

## 5 Potential impacts - construction

### 5.1 Northcote Street civil and tunnel site (including the G-loop)

#### 5.1.1 Noise management summary

The NMLs derived for the NCAs around the Northcote Street civil and tunnel site and G-loop are outlined in **Table 5-1**. Additional information on the representative monitoring locations and derived NCAs is provided in Appendix J (Technical working paper: Noise and vibration) of the EIS. No additional monitoring at representative locations was required for the assessment of potential noise impacts as a result of the proposed modification at the Northcote Street site.

**Table 5-1 Residential NMLs for the project**

NCA	Representative monitoring location	Receiver type	Standard construction NMLs (RBL+10dBA)	Out of hours NMLs (RBL+5dBA) <sup>1</sup>			Sleep disturbance screening (RBL+15dBA)
			Daytime period	Daytime period	Evening period	Night period	
NCA00	H.03	Residential	56	51	51	43	53
NCA01	H.03	Residential	56	51	51	43	53
NCA02	H.01	Residential	68	63	63	57	67
NCA03	H.04	Residential	68	63	60	49	59
NCA04	H.06	Residential	66	61	58	48	58
NCA05	L.02	Residential	61	56	54	47	57
NCA06	H.02	Residential	56	51	51	48	58
NCA07	H.02	Residential	56	51	51	48	58

Notes:

1. Out of Hours construction hours – 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

#### 5.1.2 Activity source noise levels

Sound power levels for the typical operation of construction equipment applied in the modelling are listed in **Table 5-2**. The activities are representative of works which have the potential to impact nearby sensitive receivers. Potential ground-borne noise impacts from works within the tunnel are assessed in **Section 5.1.10**.

**Table 5-2 Sound power levels for construction equipment**

Scenario name	Works ID	Equipment (realistic worst case)	Worst case items in same location	Sound power level (dBA)		
				LWA Item	Activity <sup>2</sup>	LWAmix Activity
Site establishment – Northcote Street civil and tunnel site	NST-01	Flatbed truck	1	100	106	112
		Franna crane	1	99		
		Mobile crane	1	101		
		Semi-trailer	2	106		
		Hand tools	1	96		
Tunnelling works – Northcote Street civil and tunnel site	NST-02	Front end loader	2	112	117	119
		Underground trucks	2	113		
		Surface Haulage Trucks	4	110		
		Water treatment plant <sup>1</sup>	1	87		
		Ventilation fans <sup>1</sup>	1	89		
Tunnelling support activities – Northcote Street civil and tunnel site	NST-03	Concrete truck / agitator	2	106	106	112
		Hand tools	1	96		
		Franna crane	1	99		
		Bus	1	98		
		Forklift	1	101		
		Concrete pump	1	106		
Site decommissioning – Northcote Street civil and tunnel site	NST-04	Excavator	1	104	112	123
		Mobile crane	1	101		
		Semi trailer	1	106		
		Elevated working platform	1	97		
		Truck	1	97		
		Concrete saw	1	115		
Site establishment and decommissioning G-loop	NST-05	Concrete truck / agitator	1	103	112	123
		Mobile crane	1	101		
		Semi trailer	1	106		
		Elevated working platform	1	97		
		Truck	1	97		
		Concrete saw	1	115		

Notes:

1. Equipment sound power levels are referenced from the M4-East Northcote Street tunnel site Construction Noise and Vibration Impact Statement and are indicative only. Sound power levels of the finalised equipment may differ and are subject to detailed design
2. Activity sound power levels account for the amount of time an item of plant is anticipated to operate within each 15 minute period

Specific details on construction of the ventilation and water treatment plant including the enclosure and silencer design will be confirmed by the M4-M5 Link contractor in the Construction Noise and Vibration Impact Statement (CNVIS) for this site.

### 5.1.3 In-situ noise mitigation – Northcote Street civil and tunnel site

It is proposed to use the existing M4 East tunnelling site arrangement (with minor modifications). This would include retention of the existing hoarding and acoustic shed. As these features form part of the proposed works, these are included in the assessment prior to the consideration of additional mitigation.

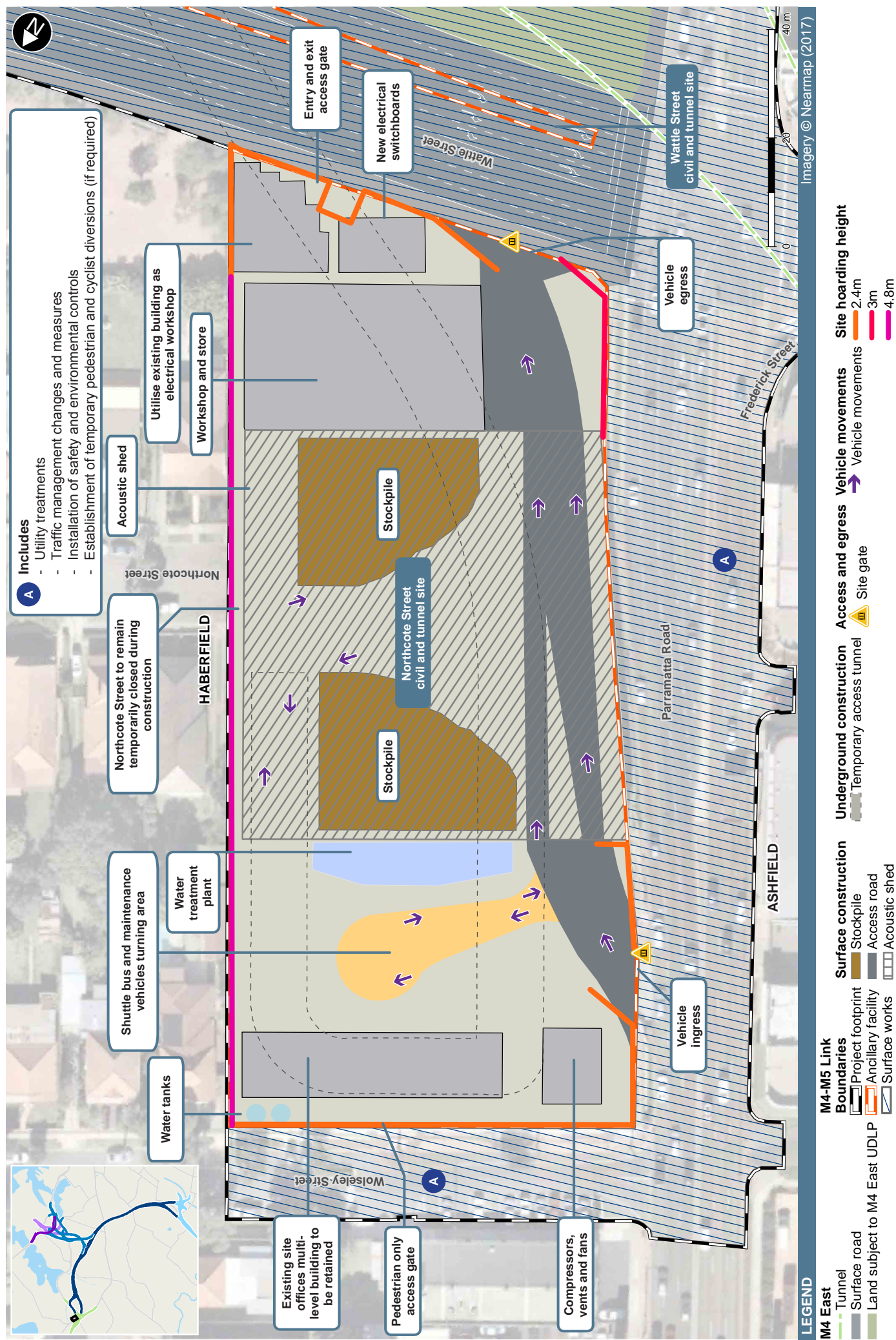
The height of hoarding and transmission loss of the acoustic shed elements has been referenced from the WestConnex M4 East CNVIS for the Northcote Tunnel Support Site (Renzo Tonin 2016). **Table 5-3** details the acoustic shed composition considered within this assessment and **Figure 5-1** depicts the indicative height and location of site hoarding. The assumptions relating to the height of hoarding and transmission loss of the acoustic shed at the Northcote Street civil and tunnel site would be validated as part of the CNVIS that will be prepared for this site.

**Table 5-3 Northcote Street civil and tunnel site acoustic shed composition**

Acoustic shed element	Octave band transmission loss (dB) <sup>1</sup>						
	63	125	250	500	1000	2000	4000
Walls facing north east	20	24	29	33	38	41	46
All other walls including roof	16	20	24	29	33	35	41

Notes:

1. It is assumed that octave band transmission loss (dB) and hoarding height is consistent with that referenced in the WestConnex M4 East CNVIS for the Northcote Tunnel Support Site (Renzo Tonin 2016).



**Figure 5-1** Indicative Northcote Street civil and tunnel site hoarding height

## 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 5-4** for residential, commercial and 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.

Shading in the following tables denotes 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 to changes in noise levels than the daytime or evening for most people):

- Noise levels 1 dBA 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 the position of plant items and the distance to noise sensitive receivers as well as across different stages of construction.

The predicted NML exceedances in this area are summarised in **Table 5-5**. The assessment presented in this table takes into consideration the assessed construction scenarios in this area. The number of receivers predicted to experience exceedances of the NMLs is shown in bands and are separated into day, evening and night-time periods, as appropriate.

