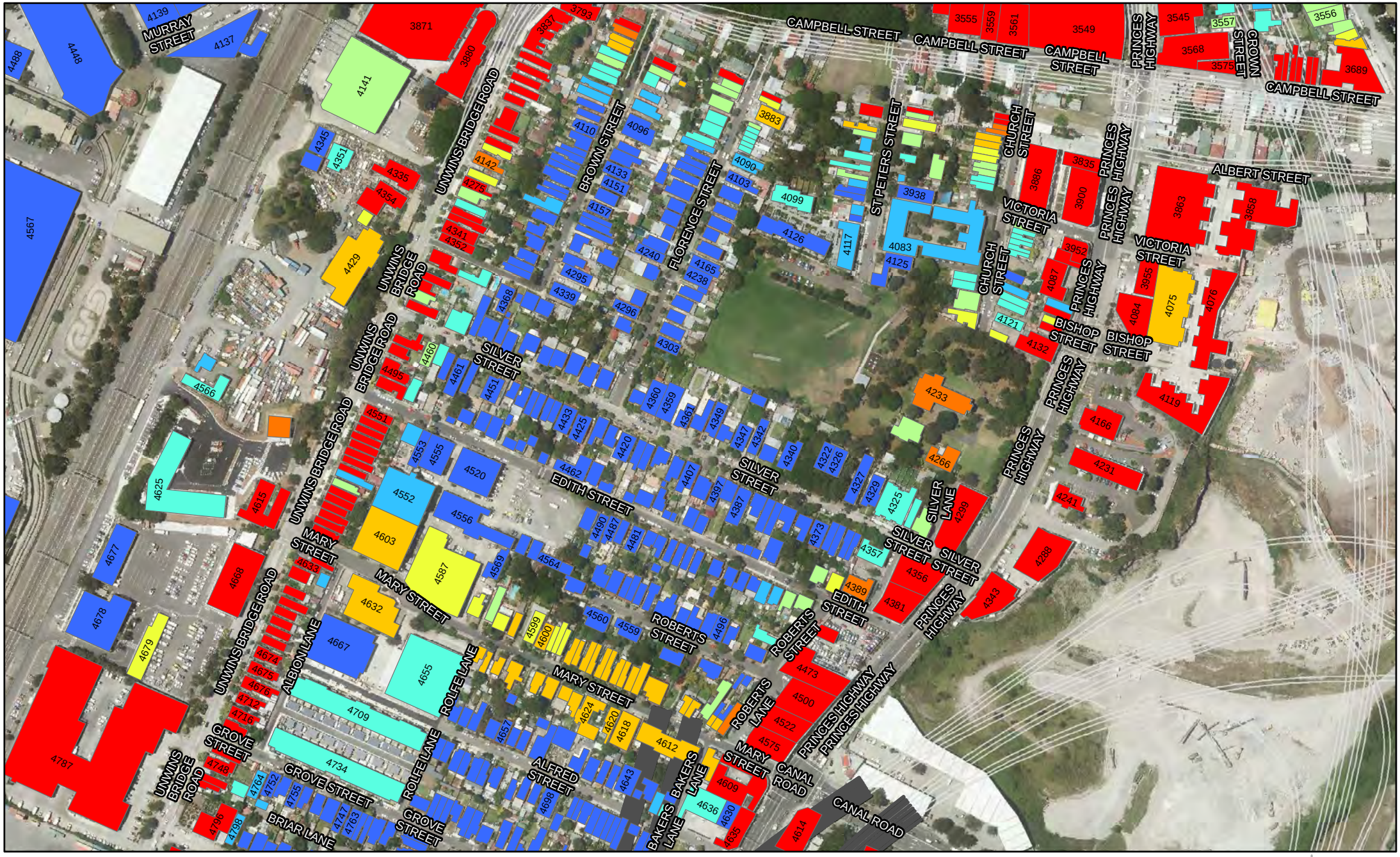
St Peters Interchange - Year 2031 build daytime noise levels

Source: SKM2014

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime noise levels

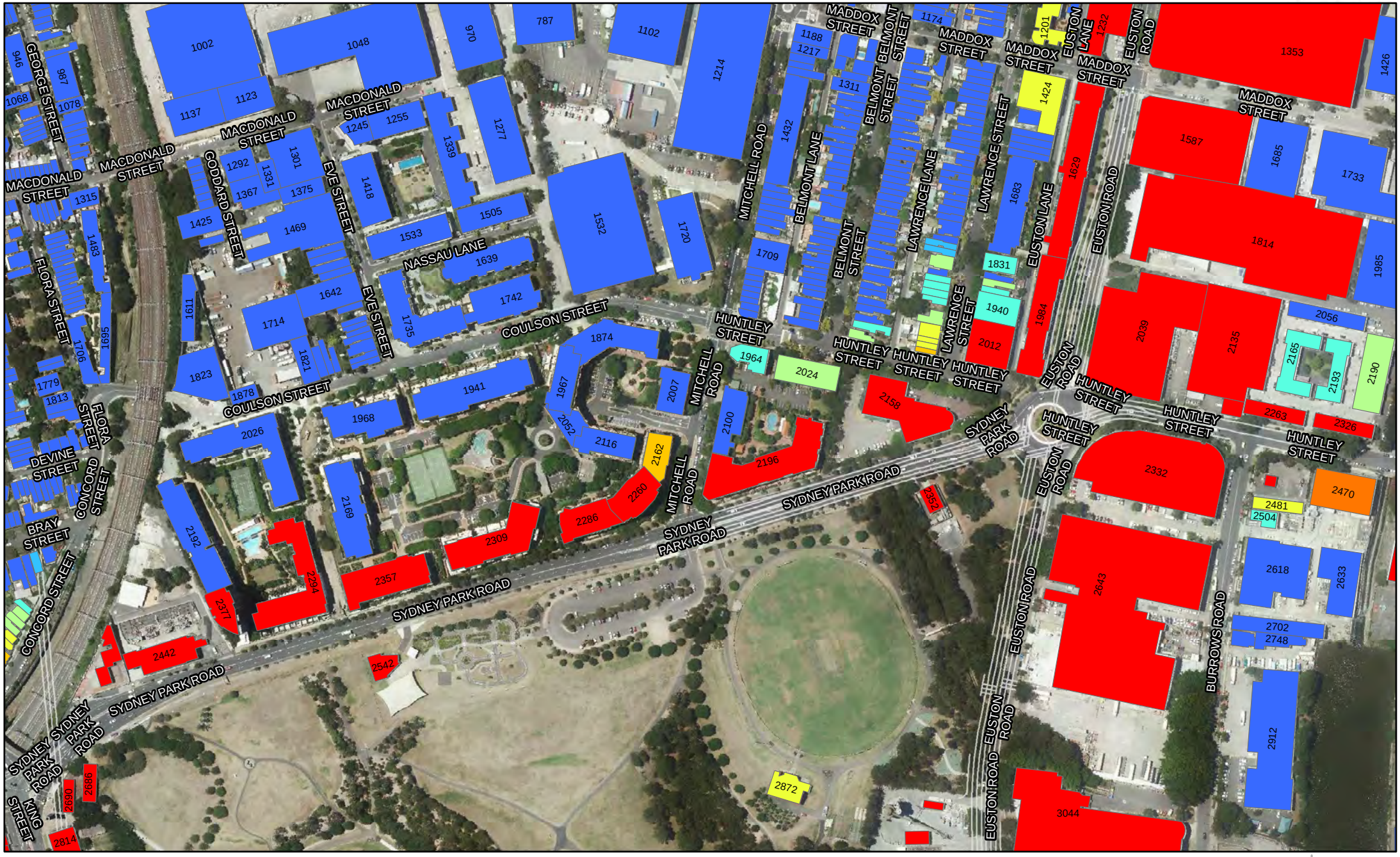
Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **2**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime noise levels

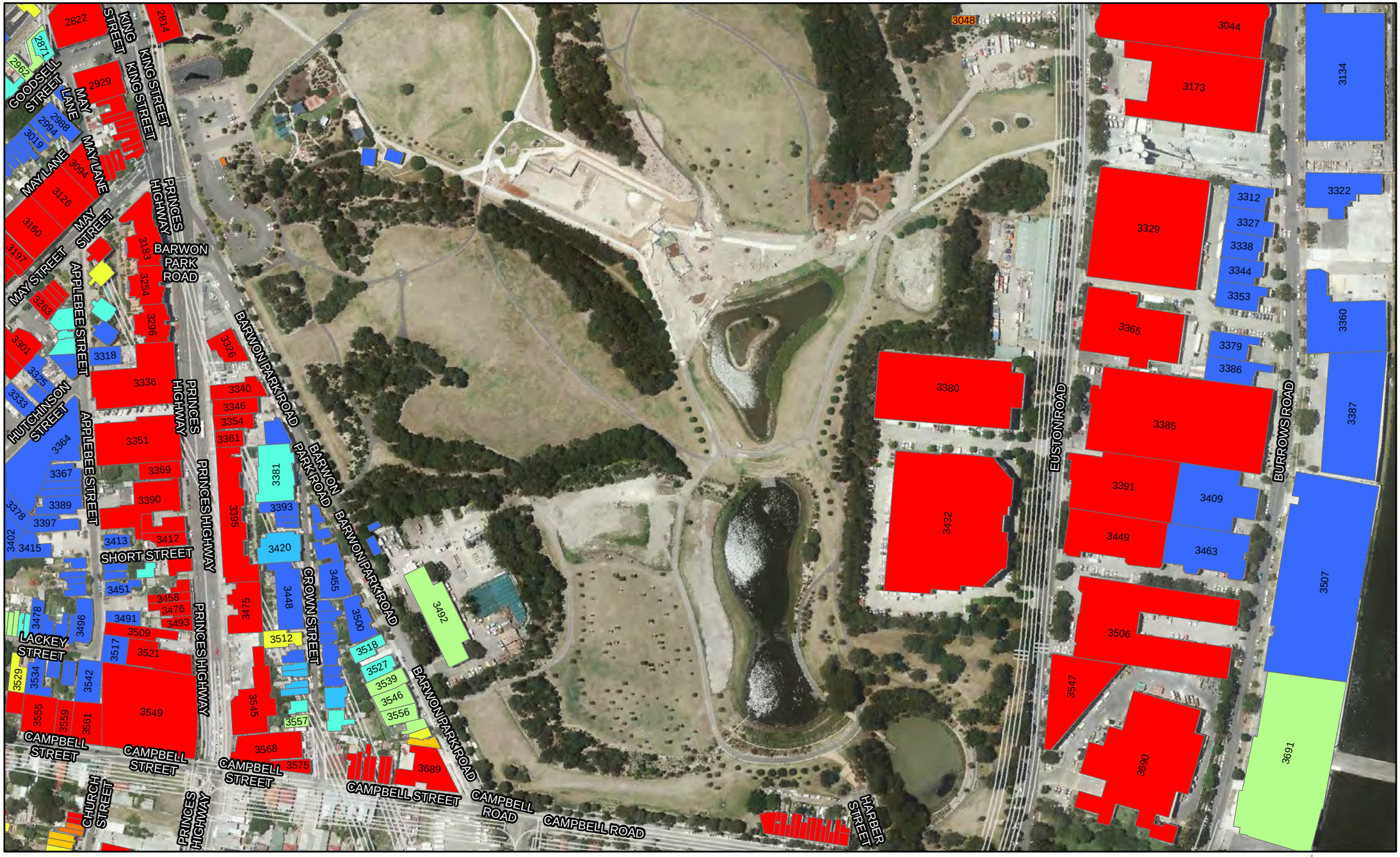
Source: SKM2014

0 50 100 200 m

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Fig. **3**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

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Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime noise levels

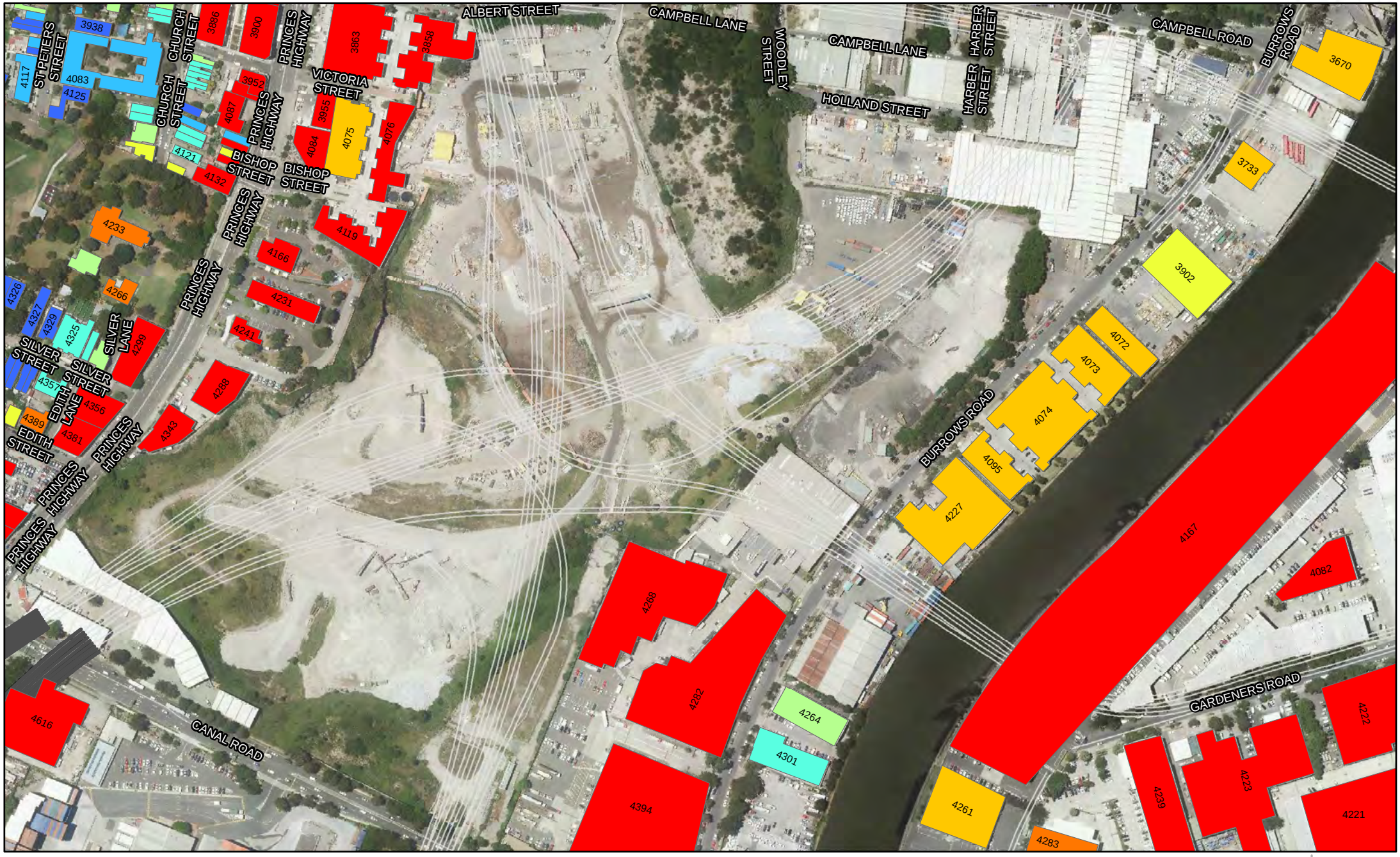
Source: SKM2014

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Fig. **4**



Predicted $L_{Aeq(15hour)}$ Noise Level, dB(A)

< 55 | 55 - 56 | 56 - 58 | 58 - 60 | 60 - 62 | 62 - 64 | 64 - 65 | >= 65

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

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Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

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Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

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Tunnel

Road design

WestConnex Stage 2

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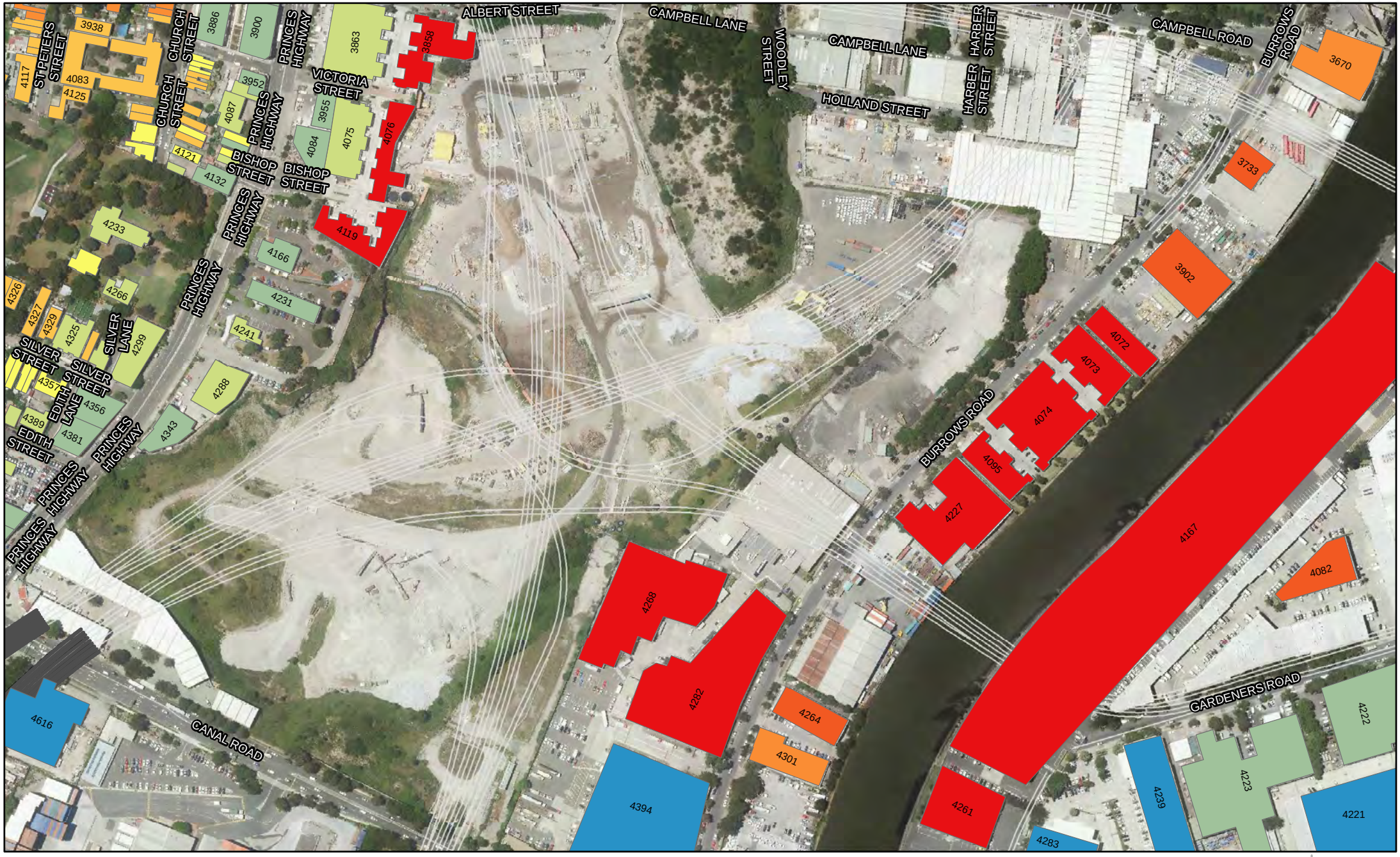
Source: SKM2014

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OCT 2015

60327128

Fig. **4**



Predicted $L_{Aeq(15hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build daytime increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time noise levels

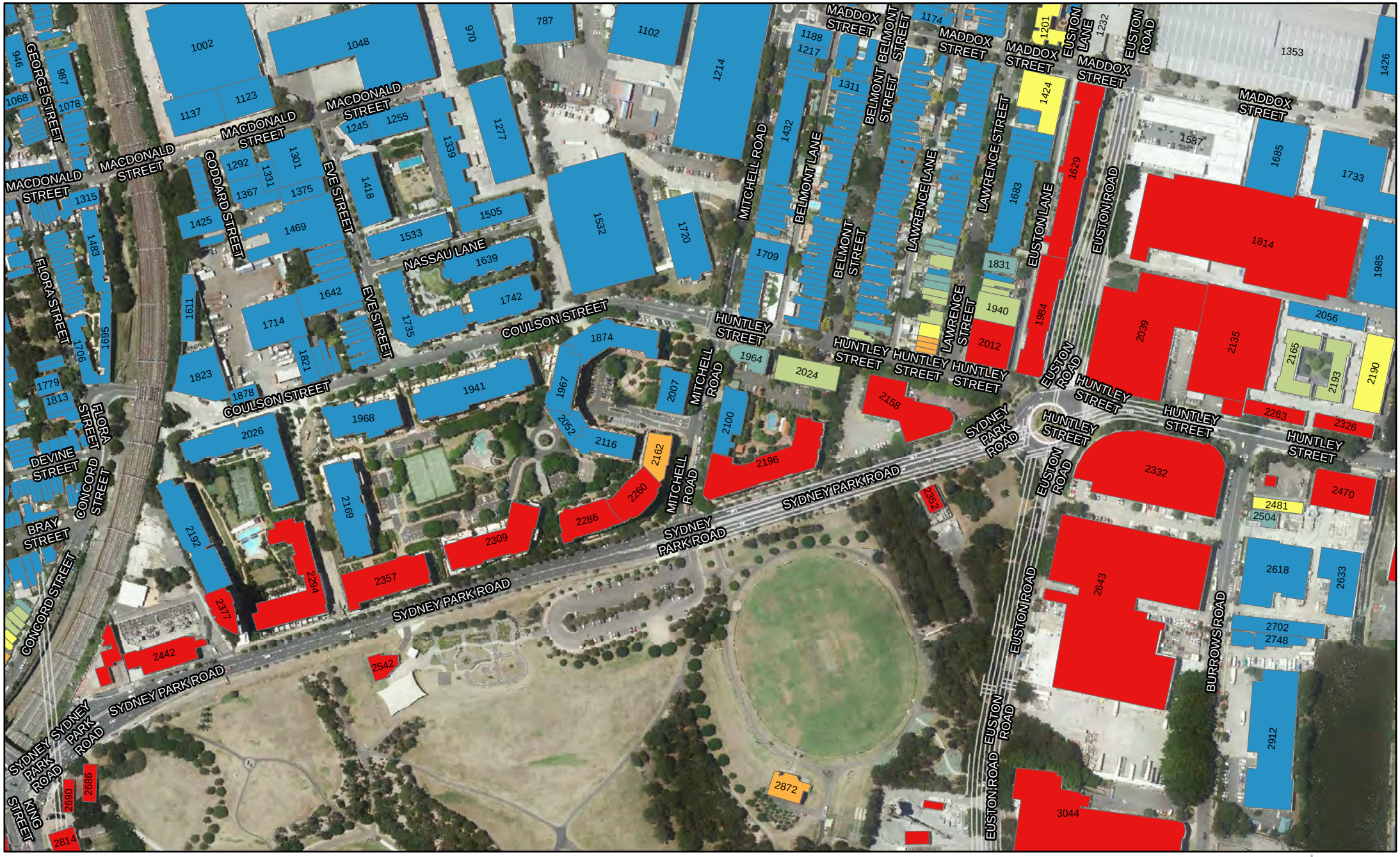
Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **2**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **3**

