

SYDENHAM TO BANKSTOWN

SUBMISSIONS AND PREFERRED INFRASTRUCTURE REPORT

> Appendix E – Noise and vibration assessment

SYDNEY METRO CITY & SOUTHWEST SYDENHAM TO BANKSTOWN UPGRADE

Submissions and Preferred Infrastructure Report Noise and Vibration Assessment

Prepared for:

Transport for NSW
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SYDNEY NSW 2000

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BASIS OF REPORT

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APPENDICES

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1 Introduction

Transport for NSW is developing the Sydney to Bankstown upgrade component of Sydney Metro City & Southwest (the project).

The project involves upgrading 10 existing stations west of Sydney (Marrickville to Bankstown inclusive), and a 13 kilometre long section of the Sydney Trains T3 Bankstown Line, between west of Sydney Station and west of Bankstown Station, to improve accessibility for customers and meet the standards required for metro operations. The project would enable Sydney Metro to operate beyond Sydney, to Bankstown.

The Environmental Impact Assessment for the project was exhibited in August 2017 (the exhibited project). To address a number of issues raised in submissions during the public exhibition period, Transport for NSW has developed a design solution that enables the retention of existing station entrances, heritage buildings and concourses, but enables upgrades that provide accessible stations.

Importantly, these changes to the exhibited project have enabled the development of a preferred project that not only addresses a number of the issues raised in submissions, but also significantly minimises potential impacts – especially in respect of heritage, vegetation, construction noise and traffic impacts, while delivering a world class metro (the preferred project).

This report provides an assessment of the potential construction and operational noise and vibration impacts for the preferred project.

Reference should be made to the EIS Noise and Vibration Technical Paper (SLR Report '610.15897-R02, *'Sydney Metro City & Southwest Sydney to Bankstown, Technical Paper 2 – Noise and Vibration Assessment'*, dated August 2017) for further details on the criteria and methodology used to assess the preferred project.

2 Construction Noise and Vibration Assessment

The following assessment uses the same construction assessment methodology and assumptions as used in the EIS Noise and Vibration Technical Paper. Where changes have been made to the input data, this is noted below.

2.1 Works Description

2.1.1 Construction Activities

The revised construction scenarios and corresponding works activities for the preferred project are outlined in **Table 1**, together with details on the periods that the various works would be undertaken in. The anticipated total indicative durations of activities are also summarised, noting that the works activities would be intermittent during this period and would not be expected to be undertaken on a continual basis.

Table 1 Construction Activities and Period of Operation

Scenario	Works ID	Total Indicative Duration (Weeks) ¹	Activity	Hours of Works ²				
				Std. Day	Possession / Closedown			
					Day	Day OOH	Eve	Night
General Worksites	W.0001	4	Site Establishment	✓	✓	-	-	-
	W.0002	52	Worksite Operations	✓	✓	✓	✓	✓
Corridor Works - Ground & Track	W.0003	12 days	Trackform	✓	✓	✓	✓	✓
	W.0004	4 days	Trackform - Ballast Tamper	✓	✓	✓	✓	✓
Corridor Works - Track Support Systems	W.0005	12	Comms Works/Security Fencing	✓	✓	✓	✓	✓
	W.0006	6	Segregation Fencing	✓	✓	✓	✓	✓
Station Works	W.0007	3	Site Establishment	✓	✓	-	-	-
	W.0008	10	Excavation	✓	✓	✓	✓	-
	W.0009	10	Excavation - Excavator & Saw	✓	✓	✓	-	-
	W.0010	8	Concrete & Structural Works	✓	✓	✓	✓	✓
	W.0011	20	Station Installation & Fitout	✓	✓	✓	✓	✓
Bridge Worksites	W.0012	2	Site Establishment	✓	✓	✓	✓	✓
	W.0013	2	Impact Protection & Screens	✓	✓	✓	✓	✓
	W.0014	2	Impact Protection & Screens - Saw	✓	✓	-	-	-
Substations	W.0015	2	Site Establishment	✓	✓	✓	-	-
	W.0016	6	Construction & Installation	✓	✓	✓	✓	-

Note 1: Durations should be regarded as indicative and represent the total estimated duration of works at a typical worksite over the entire construction period. There would be sites within each category that require works to be shorter or slightly longer than shown.

Note 2: Intrusive works outside of standard construction hours would typically only be undertaken during possessions/closedowns.

Note 3: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The revised construction scenarios and corresponding works activities presented in **Table 1** would be undertaken for the full extent of the project area with the exception of Bankstown Station where works would be performed in line with assumptions presented in the EIS Noise and Vibration Technical Paper.

Reference should be made to the EIS Noise and Vibration Technical Paper for all construction noise and vibration impacts on the western side of Stacey Street in Bankstown.

2.1.2 Working Hours

Construction works would typically be undertaken during the recommended standard daytime construction hours defined in the NSW *Interim Construction Noise Guideline* (ICNG) as:

- 7.00 am and 6.00 pm Monday to Friday
- 8.00 am and 1.00 pm on Saturdays.

Activities requiring the use of highly noise intensive equipment which result in impulsive or tonal noise emissions, such as concrete saws and ballast tampers, would be limited to these hours, except as permitted by an environment protection licence which would be obtained once the preferred project is approved. It is anticipated that any out of hours work permitted by an environment protection licence would implement the following order of priority:

- Day (Saturday 1 pm to 6 pm)
- Day (Sunday 8 am to 6 pm)
- Evening (6 pm to 10 pm)
- Night (10 pm to midnight)
- Night (midnight to 7 am / 8 am).

However, as the project is located within an active rail corridor, works outside of the recommended standard construction hours would also be required where works cannot safely be undertaken during standard construction hours due to their proximity to the existing rail lines or where there would be a risk that the works may adversely affect the existing operating lines (refer **Section 2.1.3**).

Other works which may be undertaken outside of recommended standard construction hours without any further approval may include:

- The delivery of materials outside of approved hours as required by the Police or other authorities (including Roads and Maritime Services) for safety reasons
- Where it is required to avoid the loss of lives, property and/or to prevent environmental harm in an emergency.

With the exception of emergency works, activities would not take place outside the recommended standard hours without prior discussion with the relevant government authorities.

2.1.3 Rail Possession Periods

Some construction works would need to be undertaken during rail possession periods when trains are not operating, to ensure that works are carried out as efficiently as possible and that worker safety is maintained. This would include possessions of both the Sydney Trains tracks, and the freight tracks located between Marrickville and west of Campsie stations. Works that may need to be undertaken during possession periods include:

- Station works and activities on stations which cannot be undertaken during operation of the network
- Track and corridor works
- Bridge works

During these periods, highly noise intensive equipment, such as ballast tampers, would not be used during the night-time period (between 10 pm and 7 am), unless constraints exist such as:

- Works requiring a weekend rail shutdowns and where those works cannot be undertaken during daytime and evening periods, due to the limited duration of the rail possession; or
- Works subject to requirements of the relevant road authorities, emergency services, or the Sydney Coordination Office.

Additional information on rail possessions is presented in Section 2.7.2 of the Submissions and Preferred Infrastructure Report.

2.1.4 Works Schedule

Subject to planning approval, construction of the project is planned to commence in 2019, with completion planned for 2024 (including commissioning). An indicative construction program is shown in **Table 2**.

Table 2 Indicative Construction Program

Construction activity	Indicative construction timeframe																			
	2018				2019				2020				2021				2022			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Enabling works					●												●			
Station works (all stations)																				
Platform raising/re-levelling					●													●		
Concourse works					●													●		
Corridor works																				
Track and overhead wiring works					●													●		
Bridge works (where required)					●													●		
Line-wide metro system installation														●						●
Associated infrastructure																				
Services buildings					●														●	
Traction power					●														●	
Finishing, testing and commissioning																				
Testing and commissioning														●						●
Final conversion to Sydney Metro																				●●

2.2 Changes to Construction Works

A comparison of the key changes to the proposed construction works in each NCA with reference to the EIS Noise and Vibration Technical Paper is provided below in **Table 3**. The major changes with respect to altered noise impacts are also listed in **Table 4**. The location of precinct and NCA boundaries is displayed in **Appendix A**.

Table 3 Construction Works – Comparison to Exhibited Project

Precinct	NCA	Changes to Construction Works for the Preferred Project
Marrickville	NCA01	A number of worksites along the corridor have been removed. Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required.
Dulwich Hill	NCA02	A number of worksites along the corridor have been removed. Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required.
Hurlstone Park	NCA03	A number of worksites along the corridor have been removed. Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required.
Canterbury	NCA04	Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required.
	NCA05	A number of activities along the corridor have been removed. Works at bridges have been limited to the bridges themselves.
Campsie	NCA06	A number of worksites along the corridor have been removed. Works at bridges/stations have been limited to the bridges/platforms themselves. The requirement for track works has been revised.
Belmore	NCA07	Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required.
Lakemba	NCA08	Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required. No requirement for segregation fencing between ARTC and Metro lines.
Wiley Park	NCA09	Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required. No requirement for segregation fencing between ARTC and Metro lines.
Punchbowl	NCA10	Works at bridges/stations have been limited to the bridges/platforms themselves. Track works no longer required. No requirement for segregation fencing between ARTC and Metro lines.
Bankstown	NCA11	Works at bridges have been limited to the bridges themselves. No requirement for segregation fencing between ARTC and Metro lines.
	NCA12	As per the exhibited project.
	NCA13	As per the exhibited project.

Table 4 Major Changes to Construction of the Preferred Project that Reduce Noise Impacts

ID	Change
1	Rockbreakers were required in the EIS Noise and Vibration Technical Paper in several construction scenarios and at major locations along the project area, with rockbreakers typically being the cause of the highest noise levels and impacts. The preferred project has resulted in rockbreakers no longer being required.
2	Station works have been limited to alterations to the platform height only, and other minor upgrade works. Previously, the majority of the stations were proposed to be demolished and rebuilt.
3	The requirement for track works has been revised. Previously re-alignment works were proposed at most stations and in between stations at several locations. Track works are now only required at isolated locations, for example at Bankstown station and at locations where cross-overs are required to be altered or installed.
4	Bridge works have been limited to provision of throw screens and protection measures. Previously, some bridges were being replaced or required more intensive strengthening works.
5	The noise modelling for bridges and station works previously assumed that works would occur at the bridge or station and at the associated construction compounds. The current noise modelling has been refined to only have the major noise generating scenarios at the location of the bridges or station platforms, with site establishment works at the compounds.

2.3 Overview of Construction Noise Modelling

2.3.1 Construction Activity Source Noise Levels

Sound power levels for the typical operation of construction equipment applied in the modelling of the construction of the preferred project are listed in **Table 5**. These noise levels have been taken from verified test data and global standards that form part of SLR's noise database.

Table 5 Construction Works and Sound Power Levels for Construction Equipment

Plant Item		Back Hoe (7.5 tonne JCB)	Ballast Tamper	Bobcat	Compressor	Concrete Pump	Concrete Truck / Agitator	Diamond Saw ¹	Excavator	Franna Crane	Generator	Hand Tools	Mobile Crane (300 tonne)	Mobile Crane (50 tonne)	Piling Rig (Bored)	Roller (non-vibratory) ¹	Truck (12-15 tonne)	Water Tanker (8000 litre)	Welding Equipment
Sound Power Level (L _{Aeq})		102	118	104	95	106	106	115	109	99	101	94	104	100	108	100	103	98	97
Assumed On-time in 15 Minute Period (Minutes)		15	7.5	15	15	7.5	7.5	7.5	15	15	15	15	15	15	7.5	15	7.5	15	15
SWL Max		111	126	110	97	109	112	123	115	107	104	100	110	106	118	108	108	103	100
Works ID	Scenario	Activity																	
W.0001	General Worksites	Site Establishment												X			X	X	
W.0002		Worksite Operations								X							X		
W.0003	Corridor Works - Ground & Track	Trackform			X								X				X		
W.0004		Trackform - Ballast Tamper		X															
W.0005	Corridor Works - Track Support Systems	Comms Works/Security Fencing	X								X	X							X
W.0006		Segregation Fencing								X		X					X		
W.0007	Station Works	Site Establishment								X				X		X	X		
W.0008		Excavation				X			X		X	X							
W.0009		Excavation - Excavator & Saw						X	X										
W.0010		Concrete & Structural Works					X							X	X		X		
W.0011		Station Installation & Fitout								X	X	X		X			X		

W.0012	Bridge Worksites	Plant Item	Back Hoe (7.5 tonne JCB)	Ballast Tamper	Bobcat	Compressor	Concrete Pump	Concrete Truck / Agitator	Diamond Saw ¹	Excavator	Franna Crane	Generator	Hand Tools	Mobile Crane (300 tonne)	Mobile Crane (50 tonne)	Piling Rig (Bored)	Roller (non-vibratory) ¹	Truck (12-15 tonne)	Water Tanker (8000 litre)	Welding Equipment
			Site Establishment								X			X	X			X		
			Impact Protection & Screens				X	X			X			X	X			X	X	
			Impact Protection & Screens - Saw						X											
			Site Establishment				X	X			X				X		X	X		
			Construction & Installation								X			X	X			X		
W.0013	Substations																			
W.0014																				
W.0015							X	X			X				X		X	X		
W.0016											X				X			X		

Note 1: The ICNG requires that activities identified as particularly annoying (such as jackhammering, rock breaking and power saw operation) have a 5 dB 'penalty' added to predicted noise levels when using the quantitative method.

2.4 Predicted Noise Levels – Project Overview

A summary of the predicted noise levels (without additional mitigation) in each of the NCAs for the various work activities is presented in **Table 6** for the following receiver types:

- Residential (during daytime, evening and night time periods)
- Commercial
- Other sensitive receivers, including educational and medical facilities, places of worship, and childcare centres.

The noise levels are representative of the realistic worst-case impacts where works are at their closest and are intended to give an overview of the likely realistic worst case noise levels from the construction works for the preferred project.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver, as the noise levels presented in this report are based on a realistic worst-case assessment.

The predicted construction noise impacts from the exhibited project are compared against the predicted construction noise impacts from the preferred project in **Section 2.6**.

Construction noise contours showing the worst-case noise predictions for all scenarios during the daytime and night-time are presented in **Appendix A**.

Table 6 Predicted Worst case Noise Levels from the Preferred Project - All Works and All NCAs (cell colouring refers to exceedance category, refer to table note 1 and legend)

Precinct	NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹															
			W.0001 - Site Establishment	W.0002 - Worksite Operations	W.0003 - Trackform	W.0004 - Trackform - Ballast Tamper	W.0005 - Comms Works/ Security Fencing	W.0006 - Segregation Fencing	W.0007 - Site Establishment	W.0008 - Excavation	W.0009 - Excavation - Excavator & Saw	W.0010 - Concrete & Structural Works	W.0011 - Station Installation & Fitout	W.0012 - Site Establishment	W.0013 - Impact Protection & Screens	W.0014 - Impact Protection & Screens - Saw	W.0015 - Site Establishment	W.0016 - Construction & Installation
Residential - Standard Daytime																		
Marrickville	NCA01	48	71	68	<30	<30	76	73	73	77	81	77	73	69	76	79	53	48
Dulwich Hill	NCA02	48	38	35	<30	<30	76	73	70	74	78	74	70	74	78	81	78	73
Hurlstone Park	NCA03	48	34	31	<30	<30	76	73	76	80	84	80	76	73	74	77	65	60
Canterbury	NCA04	50	54	51	40	47	74	71	72	76	80	76	72	70	73	76	69	64
	NCA05	46	59	56	68	75	71	68	44	48	52	48	44	69	71	74	38	33
Campsie	NCA06	55	72	69	74	81	75	72	63	67	71	67	63	73	73	76	67	62
Belmore	NCA07	51	70	67	56	63	72	53	61	65	69	65	61	67	70	73	48	43
Lakemba	NCA08	57	57	54	<30	<30	69	<30	66	70	74	70	66	65	69	72	71	66
Wiley Park	NCA09	54	42	39	<30	<30	73	<30	69	73	77	73	69	40	45	48	41	36
Punchbowl	NCA10	57	56	53	40	47	68	<30	59	63	67	63	59	36	37	40	56	51
Bankstown ³	NCA11	57	59	56	74	81	73	<30	42	46	50	46	42	70	70	73	71	66

Legend

1 - 10 dB above NML	11 - 20 dB above NML	>20 dB above NML
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Precinct	NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹																
Residential - Evening			W.0001 - Site Establishment	W.0002 - Worksite Operations	W.0003 - Trackform	W.0004 - Trackform - Ballast Tamper	W.0005 - Comms Works/ Security Fencing	W.0006 - Segregation Fencing	W.0007 - Site Establishment	W.0008 - Excavation	W.0009 - Excavation - Excavator & Saw	W.0010 - Concrete & Structural Works	W.0011 - Station Installation & Fitout	W.0012 - Site Establishment	W.0013 - Impact Protection & Screens	W.0014 - Impact Protection & Screens - Saw	W.0015 - Site Establishment	W.0016 - Construction & Installation	
	Marrickville	NCA01	43	-	68	<30	<30	76	73	-	77	-	77	73	69	76	-	-	48
	Dulwich Hill	NCA02	43	-	35	<30	<30	76	73	-	74	-	74	70	74	78	-	-	73
	Hurlstone Park	NCA03	43	-	31	<30	<30	76	73	-	80	-	80	76	73	74	-	-	60
	Canterbury	NCA04	45	-	51	40	47	74	71	-	76	-	76	72	70	73	-	-	64
		NCA05	41	-	56	68	75	71	68	-	48	-	48	44	69	71	-	-	33
	Campsie	NCA06	47	-	69	74	81	75	72	-	67	-	67	63	73	73	-	-	62
	Belmore	NCA07	46	-	67	56	63	72	53	-	65	-	65	61	67	70	-	-	43
	Lakemba	NCA08	52	-	54	<30	<30	69	<30	-	70	-	70	66	65	69	-	-	66
	Wiley Park	NCA09	49	-	39	<30	<30	73	<30	-	73	-	73	69	40	45	-	-	36
	Punchbowl	NCA10	52	-	53	40	47	68	<30	-	63	-	63	59	36	37	-	-	51
	Bankstown ³	NCA11	52	-	56	74	81	73	<30	-	46	-	46	42	70	70	-	-	66

Legend



Precinct	NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹																
Residential - Night-time			W.0001 - Site Establishment	W.0002 - Worksite Operations	W.0003 - Trackform	W.0004 - Trackform - Ballast Tamper	W.0005 - Comms Works/ Security Fencing	W.0006 - Segregation Fencing	W.0007 - Site Establishment	W.0008 - Excavation	W.0009 - Excavation - Excavator & Saw	W.0010 - Concrete & Structural Works	W.0011 - Station Installation & Fitout	W.0012 - Site Establishment	W.0013 - Impact Protection & Screens	W.0014 - Impact Protection & Screens - Saw	W.0015 - Site Establishment	W.0016 - Construction & Installation	
	Marrickville	NCA01	38	-	68	<30	<30	76	73	-	-	-	77	73	69	76	-	-	-
	Dulwich Hill	NCA02	38	-	35	<30	<30	76	73	-	-	-	74	70	74	78	-	-	-
	Hurlstone Park	NCA03	39	-	31	<30	<30	76	73	-	-	-	80	76	73	74	-	-	-
	Canterbury	NCA04	40	-	51	40	47	74	71	-	-	-	76	72	70	73	-	-	-
		NCA05	37	-	56	68	75	71	68	-	-	-	48	44	69	71	-	-	-
	Campsie	NCA06	40	-	69	74	81	75	72	-	-	-	67	63	73	73	-	-	-
	Belmore	NCA07	40	-	67	56	63	72	53	-	-	-	65	61	67	70	-	-	-
	Lakemba	NCA08	46	-	54	<30	<30	69	<30	-	-	-	70	66	65	69	-	-	-
	Wiley Park	NCA09	41	-	39	<30	<30	73	<30	-	-	-	73	69	40	45	-	-	-
	Punchbowl	NCA10	46	-	53	40	47	68	<30	-	-	-	63	59	36	37	-	-	-
	Bankstown ³	NCA11	44	-	56	74	81	73	<30	-	-	-	46	42	70	70	-	-	-

Legend



Precinct	NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹																
Commercial			W.0001 - Site Establishment	W.0002 - Worksite Operations	W.0003 - Trackform	W.0004 - Trackform - Ballast Tamper	W.0005 - Comms Works/ Security Fencing	W.0006 - Segregation Fencing	W.0007 - Site Establishment	W.0008 - Excavation	W.0009 - Excavation - Excavator & Saw Works	W.0010 - Concrete & Structural Works	W.0011 - Station Installation & Fitout	W.0012 - Site Establishment	W.0013 - Impact Protection & Screens	W.0014 - Impact Protection & Screens - Saw	W.0015 - Site Establishment	W.0016 - Construction & Installation	
	Marrickville	NCA01	70	72	69	<30	68	65	66	70	74	70	66	62	69	72	41	36	
	Dulwich Hill	NCA02	70	<30	<30	<30	63	60	63	67	71	67	63	57	62	65	46	41	
	Hurlstone Park	NCA03	70	<30	<30	<30	74	71	67	71	75	71	67	66	77	80	36	31	
	Canterbury	NCA04	70	55	52	39	46	72	70	74	78	74	70	65	70	73	46	41	
		NCA05	70	73	70	44	51	69	66	44	48	52	48	44	55	63	31	<30	
	Campsie	NCA06	70	76	73	52	59	70	70	74	78	74	70	51	56	59	48	43	
	Belmore	NCA07	70	81	78	44	51	76	66	70	74	70	66	48	51	54	44	39	
	Lakemba	NCA08	70	71	68	<30	75	<30	75	79	83	79	75	72	78	81	59	54	
	Wiley Park	NCA09	70	35	32	<30	65	<30	59	63	67	63	59	33	38	41	<30	<30	
	Punchbowl	NCA10	70	73	70	37	44	75	<30	75	79	83	79	75	<30	<30	49	44	
	Bankstown ³	NCA11	70	43	40	66	73	69	<30	32	36	40	36	32	56	48	51	45	40

Legend



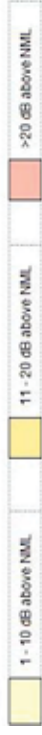
Precinct	NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹															
			W.0001 - Site Establishment	W.0002 - Worksite Operations	W.0003 - Trackform	W.0004 - Trackform - Ballast Tamper	W.0005 - Comms Works/ Security Fencing	W.0006 - Segregation Fencing	W.0007 - Site Establishment	W.0008 - Excavation	W.0009 - Excavation - Excavator & Saw	W.0010 - Concrete & Structural Works	W.0011 - Station Installation & Fitout	W.0012 - Site Establishment	W.0013 - Impact Protection & Screens	W.0014 - Impact Protection & Screens - Saw	W.0015 - Site Establishment	W.0016 - Construction & Installation
Other Sensitive																		
Marrickville	NCA01	-	53	50	<30	<30	70	67	65	69	73	69	65	68	68	71	47	42
Dulwich Hill	NCA02	-	35	32	<30	<30	63	60	59	63	67	63	59	58	62	65	60	55
Hurlstone Park	NCA03	-	<30	<30	<30	<30	74	71	48	52	56	52	48	72	74	77	38	33
Canterbury	NCA04	-	46	43	38	45	74	71	53	57	61	57	53	48	54	57	50	45
	NCA05	-	62	59	42	49	64	61	46	50	54	50	46	52	58	61	37	32
Campsie	NCA06	-	64	61	73	80	71	68	48	52	56	52	48	61	63	66	68	63
Belmore	NCA07	-	64	61	49	56	76	57	67	71	75	71	67	61	67	70	43	38
Lakemba	NCA08	-	61	58	<30	<30	67	<30	67	71	75	71	67	65	67	70	51	46
Wiley Park	NCA09	-	36	33	<30	<30	63	<30	63	67	71	67	63	34	40	43	36	31
Punchbowl	NCA10	-	71	68	39	46	71	<30	61	65	69	65	61	34	<30	<30	58	53
Bankstown ³	NCA11	-	37	34	44	51	60	<30	33	37	41	37	33	40	39	42	54	49

Note 1: Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dB, orange 11 - 20 dB, yellow 1-10 dB) based on the controlling time period for a given activity (refer to **Table 1**).

Note 2: Other Sensitive receiver NMLs are dependent on classification. As the above table shows the highest predicted noise level for a particular activity, the most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs therefore no single NML can be provided.

Note 3: Results for NCA12 and NCA13 are as per the exhibited project EIS Noise and Vibration Technical Paper.

Legend



Review of the predicted noise levels from the preferred project in the above table indicates the following:

- The highest noise impacts in all NCAs are generally reduced for the preferred project compared to those predicted in the EIS Noise and Vibration Technical Paper for the exhibited project. This generally results from less noise intensive equipment being used and fewer worksites.
- The highest noise levels are generally predicted during works which require noise intensive plant items, such as a diamond saw and/or ballast tamper. This includes the following scenarios:
 - W.0004 – Corridor Works - Ground & Track - Trackform - Ballast Tamper
 - W.0009 – Station Works - Excavation - Excavator & Saw
 - W.0014 – Bridge Worksites - Impact Protection & Screens - Saw
- Whilst all NCAs are predicted to be subject to impacts, the highest impacts are generally seen in NCA01 to NCA04, NCA06 and NCA11, due to the close proximity of residential receivers to the worksites in these catchments.
- Works activities that do not include high noise generating items of plant generally result in considerably lower impacts.
- Diamond saws would only be needed during excavation of the existing top concrete layer of station platforms and the potential noise impacts from the use of this highly noise intrusive item have been controlled by restricting these works to daytime periods.
- Night-time impacts are however predicted during some scenarios when work is located close to adjacent receivers or when noise generating items are in use such as excavators, concrete pumps/trucks, cranes, etc.
- Ballast tamping, as part of Track Works, is the most noise intensive item of equipment that is potentially required during the night-time. Track Works are however now only required in a small number of locations (as opposed to at the majority of stations for the exhibited project (EIS Noise and Vibration Technical Paper)) which has substantially reduced the number of receivers impacted. Furthermore, whilst high noise levels are anticipated during use of the tamper, the impacts would be expected to last for a relatively short period as the works progress quickly. It is also noted that this activity would generally be expected to be completed during the daytime, with night-time works only required to make the track safe prior to re-opening, if needed.
- It is also noted that the requirement for rockbreaking has been entirely removed from the project. This item of highly noise intensive equipment was previously driving many of the worst-case impacts for the exhibited project as presented in the EIS Noise and Vibration Technical Paper.

2.5 Predicted Noise Levels and NML Exceedances – Precincts

The construction works would occur in a number of distinct areas. The predicted construction noise impacts from the project are summarised in the following sections based on precinct areas which generally follow the stations along the route, consistent with the EIS Noise and Vibration Technical Paper.

Temporary acoustic hoarding of 3 m in height has been included around the station compounds, as per the Noise and Vibration Technical Paper.

2.5.1 Marrickville Precinct (NCA01)

The revised locations of the various construction worksites in the Marrickville precinct are shown below in **Figure 1**.

Figure 1 Marrickville Precinct - Construction Areas



Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.

Note: Refer to **Appendix A** for large format construction area figures

Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 - Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.1.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 7**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 7 Overview of NML Exceedances from the Preferred Project – Marrickville Precinct (NCA01) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵																	
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance		
							Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance		
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	4	1150	-	-	72	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	52	1150	-	-	38	1	-	119	7	1	119	7	1	211	38	1	119	7	1	119	7	1
W.0003	Corridor - Ground & Track	Trackform	12 days	1150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4 days	1150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	1150	4	-	361	68	56	500	179	78	500	179	78	440	360	124	499	179	78	499	179	78
W.0006		Segregation Fencing	6	1150	-	-	248	64	25	429	104	67	429	104	67	509	247	89	428	104	67	428	104	67
W.0007	Station Works	Site Establishment	3	1150	-	-	117	16	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	1150	5	-	233	40	14	440	95	22	440	95	22	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	1150	13	-	401	81	21	528	212	44	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	1150	5	-	233	40	14	440	95	22	440	95	22	533	232	54	524	166	35	524	166	35
W.0011	Bridge Worksites	Station Installation & Fitout	20	1150	-	-	117	16	10	269	48	14	269	48	14	472	116	26	166	22	13	166	22	13
W.0012		Site Establishment	2	1150	-	-	64	20	1	181	25	12	181	25	12	313	63	21	145	22	11	145	22	11
W.0013		Impact Prot. & Screens	2	1150	2	-	145	35	5	277	71	15	277	71	15	350	144	40	215	58	8	215	58	8
W.0014		Impact Prot. & Screens - Saw	2	1150	4	-	216	59	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	1150	-	-	9	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	6	1150	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.1.2 Worst-case Impacts during Standard Daytime Construction Hours

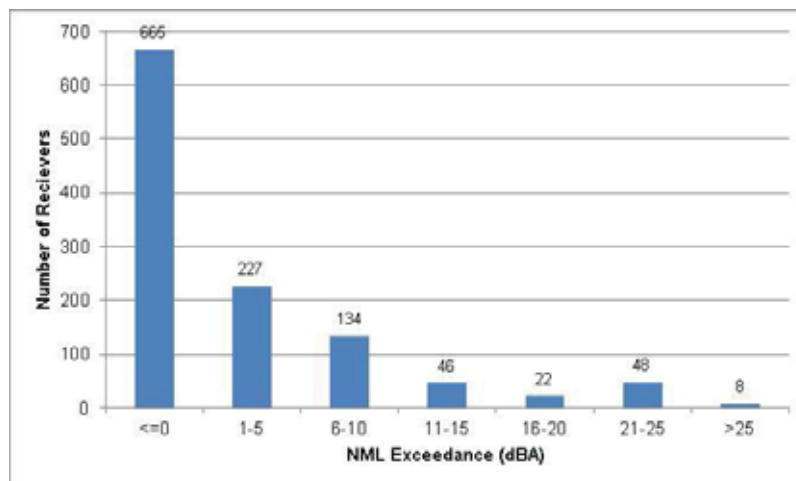
During standard daytime construction hours, **Table 7** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activities W.0005 and W.0006. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’. **Figure 2** indicates the distribution of exceedances for this activity during the daytime.