Table 5-4 Predicted worst case noise levels – Northcote Street civil and tunnel site

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) <sup>1</sup>				
		NST-01 Site establishment	NST-02 Tunnelling activities	NST-03 Tunnelling support activities	NST-04 Site decommissioning	NST-05 G-loop establishment and decommissioning
Residential - Standard Daytime						
NCA00	56	40	37	37	46	40
NCA01	56	52	53	54	58	41
NCA02	68	66	57	59	72	48
NCA03	68	43	42	44	49	51
NCA04	66	38	36	38	44	60
NCA05	61	32	31	33	38	65
NCA06	56	47	43	43	53	55
NCA07	56	41	38	36	47	46
Residential – Evening						
NCA00	51	-	37	37	-	40
NCA01	51	-	53	54	-	41
NCA02	63	-	57	59	-	48
NCA03	60	-	42	44	-	51
NCA04	58	-	36	38	-	60
NCA05	54	-	31	33	-	65
NCA06	51	-	43	43	-	55
NCA07	51	-	38	36	-	46
Residential - Night-time						
NCA00	43	-	37	37	-	40
NCA01	43	-	53	54	-	41
NCA02	57	-	57	59	-	48
NCA03	49	-	42	44	-	51
NCA04	48	-	36	38	-	60
NCA05	47	-	31	33	-	65
NCA06	48	-	43	43	-	55
NCA07	48	-	38	36	-	46

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) <sup>1</sup>				
		NST-01 Site establishment	NST-02 Tunnelling activities	NST-03 Tunnelling support activities	NST-04 Site decommissioning	NST-05 G-loop establishment and decommissioning
Commercial						
NCA01	70	58	61	56	64	43
NCA02	70	61	56	60	67	40
NCA03	70	-	-	-	-	-
NCA04	70	36	37	37	43	54
NCA05	70	-	-	-	-	-
NCA06	70	47	43	38	53	50
NCA07	70	40	35	35	46	46
Other Sensitive						
NCA00	- Refer to note 2	<30	<30	<30	<30	<30
NCA01		42	39	44	49	37
NCA02		50	47	48	56	46
NCA03		-	-	-	-	-
NCA04		30	30	31	36	83
NCA05		<30	<30	<30	35	50
NCA06		<30	<30	<30	32	38
NCA07		41	38	37	47	46

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
2. 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 5-5 Overview of NML exceedances – Northcote Street civil and tunnel site

Activity ID	Activity	Weeks <sup>1</sup>	Activity duration within overall project program <sup>2</sup>				Number of receivers		NML exceedance receiver count <sup>3</sup>														
			25	50	75	100	Total	Highly noise affected <sup>4</sup>	Daytime			Daytime (out of hours)			Evening			Night-time			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
NST-01	Site establishment	24					1747	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NST-02	Tunnelling	116					1747	-	-	-	-	1	-	-	1	-	-	41	-	-	162	8	-
NST-03	Tunnelling support activities	116					1747	-	-	-	-	2	-	-	2	-	-	71	1	-	35	-	-
NST-04	Site decommissioning	52					1747	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NST-05	G-loop establishment and decommissioning	10					1747	-	6	-	-	31	-	-	43	2	-	196	22	-	225	31	-

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 per cent) of activity duration within overall proposal program. Where percentage is less than 13 per cent, 13 per cent 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).



#### 5.1.4 NML exceedances

##### Site establishment (NST-01) and decommissioning (NST-04)

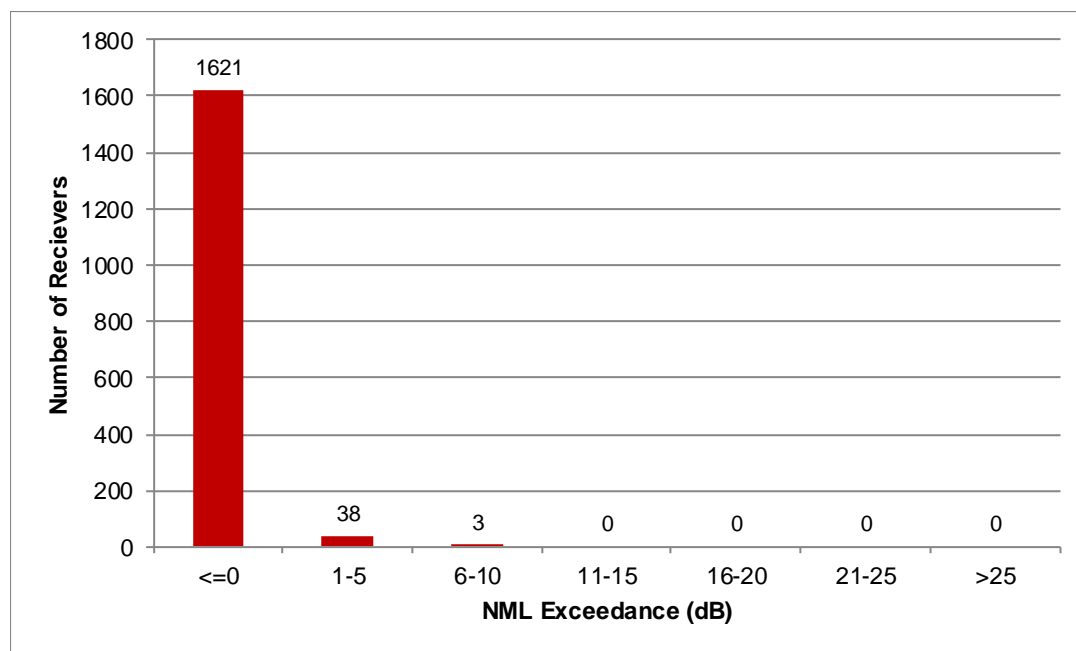
No exceedances of the daytime NMLs are predicted during site establishment (NST-01). This is primarily due to the planned use of the existing acoustic shed and upper parts of the existing decline tunnel, with no major surface earthworks therefore required during site establishment.

During decommissioning (scenario NST-04), minor exceedances (up to 10 dBA) at five sensitive receivers are predicted during standard construction hours within NCA01 and NCA02. Exceedances would be expected to be attributed to the use of excavators and concrete saws during the decommissioning of the site.

##### Tunnelling activities (NST-02)

During tunnelling activities (scenario NST-02) worst case predicted exceedances of the night-time airborne NMLs are predicted at residential receivers located to the west of the site (NCA01), with a maximum exceedance of 10 dBA predicted. These exceedances are due to the openings in both the site hoarding and the acoustic shed to allow truck access and egress from the site.

**Figure 5-2** indicates the distribution of exceedances for tunnelling activities during the night time period and shows that the majority of the receivers are predicted to be subject to no or minor exceedances (one to five dBA exceedances) of the night time NMLs, with worst-case impacts of up to 10 dBA limited to only three receivers within NCA01. **Figure 5-3** shows a grid noise map of the works scenario NST-02, which illustrates how noise emissions propagate from the site.



