

Appendix

B

Technical working paper: Noise and vibration

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1 Introduction

1.1 Background

The noise and vibration impacts during construction and operation of the M4-M5 Link project (the project) have been assessed in Appendix J (Technical working paper: Noise and vibration) of the environmental impact statement (EIS) for the project.

In accordance with section 115Z(6) of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act), a preferred infrastructure report (PIR) has been prepared for the project. The PIR for the project describes the design changes or refinements that have been identified to minimise environmental impacts, address design and constructability issues and to address issues raised during exhibition of the EIS.

1.2 Purpose of this report

This report provides an assessment of the changed and/or additional noise and vibration impacts associated with the design changes that have been identified in the PIR. The design changes described in the PIR are proposed to minimise environmental impacts, address design and constructability issues and to address issues raised during public exhibition of the EIS. These changes are summarised in **section 1.3**.

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

1.3 Summary of design changes

The design changes and/or refinements assessed in this report and as identified in the PIR include:

- An additional construction ancillary facility at Rozelle, to the east of the White Bay Power Station on land owned by the Port Authority of NSW – the White Bay civil site (C11). The site would be used primarily to support truck marshalling and construction workforce parking
- Relocation of the bioretention facility at Rozelle from within the informal car park adjacent to Manning Street as proposed in the EIS, to around 150 metres north within King George Park adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge.

These changes are described in detail in the PIR.

1.4 Terminology

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

2 Project changes

2.1 White Bay civil site (C11)

2.1.1 Background

An additional construction ancillary facility is proposed on a portion of the Port Authority of NSW's land located near White Bay at Rozelle. The facility would provide a truck marshalling area for around 40 heavy vehicles transporting tunnel spoil and around 50 parking spaces for the construction workforce. The facility would also provide additional space to store construction plant, machinery and materials at the site. The site is referred to as the White Bay civil site (C11). The location and an indicative site layout are shown in **Figure 2-1**.

This site is part of the larger Glebe Island/White Bay Port Precinct, currently used for dry bulk imports, exports, vessel lay-ups, ad-hoc port and working harbour activities and cruise ships, functioning 24 hours a day, seven days a week. The site is not currently being used, is vacant and comprises poor quality hardstand that would need to be replaced to support the proposed use.

2.1.2 Works schedule

An indicative program for works at the White Bay civil site is provided in **Table 2-1**. Use of the White Bay civil site would commence in early 2019.

Table 2-1 Indicative construction program – White Bay civil site (C11)

Construction activity	Indicative construction timeframe											
	2018				2019				2020			
Site establishment												
Truck marshalling and parking												

2.2 Relocation of the bioretention facility at Rozelle

2.2.1 Background

The PIR proposes to relocate the bioretention facility from the informal car park within King George Park at Rozelle (adjacent to Manning Street) as described in Chapter 5 (Project description) of the EIS. The bioretention facility would be relocated around 150 metres north of the location proposed in the EIS, to an area adjacent to Victoria Road at the eastern abutment of Iron Cove Bridge and within King George Park.

Further information regarding the location for the relocated bioretention facility is provided in the PIR.

2.2.2 Construction activities

To construct the bioretention facility, construction vehicles would access the site via Victoria Road and the Iron Cove Link civil site (C8). Where feasible, construction vehicles would not use local surrounding roads, including Byrnes Street, Clubb Street, Toelle Street, Callan Street, Springside Street and Manning Street for construction of the bioretention facility. If possible, the facility would be constructed following site establishment of the Iron Cove Link civil site to enable direct access from the civil site via Victoria Road, where feasible. It is anticipated that it would take around three months to construct.

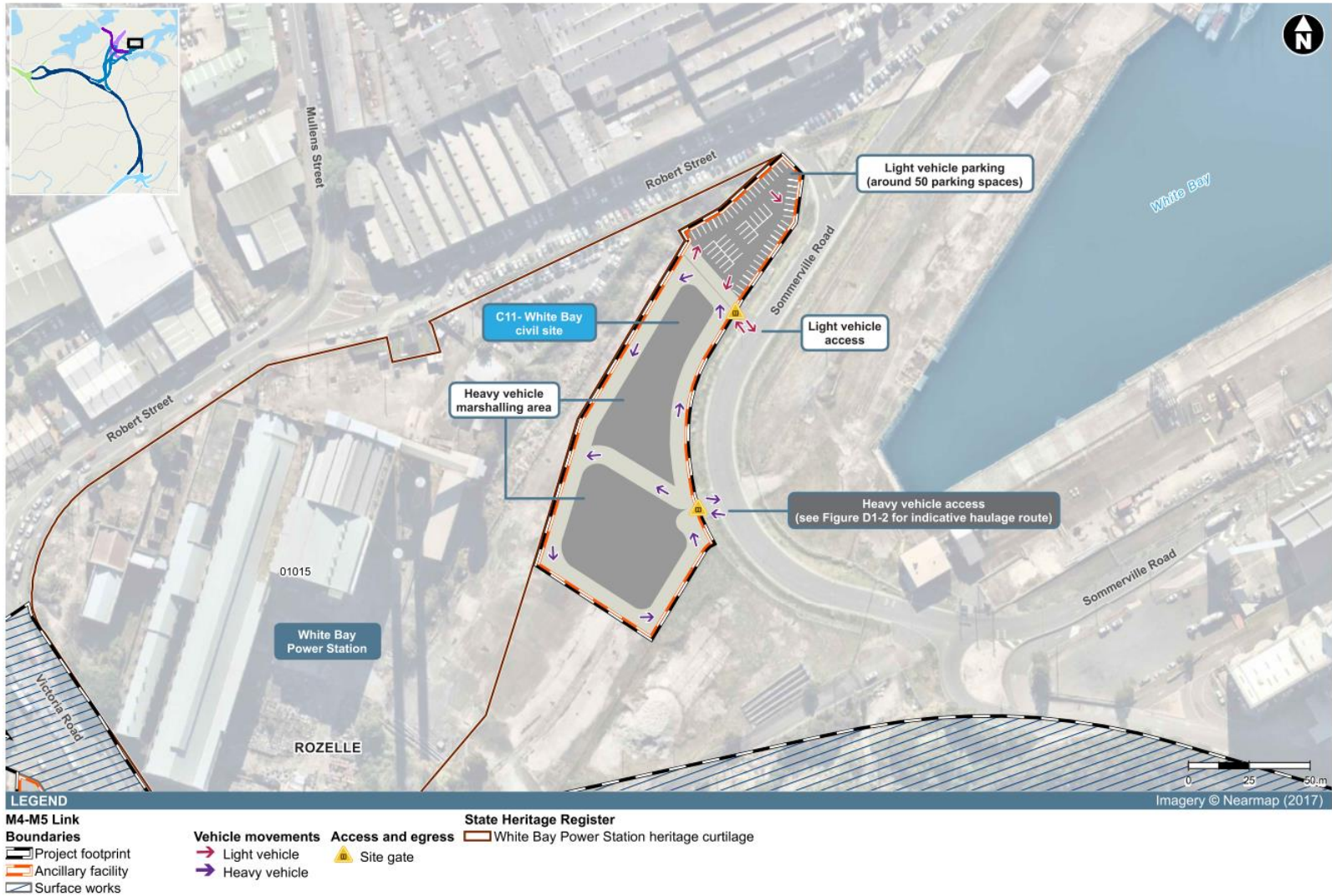


Figure 2-1 Indicative White Bay civil site (C11) layout

3 White Bay civil site (C11)

3.1 Construction activity scenarios

A number of scenarios have been developed to assess potential impacts associated with construction works at the White Bay civil site (C11). **Table 3-1** outlines the construction scenarios and corresponding activities, as well as noting the assessed periods of the works. The estimated durations of activities are also summarised, noting that the activities are intermittent during this period and would not be expected to be undertaken every day during the scheduled activity.

Construction site operations have been split into the following activities which are representative of movements which are likely to occur at the White Bay civil site (however this is subject to confirmation by the contractor during detailed design and construction planning):

- Peak operation, limited to the daytime only and represents the peak truck movements within the site likely to occur in any 15-minute period
- Typical operations, applicable to all time periods with the exception of the night-time period and represents the normal expected truck movements within the site in any 15-minute period
- Night operations, represents the typical operations within the site likely to occur during the night-time period.

Table 3-1 Construction activities and period of operation – White Bay civil site (C11)

Scenario	Works ID ¹	Indicative duration (Weeks) ²	Activity	Period of works ^{3,4}				
				Day	Day OOH	Eve	Night	5am to 7am
Site establishment	WBM-01	4	Demolition of existing hardstand and site levelling - with breaker	✓				
	WBM-02	5	Demolition of existing hardstand and site levelling - no breaker	✓				
	WBM-03	8	Hardstand construction using compaction equipment	✓				
	WBM-04	1	Asphalt layer and line marking	✓				
	WBM-05	8	Construction of gate house	✓				
Site Operations	WBM-06	156	Site operations - peak	✓				
	WBM-07	156	Site operations - typical	✓	✓	✓		✓
	WBM-08	156	Site operations - night				✓	
	WBM-09	156	Site operations - laydown	✓	✓	✓	✓	✓

Notes:

1. The duration refers to the overall period during which the work activities would be undertaken. In reality the work activities are likely to be undertaken intermittently (not continuously) and the impacts would be localised in areas adjacent to where the works activity is being undertaken. The overall duration of work activities would be confirmed during detail design
2. A morning shoulder period has been included for the assessment of vehicle movements 5:00 am to 7:00 am
3. Works periods are defined as:
 - Daytime 7:00 am to 6:00 pm Monday to Friday, 8:00 am to 1:00 pm Saturday
 - Day out of hours Saturday 1:00 pm to 6:00 pm, Sunday and Public holidays 8:00 am to 6:00 pm
 - Evening (Eve) 6:00 pm to 10:00 pm Monday to Sunday
 - Night-time 10:00 pm to 7:00 am Monday to Friday and 10:00 pm to 8:00 am Saturday, Sunday and Public holidays
 - Shoulder period (5:00 am to 7:00 am) Monday to Friday

3.2 Noise management level summary

To supplement noise monitoring undertaken for the EIS (refer to Appendix J (Technical working paper: Noise and vibration) of the EIS), background noise monitoring previously undertaken at 1 Batty Street at Balmain as part of the Noise Impact Assessment for the Interim Exhibition Facility located at Glebe Island has been used (refer to SLR Report 610.11854 dated 7 November 2012).