Figure 2 NML Exceedances Daytime – ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to 56 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.1.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 7** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

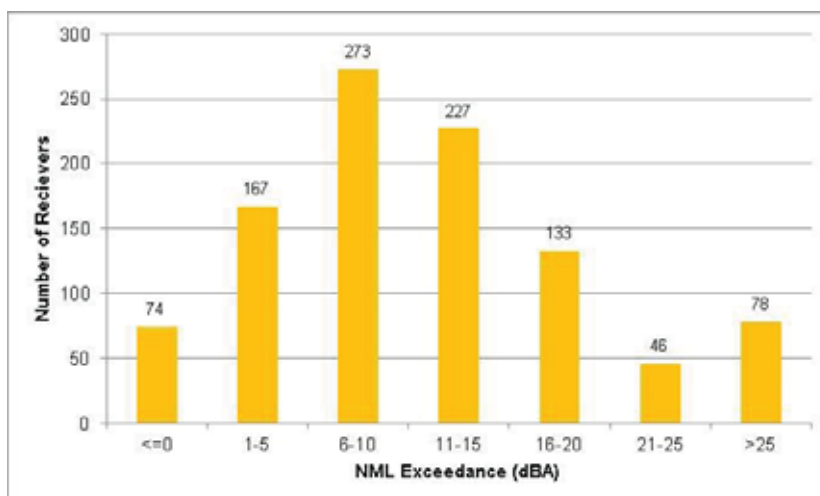
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0010 – Station Works - Concrete & Structural Works
- W.0013 – Bridge Worksites - Impact Prot. & Screens

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activities W.0005 and W.0006 as the works would be undertaken along the length of the rail corridor. As noted previously, these works activities do not use noise intensive equipment, with the loudest item being a back hoe or truck. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activities for 'W.0010 – Station Works - Concrete & Structural Works' and 'W.0013 – Bridge Worksites - Impact Prot. & Screens' are required in discrete locations at stations and bridges, and generally only affect the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 3** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

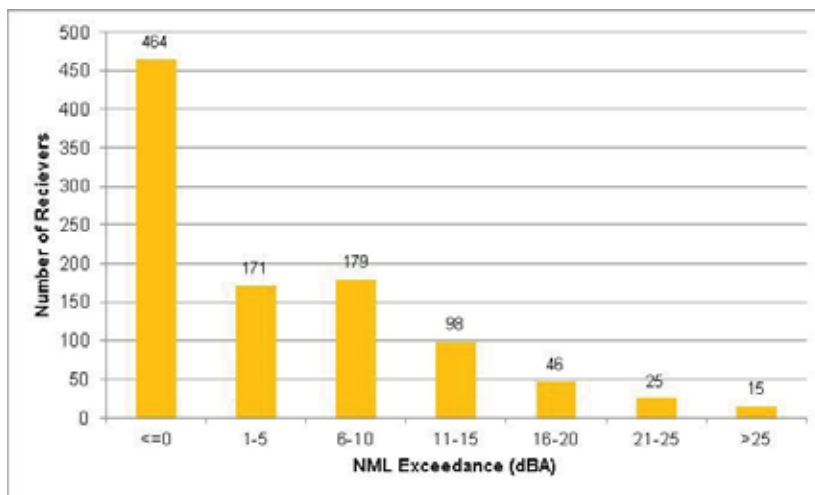
Figure 3 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 124 receivers, there are many receivers in this precinct that are subject to lower impacts.

The night-time impacts from 'W.0013 – Bridge Worksites - Impact Prot. & Screens' are shown in **Figure 4**.

Figure 4 NML Exceedances Night-time – 'W. 0013 – Bridge Worksites - Impact Prot. & Screens'



The above shows that the impacts from these works are generally only apparent at receivers which are immediately adjacent to the works. It is noted that these works are not particularly noise intensive and the exceedances are due to the proximity of the works to the nearest receivers when the works are at their closest.

2.5.1.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 8**. The table shows the number of residential receivers separated by works activity and NCA.

Table 8 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

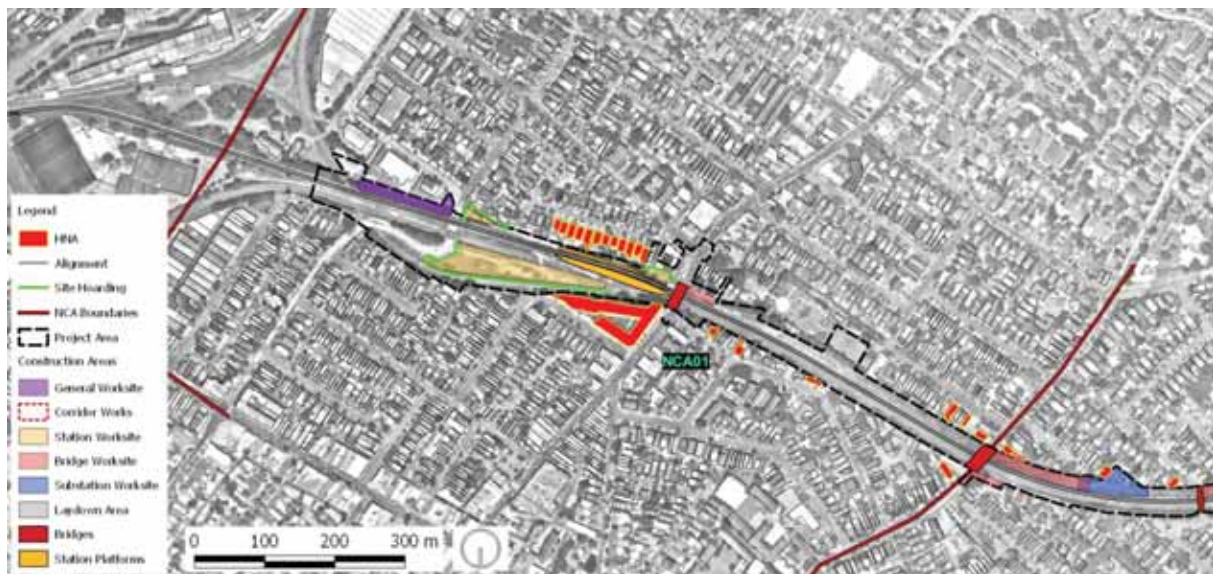
Works	Scenario	Activity	NCA01		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	4	4	4
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	5	5	-
W.0009		Excavation – Excav. & Saw	13	-	-
W.0010		Concrete & Structural Works	5	5	5
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	2	2	2
W.0014		Impact Prot. & Screens - Saw	4	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing', where four receivers are predicted to be Highly Noise Affected during the all periods. The works are not noise intensive and the impacts result from the close proximity to some receivers.
- 'W.0009 – Station Works - Excavation - Excavator & Saw', where 13 receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.
- 'W.0010 – Station Works - Concrete & Structural Works', where five receivers are predicted to be Highly Noise Affected during all periods, which results from receivers being located close to the station platforms where the works would occur.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 5**.

Figure 5 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 - Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.1.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 9**.

Table 9 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0007	Station Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Café/bar – 1 Warburton Street, Marrickville.

2.5.2 Dulwich Hill Precinct (NCA02)

The revised locations of the various construction worksites in the Dulwich Hill precinct are shown below in **Figure 6**.

Figure 6 Dulwich Hill Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.2.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 10**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 10 Overview of NML Exceedances from the Preferred Project – Dulwich Hill Precinct (NCA02) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers		Possession / Closedown Works ⁵											
				Total	HNA ³	With NML Exceedance ⁴						Standard Daytime					
						Daytime OOH						Evening					
						1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	4	1279	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	52	1279	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	12 days	1279	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4 days	1279	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	1279	5	268	164	31	506	187	101	505	187	101	601	265	195
W.0006		Segregation Fencing	6	1279	-	206	120	17	331	176	51	331	176	51	561	206	137
W.0007	Station Works	Site Establishment	3	1279	-	61	23	2	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	1279	-	165	35	3	478	51	22	478	51	22	-	-	-
W.0009		Excavation – Excav. & Saw	10	1279	2	409	50	16	643	135	34	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	1279	-	165	35	3	478	51	22	478	51	22	661	164	38
W.0011	Bridge Worksites	Station Installation & Fitout	20	1279	-	61	23	2	221	41	4	221	41	4	518	61	25
W.0012		Site Establishment	2	1279	-	187	102	15	370	130	57	370	130	57	577	186	117
W.0013		Impact Prot. & Screens	2	1279	2	297	79	6	573	137	33	573	137	33	638	293	85
W.0014		Impact Prot. & Screens - Saw	2	1279	4	464	102	22	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	1279	1	129	26	3	267	40	17	-	-	-	-	-	-
W.0016		Construction & Installation	6	1279	-	40	16	1	127	26	3	127	26	3	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICING definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.2.2 Worst-case Impacts during Standard Daytime Construction Hours

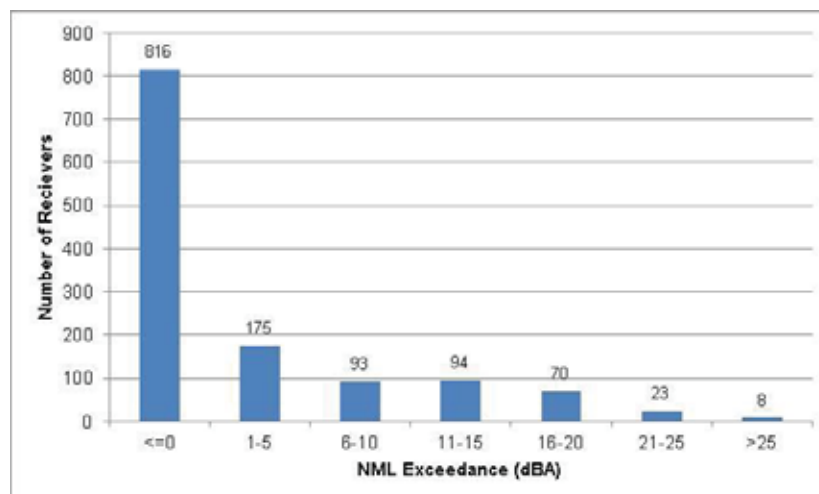
During standard daytime construction hours, **Table 10** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw
- W.0014 - Bridge Worksites - Impact Protection & Screens - Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activities W.0005 and W.0006. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’. **Figure 7** indicates the distribution of exceedances for this activity during the daytime.

Figure 7 NML Exceedances Daytime – ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to 31 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.2.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 10** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0012 – Bridge Worksites - Site Establishment
- W.0013 – Bridge Worksites - Impact Protection & Screens

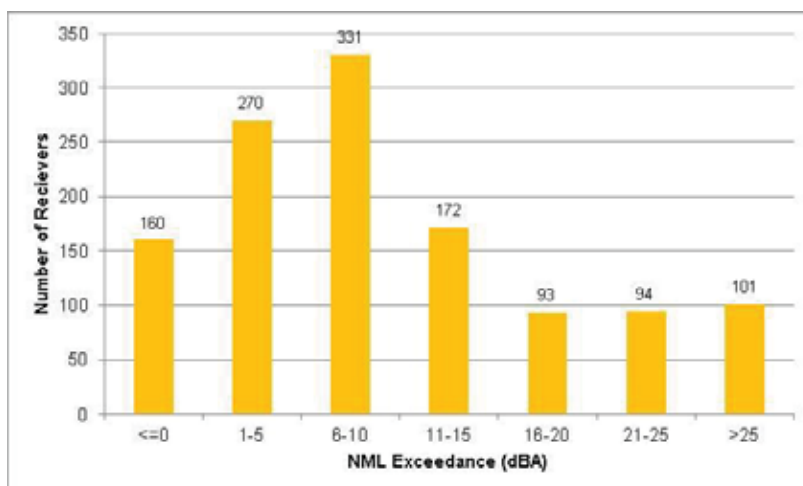
Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activities W.0005 and W.0006 as the works would be undertaken along the length of the rail corridor. As noted previously, these works activities do not use noise intensive equipment, with the loudest item being a back hoe or truck. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity 'W.0012 – Bridge Worksites - Site Establishment' is required at the commencement of the works to establish the construction compounds associated with bridge works and does not use any highly noise intensive equipment.

Activity 'W.0013 – Bridge Worksites - Impact Prot. & Screens' is required in discrete locations at bridges and generally only affect the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 8** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

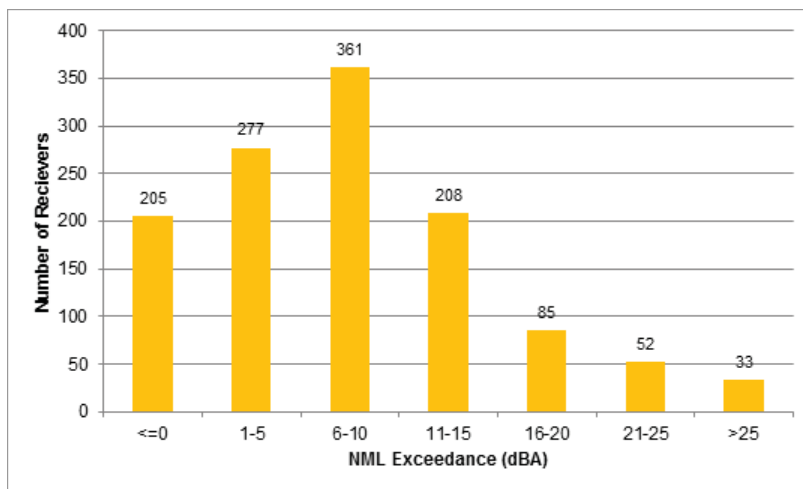
Figure 8 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 195 receivers, there are many receivers in this precinct that are subject to lower impacts.

The night-time impacts from 'W.0013 – Bridge Worksites - Impact Prot. & Screens' are shown in **Figure 9**.

Figure 9 NML Exceedances Night-time – 'W. 0013 – Bridge Worksites - Impact Prot. & Screens'



The above shows that the impacts from these works are generally only apparent at receivers which are immediately adjacent to the works. It is noted that these works are not particular noise intensive and the exceedances are due to the proximity of the works to the nearest receivers when the works are at their closest.

2.5.2.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 11**. The table shows the number of residential receivers separated by works activity and NCA.

Table 11 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA02		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	5	5	5
W.0006		Segregation Fencing	-	-	-

Works	Scenario	Activity	NCA02		
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	2	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	2	2	2
W.0014		Impact Prot. & Screens - Saw	4	-	-
W.0015	Substations	Site Establishment	1	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing', where five receivers are predicted to be Highly Noise Affected during the all periods. The works are not noise intensive and the impacts result from the close proximity to some receivers.
- 'W.0014 – Bridge Worksites - Impact Protection & Screens – Saw', where four receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 10**.

Figure 10 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.2.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 12**.

Table 12 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	2	-	-	-	-	-	2	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	2	-	-	-	-	-	2	-	-
W.0015	Substations	Site Establishment	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- No other sensitive receivers in this area are predicted to be subject to worst-case exceedances of 11 to 20 dB above NML, or higher.

2.5.3 Hurlstone Park Precinct (NCA03)

The revised locations of the various construction worksites in the Hurlstone Park precinct are shown below in **Figure 11**.

Figure 11 Hurlstone Park Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.3.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 13**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 13 Overview of NML Exceedances from the Preferred Project – Hurlstone Park Precinct (NCA03) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers		Possession / Closedown Works ⁵											
				Total	HNA ³	With NML Exceedance ⁴						Standard Daytime					
						Daytime OOH						Evening					
						1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	4	751	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	52	751	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	12 days	751	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4 days	751	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	751	2	243	101	41	364	152	84	363	152	83	342	229	128
W.0006		Segregation Fencing	6	751	-	191	86	15	303	116	55	302	116	54	368	161	92
W.0007	Station Works	Site Establishment	3	751	1	75	19	4	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	751	2	177	31	9	396	64	21	393	64	21	-	-	-
W.0009		Excavation – Excav. & Saw	10	751	5	340	48	19	431	155	36	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	751	2	177	31	9	396	64	21	393	64	21	424	155	36
W.0011		Station Installation & Fitout	20	751	1	75	19	4	210	33	12	210	33	12	393	64	21
W.0012	Bridge Worksites	Site Establishment	2	751	-	124	40	3	280	52	24	280	52	23	368	107	39
W.0013		Impact Prot. & Screens	2	751	-	249	59	10	398	115	29	397	115	28	413	219	49
W.0014		Impact Prot. & Screens - Saw	2	751	5	359	79	23	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	751	-	33	10	-	82	13	2	-	-	-	-	-	-
W.0016		Construction & Installation	6	751	-	13	2	-	33	10	-	33	10	-	-	-	-

Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater).
Note 4: Based on worst case predicted noise levels.
Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.3.2 Worst-case Impacts during Standard Daytime Construction Hours

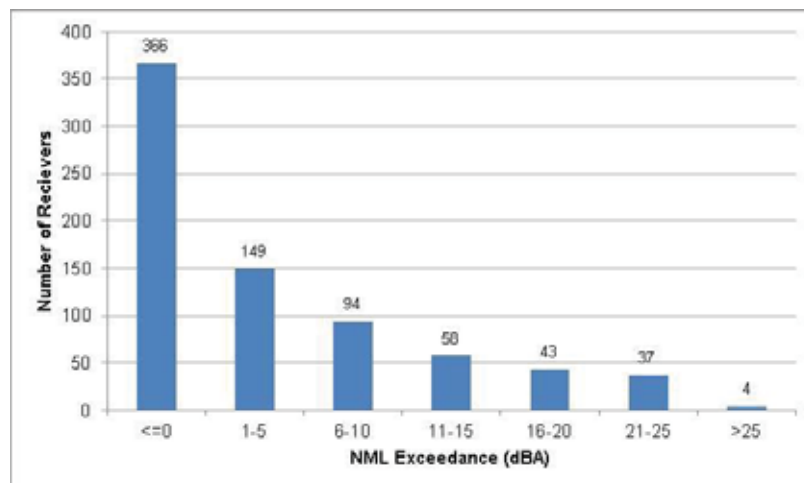
During standard daytime construction hours, **Table 13** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw
- W.0014 - Bridge Worksites - Impact Protection & Screens - Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activities W.0005 and W.0006. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’. **Figure 12** indicates the distribution of exceedances for this activity during the daytime.

Figure 12 NML Exceedances Daytime – ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to 41 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.3.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 13** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

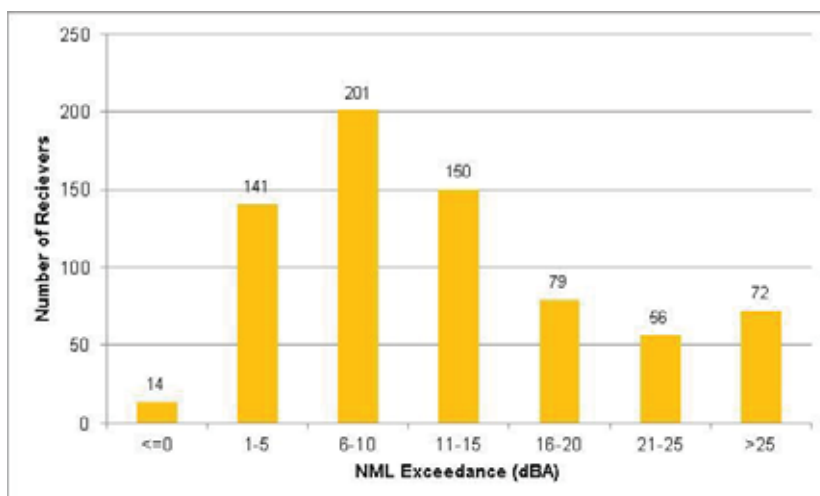
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0010 – Station Works - Concrete & Structural Works
- W.0013 – Bridge Worksites - Impact Prot. & Screens

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activities W.0005 and W.0006 as the works would be undertaken along the length of the rail corridor. As noted previously, these works activities do not use noise intensive equipment, with the loudest item being a back hoe or truck. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activities for 'W.0010 – Station Works - Concrete & Structural Works' and 'W.0013 – Bridge Worksites - Impact Protection & Screens' are required in discrete locations at stations and bridges, and generally only affect the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 13** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 13 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 128 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.3.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 14**. The table shows the number of residential receivers separated by works activity and NCA.

Table 14 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA03		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	2	2	2
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	1	-	-
W.0008		Excavation	2	2	-
W.0009		Excavation – Excav. & Saw	5	-	-
W.0010		Concrete & Structural Works	2	2	2
W.0011		Station Installation & Fitout	1	1	1
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	5	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing', where two receivers are predicted to be Highly Noise Affected during the all periods. The works are not noise intensive and the impacts result from the close proximity to some receivers.
- 'W.0009 – Station Works - Excavation - Excavator & Saw', where five receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.
- 'W.0014 – Bridge Worksites - Impact Prot. & Screens – Saw', where five receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 14**.

Figure 14 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 - Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.3.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 15**.

Table 15 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

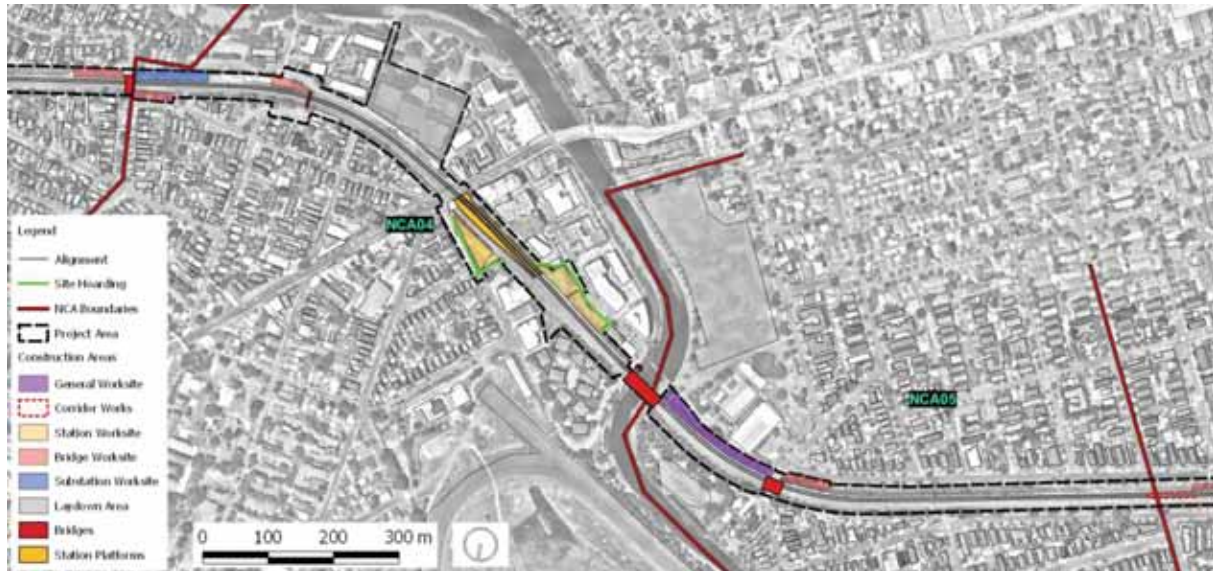
The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Childcare Centre – Dulwich Hill Child Care Centre, 66 Garnet St, Hurlstone Park.
- A number of receivers are predicted to have impacts of >20 dB above NML. The construction scenarios with these higher impacts are generally not noise intensive and the exceedances result from the proximity of the works to the receivers, meaning that the worst-case impacts would generally only be apparent for a relatively short duration. High impacts are however also seen during use of a diamond saw and this noise intensive plant item would likely only be required for short durations.

2.5.4 Canterbury Precinct (NCA04 and NCA05)

The revised locations of the various construction worksites in the Canterbury precinct are shown below in **Figure 15**.

Figure 15 Canterbury Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.4.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 16**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 16 Overview of NML Exceedances from the Preferred Project – Canterbury Precinct (NCA04 and NCA05) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers		Possession / Closedown Works ⁵											
				Total	HNA ³	With NML Exceedance ⁴						Standard Daytime					
						Daytime OOH						Evening					
						1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	4	708	-	57	2	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	52	708	-	20	-	-	92	2	-	92	2	-	168	13	74
W.0003	Corridor - Ground & Track	Trackform	12 days	708	-	75	14	1	165	34	4	165	34	4	248	67	11
W.0004		Trackform - Ballast Tamper	4 days	708	1	219	47	7	248	96	19	248	96	19	149	197	43
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	708	-	253	127	20	319	172	84	315	172	84	268	234	138
W.0006		Segregation Fencing	6	708	-	198	101	7	287	129	50	287	129	50	326	180	101
W.0007	Station Works	Site Establishment	3	708	-	24	3	1	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	708	1	58	6	2	222	21	3	220	21	3	-	-	-
W.0009		Excavation – Excav. & Saw	10	708	2	168	19	3	425	39	8	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	708	1	58	6	2	222	21	3	220	21	3	439	47	8
W.0011	Bridge Worksites	Station Installation & Fitout	20	708	-	24	3	1	68	15	2	68	15	2	225	24	4
W.0012		Site Establishment	2	708	-	118	31	2	268	58	8	268	58	8	348	113	27
W.0013		Impact Prot. & Screens	2	708	-	211	47	7	325	115	18	325	115	18	387	195	49
W.0014		Impact Prot. & Screens - Saw	2	708	1	285	79	11	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	708	-	26	8	-	42	16	2	-	-	-	-	-	-
W.0016		Construction & Installation	6	708	-	16	2	-	26	8	-	26	8	-	-	-	-

- Note 1:** Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2:** Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3:** Highly Noise Affected, based on ICNG definition (i.e. predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater).
- Note 4:** Based on worst case predicted noise levels.
- Note 5:** OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.4.2 Worst-case Impacts during Standard Daytime Construction Hours

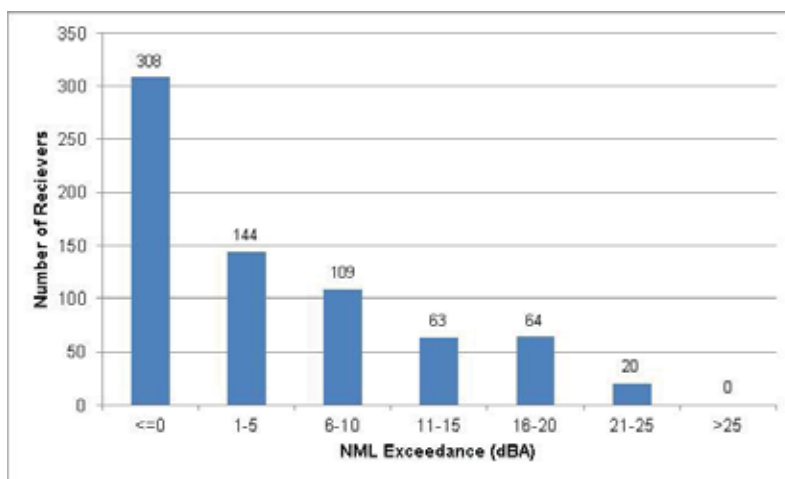
During standard daytime construction hours, **Table 16** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0014 - Bridge Worksites - Impact Protection & Screens - Saw

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activity W.0005. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 16** indicates the distribution of exceedances for this activity during the daytime.

Figure 16 NML Exceedances Daytime – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to 20 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.4.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 16** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

- W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing
- W.0013 – Bridge Worksites - Impact Protection & Screens

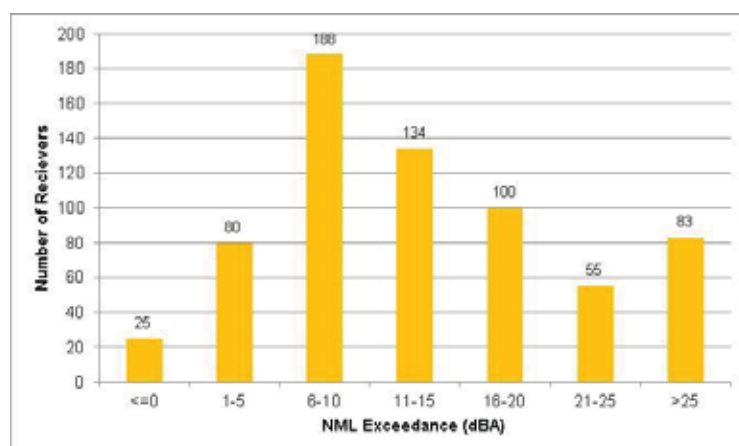
Trackform works which require a ballast tamper are required as part of 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper' in a small area of this precinct. Whilst high noise levels are anticipated during use of the tamper, the impacts would be expected to last for only a few days as the works progress relatively quickly.

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activities W.0005 and W.0006 as the works would be undertaken along the length of the rail corridor. As noted previously, these works activities do not use noise intensive equipment, with the loudest item being a back hoe or truck. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity 'W.0013 – Bridge Worksites - Impact Prot. & Screens' is required in discrete locations at bridges and generally only affects the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 17** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 17 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 138 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.4.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 17**. The table shows the number of residential receivers separated by works activity and NCA.

Table 17 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

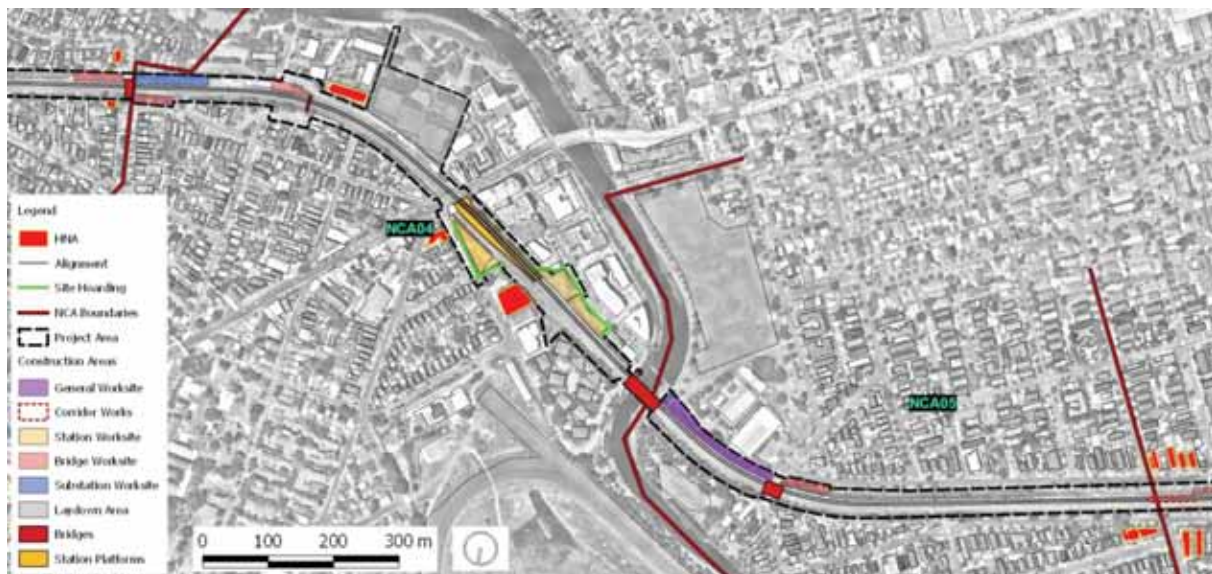
Works	Scenario	Activity	NCA04			NCA05		
			Day	Eve	Night	Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	1	1	1
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-
W.0008		Excavation	1	1	-	-	-	-
W.0009		Excavation – Excav. & Saw	2	-	-	-	-	-
W.0010		Concrete & Structural Works	1	1	1	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	1	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- ‘W.0009 – Station Works - Excavation - Excavator & Saw’, where two receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 18**.

Figure 18 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.4.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 18**.