**Figure 5-2 Activity NST-02 noise level exceedance, Night time**



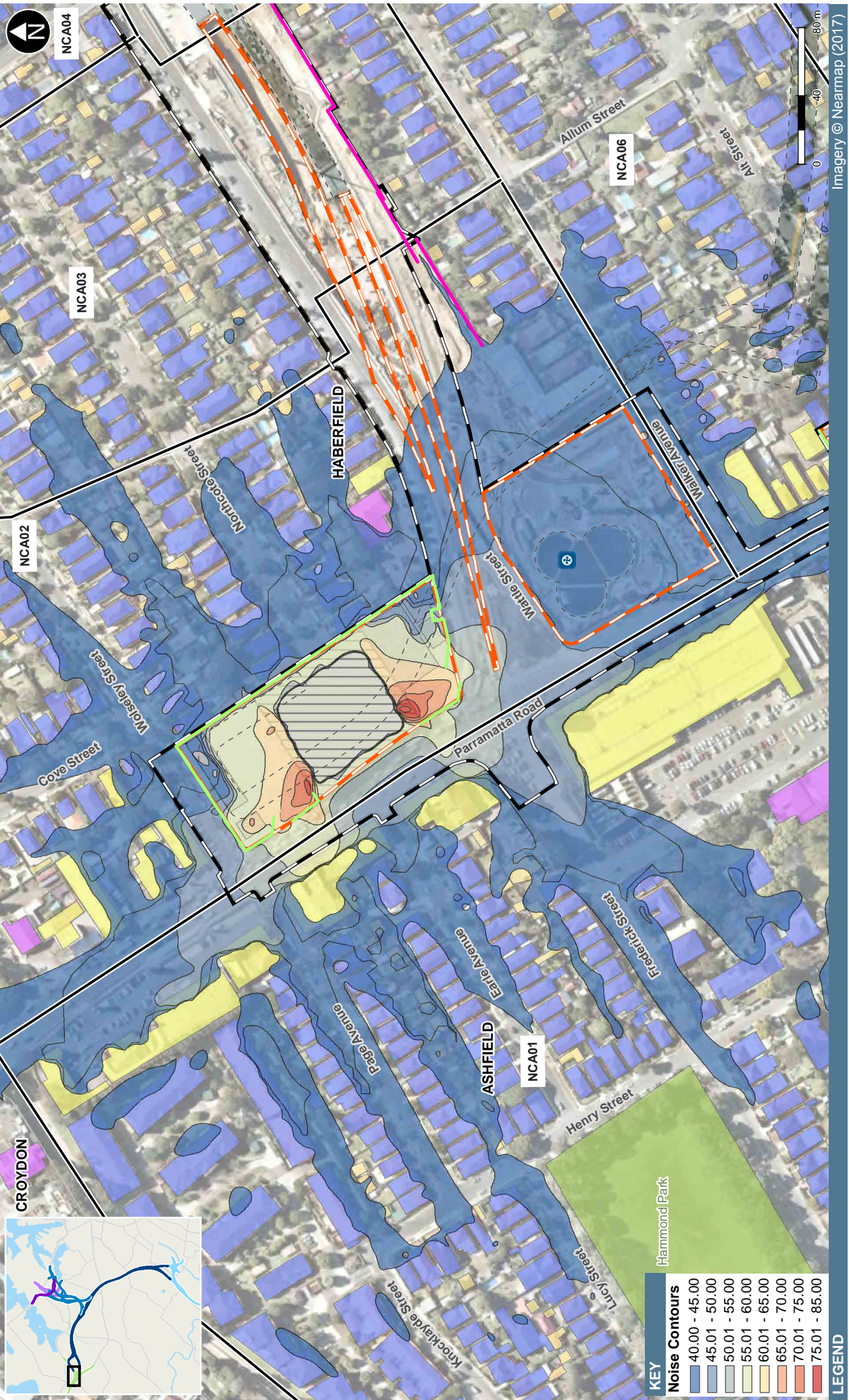


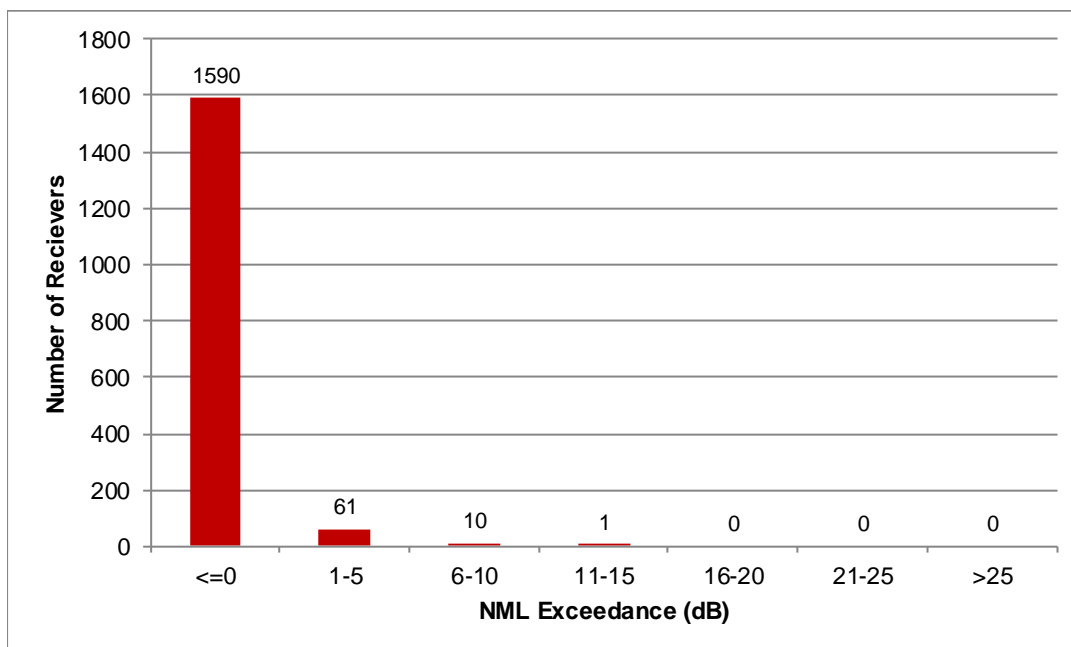
Figure 5-3 Grid Noise Map for tunneling activities (NST-02)

### Tunnelling support activities (NST-03)

NML exceedances of up to 15 dBA (during the night period) are predicted during tunnelling support activities (NST-03) in NCA01 and NCA02. **Figure 5-4** indicates the distribution of exceedances for tunnelling support activities (NST-03) (night) prior to the application of any additional mitigation. **Figure 5-5** shows a grid noise map of the works scenario NST-02, which illustrates how noise emissions propagate from the site.

While the worst case impacts may result in up to 15 dBA exceedance of NMLs during the night time period, this is limited to one receiver within NCA01 with the majority of the receivers in this area being subject to considerably lower impacts. Exceedances are generally expected due to the use of concrete pumps associated with concrete deliveries. Mitigation of these exceedances could include investigation of source mitigation such as localised barriers or enclosures around the source control noise emissions.

As per all construction works associated with the M4-M5 link project, the Northcote Street civil and tunnel site will operate in accordance with the project conditions of approval. Conditions which relate directly to the site have been identified in **Section 4.2**. These include both E73 which requires the site to operate within NMLs during construction works outside of standard hours and E72 which defines the time periods as to when highly noise intensive works can be conducted on the site.



**Figure 5-4** Activity NST-03 noise level exceedance, night-time





Figure 5-5 Grid Noise Map for tunneling support activities (NST-03)



### 5.1.5 Construction of the G-loop (NST-05)

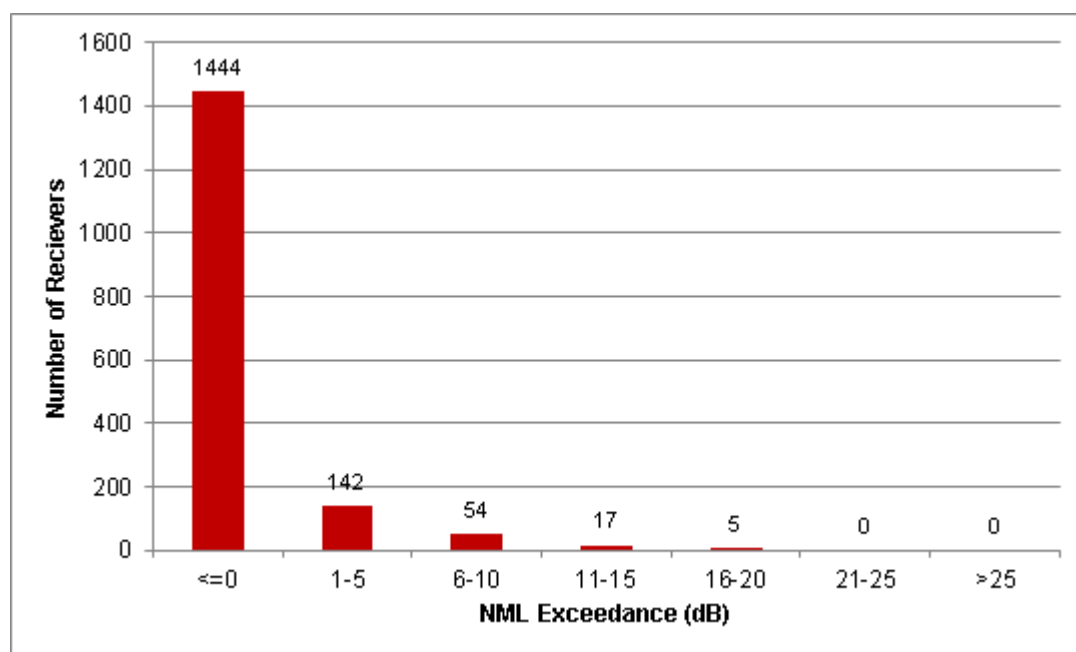
Works activity NST-5 is representative of establishment works for the reinstatement of the G-loop. These works may be conducted outside of standard construction hours to avoid impacts on the road network during the busier periods. Moderate NML exceedances of up to 20 dBA are predicted when the concrete saw is operating. Noise impacts are generally limited to receivers that are situated near to the G-loop within NCA04, NCA05 and NCA06.

Commissioning of the G-loop is expected to take up to two weeks, with the majority of works undertaken during standard construction hours. Some limited night works will be required to construct tie-ins with the operational road network to minimise disruptions to traffic. Decommissioning of the G-loop is expected to take up to eight weeks, with the majority of works also to be undertaken during standard construction hours. As with commissioning, some limited night works would be required where works have the potential to impact on the operational road network. The construction of the G-loop would be managed via the implementation of the mitigation and management measures outlined in the EIS and the conditions of approval for the project.

The operation and location of the dominant item typically controls the level of noise emissions. For the construction of the G-loop (activity NST-05) the operation of the concrete saw dominates the noise predictions and as such mitigation and management measures should focus on the operation of this item particularly during OOHWs. It is estimated that when the concrete saw is not in operation, NML exceedances would generally reduce by up to 4 dBA and up to 10 dB noise reduction could be achieved with the use of localised hoarding around the concrete saw.

As per all construction works associated with the M4-M5 link project, the construction of the G-loop will be undertaken in accordance with the project Conditions of approval. Conditions which relate directly to these works have been identified in **Section 4.2**. These include both E76 which requires appropriate respite periods to be identified and the community consulted with prior to any out of hours works which may require road occupancy or other works noted in E75 and, E72 which defines the time periods as to when highly noise intensive works can be conducted on the site.

**Figure 5-6** indicates the distribution of exceedances for activity NST-05 (at night) for receivers within the Haberfield study area.



**Figure 5-6** Activity NST-05 noise level exceedance, night-time

### 5.1.6 Sleep disturbance

A review of the predicted LA1(1minute) exceedances at the nearest noise sensitive receivers provided in **Table 5-5** indicates that the sleep disturbance screening criterion is likely to be exceeded when night works associated with tunnelling (NST-02), tunnelling support activities (NST-03) and the construction of the G-loop (NST-05) are occurring adjacent to residential receivers.

The assessment has included predictions of maximum noise impacts for assessment of potential sleep disturbance, however, it is noted that the ICNG only requires the project to consider maximum noise levels where construction works are planned to extend over more than two consecutive nights.

The project wide Construction Noise and Vibration Management Sub-Plan (CNVMP) will set parameters around how works outside standard daytime construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments.

### 5.1.7 Construction mitigation and management measures

Particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies as per the standard mitigation measures detailed in the ICNG and CNVG. Where feasible and reasonable, mitigating impacts via means of source and or path control are preferred.

Based on the noise impact assessment of the proposed works, the following mitigation measures summarised in **Table 5-6** should be further investigated in addition to the standard suite of measures in the ICNG and CNVG.