AECOM



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time noise levels

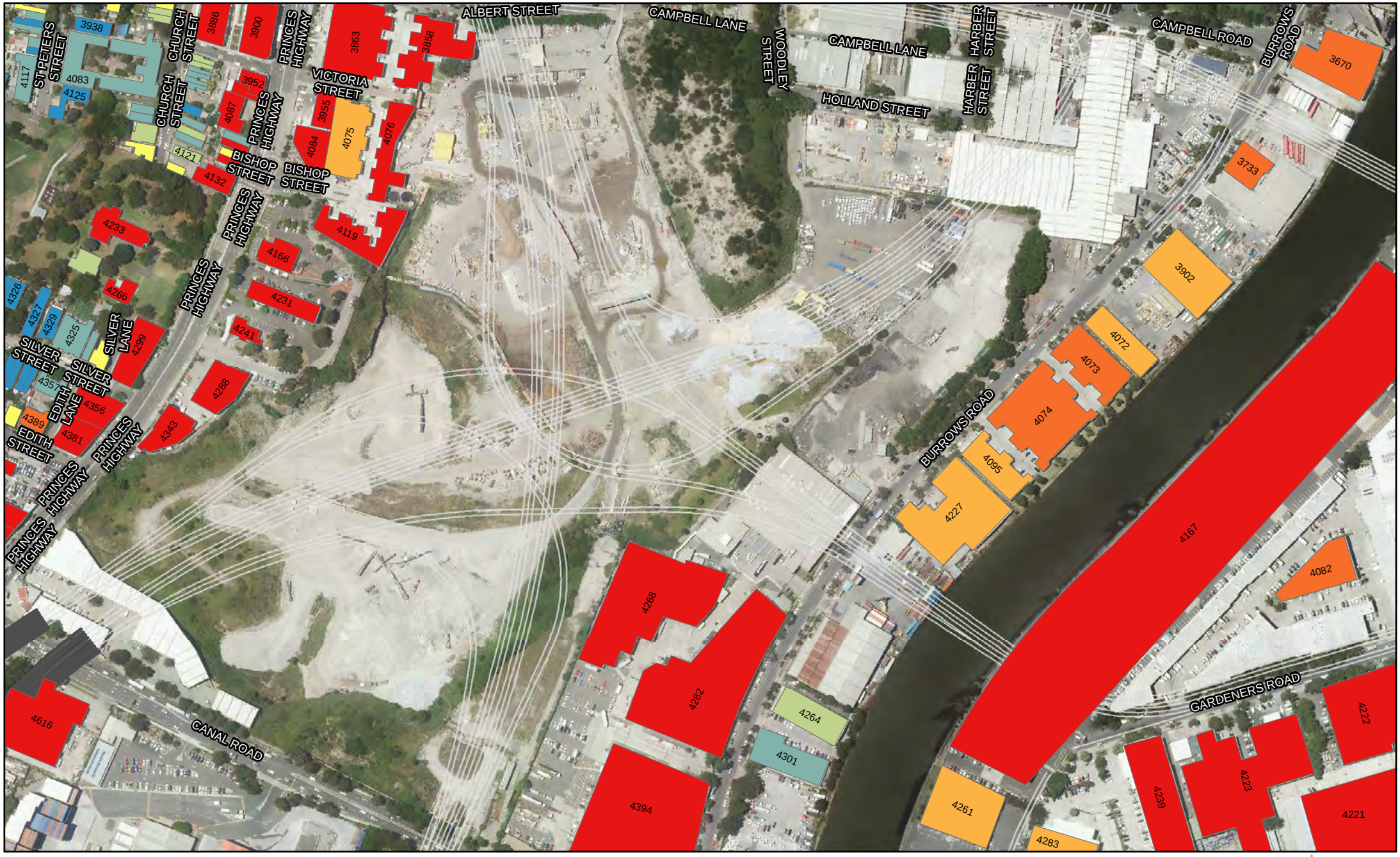
Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **4**



Predicted $L_{Aeq(9hour)}$ Noise Level, dB(A)

< 50 | 51 - 53 | 53 - 55 | 55 - 57 | 57 - 59 | 59 - 60 | >= 60

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **5**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

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Fig. **1**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time increase in noise levels

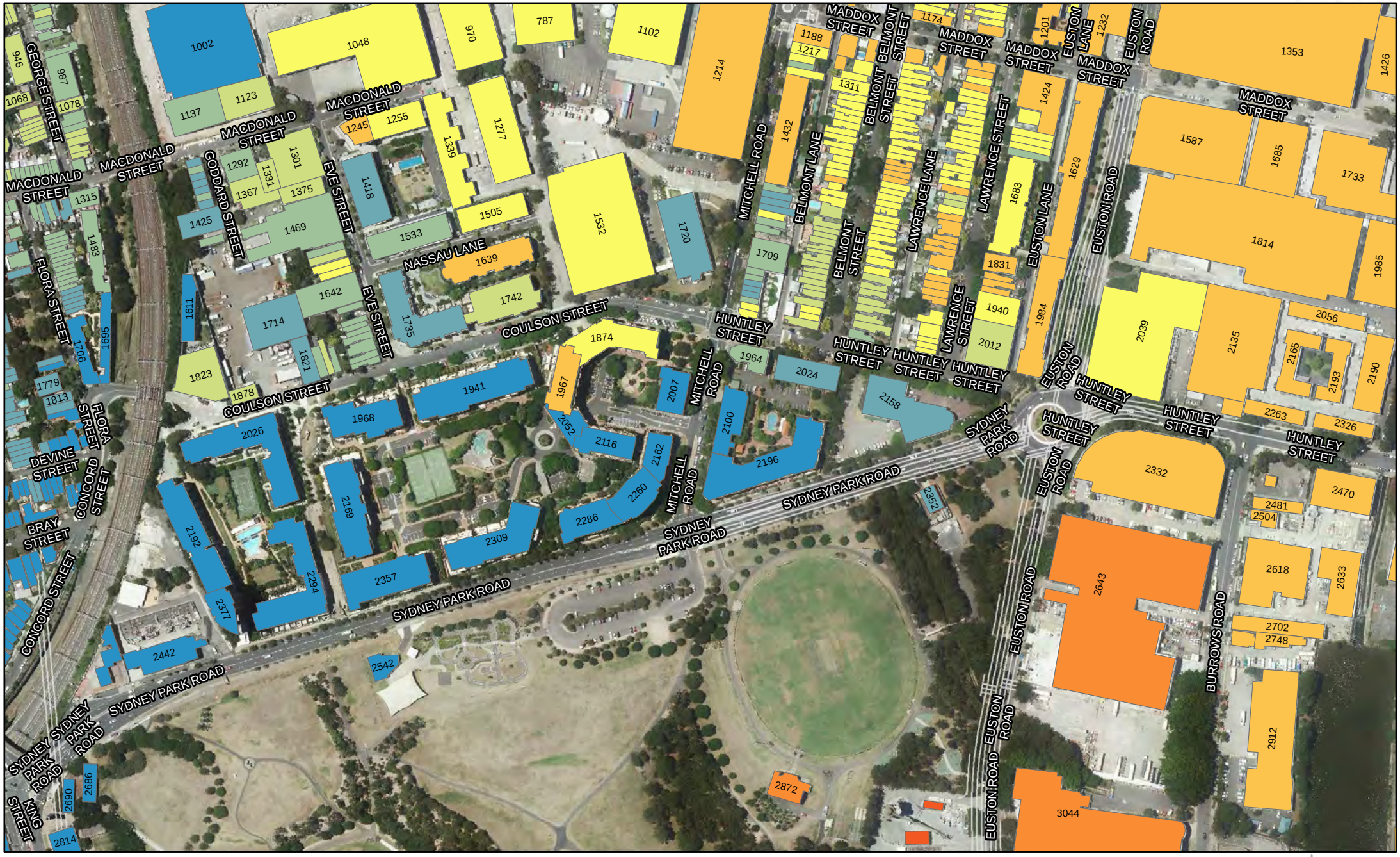
Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **2**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **3**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time increase in noise levels

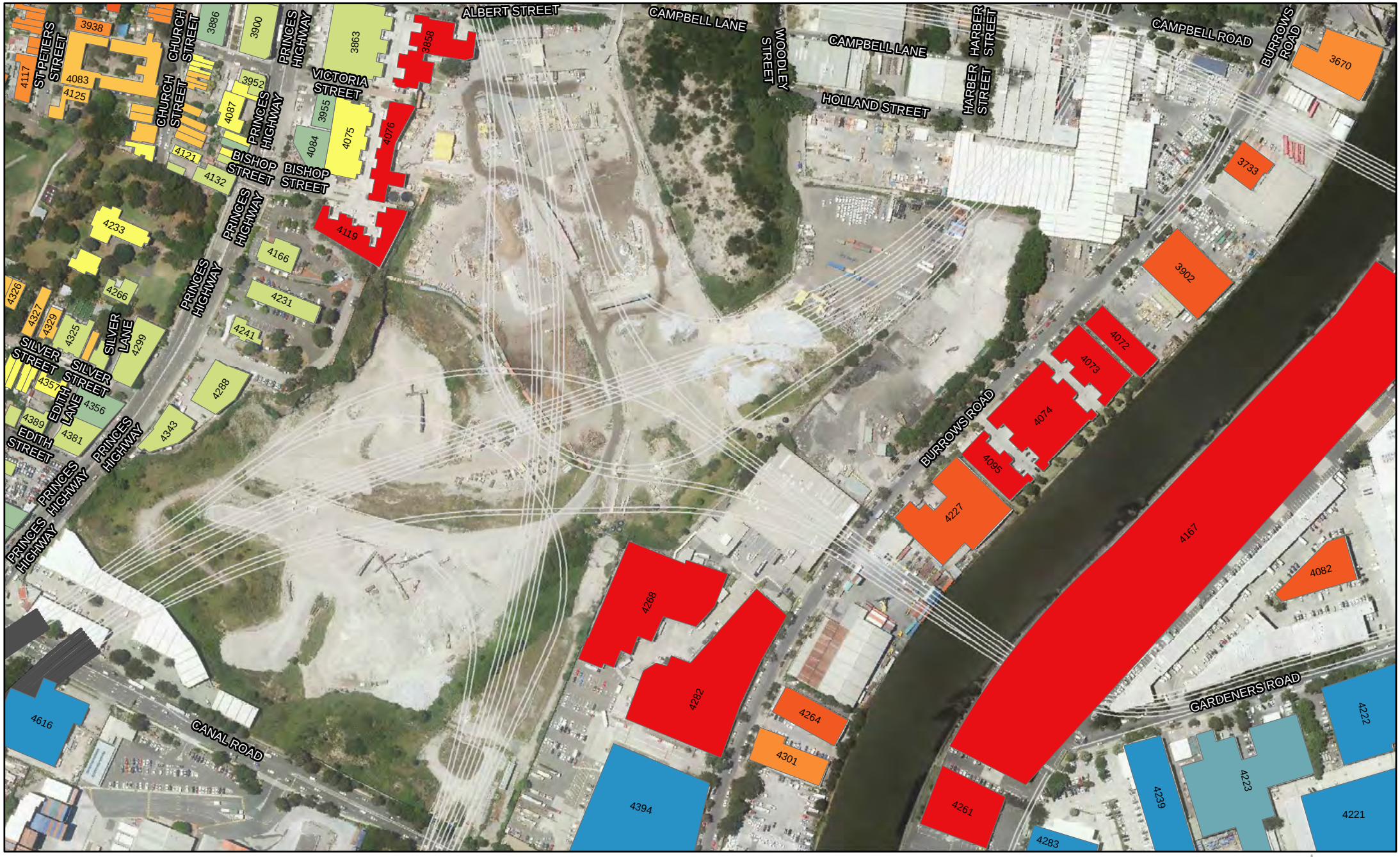
Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **4**



Predicted $L_{Aeq(9hour)}$ Increase in Noise, dB(A)

< -2 | -2 - -1 | -1 - 0 | 0 - 1 | 1 - 2 | 2 - 5 | 5 - 10 | 10 - 15 | > 15

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Year 2031 build night-time increase in noise levels

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **5**



Sensitive receivers eligible for the consideration of noise mitigation

- Not eligible for the consideration of noise mitigation
- Exceeds the cumulaitve noise limit
- Exceeds the noise criteria and increases by >2.0dB

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Receivers eligible for the consideration of noise mitigation

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **1**



Sensitive receivers eligible for the consideration of noise mitigation

- Not eligible for the consideration of noise mitigation
- Exceeds the cumulaitve noise limit
- Exceeds the noise criteria and increases by >2.0dB

- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Receivers eligible for the consideration of noise mitigation

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **2**



Sensitive receivers eligible for the consideration of noise mitigation

- Not eligible for the consideration of noise mitigation
- Exceeds the cumulaitve noise limit
- Exceeds the noise criteria and increases by >2.0dB

- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Receivers eligible for the consideration of noise mitigation

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **3**



Sensitive receivers eligible for the consideration of noise mitigation

- Not eligible for the consideration of noise mitigation
- Exceeds the cumulaitve noise limit
- Exceeds the noise criteria and increases by >2.0dB

Tunnel

Road design

WestConnex Stage 2

St Peters Interchange - Receivers eligible for the consideration of noise mitigation

Source: SKM2014

0 50 100 200 m

OCT 2015

60327128

Fig. **4**



Sensitive receivers eligible for the consideration of noise mitigation

- Not eligible for the consideration of noise mitigation
- Exceeds the cumulaitve noise limit
- Exceeds the noise criteria and increases by >2.0dB

- Tunnel
- Road design

WestConnex Stage 2

St Peters Interchange - Receivers eligible for the consideration of noise mitigation

Source: SKM2014

0 50 100 200 m

OCT 2015

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Fig. **5**

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Appendix M

Operational noise results- road traffic tables

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Kingsgrove – Predicted daytime $L_{Aeq(15hour)}$ noise level – Properties eligible for the consideration of noise mitigation

ID	Address	Use	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
9382	1 Kirrang Street, Beverly Hills	Residential	60	64	65	1.2	64	65	0.6	Yes	Yes

Kingsgrove – Predicted night-time $L_{Aeq(9hour)}$ noise level – Properties eligible for the consideration of noise mitigation

ID	Address	Use	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
9382	1 Kirrang Street, Beverly Hills	Residential	55	60	60	0.2	61	60	-1.1	Yes	Yes

St Peters Interchange - Predicted daytime $L_{Aeq(15hour)}$ predicted noise levels – Properties eligible for the consideration of noise mitigation