Table 18 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

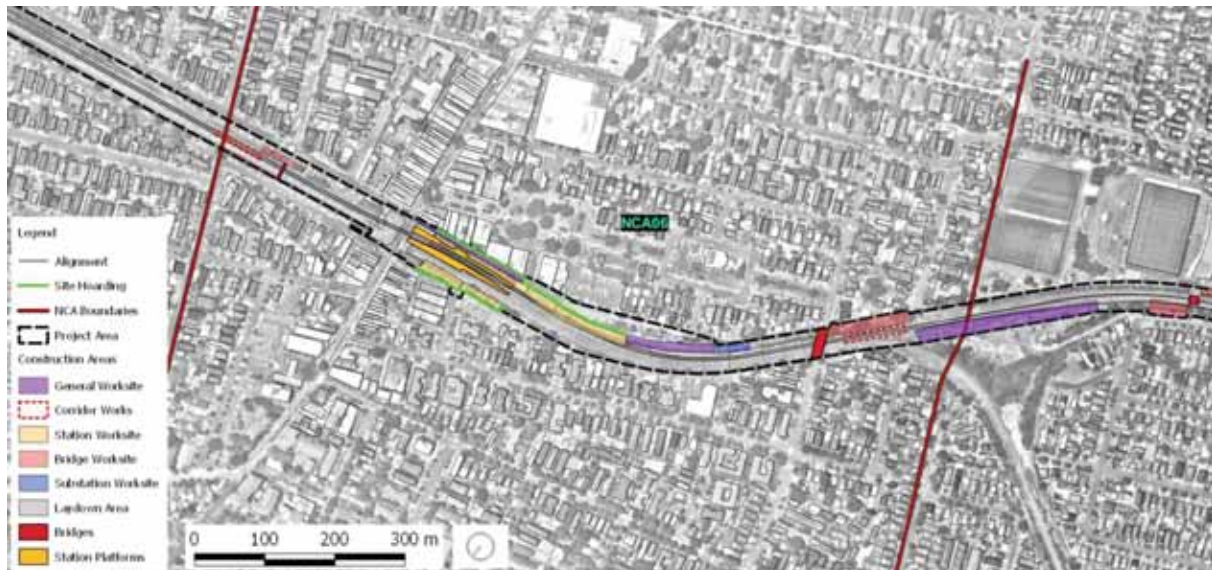
The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Café/bar – 208 Canterbury Road, Canterbury.

2.5.5 Campsie Precinct (NCA06)

The revised locations of the various construction worksites in the Campsie precinct are shown below in **Figure 19**.

Figure 19 Campsie Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.5.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 19**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 19 Overview of NML Exceedances from the Preferred Project – Campsie Precinct (NCA06) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵																		
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance			
							Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance			
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	
W.0001	General Worksites	Site Establishment	4	668	-	50	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>20 dB	
W.0002		Worksite Operations	52	668	-	25	1	-	70	4	-	93	14	1	181	65	4	106	20	1	1	1	1	1	
W.0003	Corridor - Ground & Track	Trackform	12 days	668	-	51	20	-	95	32	3	127	42	13	244	94	34	116	40	4	4	4	4	4	4
W.0004		Trackform - Ballast Tamper	4 days	668	13	124	41	4	203	70	26	246	95	34	233	195	95	211	217	102	102	102	102	102	102
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	668	1	99	43	-	144	71	9	172	91	17	287	139	77	216	94	40	40	40	40	40	40
W.0006		Segregation Fencing	6	668	-	88	14	-	111	58	1	143	68	9	262	105	59	150	82	14	14	14	14	14	14
W.0007	Station Works	Site Establishment	3	668	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	668	-	25	1	-	35	7	-	48	14	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	668	-	31	7	-	63	17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	668	-	25	1	-	35	7	-	48	14	-	217	30	7	117	24	4	4	4	4	4	4
W.0011		Station Installation & Fitout	20	668	-	8	-	-	24	1	-	24	7	-	77	24	1	24	4	-	-	-	-	-	-
W.0012		Bridge Worksites	Site Establishment	2	668	-	33	4	-	52	14	2	57	25	3	181	51	16	65	29	3	3	3	3	3
W.0013	Impact Prot. & Screens		2	668	-	52	15	-	75	26	3	127	46	7	266	71	29	124	46	7	7	7	7	7	
W.0014	Impact Prot. & Screens - Saw		2	668	2	70	20	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations		Site Establishment	2	668	-	34	2	-	39	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	6	668	-	17	-	-	35	1	-	41	9	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICING definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.5.2 Worst-case Impacts during Standard Daytime Construction Hours

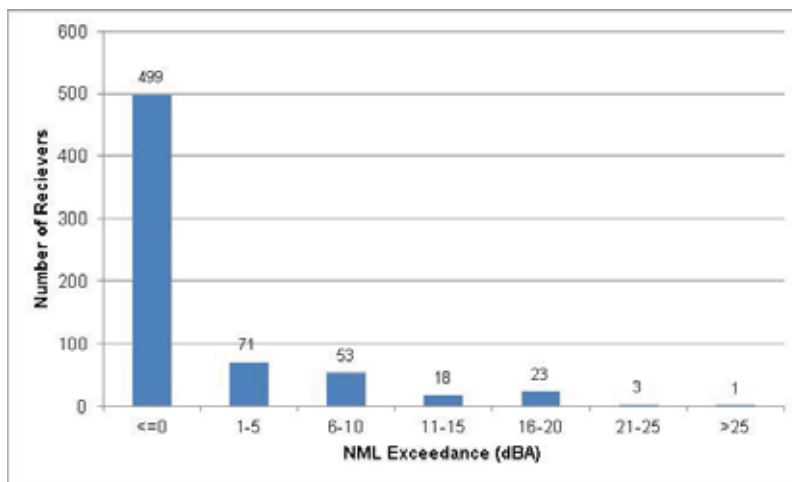
During standard daytime construction hours, **Table 19** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper
- W.0014 - Bridge Worksites - Impact Protection & Screens - Saw

Trackform works which require a ballast tamper are required as part of 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper' in a small area of this precinct. Whilst high noise levels are anticipated during use of the tamper, the impacts would be expected to last for only a few days as the works progress relatively quickly.

The activity with potential for the highest number of NML exceedances is 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper'. **Figure 20** indicates the distribution of exceedances for this activity during the daytime.

Figure 20 NML Exceedances Daytime – W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to four receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.5.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 19** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

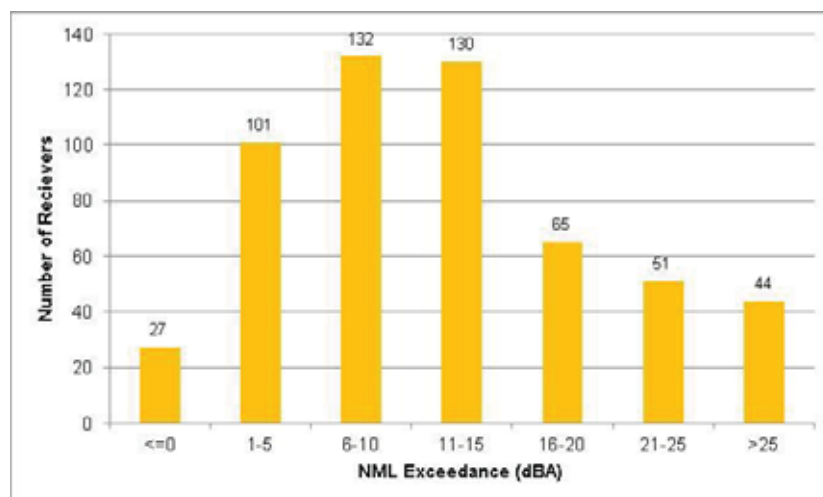
- W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0006 – Corridor Works - Track Support Systems - Segregation Fencing

Trackform works which require a ballast tamper are required as part of 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper' and whilst high noise levels are likely, the impacts would be expected to last for only a few days.

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activities W.0005 and W.0006 as the works would be undertaken along the length of the rail corridor. As noted previously, these works activities do not use noise intensive equipment, with the loudest item being a back hoe or truck. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper'. **Figure 21** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 21 NML Exceedances Night-time – 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 95 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.5.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 20**. The table shows the number of residential receivers separated by works activity and NCA.

Table 20 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA06		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	13	13	13
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	1	1	1
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	2	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- ‘W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper’, where 13 receivers are predicted to be Highly Noise Affected during all periods, which results from a tamper being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 22**.

Figure 22 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.5.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 21**.

Table 21 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4	-	-	1	-	-	1	-	-	2	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	1	-	-	-	1	-	2	1	-	2	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	1	-	-	2	-	-	2	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	2	-	-	1	-	-	2	-	-	1	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Place of worship – St John's Anglican Church, Campsie
 - Childcare – Carrington Occasional Child Care Centre, 2 Carrington Street, Campsie

2.5.6 Belmore Precinct (NCA07)

The revised locations of the various construction worksites in the Belmore precinct are shown below in **Figure 23**.

Figure 23 Belmore Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.6.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 22**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 22 Overview of NML Exceedances from the Preferred Project – Belmore Precinct (NCA07) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵														
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime			Daytime OOH			Evening			Night-time			Sleep Disturbance		
										1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	4	1068	-	-	63	14	-	-	-	-	-	-	-	-	-	-	-	>20 dB	
W.0002		Worksite Operations	52	1068	-	-	32	5	-	96	16	1	91	16	1	299	34	9	127	16	1
W.0003	Corridor - Ground & Track	Trackform	12 days	1068	-	-	7	-	-	78	-	-	78	-	-	241	12	-	33	-	
W.0004		Trackform - Ballast Tamper	4 days	1068	-	-	119	3	-	275	24	-	275	24	-	397	151	3	410	178	4
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	1068	-	-	166	57	3	393	88	25	385	87	24	483	193	61	431	94	29
W.0006		Segregation Fencing	6	1068	-	-	6	-	-	35	-	-	35	-	-	184	10	-	46	-	-
W.0007	Station Works	Site Establishment	3	1068	-	-	15	1	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	1068	-	-	31	4	1	115	12	1	113	12	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	1068	-	-	99	12	1	269	23	5	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	1068	-	-	31	4	1	115	12	1	113	12	-	394	40	4	265	21	4
W.0011		Station Installation & Fitout	20	1068	-	-	15	1	-	42	5	-	41	4	-	187	14	1	21	4	-
W.0012	Bridge Worksites	Site Establishment	2	1068	-	-	29	9	-	88	10	3	87	10	3	325	29	9	87	10	3
W.0013		Impact Prot. & Screens	2	1068	-	-	56	9	-	194	17	5	193	17	5	510	65	11	143	14	4
W.0014		Impact Prot. & Screens - Saw	2	1068	-	-	123	13	1	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	1068	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	6	1068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.6.2 Worst-case Impacts during Standard Daytime Construction Hours

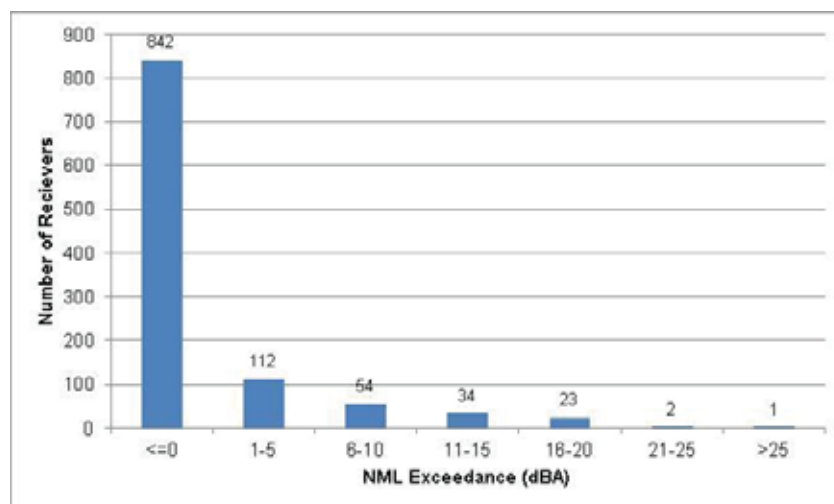
During standard daytime construction hours, **Table 22** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw
- W.0014 – Bridge Worksites - Impact Protection & Screens - Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activity W.0005. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’. **Figure 24** indicates the distribution of exceedances for this activity during the daytime.

Figure 24 NML Exceedances Daytime – ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to three receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.6.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 22** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

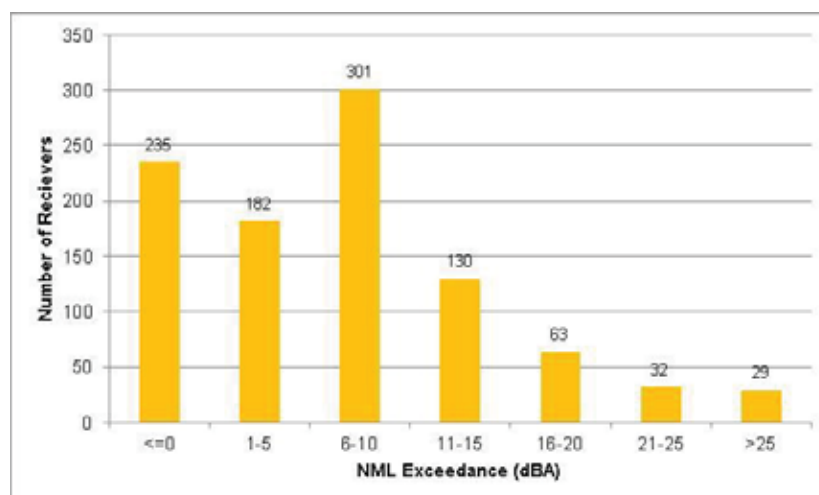
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0013 – Bridge Worksites - Impact Prot. & Screens

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activity W.0005 as the works would be undertaken along the length of the rail corridor. As noted previously, this works activity does not use noise intensive equipment, with the loudest item being a back hoe. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity 'W.0013 – Bridge Worksites - Impact Protection & Screens' is required in discrete locations at bridges and generally only affect the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 25** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 25 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 61 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.6.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 23**. The table shows the number of residential receivers separated by works activity and NCA.

Table 23 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA07		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that no receivers are predicted to be Highly Noise Affected in this catchment, as shown in **Figure 26**.

Figure 26 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.6.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 24**.

Table 24 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	1	-	-	-	1	-	-	-	1	-	1	-	1	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-
W.0008		Excavation	1	-	-	1	-	-	-	-	-	1	-	1	-	-	-
W.0009		Excavation – Excav. & Saw	1	-	-	-	1	-	-	-	-	1	1	1	1	-	-
W.0010		Concrete & Structural Works	1	-	-	1	-	-	-	-	-	1	-	1	-	-	-
W.0011		Station Installation & Fitout	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Educational – Montessori Preschool, 24 Redman Parade, Belmore
 - Medical – 38-40 Redman Parade, Belmore
 - Childcare – Montessori Child Care, 24 Redman Parade, Belmore
 - Childcare – 38 Redman Parade, Belmore
 - Public building – Belmore Community Centre
- A number of receivers are predicted to have impacts of >20 dB above NML. The construction scenarios with these higher impacts are generally not noise intensive and the exceedances result from the proximity of the works to the receivers, meaning that the worst-case impacts would generally only be apparent for a relatively short duration. High impacts are however also seen during use of a diamond saw and this noise intensive plant item would likely only be required for short durations during removal of the existing station platform.

2.5.7 Lakemba Precinct (NCA08)

The revised locations of the various construction worksites in the Lakemba precinct are shown below in **Figure 27**.

Figure 27 Lakemba Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.7.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 25**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 25 Overview of NML Exceedances from the Preferred Project – Lakemba Precinct (NCA08) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵																		
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance			
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB				
W.0001	General Worksites	Site Establishment	4	667	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>20 dB
W.0002		Worksite Operations	52	667	-	2	-	3	-	-	-	-	1	-	-	-	-	11	-	-	3	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	12 days	667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4 days	667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	667	-	99	4	-	126	63	-	124	61	-	298	98	6	143	69	-	-	-	-	-	-
W.0006		Segregation Fencing	6	667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	3	667	-	16	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	667	-	25	6	-	65	15	-	64	13	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	667	-	70	17	-	157	21	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	667	-	25	6	-	65	15	-	64	13	-	185	24	4	136	16	2	-	-	-	-	-
W.0011		Station Installation & Fitout	20	667	-	16	2	-	27	6	-	25	5	-	87	16	-	16	2	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	2	667	-	21	1	-	27	3	-	25	2	-	48	18	-	24	2	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	2	667	-	39	2	-	73	9	-	71	8	-	194	41	2	57	7	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	2	667	-	58	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015		Substations	Site Establishment	2	667	-	29	5	-	66	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016	Construction & Installation		6	667	-	15	-	-	27	5	-	27	5	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.

Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.

Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).

Note 4: Based on worst case predicted noise levels.

Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.7.2 Worst-case Impacts during Standard Daytime Construction Hours

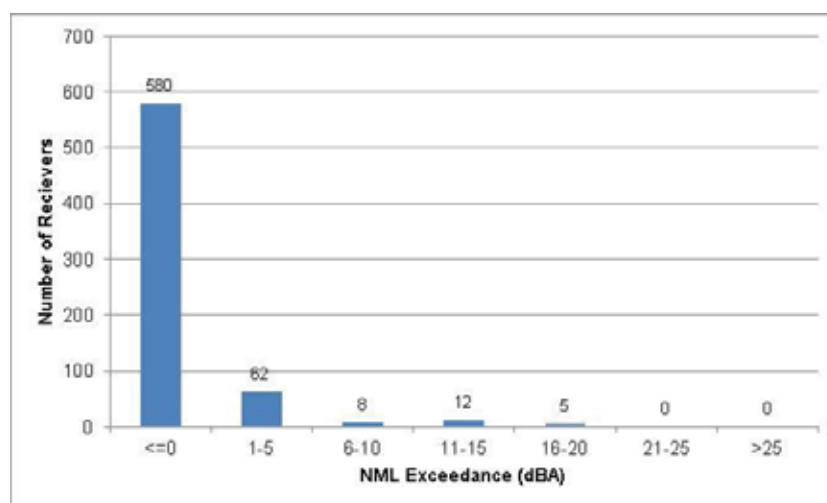
During standard daytime construction hours, **Table 25** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0009 – Station Works - Excavation - Excavator & Saw
- W.0014 – Bridge Worksites - Impact Protection & Screens - Saw

Activities for 'W.0009 – Station Works - Excavation - Excavator & Saw' and 'W.0014 – Bridge Worksites - Impact Protection & Screens - Saw' are required in discrete locations at stations and bridges, and both make use of a saw.

The activity with potential for the highest number of NML exceedances is 'W.0009 – Station Works - Excavation - Excavator & Saw'. **Figure 28** indicates the distribution of exceedances for this activity during the daytime.

Figure 28 NML Exceedances Daytime – 'W.0009 – Station Works - Excavation - Excavator & Saw'



The above graph shows that whilst the worst-case impacts may result in exceedances of 11 to 20 dB above the daytime NML, this is limited to 17 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts. No receivers are predicted to experience exceedances of the NML by more than 20 dB.

2.5.7.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 25** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

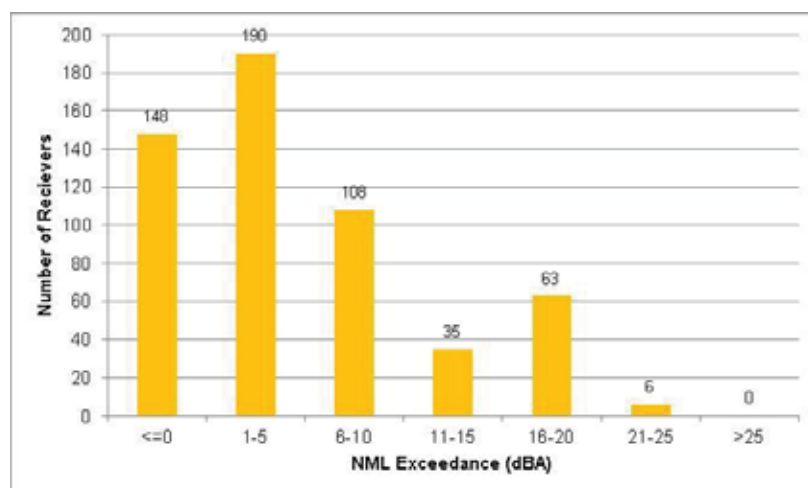
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0010 – Station Works - Concrete & Structural Works

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activity W.0005 as the works would be undertaken along the length of the rail corridor. As noted previously, this works activity does not use noise intensive equipment, with the loudest item being a back hoe. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity ‘W.0010 – Station Works - Concrete & Structural Works’ is required in discrete locations at stations and generally only affect the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’. **Figure 29** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 29 NML Exceedances Night-time – ‘W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at six receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.7.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 26**. The table shows the number of residential receivers separated by works activity and NCA.

Table 26 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA08		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that no receivers are predicted to be Highly Noise Affected in this catchment, as shown in **Figure 30**.

Figure 30 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.7.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 9**.

Table 27 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	1	-	-	2	-	-	1	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	1	-	-	1	-	-	2	-	-	1	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	1	-	-	1	1	-	-	1	-
W.0008		Excavation	-	-	-	1	-	-	1	-	-	2	-	-	1	1	-
W.0009		Excavation – Excav. & Saw	4	-	-	1	-	-	2	1	-	2	2	-	1	1	-
W.0010		Concrete & Structural Works	-	-	-	1	-	-	1	-	-	2	-	-	1	1	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	1	-	-	1	1	-	-	1	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	1	-	-	1	1	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	1	-	-	1	1	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	1	-	-	2	2	-	2	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Place of worship – Lakemba Uniting Church, 69 Haldon Street, Lakemba
 - Childcare – 27 Railway Parade, Lakemba
 - Childcare – 44 Railway Parade, Lakemba
 - Public building – Canterbury City Community Centre, 130 Railway Parade, Lakemba

2.5.8 Wiley Park Precinct (NCA09)

The revised locations of the various construction worksites in the Wiley Park precinct are shown below in **Figure 31**.

Figure 31 Wiley Park Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.8.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 28**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 28 Overview of NML Exceedances from the Preferred Project – Wiley Park Precinct (NCA09) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵																	
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance		
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB			
W.0001	General Worksites	Site Establishment	4	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	52	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	12 days	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	4 days	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	606	-	92	60	-	154	93	4	147	93	4	312	113	88	233	99	19	-	-	-	-
W.0006		Segregation Fencing	6	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	3	606	-	17	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	606	-	26	6	-	112	11	2	103	10	2	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	606	2	86	12	2	319	18	5	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	606	-	26	6	-	112	11	2	103	10	2	409	46	9	371	28	6	-	-	-	-
W.0011		Station Installation & Fitout	20	606	-	17	3	-	34	6	-	28	6	-	302	14	5	28	6	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	2	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	2	606	-	-	-	-	-	-	-	-	-	-	37	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	2	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	6	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.8.2 Worst-case Impacts during Standard Daytime Construction Hours

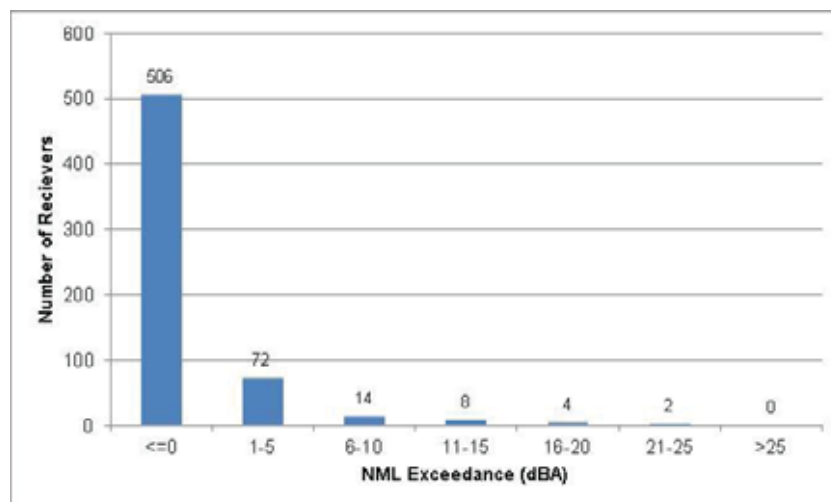
During standard daytime construction hours, **Table 28** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activity W.0005. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0009 – Station Works - Excavation - Excavator & Saw’. **Figure 32** indicates the distribution of exceedances for this activity during the daytime.

Figure 32 NML Exceedances Daytime – ‘W.0009 – Station Works - Excavation - Excavator & Saw’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to two receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.8.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 28** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

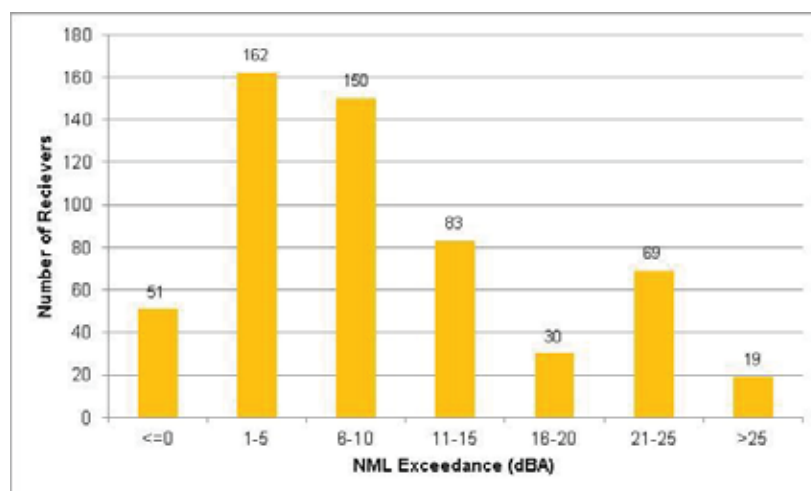
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0010 – Station Works - Concrete & Structural Works

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activity W.0005 as the works would be undertaken along the length of the rail corridor. As noted previously, this works activity does not use noise intensive equipment, with the loudest item being a back hoe. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity 'W.0010 – Station Works - Concrete & Structural Works' is required a discrete location at the station and generally only affects the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 33** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 33 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 88 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.8.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 29**. The table shows the number of residential receivers separated by works activity and NCA.

Table 29 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA09		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	2	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- ‘W.0009 – Station Works - Excavation - Excavator & Saw’, where two receivers are predicted to be Highly Noise Affected during the daytime, which results from a saw being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 34**.

Figure 34 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 - Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.8.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 30**.

Table 30 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	7	-	-	-	-	-	1	-	-	-	-	-	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	9	1	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	15	4	-	-	-	-	1	-	-	1	-	-	-	-	-
W.0010		Concrete & Structural Works	9	1	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0011		Station Installation & Fitout	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Educational – Wiley Park Girls High School
 - Educational – Lakemba Public School

2.5.9 Punchbowl Precinct (NCA10)

The revised locations of the various construction worksites in the Punchbowl precinct are shown below in **Figure 35**.

Figure 35 Punchbowl Precinct – Construction Areas



- Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.
- Note: Refer to **Appendix A** for large format construction area figures
- Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.9.1 NML Exceedances

The predicted NML exceedances in this precinct are summarised in **Table 31**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 31 Overview of NML Exceedances from the Preferred Project – Punchbowl Precinct (NCA10) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵														
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime			Daytime OOH			Evening			Night-time			Sleep Disturbance		
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB			
W.0001	General Worksites	Site Establishment	4	718	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	>20 dB	
W.0002		Worksite Operations	52	718	-	1	2	-	3	2	-	2	1	-	35	1	-	4	-	-	
W.0003	Corridor - Ground & Track	Trackform	12 days	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0004		Trackform - Ballast Tamper	4 days	718	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	718	-	94	6	-	131	52	-	111	49	-	258	81	8	134	50	-	
W.0006		Segregation Fencing	6	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0007	Station Works	Site Establishment	3	718	-	15	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0008		Excavation	10	718	-	24	2	-	56	3	-	41	1	-	-	-	-	-	-	-	
W.0009		Excavation – Excav. & Saw	10	718	-	51	10	-	92	14	-	-	-	-	-	-	-	-	-	-	
W.0010		Concrete & Structural Works	8	718	-	24	2	-	56	3	-	41	1	-	125	13	-	75	4	-	
W.0011		Station Installation & Fitout	20	718	-	15	1	-	26	1	-	13	-	-	54	2	-	4	-	-	
W.0012	Bridge Worksites	Site Establishment	2	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0013		Impact Prot. & Screens	2	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0014		Impact Prot. & Screens - Saw	2	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.0015	Substations	Site Establishment	2	718	-	1	-	-	12	-	-	-	-	-	-	-	-	-	-	-	
W.0016		Construction & Installation	6	718	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq}(15\text{minute})$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.9.2 Worst-case Impacts during Standard Daytime Construction Hours

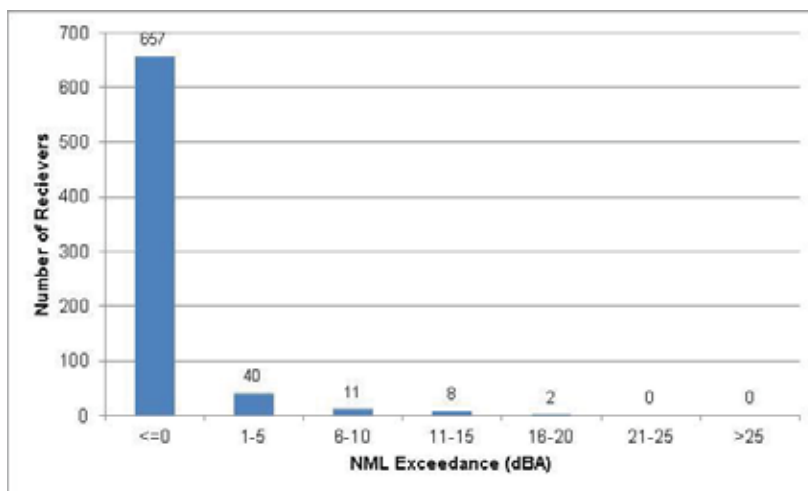
During standard daytime construction hours, **Table 31** shows that activities which use noise intrusive plant items, such as a saw, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0009 – Station Works - Excavation - Excavator & Saw

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activity W.0005. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0009 – Station Works - Excavation - Excavator & Saw’. **Figure 36** indicates the distribution of exceedances for this activity during the daytime.

Figure 36 NML Exceedances Daytime – ‘W.0009 – Station Works - Excavation - Excavator & Saw’



The above graph shows that whilst the worst-case impacts may result in exceedances of 11 to 20 dB above the daytime NML, this is limited to 10 receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts. No receivers are predicted to experience exceedances of the NML by more than 20 dB.

2.5.9.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 31** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

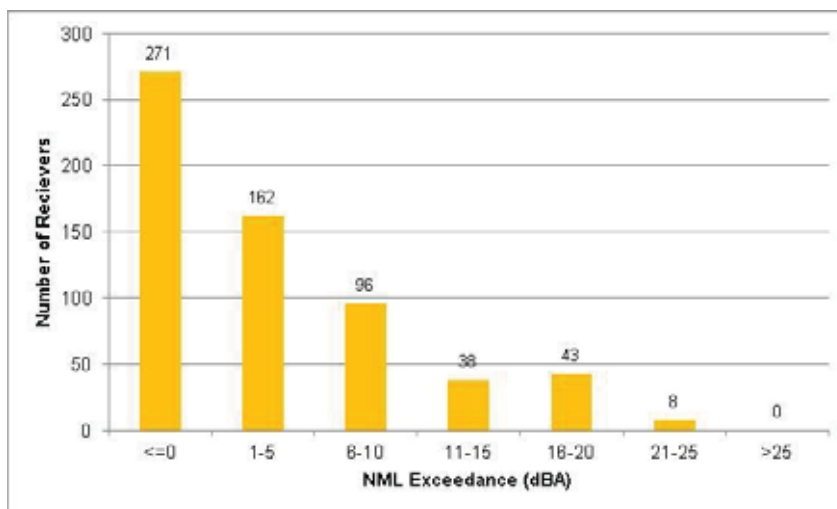
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing
- W.0010 – Station Works - Concrete & Structural Works

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activity W.0005 as the works would be undertaken along the length of the rail corridor. As noted previously, this works activity does not use noise intensive equipment, with the loudest item being a back hoe. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

Activity 'W.0010 – Station Works - Concrete & Structural Works' is required in a discrete location at the station and generally only affects the immediately surrounding receivers.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 37** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time

Figure 37 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at eight receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.9.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 32**. The table shows the number of residential receivers separated by works activity and NCA.