**Table 5-6 Recommended site specific noise mitigation measures to be considered**

Activity	Mitigation description	Reason
NST-02, NST 05	Use of structures such as site sheds to shield residential receivers from construction activities.	Exceedances have been identified for works conducted within the Northcote Street civil and tunnel site.
	Non-tonal reversing beepers (or an equivalent) must be fitted and used on all construction vehicles and mobile plant regularly used onsite.	
	Plan traffic flow, parking and loading/unloading areas to minimise truck reversing movements within the site.	
	Partially close the roller door during out of hours periods to the minimum height required to allow trucks to access the shed.	
	Access to the site to be sealed to limit noise impacts by trucks accessing and egressing the site.	

### 5.1.8 Consecutive construction impacts

The CNVG recognises that mitigation measures aimed at short term works may be less effective where longer term impacts are apparent and requires additional consideration of reasonable and feasible management measures to minimise impacts on the community.

When evaluating the extent of noise impacts within the Haberfield area, it is noted that this area would likely be subject to potential construction impacts from works associated with other infrastructure projects, including the approved M4 East project currently under construction.

The indicative construction program for M4-East and M4-M5 Link associated with the Northcote Street site are shown below in **Table 5-7**.

**Table 5-7 Indicative construction program for Northcote Street civil and tunnel site – M4 East and M4-M5 Link projects**

Project use of Northcote Street site	2016				2017				2018				2019				2020				2021				2022				2023			
	Q				Q				Q				Q				Q				Q				Q				Q			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
M4 East																																
M4-M5 Link																																

The noise and vibration impacts discussed in this report consider the duration of the M4-M5 Link project use of the Northcote Street civil and tunnel site in isolation, whereas the potential impacts from the identified consecutive projects may be longer for receivers near this site. While the majority of the highly noise intrusive works associated with the Northcote Street civil and tunnel site have occurred as part of the M4 East project (predominantly building demolition, bulk earthworks, construction of the acoustic shed and other construction activities that occurred outside of the acoustic shed), the M4-M5 Link project use of this site is predicted to result in impacts (of a lesser degree) for similar receivers in the area.

Receivers which front Parramatta Road between Page Avenue and Frederick Street at Haberfield within NCA01, and in NCA02 at receivers adjoining the Northcote Street site, are predicted to experience up to 10 dBA exceedances of the project NMLs (in the night-time period) during tunnelling operations (NST-02). While the magnitude of the predicted exceedance is relatively low, these impacts are predicted at receivers which would likely have been exposed to noise impacts during construction of the M4 East project.

The Construction Noise and Vibration Management Sub-Plan that will be prepared for the project will consider where longer term impacts are apparent and provide consideration of reasonable and feasible management measures to minimise impacts on the community. These will be consistent with the management and mitigation measures set out in the EIS, SPIR and the conditions of approval for the project, including condition E88.

Condition E88 identifies that at receiver noise mitigation in the form of at-property treatment must be offered to the land owner for habitable living spaces, or other mitigation or management measures as agreed by the occupier, to residential properties identified in Appendix E of the conditions of approval. Mitigation must be offered prior to works commencing. This requirement does not apply if the sensitive receiver has been provided with noise mitigation under the Roads and Maritime Noise Abatement Program or the State Environment Planning Policy (Infrastructure) 2007 (clause 102(3)). The adequacy of at-property treatments will be reviewed where previous treatments have been installed as part of other projects.

The proposed modification does not result in a change to the properties identified within Appendix E of the conditions of approval as the footprint assessed in the EIS has not been modified. As a result there will be no additional receivers impacted as a result of the modification.

Receivers in NCA05 and NCA05 east of Wattle Street / Dobroyd Parade have been subject to noise impacts during the construction of the M4 East project, including impacts resulting from the reconfiguration of Wattle Street, the construction of the Wattle Street entry and exit ramps and the use of the G-loop by construction vehicles. These receivers would be subject to potential ongoing noise impacts during construction of the project, particularly as a result of the proposed ongoing use of the G-loop. As described in **section 5.1.9**, two properties (83 and 85 Dobroyd Parade) have been provided at-property treatment as part of the M4 East project as a result of the use of the G-loop (refer to WestConnex M4 East CNVIS for the Northcote Tunnel Support Site (Renzo Tonin 2016)).

Likely noise impacts from the proposed use of the G-loop for the construction of the M4-M5 Link project would be consistent with or less than noise impacts from the M4 East project due to a forecast reduction in the number of heavy vehicles using the G-loop. In addition, the noise barrier being provided as part of M4 East project along the east side of Wattle Street / Dobroyd Parade would assist in ameliorating potential noise impacts from the G-loop on some receivers in NCA05 and NCA06.

Receivers in NCA05 and NCA06 are predicted to experience exceedances of the NML of less than 10 dBA during the evening and night-time periods during G-Loop establishment and decommissioning only, which would be a short-term activity. No exceedances of the NMLs are predicted within these NCAs as a result of tunnelling or tunnelling support activities, which are the activities that would occur over longer durations during the M4-M5 Link construction period.

### 5.1.9 Construction road traffic noise assessment

As described in **section 2.1.4** two spoil haulage routes have been assessed for the Northcote Street civil and tunnel site. **Table 5-8** describes each route proposed for spoil haulage. **Figure 2-4** shows the proposed spoil haulage routes.

**Table 5-8 Indicative spoil haulage routes for Northcote Street civil and tunnel site**

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

All of the roads included in the proposed haulage routes are managed by Roads and Maritime. The roads all have two traffic lanes, some with provision for car parking in each direction, and are not divided carriageways (except for the section of Wattle Street around the M4 East entry and exit ramps). The speed limit on roads along the routes is 60 kilometres per hour.

#### Construction road traffic noise assessment

The forecast maximum daily heavy and light vehicles volumes predicted to use the Northcote Street civil and tunnel site are presented in **Table 5-9**. These volumes are based on the information available at the time of preparing this assessment and are subject to detailed construction planning and detailed design. Maximum forecast daily volumes have been used to provide a conservative assessment.



**Table 5-9 Construction traffic forecast – Haberfield and Ashfield civil and tunnel sites**

Road	Daytime 15hr 0700-2200 <sup>1,2</sup>		Night-time 9hr 2200-0700 <sup>1,2</sup>	
	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles
Northcote Street civil and tunnel site	90	15	54	9

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

Pre-construction (2012) daily numbers of vehicle movements on the local road network are shown in **Table 5-10** for the daytime and night time periods. 2012 has been selected as the base year to reflect the road network around this site before construction of the M4 East commenced.

**Table 5-10 Existing (pre-construction 2012) traffic volumes on modelled roads around the Haberfield and Ashfield civil and tunnel sites**

Road	Daytime 15hr 0700-2200		Night-time 9hr 2200-0700	
	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles
Parramatta Road	6,732	69,404	886	11,112
Wattle Street	3,809	37,321	502	5,980
Ramsay Street <sup>1</sup>	122	12,711	16	2,006
Great North Road	891	18,378	117	2,919

Notes:

1. No (pre-construction 2012) volumes are available for Fairlight Street. The assessment has used volumes for Ramsay Street as a proxy for the purposes of this assessment.

The proposed haulage routes for the Northcote Street civil and tunnel site are presented in **Table 5-11** along with the assessment of predicted increase in noise impacts along the modelled roads. Forecast construction traffic volumes (heavy and light vehicles) as presented in **Table 5-9** have been added to the existing (pre-construction) vehicle movements presented in **Table 5-10** to derive the predicted change in construction traffic noise levels on the modelled roads along the spoil haulage routes.

**Table 5-11 Construction road traffic noise assessment – Northcote civil and tunnel site**

Site	Vehicle type	Road	Predicted traffic noise increase (dBA) <sup>1</sup>	
			Daytime	Night-time
Northcote Street civil and tunnel site	Light & heavy	Parramatta Rd	<0.5	<0.5
		Wattle St	<0.5	<0.5
		Ramsay St / Rd	<0.5	1.6
		Fairlight St	<0.5	1.7
		Great North Rd	<0.5	1.5

Notes:

1. Existing traffic noise levels based on traffic modelling undertaken by RMS and/or AADTs where available.

The results of the construction road traffic noise assessment presented in **Table 5-11** shows that construction traffic is below the assessment criterion (2 dB) which reflects only marginal forecast change in LAeq noise levels at receivers along the proposed routes. The predicted change in noise level is less than 2 dB along all roads during the daytime and night-time period.

## Route A

When Route A is in use Ramsay Street, Fairlight Street and Great North Road are predicted to experience the greatest change in noise levels, with increases of up to 1.7 dBA forecast during the night-time period. While this predicted increase is below the 2 dB criterion, Ramsay Street and Great North Road have relatively low volumes of heavy vehicles during the night time period (see **Table 5-10**). Additionally, the size and type of heavy vehicle used to haul spoil (truck and dog) is not common on Ramsay Street during the night time period.

Individual pass-by maximum noise levels of project related spoil haulage trucks are therefore likely to be higher than traffic noise levels without construction during the night-time period. The project should consider the potential impact from maximum noise levels that heavy vehicles may have on surrounding receivers along Ramsay Street, Fairlight Street and Great North Road when considering the routes for construction traffic during the night time period.

## Route B (G-loop)

When Route B is in use, construction traffic would use Wattle Street / Dobroyd Parade to access and egress the G-loop. The construction road traffic noise assessment in **Table 5-11** indicates that construction traffic is unlikely to result in a noticeable increase in LAeq noise levels at receivers along Wattle Street / Dobroyd Parade (noise levels are predicted to increase by less than 0.5 dB during the daytime and night time periods).

In addition to an assessment of potential impacts on receivers along Wattle Street / Dobroyd Parade against the RNP, the G-loop is considered a construction site road for use by construction vehicles only and as such noise emissions associated with its use would be assessed against construction NMLs. An assessment of the use of the 'G-loop' was conducted as part of the WestConnex M4 East CNVIS for the Northcote Tunnel Support Site (Renzo Tonin 2016) and, as a result, two properties (83 and 85 Dobroyd Parade) have been provided at-property treatment.

