

Chapter 13

Noise and vibration

13 Noise and vibration

13.1 Introduction

This chapter summarises the potential noise and vibration impacts of the proposal during construction and operation. A Noise and Vibration Impact Assessment (NVIA) has been prepared and is included as **Technical Report I**.

The methodology for the NVIA included:

- Finding out the nearest and most potentially affected noise and vibration sensitive receivers
- Gaining a clear understanding of the existing noise environment through noise monitoring at selected locations
- Detecting the noise and vibration sources during construction and operation of the proposal
- Carrying out a noise and vibration assessment for both construction and operation impacts. This included quantitative assessments for noise impacts, using SoundPlan noise modelling software.

The NVIA was prepared following the below guidelines:

- NSW Noise Policy for Industry (NPfI) (Environment Protection Authority, 2017)
- NSW Road Noise Policy (Department of Environment, Climate Change and Water (DECCW), 2011)
- Interim construction noise guideline (ICNG) (Department of Environment and Climate Change (DECC), 2009)
- Assessing vibration: A technical guideline (Department of Environment and Conservation, 2009).

13.2 Existing environment

Figure 13.1 shows sensitive receivers close to the proposal site and potentially affected by noise and vibration from the proposal. Land uses that are sensitive to noise include residential areas, churches, hospitals, schools and recreation areas¹.

The nearest residential receivers are located about 1km to the south of the proposal (recorded as R1 and R2 on **Figure 13.1**). The nearest industrial receivers are directly adjacent to the proposal site at I1 and I2. Commercial activities are located at C1 and C2.

¹ NPfI, 2017.

A childcare centre is in the Eastern Creek Industrial Area (K1). Bungaribee Trail is part of the Western Sydney Parklands (WSP) located at least 3km north-east of the proposal site (P1).

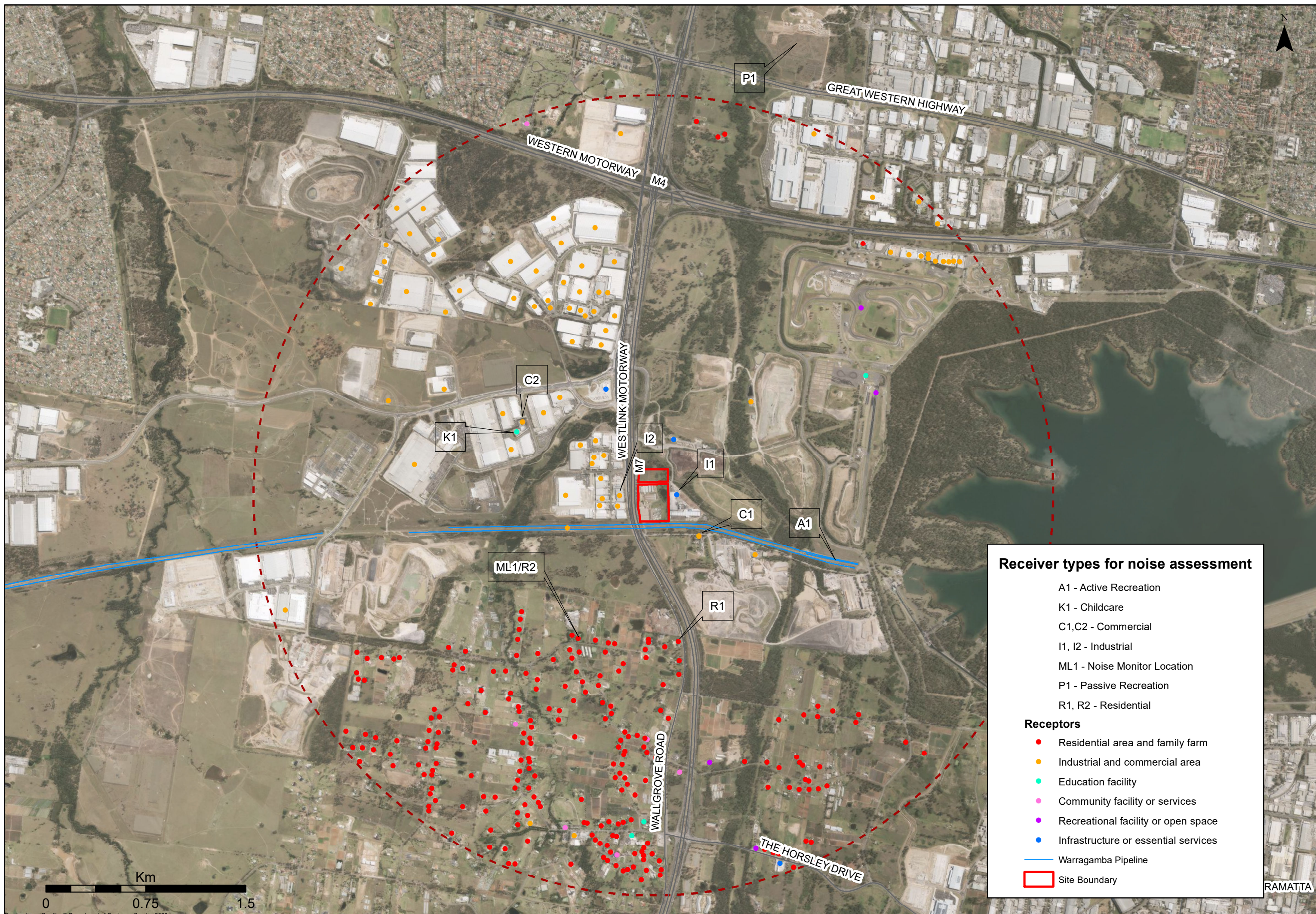
The nearest active recreation area is the Sporting Car Club, Sydney Dragway and Motorsport Park located about 1km to the east of the proposal (A1).