Noise monitoring results are detailed in **Table 3-2**. Monitoring data was reviewed to eliminate the influence from ship activity within White Bay on the collected data to obtain levels which are representative of the ambient conditions without ship activity.

Table 3-2 Supplementary background noise monitoring data – White Bay civil site (C11)

Noise monitoring location	Measured noise level (dBA)					
	Rating Background Level (RBL)			LAeq		
	Daytime	Evening	Night-time	Daytime	Evening	Night-time
1 Batty Street	51	49	42	57	53	47

To verify monitoring data collected as part of the aforementioned project, three attended surveys were undertaken between 9 November and 16 November 2017 to quantify the existing ambient noise conditions. Monitoring was conducted over a three hour period during the daytime, a three hour period during the evening, and a two hour period during the morning shoulder. The monitoring was undertaken during periods where no ship activity was present in White Bay to obtain levels which are representative of the ambient conditions without ship activity. The noise monitoring results are detailed in **Table 3-3**.

Table 3-3 Supplementary attended noise monitoring data – White Bay civil site (C11)

Measurement Period	Measured Noise Levels dBA		Comments
	LAeq	LA90	
Daytime 9:00 am to 12:00 pm 9/11/2017	54	50	Ambient levels are dominated by distant road traffic noise from Anzac Bridge, The Crescent and Victoria Road and infrequent plane passbys
Evening 7:00 pm to 10:00 pm 9/11/2017	52	49	Ambient levels are dominated by distant road traffic noise from Anzac Bridge, The Crescent and Victoria Road and infrequent plane passbys
Shoulder period 5:00 am to 7:00 am 16/11/2017	51	47	Ambient levels are dominated by distant road traffic noise from Anzac Bridge, The Crescent and Victoria Road and infrequent plane passbys

Attended measurement results detailed in **Table 3-3** indicate a similar noise environment to that measured as part of the Noise Impact Assessment for the Interim Exhibition Facility. The previously monitored data presented in **Table 3-2** is considered to be valid for use in the following assessment based on the attended survey results.

Refer to **Figure 3-1** for the noise monitoring locations, relevant NCAs and receivers surrounding the White Bay civil site. The ambient noise levels in this area are typically dominated by road traffic noise from Anzac Bridge, The Crescent and Victoria Road.



Figure 3-1 Noise monitoring locations, NCAs and receivers surrounding the White Bay civil site (C11)

The noise management levels (NMLs) derived for the White Bay civil site are outlined below in **Table 3-4** and include monitoring locations undertaken as part of the EIS. Additional information is provided in section 3 of the Appendix J (Technical working paper: Noise and vibration) of the EIS on the noise catchment areas (NCA) used throughout the project area.

Table 3-4 Residential NMLs for the project – White Bay civil site (C11)

NCA	Representative monitoring location	Standard construction NMLs (RBL+10dBA)	Out of hours NMLs (RBL+5dBA) ¹				Sleep disturbance screening (RBL+15dBA)
		Daytime period	Daytime period	Evening period	Night-time period	Shoulder period ³	
NCA20	R.14	54	49	47	40	45	50
NCA21	R.15	58	53	53	47	50	57
NCA23	R.09	59	54	50	41	48	51
NCA24	R.01	64	59	57	49	54	59
NCA25	R.02	61	56	56	50	53	60
NCA27	R.16	59	54	54	47	51	57
NCA28	n/a ²	55	50	45	40	45	50
NCA29	1 Batty St	61	56	54	47	52	59
NCA30	R.03	71	66	65	49	58	59

Notes:

1. Out of hours construction – Evening hours are 6:00 pm to 10:00 pm. Night-time hours are 10:00 pm to 7:00 am Sunday to Saturday and 10:00 pm Saturday to 8:00 am Sunday
2. No unattended noise monitoring was conducted within this NCA or nearby. Australian Standard (AS) 1055 descriptions and measurement of environmental noise – part 2 Application to specific situations has been used to establish a background noise level for screening purposes only. Where the construction noise assessment predicts an exceedance of NMLs for this location, it is recommended that monitoring be conducted during the detailed design stage to confirm the existing environment
3. The residential NMLs for the morning shoulder period (5:00 am to 7:00 am) have been calculated in accordance with the Industrial Noise Policy (INP) using the mid-point between the RBLs of the two adjacent periods.

The *Interim Construction Noise Guideline* (ICNG) (EPA, 2009) quantitative assessment method provides NMLs for other sensitive land uses, such as educational institutions, hospitals, medical facilities and outdoor recreational areas. These land uses are considered potentially sensitive to construction noise only when the properties are in use.

The project specific $L_{Aeq(15\text{minute})}$ NMLs for other non-residential noise sensitive receivers which are situated near to the White Bay civil site and referenced from the ICNG are provided in **Table 3-5**.

For sensitive receivers such as schools and places of worship, the NMLs presented in **Table 3-5** are based on internal noise levels. For the purpose of this assessment, it is conservatively assumed that all schools and places of worship are openable windows that can open. On the basis that external noise levels are typically 10 dBA higher than internal noise levels when windows are open, an external NML of 55 dBA $L_{Aeq(15\text{minute})}$ has been adopted.

Table 3-5 NMLs for other sensitive receivers – White Bay civil site (C11)

Land use	NML LAeq(15minute) (Applied when the property is in use)
Classrooms at schools and other education institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dBA
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. reading, meditation)	External noise level 60 dBA
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

3.3 Activity source noise levels

Sound power levels for the typical operation of construction equipment applied in the modelling are listed in **Table 3-6**. The activities are representative of works which have the potential to impact nearby sensitive receivers.

Table 3-6 Sound power levels for construction equipment – White Bay civil site (C11)

Scenario name	Works ID	Activity	Equipment (realistic worst case)	Worst case items in same location	Sound power level (LWA) (dBA) ^{1,2}		
					LWA		LWAmix
					Item	Activity	Activity
Site Establishment	WBM-01	Demolition of existing hardstand and site levelling - With Breaker	Excavator (Breaker) / Jackhammer	1	121	119	124
			Truck	1	98		
			Dozer	1	110		
			Excavator	1	104		
			Grader	1	108		
	WBM-02	Demolition of existing hardstand and site levelling - No Breaker	Truck	1	98	113	118
			Dozer	1	110		
			Excavator	1	104		
			Grader	1	108		
	WBM-03	Hardstand construction using compaction equipment	Excavator	1	102	110	117
			Truck	1	98		
			Vibratory Roller	1	109		
			Roller	1	100		
	WBM-04	Asphalt layer and line marking	Paving Machine	1	104	105	112
			Line Marking Plant	1	98		
	WBM-05	Construction of gate house	Crane (small)	1	98	101	108
			Truck (HIAB)	1	98		
Site Operations	WBM-06	Site operations – peak (Daytime only)	Trucks	25	110	114	117
			Air brakes	25	115		
			Door Slams	25	93		
			Truck Idling	3	90		
			Generators	1	101		
			Air Conditioning units	2	63		
			Car Parking	10	94		
	WBM-07	Site operations – typical (Daytime, day out of hours and shoulder period only)	Trucks	15	110	112	117
			Air brakes	15	115		
			Door Slams	15	93		
			Truck Idling	3	90		
			Generators	1	101		
			Air Conditioning units	2	63		
			Car Parking	10	94		
	WBM-08	Site operations - night	Trucks	5	110	108	117
			Air brakes	5	115		
			Door Slams	5	93		
			Truck Idling	1	90		
			Generators	1	101		
			Air Conditioning units	2	63		
			Car Parking	10	94		
	WBM-09	Laydown and storage	Truck	1	98	103	107
			Hand tools	1	94		
			Franna crane	1	99		
			Telehandler	1	92		
			Water tanker	1	98		

Notes:

1. In accordance with the ICNG for activities identified as particularly annoying (such as jackhammering, rock-breaking and power saw operation), a 5 dBA 'penalty' is added to predicted noise levels when using the quantitative method
2. Activity sound power levels account for the amount of time an item of plant is anticipated to operate within each 15-minute period

3.4 Predicted noise levels

A summary of the predicted noise levels (without additional mitigation) in each of the NCAs for the various work activities is presented in **Table 3-7** to **Table 3-10** for residential receivers, **Table 3-11** for commercial receivers and **Table 3-12** for other sensitive receivers. The noise levels are representative of impacts where works are closest to each NCA and are intended to give an overview of the noise from the proposed works.

The colours in the following tables represent the predicted noise levels based on the exceedance of the NML during that period and for that receiver type. A qualitative description of the NML exceedance bands is given below, noting that the impact of these potential exceedances would depend on the period in which they were to occur (ie the night-time period is typically more sensitive than the daytime or evening for most people):

- Noise levels one to 10 dBA above NMLs – impacts would typically be marginal to minor
- Noise levels 11 dBA to 20 dBA above NMLs – impacts would typically be moderate
- Noise levels >20 dBA above NMLs – impacts would typically be high.

For most construction activities, it is expected that the actual construction noise level would generally be lower than the worst-case prediction made at the most-exposed receiver. This is because noise level varies with position of plant item or noise sensitive receiver as well as across different stages of construction.

Maps detailing the maximum noise level at each building along with identification of the buildings where exceedances are predicted for each construction scenario are included **Annexure A**.