The M4 East project assessed a maximum 20 heavy vehicles per hour egressing from the Northcote Street site (refer to section 6.6.5 of the M4 East EIS (Roads and Maritime, 2015)). Eight vehicles per hour are forecast to egress from the Northcote Street civil and tunnel site during construction of the M4-M5 Link project. As such, it is considered that the likely noise impacts from the proposed use of the G-loop would be consistent with or less than that from the M4 East project. As the identified impacted receivers have been offered mitigation (at-property treatment) as part of the M4 East project, and the use of the 'G-loop' would be consistent with the use of this route by M4 East construction traffic, no further assessment of noise impacts for the G-loop is required.

With regard to potential night-time maximum noise events, construction traffic on Wattle Street and Parramatta Road are unlikely to significantly increase the number of maximum noise events due to the relatively high existing traffic volumes on these road, including heavy vehicles.

The Construction Traffic Transport and Access Management Sub-Plan that will be prepared for the project will include instructions for operation of vehicles entering and leaving the sites to assist in minimising construction traffic noise.

## Mitigation and management measures – Construction road traffic noise

The following measures are recommended, and should be confirmed during detailed design:

- Appropriate training should be provided to contractors in order to minimise noise when entering and leaving the sites and the use of compression brakes on local roads.

### 5.1.10 Ground-borne noise assessment

Tunnelling works associated with the Northcote Street civil and tunnel site decline access tunnel to the mainline tunnel alignment have the potential to result in ground-borne noise impacts at the nearest sensitive receivers.

The ground-borne noise assessment is based on the worst case predicted LAeq internal ground-borne noise level when the tunnelling works are at their closest point below each sensitive receiver.

In addition to ground-borne noise criteria, human comfort vibration levels are applicable at all receivers during all time periods (day, evening and night). Based on the proposed depth of the access tunnel, no sensitive receivers are located within the minimum working distances (refer to **Table 4-4**) and are not further considered for road-header operation during tunnelling works.

While the proposed construction methodology utilises road headers to construct the access tunnel, ground borne noise impacts have been included for a large rock breaker to provide an assessment of impacts if these were to be used.

**Table 5-12** summarises the maximum ground-borne noise levels from both road header and rock-breaker tunnelling works associated with the temporary access tunnel at the Northcote Street civil and tunnel site. Ground-borne noise contours are provided in **Figure 5-7** and **Figure 5-8**. The exceedances listed in **Table 5-12** assume that the tunnelling works will occur 24 hours a day, and therefore consider potential exceedances of the more stringent night-time ground-borne levels.

**Table 5-12 Worst case predicted ground-borne noise levels during tunnelling – Northcote decline access tunnel**

NCA	Worst case ground-borne noise level at a residential receiver (dBA LAeq(15minute))	Number of residential receivers where criteria are exceeded	Number of other sensitive receivers where criteria are exceeded	Number of commercial receivers where criteria are exceeded
Road-header tunnelling works				
NCA01	27	-	-	-
NCA02	33	-	-	-
NCA03	21	-	-	-
NCA06	32	-	-	-
NCA07	22	-	-	-
Rock-breaker tunnelling works				
NCA01	37	1	-	-
NCA02	49	8	1	-
NCA03	23	-	-	-
NCA06	47	28	-	-
NCA07	26	-	-	-

During road-heading tunnelling works, the worst case ground-borne noise levels are predicted to be compliant with the more stringent 35 dBA LAeq(15minute) night-time criterion at all sensitive receivers which are potentially affected by ground-borne noise from road-header tunnelling works.

During rock-breaker tunnelling works, the worst case ground-borne noise levels are predicted to exceed the 35 dBA LAeq(15minute) night-time criterion at up to 38 sensitive receivers in NCA01, NCA02 and NCA06. Additionally, there is potential for human comfort vibration levels to be exceeded where rock breakers are used within the tunnel for extended periods of time. The human comfort vibration criteria is significantly lower than the criteria for cosmetic damage and takes into account both intensity and duration of the works. This should be assessed in greater detail in the preparation of the tunnelling CNVIS when more detailed construction methodology information is available.

The ground-borne noise predictions are based on the nearest sensitive receivers above or adjacent to the proposed tunnel alignment. The ground-borne noise impacts would reduce for sensitive receivers offset horizontally from the access tunnel due to the increased slant distance. In addition, it is

expected that a combination of road headers and rock-breakers would be used during construction. The exceedances under the rock-breaker tunnelling works scenario are therefore conservative and impacts would be expected to be less than those predicted under this scenario.



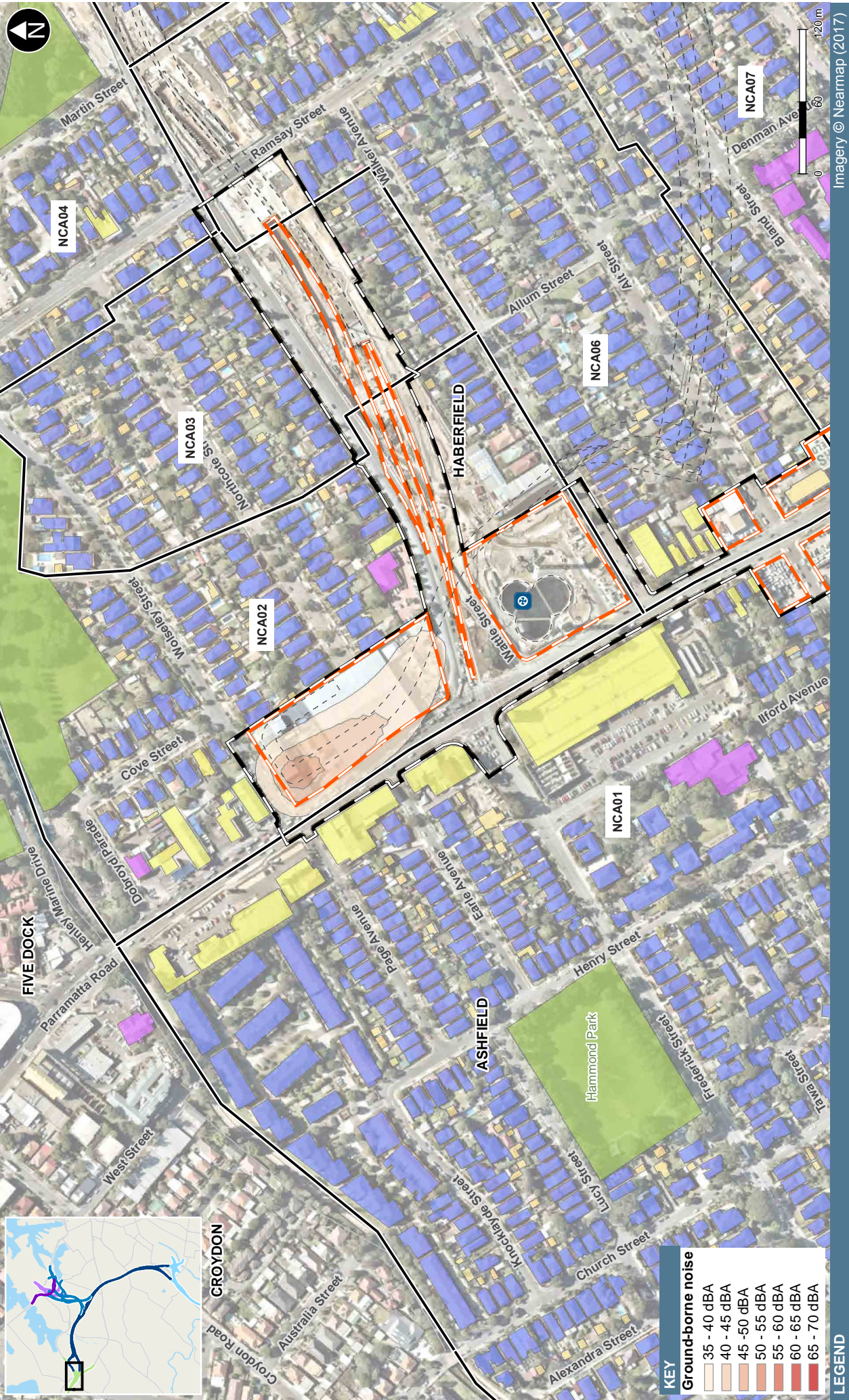


Figure 5-7 Ground borne noise - road header





Figure 5-8 Ground borne noise - rock-breaker



## Mitigation and management measures – Ground-borne noise impacts

**Table 5-12** indicates that there are 37 residential receivers and one other sensitive receiver where ground-borne noise levels are predicted to exceed the night-time ground-borne noise level by up to 14 dBA.

With reference to the CNVG ground-borne noise mitigation measures, the following mitigation measures should be considered where feasible and reasonable:

- Validation of predicted ground-borne noise levels through the use of monitoring
- Notification letterbox drops to receivers in the area around the works location, detailing work activities, time periods over which these will occur, impacts and mitigation measures
- Specific notifications provided to receivers where the ground-borne noise levels are predicted to exceed the night-time ground-borne noise management level, providing additional information when relevant and more specific information than covered in general letterbox drops
- Individual briefings to inform the residents about the impacts of the works and mitigation measures that will be implemented. Where the resident cannot be met with individually then an alternative form of engagement should be used.
- Respite offers may be offered to the affected residents during works where noise levels are predicted to exceed the ground-borne noise management level by 10 dBA or more
- Alternative accommodation options may be offered to the affected residents for the periods where noise levels are predicted to exceed the ground-borne noise management level by 10 dBA or more.

As per all construction works associated with the M4-M5 link project, the access tunnel would be required to be constructed in accordance with the project conditions of approval. Conditions which relate directly to the works have been identified in **section 4.2**. These include E82 which defines when mitigation measures must be applied for ground borne noise impacts, E83 which outlines the notification process where cosmetic damage vibration screen criteria is expected to be exceeded and E105 which requires pre-dilapidation surveys to be offered where surface structures are at risk of settlement or vibration.