The WaterNSW Warragamba Pipeline Corridor is a sensitive utility and is located immediately adjacent to the proposal site's southern boundary.

Table 13.1 lists the sensitive receiver and noise logger locations

Table 13.1: Receiver and noise logger locations

Receiver	ID	Address	Distance to site (m)
Residential	R1	783 Wallgrove Road, Horsley Park	920
	R2	58 Burley Road, Horsley Park	955
Commercial	C1	Brickworks Building Products, 738–780 Wallgrove Road, Horsley Park	260
	C2	Plus Fitness 24/7, 7–9/2A Southridge Street, Eastern Creek	935
Industrial	I1	Global Renewables, Wallgrove Road, Eastern Creek	70
	I2	Century Yuasa Batteries, 17 Shale Place, Eastern Creek	105
Childcare	K1	Little Graces Childcare Centre, Unit 2, Southridge Street, Eastern Creek	965
Passive recreational areas	P1	Bungaribee Trail, Western Sydney Parklands, Eastern Creek	3200
Active recreation area	A1	North Shore Sporting Car Club, Ferrers Road, Eastern Creek	1240
Noise logger	ML1	58 Burley Road, Horsley Park	955



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 13.1: Sensitive noise receivers

A noise logger was located at 58 Burley Road, Horsley Park, to perform unattended long-term noise measurements. This noise logger is representative of the nearest residential receivers (and potentially the most affected receivers). Noise measurements were carried out between Thursday, 6 February 2020 and Monday, 17 February 2020, to capture noise levels.

The noise measurements from the noise logger are used to define the existing background noise levels referred to as rating background levels (RBL) (Column A in **Table 13.2**). The ambient noise is the noise level measured at a receptor location considering multiple noise sources (Column B in **Table 13.2**).

Table 13.2: Long-term noise monitoring results, dB(A)

Location	Time period ²	Column A Rating Background Levels (RBL) L_{A90}	Column B Ambient L_{Aeq} noise levels
ML1 – 58 Burley Road, Horsley Park NSW 2175	Day	42	52
	Evening	47	57
	Night	43	51

The measured noise levels in the evening and night were higher than those measured in the day. This is because the influence of the Westlink M7 motorway (the M7) and industrial activities which operate 24/7 in the area. The results from the noise measurements show that the existing noise environment is mainly influenced by the traffic noise on the M7 and by wildlife (birds and insects).

