



Neerabup Resource Recovery Precinct

Environmental Noise Assessment



Prepared for City of Wanneroo

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Executive Summary

The City of Wanneroo are proposing to develop the Neerabup Resource Recovery Precinct (NRRP). The NRRP will be developed on Old Yanchep Road and is located approximately 1km from the nearest noise sensitive receivers.

This report summarises an environmental noise assessment undertaken for the NRRP.

Aim

The aim of the study is to determine if the proposed NRRP operations comply with the Environmental Protection (Noise) Regulations (the Regulations) at surrounding noise sensitive receivers, and where applicable, provide high-level noise control advice to comply with the Regulations.

Noise Modelling

Noise modelling was undertaken to represent NRRP, including operations at the major areas on-site such as the Material Recycling Facility (MRF), Waste Transfer Station (WTS) and Community Recycling Centre (CRC).

The model was setup with scenarios to represent equipment and operations that take place during day and night time¹ periods according to the Regulations. Some of the major equipment noise sources include heavy vehicles, waste collection trucks, light vehicles, bin lift trucks, fixed equipment and front end loaders inside the MRF and WTS sheds.

The model was run under worst case weather conditions, and compared against the assigned levels.

Conclusions

Based on the outcomes of the noise modelling and analysis, the proposed NRRP operations comply with the assigned noise levels at all noise sensitive receivers under worst case conditions.

As a result, no additional noise control is proposed for the facility.

¹ The facility will undertake some limited operations between 6am and 7am Monday to Saturday, and on an as-required basis on some Sundays and Public Holidays between 6am and 9am.

Table of Contents

1	Introduction	1
1.1	Aim	1
1.2	Scope	1
1.3	Applicable Documents	1
2	Facility Overview	2
2.1	Hours of Operation	2
2.2	Traffic Routes and Volumes	3
2.3	Noise Generating Activities	4
2.4	Noise Sensitive Receivers	4
3	Assessment Criteria	8
3.1	Environmental Protection (Noise) Regulations 1997	8
3.2	Assigned Noise Levels	8
3.2.1	Influencing Factors	9
3.2.2	Significant Contributor	9
3.2.3	Adjustments for intrusive or dominant characteristics	9
3.2.4	Applicable Noise Criteria	9
4	Noise Modelling Overview	11
4.1	Modelling Software	11
4.2	Model Inputs	11
4.2.1	Noise Sources	11
4.2.2	Noise Sensitive Receivers	12
4.2.3	Buildings	12
4.2.4	Topography and Ground Absorption	12
4.2.5	Meteorological Conditions	13
4.3	Noise Modelling Scenarios	13
5	Noise Modelling Results	16
6	Conclusions	21

Tables

Table 2-1: Opening Hours	3
Table 2-1: Traffic Types and Volumes	4
Table 2-2: GPS Coordinates of Modelled Noise Sensitive Receivers	4
Table 3-1: Environmental Protection (Noise) Regulations - Assigned Noise Levels	8
Table 3-4: Applicable assigned noise levels	10
Table 4-1: SWL's used in modelling	12
Table 4-2: Weather conditions applied to the model	13
Table 5-1: Daytime Operations Model Results	16
Table 5-2: Night-time Operations Model Results	16

Figures

Figure 2-1: Project Location and noise sensitive receivers	6
Figure 2-2: Site Layout	7
Figure 4-1: Model Layout Scenario 1	14
Figure 4-2: Model Layout Scenario 2	15
Figure 4-3: Model Layout Scenario 3	15
Figure 5-1: Noise Contour Map – Scenario 1 Daytime (LA10)	17
Figure 5-2: Noise Contour Map – Scenario 2 Nighttime (LA10)	18
Figure 5-3: Noise Contour Map – Scenario 3 Daytime (LA1)	19
Figure 5-4: Noise Contour Map – Scenario 1 Daytime (LA10) Zoomed	20

Appendices

APPENDIX A Noise Source Levels

1 Introduction

The City of Wanneroo are proposing to develop the Neerabup Resource Recovery Precinct (NRRP). The NRRP will be developed on Old Yanchep Road and is located approximately 1km from the nearest noise sensitive receivers.

This report summarises an environmental noise assessment undertaken for the NRRP.