## 5.2 Parramatta Road West and Parramatta Road East civil sites

### 5.2.1 Qualitative assessment

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

**Table 5-13** provides a qualitative assessment of the use of the Parramatta Road West and Parramatta Road East civil sites generally in accordance with condition C19 and includes identified differences in noise and/or vibration impact between the equivalent work activities for each of the proposed activities as described in the EIS and SPIR, and those of the proposed modification.

**Table 5-13**      **Qualitative assessment of the use of the Parramatta Road West and Parramatta Road East civil sites generally in accordance with condition C19**

<b>Proposed Activity Scenario</b>	<b>Description</b>	<b>Equivalent activity assessed in the EIS (EIS Activity Ref)</b>	<b>Proposed period of work</b>	<b>EIS/SPIR assessed period of work</b>	<b>Are predicted impacts likely to be different than that assessed in the EIS (reduced / consistent / higher) (Qualitative discussion)</b>	<b>Recommended additional mitigation methods that can be considered to manage impacts where they are likely to be higher than that assessed in the EIS/SPIR</b>
Site establishment	Demolition of buildings and structures such as the workshops, awnings and stores	Yes (OPTB-01)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – The extent of the site footprint was assessed in the EIS. Several buildings located within the site may be retained for use during construction. These would be demolished at the end of construction.	Recommended mitigation methods outlined in the EIS, SPIR and CoA are considered appropriate.
	Vegetation clearing and removal	Yes (OPTB - 05) (OPTB - 03)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – No material change to the amount of vegetation clearing described and assessed in the EIS.	
	Establishment of temporary noise attenuation measures	Yes (OPTB - 03)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – The extent of the site footprint was assessed in the EIS.	
	Utility works including protection and/or adjustment of existing utilities	Yes (OPTB-02) (OPTB-04)	All periods	Standard daytime hours – (OPTB-02)  All time periods – (OPTB-04)	<b>Consistent</b> – EIS scenario OPTB-02 (utility works) assessed utility works required within the compound.  As there is no requirement for the site to provide power to support tunnelling, the extent of utility works would be less than that assessed in the EIS.  EIS scenario OPTB-04 addressed pavement and infrastructure works required where the site adjoins Parramatta Road and was assessed against all time periods (day, evening and night).	



Proposed Activity Scenario	Description	Equivalent activity assessed in the EIS (EIS Activity Ref)	Proposed period of work	EIS/SPIR assessed period of work	Are predicted impacts likely to be different than that assessed in the EIS (reduced / consistent / higher) (Qualitative discussion)	Recommended additional mitigation methods that can be considered to manage impacts where they are likely to be higher than that assessed in the EIS/SPIR
	Contamination remedial work	Yes (OPTB - 05)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – The extent of the site footprint was assessed in the EIS.	
	Construction of a pedestrian walkway over Parramatta Road	No	All periods	All periods	An assessment of potential noise and vibration impacts associated with the construction of the pedestrian walkway is included in <b>Section 5.3</b> .	
	Establishment of site offices, amenities and temporary infrastructure	Yes (OPTB - 05)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – The extent of the site footprint was assessed in the EIS. The proposed layout of the site would also provide a greater level of shielding than that assessed in the EIS as some existing buildings may be retained through the operation of the site.	

Proposed Activity Scenario	Description	Equivalent activity assessed in the EIS (EIS Activity Ref)	Proposed period of work	EIS/SPIR assessed period of work	Are predicted impacts likely to be different than that assessed in the EIS (reduced / consistent / higher) (Qualitative discussion)	Recommended additional mitigation methods that can be considered to manage impacts where they are likely to be higher than that assessed in the EIS/SPIR
Site operations	Laydown and storage of materials  Plant and equipment assembly  Heavy vehicle, equipment and plant storage  Delivery of materials, plant and equipment	Yes (OPTB-07)	All periods	All periods	<p><b>Consistent</b> - The EIS assessed general laydown operations within select areas of the site footprint. Although the proposed use of the site is to include laydown operations over a larger area of the footprint, it is expected that the predicted absolute level of noise would be comparable to that presented in the EIS at the closest receiver due to similar items of plant being used. As such, mitigation measures identified in the EIS, SPIR and CoAs are considered appropriate.</p> <p>The proposed layout of the site would also provide a greater level of shielding than that assessed in the EIS as some existing buildings may be kept in place through the operation of the site.</p> <p>The proposed site footprint is consistent with that assessed in the EIS.</p>	A Construction Noise and Vibration Impact Statement (CNVIS) will be prepared based on the revised layout of the site and will detail noise mitigation and management measures in line with the contractor's finalised construction methodology.
	Construction traffic access	Yes	All periods	All periods	<p><b>Reduced</b> - The site is to be used for civil activities, with no spoil storage or haulage proposed from the site.</p> <p>The EIS assessed spoil haulage from the Parramatta Road West site as it was a tunnelling compound. This would result in reduced number of heavy vehicles (spoil haulage truck and dogs) accessing the site</p>	-

Proposed Activity Scenario	Description	Equivalent activity assessed in the EIS (EIS Activity Ref)	Proposed period of work	EIS/SPIR assessed period of work	Are predicted impacts likely to be different than that assessed in the EIS (reduced / consistent / higher) (Qualitative discussion)	Recommended additional mitigation methods that can be considered to manage impacts where they are likely to be higher than that assessed in the EIS/SPIR
Site rehabilitation and landscaping	Demobilisation including works to prepare the site for a future use in accordance with the M4-M5 Link Residual Land Management Plan	Yes (OPTB - 11)	Standard daytime hours	Standard daytime hours	<b>Consistent</b> – The extent of the site footprint was assessed in the EIS.	Recommended mitigation methods outlined in the EIS, SPIR and CoA are considered appropriate.

## 5.2.2 Discussion

Review of the assessment outlined in **Table 5-13** indicates that the proposed use of the Parramatta Road West and Parramatta Road East civil sites is considered to be consistent with the assessment undertaken in the M4-M5 Link EIS and SPIR and would not result in a change to the mitigation proposed for the equivalent activities. The proposed modification would remove tunnelling activities from the site and is therefore expected to result in a reduction in the impact on nearby receivers previously predicted in association with tunnelling related activities. There would be no change to the project footprint as assessed in the EIS and SPIR.

Consistent with recommendations in the EIS and SPIR, a CNVIS will be prepared based on the finalised construction methodology and will include consideration of the indicative revised layout and use of the site, including the location of specific items of plant. The CNVIS will include details of how the noise emissions from the sites will be managed to achieve compliance with the applicable noise management levels as required by condition of approval C19. Where non-compliances are predicted within the CNVIS, the contractor will explore at source noise mitigation options that may include, but are not limited to:

- Site perimeter hoarding
- Localised enclosures around noise sources
- Judicious selection of fixed plant and equipment
- Optimisation of site layout to maximise localised shielding by on-site buildings
- Positioning driveways away from sensitive receivers
- If necessary, limiting noise intensive activities during sensitive periods.

Noise and vibration impacts on receivers in the vicinity of the Parramatta Road West and Parramatta Road East civil sites, assessed in accordance with the ICNG and CNVG, were identified in the EIS. Condition of approval (E88) requires mitigation in the form of “at-property treatment” to be offered to habitable spaces identified within the Appendix E of the conditions of approval.

Sensitive receivers adjoining the Parramatta Road East and Parramatta Road West civil sites were identified in Appendix E of the conditions of approval due to their proximity to the works associated with the construction of the M4-M5 Link project and the impacts associated with the consecutive and long-term nature of construction of the wider WestConnex project. While the modification proposes the use of these sites as civil sites (with the use to be generally in accordance with condition C19), the assessed EIS construction activities other than tunnelling would still occur within the site footprint and as such, noise impacts are expected to be consistent with those identified in the EIS and would not change the boundaries defined in Appendix E of the conditions of approval.

As per all construction works associated with the project, the Parramatta Road East and Parramatta Road West civil sites will operate in accordance with the project conditions of approval. Conditions that relate directly to the site have been identified in **section 4.2**. These include C19 and E73 that require the site to operate within NMLs and E72 which defines the time periods as to when highly noise intensive works can be conducted on the site.

## 5.3 Parramatta Road West and East civil sites – pedestrian walkway

### 5.3.1 Noise management summary

The NMLs derived for the NCAs around the Parramatta Road West and Parramatta Road East civil sites are outlined in **Table 5-14**. Additional information on the representative monitoring locations and derived NCAs is provided in Appendix J (Technical working paper: Noise and vibration) of the EIS. No additional monitoring at representative locations was required for the assessment of potential noise impacts as a result of the proposed modification at the Northcote Street site.

**Table 5-14 Residential NMLs for the project**

NCA	Representative monitoring location	Receiver type	Standard construction NMLs (RBL+10dBA) Daytime period	Out of hours NMLs (RBL+5dBA) <sup>1</sup>			Sleep disturbance screening (RBL+15dBA)
				Daytime period	Evening period	Night period	
NCA00	H.03	Residential	56	51	51	43	53
NCA01	H.03	Residential	56	51	51	43	53
NCA02	H.01	Residential	68	63	63	57	67
NCA03	H.04	Residential	68	63	60	49	59
NCA04	H.06	Residential	66	61	58	48	58
NCA05	L.02	Residential	61	56	54	47	57
NCA06	H.02	Residential	56	51	51	48	58
NCA07	H.02	Residential	56	51	51	48	58

Notes:

1. Out of Hours construction hours – 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

### 5.3.2 Activity source noise levels

Sound power levels for the typical operation of construction equipment applied in the modelling are listed in **Table 5-15**. The activities are representative of works which have the potential to impact nearby sensitive receivers.