13.3 Assessment

13.3.1 Construction noise impacts

The construction noise impacts have been assessed using a quantitative assessment method and following the Interim Construction Noise Guideline (ICNG) (DECC, 2009). The ICNG focuses on applying a range of work practices to minimise construction noise impacts, rather than focusing on achieving numeric noise levels. The ICNG outlines how construction noise management levels should be recognised for each type of noise receiver, including residential, recreational areas, commercial, and industrial. Based on the existing environment noise results and the ICNG criteria, noise management levels have been set for each noise receiver group near the proposal site.

² Day: 07:00 to 18:00 Monday to Saturday and 08:00 to 18:00 Sundays and public holidays

Evening: 18:00 to 22:00 Monday to Sunday and public holidays

Night: 22:00 to 07:00 Monday to Saturday and 22:00 to 08:00 Sundays and public holidays

As required by the NPfI, the external ambient noise levels presented are free-field noise levels [no façade reflection]. No correction was needed to the measured results.

Residential receivers can be ‘noise affected’ where construction activities result in construction noise 10dB above the existing environment³. Residential receivers who are ‘highly noise affected’ are those who would receive construction noise levels above 75dB $L_{Aeq(15\text{minute})}$, which could elicit a strong community reaction to the noise.

It is anticipated that most construction activities will be carried out within standard construction hours (Monday to Friday 7am to 6pm, Saturday 8am to 1pm, no work on Sunday or public holidays). The ICNG acknowledges that the following activities have justification to be carried out outside the standard recommended construction hours, assuming all feasible and reasonable mitigation measures are employed to minimise the impacts to the surrounding sensitive land uses:

- The delivery of oversized plant or structures that police or other authorities determine to need special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours.

The construction noise management levels for the proposal were calculated for each noise receiver group and are presented in **Table 13.3**.

Table 13.3: ICNG Construction noise management levels

Receiver	Standard hours $L_{Aeq(15\text{ min})}$ ⁴	
	Noise affected	Highly noise affected ⁵
R01	52	75
R02	52	75
C1	70	-
C2	70	-
I1	75	-
I2	75	-
K1	65	-
P1	60	-
A1	65	-

³ DECC, 2009

⁴ 7am to 6pm Monday to Friday, 8am to 1pm Saturday, no work on Sunday or public holidays.

⁵ Applies to residential receivers only as defined in the ICNG.

The construction for the proposal has been split into five phases:

1. Demolition
2. Site establishment and enabling works
3. Main construction works
4. Testing and commissioning
5. Finishing and landscaping.

Construction noise levels have been calculated for each construction phase by applying a sound power level to each item of construction equipment assumed to be used in each construction phase. These are compared to the noise management levels assigned to each sensitive receiver group.

Table 13.4 shows the predicted construction noise levels.

Table 13.4: Predicted construction noise levels at sensitive receivers, dB(A)⁶

Rec ID	Receiver type	Predicted Noise Level, $L_{Aeq,15min}$ Construction Phases			Noise management levels – Standard hours $L_{Aeq,15min}$	
		Phase 1 Demolition	Phase 2 Earthworks and enabling	Phase 3–5 Construction, testing, commissioning, finishing and landscaping	Noise affected	Highly noise affected
R1	Residential	68	63	63	52	75
R2	Residential	67	63	63	52	75
C1	Commercial	79	74	74	70	-
C2	Commercial	67	63	63	70	-
I1	Industrial	90	86	85	75	-
I2	Industrial	86	82	82	75	-
K1	Child Care	67	63	63	65	-
P1	Passive recreation area	57	52	52	60	-
A1	Active recreation area	64	60	60	65	-

The table above shows that for the proposed construction activities, during all construction phases, the noise management level would be exceeded for residential receivers, industrial receivers and some commercial receiver groups.