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
1424	220-230 Lawrence Street Alexandria	Residential Redeveloped	60	58	59	0.6	58	61	2.2	No	Yes
1629	93-103 Euston Road Alexandria	Residential Redeveloped	60	71	74	2.8	71	76	4.4	Yes	Yes
1984	125 Euston Road Alexandria	Residential Redeveloped	60	72	74	1.7	71	76	4.7	Yes	Yes
2012	288-302 Lawrence Street Alexandria	Residential Redeveloped	60	67	66	-0.5	67	68	1.0	Yes	Yes
3439	58 Hutchinson Street St Peters	Residential New	55	53	54	1.1	53	55	2.6	No	No
3443	71 Hutchinson Street St Peters	Residential New	55	52	54	2.1	52	55	3.4	No	No
3445	73 Hutchinson Street St	Residential	55	52	55	2.5	52	56	3.8	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
	Peters	New									
3454	60 Hutchinson Street St Peters	Residential New	55	54	56	2.4	54	58	3.7	No	Yes
3456	68 Hutchinson Street St Peters	Residential New	55	57	59	2.9	57	61	4.2	Yes	Yes
3457	77 Hutchinson Street St Peters	Residential New	55	55	58	3.3	55	59	4.5	No	Yes
3459	79 Hutchinson Street St Peters	Residential New	55	55	59	3.3	55	60	4.5	Yes	Yes
3461	51 Lackey Street St Peters	Residential New	55	56	59	3.0	56	60	4.3	Yes	Yes
3462	55 Lackey Street St Peters	Residential New	55	56	59	3.1	56	60	4.4	Yes	Yes
3465	53 Lackey Street St Peters	Residential New	55	56	59	3.1	56	60	4.3	Yes	Yes
3467	47 Lackey Street St Peters	Residential New	55	56	59	3.1	56	60	4.4	Yes	Yes
3468	81 Hutchinson Street St Peters	Residential New	55	56	59	3.2	56	60	4.5	Yes	Yes
3469	49 Lackey Street St Peters	Residential New	55	56	59	3.0	56	60	4.3	Yes	Yes
3470	41 Lackey Street St Peters	Residential New	55	55	59	3.2	55	60	4.5	Yes	Yes
3473	43 Lackey Street St Peters	Residential New	55	55	59	3.2	55	60	4.5	Yes	Yes
3474	45 Lackey Street St Peters	Residential New	55	55	59	3.3	55	60	4.6	Yes	Yes
3477	35 Lackey Street St Peters	Residential New	55	55	58	3.0	55	59	4.3	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3479	83 Hutchinson Street St Peters	Residential New	55	56	59	3.1	56	61	4.3	Yes	Yes
3480	39 Lackey Street St Peters	Residential New	55	55	59	3.2	55	60	4.5	Yes	Yes
3481	37 Lackey Street St Peters	Residential New	55	55	58	3.1	55	60	4.4	Yes	Yes
3482	33 Lackey Street St Peters	Residential New	55	55	58	3.1	55	59	4.4	No	Yes
3484	31 Lackey Street St Peters	Residential New	55	55	58	3.1	55	59	4.4	No	Yes
3485	23 Lackey Street St Peters	Residential New	55	54	57	2.9	54	59	4.2	No	Yes
3486	29 Lackey Street St Peters	Residential New	55	55	58	3.2	55	59	4.5	No	Yes
3487	27 Lackey Street St Peters	Residential New	55	55	58	2.9	55	59	4.2	No	Yes
3488	25 Lackey Street St Peters	Residential New	55	55	58	3.1	55	59	4.4	No	Yes
3489	21 Lackey Street St Peters	Residential New	55	54	56	2.5	54	57	3.9	No	Yes
3490	85 Hutchinson Street St Peters	Residential New	55	57	60	3.1	52	56	3.3	Yes	Yes
3494	19 Lackey Street St Peters	Residential New	55	53	55	2.2	53	56	3.6	No	Yes
3511	87 Hutchinson Street St Peters	Residential New	55	57	60	3.3	57	62	4.5	Yes	Yes
3518	35 Barwon Park Road St Peters	Residential New	55	53	55	2.1	53	56	3.5	No	Yes
3526	65 Crown Street St Peters	Residential New	55	55	53	-1.7	51	56	4.7	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3527	31 Barwon Park Road St Peters	Residential New	55	52	55	2.3	52	56	3.8	No	Yes
3533	67 Crown Street St Peters	Residential New	55	55	53	-1.5	51	56	4.7	No	Yes
3544	71 Crown Street St Peters	Residential New	55	51	54	2.3	51	55	4.1	No	No
3548	38 Crown Street St Peters	Residential New	55	52	54	1.7	52	55	3.3	No	No
3551	67 Campbell Road St Peters	Residential New	55	62	64	1.8	62	65	3.1	Yes	Yes
3553	73 Crown Street St Peters	Residential New	55	53	55	1.7	53	57	3.4	No	Yes
3555	63 Campbell Street St Peters	Residential New	55	69	68	-0.3	69	70	1.0	Yes	Yes
3557	75 Crown Street St Peters	Residential New	55	56	57	0.8	53	60	6.9	Yes	Yes
3558	44 Crown Street St Peters	Residential New	55	54	57	2.8	54	58	3.9	No	Yes
3560	47 Barwon Park Road St Peters	Residential New	55	55	59	4.1	55	60	4.9	Yes	Yes
3562	49 Barwon Park Road St Peters	Residential New	55	56	61	4.5	56	61	5.1	Yes	Yes
3565	51 Barwon Park Road St Peters	Residential New	55	58	62	4.2	58	63	4.8	Yes	Yes
3570	25 Campbell Road St Peters	Residential New	55	71	73	1.1	71	73	1.9	Yes	Yes
3573	29 Campbell Road St Peters	Residential New	55	73	72	-0.3	72	73	1.8	Yes	Yes
3576	27 Campbell Road St Peters	Residential New	55	71	73	1.2	71	73	1.9	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3577	21 Campbell Road St Peters	Residential New	55	71	73	1.3	71	74	2.1	Yes	Yes
3671	2 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3672	6 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3673	8 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3674	10 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3675	12 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3676	14 Campbell Road Alexandria	Residential New	55	69	72	3.3	69	73	3.8	Yes	Yes
3677	16 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3678	18 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3679	20 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3680	32 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	4.0	Yes	Yes
3681	24 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3682	22 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3683	26 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	4.0	Yes	Yes
3684	28 Campbell Road Alexandria	Residential New	55	69	72	3.5	69	73	4.0	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3685	30 Campbell Road Alexandria	Residential New	55	69	72	3.4	69	73	3.9	Yes	Yes
3686	32 Campbell Road Alexandria	Residential New	55	63	68	4.8	63	69	5.7	Yes	Yes
3687	23-29 Campbell Road St Peters	Residential New	55	71	73	1.3	71	73	2.0	Yes	Yes
3688	19 Campbell Road St Peters	Residential New	55	71	73	1.4	71	74	2.2	Yes	Yes
3689	53 Barwon Park Road St Peters	Residential New	55	71	73	2.2	71	74	3.0	Yes	Yes
3795	75 Church Street St Peters	Residential New	55	59	67	8.1	59	68	9.1	Yes	Yes
3797	3 Brown Street St Peters	Residential New	55	56	68	12.8	56	69	13.8	Yes	Yes
3805	77 Church Street St Peters	Residential New	55	57	65	7.2	57	65	8.1	Yes	Yes
3808	5 Brown Street St Peters	Residential New	55	56	63	7.7	56	65	8.9	Yes	Yes
3809	79 Church Street St Peters	Residential New	55	55	64	9.5	55	65	10.4	Yes	Yes
3817	81 Church Street St Peters	Residential New	55	52	64	11.5	52	64	12.3	Yes	Yes
3818	4 St Peters Street St Peters	Residential New	55	52	65	13.1	52	66	14.2	Yes	Yes
3822	7 Brown Street St Peters	Residential New	55	54	62	8.5	54	63	9.6	Yes	Yes
3826	6 St Peters Street St Peters	Residential New	55	55	62	7.5	50	60	9.2	Yes	Yes
3829	83 Church Street St Peters	Residential New	55	55	62	7.4	55	63	8.6	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3831	9 Brown Street St Peters	Residential New	55	53	62	8.7	53	63	9.8	Yes	Yes
3834	7 Florence Street St Peters	Residential New	55	48	66	17.4	48	67	18.5	Yes	Yes
3838	1b St Peters Street St Peters	Residential New	55	56	65	8.7	56	66	9.8	Yes	Yes
3839	8 St Peters Street St Peters	Residential New	55	53	60	6.9	53	61	8.2	Yes	Yes
3840	85 Church Street St Peters	Residential New	55	50	61	11.8	50	62	12.6	Yes	Yes
3843	10 Brown Street St Peters	Residential New	55	50	64	13.8	50	65	14.9	Yes	Yes
3846	11 Brown Street St Peters	Residential New	55	52	59	7.2	55	58	2.3	No	Yes
3849	9 Florence Street St Peters	Residential New	55	50	61	10.5	49	59	10.0	Yes	Yes
3851	4 Florence Street St Peters	Residential New	55	50	64	14.5	50	65	15.7	Yes	Yes
3852	87 Church Street St Peters	Residential New	55	54	60	5.9	54	61	7.1	Yes	Yes
3855	1/12 Brown Street St Peters	Residential New	55	50	59	9.2	52	59	6.6	No	Yes
3856	11 Florence Street St Peters	Residential New	55	52	61	8.7	50	60	10.1	Yes	Yes
3859	13 Brown Street St Peters	Residential New	55	52	58	6.1	52	59	7.4	No	Yes
3860	6 Florence Street St Peters	Residential New	55	51	60	9.4	51	61	10.6	Yes	Yes
3861	5 St Peters Street St Peters	Residential New	55	55	63	7.5	55	64	8.7	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3862	89 Church Street St Peters	Residential New	55	53	59	5.4	53	60	6.7	Yes	Yes
3867	1/12 Brown Street St Peters	Residential New	55	52	61	9.2	52	62	10.3	Yes	Yes
3868	12 St Peters Street St Peters	Residential New	55	53	58	5.0	53	59	6.3	No	Yes
3872	16 Brown Street St Peters	Residential New	55	52	56	4.2	52	57	5.4	No	Yes
3873	7 St Peters Street St Peters	Residential New	55	52	58	5.5	52	59	6.8	No	Yes
3874	91a Church Street St Peters	Residential New	55	52	57	4.8	52	58	6.2	No	Yes
3877	15 Brown Street St Peters	Residential New	55	52	56	4.9	52	58	6.2	No	Yes
3882	13 Florence Street St Peters	Residential New	55	51	58	7.3	51	59	8.5	No	Yes
3883	8 Florence Street St Peters	Residential New	55	54	61	7.3	54	62	8.5	Yes	Yes
3885	17 Brown Street St Peters	Residential New	55	51	56	4.4	51	57	5.7	No	Yes
3887	91b Church Street St Peters	Residential New	55	53	57	4.4	53	59	5.8	No	Yes
3890	9 St Peters Street St Peters	Residential New	55	48	55	6.2	48	56	7.5	No	Yes
3894	16 St Peters Street St Peters	Residential New	55	51	55	3.6	51	56	5.1	No	Yes
3895	18 St Peters Street St Peters	Residential New	55	52	58	5.6	52	59	6.9	No	Yes
3896	91c Church Street St Peters	Residential New	55	52	56	3.9	52	58	5.4	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3897	22 Brown Street St Peters	Residential New	55	50	54	4.5	50	55	5.8	No	No
3899	19 Brown Street St Peters	Residential New	55	51	55	3.2	51	56	4.5	No	Yes
3903	10 Florence Street St Peters	Residential New	55	52	57	4.9	52	58	6.1	No	Yes
3907	15 Florence Street St Peters	Residential New	55	50	56	6.0	50	57	7.3	No	Yes
3908	91d Church Street St Peters	Residential New	55	53	56	3.4	53	58	5.0	No	Yes
3909	12 Florence Street St Peters	Residential New	55	52	57	4.8	52	58	6.1	No	Yes
3910	11 St Peters Street St Peters	Residential New	55	51	56	5.9	51	58	7.2	No	Yes
3913	21 Brown Street St Peters	Residential New	55	51	54	3.1	51	55	4.4	No	No
3914	24 Brown Street St Peters	Residential New	55	50	54	4.2	50	56	5.5	No	Yes
3916	14 Florence Street St Peters	Residential New	55	52	56	3.9	52	57	5.2	No	Yes
3921	17 Florence Street St Peters	Residential New	55	51	55	4.6	51	57	5.9	No	Yes
3923	13 St Peters Street St Peters	Residential New	55	51	56	5.5	51	58	6.8	No	Yes
3925	16 Florence Street St Peters	Residential New	55	51	56	4.3	51	57	5.7	No	Yes
3926	18 St Peters Street St Peters	Residential New	55	51	54	3.1	51	55	4.3	No	No
3927	23 Brown Street St Peters	Residential New	55	51	53	2.6	51	55	4.0	No	No

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3928	18 Florence Street St Peters	Residential New	55	52	55	3.8	52	57	5.2	No	Yes
3934	19 Florence Street St Peters	Residential New	55	51	55	4.3	51	56	5.6	No	Yes
3935	20 Florence Street St Peters	Residential New	55	51	55	3.9	51	56	5.3	No	Yes
3936	15 St Peters Street St Peters	Residential New	55	52	57	5.3	52	58	6.6	No	Yes
3940	17 St Peters Street St Peters	Residential New	55	50	54	3.4	50	56	5.2	No	Yes
4059	8/635 Gardeners Road Mascot	Residential New	55	59	60	1.7	59	63	4.2	Yes	Yes
4086	21 St Peters Street St Peters	Residential New	55	50	53	3.2	50	55	4.8	No	No
4089	23 St Peters Street St Peters	Residential New	55	51	54	2.9	51	55	4.7	No	No
4090	24 Florence Street St Peters	Residential New	55	50	54	3.3	50	55	4.7	No	No
4092	21 Florence Street St Peters	Residential New	55	51	55	3.9	51	56	5.3	No	Yes
4096	30 Brown Street St Peters	Residential New	55	50	53	3.5	50	55	4.9	No	No
4099	31 St Peters Street St Peters	Residential New	55	52	56	3.9	52	57	5.3	No	Yes
4100	25 Brown Street St Peters	Residential New	55	51	53	2.3	51	54	3.7	No	No
4103	26 Florence Street St Peters	Residential New	55	50	53	3.1	50	54	4.6	No	No
4115	29 Florence Street St Peters	Residential New	55	50	53	2.6	50	55	4.1	No	No

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
4117	31 St Peters Street St Peters	Residential New	55	51	54	3.2	51	56	4.9	No	Yes

Note1: The noise criterion for a School is an internal noise level. Façade noise levels have been reported in this table. A reduction of 12.5 dB(A) with open window and 22.5 dB(A) with windows closed can be assumed (accounting for façade reflection in the calculation). The $L_{Aeq(15hour)}$ and $L_{Aeq(1hour)}$ during school hours have been found to be around the same level, requiring no correction.

St Peters Interchange $L_{Aeq(9hour)}$ predicted noise levels – Properties eligible for the consideration of noise mitigation

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
1424	220-230 Lawrence Street Alexandria	Residential Redeveloped	55	53	55	1.2	53	56	2.8	No	Yes
1629	93-103 Euston Road Alexandria	Residential Redeveloped	55	66	69	3.1	66	71	4.8	Yes	Yes
1984	125 Euston Road Alexandria	Residential Redeveloped	55	67	69	1.9	67	71	3.5	Yes	Yes
2012	288-302 Lawrence Street Alexandria	Residential Redeveloped	55	62	62	-0.6	62	63	0.9	Yes	Yes
3439	58 Hutchinson Street St Peters	Residential New	50	46	50	3.2	46	51	4.7	No	Yes
3443	71 Hutchinson Street St Peters	Residential New	50	45	50	5.1	45	51	6.4	No	Yes
3445	73 Hutchinson Street St Peters	Residential New	50	45	51	5.7	45	52	7.0	No	Yes
3454	60 Hutchinson Street St Peters	Residential New	50	47	53	5.7	47	54	7.1	No	Yes
3456	68 Hutchinson Street St Peters	Residential New	50	49	56	6.9	49	57	8.2	Yes	Yes
3457	77 Hutchinson Street St	Residential	50	47	55	7.7	47	56	9.0	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
	Peters	New									
3459	79 Hutchinson Street St Peters	Residential New	50	47	55	7.6	47	56	9.0	Yes	Yes
3461	51 Lackey Street St Peters	Residential New	50	48	55	7.5	48	56	8.8	Yes	Yes
3462	55 Lackey Street St Peters	Residential New	50	48	55	7.4	48	56	8.7	Yes	Yes
3465	53 Lackey Street St Peters	Residential New	50	48	55	7.4	48	57	8.8	Yes	Yes
3467	47 Lackey Street St Peters	Residential New	50	48	55	7.4	48	56	8.8	Yes	Yes
3468	81 Hutchinson Street St Peters	Residential New	50	48	55	7.6	45	51	6.4	Yes	Yes
3469	49 Lackey Street St Peters	Residential New	50	48	55	7.5	48	56	8.8	Yes	Yes
3470	41 Lackey Street St Peters	Residential New	50	47	55	7.4	47	56	8.8	Yes	Yes
3473	43 Lackey Street St Peters	Residential New	50	48	55	7.4	48	56	8.8	Yes	Yes
3474	45 Lackey Street St Peters	Residential New	50	47	55	7.6	47	56	8.9	Yes	Yes
3477	35 Lackey Street St Peters	Residential New	50	47	54	7.1	47	56	8.5	Yes	Yes
3479	83 Hutchinson Street St Peters	Residential New	50	48	56	7.4	48	57	8.8	Yes	Yes
3480	39 Lackey Street St Peters	Residential New	50	48	55	7.3	48	56	8.7	Yes	Yes
3481	37 Lackey Street St Peters	Residential New	50	47	55	7.2	47	56	8.6	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3482	33 Lackey Street St Peters	Residential New	50	47	54	7.1	47	56	8.5	Yes	Yes
3484	31 Lackey Street St Peters	Residential New	50	47	54	7.1	47	56	8.5	Yes	Yes
3485	23 Lackey Street St Peters	Residential New	50	47	53	6.6	47	55	8.0	Yes	Yes
3486	29 Lackey Street St Peters	Residential New	50	47	54	7.1	47	56	8.5	Yes	Yes
3487	27 Lackey Street St Peters	Residential New	50	47	54	7.0	47	55	8.4	Yes	Yes
3488	25 Lackey Street St Peters	Residential New	50	47	54	7.0	47	55	8.4	Yes	Yes
3489	21 Lackey Street St Peters	Residential New	50	46	52	6.0	46	54	7.4	No	Yes
3490	85 Hutchinson Street St Peters	Residential New	50	45	51	5.2	45	52	6.6	No	Yes
3494	19 Lackey Street St Peters	Residential New	50	46	51	5.2	46	52	6.6	No	Yes
3511	87 Hutchinson Street St Peters	Residential New	50	49	57	7.9	49	58	9.2	Yes	Yes
3518	35 Barwon Park Road St Peters	Residential New	50	47	50	2.8	47	52	4.1	No	Yes
3526	65 Crown Street St Peters	Residential New	50	46	49	3.2	46	51	5.1	No	Yes
3527	31 Barwon Park Road St Peters	Residential New	50	47	50	2.8	47	51	4.2	No	Yes
3533	67 Crown Street St Peters	Residential New	50	46	49	3.3	46	51	5.1	No	Yes
3544	71 Crown Street St Peters	Residential New	50	46	49	3.1	46	51	4.8	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3548	38 Crown Street St Peters	Residential New	50	47	49	2.5	47	51	3.9	No	Yes
3551	67 Campbell Road St Peters	Residential New	50	53	60	7.4	53	62	8.8	Yes	Yes
3553	73 Crown Street St Peters	Residential New	50	48	50	2.3	48	52	3.9	No	Yes
3555	63 Campbell Street St Peters	Residential New	50	59	65	5.6	59	66	6.9	Yes	Yes
3557	75 Crown Street St Peters	Residential New	50	49	54	4.3	49	55	5.9	Yes	Yes
3558	44 Crown Street St Peters	Residential New	50	49	52	3.3	49	53	4.4	No	Yes
3560	47 Barwon Park Road St Peters	Residential New	50	50	55	4.8	50	56	5.6	Yes	Yes
3562	49 Barwon Park Road St Peters	Residential New	50	51	56	5.0	51	57	5.8	Yes	Yes
3565	51 Barwon Park Road St Peters	Residential New	50	54	58	4.7	54	59	5.3	Yes	Yes
3570	25 Campbell Road St Peters	Residential New	50	67	69	1.7	67	69	2.5	Yes	Yes
3573	29 Campbell Road St Peters	Residential New	50	67	69	1.7	67	69	2.5	Yes	Yes
3576	27 Campbell Road St Peters	Residential New	50	67	69	1.8	67	69	2.5	Yes	Yes
3577	21 Campbell Road St Peters	Residential New	50	67	69	1.9	67	70	2.7	Yes	Yes
3671	2 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3672	6 Campbell Road Alexandria	Residential New	50	64	68	3.6	64	69	4.2	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3673	8 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.2	Yes	Yes
3674	10 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3675	12 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3676	14 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3677	16 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3678	18 Campbell Road Alexandria	Residential New	50	64	68	3.7	64	69	4.3	Yes	Yes
3679	20 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.4	Yes	Yes
3680	32 Campbell Road Alexandria	Residential New	50	65	68	3.8	65	69	4.4	Yes	Yes
3681	24 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.4	Yes	Yes
3682	22 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.4	Yes	Yes
3683	26 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.4	Yes	Yes
3684	28 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.4	Yes	Yes
3685	30 Campbell Road Alexandria	Residential New	50	64	68	3.8	64	69	4.5	Yes	Yes
3686	32 Campbell Road Alexandria	Residential New	50	58	64	5.2	58	64	6.1	Yes	Yes
3687	23-29 Campbell Road St Peters	Residential New	50	67	69	2.0	67	69	2.7	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3688	19 Campbell Road St Peters	Residential New	50	67	69	2.1	67	70	2.8	Yes	Yes
3689	53 Barwon Park Road St Peters	Residential New	50	66	69	2.8	66	70	3.6	Yes	Yes
3795	75 Church Street St Peters	Residential New	50	53	64	10.4	53	65	11.6	Yes	Yes
3797	3 Brown Street St Peters	Residential New	50	50	65	15.2	50	66	16.5	Yes	Yes
3805	77 Church Street St Peters	Residential New	50	51	61	9.2	51	62	10.3	Yes	Yes
3808	5 Brown Street St Peters	Residential New	50	48	60	11.8	48	61	13.2	Yes	Yes
3809	79 Church Street St Peters	Residential New	50	48	60	12.6	48	61	13.6	Yes	Yes
3817	81 Church Street St Peters	Residential New	50	45	60	14.7	45	61	15.7	Yes	Yes
3818	4 St Peters Street St Peters	Residential New	50	46	62	15.5	46	63	16.8	Yes	Yes
3822	7 Brown Street St Peters	Residential New	50	46	59	12.5	46	60	13.8	Yes	Yes
3826	6 St Peters Street St Peters	Residential New	50	45	55	10.0	45	56	11.4	Yes	Yes
3829	83 Church Street St Peters	Residential New	50	47	58	11.3	47	60	12.6	Yes	Yes
3831	9 Brown Street St Peters	Residential New	50	45	58	12.6	45	59	13.9	Yes	Yes
3834	7 Florence Street St Peters	Residential New	50	43	62	19.7	43	63	21.0	Yes	Yes
3838	1b St Peters Street St Peters	Residential New	50	49	61	12.6	49	62	14.0	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3839	8 St Peters Street St Peters	Residential New	50	46	57	10.6	46	58	12.0	Yes	Yes
3840	85 Church Street St Peters	Residential New	50	44	57	13.6	47	58	11.4	Yes	Yes
3843	10 Brown Street St Peters	Residential New	50	44	60	16.0	44	62	17.4	Yes	Yes
3846	11 Brown Street St Peters	Residential New	50	49	53	3.8	48	54	5.6	No	Yes
3849	9 Florence Street St Peters	Residential New	50	43	54	10.9	43	55	12.2	Yes	Yes
3851	4 Florence Street St Peters	Residential New	50	44	61	16.7	44	62	18.0	Yes	Yes
3852	87 Church Street St Peters	Residential New	50	46	56	9.6	46	57	10.9	Yes	Yes
3855	1/12 Brown Street St Peters	Residential New	50	46	54	8.4	46	56	9.7	Yes	Yes
3856	11 Florence Street St Peters	Residential New	50	43	55	11.9	43	56	13.3	Yes	Yes
3859	13 Brown Street St Peters	Residential New	50	45	54	9.2	45	55	10.6	Yes	Yes
3860	6 Florence Street St Peters	Residential New	50	44	57	12.5	44	58	13.8	Yes	Yes
3861	5 St Peters Street St Peters	Residential New	50	48	59	11.2	48	61	12.5	Yes	Yes
3862	89 Church Street St Peters	Residential New	50	46	55	8.8	46	57	10.2	Yes	Yes
3867	1/12 Brown Street St Peters	Residential New	50	46	58	12.0	46	59	13.4	Yes	Yes
3868	12 St Peters Street St Peters	Residential New	50	46	54	8.3	46	55	9.7	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3872	16 Brown Street St Peters	Residential New	50	45	52	7.0	45	54	8.3	No	Yes
3873	7 St Peters Street St Peters	Residential New	50	46	54	8.2	46	55	9.7	Yes	Yes
3874	91a Church Street St Peters	Residential New	50	45	53	7.4	45	54	8.9	No	Yes
3877	15 Brown Street St Peters	Residential New	50	45	53	7.7	45	54	9.1	No	Yes
3882	13 Florence Street St Peters	Residential New	50	45	55	9.9	45	56	11.2	Yes	Yes
3883	8 Florence Street St Peters	Residential New	50	47	58	10.5	47	59	11.8	Yes	Yes
3885	17 Brown Street St Peters	Residential New	50	45	52	7.2	45	53	8.6	No	Yes
3887	91b Church Street St Peters	Residential New	50	46	53	7.2	46	55	8.7	Yes	Yes
3890	9 St Peters Street St Peters	Residential New	50	43	51	8.1	43	52	9.4	No	Yes
3894	16 St Peters Street St Peters	Residential New	50	44	51	6.6	44	53	8.1	No	Yes
3895	18 St Peters Street St Peters	Residential New	50	45	54	9.1	45	56	10.5	Yes	Yes
3896	91c Church Street St Peters	Residential New	50	46	53	6.8	46	54	8.3	No	Yes
3897	22 Brown Street St Peters	Residential New	50	44	50	6.8	44	52	8.1	No	Yes
3899	19 Brown Street St Peters	Residential New	50	45	51	5.5	45	52	6.9	No	Yes
3903	10 Florence Street St Peters	Residential New	50	46	53	7.2	46	55	8.5	Yes	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3907	15 Florence Street St Peters	Residential New	50	44	52	8.4	44	54	9.8	No	Yes
3908	91d Church Street St Peters	Residential New	50	46	52	6.3	46	54	7.8	No	Yes
3909	12 Florence Street St Peters	Residential New	50	46	53	7.0	46	54	8.4	No	Yes
3910	11 St Peters Street St Peters	Residential New	50	44	53	8.3	44	54	9.7	No	Yes
3913	21 Brown Street St Peters	Residential New	50	45	50	5.4	45	51	6.8	No	Yes
3914	24 Brown Street St Peters	Residential New	50	44	51	6.2	44	52	7.6	No	Yes
3916	14 Florence Street St Peters	Residential New	50	46	52	6.0	46	54	7.4	No	Yes
3921	17 Florence Street St Peters	Residential New	50	45	52	6.8	43	51	7.9	No	Yes
3923	13 St Peters Street St Peters	Residential New	50	44	53	8.2	44	54	9.6	No	Yes
3925	16 Florence Street St Peters	Residential New	50	45	52	6.5	45	53	7.9	No	Yes
3926	18 St Peters Street St Peters	Residential New	50	44	50	5.7	44	51	7.2	No	Yes
3927	23 Brown Street St Peters	Residential New	50	45	50	4.8	45	51	6.2	No	Yes
3928	18 Florence Street St Peters	Residential New	50	46	52	6.0	46	53	7.4	No	Yes
3934	19 Florence Street St Peters	Residential New	50	45	51	6.5	45	52	7.9	No	Yes
3935	20 Florence Street St Peters	Residential New	50	45	51	6.1	45	53	7.5	No	Yes