Table 3-7 Predicted worst case noise levels – White Bay civil site (C11) – residential daytime period

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Residential - Standard Daytime										
NCA21	58	49	43	40	35	30	44	42	-	33
NCA22	-	-	-	-	-	-	-	-	-	-
NCA23	59	48	42	39	34	<30	42	40	-	32
NCA24	64	50	44	41	36	31	42	41	-	34
NCA25	61	59	53	50	45	36	52	50	-	43
NCA26	-	-	-	-	-	-	-	-	-	-
NCA27	59	51	45	42	37	32	46	44	-	35
NCA28	55	48	42	39	34	30	41	39	-	32
NCA29	61	61	55	52	47	42	55	53	-	45
NCA30	71	52	46	43	38	34	46	44	-	36

Notes:

1. Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dBA, orange 11 - 20 dBA, yellow 1-10 dBA) based on the controlling time period

Table 3-8 Predicted worst case noise levels – White Bay civil site (C11) – residential evening period

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Residential – Evening										
NCA21	53	-	-	-	-	-	-	42	-	33
NCA22	-	-	-	-	-	-	-	-	-	-
NCA23	50	-	-	-	-	-	-	40	-	32
NCA24	57	-	-	-	-	-	-	41	-	34
NCA25	56	-	-	-	-	-	-	50	-	43
NCA26	-	-	-	-	-	-	-	-	-	-
NCA27	54	-	-	-	-	-	-	44	-	35
NCA28	45	-	-	-	-	-	-	39	-	32
NCA29	54	-	-	-	-	-	-	53	-	45
NCA30	65	-	-	-	-	-	-	44	-	36

Notes:

1. Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dBA, orange 11 - 20 dBA, yellow 1-10 dBA) based on the controlling time period

Table 3-9 Predicted worst case noise levels – White Bay civil site (C11) – residential night-time period

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Residential - Night-time										
NCA21	47	-	-	-	-	-	-	-	38	33
NCA22	-	-	-	-	-	-	-	-	-	-
NCA23	41	-	-	-	-	-	-	-	36	32
NCA24	49	-	-	-	-	-	-	-	37	34
NCA25	50	-	-	-	-	-	-	-	46	43
NCA26	-	-	-	-	-	-	-	-	-	-
NCA27	47	-	-	-	-	-	-	-	40	35
NCA28	40	-	-	-	-	-	-	-	35	32
NCA29	47	-	-	-	-	-	-	-	49	45
NCA30	49	-	-	-	-	-	-	-	40	36

Notes:

1. Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dBA, orange 11 - 20 dBA, yellow 1-10 dBA) based on the controlling time period

Table 3-10 Predicted worst case noise levels – White Bay civil site (C11) – residential shoulder period (5am to 7am)

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Residential – shoulder period (5am to 7am)										
NCA21	50	-	-	-	-	-		42	-	33
NCA22	-	-	-	-	-	-		-	-	-
NCA23	48	-	-	-	-	-		40	-	32
NCA24	54	-	-	-	-	-		41	-	34
NCA25	53	-	-	-	-	-		50	-	43
NCA26	-	-	-	-	-	-		-	-	-
NCA27	51	-	-	-	-	-		44	-	35
NCA28	45	-	-	-	-	-		39	-	32
NCA29	52	-	-	-	-	-		53	-	45
NCA30	58	-	-	-	-	-		44	-	36

Notes:

1. Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dBA, orange 11 - 20 dBA, yellow 1-10 dBA) based on the controlling time period

Table 3-11 Predicted worst case noise levels – White Bay civil site (C11) – commercial

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Commercial										
NCA21	70	<30	<30	<30	<30	<30	<30	<30	<30	<30
NCA22	70	-	-	-	-	-	-	-	-	-
NCA23	70	47	41	38	33	<30	41	39	35	31
NCA24	70	53	47	44	39	35	45	43	38	37
NCA25	70	32	<30	<30	<30	<30	<30	<30	<30	<30
NCA26	70	55	49	46	41	35	49	47	43	39
NCA27	70	48	42	39	34	<30	42	41	37	32
NCA28	70	45	39	36	31	<30	36	34	<30	<30
NCA29	70	72	66	63	58	49	61	59	55	51
NCA30	70	51	45	42	37	32	44	43	39	35

Notes:

1. Colouring indicates the range of predicted worst case NML exceedances without any additional mitigation based on nearest receiver (red >20 dBA, orange 11 - 20 dBA, yellow 1-10 dBA) based on the controlling time period

Table 3-12 Predicted worst case noise levels – White Bay civil site (C11) – other sensitive receivers

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) ¹								
		WBM-01	WBM-02	WBM-03	WBM-04	WBM-05	WBM-06	WBM-07	WBM-08	WBM-09
Other Sensitive										
NCA21	-	<30	<30	<30	<30	<30	<30	<30	<30	<30
NCA22	-	-	-	-	-	-	-	-	-	-
NCA23	-	47	41	38	33	<30	42	40	36	31
NCA24	-	51	45	42	37	31	42	40	37	35
NCA25	-	54	48	45	40	36	45	43	39	38
NCA26	-	-	-	-	-	-	-	-	-	-
NCA27	-	50	44	41	36	31	44	43	39	34
NCA28	-	-	-	-	-	-	-	-	-	-
NCA29	-	72	66	63	58	51	61	60	56	53
NCA30	-	49	43	40	35	<30	41	40	36	33

Notes:

1. The NML is dependent on the classification of a given sensitive receiver. As the table represents the highest predicted noise level for a particular activity, the most affected “other sensitive” receiver may change between each activity depending on the location of the works. No NMLs can be provided in this table for “other sensitive receivers as result of the various types of “other sensitive” receivers within each NCA which may be affected by different activities.

Table 3-13 Overview of NML exceedances – White Bay civil site (C11)

Activity ID	Activity	Weeks ¹	Activity duration within overall project program ²								Number of receivers																	
											Total	Highly noise affected ⁴	NML exceedance receiver count ³															
			Daytime			Daytime (out of hours)			Evening				Night-time			Shoulder Period (5am to 7am)			Sleep disturbance									
			1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA			>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA	1-10 dBA	11-20 dBA	>20 dBA						
		25	50	75	100																							
WBM-01	Demolition of existing hardstand and site levelling - With Breaker	4									3629	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-02	Demolition of existing hardstand and site levelling - No Breaker	5									3629	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-03	Hardstand construction using compaction equipment	8									3629	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-04	Asphalt layer and line marking	1									3629	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-05	Construction of gate house	8									3629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-06	Site operations - peak	156									3629	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
WBM-07	Site operations - typical	156									3629	-	1	-	-	1	-	-	1	-	-	-	2	-	-	-	-	
WBM-08	Site operations - night	156									3629	-	-	-	-	-	-	-	6	-	-	-	-	-	10	-	-	
WBM-09	Laydown and storage	156									3629	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:

1. Approximate overall duration of the activity in all areas of the site. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas
2. Approximate percentage (to nearest 13%) of activity duration within overall proposal program. Where percentage is less than 13%, 13% is shown for illustrative purposes
3. Based on worst case noise works area (closest to receivers)
4. Based on ICNG definition (ie predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater)

3.5 NML exceedances

Works activity WBM-01 to WBM-05 cover construction activities required for the preparation of the site and are limited to standard daytime hours only. Worst case predicted exceedances of the daytime NMLs are limited to:

- One commercial receiver located to the north of the site on Robert Street, with a maximum exceedance of two dBA predicted
- One place of worship (C3 Church Balmain), also located directly to the north of the site, with a maximum NML exceedance of 17 dBA predicted.

These exceedances are due to the use of a rockbreaker during the demolition of the existing hardstand and site levelling works (WBM-01) and would occur during the daytime only. These works are expected to be completed within eight weeks and would be managed via the implementation of the mitigation and management measures outlined in Chapter E1 (Environmental management measures) of the Submissions and preferred infrastructure report. Exceedances would significantly decrease when the rockbreaker is not in use as shown in the results for activities WBM-02 to WBM-05.

Works activities WBM-06 to WBM-09 are representative of the ongoing activities associated with the proposed use of the site. These include truck movements and laydown operations which may be conducted outside of standard construction hours. Minor predicted NML exceedances of up to five dBA are limited to the place of worship (C3 Church Balmain) during standard construction hours, day out of hours and the evening period. Night-time exceedances up to two dBA are limited to six residential receivers located to the north of the site.

Up to 10 residential receivers have also been identified as potentially exceeding (up to two dBA) the screening criteria for sleep disturbance. The dominant noise source causing these exceedances is from the movement of trucks which is considered a typical noise source within the existing ambient environment.

Noise impacts from the White Bay civil site are limited to receivers located within NCA29 and are generally at residential receivers fronting Mansfield Road and Batty Street. The existing ambient noise environment at these receivers includes noise from vehicle movements on Anzac Bridge and The Crescent, ship movements and regular aircraft fly overs. It is considered the use of this site is unlikely to cause a significant adverse noise impact given the minor magnitude of the exceedances and the existing ambient noise sources.

3.6 Construction road traffic noise

The currently proposed option for construction vehicle access to and from the site is via City West Link/The Crescent, James Craig Road and Sommersville Road. The forecast maximum daily heavy and light vehicles associated with the construction works at this site are presented in **Table 3-14**.

Table 3-14 Construction traffic forecast – White Bay civil site (C11)

Site	Maximum daily construction road traffic movements forecast during works ^{1,2}	
	Heavy	Light
White Bay civil site (C11)	284 (112 night and 172 day)	100 (50 night and 50 day)

Notes:

1. One direction flows. The assessment assumes all movements require an additional return trip
2. 15-hour and 9-hour flows have been estimated assuming that the daily volumes are distributed evenly throughout the period

The noise environment for residential receivers on Lilyfield Road which have line of sight to James Craig Road is dominated by traffic noise from The Crescent, City West Link and Victoria Road given their proximity to these major roads. These receivers are located more than 150 metres from James Craig Road, and given the projected relatively low volume of construction traffic associated with the White Bay civil site and the existing ambient road noise environment, are forecast to experience a negligible change in noise level.

Construction traffic noise impacts from vehicles using the White Bay civil site on The Crescent/City West Link and the wider arterial road network have been assessed in Appendix J (Technical working paper: Noise and vibration) of the EIS. The addition of the vehicle volumes identified in **Table 3-15** would have a negligible impact on the assessment outcomes presented in the EIS.

The use of Johnston Street at Annandale by heavy vehicles was not assessed in the EIS. Two-way flows on Johnston Street between The Crescent and Parramatta Road are up to around 1,600 vehicles per hour in the peak periods. The addition of seven one-way (southbound) heavy vehicle movements on Johnston Street would result in negligible additional construction traffic noise impacts given the existing traffic flows along this route and the small number of construction vehicles that would be added as a result of the project.