Table 32 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA10		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that no receivers are predicted to be Highly Noise Affected in this catchment, as shown in **Figure 38**.

Figure 38 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.9.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 33**.

Table 33 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-
W.0002		Worksite Operations	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	3	1	-	-	1	-	-	-	-	3	2	-	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
W.0008		Excavation	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
W.0009		Excavation – Excav. & Saw	1	-	-	1	-	-	-	-	-	3	2	-	-	-	-
W.0010		Concrete & Structural Works	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Educational – Punchbowl Boys High School
 - Medical – 15 South Terrace, Punchbowl
 - Childcare – Long Day Pre-School, 21 Dudley Street, Punchbowl

2.5.10 Bankstown Precinct (NCA11)

The revised locations of the various construction worksites in the Bankstown precinct are shown below in **Figure 39**.

Changes as a result of the preferred project have only occurred within NCA11 in this precinct. Construction works in Bankstown NCA12 and NCA13 would be completed as per the EIS Noise and Vibration Technical Paper. Reference should be made to the EIS Noise and Vibration Technical Paper for all construction noise and vibration impacts on the western side of Stacey Street in Bankstown.

Figure 39 Bankstown Precinct – Construction Areas



Note: The assessment is based on categorising each construction area by the main activity that would occur within the boundary. Many construction areas would however likely have more than one usage.

Note: Refer to **Appendix A** for large format construction area figures

Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 – Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

2.5.10.1 NML Exceedances

The predicted NML exceedances in NCA11 within this precinct are summarised in **Table 34**. The number of receivers predicted to experience exceedances of the NMLs are summarised for each scenario in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 34 Overview of NML Exceedances from the Preferred Project – Bankstown Precinct (NCA11) – All Receiver Types

Activity ID	Scenario	Activity	No. Weeks ¹	Number of Receivers			Possession / Closedown Works ⁵																	
				Total	HNA ³	With NML Exceedance ⁴	Standard Daytime						Daytime OOH			Evening			Night-time			Sleep Disturbance		
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB			
							1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB			
W.0001	General Worksites	Site Establishment	4	687	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>20 dB	
W.0002		Worksite Operations	52	687	-	-	-	-	3	-	-	-	3	-	-	29	1	-	8	-	-	-	-	
W.0003	Corridor - Ground & Track	Trackform	12 days	687	-	-	45	19	-	75	30	1	75	30	1	238	56	29	75	30	1	370	185	71
W.0004		Trackform - Ballast Tamper	4 days	687	19	-	103	31	2	213	49	29	211	49	29	372	159	64	370	185	71	117	11	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	2	687	-	-	101	36	-	125	118	1	125	118	1	342	83	111	210	117	11	-	-	-
W.0006		Segregation Fencing	6	687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	3	687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	10	687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	10	687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	8	687	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
W.0011		Station Installation & Fitout	20	687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012		Bridge Worksites	Site Establishment	2	687	-	-	29	1	-	39	22	-	39	22	-	130	26	9	48	26	-	-	-
W.0013	Impact Prot. & Screens		2	687	-	-	9	2	-	37	4	-	37	4	-	141	25	3	39	5	-	-	-	-
W.0014	Impact Prot. & Screens - Saw		2	687	-	-	25	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	2	687	-	-	29	17	-	51	33	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	6	687	-	-	33	-	-	29	17	-	29	17	-	-	-	-	-	-	-	-	-	-

- Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be sites within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.
- Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall preferred project program.
- Note 3: Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq(15\text{minute})}$ noise at residential receiver is 75 dBA or greater).
- Note 4: Based on worst case predicted noise levels.
- Note 5: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

The above shows that during some of the works, relatively high noise impacts are predicted when higher noise generating equipment is in use. It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted above for significant periods of time when noise generating equipment is not in use.

2.5.10.2 Worst-case Impacts during Standard Daytime Construction Hours

During standard daytime construction hours, **Table 34** shows that activities which use noise intrusive plant items, such as a ballast tamper, result in some of the higher impacts. The highest impacts are predicted during the following works in this precinct:

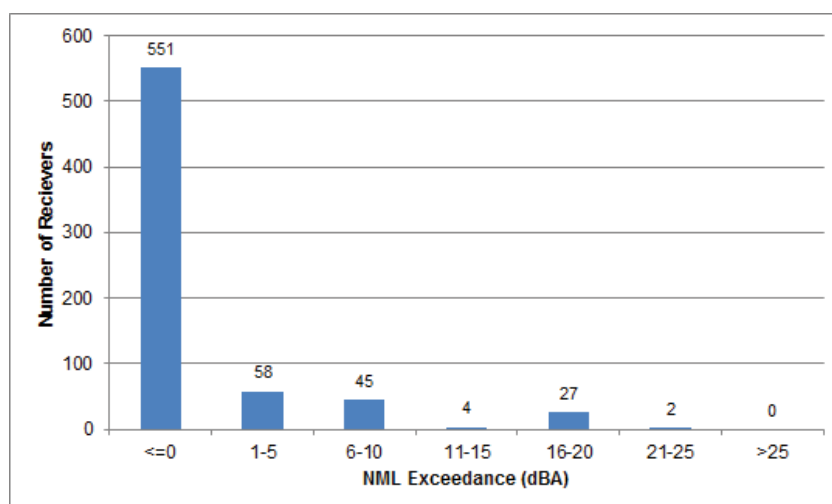
- W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing

Trackform works which require a ballast tamper are required as part of ‘W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper’ in a small area of this precinct. Whilst high noise levels are anticipated during use of the tamper, the impacts would be expected to last for only a few days as the works progress relatively quickly.

Relatively large numbers of receivers are predicted to be affected during the ‘Corridor Works - Track Support Systems’ activity W.0005. Whilst these works do not use high noise generating construction equipment, they would be required along the length of corridor in this precinct and are in relatively close proximity to certain receivers which adjoin the rail corridor.

The activity with potential for the highest number of NML exceedances is ‘W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper’. **Figure 40** indicates the distribution of exceedances for this activity during the daytime

Figure 40 NML Exceedances Daytime – ‘W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper’



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the daytime NML, this is limited to two receivers, with the majority of the receivers in this precinct being subject to considerably lower, or no impacts.

2.5.10.3 Worst-case Impacts during Out-of-Hours Works

To minimise the potential impacts during out of hours periods, rockbreakers are not proposed to be used for any of the works, and other noise intensive plant items such as saws, would generally only be used during the daytime.

During out of hours construction works, **Table 34** shows that the highest numbers of night-time NML exceedances are apparent during the following works:

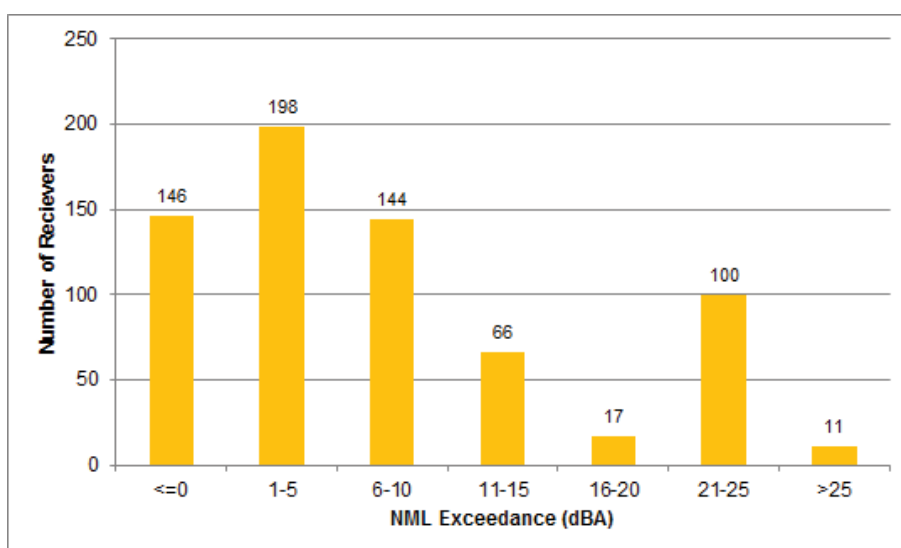
- W.0003 – Corridor – Ground & Track - Trackform
- W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper
- W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing

Trackform works which require a ballast tamper are required as part of 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper' in this precinct. Whilst high noise levels are anticipated during use of the tamper, the impacts would be expected to last for only a few days as the works progress relatively quickly.

Relatively large numbers of receivers are predicted to be affected during the 'Corridor Works - Track Support Systems' activity W.0005 as the works would be undertaken along the length of the rail corridor. As noted previously, this works activity does not use noise intensive equipment, with the loudest item being a back hoe. The predicted exceedances are due to the proximity of the works to the nearest receivers and impacts from these works would be expected to be relatively short.

The activity with potential for the highest number of NML exceedances during the night-time is 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'. **Figure 41** indicates the distribution of exceedances for this activity for receivers within this precinct during the night-time.

Figure 41 NML Exceedances Night-time – 'W.0005 – Corridor Works - Track Support Systems - Comms Works/Security Fencing'



The above graph shows that whilst the worst-case impacts may result in a greater than 20 dB exceedance of the night-time NMLs at 111 receivers, there are many receivers in this precinct that are subject to lower impacts.

2.5.10.4 Highly Noise Affected Residential Receivers

The ICNG considers residential receivers that are subject to predicted noise levels of 75 dBA or greater to be Highly Noise Affected. The number of Highly Noise Affected receivers in this precinct has been determined and is summarised in **Table 35**. The table shows the number of residential receivers separated by works activity and NCA.

Table 35 Predicted Number of Highly Noise Affected Residential Receivers by Works and NCA

Works	Scenario	Activity	NCA11		
			Day	Eve	Night
W.0001	General Worksites	Site Establishment	-	-	-
W.0002		Worksite Operations	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-
W.0004		Trackform - Ballast Tamper	19	19	19
W.0005	Corridor - Track Supp. Systems	Comms Works/Security Fencing	-	-	-
W.0006		Segregation Fencing	-	-	-
W.0007	Station Works	Site Establishment	-	-	-
W.0008		Excavation	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-
W.0010		Concrete & Structural Works	-	-	-
W.0011		Station Installation & Fitout	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-
W.0013		Impact Prot. & Screens	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-
W.0015	Substations	Site Establishment	-	-	-
W.0016		Construction & Installation	-	-	-

The above table shows that receivers are predicted to be Highly Noise Affected in this catchment during certain works activities. The highest numbers are apparent during:

- 'W.0004 – Corridor – Ground & Track - Trackform – Ballast Tamper', where 24 receivers are predicted to be Highly Noise Affected during all periods in NCA11, NCA12 and NCA13 combined, which results from a tamper being in this activity.

The location of the Highly Noise Affected residential receivers in this precinct, from all works and in any time period, are shown in **Figure 42**.

Figure 42 Highly Noise Affected Residential Receivers



Note: The two activities for 'Corridor Works - Track Support Systems' are not shown on the drawing for clarity. 'W.0005 - Comms Works/Security Fencing' would generally be required at the perimeter of the corridor and 'W.0006 - Segregation Fencing' would be required in the rail corridor between Marrickville and the rail junction between Campsie/Belmore.

The most impacted receivers are typically dwellings which surround and have direct line of sight to the various works locations. Some of the first row receivers in this area are predicted to be Highly Noise Affected, however this would only be expected to be apparent when noisy works are being carried out nearby.

2.5.10.5 Other Sensitive Receivers

The predicted daytime NML exceedances for other sensitive receivers (such as educational facilities, hospitals and childcare centres) are summarised in **Table 36**.

Table 36 Overview of Sensitive Receiver NML Exceedances in Precinct – Daytime

Works	Scenario	Activity	Education			Medical			Place of Worship			Childcare			Remaining ¹		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
W.0001	General Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0002		Worksite Operations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0003	Corridor - Ground & Track	Trackform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0004		Trackform - Ballast Tamper	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
W.0005	Corridor - Track Supp. Systems	Comms Works/Sec. Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0006		Segregation Fencing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0007	Station Works	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0008		Excavation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0009		Excavation – Excav. & Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0010		Concrete & Structural Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0011		Station Installation & Fitout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0012	Bridge Worksites	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0013		Impact Prot. & Screens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0014		Impact Prot. & Screens - Saw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0015	Substations	Site Establishment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.0016		Construction & Installation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: The 'Remaining' category includes public buildings, libraries, café/bars, etc.

The above table shows the following:

- The other sensitive receivers in this precinct are predicted to generally be subject to relatively minor impacts, with many receiver types and works activities not resulting in any exceedances of NMLs.
- Other sensitive receivers in this area which are predicted to be subject to NMLs exceedances during the higher noise generating activities are:
 - Childcare – Roly Poly Education Child Care, 9 East Terrace, Bankstown

2.6 Mitigation and Comparison to Exhibited Project

Noise mitigation for the exhibited project was discussed in detail in the EIS Noise and Vibration Technical Paper and reference should be made to that document for further information on the assessment methodology for the preferred project, including descriptions of standard mitigation measures that have been recommended.

2.6.1 Additional Mitigation Measures Review

A review based on the preferred project has been undertaken of where, after application of standard mitigation measures, the $L_{Aeq}(15\text{minute})$ construction noise and vibration levels are predicted to exceed the noise or vibration objectives. This review has been undertaken against the Additional Mitigation Measures Matrix (AMMM) from the TfNSW Construction Noise Strategy (CNS), shown in **Table 37**, to determine the additional measures to be implemented.

Table 37 Additional Mitigation Measures Matrix – Airborne Construction Noise

Time Period		Mitigation Measure			
		$L_{Aeq}(15\text{minute})$ Noise Level above Background (RBL)			
		0 to 10 dBA Noticeable	10 to 20 dBA Clearly Audible	20 to 30 dBA Moderately Intrusive	>30 dBA Highly Intrusive
Standard	Mon-Fri (7am - 6pm)	-	-	LB, M	LB, M
	Sat (8am - 1pm)				
	Sun/Pub Hol. (Nil)				
OOHW Period 1	Mon-Fri (6pm - 10pm)	-	LB	M, LB	M, IB, LB, RO, PC, SN
	Sat (7am - 8am) & (1pm - 10pm)				
	Sun/Pub Hol. (8am - 6pm)				
OOHW Period 2	Mon-Fri (10pm - 7am)	LB	M, LB	M, IB, LB, PC, SN	AA, M, IB, LB, PC, SN
	Sat (10pm - 8am)				
	Sun/Pub Hol. (6pm - 7am)				

Note: The following abbreviations are used: Alternative accommodation (AA), Monitoring (M), Individual briefings (IB), Letter box drops (LB), Project specific respite offer (RO), Phone calls (PC), Specific notifications (SN).

A summary of receiver types that are predicted to be subject to noise impacts greater than 25 dBA above the NML (ie corresponds to the '>30 dBA Highly Intrusive' category above) for the preferred project is shown in **Table 38**. A comparison is provided between the assessment completed for the exhibited project and the preferred project.

As previously discussed, the use of noise intensive equipment plant items such diamond saws would be restricted to daytime periods and the need for rockbreaking has been entirely removed.

Ballast tamping may be required during all periods and impacts during the night-time have been provided both with and without the ballast tamper to illustrate the effect that this item of equipment has on the impacts, consistent with the approach in the EIS Noise and Vibration Technical Paper for the exhibited project.

Table 38 Number of Receivers Predicted to be Subject to >25 dBA above NML Noise Levels

NCA	Residential					Commercial					Other Sensitive					HNA ²		Sleep Disturbance (>20 dB Impacts)
	Standard Day	Day OOH ¹	Evening	Night-time (with Ballast Tamper)	Night-time (without Ballast Tamper)	Standard Day	Day OOH	Evening	Night-time (with Ballast Tamper)	Night-time (without Ballast Tamper)	Standard Day	Day OOH ¹	Evening	Night-time (with Ballast Tamper)	Night-time (without Ballast Tamper)	Night-time (with Ballast Tamper)	Night-time (without Ballast Tamper)	
Exhibited Project (EIS)																		
NCA01	64	139	139	152	99	-	-	-	-	-	-	-	-	-	-	20	8	306
NCA02	147	224	223	191	164	-	-	-	-	-	-	-	-	-	-	31	23	307
NCA03	76	138	138	140	94	-	-	-	-	-	1	1	-	-	-	34	9	237
NCA04	21	42	42	38	32	-	-	-	-	-	-	-	-	-	-	6	5	54
NCA05	50	56	56	73	65	-	-	-	-	-	-	-	-	-	-	1	-	95
NCA06	13	45	66	101	65	-	-	-	-	-	-	-	-	-	-	25	9	184
NCA07	33	45	45	79	50	-	-	-	-	-	3	3	2	1	-	12	1	183
NCA08	-	7	7	19	1	-	-	-	-	-	2	2	-	-	-	4	-	52
NCA09	6	34	34	46	40	-	-	-	-	-	-	-	-	-	-	16	5	89
NCA10	-	7	7	15	-	-	-	-	-	-	3	3	1	-	-	7	-	50
NCA11	1	26	26	43	29	-	-	-	-	-	-	-	-	-	-	19	1	85
Preferred Project (this report)																		
NCA01	24	60	59	78	78	-	-	-	-	-	-	-	-	-	-	10	10	87
NCA02	12	50	36	126	126	-	-	-	-	-	-	-	-	-	-	5	5	123
NCA03	18	53	46	83	83	-	-	-	-	-	1	-	-	-	-	3	3	83
NCA04	2	13	12	26	26	-	-	-	-	-	-	-	-	-	-	1	1	25
NCA05	4	20	20	70	62	-	-	-	-	-	-	-	-	-	-	1	-	93
NCA06	1	4	22	63	47	-	-	-	-	-	-	-	-	-	-	14	1	119
NCA07	-	1	1	34	34	-	-	-	-	-	1	1	-	-	-	-	-	41
NCA08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
NCA09	-	2	-	20	20	-	-	-	-	-	-	-	-	-	-	-	-	22
NCA10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA11	-	2	2	41	16	-	-	-	-	-	-	-	-	-	-	19	-	80

Note 1: OOH = Out of hours. During the daytime, this refers to the period on Saturday between 7am – 8am, and 1pm – 10pm.

Note 2: Highly Noise Affected, based on ICNG definition (i.e. predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater).

The above shows that substantial reductions in the predicted impacts are apparent for the majority of NCAs for the preferred project. Similar reductions are seen in impacts to receivers across the daytime, evening and night-time periods.

Impacts for the preferred project are generally lower than the exhibited project (EIS Noise and Vibration Technical Paper) due to the number of worksites being revised and less noise intensive equipment being used to complete the work. The requirement for track works has also been reduced to a small number of isolated locations, whereas previously they were required at most stations. Further changes are also apparent at station sites where only platform modification works are now required as opposed to previously being demolished and re-built, and the bridge works being revised to providing throw screens and protection measures whereas previously some bridges were being replaced or required significant strengthening works.

As discussed previously, rockbreakers are also no longer required and this item of highly noise intensive equipment was previously driving many of the worst-case impacts.

The reduction in the required works and need for highly noise intensive equipment during out of hours periods has also reduced the potential sleep disturbance impacts. Significant reductions are generally seen in all NCAs, with most areas predicted to have in the region of 50 to 70% less receivers with >20 dB exceedances of the sleep disturbance goals.

2.6.2 Proposed Additional Mitigation

Based on the predicted noise levels, additional mitigation measures as per the requirements of **Table 37** have been determined for works during standard daytime construction hours and for works at night-time during possessions/closedowns. A comparison is provided for the assessment completed for the exhibited project and the preferred project.

Maps showing the location of the receivers identified for additional mitigation in the daytime and night-time period are provided in **Appendix B**.

Table 39 Receivers Identified for Additional Mitigation

NCA	Number of Receivers						
	Standard Daytime	Possession / Closedown Works					
		Night-time (OOHW2)					
		With Ballast Tamping				Without Ballast Tamping	
	LB, M	LB	M, LB	M, IB, LB, PC, SN	AA, M, IB, LB, PC, SN	M, IB, LB, PC, SN	AA, M, IB, LB, PC, SN
Exhibited Project (EIS Noise and Vibration Technical Paper)							
NCA01	565	29	452	363	152	277	99
NCA02	594	67	620	334	191	213	164
NCA03	462	6	306	260	140	181	94
NCA04	121	25	150	74	38	65	32
NCA05	291	-	168	136	73	99	65
NCA06	161	27	245	175	101	115	65
NCA07	291	120	457	312	79	134	50
NCA08	88	122	295	111	19	83	1
NCA09	126	86	300	132	46	105	40
NCA10	73	172	326	102	15	71	-
NCA11	116	169	316	153	43	129	29
Preferred Project (this report)							
NCA01	188	196	510	205	78	205	78
NCA02	233	326	564	186	126	187	125
NCA03	196	88	387	154	83	154	83
NCA04	77	68	123	70	26	70	26
NCA05	132	-	188	119	70	98	62
NCA06	69	74	260	151	63	104	47
NCA07	81	256	527	133	34	108	33
NCA08	23	291	177	73	-	73	-
NCA09	65	171	271	102	20	102	20
NCA10	2	372	144	52	-	52	-
NCA11	77	170	318	152	41	117	16

Note: LB: Letterbox drops, M: Monitoring, IB: Individual briefings, PC: Phone calls, SN: Specific notifications, AA: Alternative accommodation

The above shows that as per the reduction in noise impacts at sensitive receivers as a result of the preferred project, similar reductions are seen in the requirements for additional mitigation measures in all NCAs.

2.7 Construction Road Traffic Noise Assessment

Temporary additional road traffic associated with the preferred project generally falls into two categories:

- Construction related traffic – this includes heavy vehicle movements to/from the construction compounds transporting construction materials and spoil along defined haulage routes, as well as vehicles of construction personnel travelling to/from the construction compounds.
- Temporary Transport Management Plans (TTMP) – during periods of extended track possession associated with construction works, train replacement bus services would be required. This would introduce additional heavy vehicles (buses) onto the public road network during these periods.

An assessment of the noise impacts from each of the temporary construction road traffic categories was presented in the EIS Noise and Vibration Technical Paper. Where changes have been made to the construction traffic road traffic assumptions for the preferred project, this is noted below.

2.7.1 Construction Traffic

The EIS Noise and Vibration Technical Paper presented the potential noise impacts from the maximum daily construction vehicle volumes expected during the construction of the exhibited project. Whilst the total impact from construction vehicle traffic would reduce as a result of less construction traffic being required overall for the preferred project, the worst-case maximum daily volumes remain consistent with the EIS Noise and Vibration Technical Paper and the worst-case impacts would be the same.

However, as the number of possessions and the typical duration of possessions would be less for the preferred project when compared to the exhibited project, the frequency and duration of the potential construction traffic noise impacts would be expected to be reduced for the preferred project.

2.7.2 Temporary Transport Arrangements during Possessions

A Temporary Transport Strategy (TTS) has been developed which outlines the process for planning and delivery of a temporary, integrated, multi-modal transport network that would operate during each of the rail possession periods. For each possession period, a TTMP would be developed to allow customers to continue to reach their destinations while trains are not operating.

An assessment of the noise impacts from TTMP traffic is presented in the EIS Noise and Vibration Technical Paper for the exhibited project. The assumptions presented remain a worst-case scenario and while the maximum daily TTMP volumes remain unchanged for the preferred project, the typical duration and frequency of possessions that would result in the maximum daily TTMP volumes would be significantly less.

On this basis, both the duration and frequency of TTMP noise impacts for the preferred project are expected to be significantly less than presented in the EIS Noise and Vibration Technical Paper.

2.7.3 Cumulative Construction Road Traffic

As discussed in **Section 2.7.1** and **Section 2.7.2**, the maximum number of construction vehicle and TTMP vehicle volumes would only be in operation during rail possessions. The potential cumulative impact of the concurrent operation of these construction road traffic noise sources is presented in the EIS Noise and Vibration Technical Paper for the exhibited project. The maximum cumulative noise impacts presented are representative of a worst-case scenario for the preferred project. However, because the typical duration of the revised rail possessions would be less, the duration and frequency of cumulative noise impacts presented in the EIS Noise and Vibration Technical Paper for the exhibited project would be significantly reduced for the preferred project.

2.8 Construction Vibration Assessment

2.8.1 Vibration Intensive Plant

The construction vibration assessment for the exhibited project assessed rockbreakers as the most vibration intensive item of equipment. As rockbreakers are unlikely to be required to construct the preferred project the most vibration intensive piece of construction equipment is now a ballast tamper. The ballast tamper was previously assessed as part of the exhibited project, however the locations it would be required for the preferred project have been significantly reduced.

The vibration levels generated by a ballast tamper are significantly lower than those generated by a rockbreaker and the ballast tamper would only be used on the rail tracks in a small number of locations of the preferred project.

The removal of rockbreakers from the preferred project has significantly reduced the potential vibration impacts at the nearest receivers. All other items of equipment required by the preferred project are generally not considered vibration intensive.

It is also noted that rail tampers are routinely used for Sydney Trains rail maintenance works across the project area without significant impact to nearby sensitive receivers and structures.

Construction works associated with platform alterations would be required to be completed in the vicinity of several heritage structures at stations. These works however do not require the use of vibration intensive equipment and the potential vibration impacts from items such as concrete saws and excavators are expected to be minimal.

The required vibration intensive equipment should be reviewed during construction planning to ensure the potential vibration impacts are minimised. If impacts are considered likely then vibration monitoring should be completed to ensure acceptable levels of vibration are not exceeded.

3 Operational Noise and Vibration Assessment

3.1 Project Rail Track Design Modification

An assessment of the operational noise and vibration impacts for the exhibited project was presented in the EIS Noise and Vibration Technical Paper. The preferred project works description relating to the track design is described in Section 1.1 of the Submissions and Preferred Infrastructure Report. Key features of the track design for the preferred project in comparison to the exhibited project include:

- The preferred project would use the existing Sydney Trains tracks wherever possible and significant track modification would only be required around Bankstown Station to facilitate the separation of the metro tracks from the Sydney Trains network. The revised track design would no longer include significant realignment in the vicinity of stations.
- No new dedicated turnback track has been included in the preferred project design. Hence, there would no longer be a turnback facility at Campsie.
- No new crossovers, except for one on the eastern side of Campsie Station.
- The rail junction and turnback to the west of Bankstown Station for Sydney Trains services has been reconfigured.

3.2 Airborne Noise – Rail Operations

The design modifications described in **Section 3.1** are not anticipated to increase the operational rail airborne noise levels compared to the predictions presented in the EIS Noise and Vibration Technical Paper, with the exception of the new crossover on the eastern side of Campsie Station. Therefore, with the exception of the new crossover, the predicted airborne noise impacts and recommended feasible and reasonable noise mitigation presented in the EIS Noise and Vibration Technical Paper are considered applicable to the preferred design and are likely to be slightly conservative in some regions where previous track slewing resulted in the tracks being closer to sensitive receivers, and where new crossovers were marked for installation.

The rail turnouts at each end of the new rail crossover on the eastern side of Campsie Station would likely increase operational rail noise levels in a region of the study area that is already predicted to be sensitive to rail noise level increases (refer to Section 4.1.6.8 of the EIS Noise and Vibration Technical Paper). There is potential for the installation of a crossover in this area, as proposed as part of the preferred project, to trigger the requirement for consideration of noise mitigation options at some sensitive receivers in the vicinity of the crossover.

A detailed review of the operational rail noise impacts and the recommended feasible and reasonable noise mitigation would be undertaken during the detailed design stage of the preferred project when the rail track design is finalised.

3.3 Ground-borne Noise and Vibration

The design modifications described in **Section 3.1** for the preferred project are not anticipated to increase the operational ground-borne noise and vibration levels compared to the predictions presented in the EIS Noise and Vibration Technical Paper.

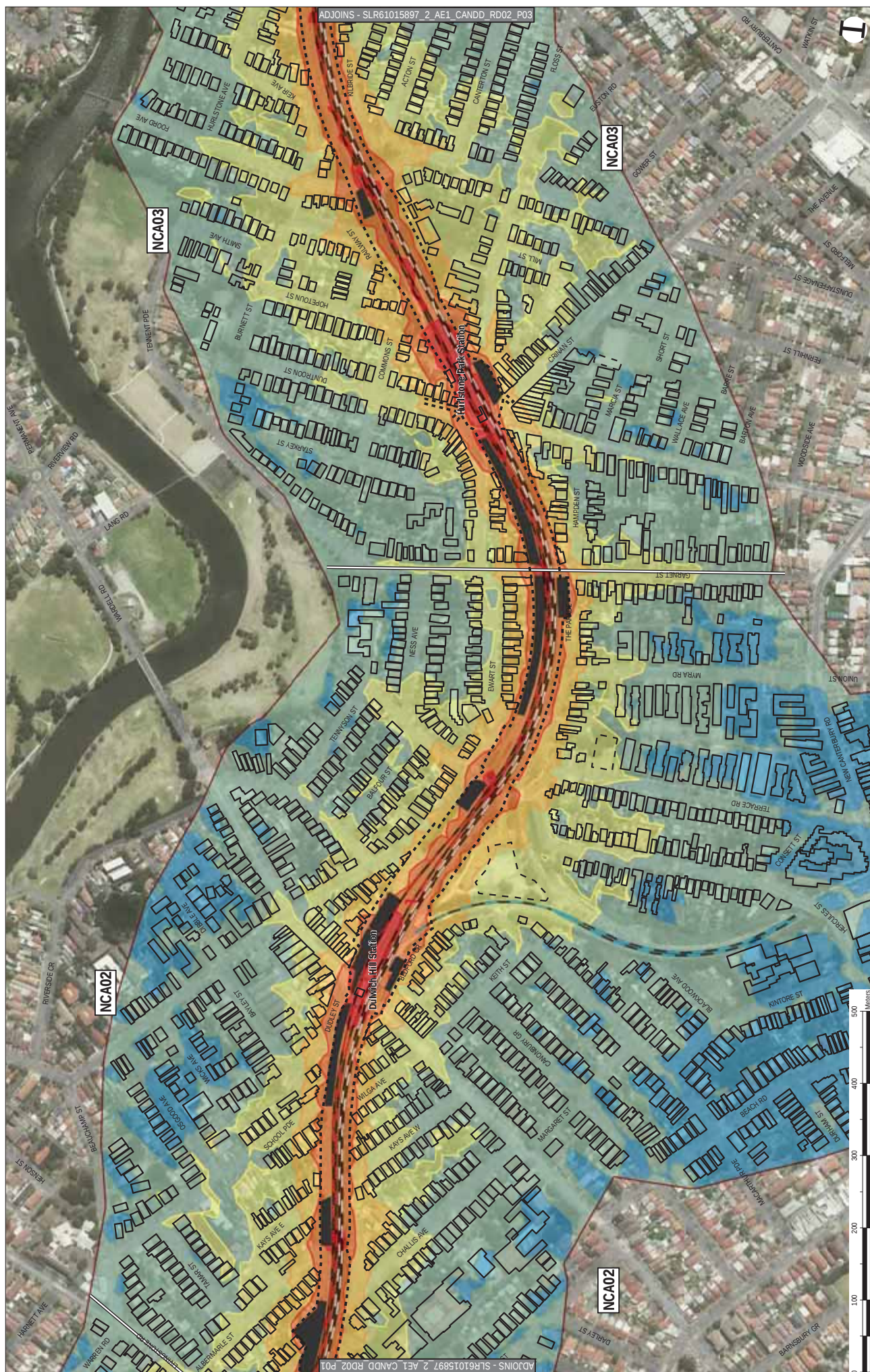
INDEX

A1 - Worst-Case Daytime LAeq(15minute) Construction Noise Predictions

A2 - Worst-Case Night-time LAeq(15minute) Construction Noise Predictions

A3 - Worst-Case Night-time LAeq(15minute) (No Ballast Tamper) Construction Noise Predictions

Construction Airborne Noise Contours - Worst-Case Daytime LAeq(15minute) Construction Noise Predictions



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Legend

- Noise Catchment Areas
- Freight Rail Tracks
- Light Rail Tracks
- Metrol Rail Tracks
- Sydney Trains Rail Tracks
- Noise Contour Calculation Boundary

Project Area	Worst Case Daytime Construction Noise (dBA)
Area 1	~45
Area 2	~55
Area 3	~65
Area 4	~75
Area 5	~85

ess Receivers

 Buildings

 Outdoor

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 Sydney Metro City & Southwest
 Sydenham to Bankstown
 Construction Airborne Noise Contours
 Worst-case Daytime
 Construction Noise Predictions
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Note: Noise contours are indicative and represent the worst-case noise levels predicted for all scenarios operating in the period.