ID	Address	Use / Road type	Criteria	Year of Opening (2021)			Design Year (2031)			Exceeds Cumulative Limit	Eligible
				No Build	Build	Increase	No Build	Build	Increase		
3936	15 St Peters Street St Peters	Residential New	50	45	53	7.8	45	55	9.2	Yes	Yes
3940	17 St Peters Street St Peters	Residential New	50	44	50	5.6	44	52	7.3	No	Yes
4059	8/635 Gardeners Road Mascot	Residential New	50	52	55	2.1	52	56	4.0	Yes	Yes
4086	21 St Peters Street St Peters	Residential New	50	44	49	5.1	44	51	6.6	No	Yes
4089	23 St Peters Street St Peters	Residential New	50	45	50	4.9	45	51	6.6	No	Yes
4090	24 Florence Street St Peters	Residential New	50	44	50	5.8	44	51	7.3	No	Yes
4092	21 Florence Street St Peters	Residential New	50	45	51	6.0	45	52	7.4	No	Yes
4096	30 Brown Street St Peters	Residential New	50	44	50	5.5	44	51	7.0	No	Yes
4099	31 St Peters Street St Peters	Residential New	50	46	52	6.3	46	53	7.7	No	Yes
4100	25 Brown Street St Peters	Residential New	50	45	49	4.3	45	51	5.8	No	Yes
4103	26 Florence Street St Peters	Residential New	50	43	49	5.6	43	51	7.1	No	Yes
4115	29 Florence Street St Peters	Residential New	50	45	49	4.5	45	51	6.0	No	Yes
4117	31 St Peters Street St Peters	Residential New	50	45	50	5.1	45	52	6.7	No	Yes

Note1: The noise criterion for a School is an internal noise level. Façade noise levels have been reported in this table. A reduction of 12.5 dB(A) with open window and 22.5 dB(A) with windows closed can be assumed (accounting for façade reflection in the calculation). The $L_{Aeq(15hour)}$ and $L_{Aeq(1hour)}$ during school hours have been found to be around the same level, requiring no correction.

Appendix N

Western surface works - noise walls

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New or Modified Noise Wall

WestConnex Stage 2

Western Surface Works - New or modified noise walls

Source:

0 100 200 400 m

AUG 2015

60327128

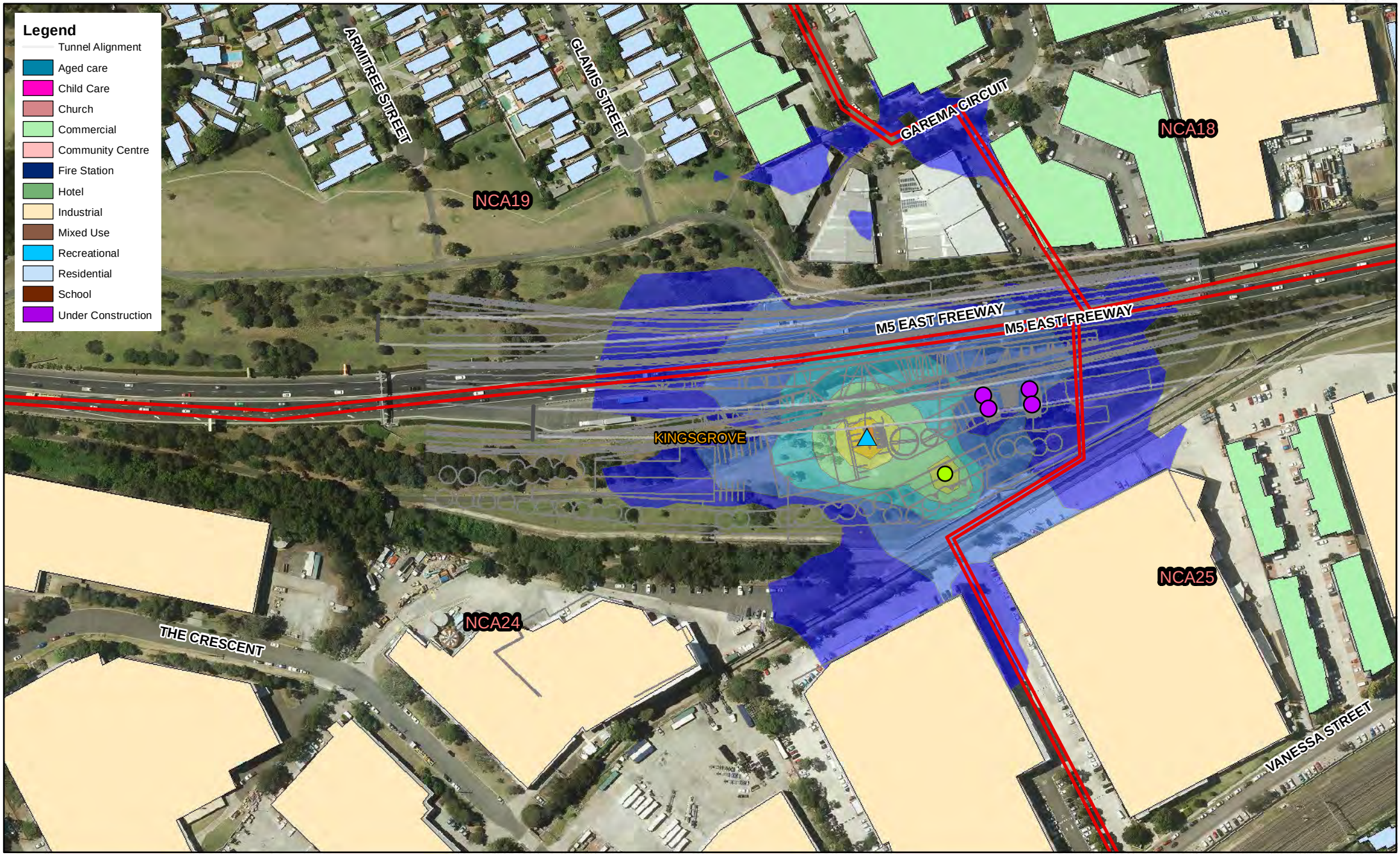
Fig. **1**

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Appendix O

Operational noise results- fixed facility maps

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Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - Kingsgrove

Normal Operations - Neutral Weather

Source: SKM2014

0 50 100 200 m

N

SEP 2015

60327128

Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

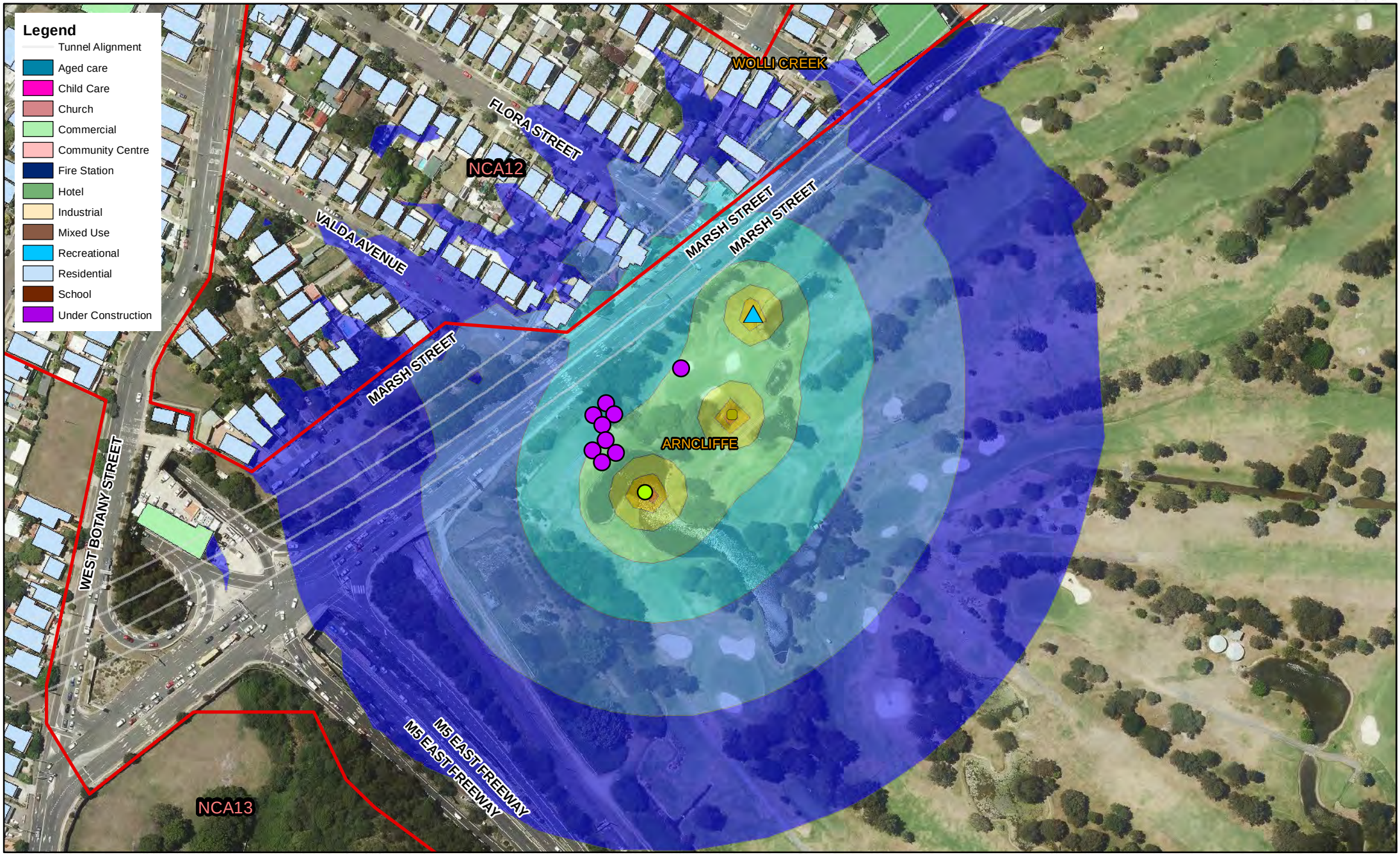
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Bexley Road
Normal Operations - Neutral Weather
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

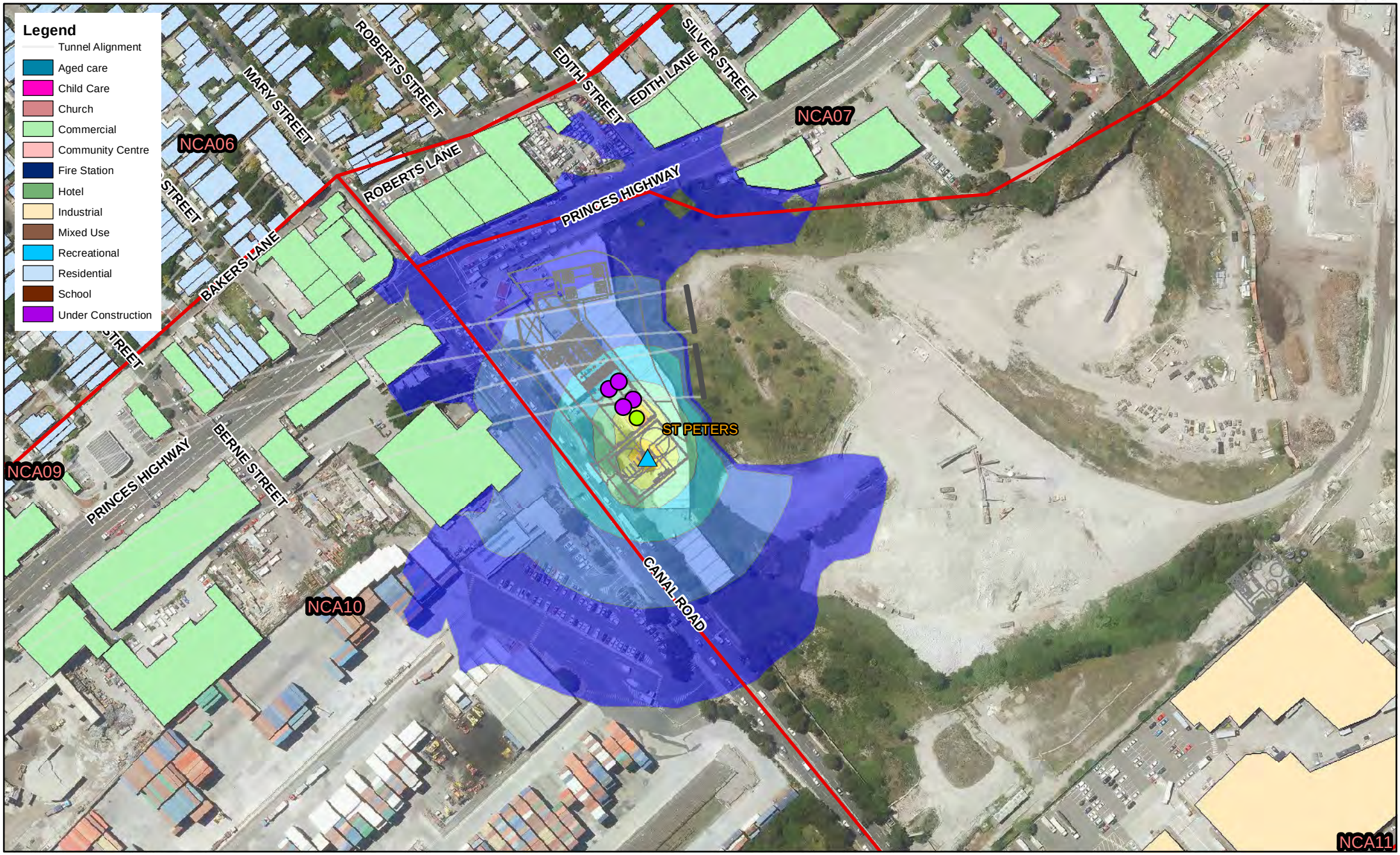
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Arncliffe
Normal Operations - Neutral Weather
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - St Peters

Normal Operations - Neutral Weather

Source: SKM2014

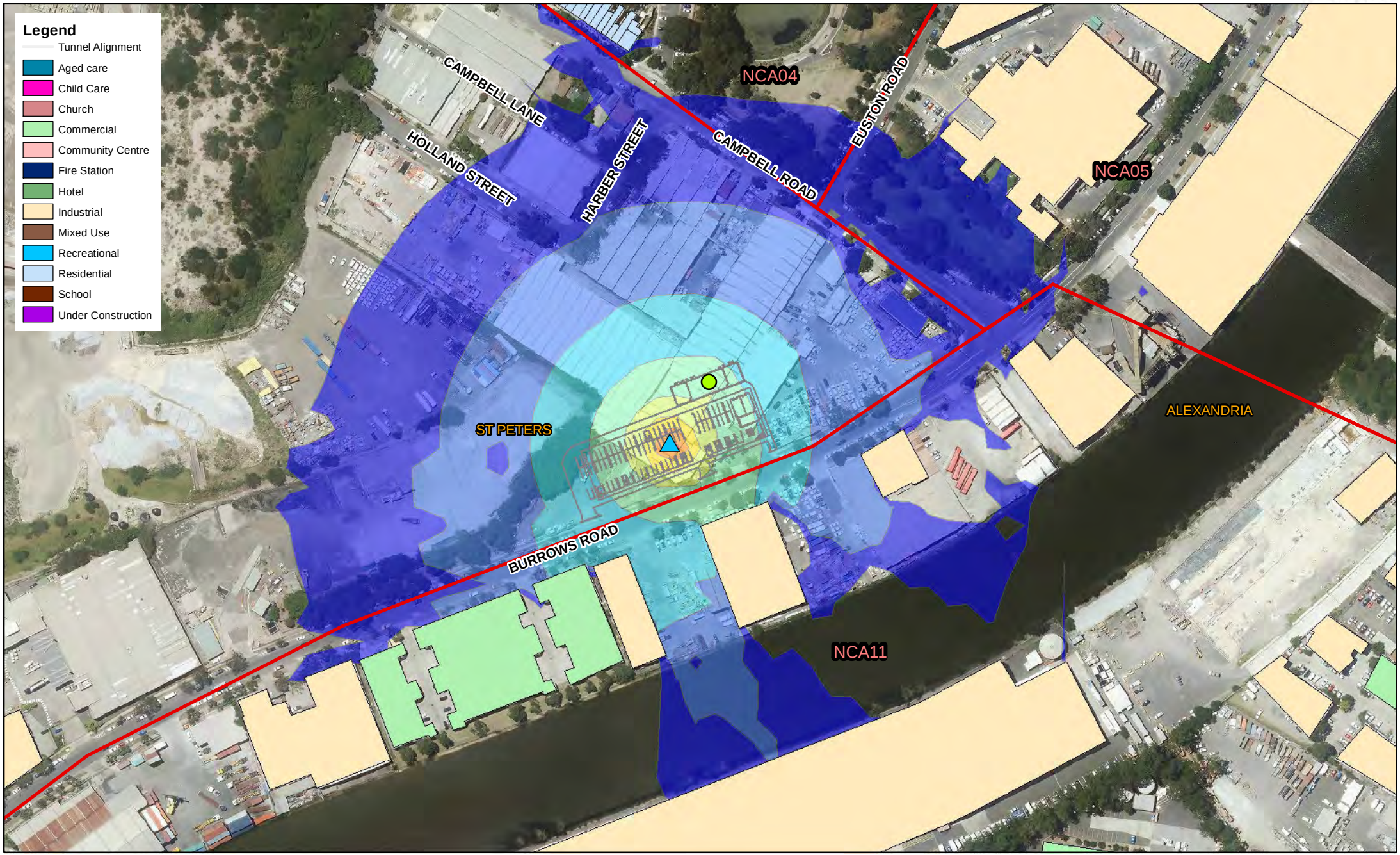
0 50 100 200 m

N

SEP 2015

60327128

Fig. **4**



AECOM

WestConnex Stage 2

Operational Fixed Facilities - MCC

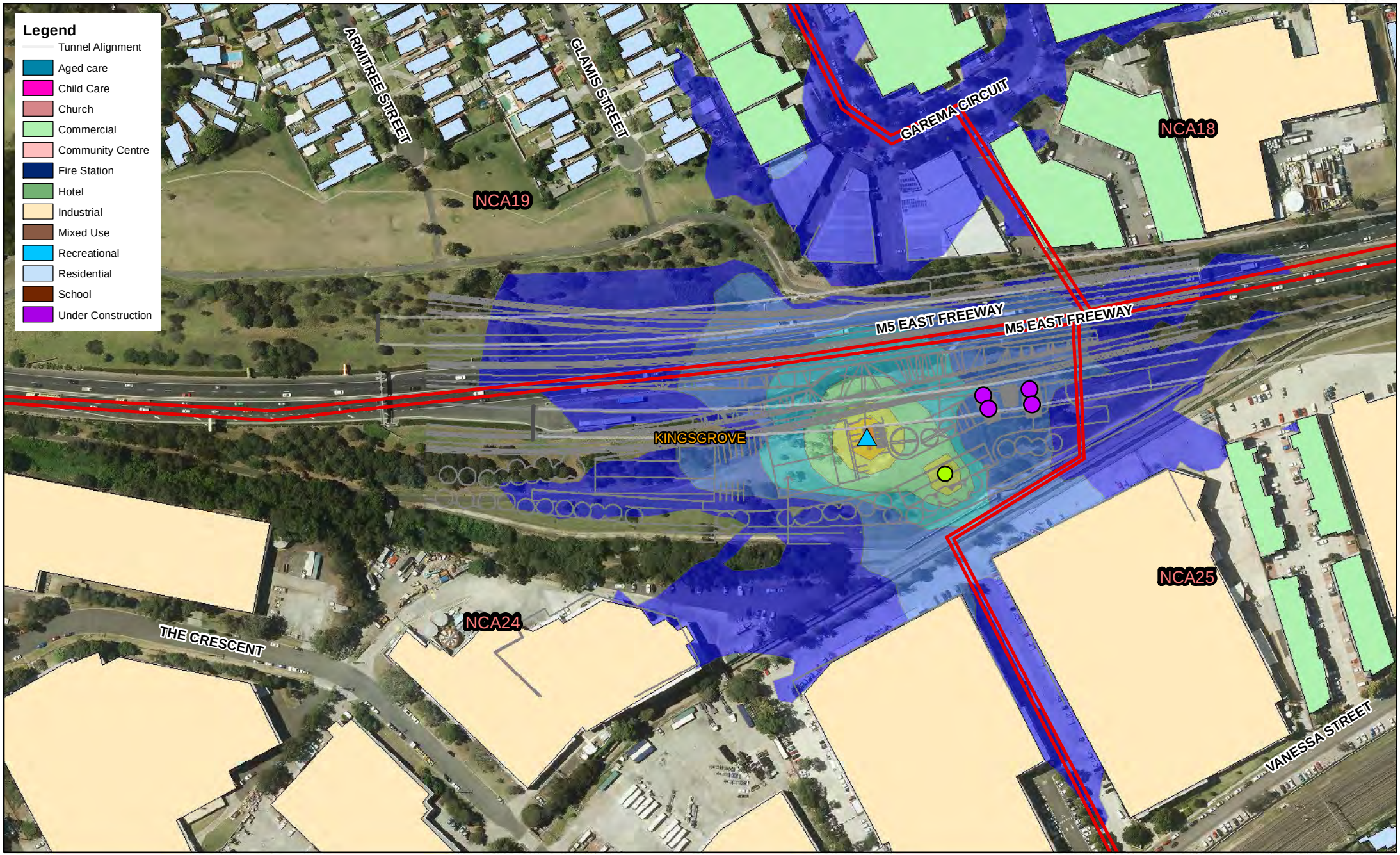
Normal Operations - Neutral Weather

Source: SKM2014

SEP 2015

60327128

Fig. **5**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Kingsgrove
Normal Operations - F-class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