**Table 5-15 Sound power levels for construction equipment – Haberfield**

Scenario name	Works ID	Equipment (realistic worst case)	Worst case items in same location	Sound power level (dBA) <sup>1,2</sup>		
				LWA		LWAmix
				Item	Activity <sup>4</sup>	Activity
Footings constructions include concrete saws	MPO-01	Concrete saw	1	115	110	123
		Excavator (small)	1	98		
		Truck	1	98		
Boarded piling	MPO-02	Piling rig (bored)	1	108	108	118
		Mobile crane	1	100		
		Concrete truck	1	106		
Bridge assembly and span lift	MPO-03	Mobile crane (large)	1	104	107	112
		Semi-trailer	2	106		
		Lighting tower	2	99		

Notes:

1. In accordance with the EPA 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

### 5.3.3 Early opportunities for noise mitigation

The proposed works include a number of opportunities to achieve a noise benefit from judicious use and design of the following standard construction features:

- **Site hoarding** – For construction concentrated in a single area, such as at the ancillary facilities, temporary acoustic hoarding/barriers around the site perimeter should be considered where feasible and reasonable to mitigate off-site noise levels. Hoarding surrounding the construction ancillary facility of solid lapped and capped construction (as opposed to standard wire mesh fence) has been included where practicable.

### 5.3.4 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 5-16** for residential, commercial and 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.

Shading in the following tables denotes 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 changes in noise levels during the night-time period are typically more sensitive than the daytime or evening for most people):

- Noise levels 1 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 the position of plant items or noise sensitive receivers as well as across different stages of construction.

The predicted NML exceedances in this area are summarised in **Table 5-17**. The assessment presented in this table takes into consideration the assessed construction scenarios associated with

the construction of the temporary overhead pedestrian bridge. The number of receivers predicted to experience exceedances of the NMLs is shown in bands and separated into day, evening and night-time periods, as appropriate.

Noise impacts associated with construction workers using the pedestrian overpass are expected to be predominantly as a result of footsteps and voices and would be negligible during all time periods (day, evening and night) given the high background noise levels from traffic on Parramatta Road.

**Table 5-16 Predicted worst case noise levels**

NCA	NML	Predicted LAeq(15minute) Noise Level (dBA) <sup>1</sup>		
		MPO-01 Footing constructions include concrete saws	MPO-02 - Boarded piling	MPO -03 Bridge span lift
Residential - Standard Daytime				
NCA00	56	54	52	51
NCA01	56	65	63	62
NCA02	68	45	43	42
NCA03	68	42	40	39
NCA04	66	37	35	34
NCA05	61	37	35	34
NCA06	56	59	57	56
NCA07	56	56	54	53
Residential – Evening				
NCA00	51	-	-	51
NCA01	51	-	-	62
NCA02	63	-	-	42
NCA03	60	-	-	39
NCA04	58	-	-	34
NCA05	54	-	-	34
NCA06	51	-	-	56
NCA07	51	-	-	53
Residential - Night-time				
NCA00	43	-	-	51
NCA01	43	-	-	62
NCA02	57	-	-	42
NCA03	49	-	-	39
NCA04	48	-	-	34
NCA05	47	-	-	34
NCA06	48	-	-	56
NCA07	48	-	-	53
Commercial				
NCA01	70	-	-	-
NCA02	70	57	55	54
NCA03	70	42	40	39
NCA04	70	-	-	-
NCA05	70	38	36	35
NCA06	70	-	-	-
NCA07	70	57	55	54
Other Sensitive				
NCA00	- Refer to note 2	<30	<30	<30
NCA01		50	48	47
NCA02		46	44	43
NCA03		-	-	-
NCA04		<30	<30	<30
NCA05		30	<30	<30
NCA06		<30	<30	<30
NCA07		53	51	50

**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
2. 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 5-17 Overview of NML exceedances

Activity ID	Activity	Weeks <sup>1</sup>	Activity duration within overall project program <sup>2</sup>					Number of receivers																	
								Total	Highly noise affected <sup>4</sup>	NML exceedance receiver count <sup>3</sup>															
			Daytime			Daytime (out of hours)				Evening			Night-time			Sleep disturbance									
			25	50	75	100			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		
MPO-01	Footing constructions include concrete saws	1							1747	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	
MPO-02	Boarded piling	3							1747	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	
MPO-03	Bridge assembly and span lift	8							1747	-	3	-	-	21	1	-	21	1	-	88	8	-	22	1	-

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)

### 5.3.5 NML exceedances

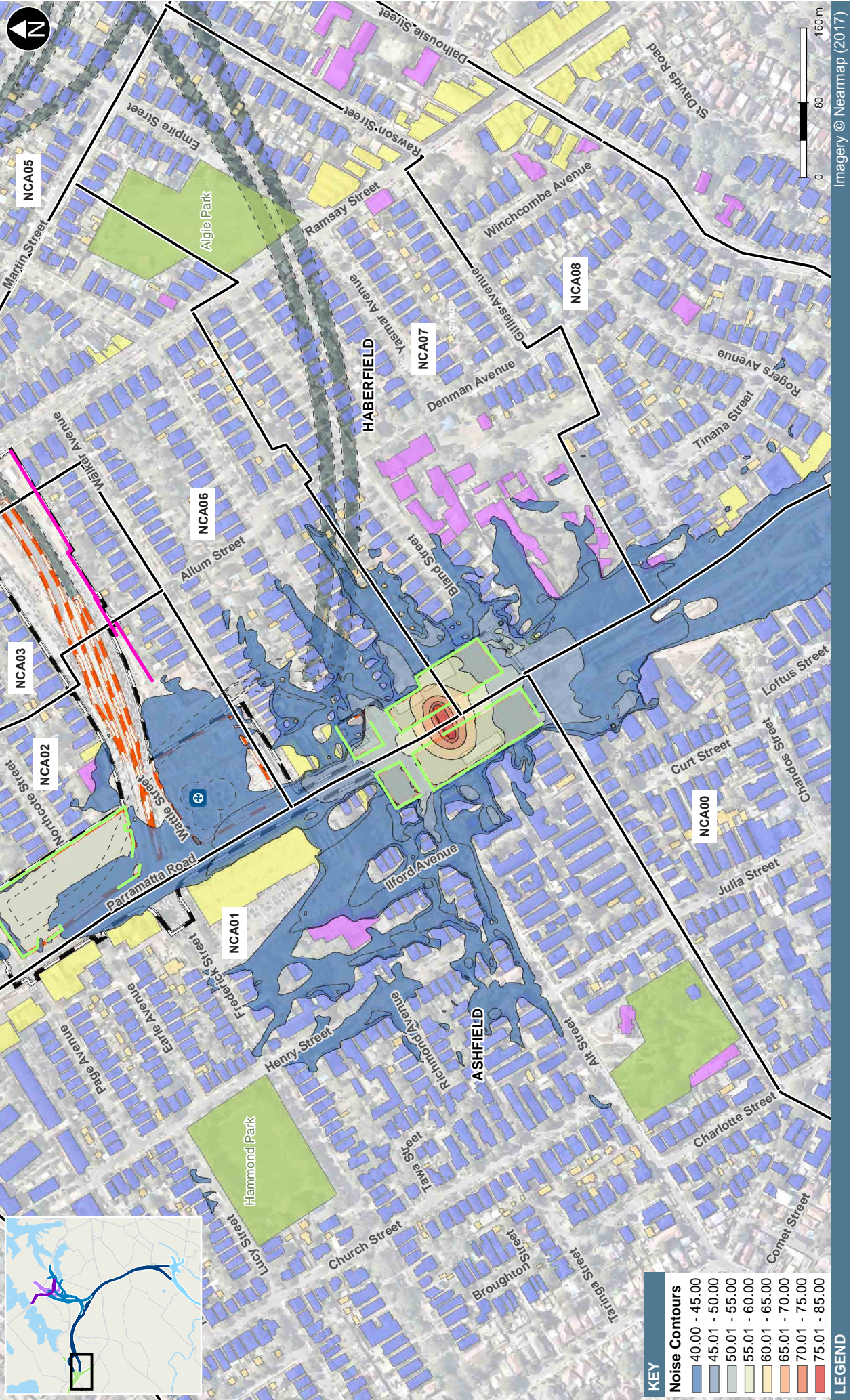
Works activity MPO-01 and MPO-02 cover construction activities required for the preparation of the footings and structure and are limited to standard daytime hours only. Worst case predicted exceedances of the daytime NMLs are predicted at 14 receivers within NCA01 and NCA06, with a maximum exceedance of nine dBA predicted. These exceedances are due to the use of a concrete saw during the demolition of the existing hardstand (MPO-01). Exceedances would significantly decrease when the concrete saw is not in use, and it would be expected that these works would be short in duration.

Works activity MPO-03 is representative of the bridge assembly and span lift which is expected to occur over a duration of up to eight weeks. However, the work associated with assembly of the bridge would be undertaken during the daytime hours and the span lift may be conducted outside of standard construction hours to avoid impacts on the road network during the peak periods. Moderate NML exceedances of up to 19 dBA are predicted when the crane for the span lift is operating. Noise impacts are generally limited to receivers that are situated near to the Parramatta Road facilities within NCA00, NCA01, NCA06 and NCA07. These works are expected to be completed over a few nights and would be managed via the implementation of the mitigation and management measures outlined in the EIS.

**Figure 5-9** shows a grid noise map of the works scenario MPO-03, which illustrates how noise emissions propagate from the site.

As per all construction works associated with the project, the Parramatta Road East and West civil sites will operate in accordance with the project conditions of approval. Conditions which relate directly to these works have been identified in **Section 4.2**. These include both E76 which requires appropriate respite periods to be identified and the community consulted with prior to any out of hours works which may require road occupancy or other works noted in E75 and, E72 which defines the time periods as to when highly noise intensive works can be conducted on the site.