3.7 Vibration

3.7.1.1 Estimated working distances and vibration intensive plant

The proposed works have been analysed to determine a best estimate of minimum working distances for the vibration intensive mechanical plant proposed for the construction activities. Proposed vibration intensive construction plant are listed in **Table 3-15** and compared to the minimum working distances identified in the EIS to determine potential vibration impacts of the main construction scenarios. Estimated minimum working distances for the site works are shown graphically in **Figure 3-2**.

Refer to **section 3.1** for a discussion of indicative durations for the construction activities.

Table 3-15 Construction vibration assessment summary – White Bay civil site (C11)

Work scenario	Vibration intensive equipment	NCA	Number of buildings within minimum working distance for highest vibration plant item			
			Cosmetic damage			Human response
			Residential and light commercial	Group 2 (typical)	Group 3 (structurally unsound) ¹	
Site establishment (WBM-01 to WBM-05)	Jackhammer Rock-breaker ² Vibratory roller	NCA25	-	-	-	-
		NCA26	-	-	1	1
		NCA29	1	2	-	4

Notes:

1. This group identifies listed heritage items only and represents a screening test applicable where a historic item is deemed to be sensitive to damage from vibration (following inspection) to be confirmed during detailed design
2. Proposed highest vibration plant item for these works

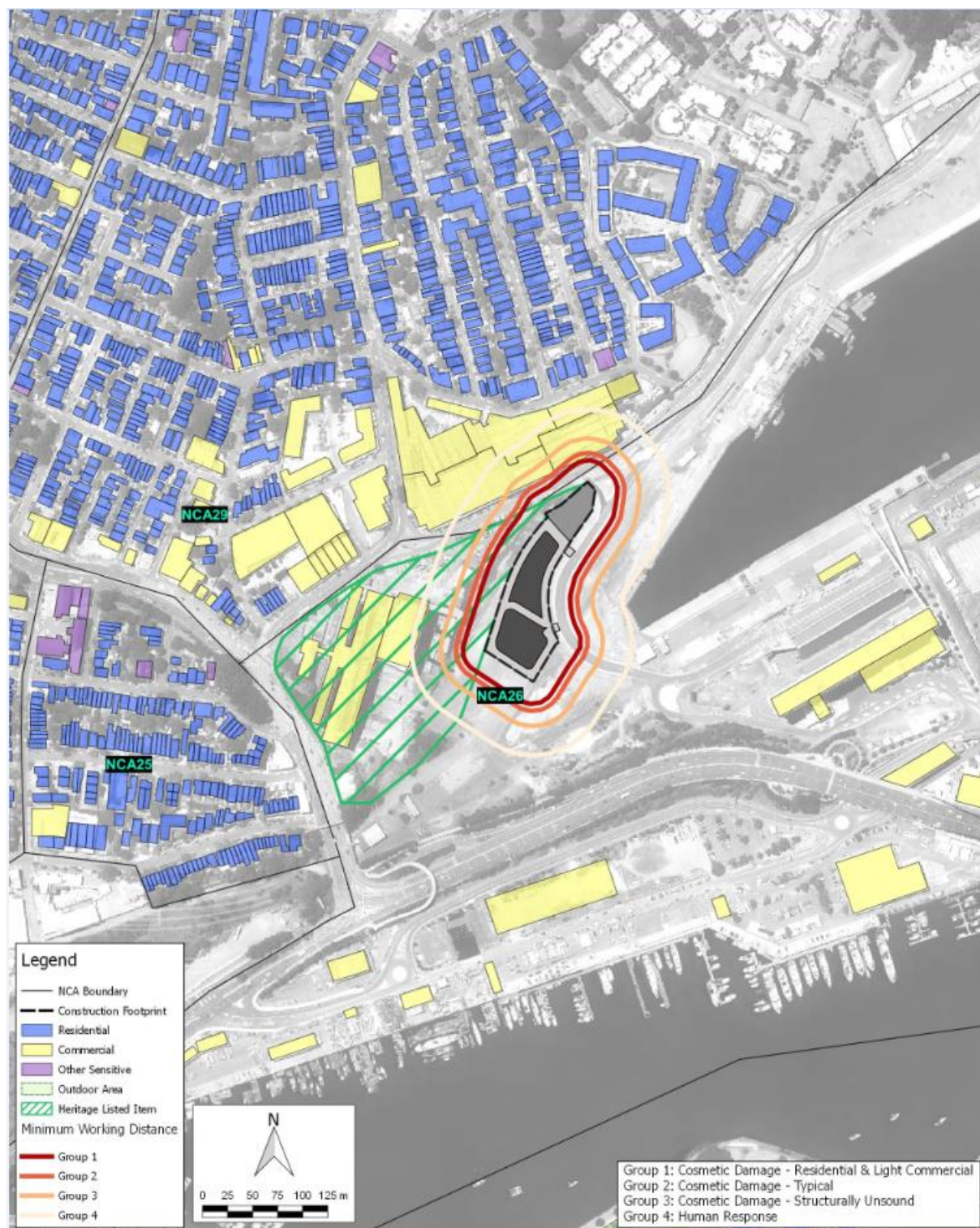


Figure 3-2 Approximate minimum working distances for vibration intensive works at the White Bay civil site (C11)

The White Bay Power Station is a State heritage listed building. Some structural elements associated with the White Bay Power Station, including the northern penstock adjacent to the north of the site, have been identified as being located within the cosmetic damage minimum working distances. The main buildings comprising the White Bay Power Station are outside of the cosmetic damage minimum working distances, however some ancillary buildings and structures may be within the Group 3 minimum working distance.

The construction type classifications and structural integrity of all the listed heritage items would be confirmed at detailed design by a suitably qualified structural engineer. This information would then be used to verify the applicable vibration criteria and associated impacts.

3.7.1.2 Cosmetic damage assessment summary

The separation distance(s) between the proposed works and the nearest buildings would generally be sufficient so that nearby buildings are unlikely to suffer 'cosmetic damage' (defined as minor surface cracking but no impact that would affect the structural integrity of the building) for most of the proposed construction equipment. However, based on the arrangement of the work zones, some items of construction equipment have the potential to be operated closer to sensitive buildings than the recommended minimum working distances. Construction with large rock-breakers has the potential to generate some of the most significant construction vibration impacts due to the vibration intensive characteristics of this plant item.

The assessment presented in **Table 3-15** indicates that during works, up to three buildings, comprising two commercial buildings and a place of worship on the northern side of Robert Street in the vicinity of the works may be within the minimum working distances should a large rock-breaker be used at the outer extents of the White Bay civil site. The required locations for vibration intensive equipment would be reviewed during detailed design when more specific construction information is available.

3.7.1.3 Human comfort vibration assessment summary

The assessment presented in **Table 3-15** indicates the proposed works using a large rock-breaker may result in up to five buildings that are within the nominated minimum working distance for human comfort vibration. The buildings are identified in **Figure 3-2** and comprise of four commercial buildings and one place of worship located on Robert Street, to the north of the site.

In relation to human comfort (response), the minimum working distances detailed in the EIS (refer to Appendix J (Technical working paper: Noise and vibration)) relate to continuous vibration and apply to residential receivers. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels occurring over shorter periods are permitted, as discussed in BS 6472 Part 1 2008 *Guide to evaluation of human exposure to vibration in buildings*.

Receivers adjacent to White Bay civil site have been identified as likely to perceive vibration impacts at times during construction works. This is expected to be primarily due to works associated with rock-breakers and other high vibration plant items. In practice vibration impacts from most construction activities would be intermittent and would only occur during part of the site establishment works (a period of around four weeks). The required locations for vibration intensive equipment should be reviewed during detailed design when more specific information is available.

3.7.1.4 Cumulative vibration impacts

Due to the intermittent nature of construction works, vibration impacts due to multiple rock-breakers working throughout the site are considered unlikely to result in concurrent vibration peaks, but rather, may increase the effective duration of the exposure to vibration. Vibration impacts due to multiple simultaneous works would therefore be managed in the same manner as for single works scenarios (dependant on the operating equipment).

4 Relocation of the bioretention facility at Rozelle

Noise generated during construction of the bioretention facility would be consistent with noise generated from other construction works in the same area, such as operation of the Iron Cove Link civil site and widening of Victoria Road. Construction activity ICL-11 (earthworks and drainage) presented in the EIS is considered to be representative of the works required to construct the bioretention facility and result in a similar level of impact to the same receivers. Impacts would generally be limited to receivers on Byrnes Street and users of King George Park, both of which are identified in the EIS report as being impacted by construction works. Impacts associated with the works would be managed through implementation of the mitigation and management measures outlined in the EIS for construction activities that would occur during standard construction hours only.