The demolition phase would also exceed the noise management level for the childcare centre on Southridge Street in the Eastern Creek industrial area.

⁶ dB(A) denotes a single-number sound pressure level that includes a frequency weighting ('A-weighting') to reflect the subjective loudness of the sound level.

The predicted noise levels are calculated using a worst-case scenario. The actual construction noise impacts are dependent on the intensity and location of activities, the type of equipment used and background noise levels in the construction period. The above predicted construction noise levels are generally conservative and do not represent a constant noise that would be experienced daily by the sensitive receivers throughout the proposal's construction period. Noisy equipment would not be operated continuously, rather for brief periods of time as needed. All construction noise will be mitigated by standard measures outlined in a Construction Noise and Vibration Management Plan (CNVMP). When applying these measures, the construction noise impacts are no greater than what could be expected from typical construction impacts.

In addition to the potential noise impacts from equipment operating on the proposal site, construction vehicles could increase the noise generated from the road network. Trucks will be used to remove construction and demolition (C&D) waste from the site travelling on Old Wallgrove Road, Wallgrove Road and the M7. It is estimated that the additional traffic on the road network generated by the construction of the proposal would increase noise levels by less than 2dB, so it would not be audibly noticeable from any sensitive receivers.

13.3.1.1 Construction vibration impacts

Vibration generated by construction activity can cause cosmetic or structural damage to nearby buildings, depending on the construction equipment used and the proximity to buildings and structures. Vibration can also cause adverse response from people occupying surrounding buildings.

Criteria for assessing human response to vibration is set out in the NSW Assessing Vibration: A Technical Guideline (DEC, 2006). The criteria are based on the British Standard (BS) 6472-1992 Evaluation of human exposure to vibration in buildings (1–80Hz). British Standard 7385:2:1993 and German standard DIN 4150-3:2016 set out guideline values for vibration effects on structures. In the absence of an Australian standard, the German standards were used in the NVIA to assess potential vibration impacts on the WaterNSW Warragamba pipelines following WaterNSW Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines (WaterNSW, 2020).

There are no structurally sensitive buildings, such as unsound buildings or heritage buildings, located within proximity to the proposal site that would experience any cosmetic or structural damage as a result of the proposed construction activities.

The WaterNSW Warragamba Pipeline Corridor is located 18m to the south of the proposal site. The proposed construction measures will make sure there are no vibration impacts on the WaterNSW Warragamba pipelines.

Equipment to be used during construction near the pipeline will be chosen carefully to avoid vibration impacts. This will include low vibration generating equipment, such as the use of smaller excavator hammers and bore piling. Table 32 of the NVIA sets out the indicative recommended minimum working distances for vibration intensive activities. Vibration monitoring will be conducted at the beginning of any vibration generating activities to confirm minimum working distances required to avoid vibration impacts. The purpose of the monitoring program is to avoid vibration over set criteria. Trigger levels would be set, which when reached, would stop any work. Work would only continue with alternative construction methods so that any vibration impacts are avoided. The above measures to avoid impacts to the Warragamba pipelines will be outlined in the CNVMP.

13.3.1.2 Operational noise impacts

Noise impacts from sources within the site

Operational noise emissions from the proposal have been assessed in line with the NPfI (EPA, 2017), which seeks to control intrusive noise impacts in the short term for residences and maintain long-term noise level amenity for residences and other land uses.

‘Amenity noise levels’ are set for the proposal and should protect against noise impacts, such as speech interference, community annoyance and some sleep disturbance. ‘Intrusive noise levels’ are those that intrude above the background level by more than 5dB. ‘Sleep disturbance levels’ are reached when noise causes awakenings and disturbance to sleep stages.

When assessing the noise levels for the proposal, two types of weather conditions were considered – standard (minimal wind conditions) and enhanced (greater wind conditions). See section 4.3 of the NVIA for further explanations of enhanced conditions.