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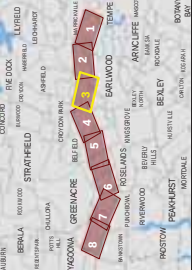
Assessed Receivers
Buildings
Outdoor

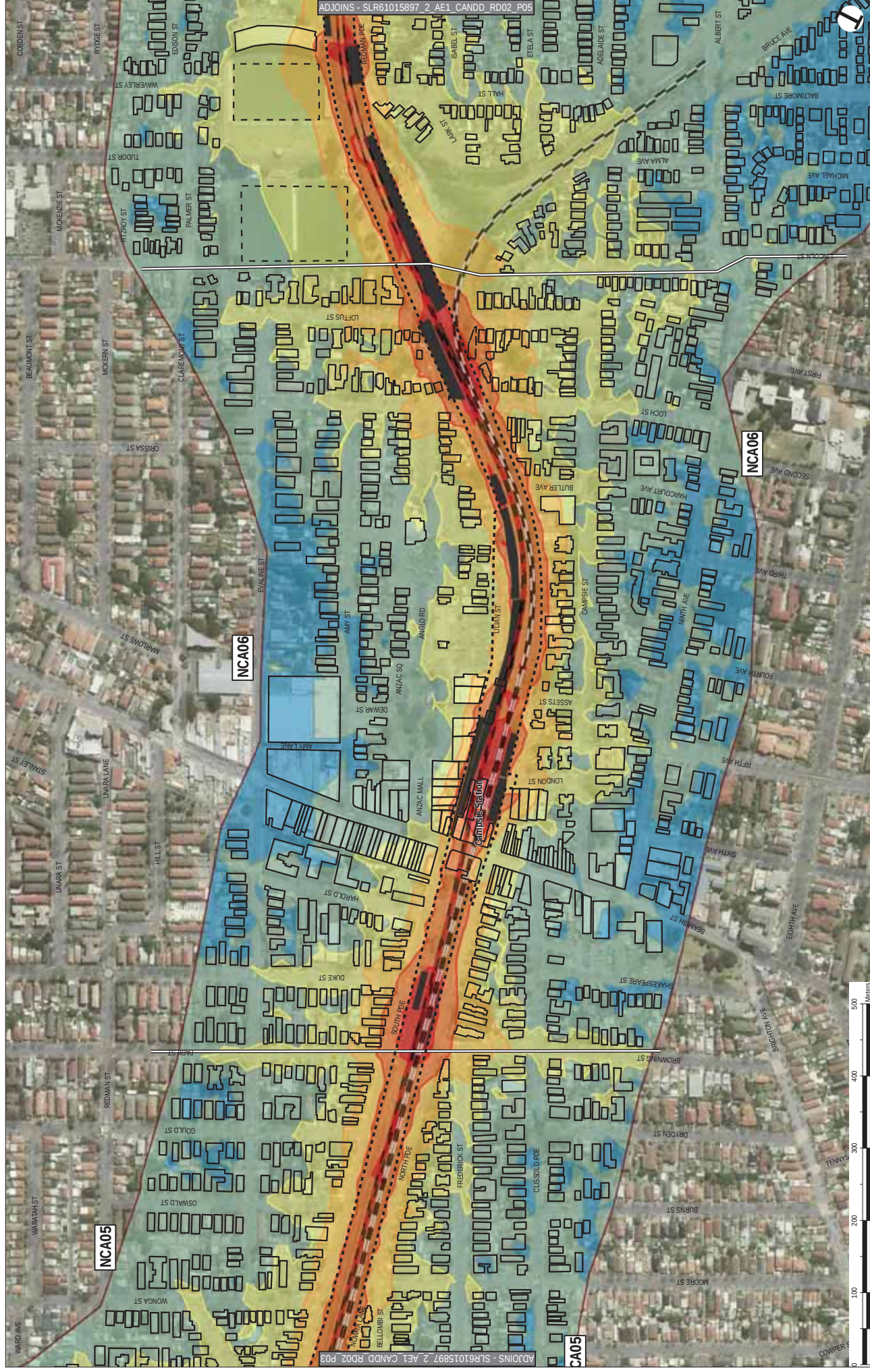
Worst Case Daytime Construction Noise
Project Area
Worksites

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

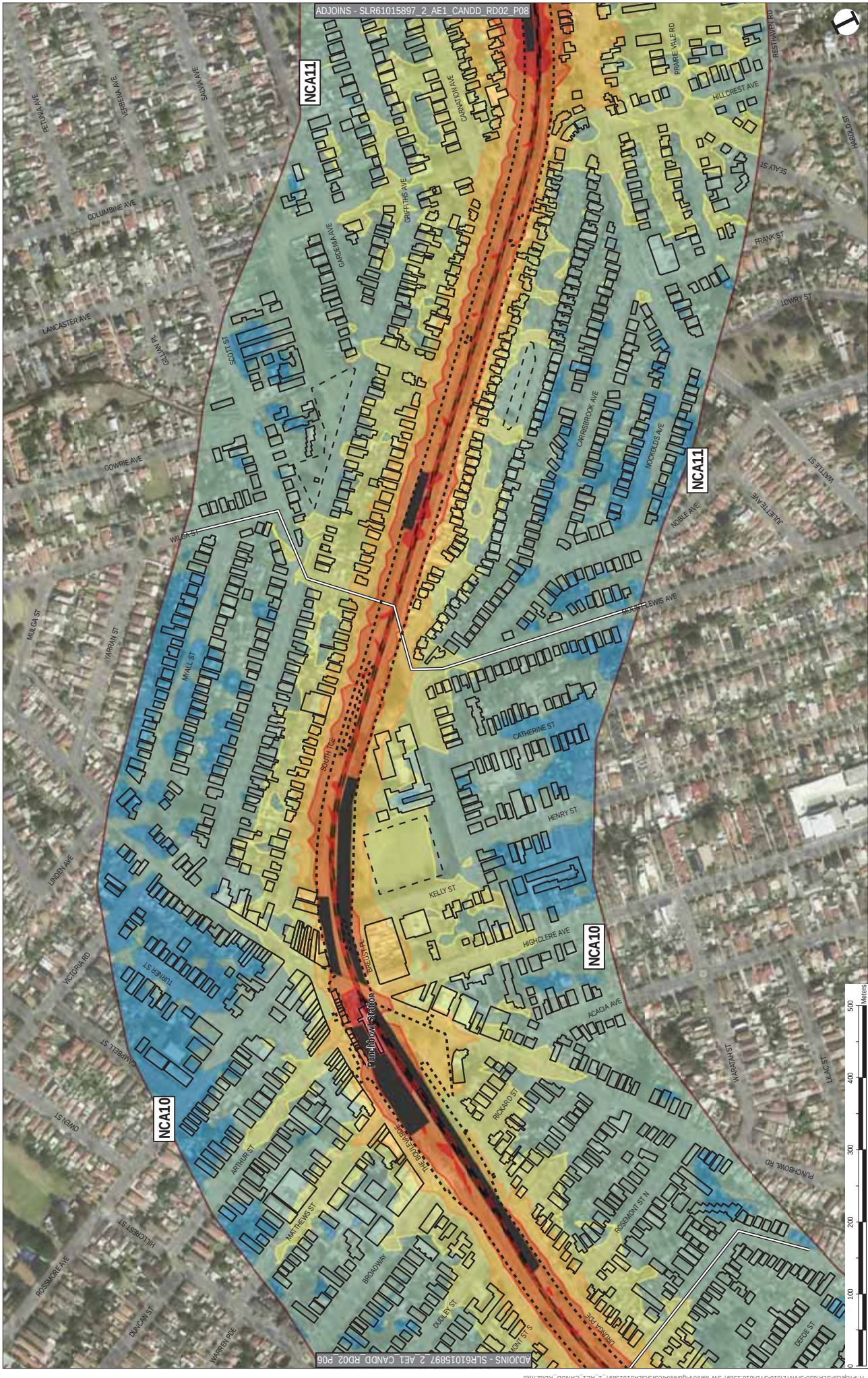
Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
> 70 dBA

Note:
Noise contours are indicative and represent the worst case noise levels predicted for all scenarios operating in the period.



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Assessed Receivers
Buildings
Outdoor

Work Sites
Project Area

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Worst Case Daytime Construction Noise
Project Area
Buildings
Outdoor

Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

Note:
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.





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Assessed Receivers

Buildings
Outdoor

Work Sites

Project Area

Noise Catchment Areas

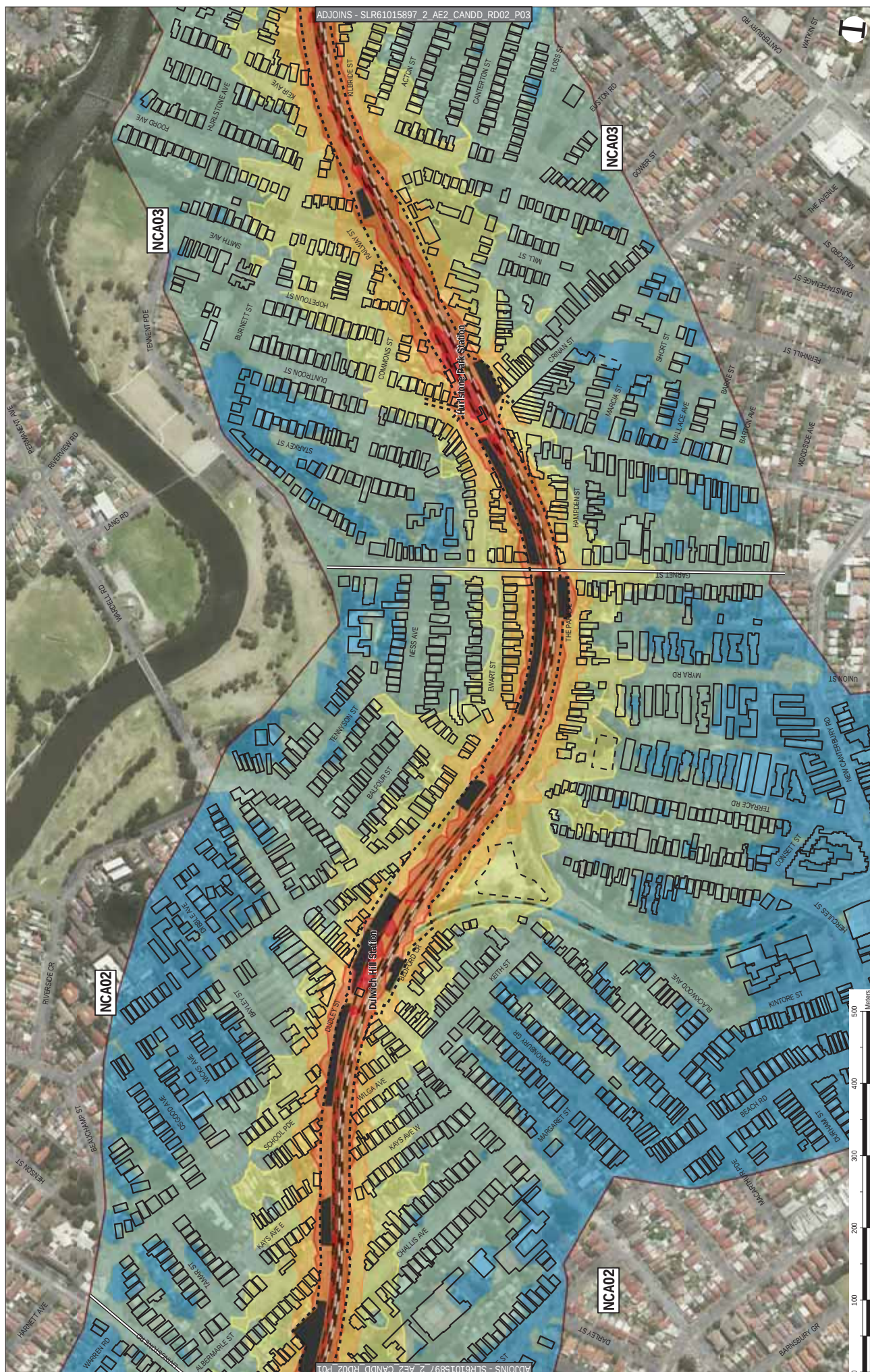
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Worst Case Daytime Construction Noise

< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
> 70 dBA

Note: Noise contours are indicative and represent the worst case noise levels predicted for all scenarios operating in the period.

Construction Airborne Noise Contours - Worst-Case Night-time LAeq(15minute) Construction Noise Predictions



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Noise Catchment Areas
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 Light Rail Tracks
 Metro Rail Tracks
 Sydney Trains Rail Tracks
 Noise Contour Calculation Boundary

Worst Case Night-time Construction Noise

< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA

Assessed Receivers

 Buildings

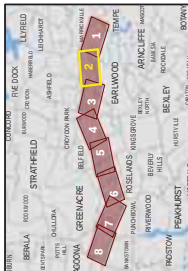
 Outdoor

Note:
* Noise contours are indicative

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Construction

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 Inham to Bankstown
 Airborne Noise Contours
 t-case Night-time
 dition Noise Predictions**
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 2 AF2 CANDD RD02 P02

ote: Noise contours are indicative and represent the worst-case noise levels predicted for all scenarios operating in the period



Noise Contour Calculation Boundary

ote: Noise contours are indicative and represent the worst-case noise levels predicted for all scenarios operating in the period





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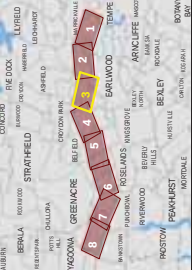
Assessed Receivers
Buildings
Outdoor

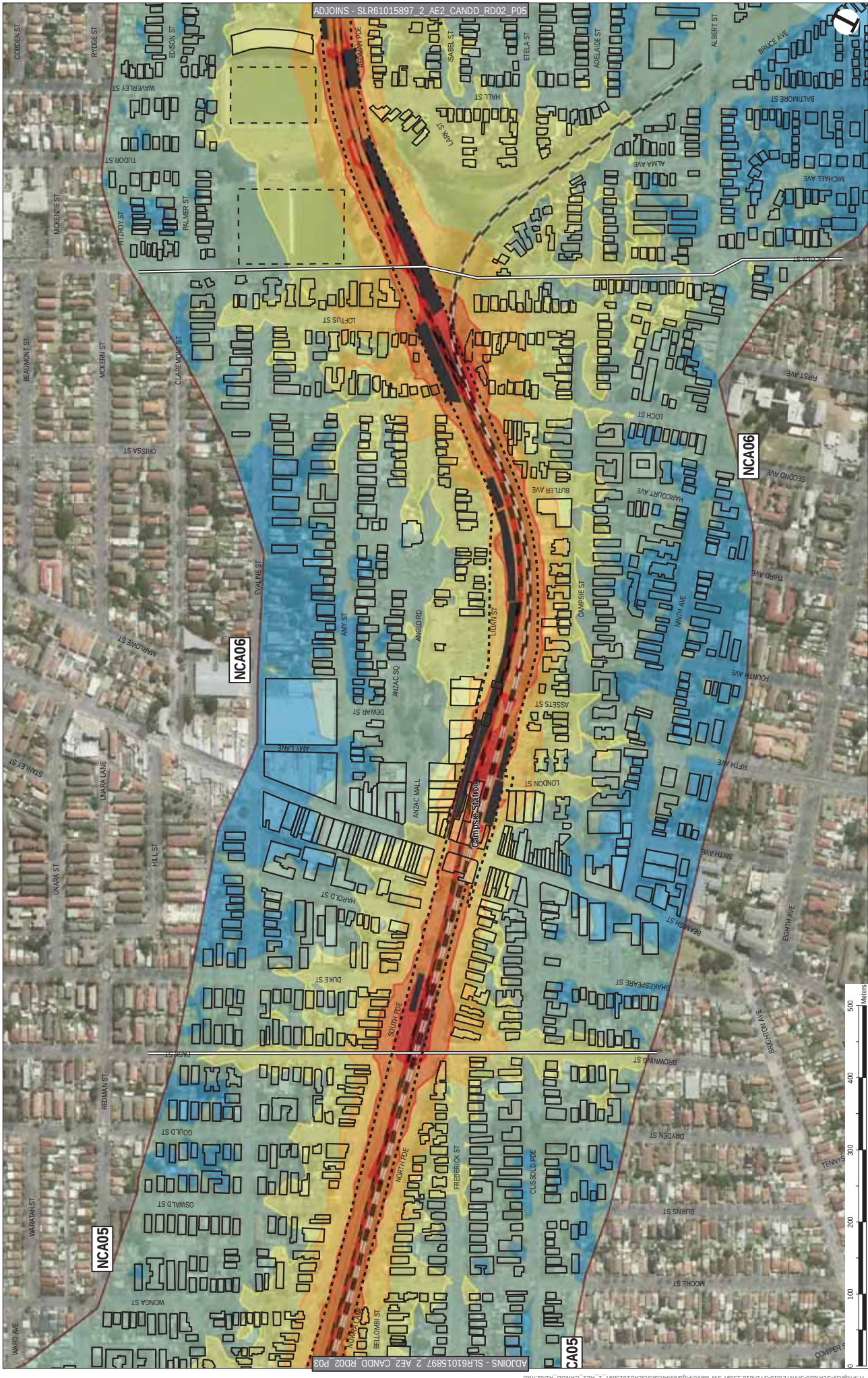
Worksites
Project Area

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Worst Case Night-time Construction Noise
Project Area
Buildings
Outdoor
Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

Note: Noise contours are indicative and represent the worst case noise levels predicted for all scenarios operating in the period.







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Construction Airborne Noise Contours
Worst-case Night-time
Construction Noise Predictions
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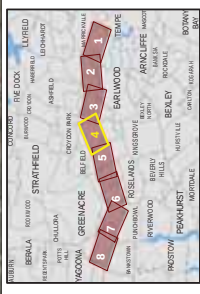
Assessed Receivers
Buildings
Outdoor

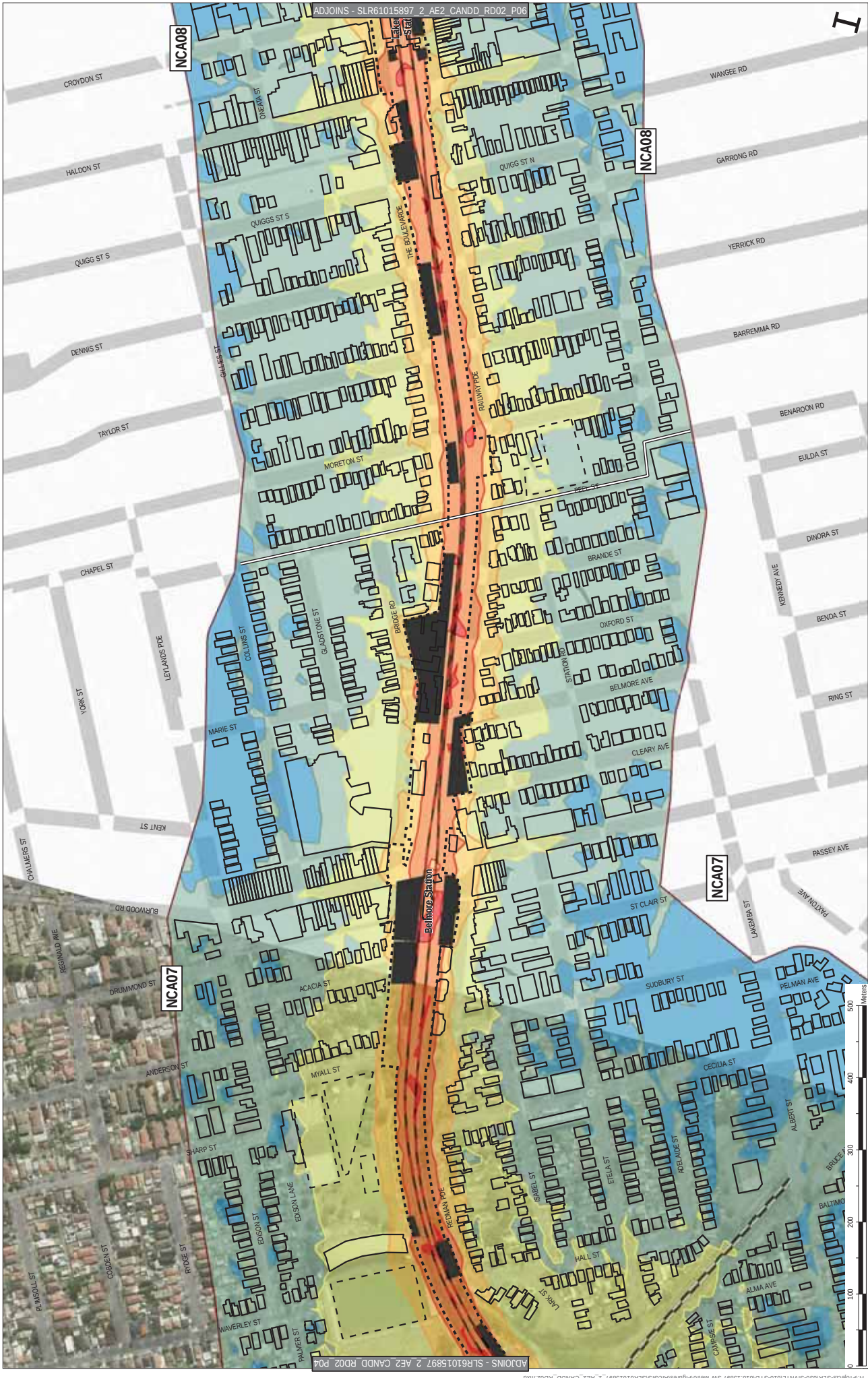
Worst Case Night-time Construction Noise
Project Area
Buildings
Outdoor
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Worksites
Project Area

Notes
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.







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Assessed Receivers

Buildings
Outdoor

Worst Case Night-time Construction Noise

< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

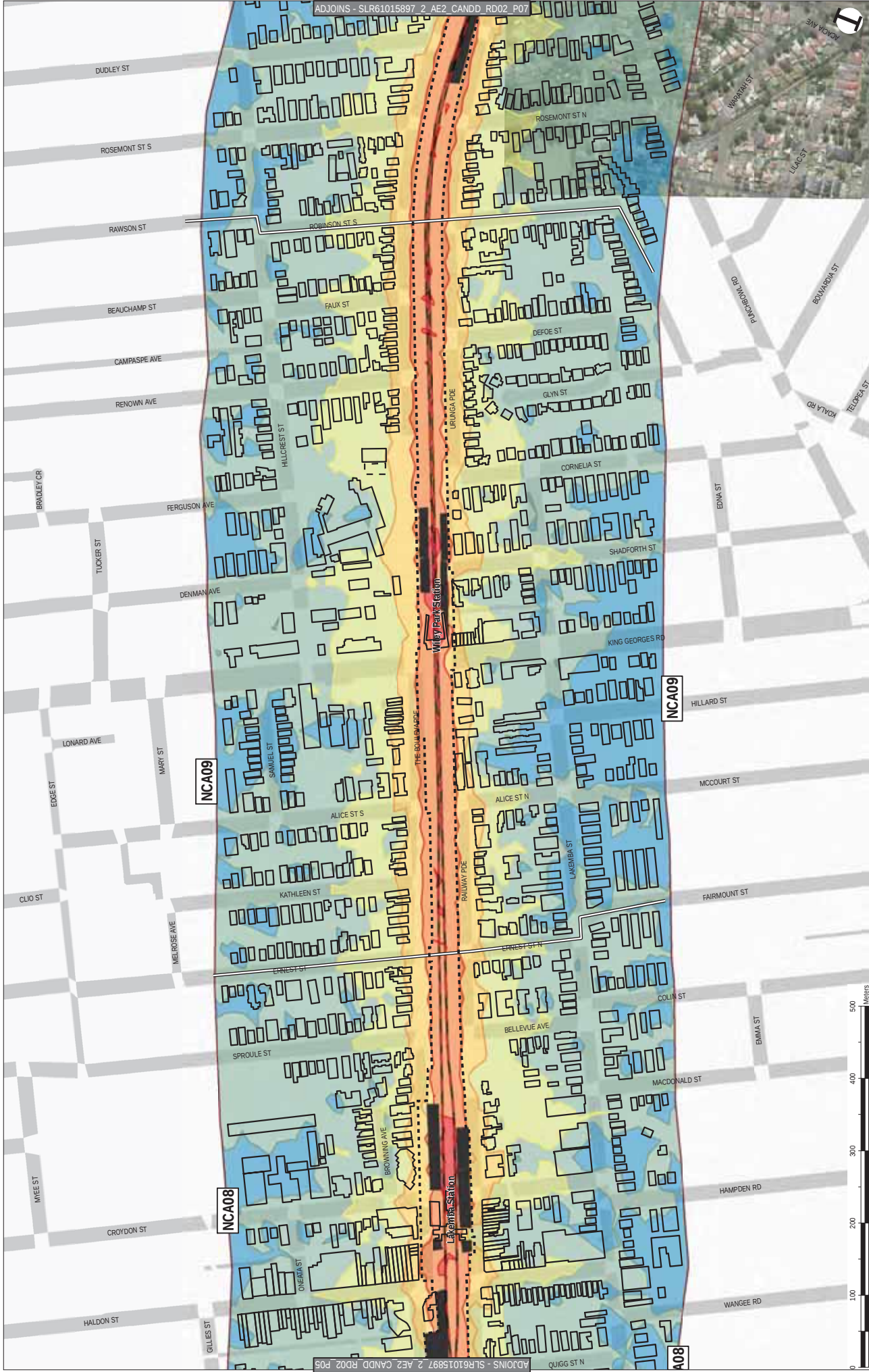
Work Sites

Project Area

Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Note:
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.





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Construction Airborne Noise Contours
Worst-case Night-time
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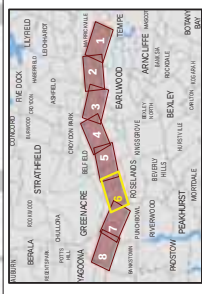
Worksites
Project Area

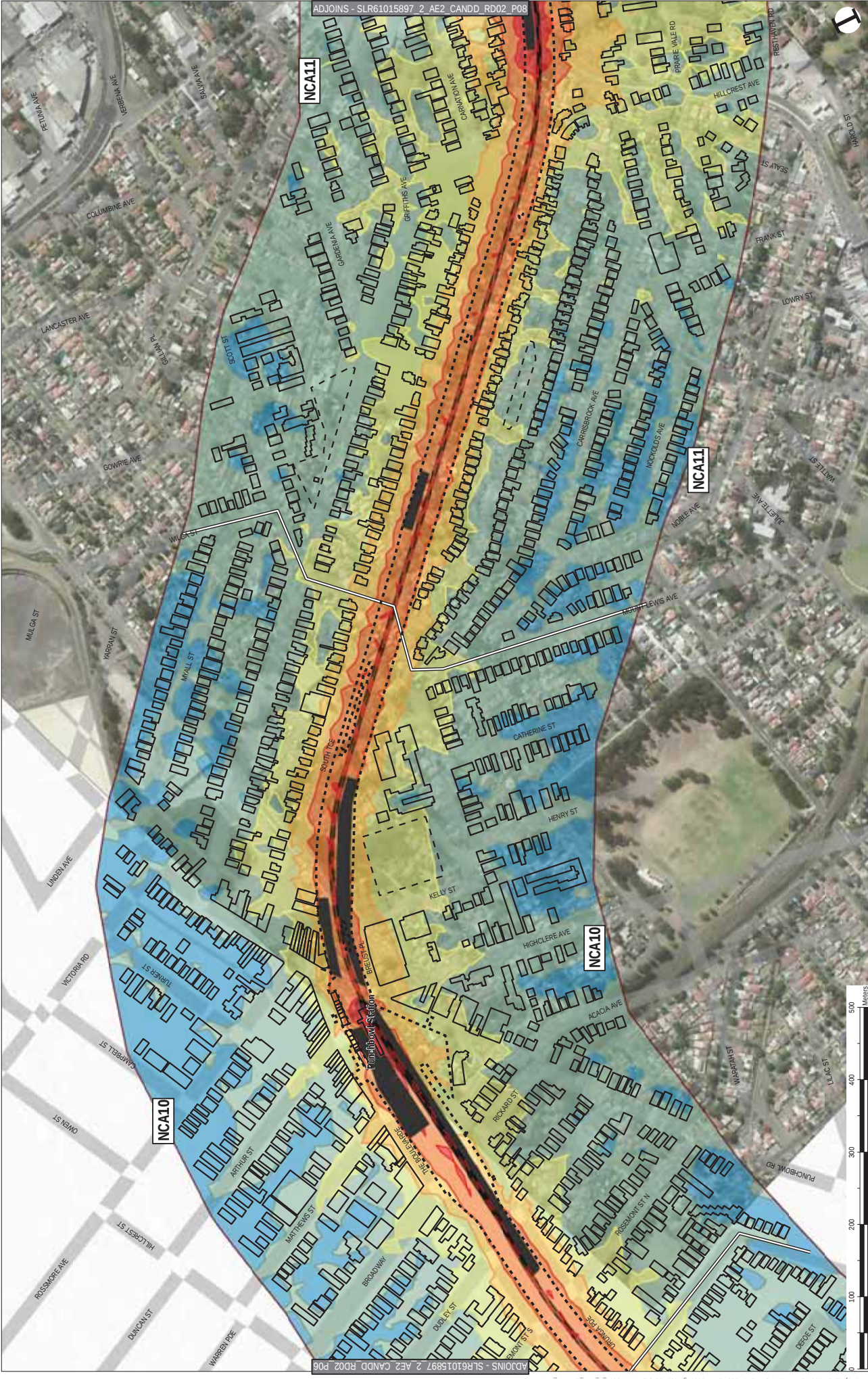
Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Assessed Receivers
Buildings
Outdoor

Worst Case Night-time Construction Noise
Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

Note:
Noise contours are indicative and represent the predicted noise levels for all scenarios operating in the period.