5 Environmental management measures

Potential noise and vibration impacts from the White Bay civil site would be managed by the following management measures as outlined in Chapter E1 of the PIR:

- NV3 - Detailed noise assessments will be carried out for all ancillary facilities required for construction of the project. The assessment will consider the proposed site layouts and noise generating activities that will occur at the facilities and assess predicted noise levels against the relevant noise management levels determined in accordance with the requirements of the ICNG. The assessments will be used to determine the appropriate noise management measures, consistent with the requirements of the ICNG and Construction Noise and Vibration Guideline (Roads and Maritime 2016)
- NV4 - Location and activity specific noise and vibration impact assessments will be carried out prior to (as a minimum) activities:
 - With the potential to result in noise levels above 75 dBA at any receiver
 - Required outside standard construction hours likely to result in noise levels greater than the relevant noise management levels
 - With the potential to exceed relevant performance criteria for vibration

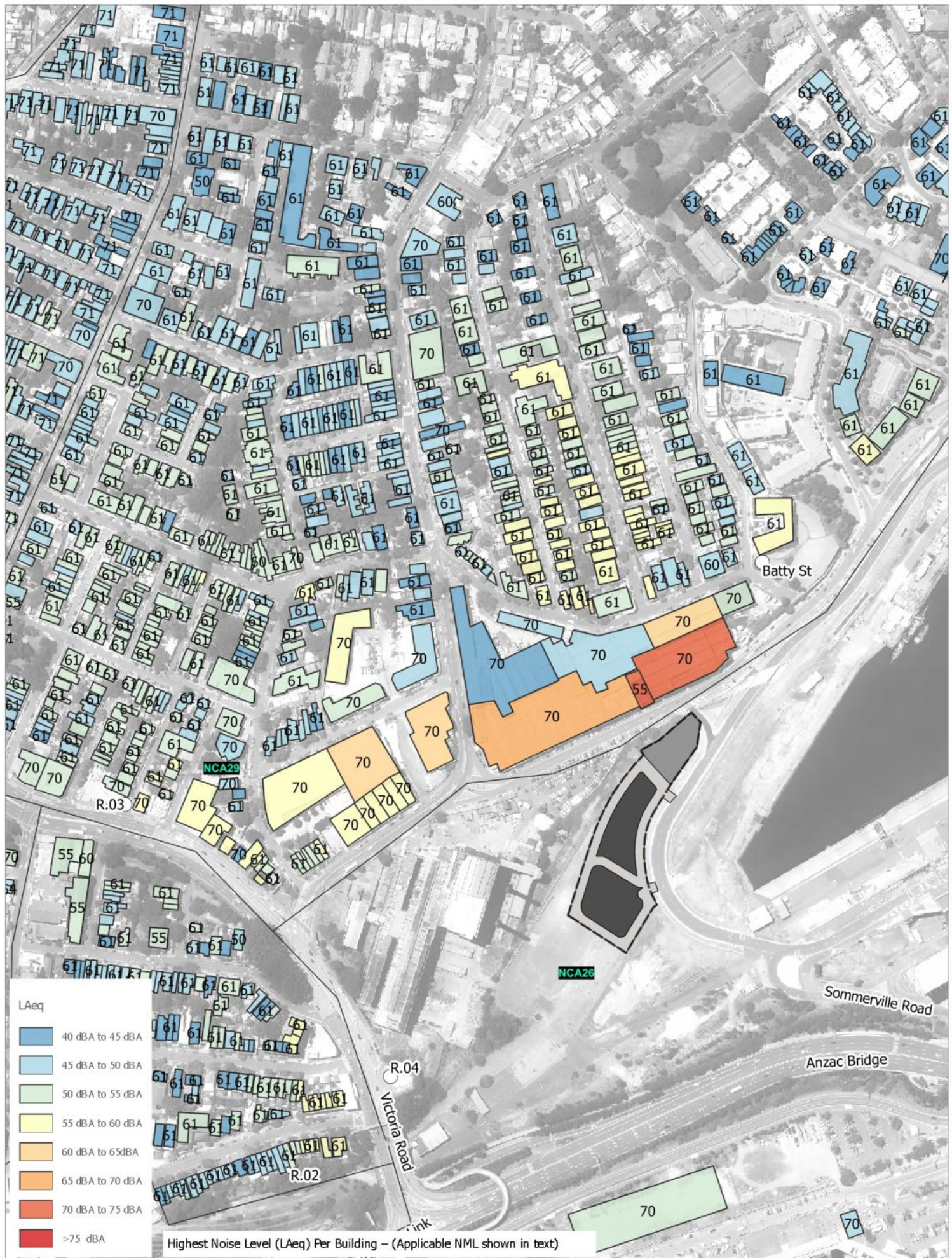
The assessments will clarify predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures, consistent with the requirements of ICNG and CNVG that will be implemented during the works

- NV6 - Monitoring will be carried out at the commencement of new noise and vibration intensive activities and works in new locations to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate.

In addition, a condition assessment of the northern penstock will be carried out by a heritage specialist and a structural engineer prior to any vibratory works in the vicinity that have the potential to impact on the item. The condition assessment will inform additional management measures to protect the northern penstock, if required. Any conservation works required to limit potential impacts on deteriorated fabric (loose bricks, corroded steel) will be identified and implemented prior to commencement of the relevant vibratory works in the vicinity.

Annexure A

Construction Scenario Noise Maps – White Bay Civil Site



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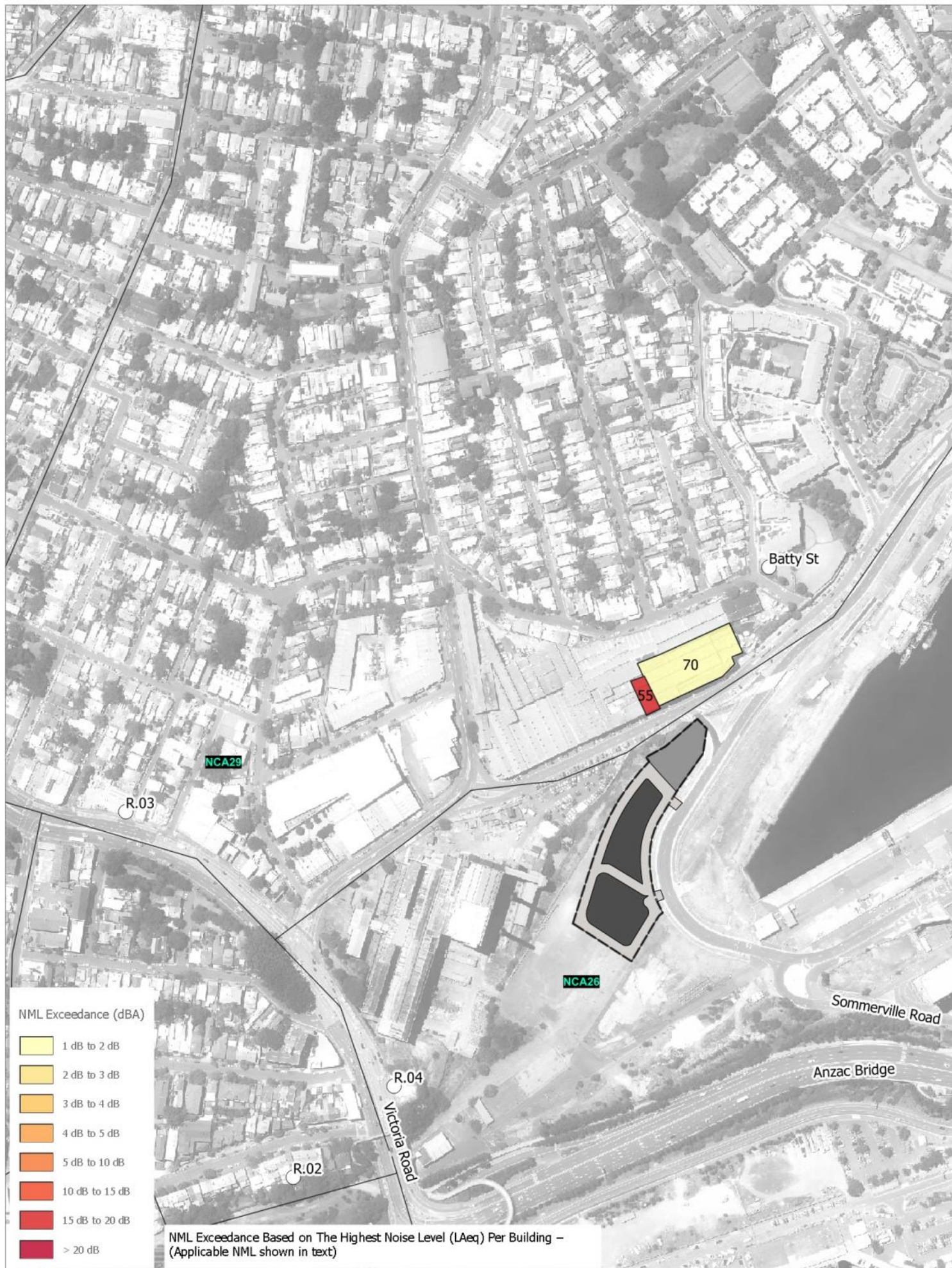


0 50 100 150 m

SMC

WESTCONNEX M4-M5 Link

**Worst-case noise level - Daytime Only
WBM-01 - Demolition of existing hardstand
and site levelling - with breaker**



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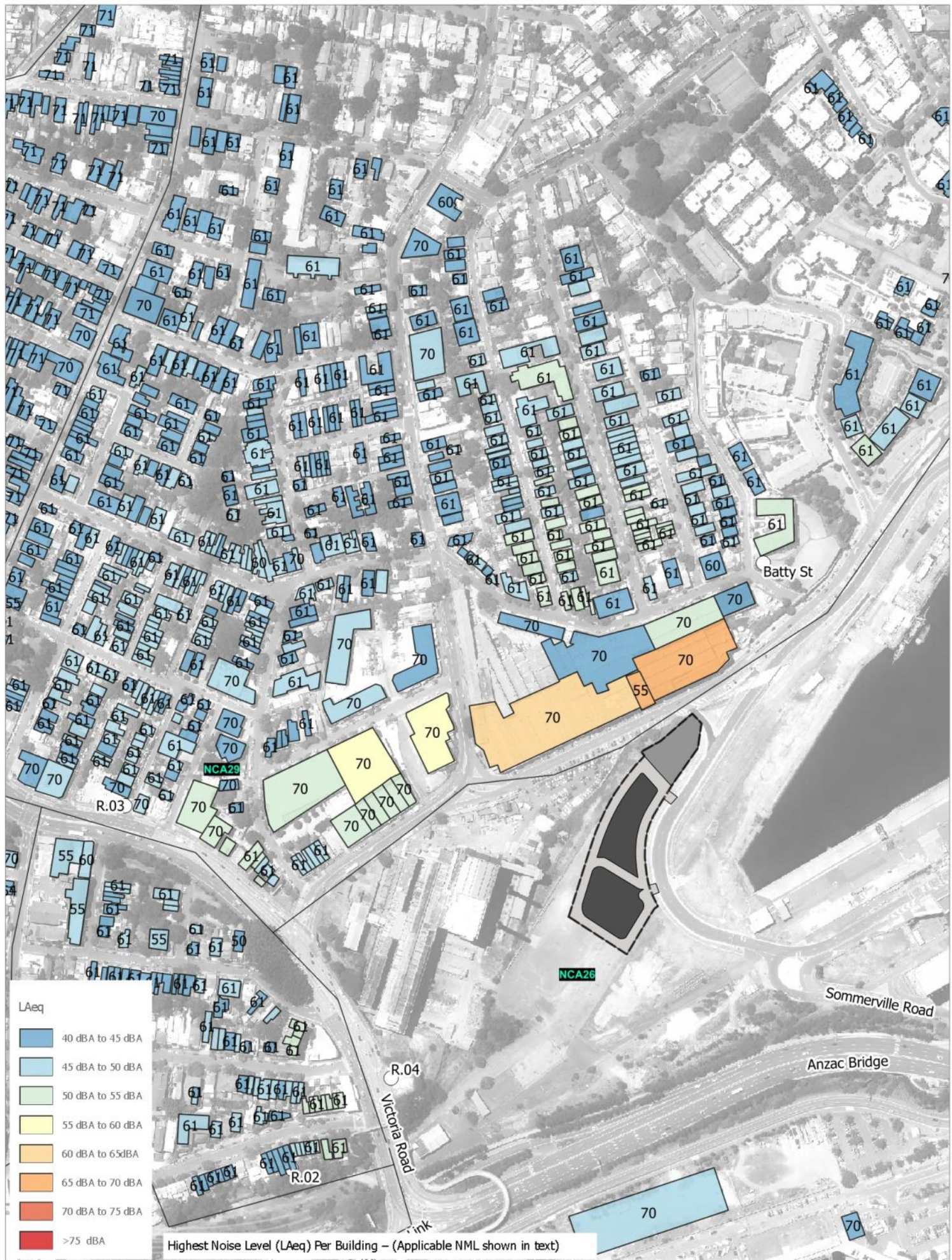