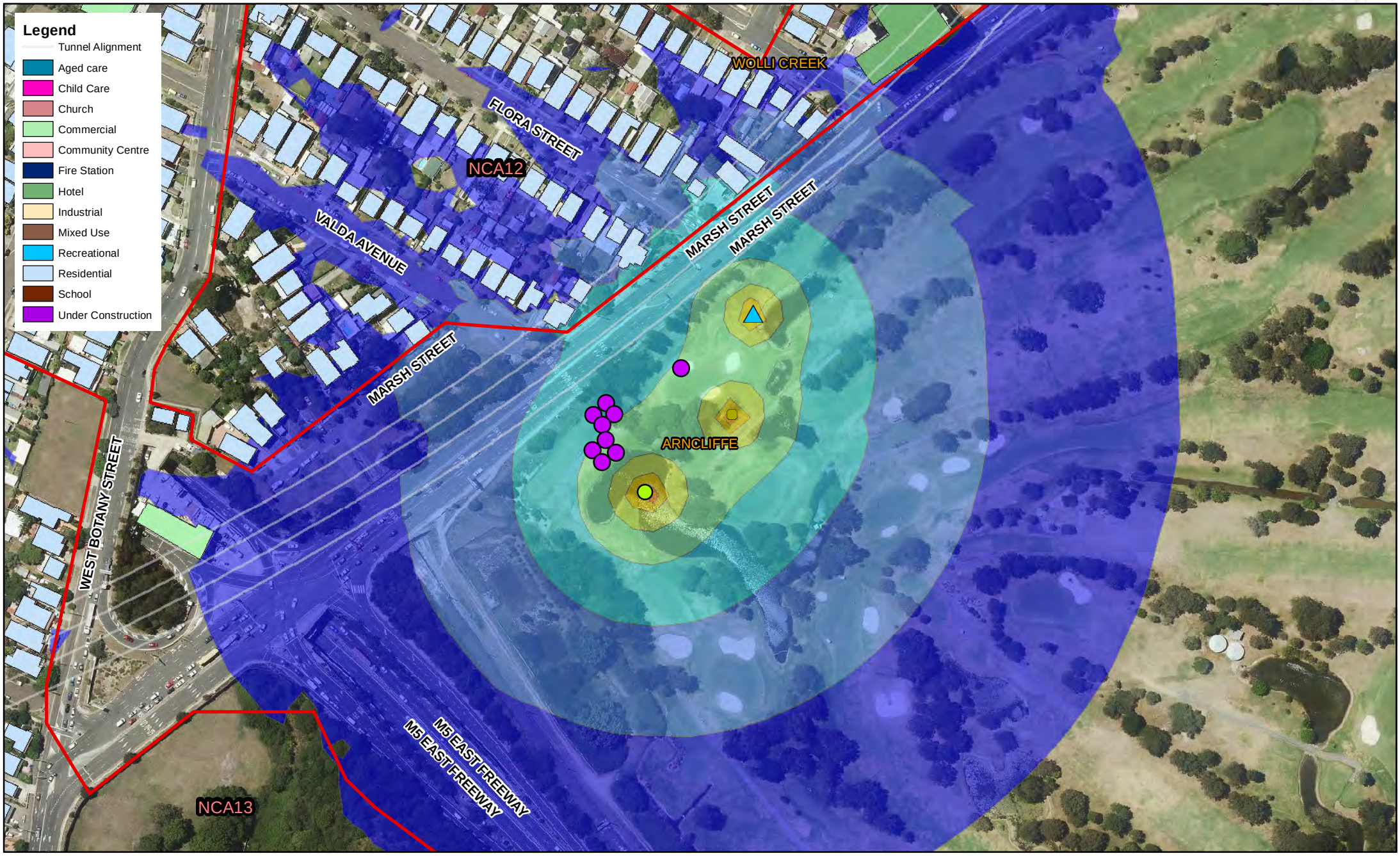
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Bexley Road
Normal Operations - F-class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

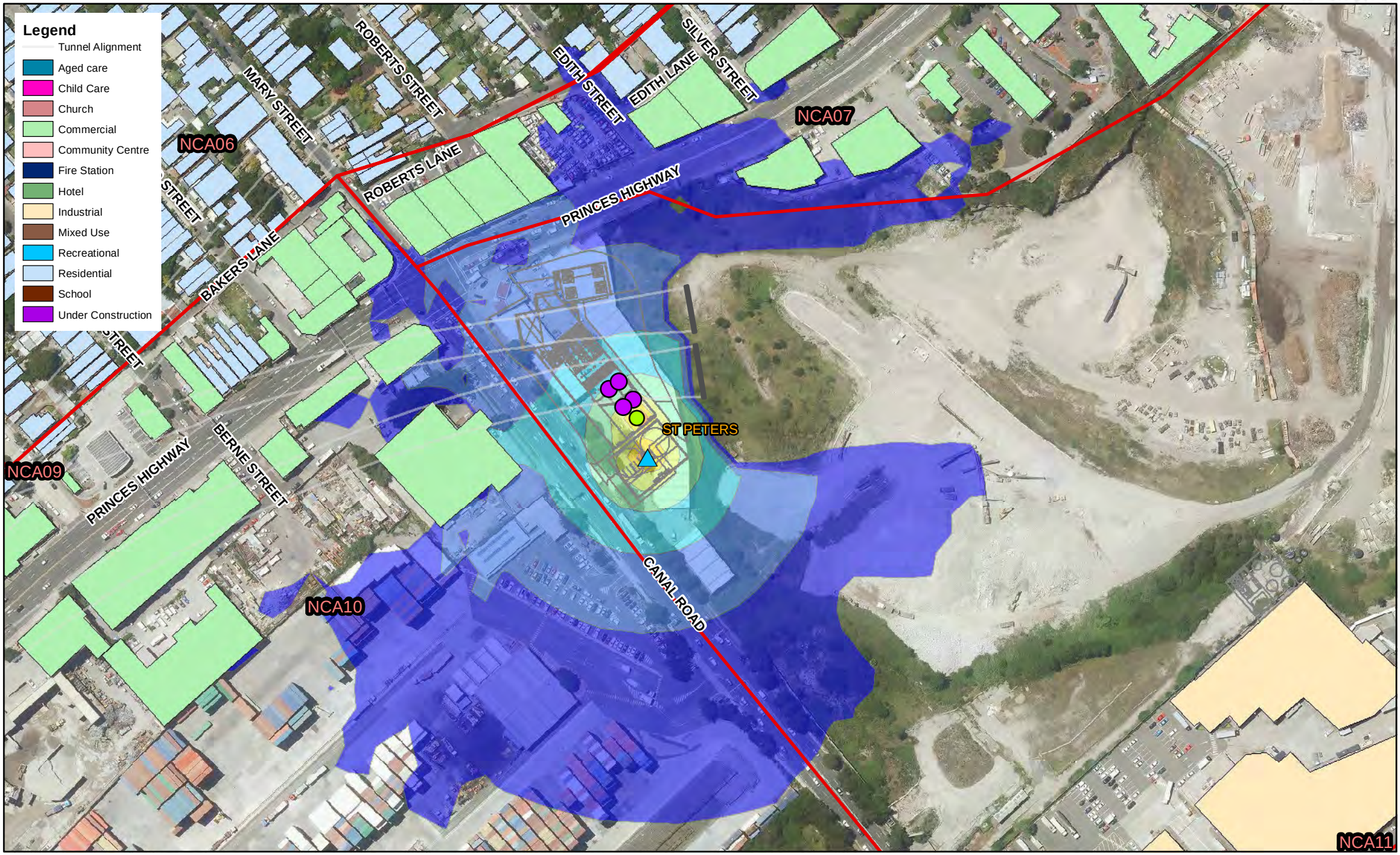
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Arncliffe
Normal Operations - F-class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - St Peters

Normal Operations - F-class Inversions

Source: SKM2014

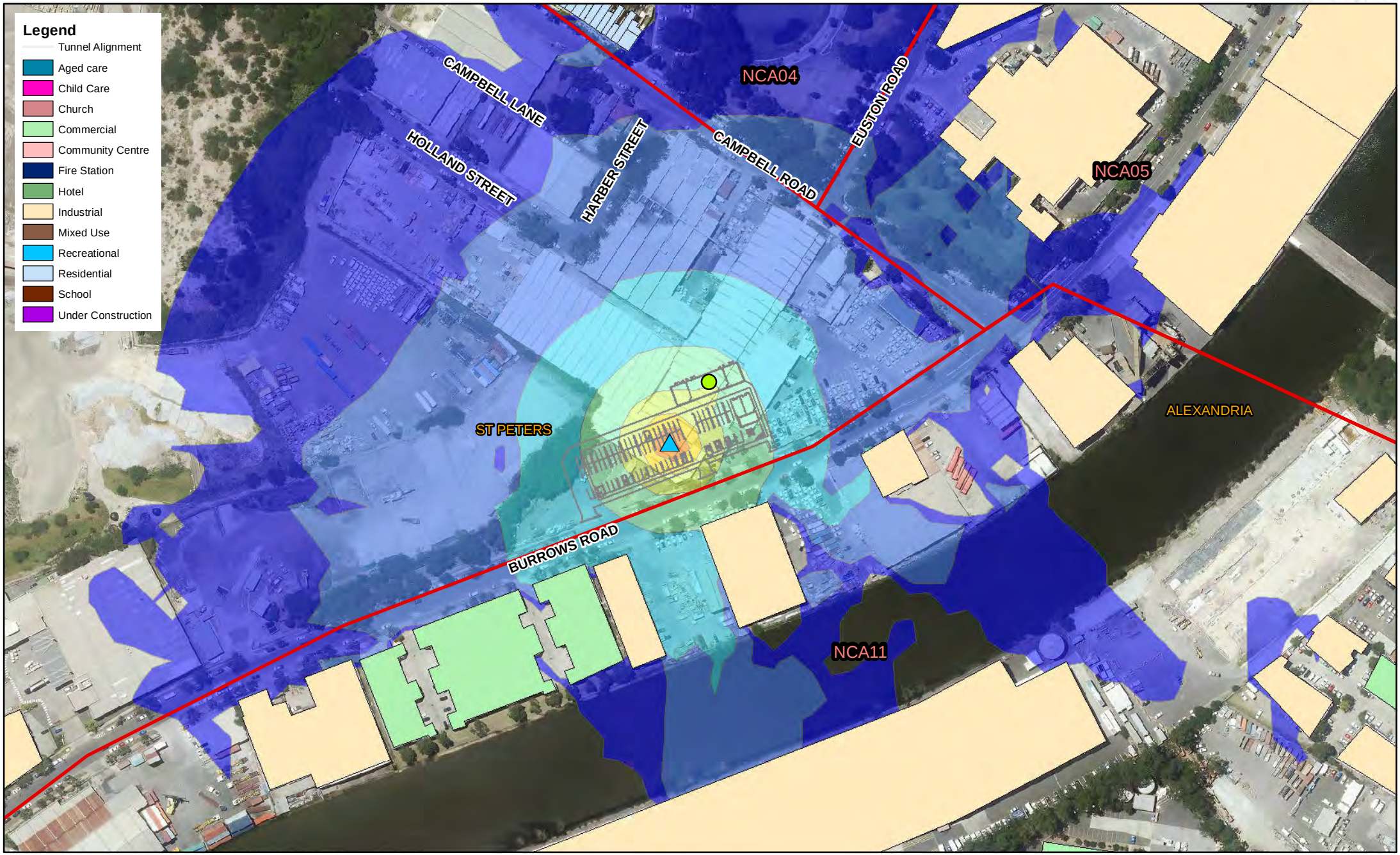
0 50 100 200 m

N

SEP 2015

60327128

Fig. **4**



AECOM

WestConnex Stage 2

Operational Fixed Facilities - MCC

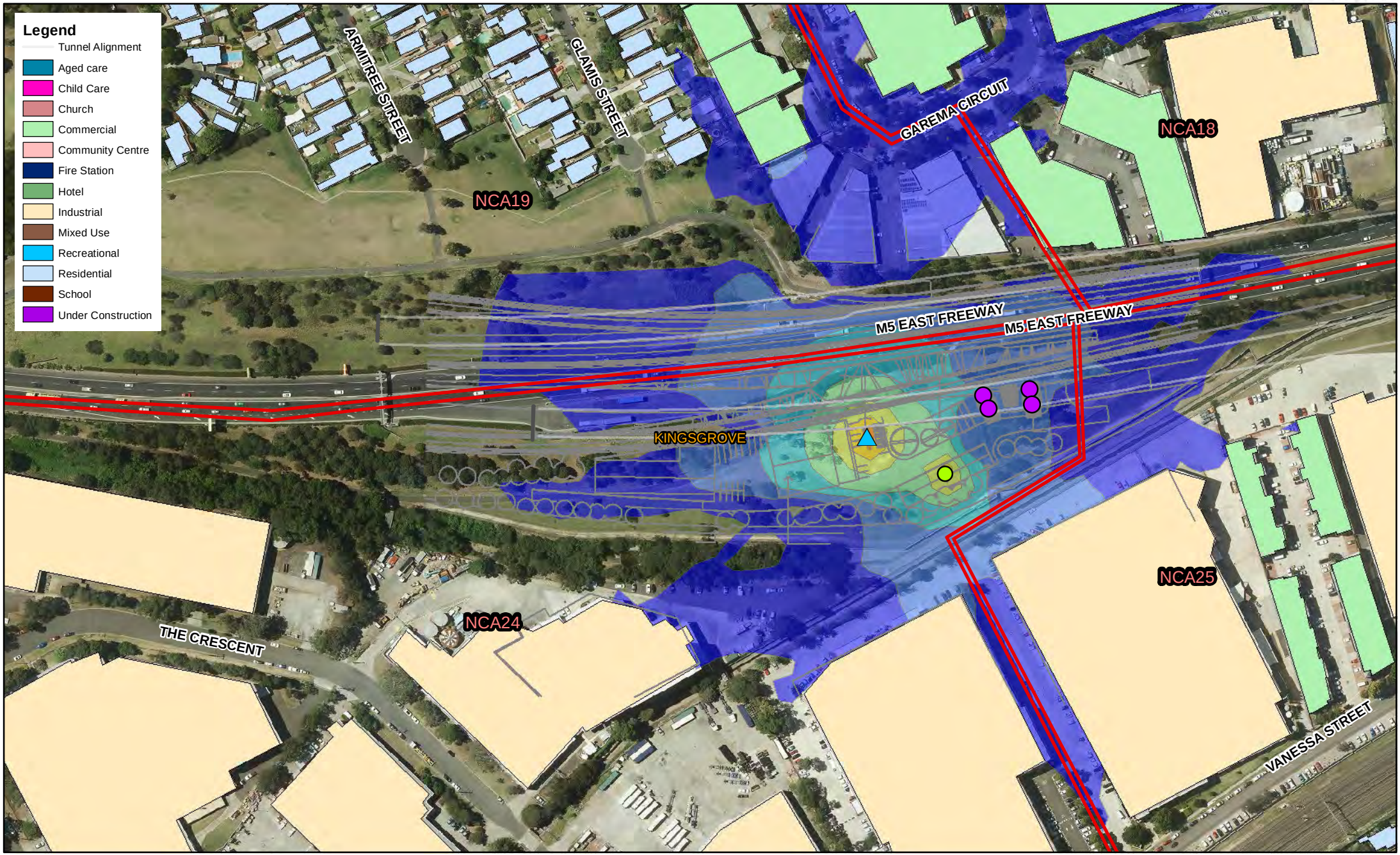
Normal Operations - F-class Inversions

Source: SKM2014

SEP 2015

60327128

Fig. **5**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Kingsgrove
Normal Operations - 3 m/s source to receiver wind
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

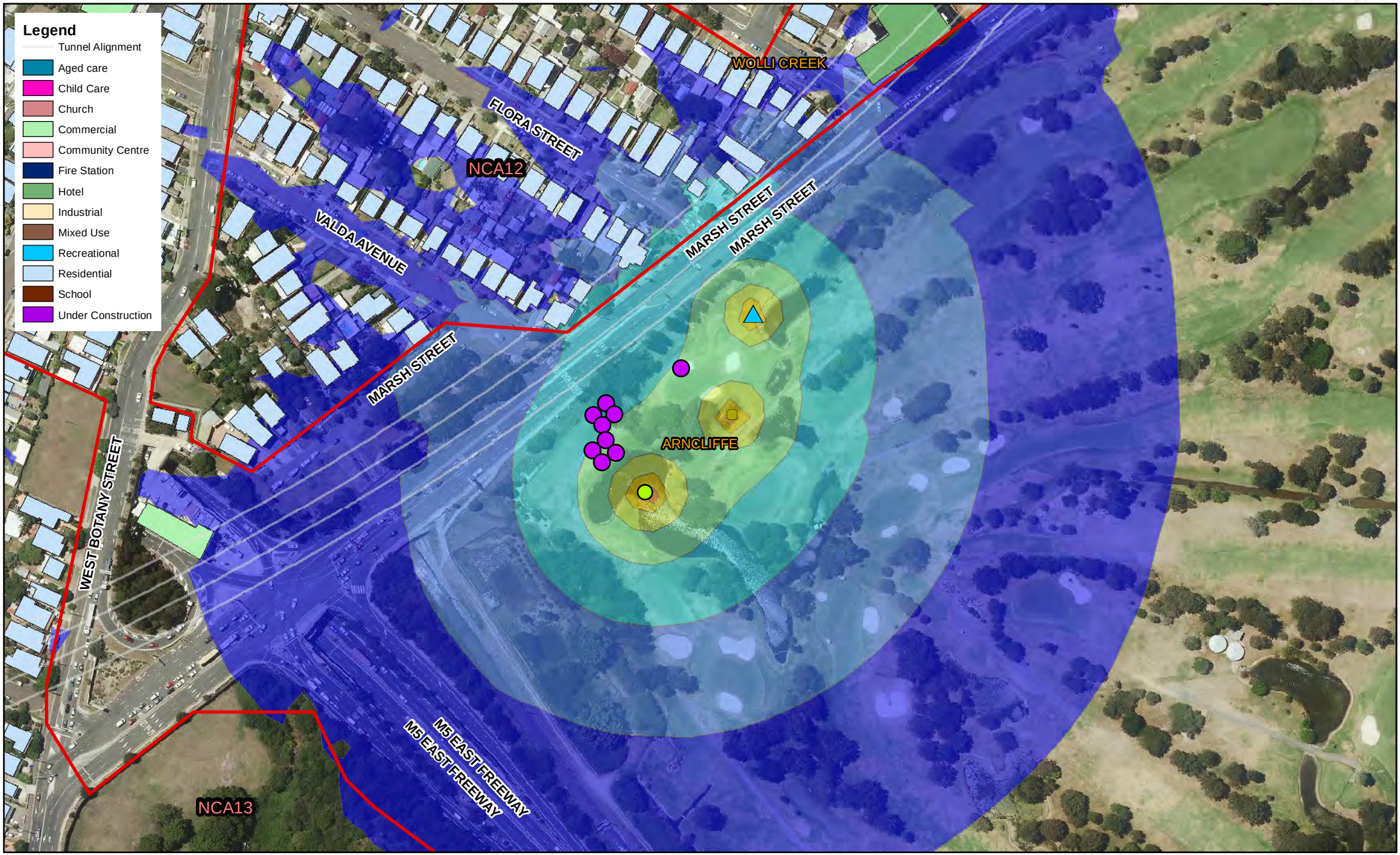
>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Bexley Road
Normal Operations - 3 m/s source to receiver wind
Source: SKM2014