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Worst-case Night-time
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Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

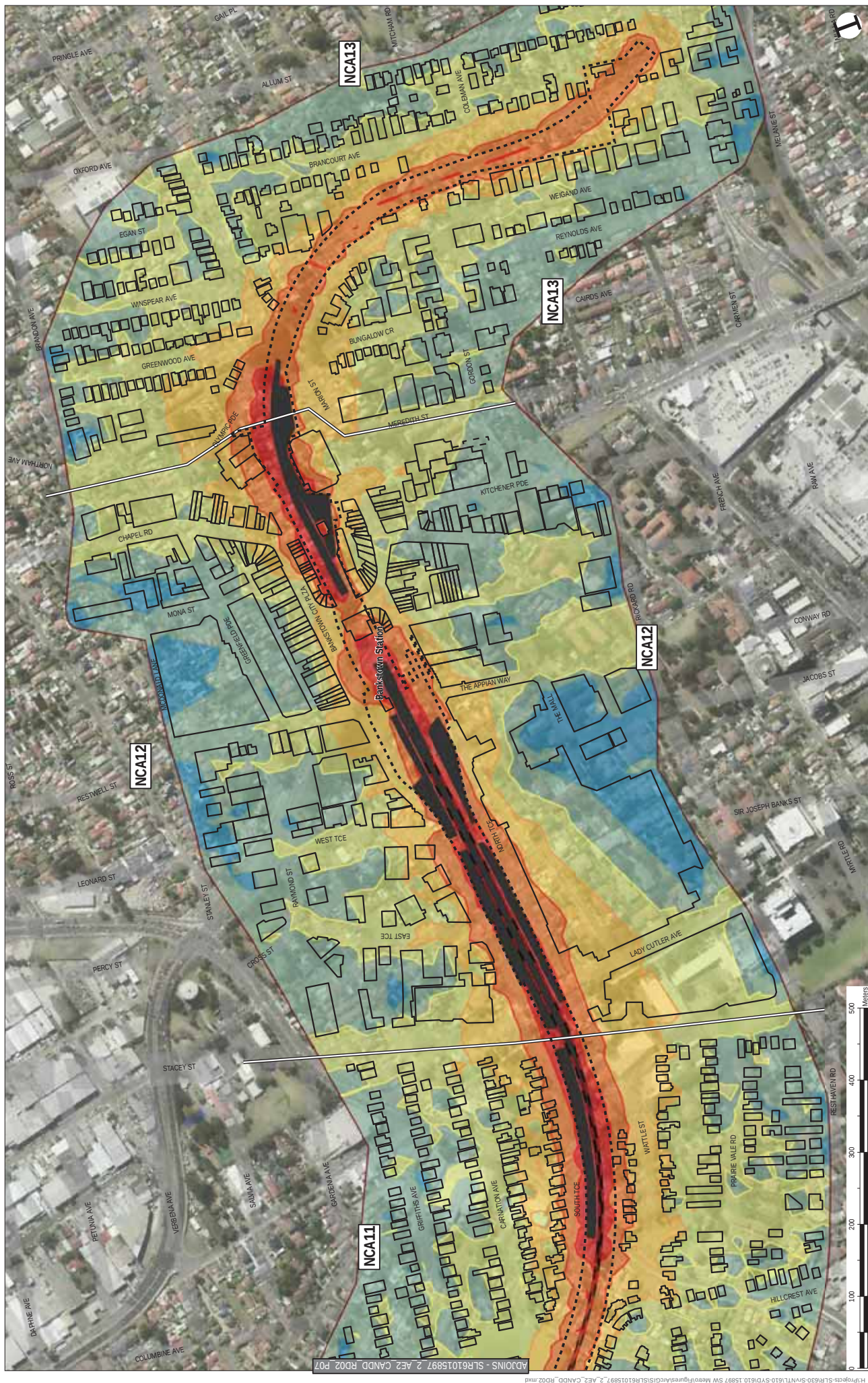
Work Sites
Project Area

Assessed Receivers
Buildings
Outdoor

Worst Case Night-time Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

Note:
Noise contours are indicative and represent the noise levels predicted for all scenarios operating in the period.

Map of Sydney Metro City & Southwest showing the project area and noise contours.





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Construction Noise Predictions
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Assessed Receivers
Buildings
Outdoor

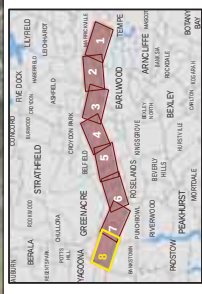
Worksites
Project Area

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

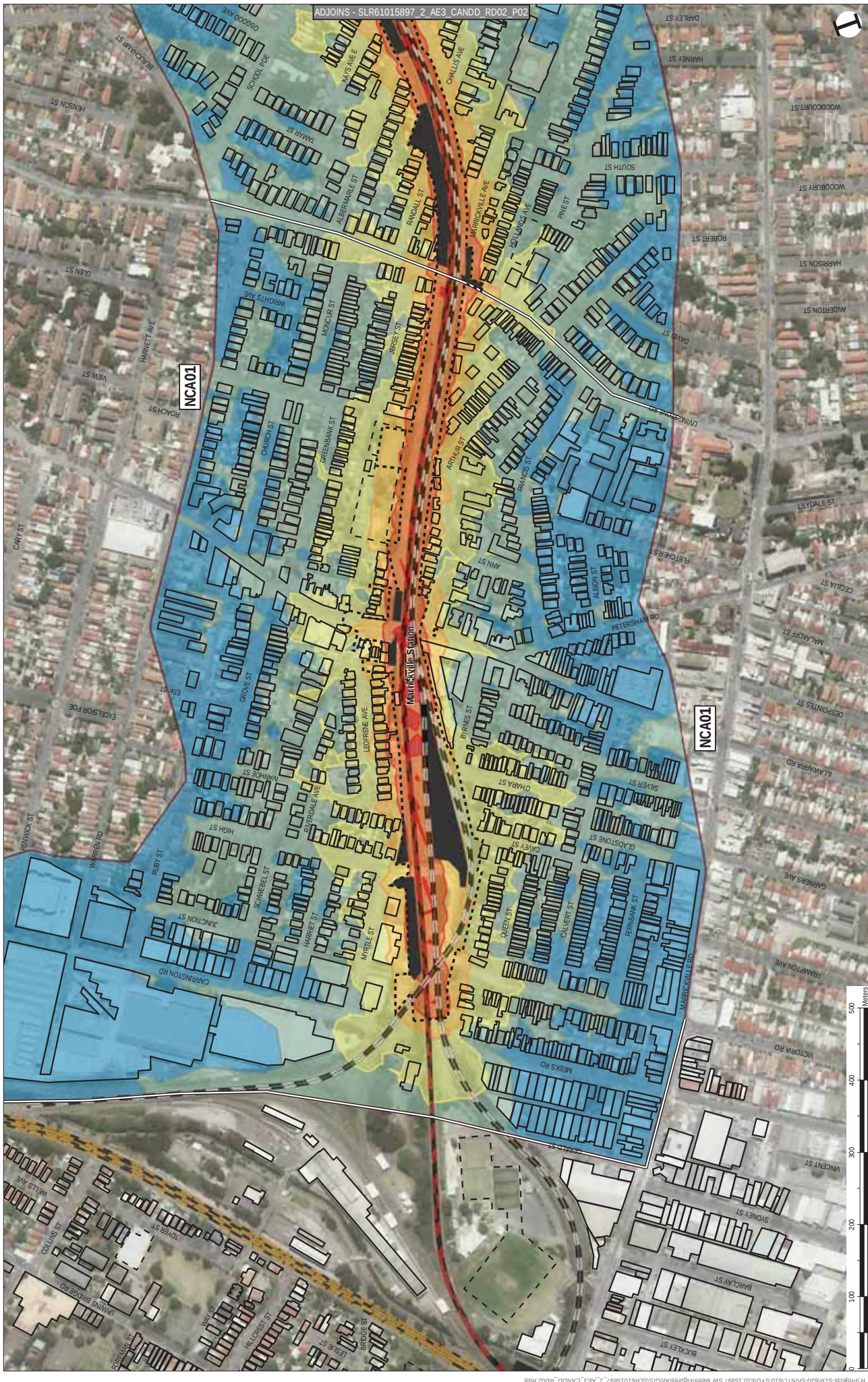
Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
> 70 dBA

Worst Case Night-time
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
> 70 dBA

Note: Noise contours are indicative and represent the worst case noise levels predicted for all scenarios operating in the period.



Construction Airborne Noise Contours
Worst-Case Night-time LAeq(15minute) (No Ballast Tamper) Construction Noise Predictions





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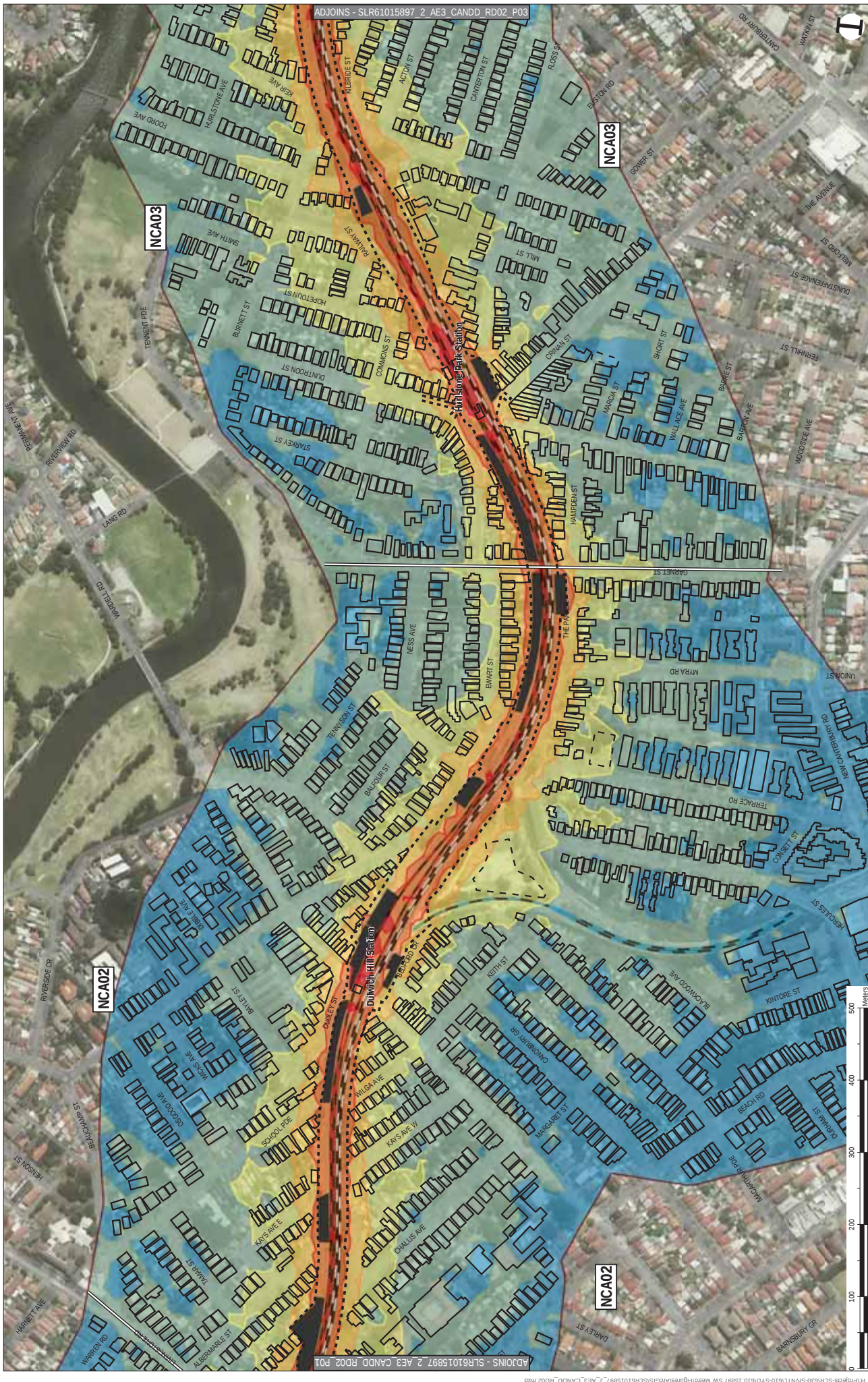
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Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Airborne Noise Contours
Worst-case Night-time (No Ballast Tamper) Construction Noise Predictions

Assessed Receivers
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Worst Case Night-time Construction Noise
Project Area
Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Note:
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the project.

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Transport for NSW

Sydney Metro City & Southwest

Sydenham to Bankstown

Construction Airborne Noise Contours

Worst-case Night-time (No Ballast Tamper) Construction Noise Predictions

ADJOINS - SLR61015897_2_AE3_CANDD_RD02_P03

Worst Case Night-time Construction Noise

Construction Noise	Assessed Receivers
< 40 dBA	Buildings
40 - 50 dBA	Outdoor
50 - 60 dBA	
60 - 70 dBA	
70 - 80 dBA	
> 80 dBA	

Note: Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the project.

Worksites

Project Area

Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

Metro Rail Tracks

Sydney Trains Rail Tracks

Noise Contour Calculation Boundary

Assessed Receivers

Buildings

Outdoor

Worst Case Night-time Construction Noise

Construction Noise	Assessed Receivers
< 40 dBA	Buildings
40 - 50 dBA	Outdoor
50 - 60 dBA	
60 - 70 dBA	
70 - 80 dBA	
> 80 dBA	

Note: Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the project.

ADJOINS - SLR61015897_2_AE3_CANDD_RD02_P02



Note:
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the worst case levels predicted for all
scenarios operating in the period.

Assessed Receivers

Buildings
Outdoor

Worst Case Night-time Construction Noise

Project Area

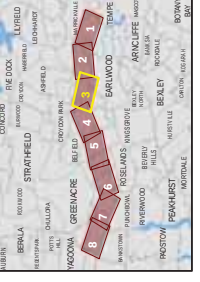
Worksites

Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Buildings
Outdoor

< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
70 - 80 dBA
> 80 dBA

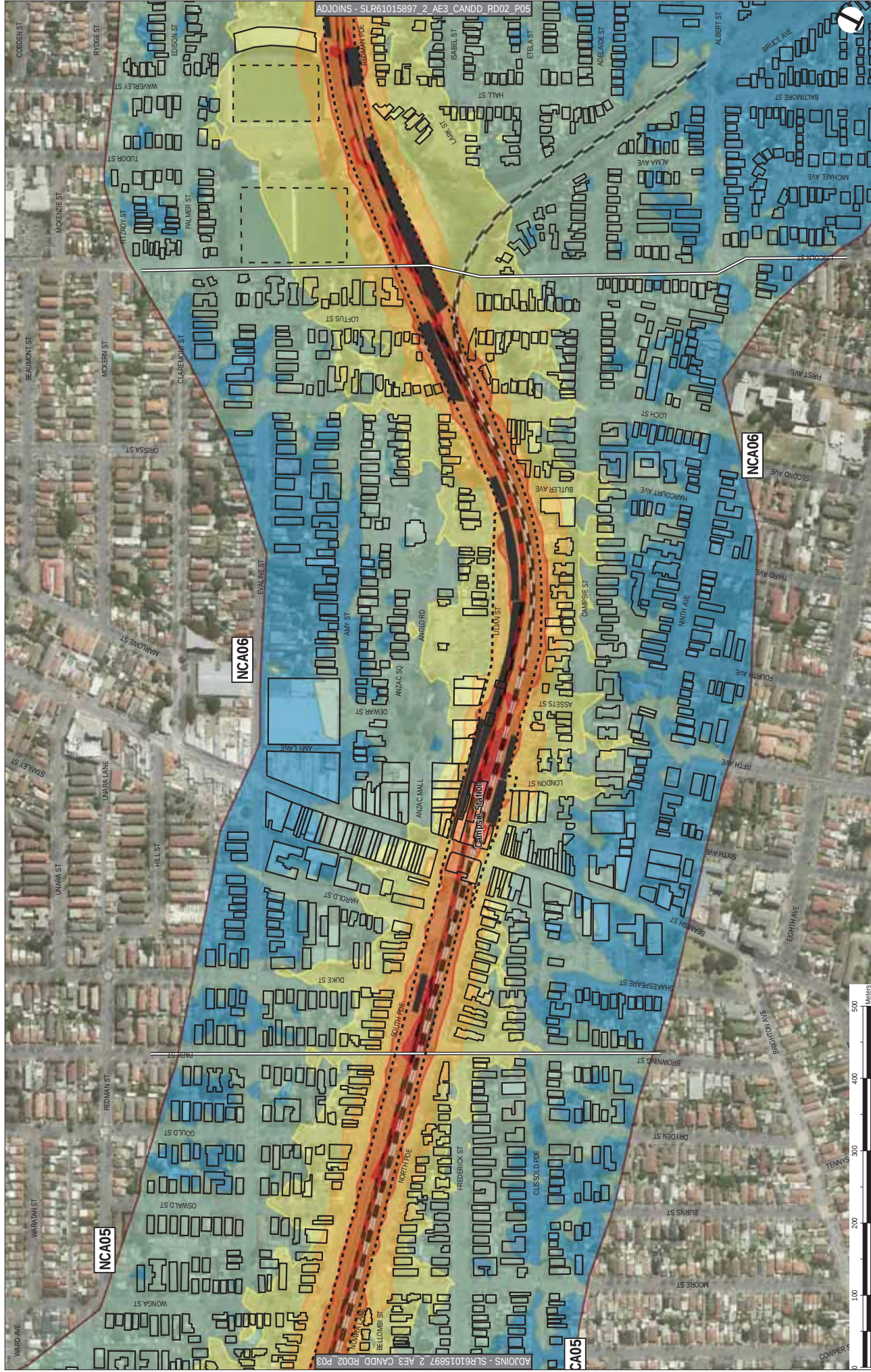


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Sydney Metro City & Southwest

Sydenham to Bankstown

Construction Airborne Noise Contours

Worst-case Night-time (No Ballast Tamper) Construction Noise Predictions

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SLR61015897_2_AE3_CANDD_RD02_P04

Assessed Receivers

Buildings

Outdoor

Worst Case Night-time Construction Noise

< 40 dBA

40 - 50 dBA

50 - 60 dBA

60 - 70 dBA

70 - 80 dBA

> 80 dBA

Worksites

Project Area

Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

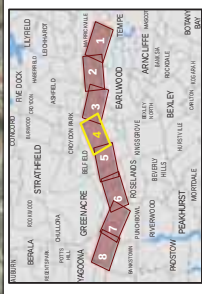
Metro Rail Tracks

Sydney Trains Rail Tracks

Noise Contour Calculation Boundary

Note:

Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.







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Sydenham to Bankstown
Construction Airborne Noise Contours
Worst-case Night-time (No Ballast
Tampers) Construction Noise Predictions

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ADJOINS - SLR61015897 2 AE3 CANDD RD02_P06

Worksites

Project Area

Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

Metro Rail Tracks

Sydney Trains Rail Tracks

Noise Contour Calculation Boundary

Assessed Receivers

Buildings

Outdoor

Worst Case Night-time Construction Noise

< 40 dBA

40 - 50 dBA

50 - 60 dBA

60 - 70 dBA

70 - 80 dBA

> 80 dBA

Note:
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.

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Construction Airborne Noise Contours
Worst-case Night-time (No Ballast Tamper) Construction Noise Predictions

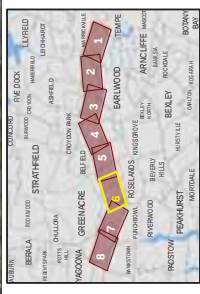
Assessed Receivers
Buildings
Outdoor

Worst Case Night-time Construction Noise
< 40 dBA
40 - 50 dBA
50 - 60 dBA
60 - 70 dBA
> 70 dBA

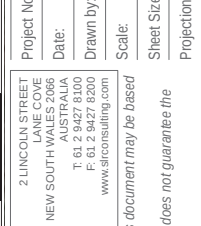
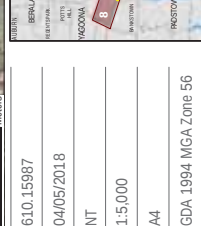
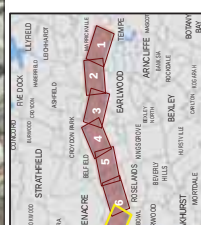
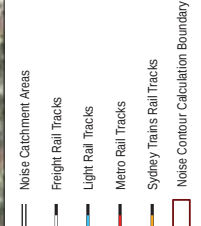
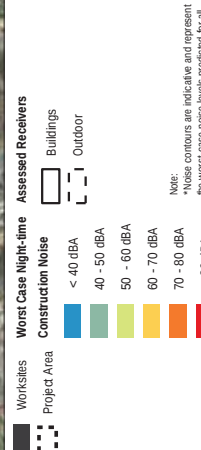
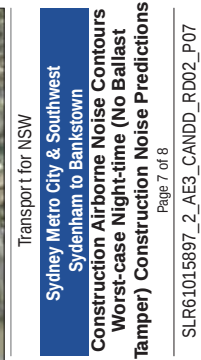
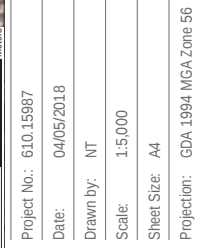
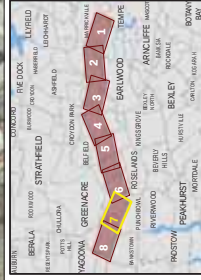
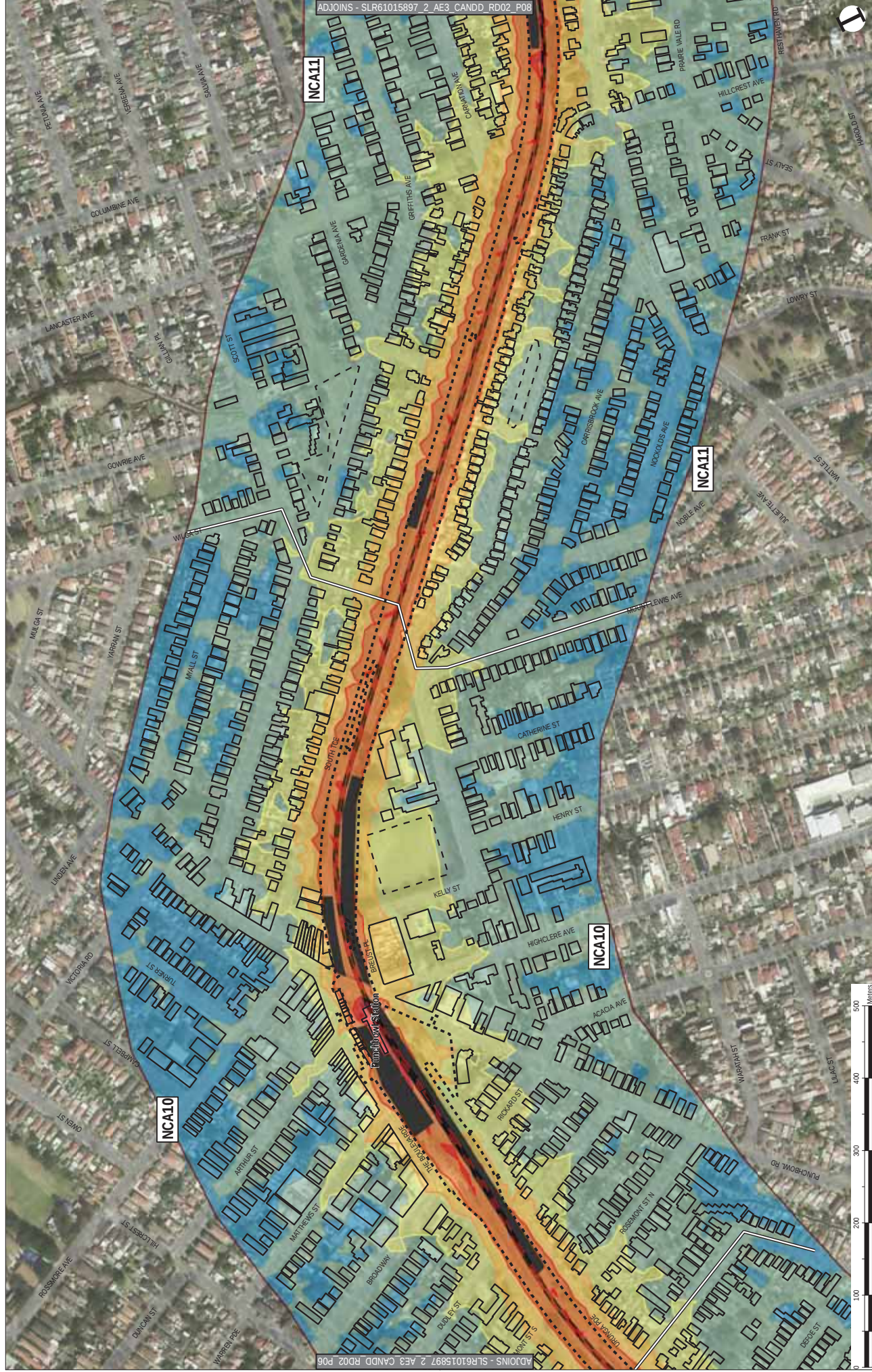
Worksites
Project Area

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Noise Contour Calculation Boundary

Note:
Noise contours are indicative and represent the worst case levels predicted for all scenarios operating in the period.



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Worst-case Night-time (No Ballast Tamper) Construction Noise Predictions

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Assessed Receivers

Buildings

Outdoor

Worst Case Night-time Construction Noise

< 40 dBA

40 - 50 dBA

50 - 60 dBA

60 - 70 dBA

70 - 80 dBA

> 80 dBA

Worksites

Project Area

Freight Rail Tracks

Light Rail Tracks

Metro Rail Tracks

Sydney Trains Rail Tracks

Noise Contour Calculation Boundary

Note:
Noise contours are indicative and represent the worst case noise levels predicted for all scenarios operating in the period.

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B1 - Construction Mitigation Daytime (Indicative)

B2 - Construction Mitigation Night-time (Indicative)

B3 - Construction Mitigation Night-time (Indicative) - No Ballast Tamper

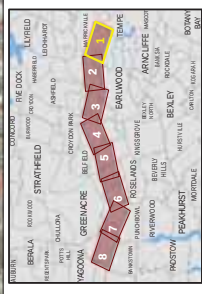
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Construction Mitigation
Daytime (Indicative)

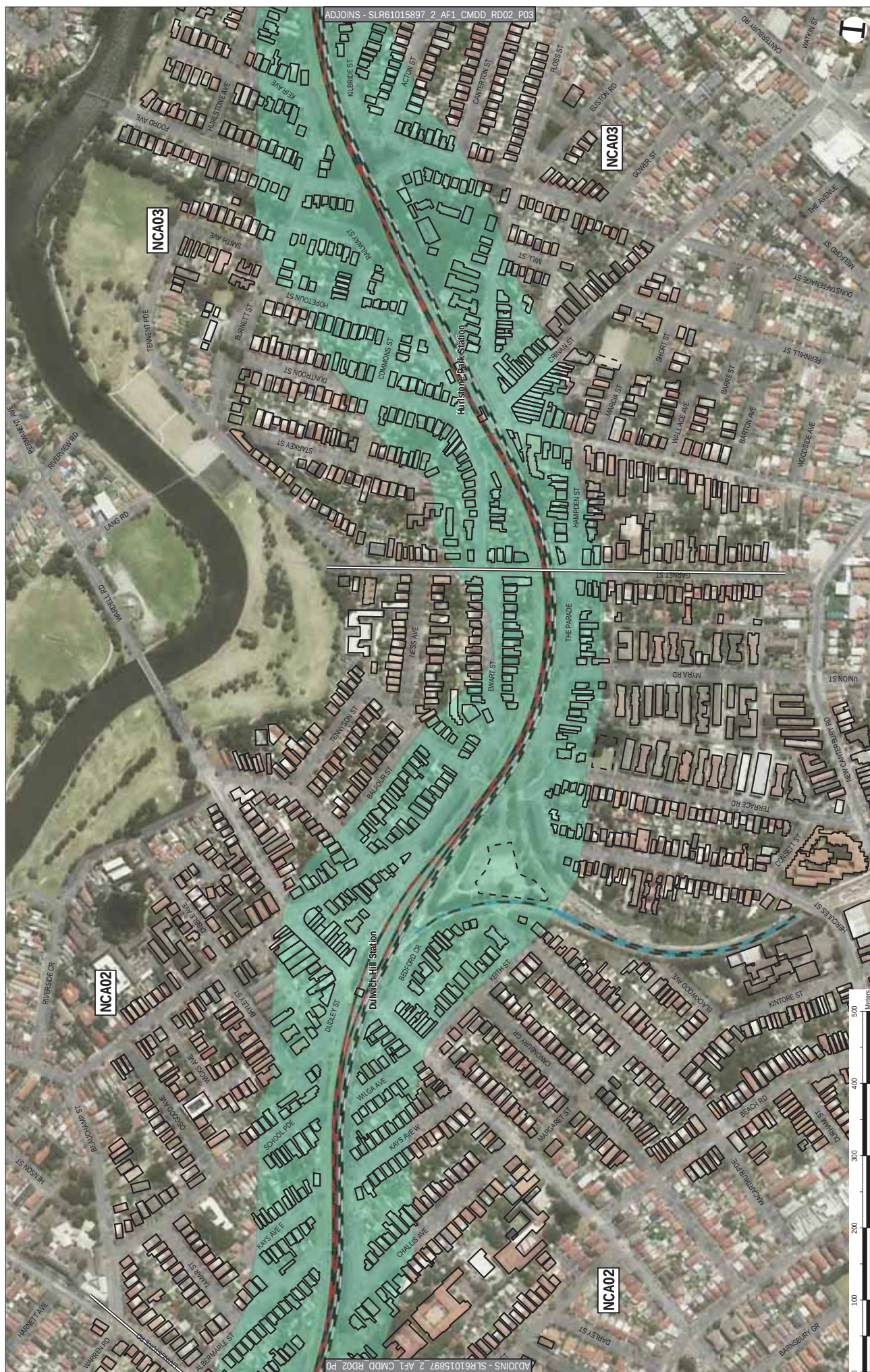
Construction Mitigation Areas

- Noise Catchment Areas
 - Freight Rail Tracks
 - Light Rail Tracks
 - Metro Rail Tracks
 - Sydney Trains Rail Tracks
- Assessed Receivers
 - M, LB
 - Buildings
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Note:
Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.



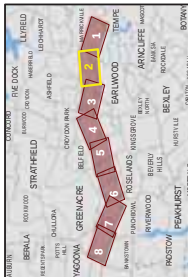
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Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Construction Mitigation Areas **Assessed Receivers**

M, LB Buildings Outdoor

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Note:
Construction mitigation areas are indicative.
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Daytime (Indicative)

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Construction Mitigation Areas

M, LB

Freight Rail Tracks

Light Rail Tracks

Metro Rail Tracks

Sydney Trains Rail Tracks

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NCA03

NCA04

NCA05

Note:

Construction mitigation areas are indicative

*The two most stringent mitigation categories have been shown only.

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Daytime (Indicative)

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Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Construction Mitigation Areas
M, LB

Assessed Receivers
Buildings
Outdoor

Legend
Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.



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Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Daytime (Indicative)

Page 5 of 8

Note:
 *Construction mitigation areas are indicative
 *The two most stringent mitigation categories have been shown only.