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WESTCONNEX M4-M5 Link

NML Exceedance - Daytime Only
WBM-01 - Demolition of existing hardstand
and site levelling - with breaker



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WESTCONNEX M4-M5 Link

**Worst-case noise level - Daytime Only
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and site levelling - no breaker**



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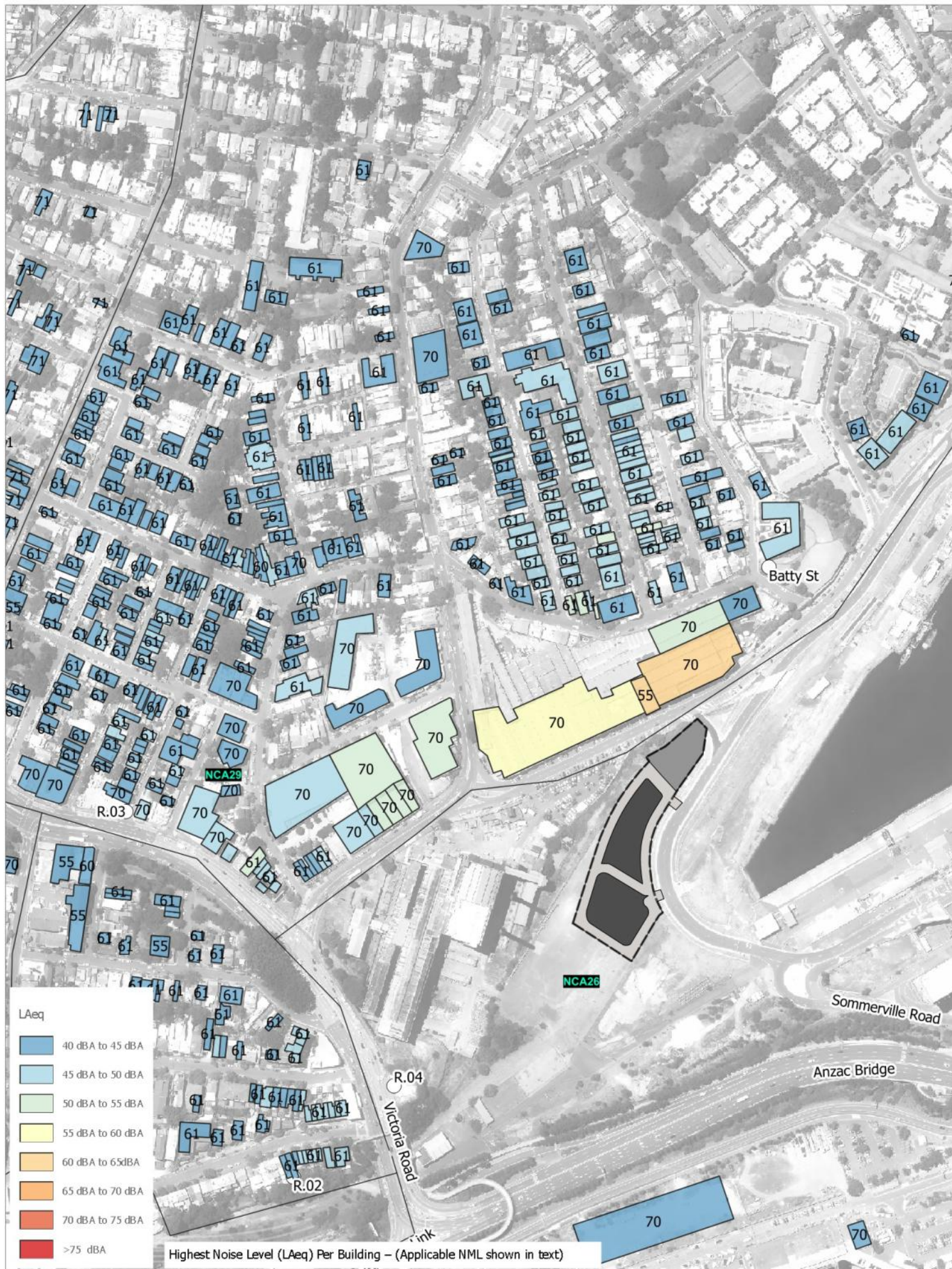


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WESTCONNEX M4-M5 Link

NML Exceedance - Daytime Only
WBM-02 - Demolition of existing hardstand
and site levelling - no breaker



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WESTCONNEX M4-M5 Link

**Worst-case noise level - Daytime Only
WBM-03 - Hardstand construction using
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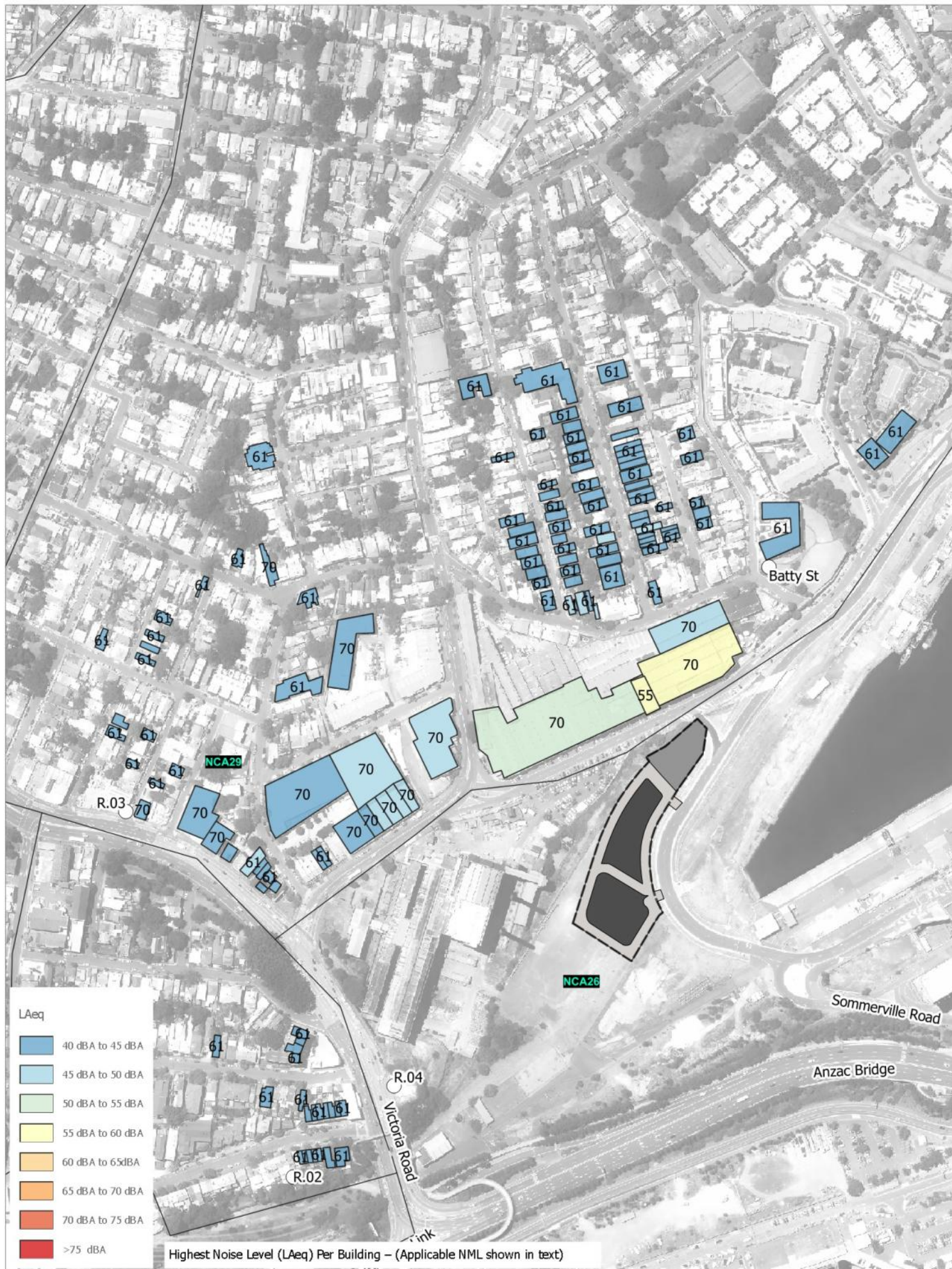
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WESTCONNEX M4-M5 Link

NML Exceedance - Daytime Only
WBM-03 - Hardstand construction using compaction equipment