0 50 100 200 m

SEP 2015
60327128
Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

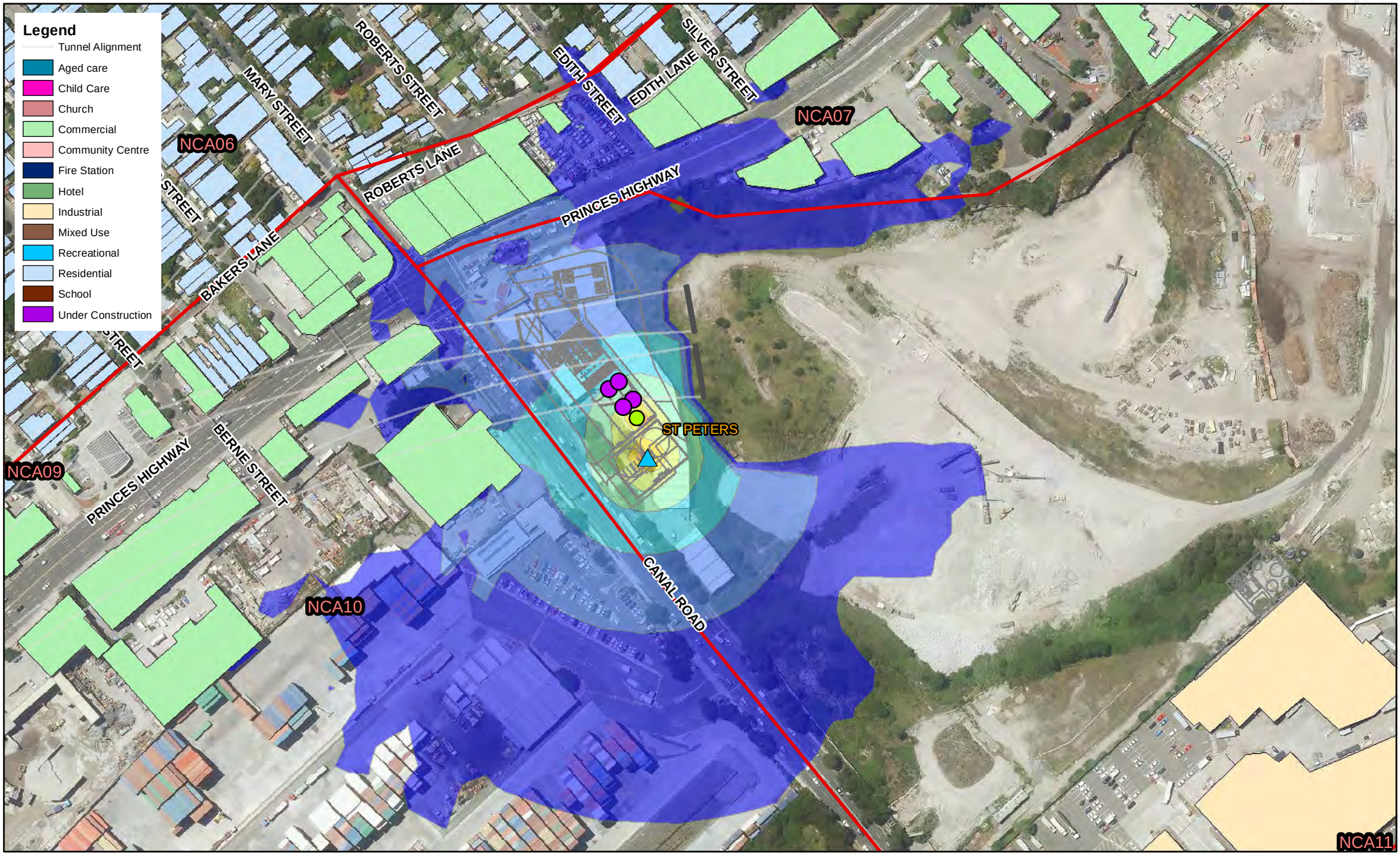
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - Arncliffe
Normal Operations - 3 m/s source to receiver wind
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - St Peters

Normal Operations - 3 m/s source to receiver wind

Source: SKM2014

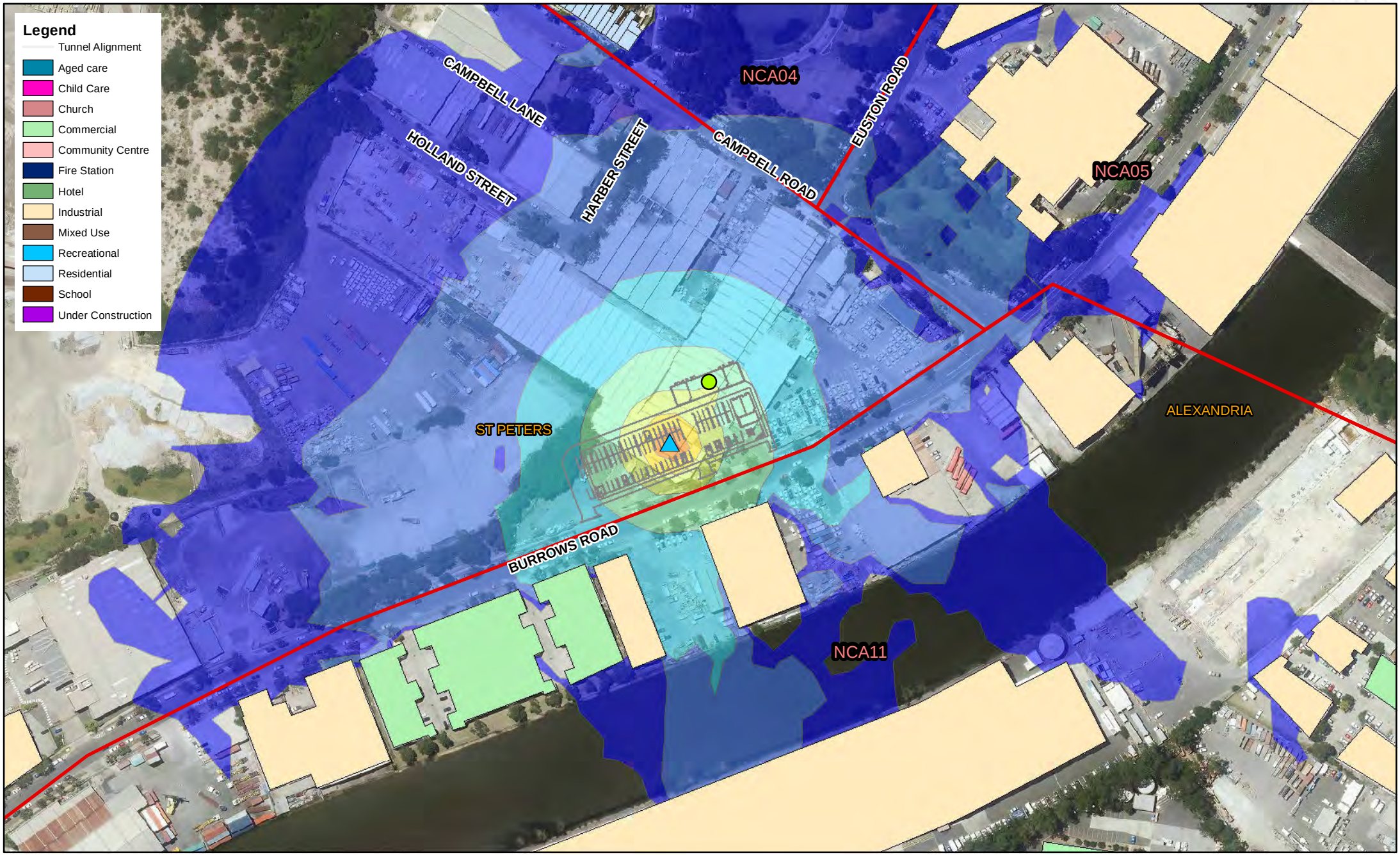
0 50 100 200 m

N

SEP 2015

60327128

Fig. **4**



AECOM

WestConnex Stage 2

Operational Fixed Facilities - MCC

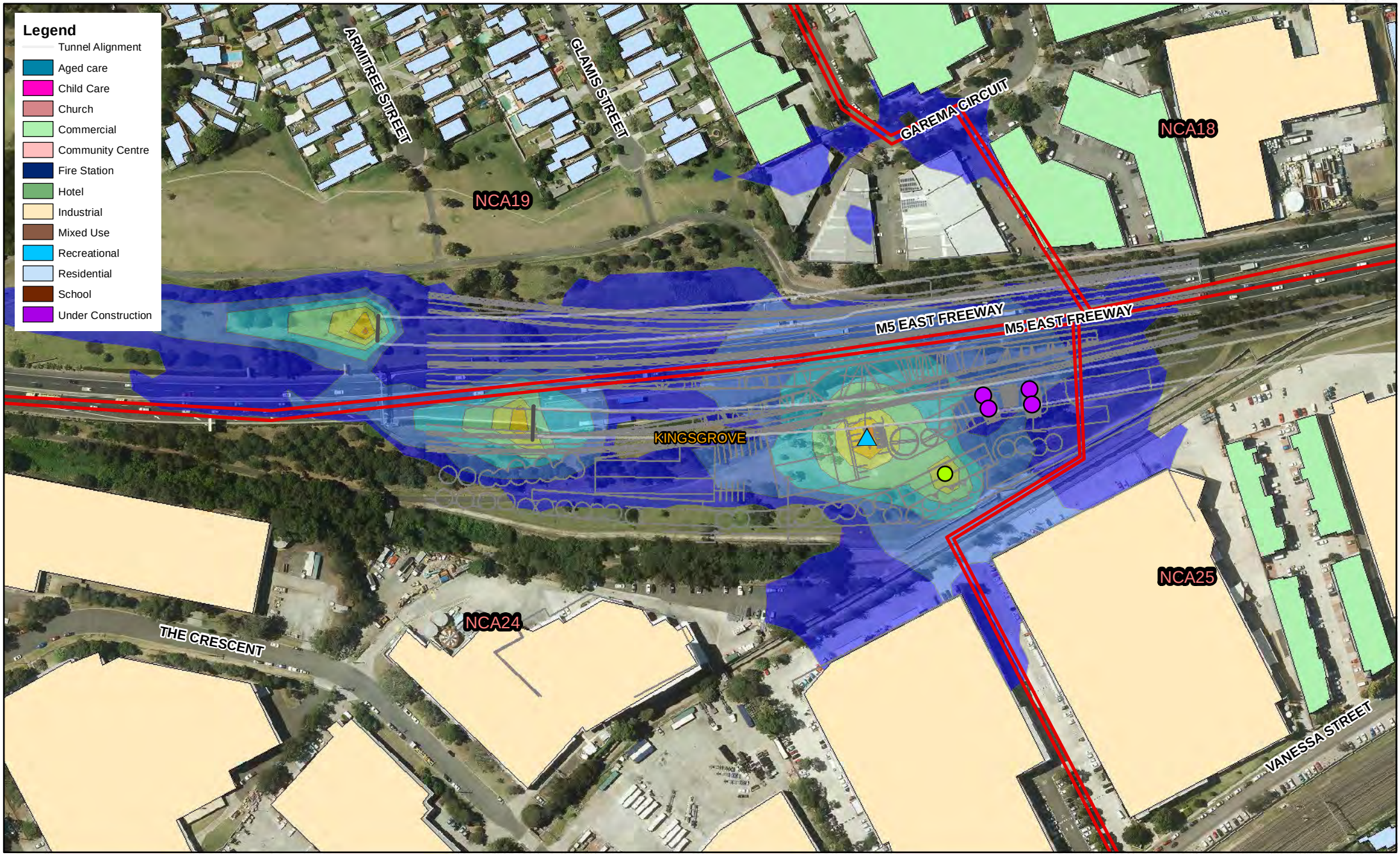
Normal Operations - 3 m/s source to receiver wind

Source: SKM2014

SEP 2015

60327128

Fig. **5**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- WaterTreatmentPlant
- Car parking
- Substation
- VentilationStations_20151409

WestConnex Stage 2

Operational Fixed Facilities - Kingsgrove

Low Speed Traffic Conditions - Neutral Weather

Source: SKM2014

0 50 100 200 m

N

SEP 2015

60327128

Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

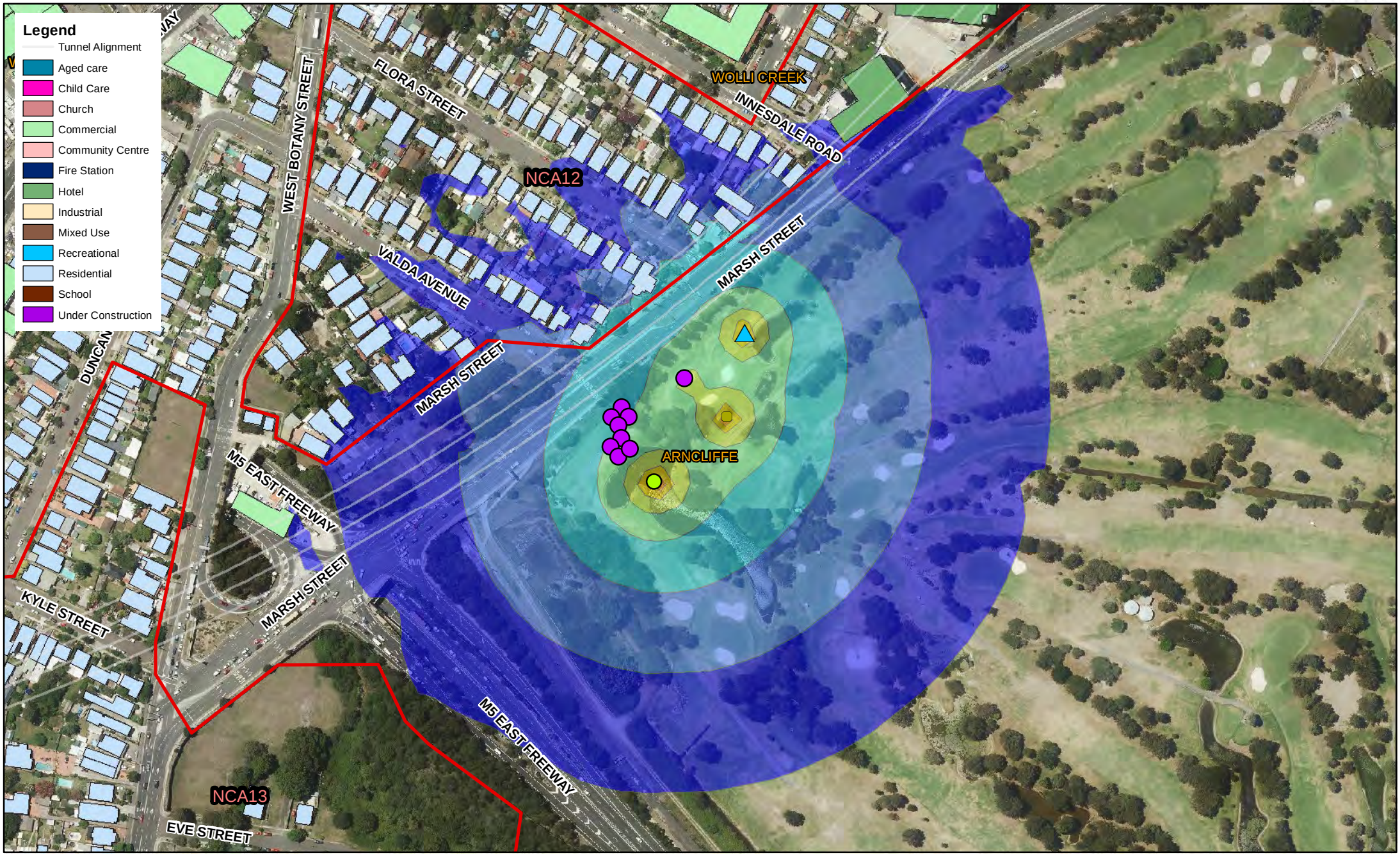
Tunnel Portal
WaterTreatmentPlant
Car parking
Substation
VentilationStations_20151409

WestConnex Stage 2
Operational Fixed Facilities - Bexley Road
Low Speed Traffic Conditions - Neutral Weather
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - Arncliffe