The NVIA predicts noise levels based on the likely activities to occur during operation of the proposal. During operation, the main noise sources generated within the site are from vehicle movements, including trucks, staff vehicles and buses, and the operation of the EfW facility.

Table 13.5 compares the predicted noise levels from the operation of the facility to the noise criteria for amenity level, intrusive level and sleep disturbance, as established in line with NPfI.

Table 13.5 shows the noise levels for each receiver group. The daytime and night-time scenarios have been considered. An evening period is not considered as the night-time scenario represents the worst case.

Table 13.5: Predicted noise levels during the operation of the proposal

Receiver ID	Weather conditions	Predicted levels					Criteria					Compliance				
		Intrusive assessment dBA (dBC)		Amenity assessment dBA (dBC)		Sleep disturbance dBA	Intrusive criteria dBA		Amenity criteria dBA		Sleep disturbance dBA	Complies with intrusive criteria?		Complies with amenity criteria?		Complies with sleep disturbance criteria?
		Day	Night	Day	Night	Night	Day	Night	Day	Night	Night	Day	Night	Day	Night	Night
R1	Standard	41 (50)	40 (50)	40 (49)	39 (49)	40	47	47	55	40	57	YES	YES	YES	YES	YES
	Enhanced	44 (52)	43 (52)	43 (51)	42 (51)	45	47	47	55	40	57	YES	YES	YES	NO	YES
R2	Standard	37 (45)	36 (45)	35 (44)	35 (43)	38	47	47	55	40	57	YES	YES	YES	YES	YES
	Enhanced	40 (47)	40 (47)	38 (46)	38 (45)	43	47	47	55	40	57	YES	YES	YES	YES	YES
C1	Standard	52 (60)	51 (59)	51 (59)	50 (58)	56	N/A	N/A	60	60	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	54 (62)	54 (61)	53 (60)	53 (60)	61	N/A	N/A	60	60	N/A	N/A	N/A	YES	YES	N/A
C2	Standard	39 (48)	38 (48)	37 (47)	36 (46)	43	N/A	N/A	60	60	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	43 (51)	42 (50)	41 (49)	40 (49)	48	N/A	N/A	60	60	N/A	N/A	N/A	YES	YES	N/A
I1	Standard	64 (71)	63 (70)	62 (69)	62 (69)	71	N/A	N/A	65	65	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	66 (72)	65 (71)	64 (71)	64 (71)	74	N/A	N/A	65	65	N/A	N/A	N/A	YES	YES	N/A
I2	Standards	61 (66)	59 (65)	57 (63)	57 (63)	67	N/A	N/A	65	65	N/A	N/A	N/A	YES	YES	N/A

Receiver ID	Weather conditions	Predicted levels					Criteria						Compliance			
		Intrusive assessment dBA (dBC)		Amenity assessment dBA (dBC)		Sleep disturbance dBA	Intrusive criteria dBA		Amenity criteria dBA		Sleep disturbance dBA	Complies with intrusive criteria?		Complies with amenity criteria?		Complies with sleep disturbance criteria?
		Day	Night	Day	Night	Night	Day	Night	Day	Night	Night	Day	Night	Day	Night	Night
	Enhanced	63 (68)	62 (67)	60 (65)	60 (65)	71	N/A	N/A	65	65	N/A	N/A	N/A	YES	YES	N/A
K1	Standard	39 (48)	38 (48)	37 (47)	36 (46)	43	N/A	N/A	50	50	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	43 (51)	42 (50)	41 (49)	40 (49)	48	N/A	N/A	50	50	N/A	N/A	N/A	YES	YES	N/A
P1	Standard	<30 (<30)	<30 (<30)	<30 (<30)	<30 (<30)	<30	N/A	N/A	45	45	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	<30 (<30)	<30 (<30)	<30 (<30)	<30 (<30)	<30	N/A	N/A	45	45	N/A	N/A	N/A	YES	YES	N/A
A1	Standard	36 (46)	35 (45)	35 (45)	35 (45)	38	N/A	N/A	50	50	N/A	N/A	N/A	YES	YES	N/A
	Enhanced	40 (48)	39 (48)	38 (47)	38 (47)	43	N/A	N/A	50	50	N/A	N/A	N/A	YES	YES	N/A

Note: dBC values have been included for the assessment of low-frequency noise

Noise generated from the operation of the proposal is predicted to comply with noise criteria at all sensitive receivers during standard weather conditions. In enhanced weather conditions where the noise is carried further, a minor exceedance (less than 2dB) in the night-time period is predicted at residential receiver R1, located to the south of the site in Horsley Park. An increase in 2dB represents a minor impact that is considered barely perceptible to the average person.