1.1 Aim

The aim of the study is to determine if the proposed NRRP operations comply with the Environmental Protection (Noise) Regulations (the Regulations) at surrounding noise sensitive receivers, and where applicable, provide high-level noise control advice to comply with the Regulations.

1.2 Scope

This report assesses noise emissions associated with NRRP operations, including waste collection trucks, light vehicles, haulage trucks, mobile equipment, Material Recycling Facility (MRF) operations and Waste Transfer Station (WTS) operations.

Noise emissions from road traffic along gazetted roads outside of the facility are excluded.

1.3 Applicable Documents

[1] *Environmental Protection Act 1986*.

[2] Environmental Protection (Noise) Regulations 1997.

[3] DWER Draft Guideline “Assessment of environmental noise emissions”, May 2021.

2 Facility Overview

The proposed NRRP will manage approximately 20,000 tonnes per annum (tpa) recyclable waste and 80,000 tpa residual waste from Wanneroo. The proposed facility location is shown in Figure 2-1. The facility layout, shown in Figure 2-2.

The NRRP will comprise three areas described below:

Waste Transfer Station (WTS) - The WTS has a designated drop-off area for residual waste materials that are accessed by haulage vehicles via a one-way internal loop road and one site exit. The WTS incorporates the following key components:

- WTS Building:
 - Loading lane.
 - Residual waste drop-off area.
 - Bunker (Front end loader operational area).

Material Recycling Facility (MRF) -The MRF has designated drop-off areas for a variety of waste and recyclable materials that are accessed by haulage vehicles via a one-way internal loop road and one site exit. The facility incorporates the following key components:

- MRF Building:
 - Receiving Area.
 - Bunker (Front end loader operational area).
 - Sorting Area.
- Storage Shed:
 - Loading lane.
 - Storage Area.

Community Recycling Centre (CRC) - The CRC has designated drop-off areas for a variety of waste and recyclable materials that are accessed by haulage vehicles via a one-way internal loop road and one site exit. The facility incorporates the following key components:

- CRC:
 - Residual Waste Drop-off Area.
 - Recycling Drop off hardstand.
 - Reuse Shop.
 - Reuse Forecourt.
 - Drop off Pads.
 - Parking.
- Supporting infrastructure including entry, exit, access roads and service areas.
- Vehicle access roads.

2.1 Hours of Operation

Table 2-1 lists the NRRP opening hours. As the facility is open during daytime and night-time periods as defined in the Noise Regulations, it is important to define which activities occur out-of-hours

between 6am and 7am Monday to Saturday and 6am to 9am on Sundays and Public holidays. The operations which occur during daytime and night-time can be summarised as follows:

- Daytime activities² – all operations occurring simultaneously.
- Night-time activities³ – 1 x front end loader operating in the WTS building and 1 x front end loader operating in the MRF building. All other activities will only begin after 7am with Sundays and Public Holidays only from 9am onwards.

The noise modelling has been undertaken representing the activities for day and night time.

Table 2-1: Opening Hours

WTS	• Monday to Friday, 6:00 AM - 6:00 PM • Saturday, 6:00 AM - 6:00 PM (as required) • Sunday, Closed • Public holidays 6:00 AM to 6:00 PM (Excl. Christmas Day, Good Friday and New Years Day)
MRF	• Monday to Friday, 6:00 AM - 7:00 PM • Saturday, 6:00 AM - 7:00 PM (as required) • Sunday, 6:00 AM - 7:00 PM (as required) • Public holidays 6:00 AM to 7:00 PM (Excluding Christmas Day, Good Friday and New Years Day)
CRC	• Monday to Friday, 8:00 AM - 4:00 PM • Saturday, Sunday and Public Holidays: ○ Summer (Sep to Apr): 10am to 3pm. ○ Winter (May to Aug): 11am to 3pm.