Construction Mitigation Areas **Assessed Receivers**

Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

Metro Rail Tracks

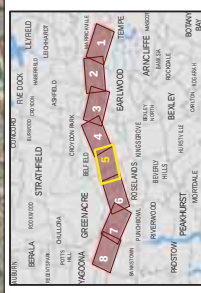
Sydney Trains Rail Tracks

M, LB

Buildings

Outdoor

Note:
*Construction



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Projection: GDA 1994 MGA Zone 56

BEHALA BEHALA POTTS SALICIA	GREENWICH GREENWICH POTTS SALICIA	STRATHFIELD STRATHFIELD POTTS SALICIA	THE DOCK THE DOCK POTTS SALICIA	LUTHER LUTHER POTTS SALICIA
---	---	---	---	---

Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

Light Rail Trains

 Metro Rail Tracks

Construction Mitigation Areas	Assessed Receivers
1. Construction Mitigation Areas 2. Assessed Receivers	

M, LB Buildings

Outdoor

Transport for NSW

**Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Daytime (Indicative)**

Page 6 of 8

Note:
*Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.

SLR61015897 2 AF1 CMDD RD02 P06

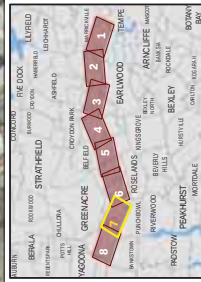


Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Daytime (Indicative)

Page 7 of 8

Note:
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Noise Catchment Areas	Construction Mitigation Areas	Assessed Receivers
Freight Rail Tracks	M, L.B	Buildings
Light Rail Tracks		Outdoor
Metro Rail Tracks		
Sydney Trains Rail Tracks		None



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Projection:	GDA 1994 MGA Zone 56

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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Daytime (Indicative)

Assessed Receivers

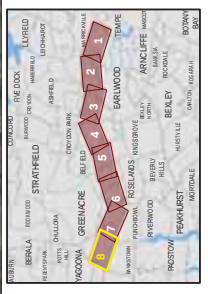
Buildings
Outdoor

Construction Mitigation Areas

M, LB

Noise Catchment Areas

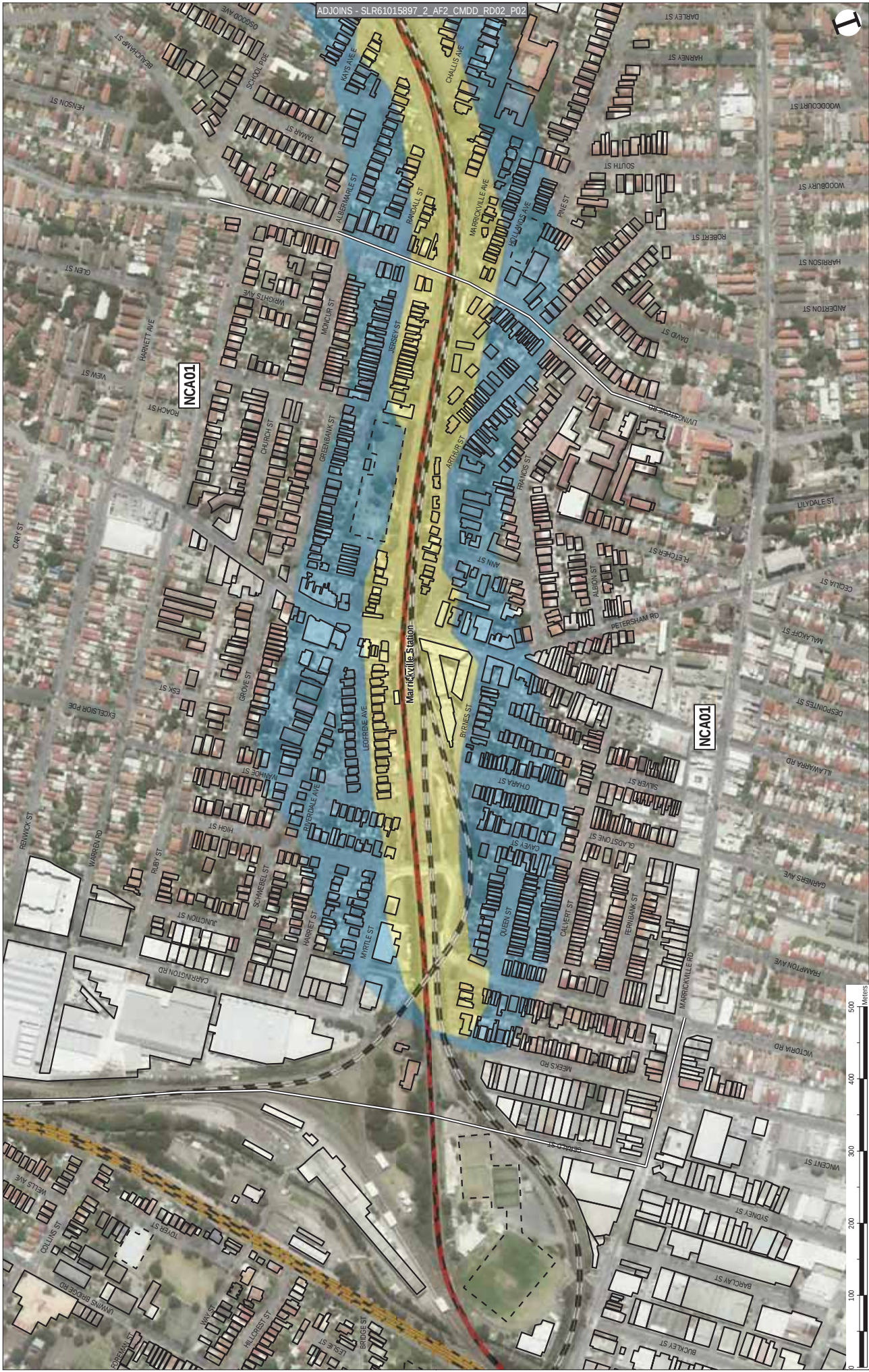
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks



Note:
Construction mitigation areas are indicative
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Construction Additional Mitigation - Construction Mitigation Night-time (Indicative)





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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

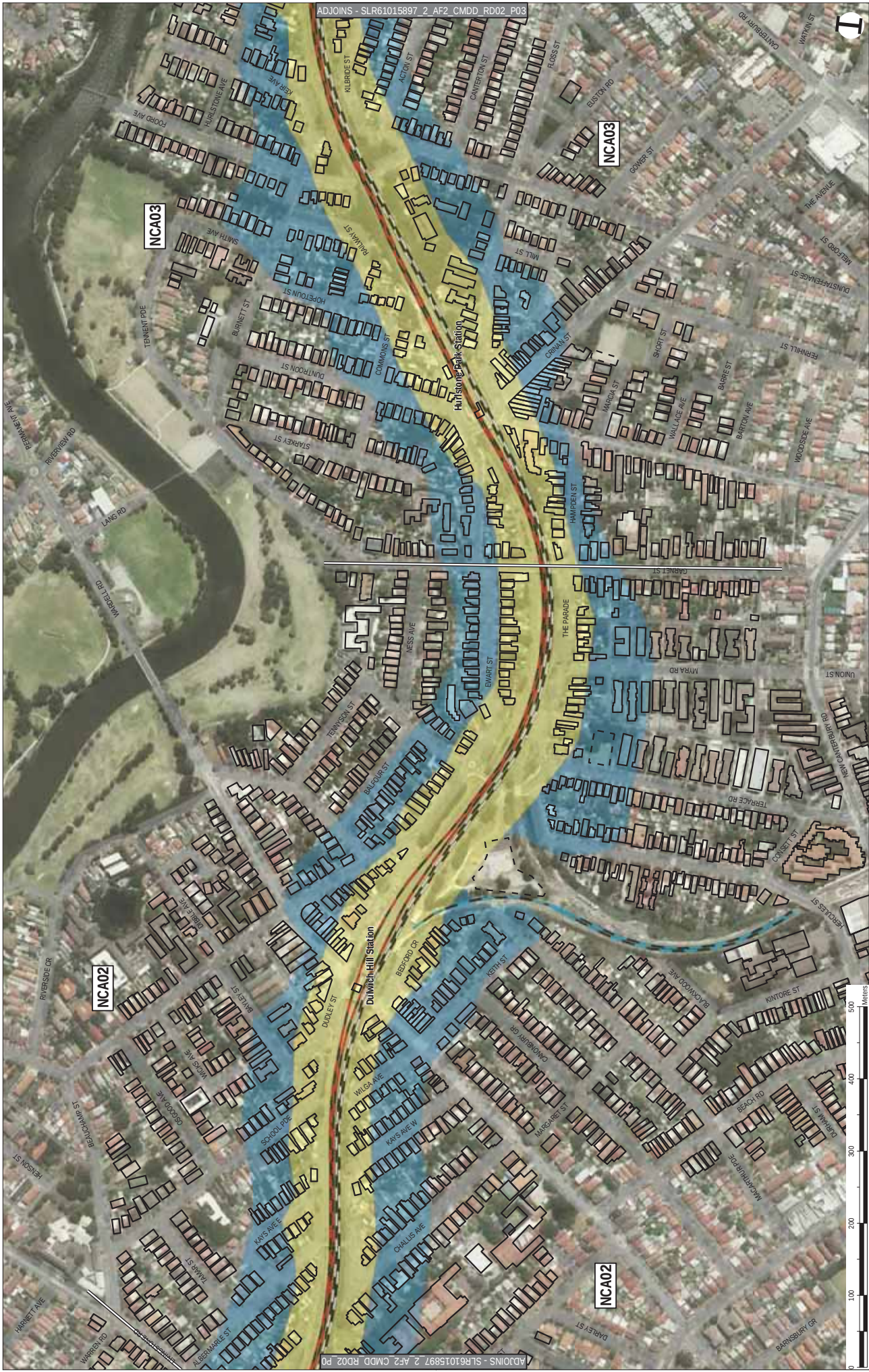
Construction Mitigation Areas
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Assessed Receivers
Buildings
Outdoor

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Note:
Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.

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Transport for NSW
Sydney Metro City & Southwest
Construction Mitigation
Night-time (Indicative)

Construction Mitigation Areas

- AA, M, IB, LB, PC, SN
- M, IB, LB, PC, SN

Noise Catchment Areas

- Freight Rail Tracks
- Light Rail Tracks
- Metro Rail Tracks
- Sydney Trains Rail Tracks

Assessed Receivers

- Buildings
- Outdoor

Legend

- AA, M, IB, LB, PC, SN
- M, IB, LB, PC, SN
- Freight Rail Tracks
- Light Rail Tracks
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- Buildings
- Outdoor

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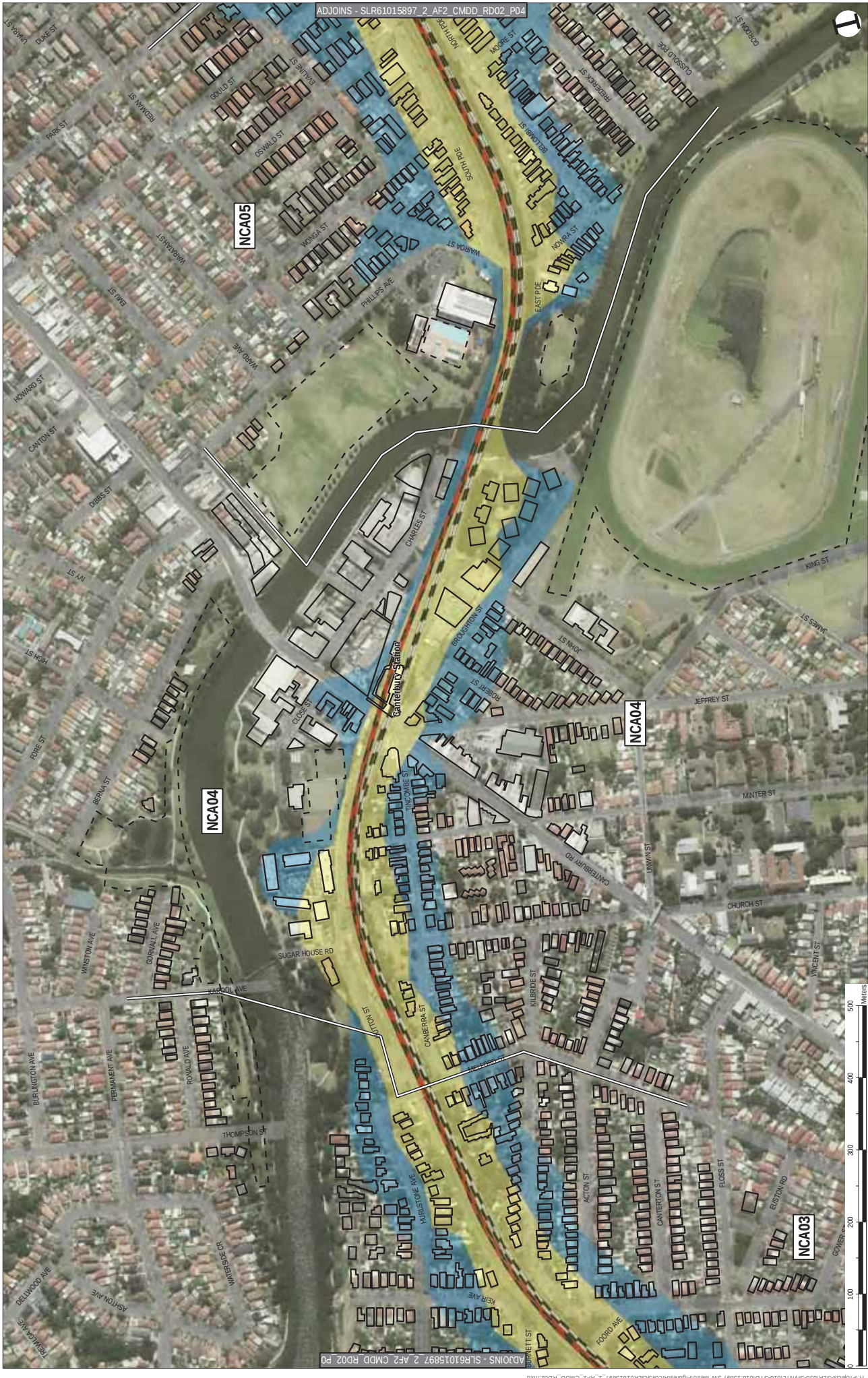
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WENTWORTH
MCCOY
GREENACRE
STRANFIELD
REDOOK
LUNED
WENTWORTH
MCCOY
GREENACRE
STRANFIELD
REDOOK
LUNED

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Transport for NSW

Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

Construction Mitigation Areas

AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Assessed Receivers

Buildings
Outdoor

Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

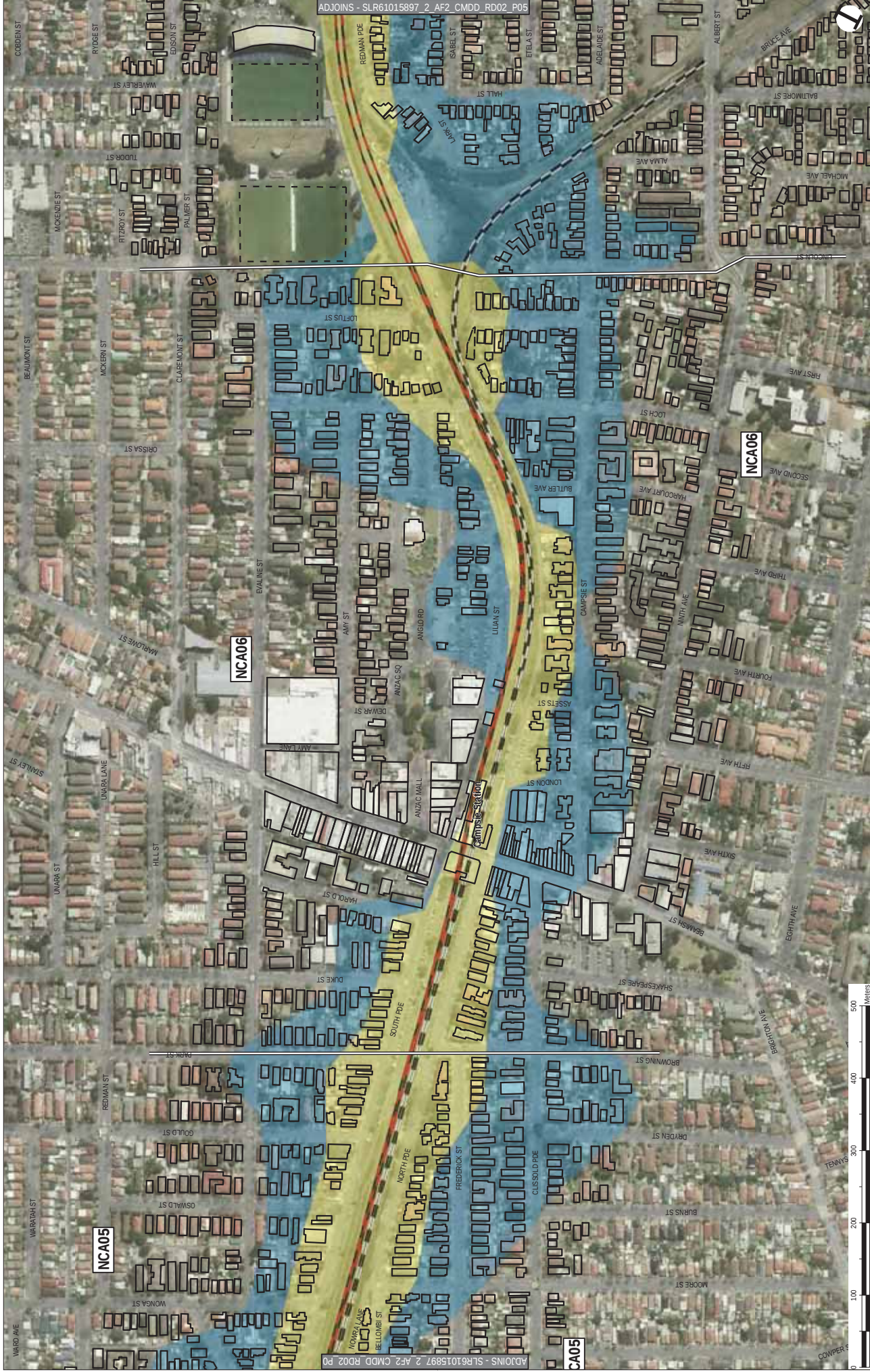
Map of Sydney Metro City & Southwest project area showing construction mitigation areas (NCA03, NCA04, NCA05) and assessed receivers (buildings and outdoor).

Map of Sydney Metro City & Southwest project area showing construction mitigation areas (NCA03, NCA04, NCA05) and assessed receivers (buildings and outdoor).

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SLR61015897_2_AF2_CMDD_RD02_P03

Note: Construction mitigation areas are indicative
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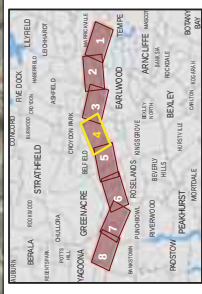
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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

Construction Mitigation Areas
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

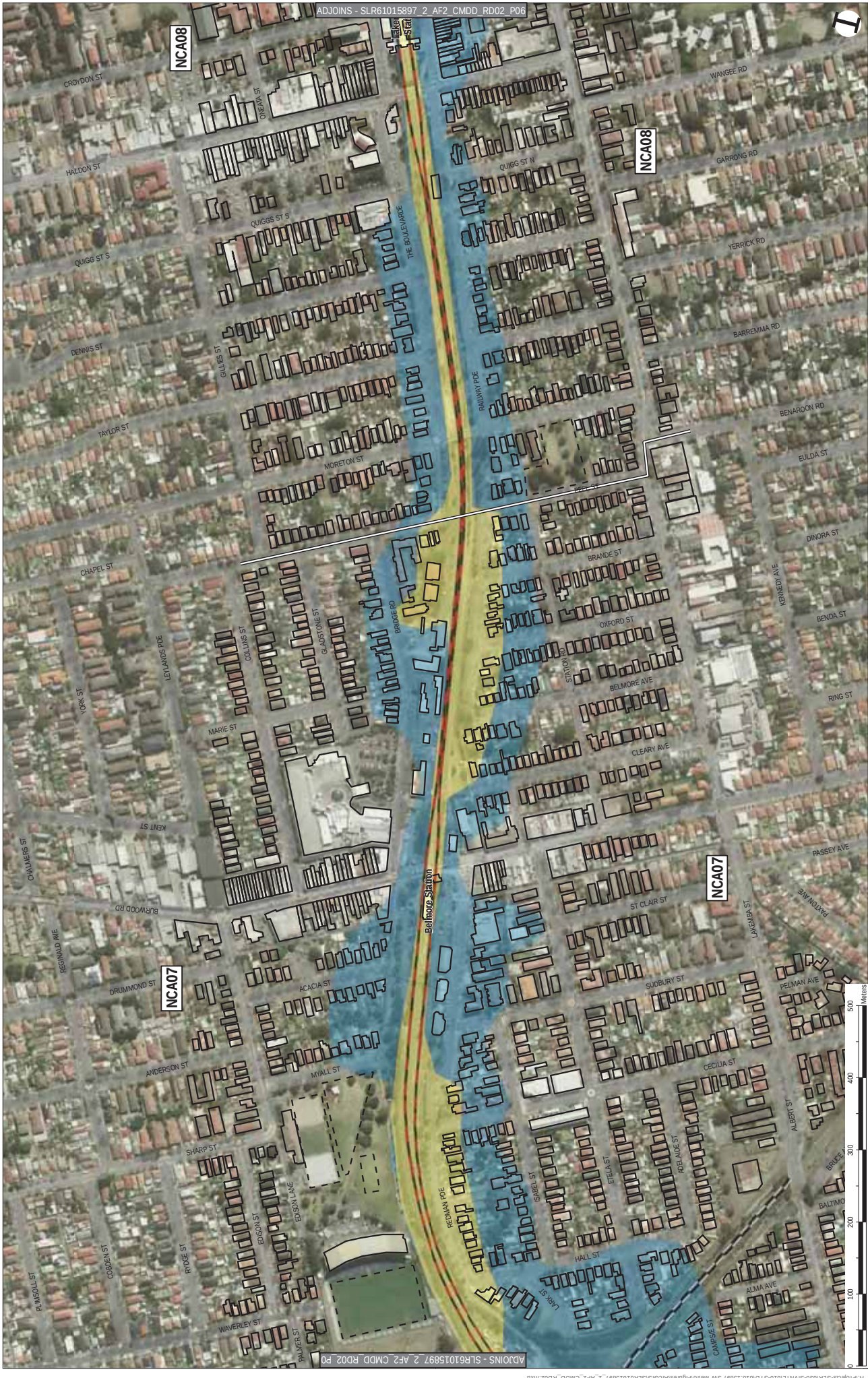
Assessed Receivers
Buildings
Outdoor



Legend
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks
Buildings
Outdoor

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SLR61015987_2_AF2_CMDD_RD02_P04

Note:
Construction mitigation areas are indicative
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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

Construction Mitigation Areas

AA, M, IB, LB, PC, SN	Buildings
M, IB, LB, PC, SN	Outdoor

Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

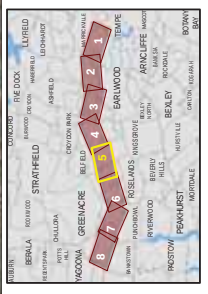
Assessed Receivers

Buildings
Outdoor

Legend

AA, M, IB, LB, PC, SN	Buildings
M, IB, LB, PC, SN	Outdoor

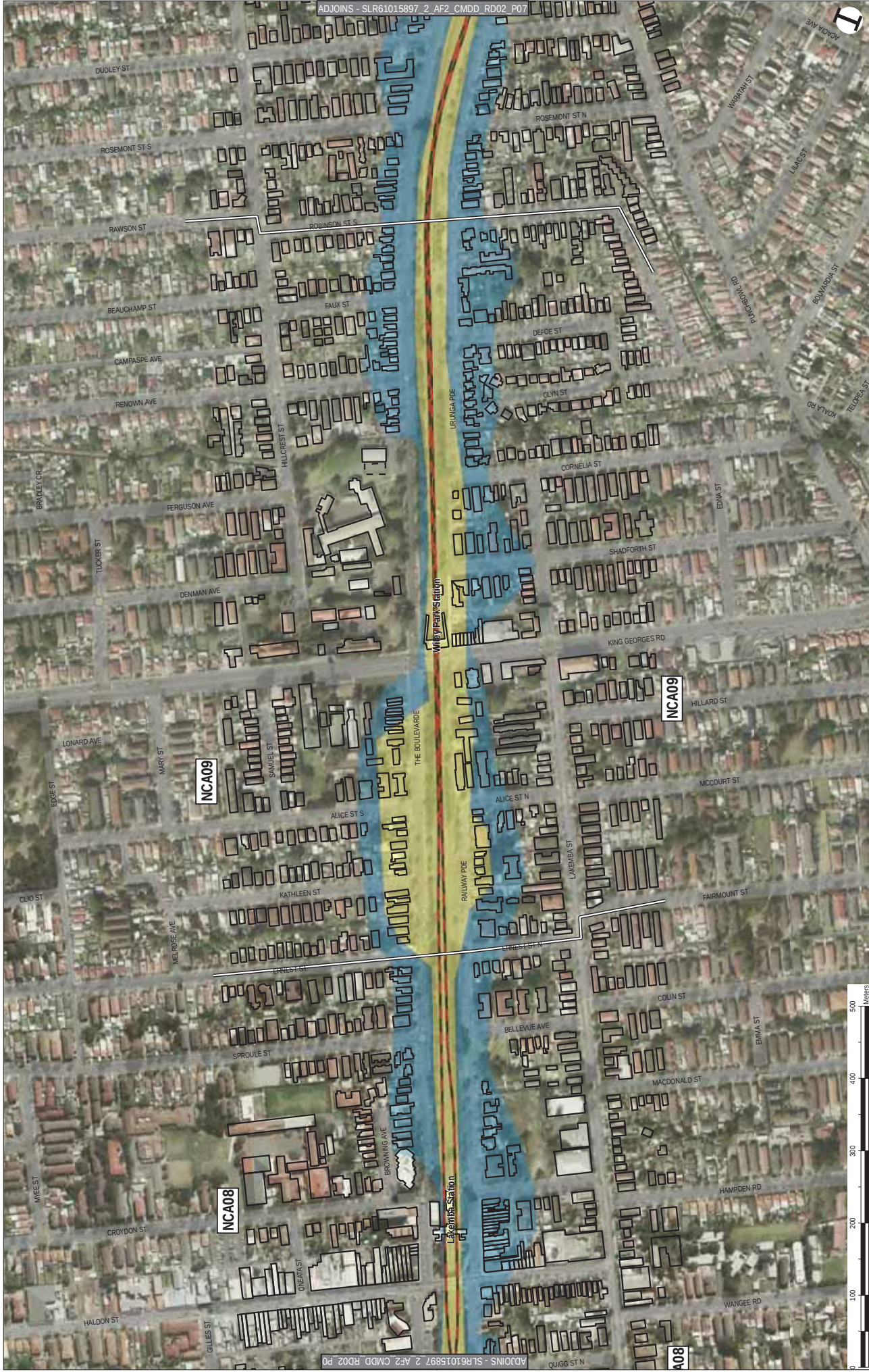
Map Index



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Note:
Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.





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Sydneyham to Bankstown
Construction Mitigation
Night-time (Indicative)

ADJOINS - SLR61015897_2_AF2_CMDD_RD02_P07

ADJOINS - SLR61015897_2_AF2_CMDD_RD02_P0

Construction Mitigation Areas

AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Assessed Receivers

Buildings
Outdoor

Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Map of Sydney Metro City & Southwest project area showing noise catchment areas and assessed receivers.

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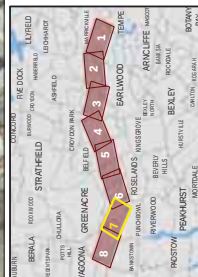
Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

Page 7 of 8

Note:
Construction mitigation areas are indicative.
The two most stringent mitigation categories have been shown only.