Imagery © Nearmap (2017)

**LEGEND**

**M4-M5 Link**

**Boundaries**

- Project footprint
- Ancillary facility
- NCA boundary

**Surface construction**

- Acoustic shed
- Building
- Site hoarding

**Underground construction**

- Mainline tunnel

**Project facilities**

- Ventilation facility

**Receivers**

- Residential
- Commercial
- Other receivers

**Outdoor area**

- Outdoor area

Noise Contours	
40.00 - 45.00	
45.01 - 50.00	
50.01 - 55.00	
55.01 - 60.00	
60.01 - 65.00	
65.01 - 70.00	
70.01 - 75.00	
75.01 - 85.00	

Figure 5-9 Grid Noise Map bridge assembly and span lift (MPO-03)



### 5.3.6 Sleep disturbance

A review of the predicted LA1(1minute) exceedances at the nearest noise sensitive receivers provided in **Table 5-17** indicates that the sleep disturbance screening criterion is likely to be exceeded when night works are occurring adjacent to residential receivers.

At this early stage in the project, the assessment has included predictions of maximum noise impacts for assessment of potential sleep disturbance, however, it is noted that the ICNG only requires the project to consider maximum noise levels where construction works are planned to extend over more than two consecutive nights.

An OOHW protocol will be developed as part of the project wide CNVMP to set parameters around how works outside standard daytime construction hours will be carried out, including timing and frequency, and the mitigation measures that will be implemented based on predicted impacts identified through location and activity specific assessments. The OOHW protocol will be developed in consultation with the NSW EPA.

### 5.3.7 Construction mitigation and management measures

Particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies as per the standard mitigation measures detailed in the ICNG and CNVG. Where feasible and reasonable, mitigating impacts via means of source and or path control are preferred.

Based on the noise impact assessment of the proposed works, the following mitigation measures summarised in **Table 5-18** should be further investigated in addition to the standard suite of measures in the ICNG and CNVG.

**Table 5-18 Recommended site specific noise mitigation measures to be considered**

Activity	Mitigation description	Reason
All	Use structures such as site sheds and or hoarding to shield residential receivers from works activities.	Exceedances have been identified for works associated with the establishment of the temporary pedestrian overpass.
	Non-tonal reversing beepers (or an equivalent) must be fitted and used on all construction vehicles and mobile plant regularly used onsite.	
	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	

### 5.3.8 Vibration from construction activities

Piling works associated with construction of the pedestrian overbridge have the potential to result in vibration impacts at the nearest sensitive receivers. The EIS details the vibration criteria applicable to the project. The criteria are based on recommended minimum working distances for construction plant, which are outlined in **Table 5-19**.

**Table 5-19 Recommended minimum working distances for vibration intensive plant**

Plant item	Rating/description	Minimum working distance			
		Cosmetic damage			Human response <sup>1</sup>
		Residential and light commercial <sup>1</sup>	Group 2 (typical) <sup>2</sup>	Group 3 (structurally unsound) <sup>2</sup>	
Pile boring	≤ 800 mm	2 m (nominal)	3 m	5 m	4 m

Notes:

1. Criteria referenced from Roads and Maritime CNVG
2. Criteria referenced from DIN 4150 (Structural vibration – Effects of vibration on structures)

The locations of the proposed works (refer to **Section 2.2**) are approximately 30 metres from the nearest sensitive receiver buildings. No sensitive receiver buildings are located within the minimum working distances for piling works. As such, cosmetic damage and human response vibration impacts from piling works associated with construction of the pedestrian overbridge are considered unlikely to occur.

## 5.4 Removal of Darley Road site from project

The EIS identified the site as the Darley Road civil and tunnel site (C4) for the construction of the project and as the Darley Road motorway operations complex (MOC1) for the operation of the project. Detailed construction planning of the approved project has determined that the Darley Road site is no longer required to support the construction and operation of the project.

Construction activities would not be carried out at the Darley Road civil and tunnel site for the proposed modification. The construction activities proposed for Darley Road civil and tunnel site in as described in the EIS would be accommodated at other project construction sites. The overall intensity (rate) of spoil removal at the other approved tunnelling sites is not expected to change, however the additional spoil to be removed would require the extension of the overall tunnelling program by around six months.

The removal of Darley Road civil and tunnel site (C4) from the project would remove the assessed construction noise and vibration impacts on nearby receivers around this site as set out in the EIS and SPIR. The extension of the overall tunnelling program by around six months at the other Stage 1 construction ancillary facilities where tunnelling would be carried out would prolong the assessed noise and vibration impacts on receivers around these sites, but as the intensity (rate) of tunnelling would not change, these noise and vibration impacts would remain consistent in their intensity.

The removal of the Darley Road motorway operations complex (MOC1) from Darley Road would result in no permanent infrastructure for the project being located at this location. This would remove the potential operational noise impacts on nearby receivers around the previously proposed Darley Road motorway operation complex (MOC1) as assessed in the EIS and SPIR.

## 5.5 Cumulative noise and vibration impacts

Concurrent noise impacts can occur where more than one works activity occurs at the same time and in the same location such that an individual receiver is potentially impacted by noise from more than one element of works. A scenario where construction equipment operates concurrently has been modelled for the Northcote Street civil and tunnel site (**section 5.1**) and for the Parramatta Road pedestrian walkway (**section 5.3**).

Cumulative noise impacts associated with the operation of multiple construction ancillary facilities in proximity to each other such as the Northcote Street and Wattle Street civil and tunnel sites or the Parramatta Road West and East civil sites are considered unlikely to occur given the following:

- The noise impacts at each site would be localised to receivers in close proximity to each construction site
- The separation distances and noise attenuation between the sites
- The location of the sites adjacent to heavily trafficked major roads such as Wattle Street and Parramatta Road which dominate the ambient noise environment
- The conditions of approval for the project which require each construction ancillary facility to operate within applicable noise management levels particularly during the more sensitive out of hours periods.

As per all construction works associated with the project, the construction ancillary facilities around Haberfield and Ashfield will operate in accordance with the project conditions of approval.

## 6 Potential impacts - operation

### 6.1 Campbell Road motorway operations complex – operational water treatment plant

The results in **Table 6-1** indicate that the assessed fixed facilities are predicted to comply with the relevant criteria during the more stringent night-time period in all NCAs in the vicinity of the operational water treatment plant.

#### 6.1.1 Construction of operational water treatment plant

Construction noise and vibration impacts on receivers in the vicinity of the Campbell Road motorway operations complex were assessed in the EIS. The relocation of the operational water treatment plant to the Campbell Road motorway operations complex (MOC5) is proposed to be located in a similar but slightly larger footprint as that assessed in the EIS, and would be around 200 metres from the nearest sensitive receiver.

The construction scenarios assessed within the EIS would be considered to be representative and consistent with the construction of the operational water treatment plant at the Campbell Road motorway operations complex (MOC5). The two scenarios assessed within the EIS which are considered to be representative of impacts associated with the construction of the operational water treatment plant at this location are the ventilation building installation (SPI-09) and the site rehabilitation and landscape (SPI-12) both of which did not identify any noise impacts at nearby receivers. Construction of the operational water treatment plant would be undertaken during standard construction hours only.

As is required for the construction of the Campbell Road motorway operations complex (MOC5), the operational water treatment plant would be constructed in accordance with the project conditions of approval.

#### 6.1.2 Operational noise assessment

Noise impacts from the operation of the fixed facilities associated with the project located at Campbell Road motorway operations complex (MOC5) have been predicted for the NCAs nearest to the facilities. These predicted noise levels are summarised in **Table 6-1** and shown in **Figure 6-1**.

**Table 6-1 Predicted noise levels – fixed facilities**

Area	NCAs	Noise level (dBA LAeq)		
		Criteria	Predicted	Exceedance
St Peters	NCA46	45	<30	-
	NCA48	45	34	-
	NCA49	45	42	-
	NCA50	45	35	-
	NCA51	44	<30	-







The operational water treatment plant at the Campbell Road motorway operations complex (MOC5) has been modelled at a SWL of 90 dBA. This is the maximum SWL that results in compliance with the criteria at all residential receivers. Other fixed plant at this location has been included in the model as per the EIS inputs to ensure that the cumulative noise from all operational plant is assessed.

The selected mechanical equipment for the facility would be reviewed and assessed against the relevant operational noise criteria at the detailed design stage of the project. Specific plant would be selected and designed to achieve compliance with the relevant criteria. The cumulative noise emissions from all fixed facility noise sources should be considered when determining the appropriate mitigation options.

### 6.1.3 Modifying factors

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, the INP describes modifying factors to be applied when assessing amenity and intrusiveness.

The indicative source levels have not been found to trigger the requirement to correct the predicted noise level due to low frequency or tonal components. Notwithstanding, tonal and/or low frequency noise is often observed from fans and the predictions would be revisited during detailed design based on the actual specifications of the final selection of equipment. Based on the assessment presented in this report, receivers in NCA49 have been identified as most likely to exceed the criteria specified in **Table 6-1** should application of a +5 dBA modifying factor be triggered on the basis of the noise characteristics of the finalised equipment.

### 6.1.4 Operational management and mitigation measures

It is noted that the equipment and sound power levels modelled are indicative only and may be subject to change during the detailed design phase of the project. It is envisaged that the mechanical plant noise sources associated with the fixed facilities will be controllable by common engineering methods that may consist of:

- Judicious location selection
- Noise barriers
- Silencers
- Acoustically lined ductwork
- Acoustic louvres.

The selected mechanical equipment should be reviewed and assessed for conformance with the established criteria at the detailed design stage of the project when specific plant selection is finalised and appropriate noise control measures can be determined. Note that the cumulative noise emissions from all fixed facility noise sources should be considered when determining the appropriate mitigation options.