The noise modelling has shown that the main noise sources for the R1 receiver would be from the boiler hall and the flue gas treatment hall. The noise modelling has assumed a worst-case scenario that any windows from the EfW facility are open. In the detailed design stage, the building envelope and plant and equipment would be reviewed to decide how the proposal can comply with noise criteria.

The results in **Table 13.5** also indicate that the difference between dBC and dBA values is less than the 15 dB (NPfI low frequency screening criterion) indicating that low frequency noise is not present at the receivers. Further assessment of low frequency would be undertaken as the design progresses.

The noise impacts on biodiversity are assessed in **Chapter 21 Biodiversity** and **Technical report Q Biodiversity Development Assessment Report**.

Noise impacts from increased road traffic

The NSW Road Noise Policy (RNP)⁷ sets out criteria for assessing noise impacts associated with increased traffic on public roads. The RNP states that if a predicted noise increase on public roads is less than 2dB, then no further assessment is needed.

The proposal would increase truck movements along Old Wallgrove Road, Wallgrove Road and the M7. The results in the NVIA show that the predicted increase in noise levels would be below the RNP screening criteria (less than 2dB change) and therefore impacts would be negligible and not be perceived as a noticeable increase in noise for receivers along these road corridors.

13.3.1.3 Operational vibration impacts

There are several vibration generating activities that will be used during operation of the proposal, including a turbine and the air-cooled condensers. The proposal will include appropriate construction to limit vibration transmissions through the ground. This includes using piled rafts which will incorporate a spring damper system, to reduce the vibration effect of the equipment. With these design-embedded mitigation measures in place, there are no predicted operational vibration impacts at surrounding sensitive receivers or structurally sensitive infrastructure.

⁷ DECCW, 2018.

13.4 Mitigation

Table 13.6 describes the measures that would be applied to mitigate against, minimise, manage and monitor the potential noise and vibration impacts. These mitigation measures will make sure that the noise impacts from the proposal are acceptable.

Table 13.6: Noise and vibration mitigation measures

ID	Impact	Mitigation
Design embedded mitigation measures		
NV1	Noise from the operation of the EfW facility	The building design mitigates noise impacts by being an almost fully enclosed building. Further opportunities will be recognised in the detailed design stage so that the proposal mitigates against any non-compliances with the noise criteria.
NV2	Vibration from operational equipment	An assessment of natural frequencies of footings will be completed so that resonant response does not occur during ramp-up, operation and ramp-down of the generator turbine. The building design will include piles where appropriate, to reduce vibration impacts from the turbine and air-cooled condensers.
Construction mitigation measures		
NV3	Construction noise	A detailed Construction Noise and Vibration Management Plan (CNVMP) will be prepared. This plan will include, but not be limited to, the following: <ul style="list-style-type: none"> • Roles and responsibilities • Noise sensitive receiver locations • Noise mitigation strategy • Monitoring methods • Community engagement strategy.
NV4	Vibration impacts on the WaterNSW Warragamba pipelines	Works near the Warragamba Pipeline Corridor will be monitored for vibration. This will include setting trigger levels and adapting the construction methods accordingly.
Operational mitigation measures		
NV5	Noise from the operation of the EfW facility	As part of the OEMP, specific noise management measures will be included so that the ongoing operation of the EfW facility adheres to noise criteria and avoids adverse noise impacts on sensitive receivers. A six-month post-commissioning report would be prepared as part of this OEMP.