Noise Catchment Areas	Construction Mitigation Areas	Assessed Receivers
Freight Rail Tracks	AA, M, LB, PC, SN	Buildings
Light Rail Tracks	M, LB, PC, SN	Outdoor
Metro Rail Tracks		
Sydney Trans Rail Tracks		

Notes:

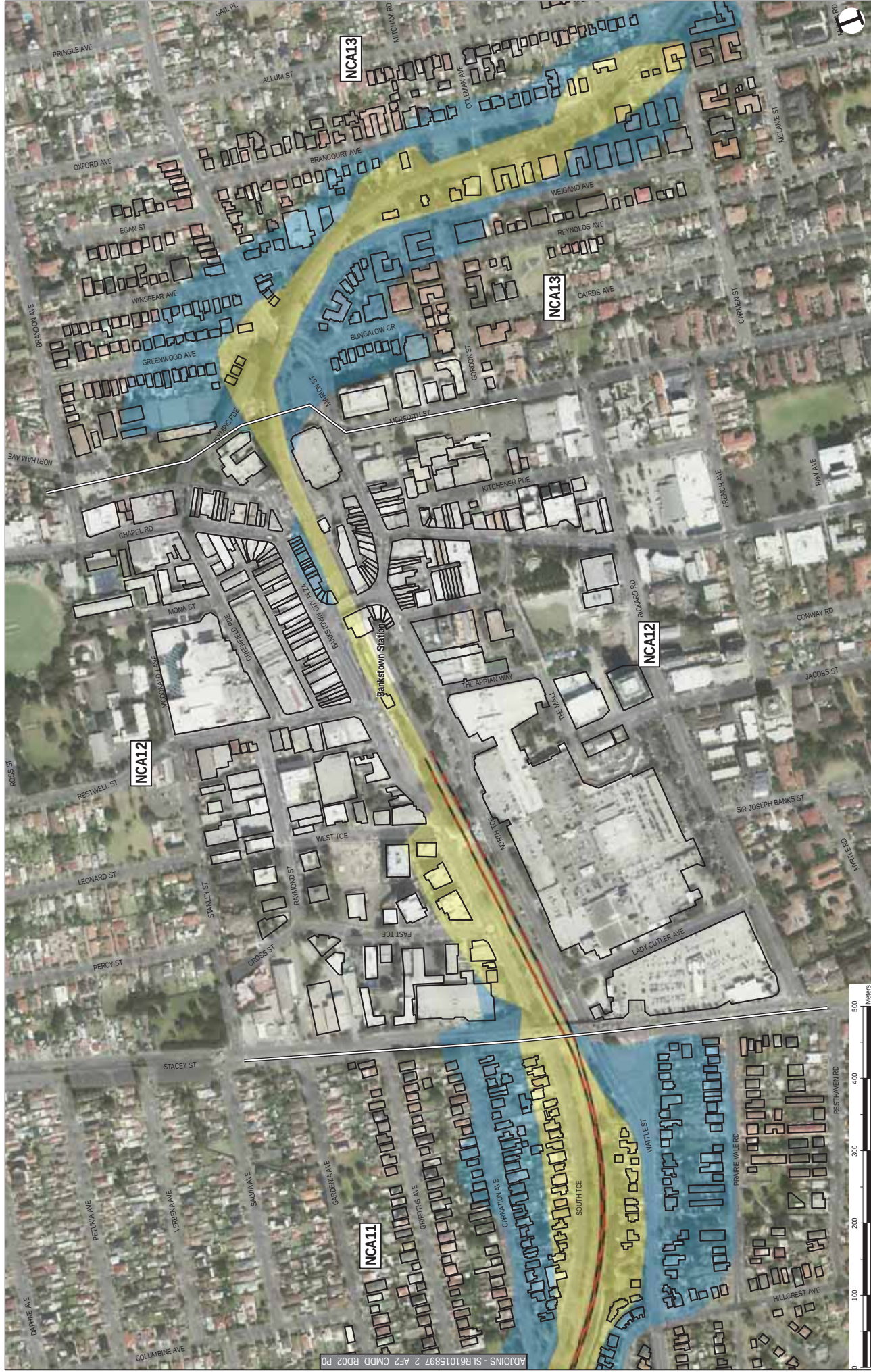


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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)

Construction Mitigation Areas

AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

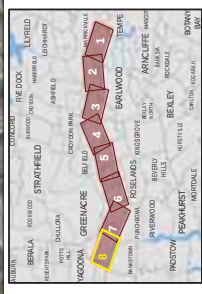
Noise Catchment Areas

Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

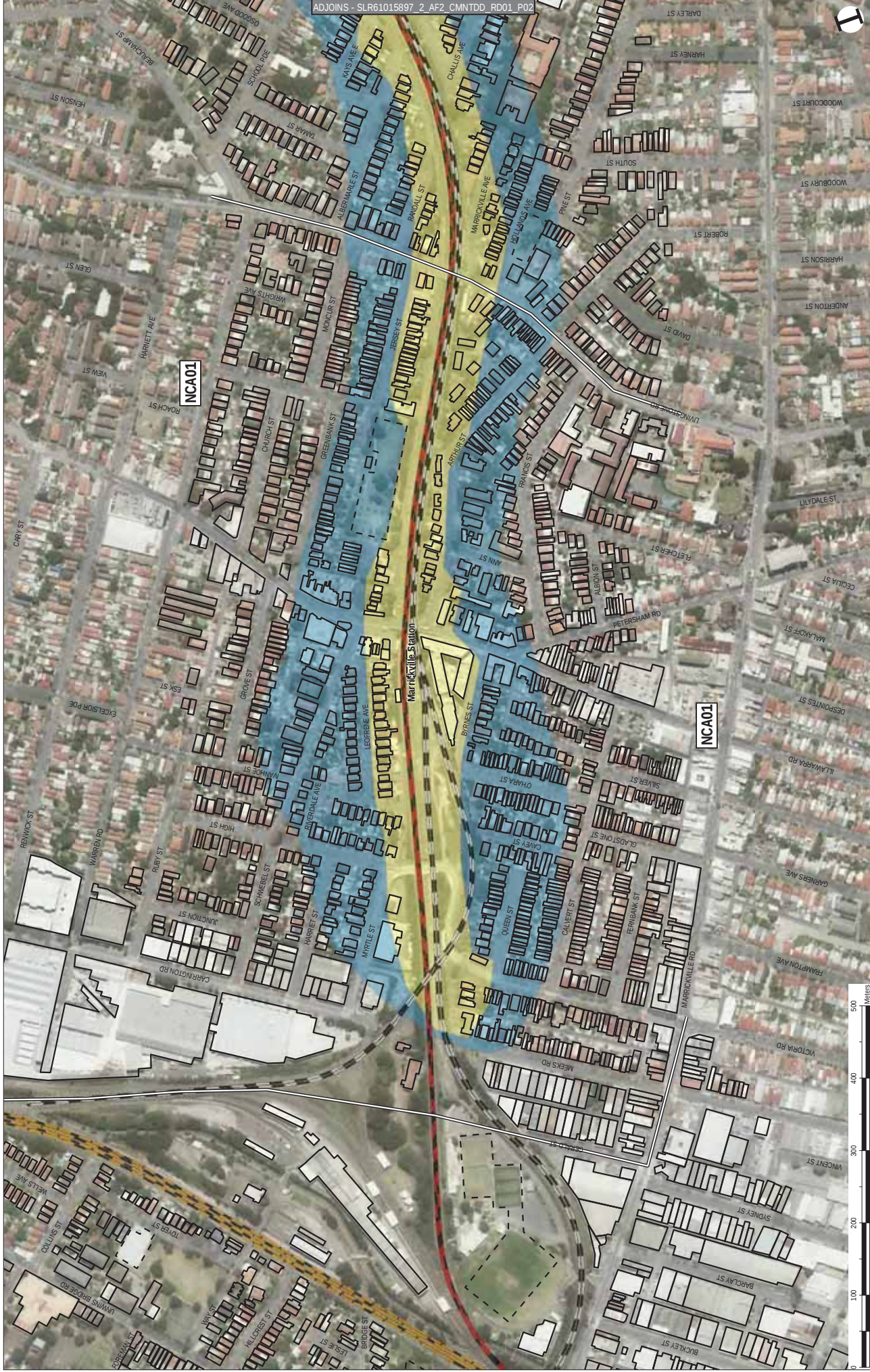
Assessed Receivers

Buildings
Outdoor

Note:
Construction mitigation areas are indicative
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Construction Additional Mitigation - Construction Mitigation Night-time (Indicative) - No Ballast Tamper





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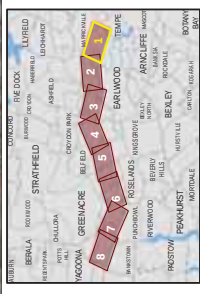
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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper

Construction Mitigation Areas
No Ballast Tamper
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Assessed Receivers
Buildings
Outdoor

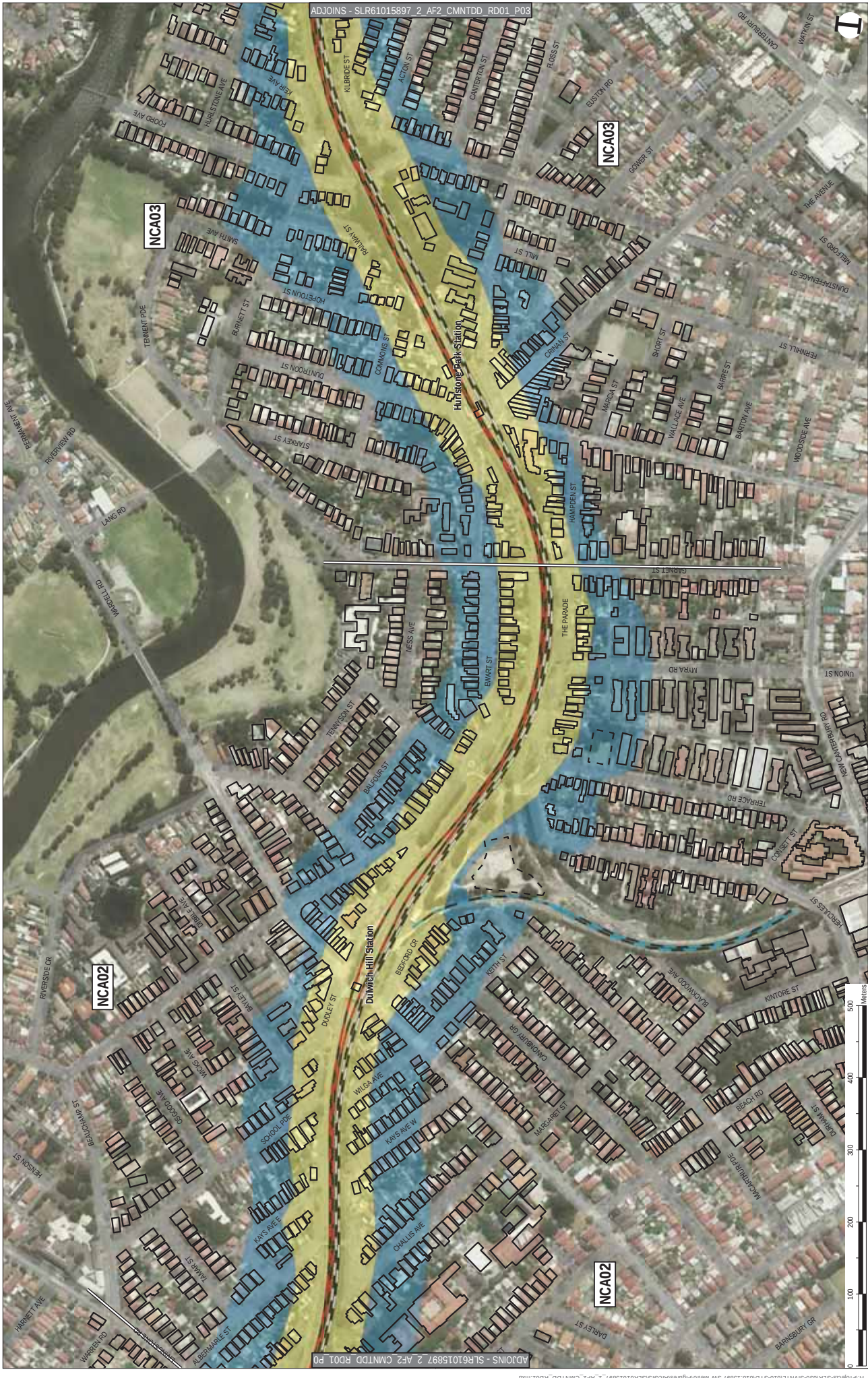
Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks



ADJOINS - SLR61015897_2_AF2_CMNTDD_RD01_P02

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Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper

Noise Catchment Areas

- Freight Rail Tracks
- Light Rail Tracks
- Metro Rail Tracks
- Sydney Trains Rail Tracks

Construction Mitigation Areas

- No Ballast Tamper
- AA, M, IB, LB, PC, SN
- M, IB, LB, PC, SN

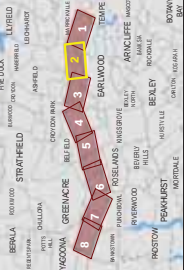
Assessed Receivers

- Buildings
- Outdoor

Legend

- Freight Rail Tracks
- Light Rail Tracks
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- No Ballast Tamper
- AA, M, IB, LB, PC, SN
- M, IB, LB, PC, SN
- Buildings
- Outdoor

Map Index



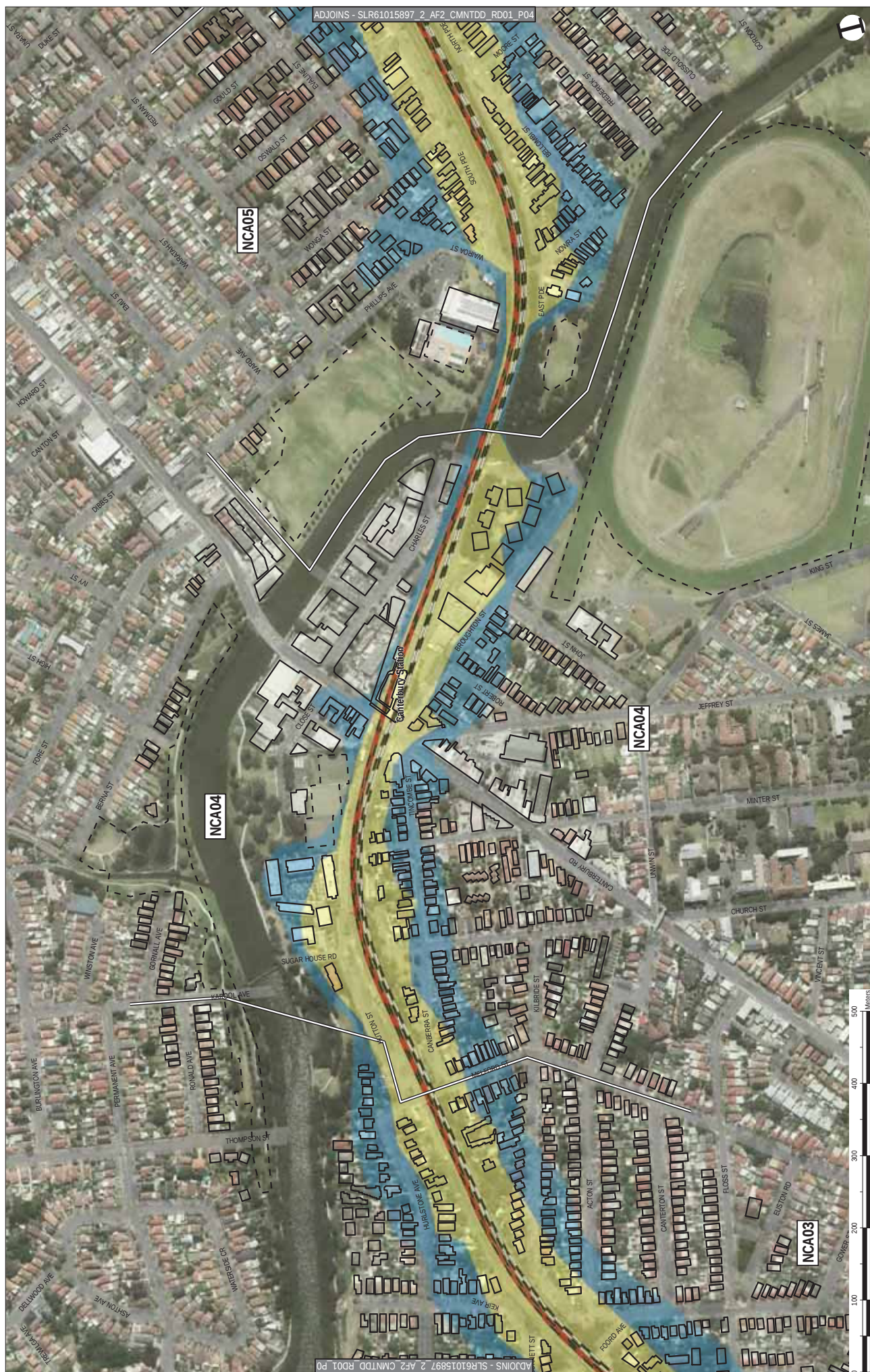
Notes

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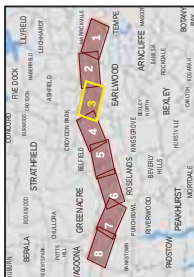


Transport for NSW
Sydney Metro City & Southwest
Sydenham to Banksstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper

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Note:
Construction mitigation areas are indicative.
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	Noise Catchment Areas	Construction Mitigation Areas	Assessed Receivers
Freight Rail Tracks		AA, M, IB, LB, PC, SN	Buildings 
Light Rail Tracks		M, IB, LB, PC, SN	Outdoor 
Metro Rail Tracks			
Surface Transits Rail Tracks			

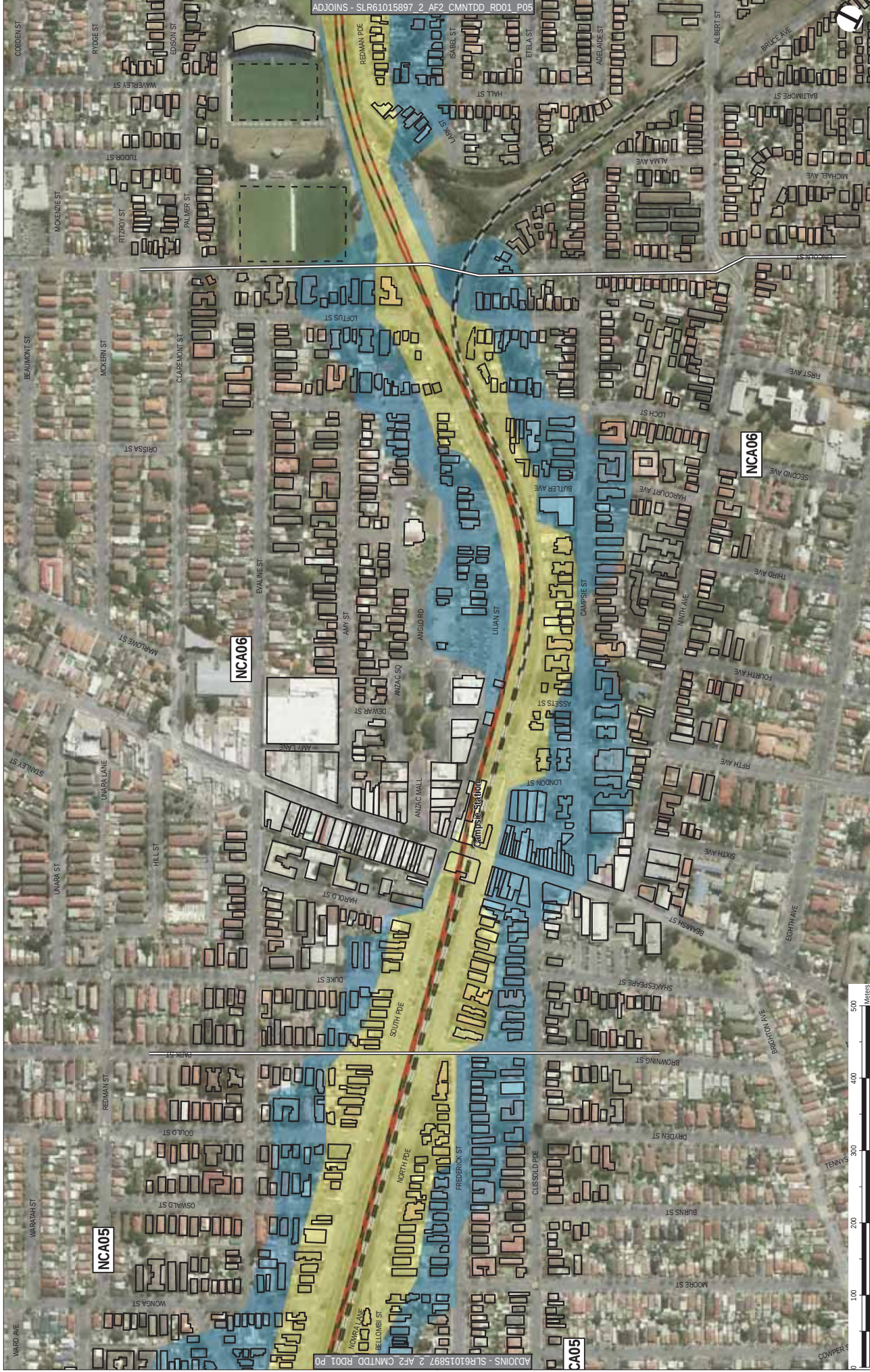


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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper

Construction Mitigation Areas
No Ballast Tamper
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

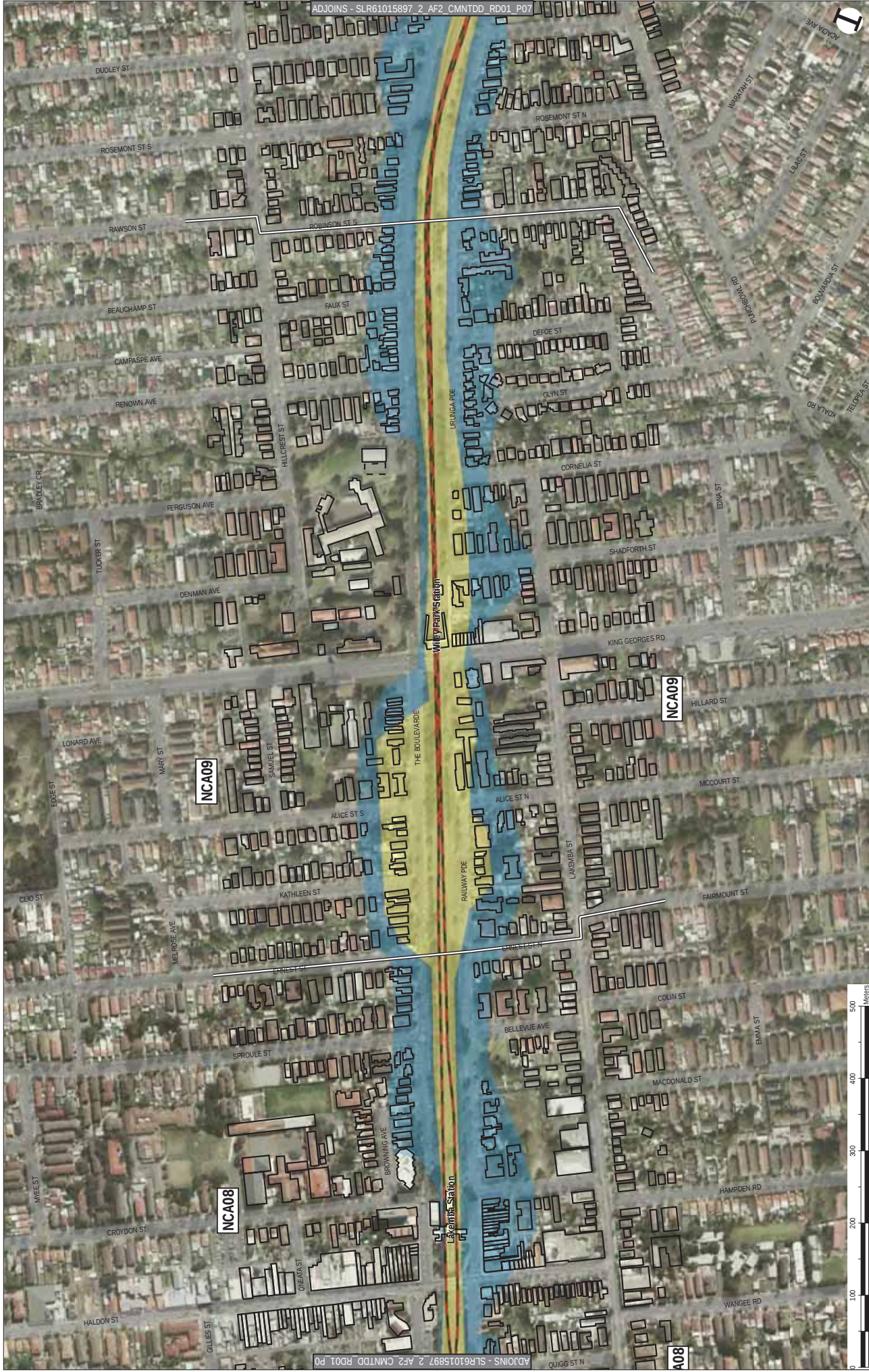
Assessed Receivers
Buildings
Outdoor

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Legend
Buildings
Outdoor
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

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Notes
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Sydney Metro City & Southwest

Sydenham to Bankstown

Construction Mitigation

Night-time (Indicative)

No Ballast Tamper

Construction Mitigation Areas

No Ballast Tamper

AA, M, IB, LB, PC, SN

M, IB, LB, PC, SN

Assessed Receivers

Buildings

Outdoor

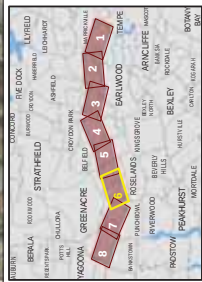
Noise Catchment Areas

Freight Rail Tracks

Light Rail Tracks

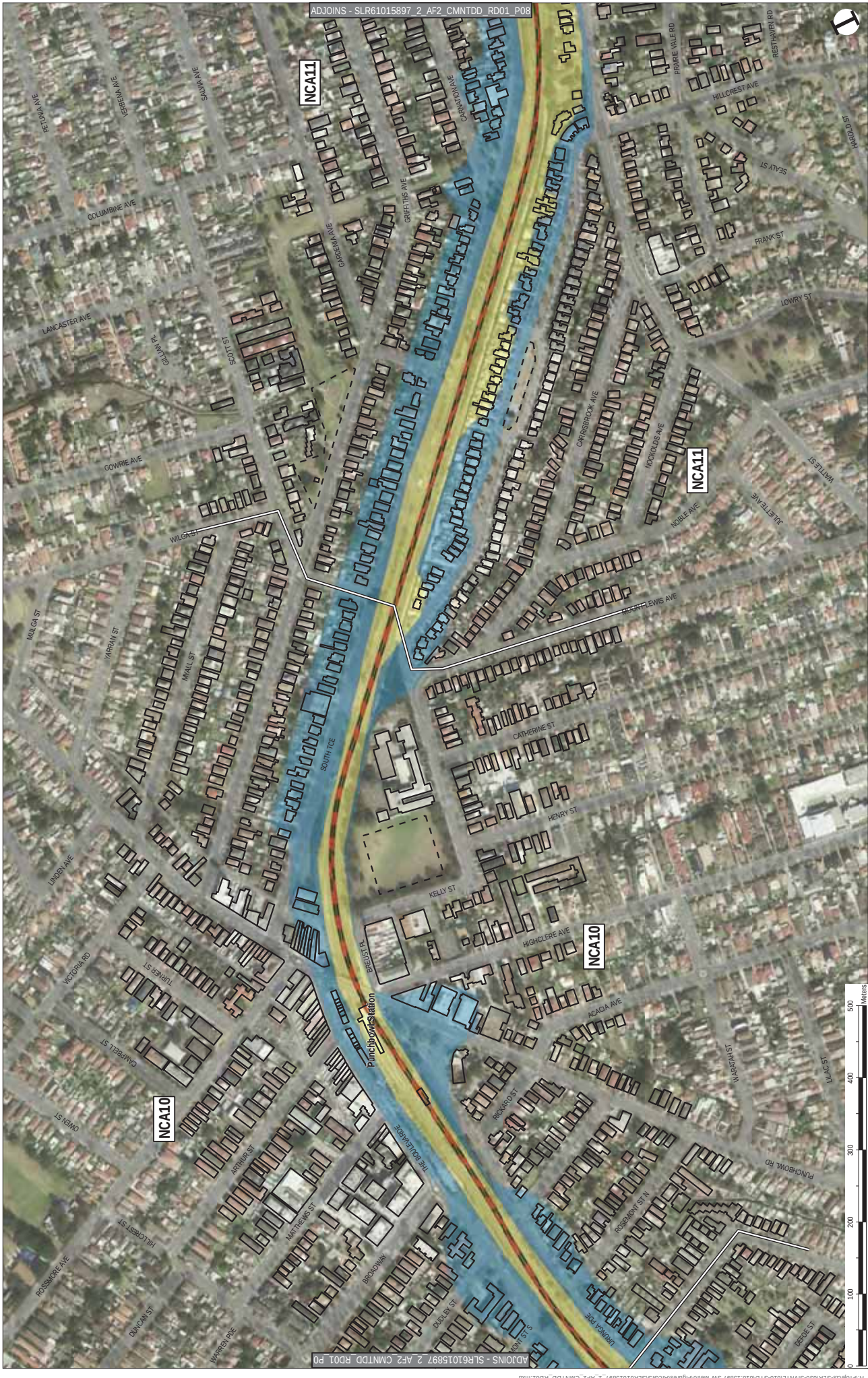
Metro Rail Tracks

Sydney Trains Rail Tracks



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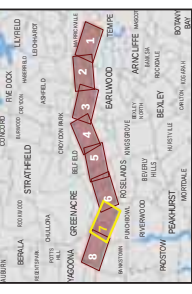
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Date: 04/05/2018
Drawn by: NT
Scale: 1:5,000
Sheet Size: A4
Projection: GDA 1994 MGA Zone 56

Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper
Page 7 of 8

Construction Mitigation Areas
No Ballast Tamper
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

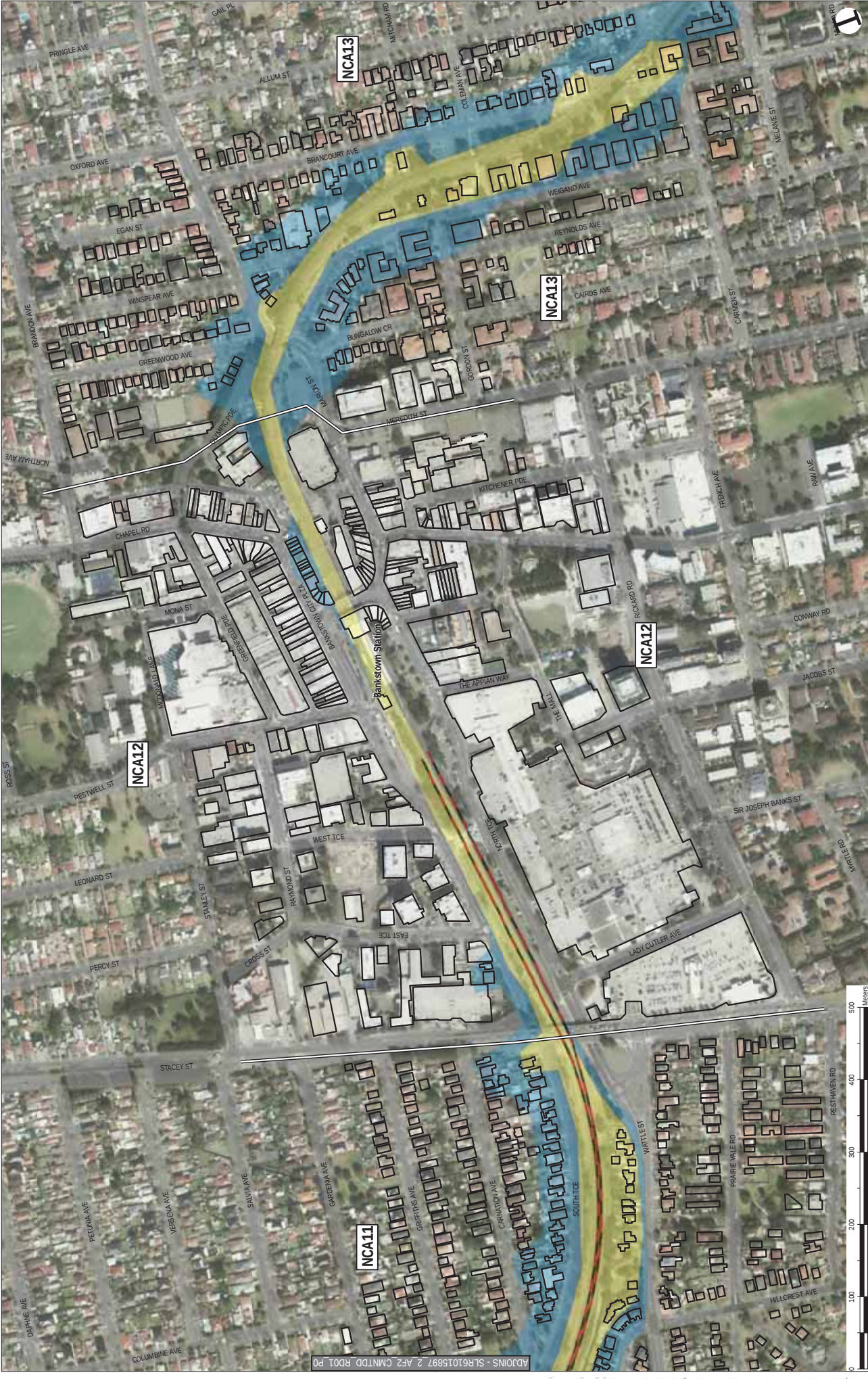
Assessed Receivers
Buildings
Outdoor

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks



ADJOINS - SLR61015897_2_AF2_CMNTDD_RD01_P08

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Transport for NSW
Sydney Metro City & Southwest
Sydenham to Bankstown
Construction Mitigation
Night-time (Indicative)
No Ballast Tamper

Construction Mitigation Areas
No Ballast Tamper
AA, M, IB, LB, PC, SN
M, IB, LB, PC, SN

Noise Catchment Areas
Freight Rail Tracks
Light Rail Tracks
Metro Rail Tracks
Sydney Trains Rail Tracks

Assessed Receivers
Buildings
Outdoor

Legend
NCA11
NCA12
NCA13
AA
M
IB
LB
PC
SN
M
IB
LB
PC
SN

Note:
Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only.

SYDENHAM TO BANKSTOWN

SUBMISSIONS AND PREFERRED INFRASTRUCTURE REPORT

> Appendix E – Noise and vibration assessment