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WESTCONNEX M4-M5 Link

Worst-case noise level - Daytime Only
WBM-04 - Asphalt layer and line marking



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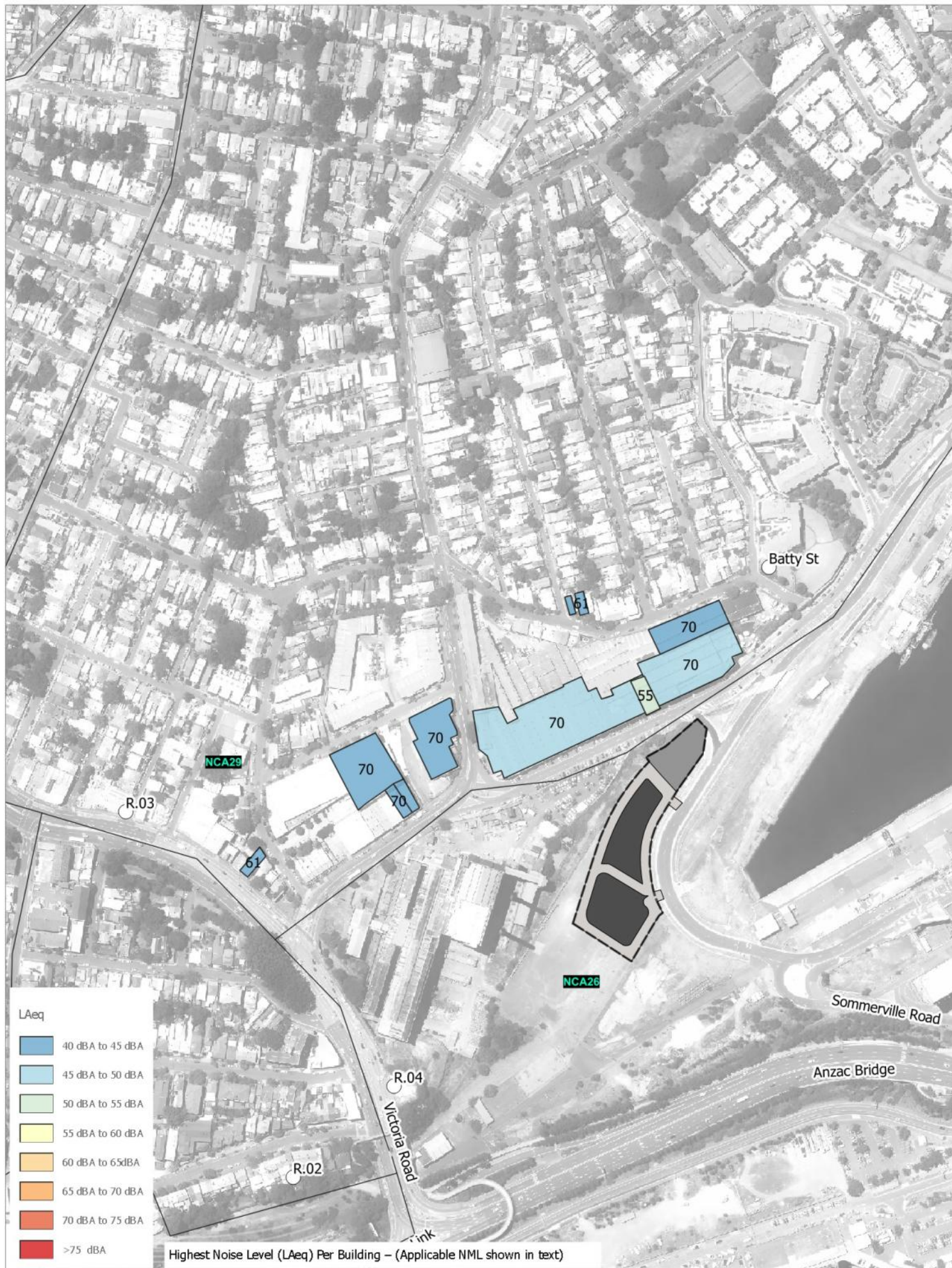
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NML Exceedance - Daytime Only
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WESTCONNEX M4-M5 Link

**Worst-case noise level - Daytime Only
WBM-05 - Construction of gate house**



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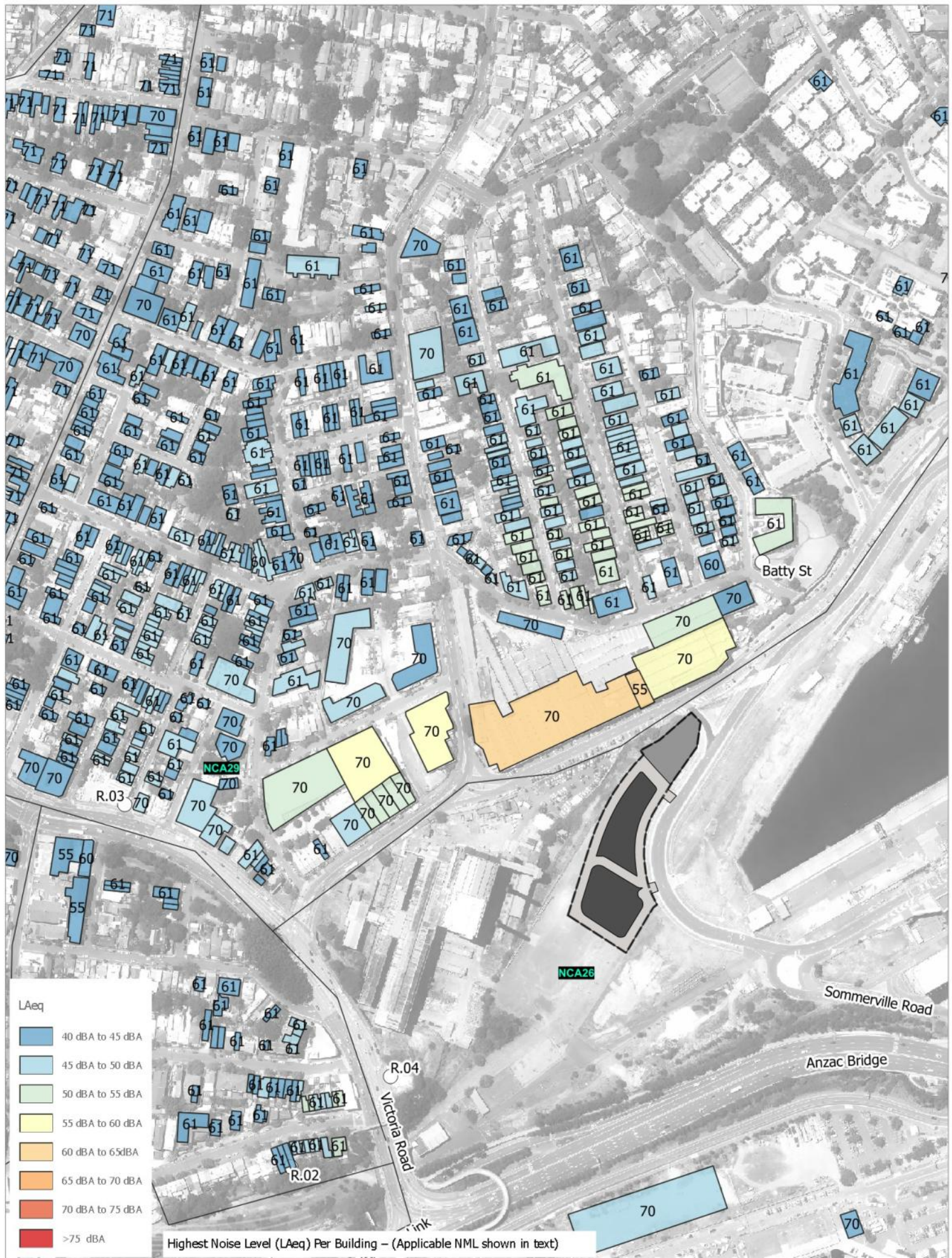


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WESTCONNEX M4-M5 Link

**NML Exceedance - Daytime Only
WBM-05 - Construction of gate house**



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WESTCONNEX M4-M5 Link

Worst-case noise level - Daytime Only
WBM-06 - Site operations - peak



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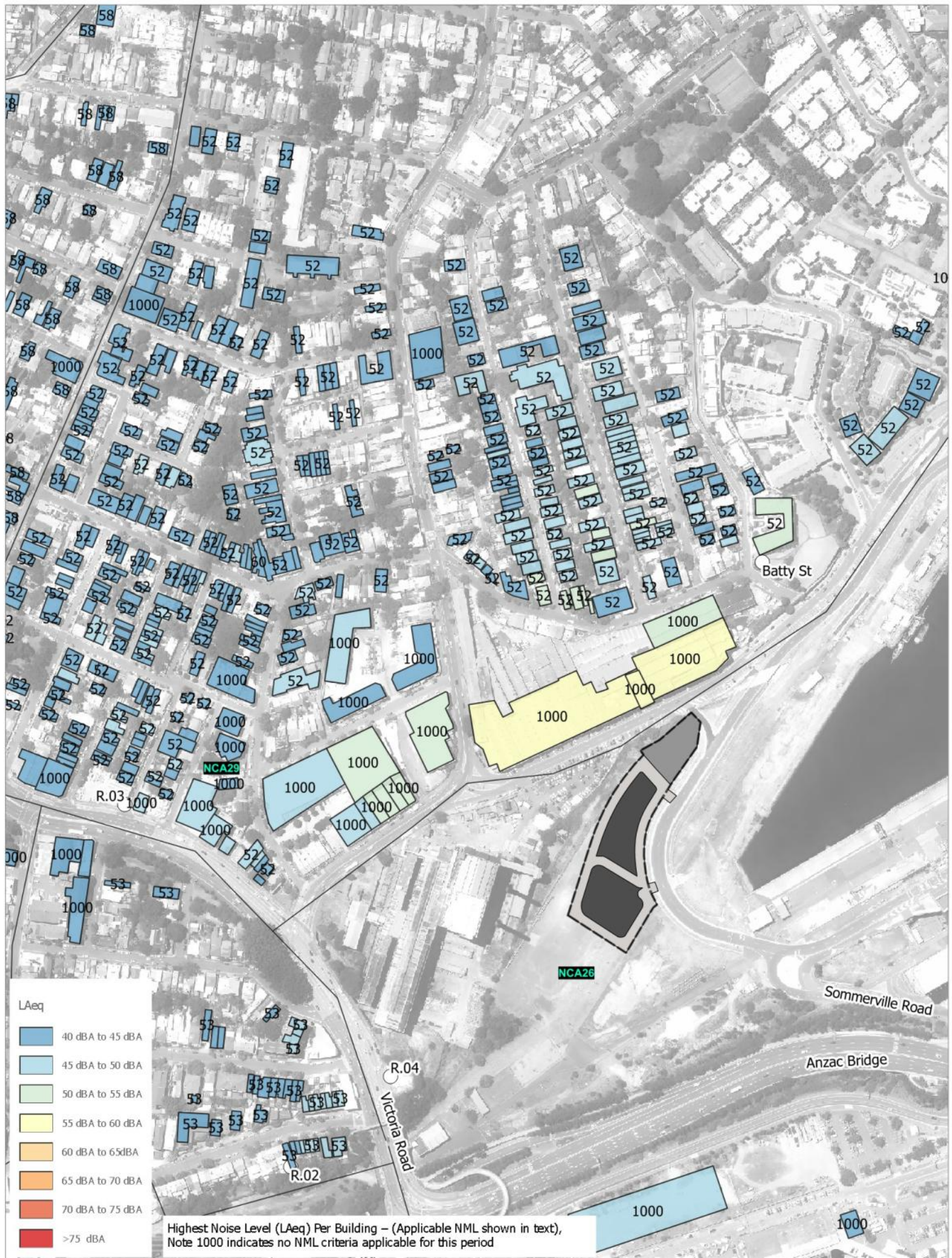