2.2 Traffic Routes and Volumes

All waste trucks, heavy vehicles and service vehicles enter the site via a shared access point and pass over the weighbridge. Once within the facility, there follow separate paths to the WTS and MRF facilities. Traffic bound for each facility is described below:

- **WTS:** Kerbside collection trucks enter the WTS building and tip waste onto the floor before either proceeding to the truck wash or exiting the site via the weighbridge. Once the waste is unloaded, a front-end loader within the WTS building transfers it either to the waste storage bunker or directly into a transfer trailer (via the western loadout lane) or the compactor (via the eastern loadout lane).
- **MRF:** The MRF consists of two fully enclosed buildings: the Receival and Processing Building, where materials are received, processed, and baled, and the Storage and Dispatch Building, located directly to the north, where baled products are stored and loaded for dispatch. Kerbside collection trucks enter the Receival and Processing Building from the eastern side to

² 7am to 7pm Mon-Sat and 9am to 7pm Sundays and Public Holidays.

³ 6am to 7am Mon-Sat and 6am to 9am Sundays and Public Holidays.

unload recyclables and then exit via the weighbridge. Haulage vehicles reverse into the Storage and Dispatch Building to collect baled recyclables for off-site transport.

- **CRC:** Community traffic enters through the CRC entrance and circulates anti-clockwise through the facility. Operational and service vehicles (Front end loader and hook lift truck) for the CRC operate across the rear service lanes to service the drop-off areas. Residential waste is placed into L-bins on the floor and once full a front end loader loads the contents of the L-bin into the waste bin. Once the waste bin is full, a hook truck collects the bins and transfers it to the WTS, recyclables to the MRF for transfer off site or moved to the long-term stockpile area where they are stored until pick up by contractors.

Table 2-2 provides a summary of estimated peak daily usage times (which occur for 1-2 hours per day), provided by the City of Wanneroo. Traffic will utilise the facility during day-time periods² only, and this has been used in the noise model inputs (see section 4.2).

Table 2-2: Traffic Types and Volumes

Traffic Movement	Area	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Peak times (per hour)	MRF	- Waste Collection Vehicle - Kerbside collection trucks (x44 per hour) - Haulage Vehicle - PM S 19M (x2 per hour)						
	WTS	- Waste Collection Vehicle - Kerbside collection trucks (x40 per hour) - Haulage Vehicle - PM S 19M (x3 per hour)						
	CRC	- Light vehicles (x38 per hour) - L-Bin Services (x60 per day)						

2.3 Noise Generating Activities

The NRRP operations will comprise the following noise generating activities:

- **WTS:** Front end loader.
- **MRF:** Front end loader, conveyor, cardboard Compactor and Comag Compactor.
- **Storage Shed:** Forklift.
- **CRC:** Hook lift truck, forklift, people placing on L-Bin, two Front end loaders (for Green Waste and transferring L-bins to a larger waste bin) and commercial trucks (waste trucks and haulage vehicles).

2.4 Noise Sensitive Receivers

An aerial review of the study area found five noise sensitive receivers (see Table 2-3 and Figure 2-1) closest to the premises that have been included in the noise model.

Table 2-3: GPS Coordinates of Modelled Noise Sensitive Receivers

Receiver Reference	Description	UTM, Zone 50J	
		Easting	Northing
R1	Residential Property #1	386463	6497030
R2	Residential Property #2	388554	6495458
R3	Residential Property #3	388022	6495180

Receiver Reference	Description	UTM, Zone 50J	
		Easting	Northing
R4	Residential Property #4	388194	6494795
R5	Residential Property #5	387273	6493718