Low Speed Traffic Conditions - Neutral Weather

Source: SKM2014

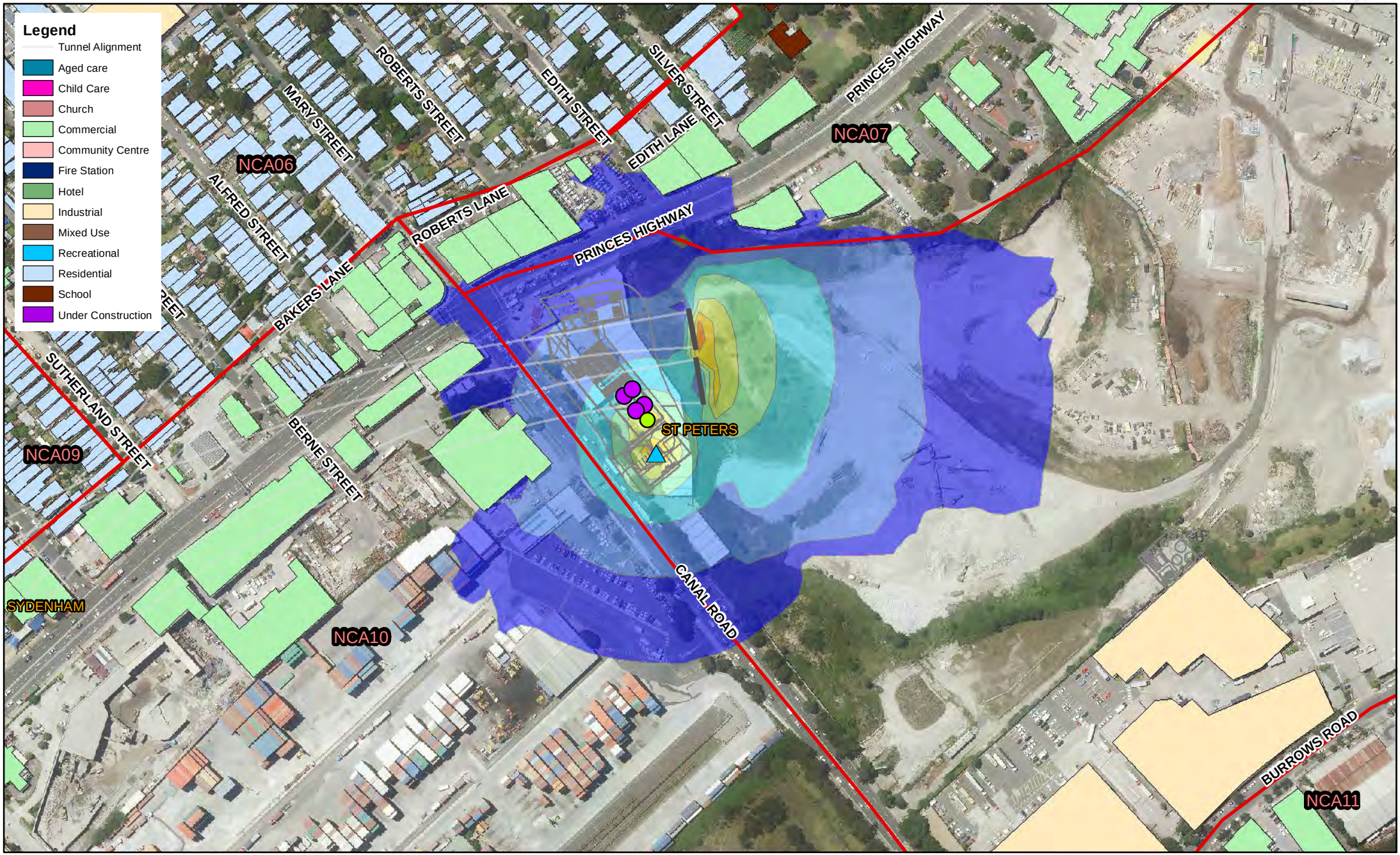
0 50 100 200 m

N

SEP 2015

60327128

Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - St Peters

Low Speed Traffic Conditions - Neutral Weather

Source: SKM2014

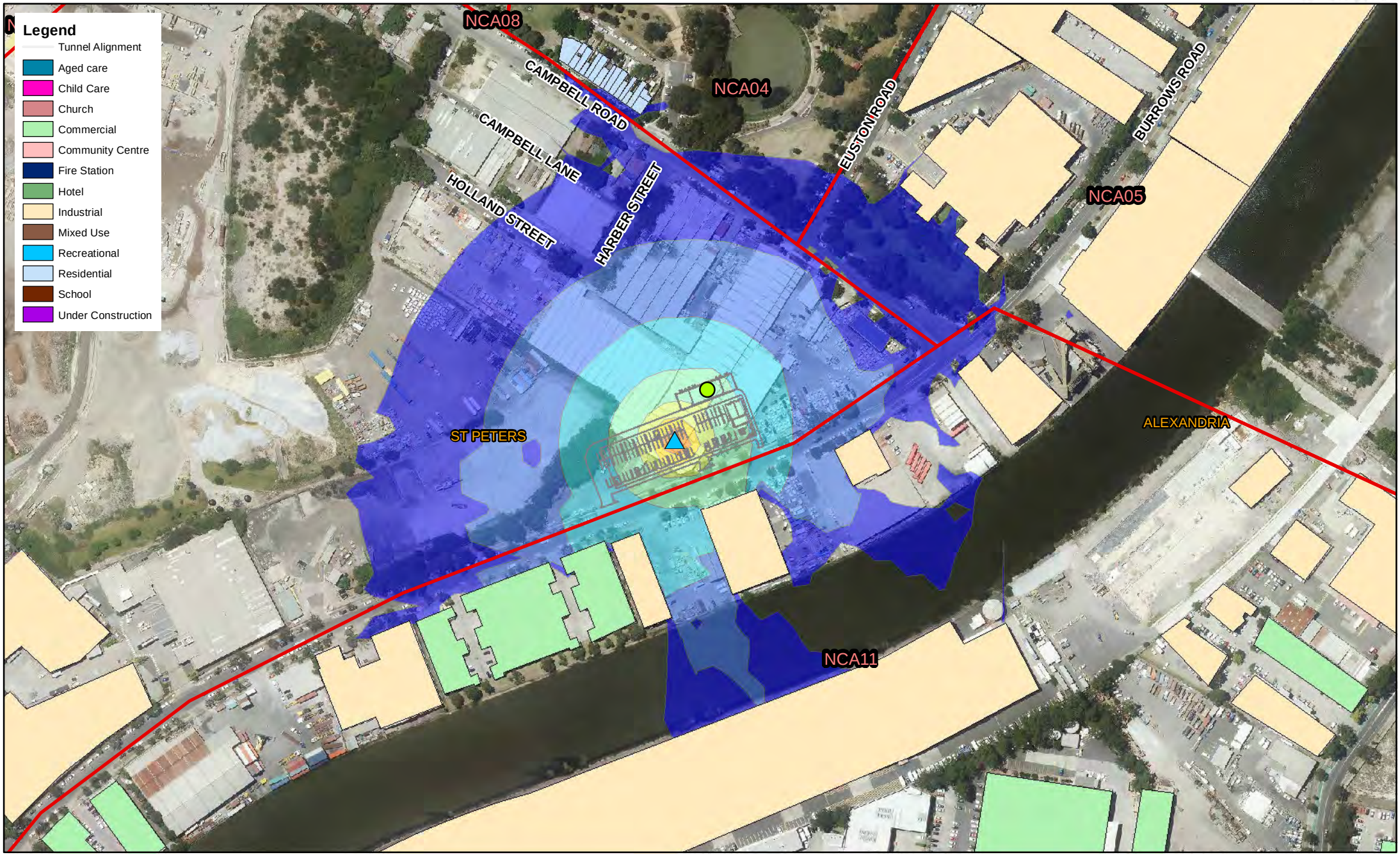
0 50 100 200 m

N

SEP 2015

60327128

Fig. **4**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - MCC

Low Speed Traffic Conditions - Neutral Weather

Source: SKM2014

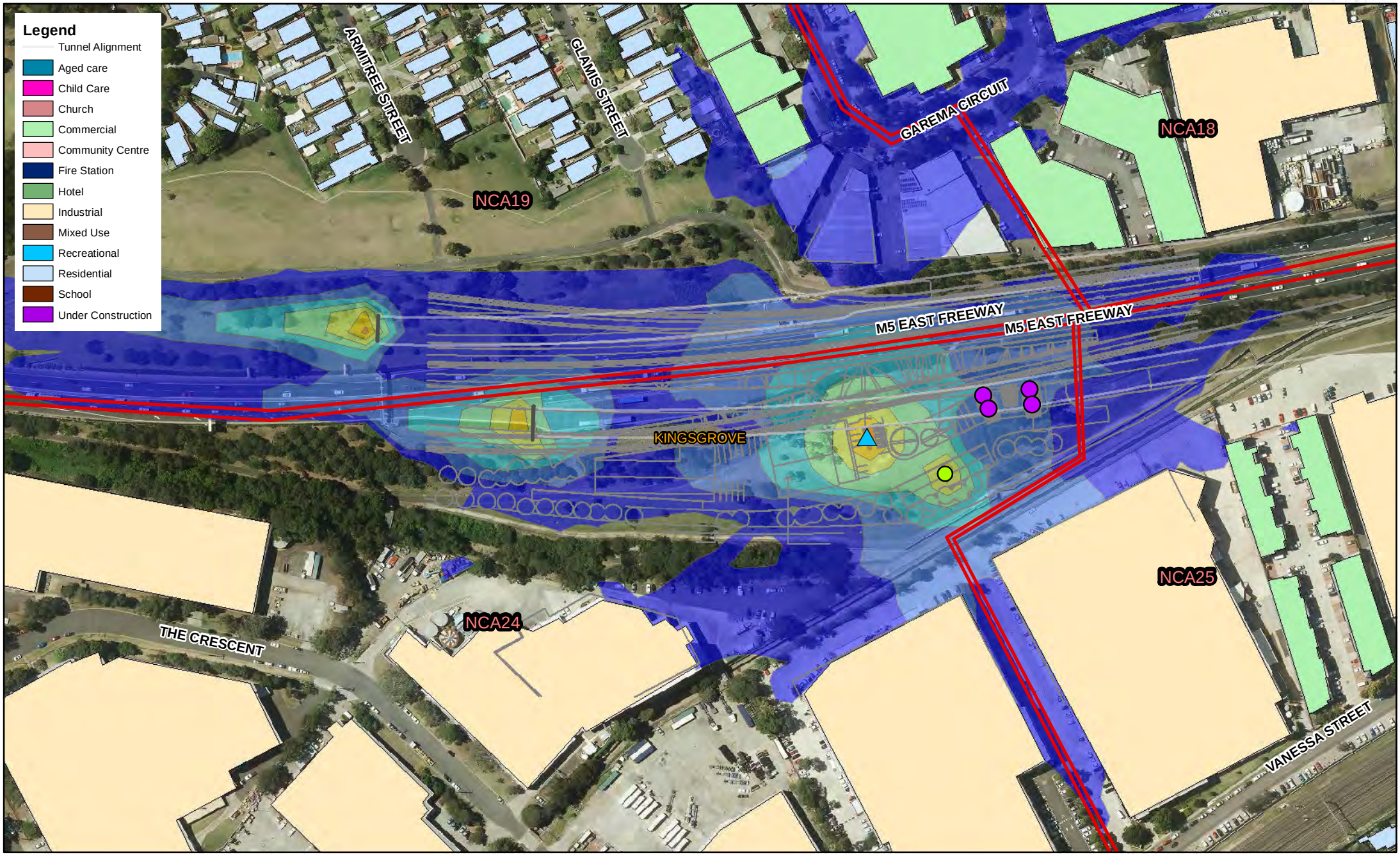
0 50 100 200 m

N

SEP 2015

60327128

Fig. **5**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

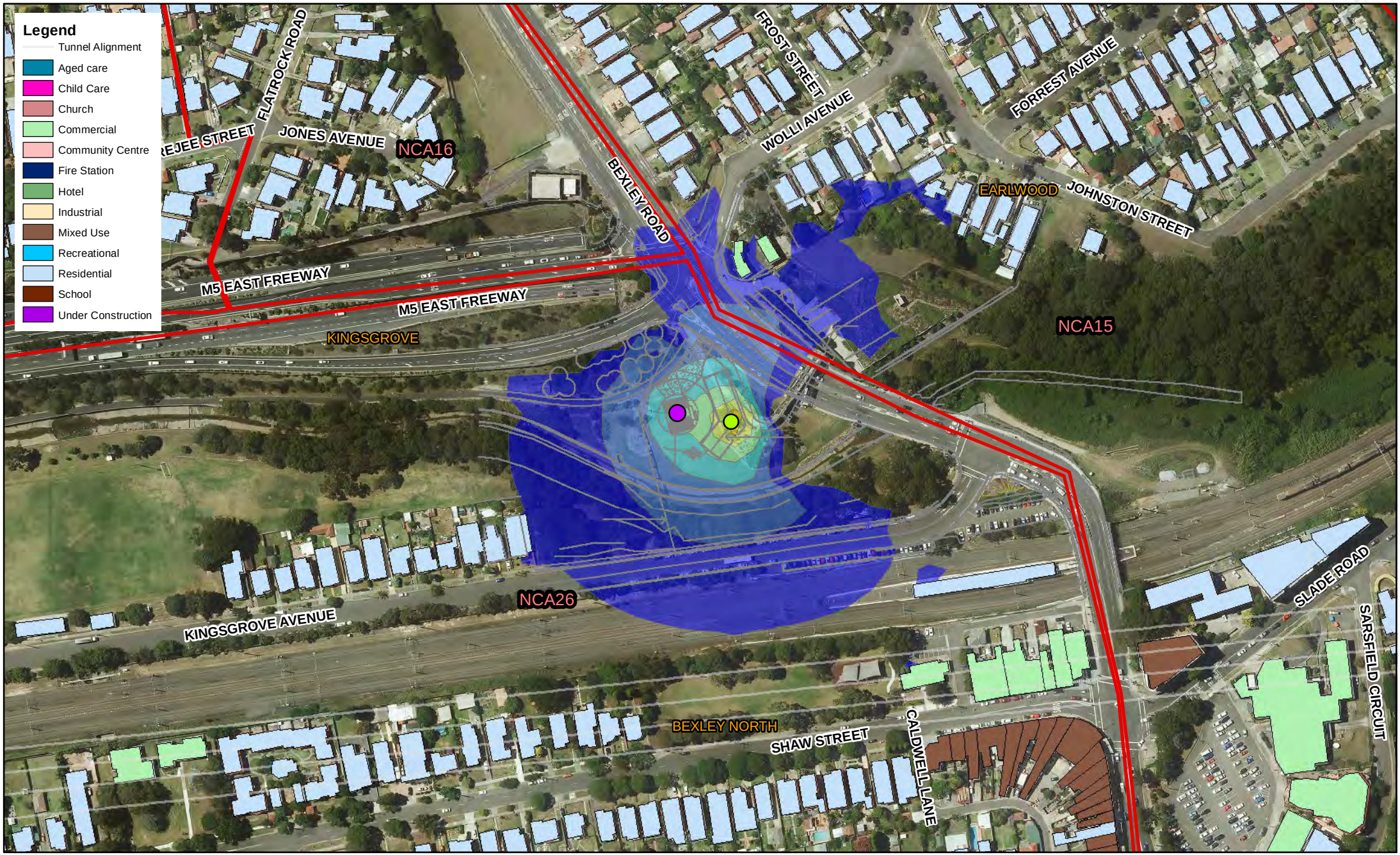
Tunnel Portal
WaterTreatmentPlant
Car parking
Substation
VentilationStations_20151409

WestConnex Stage 2
Operational Fixed Facilities - Kingsgrove
Low Speed Traffic Conditions - F-Class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

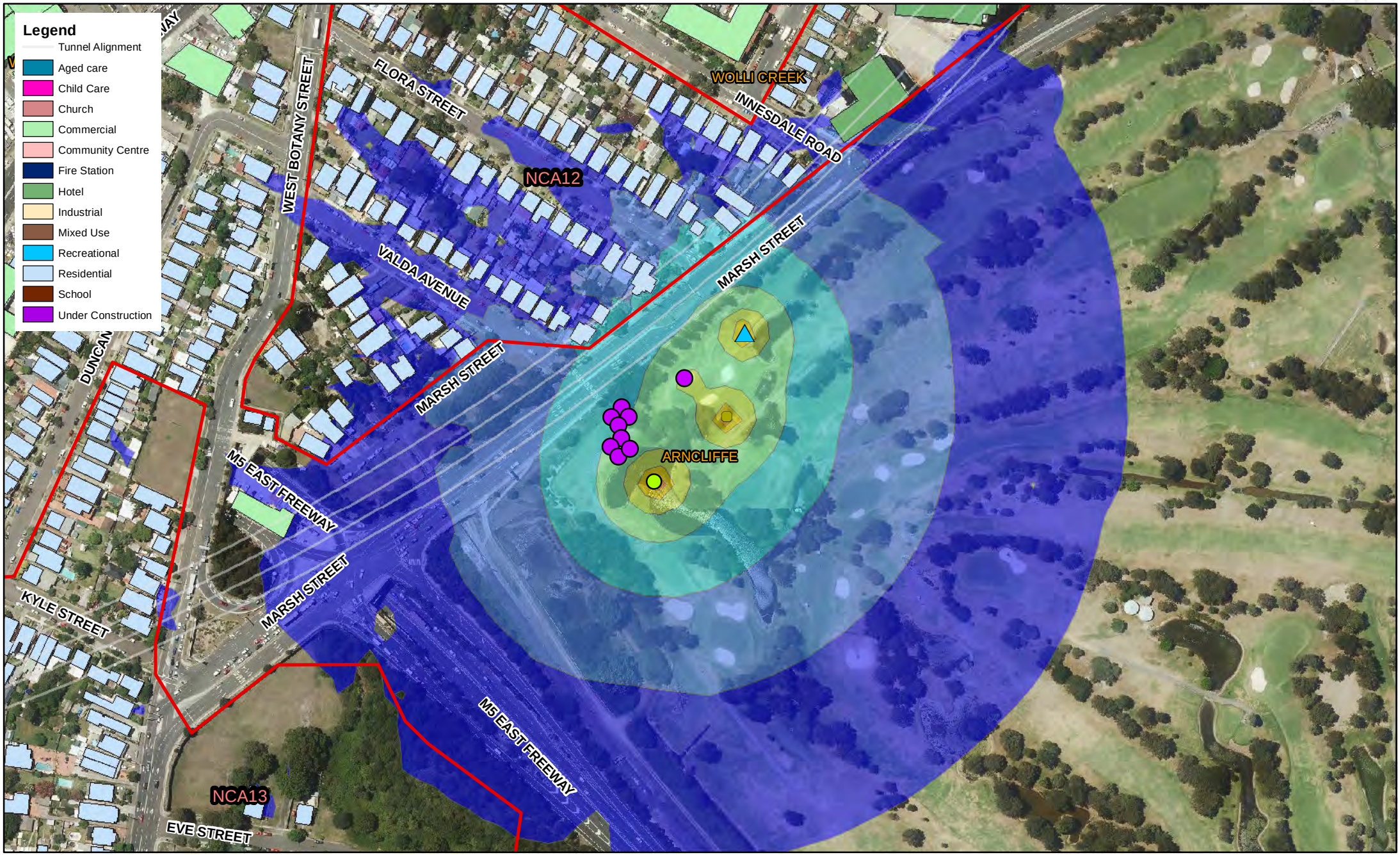
Tunnel Portal
WaterTreatmentPlant
Car parking
Substation
VentilationStations_20151409

WestConnex Stage 2
Operational Fixed Facilities - Bexley Road
Low Speed Traffic Conditions - F-Class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - Arncliffe