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WESTCONNEX M4-M5 Link

**NML Exceedance - Daytime Only
WBM-06 - Site operations - peak**



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WESTCONNEX M4-M5 Link

Worst-case noise level - Shoulder Period
(5am - 7am) Only
WBM-07 - Site operations - typical

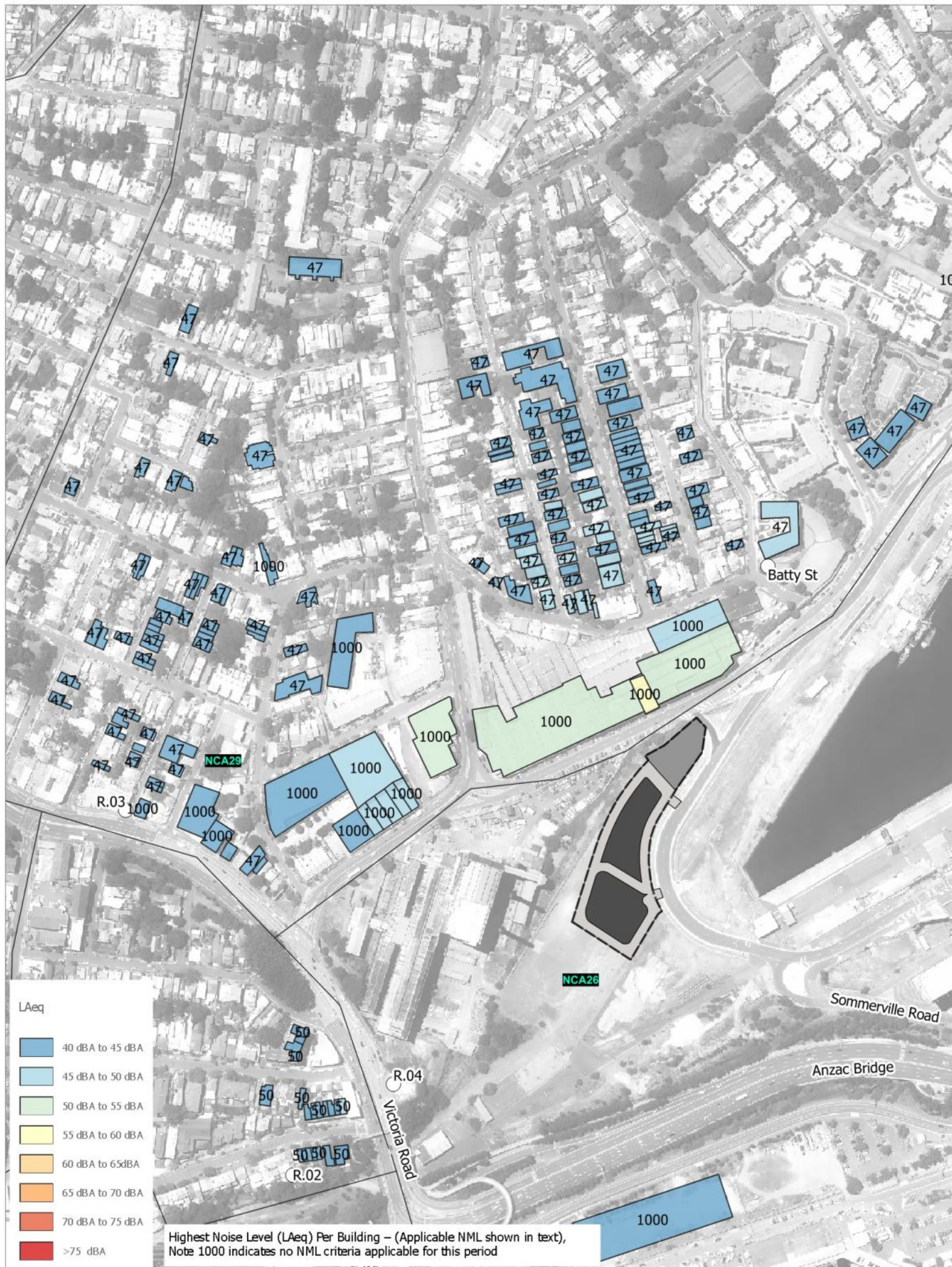


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WESTCONNEX M4-M5 Link

**Worst-case noise level - Night-time
WBM-08 - Site operations - Night**



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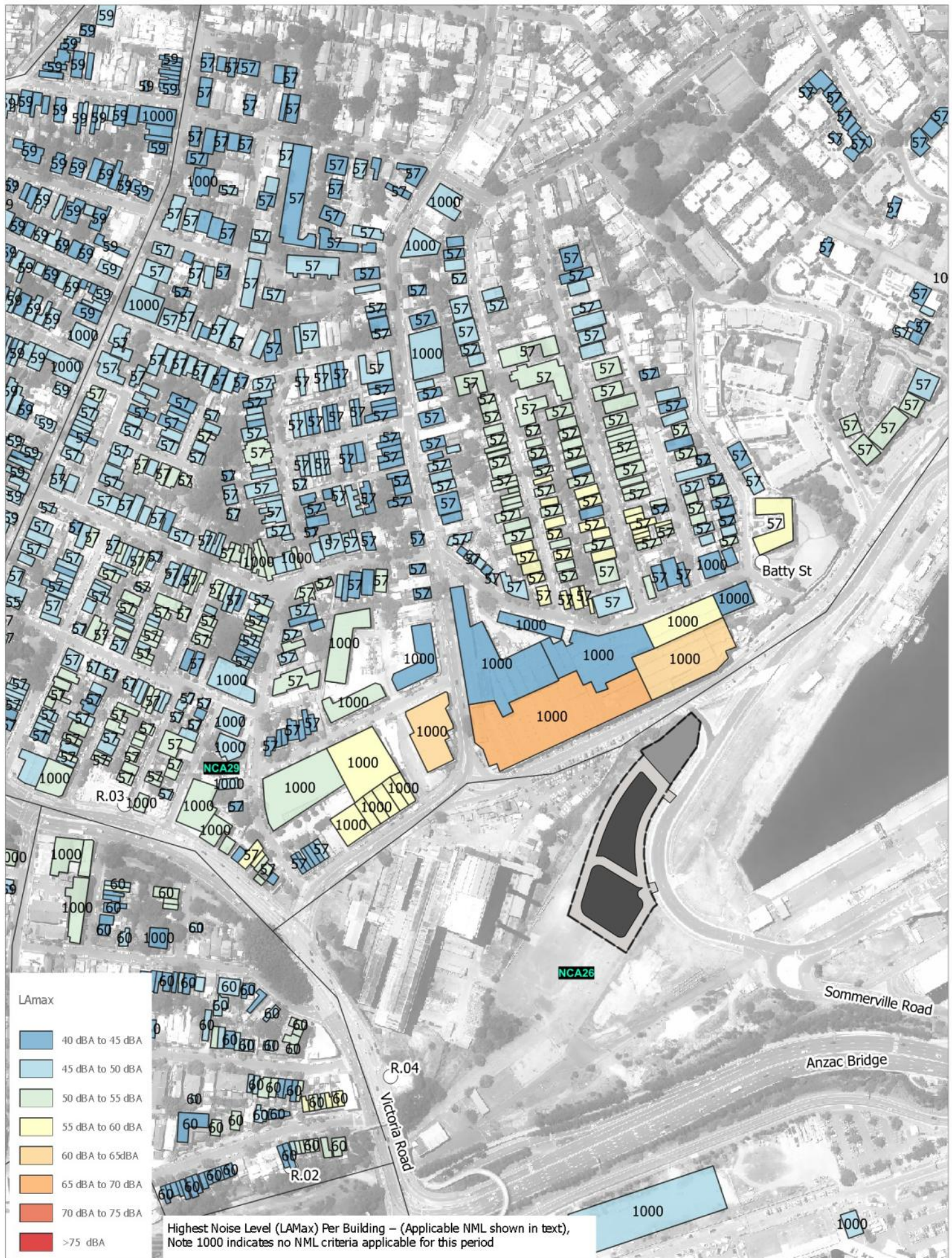


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WESTCONNEX M4-M5 Link

NML Exceedance - Night-time
WBM-08 - Site operations - Night



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0 50 100 150 m

SMC

WESTCONNEX M4-M5 Link

**Worst-case noise level - Sleep
Disturbance
WBM-08 - Site operations - Night**



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WESTCONNEX M4-M5 Link

**NML Exceedance - Sleep Disturbance
WBM-08 - Site operations - Night**