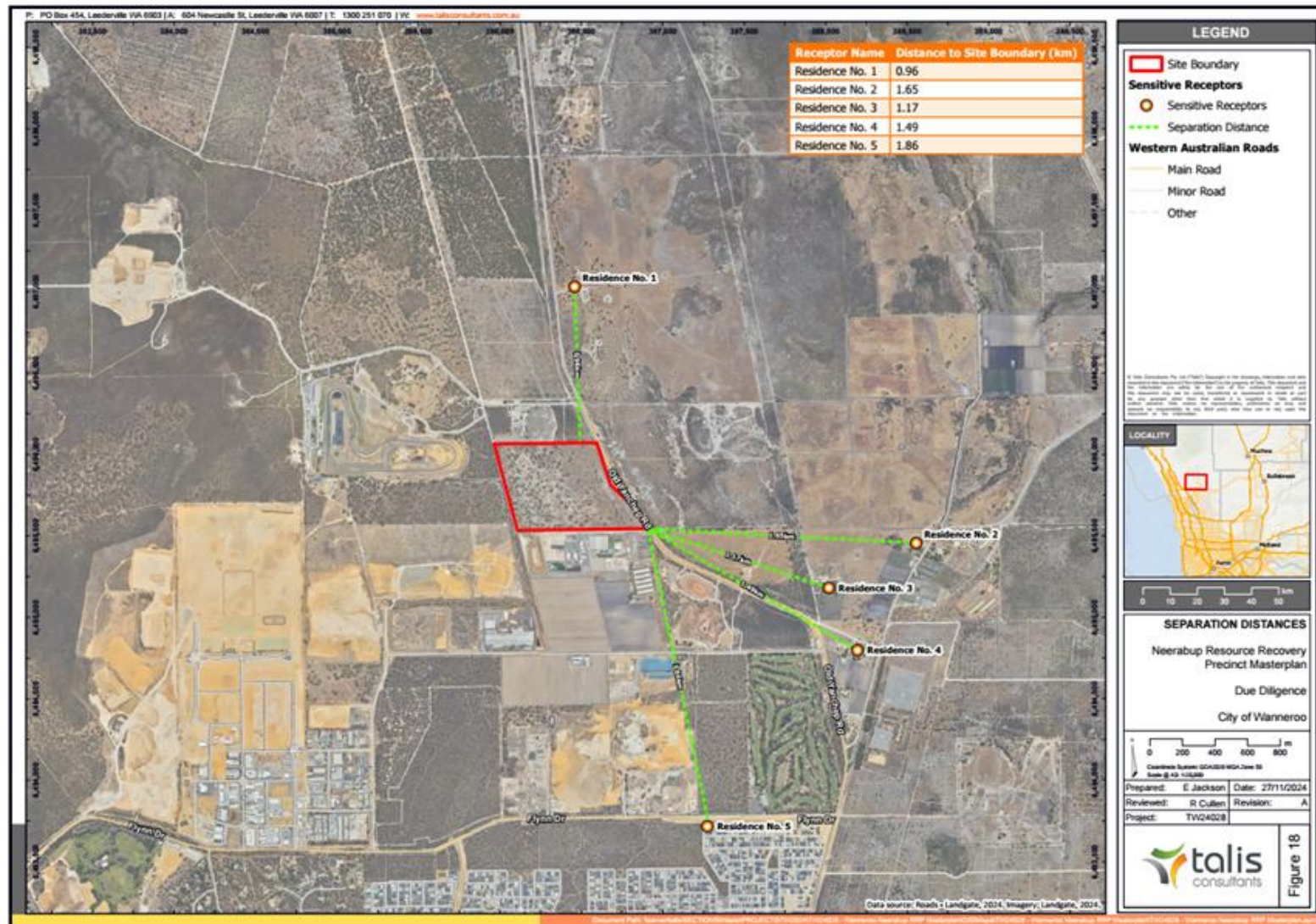
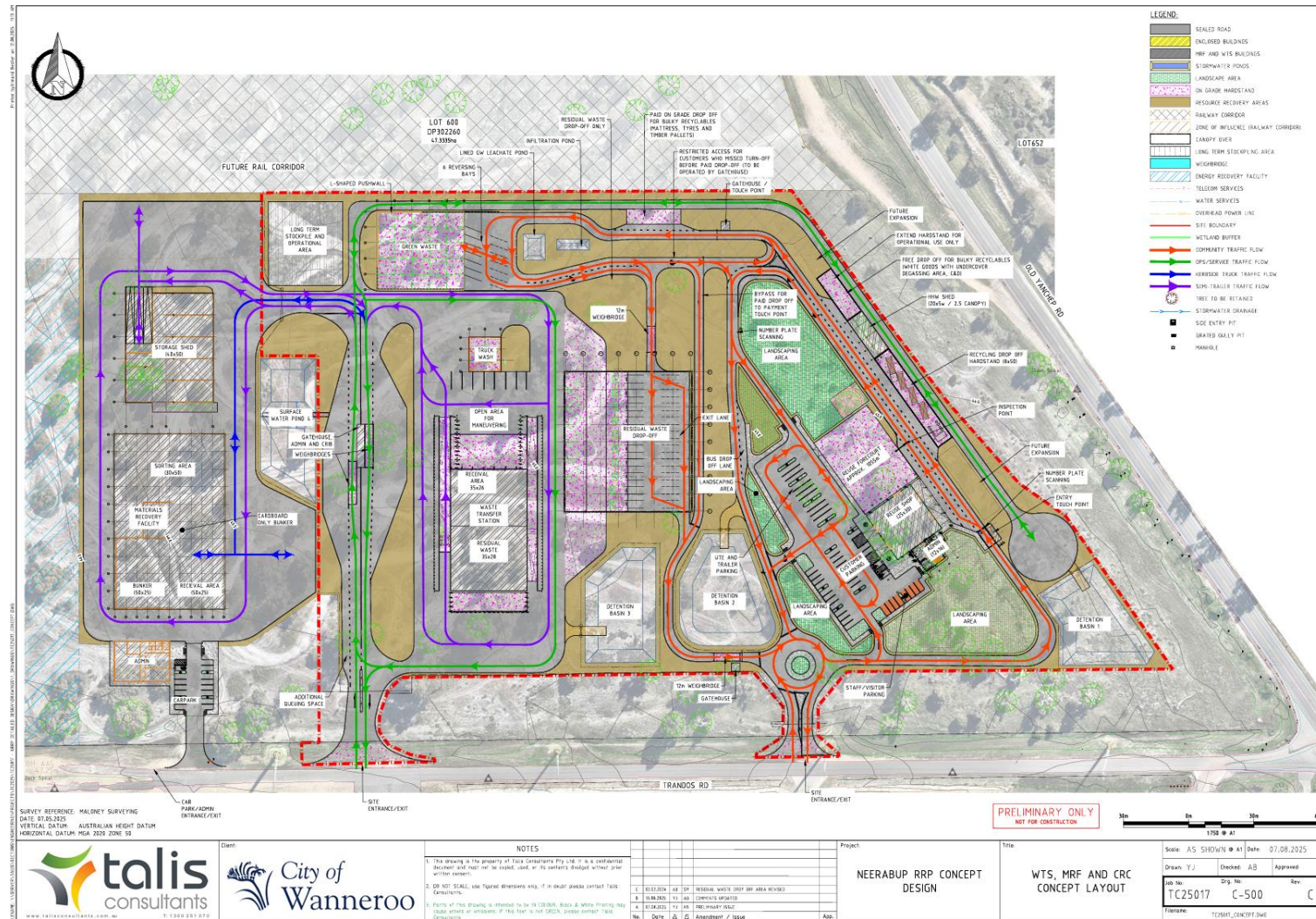