Low Speed Traffic Conditions - F-class Inversions

Source: SKM2014

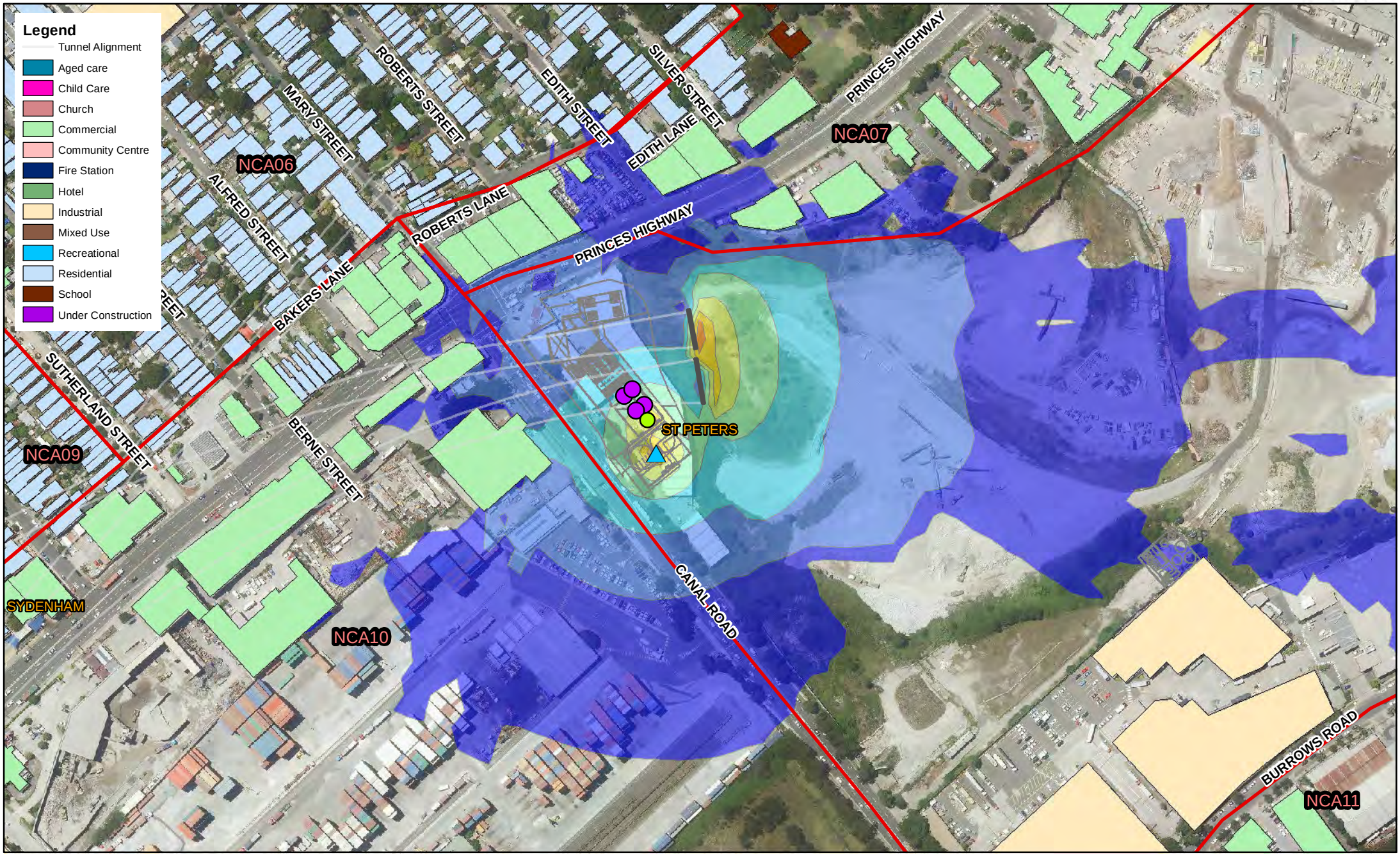
0 50 100 200 m

N

SEP 2015

60327128

Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - St Peters

Low Speed Traffic Conditions - F-class Inversions

Source: SKM2014

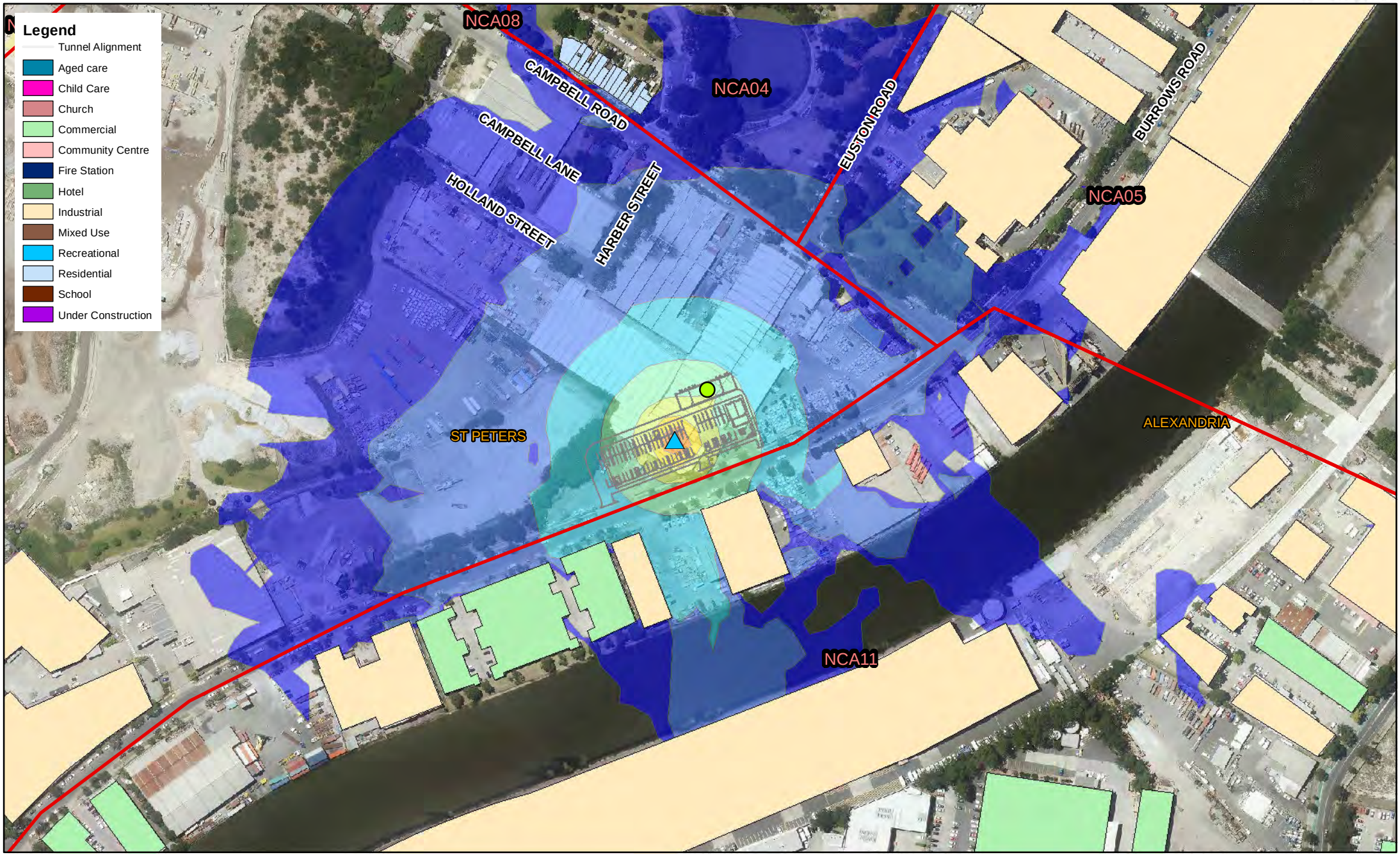
0 50 100 200 m

N

SEP 2015

60327128

Fig. **4**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

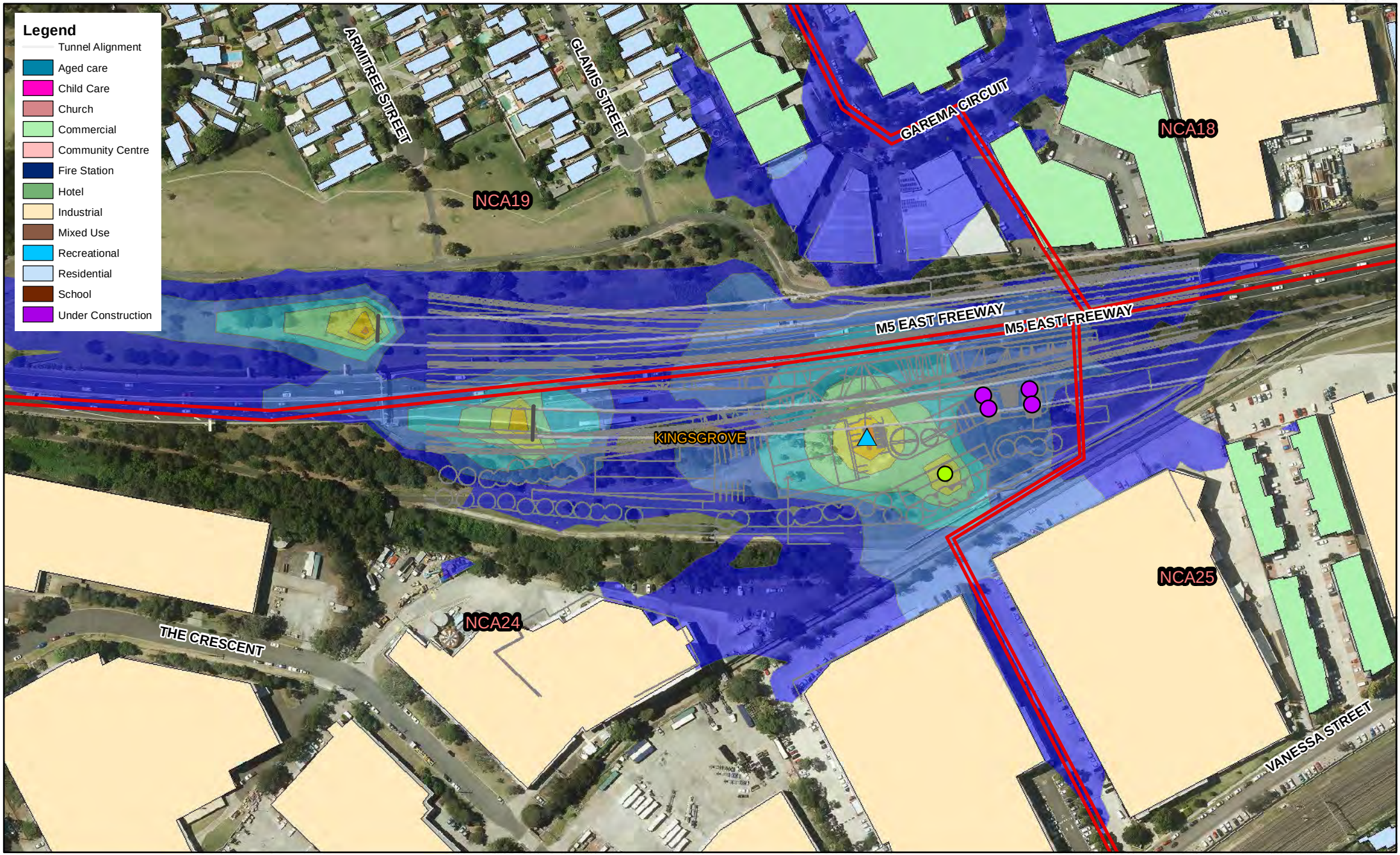
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - MCC
Low Speed Traffic Conditions - F-class Inversions
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **5**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- WaterTreatmentPlant
- Car parking
- Substation
- VentilationStations_20151409

WestConnex Stage 2

Operational Fixed Facilities - Kingsgrove

Low Speed Traffic Conditions - 3 m/s source to receiver wind

Source: SKM2014

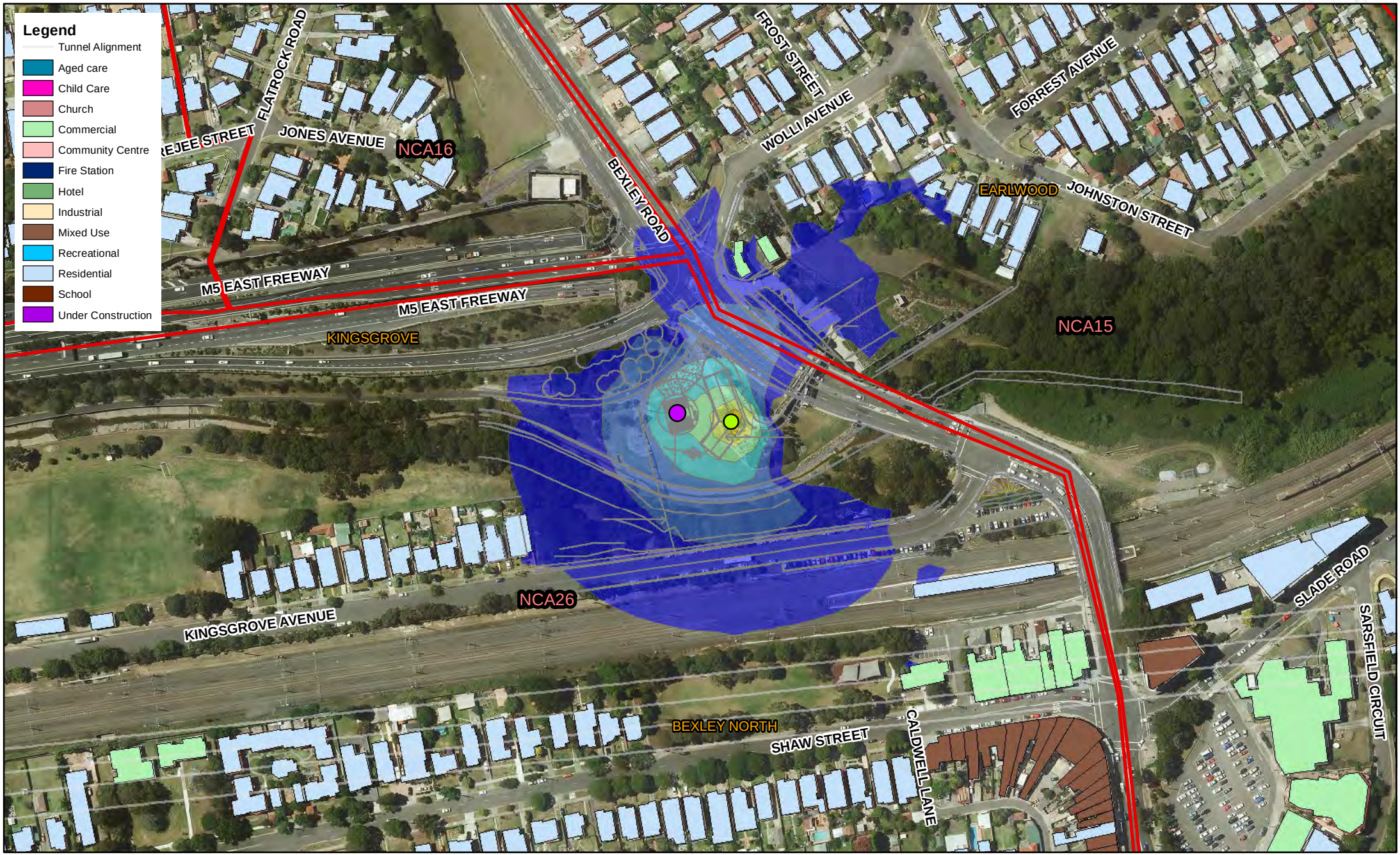
0 50 100 200 m

N

SEP 2015

60327128

Fig. **1**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

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Tunnel Portal
WaterTreatmentPlant
Car parking
Substation
VentilationStations_20151409

WestConnex Stage 2

Operational Fixed Facilities - Bexley Road

Low Speed Traffic Conditions - 3 m/s source to receiver wind

Source: SKM2014

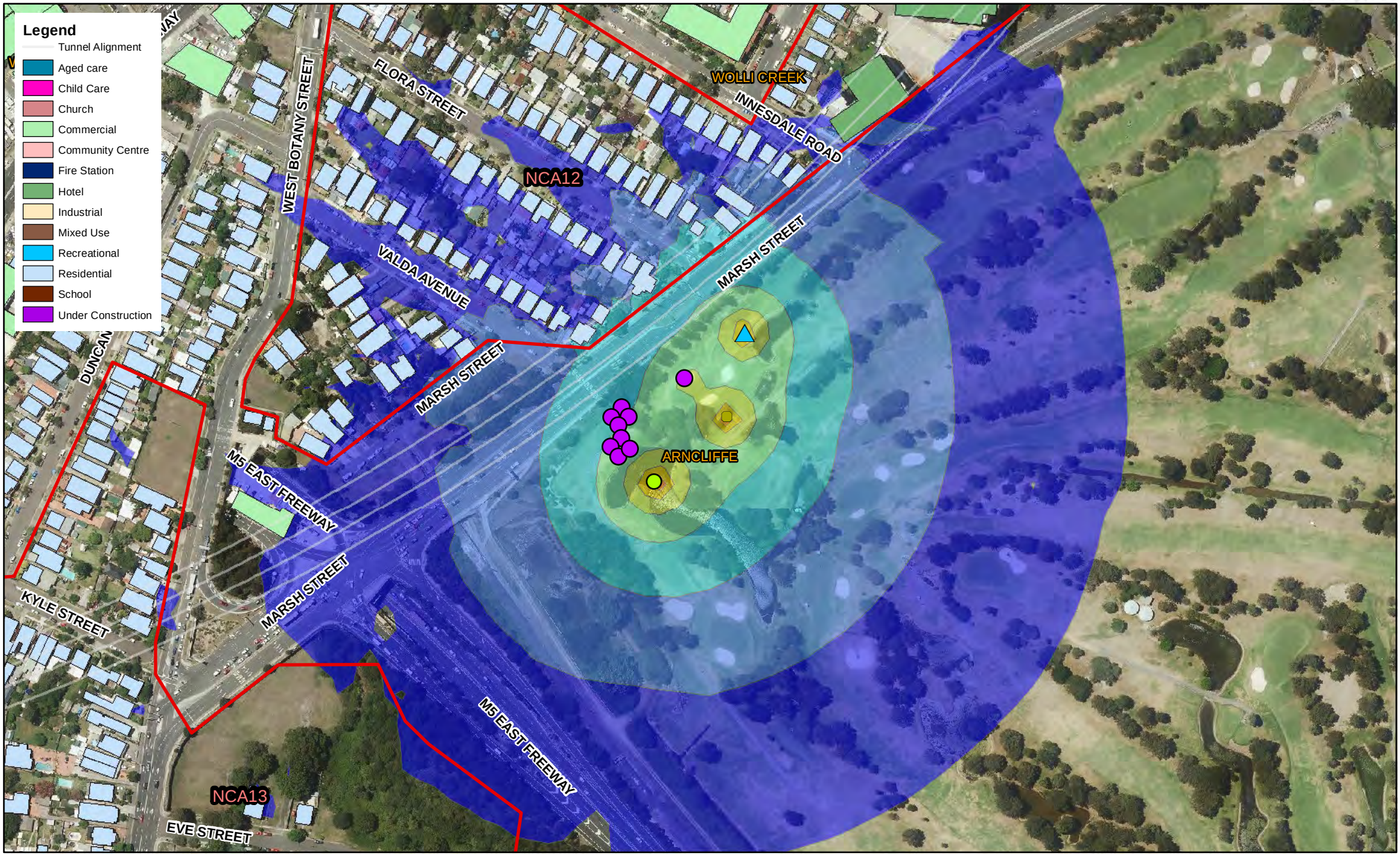
0 50 100 200 m

N

SEP 2015

60327128

Fig. **2**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

- Tunnel Portal
- Water Treatment Plant
- Car parking
- Substation
- Ventilation Stations

WestConnex Stage 2

Operational Fixed Facilities - Arncliffe

Low Speed Traffic Conditions - 3 m/s source to receiver wind

Source: SKM2014

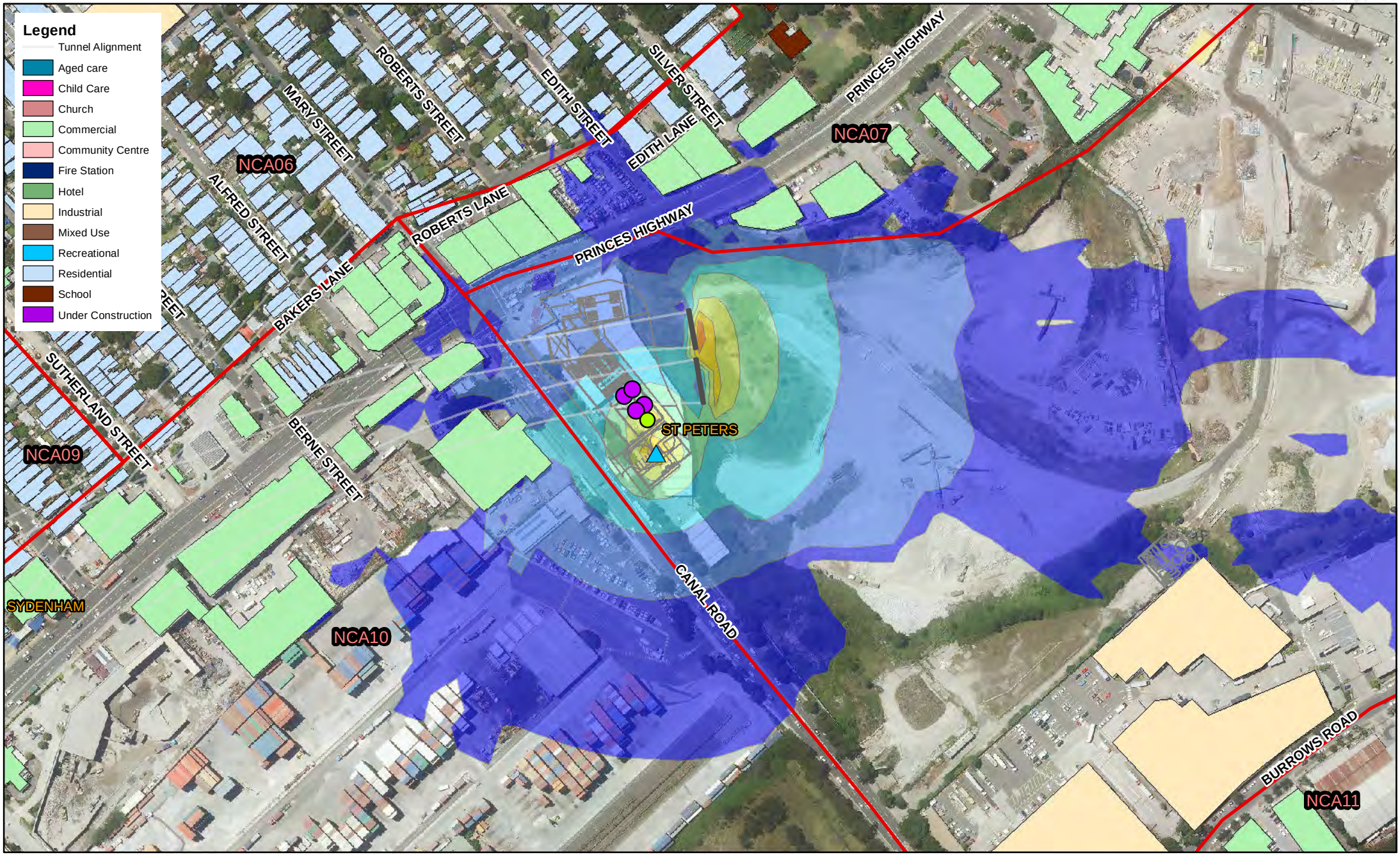
0 50 100 200 m

N

SEP 2015

60327128

Fig. **3**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

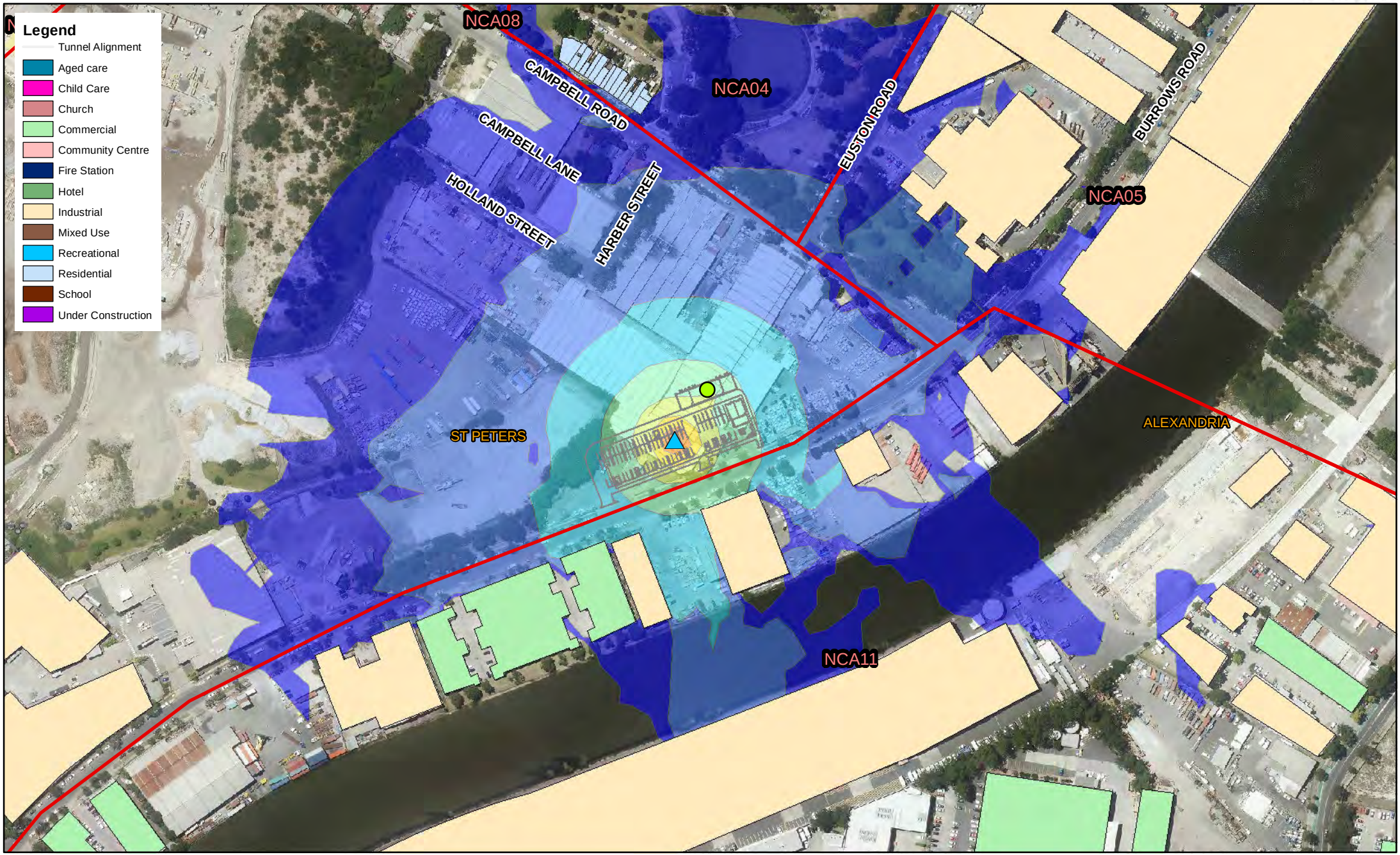
Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - St Peters
Low Speed Traffic Conditions - 3 m/s source to receiver wind
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128
Fig. **4**



Sound Pressure Level, $L_{Aeq,15min}$ dB(A)

>65 | 60-65 | 55-60 | 50-55 | 45-50 | 40-45 | 35-40 | 30-35

Tunnel Portal
Water Treatment Plant
Car parking
Substation
Ventilation Stations

WestConnex Stage 2
Operational Fixed Facilities - MCC
Low Speed Traffic Conditions - 3 m/s source to receiver wind
Source: SKM2014

0 50 100 200 m

N

SEP 2015
60327128

Fig. **5**

WestConnex