Figure 2-1: Project Location and noise sensitive receivers



3 Assessment Criteria

3.1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented via the Environmental Protection (Noise) Regulations 1997 (the Regulations), which are made under the Environmental Protection Act 1986.

The Regulations define assigned levels, which apply to noise received at noise sensitive premises, such as residential areas. The assigned levels are determined by a combination of a base noise level plus an Influencing Factor (IF).

The assigned noise levels include L_{A51} , L_{A510} and L_{A5MAX} noise parameters, defined as:

- L_{A5MAX} means an assigned level which, measured as an $L_{A\text{ Slow}}$ value, is not to be exceeded at any time.
- L_{A51} means an assigned level which, measured as an $L_{A\text{ Slow}}$ value, is not to be exceeded for more than 1% of the representative assessment period.
- L_{A510} means an assigned level which, measured as an $L_{A\text{ Slow}}$ value, is not to be exceeded for more than 10% of the representative assessment period⁴.

A representative assessment period of 1 hour has been assessed to align with the peak vehicle movements (see Table 4-1).

For noise sensitive premises, the time of day also affects the assigned noise levels. As the NRRP operates 06:00 to 18:00 hours (see section 2.1), the facility will operate during both day and night-time periods. As such, the operations which occur during both these periods have been defined and assessed.

The focus of this assessment is a comparison of all equipment operating simultaneously against the L_{A10} assigned level. From time to time, glass or metal may be dumped into an empty bin. This will affect the L_{A1} or L_{A5MAX} received levels. This activity has been assessed, and to be conservative, has been assessed against the L_{A1} (which is more stringent than the L_{A5MAX}).

3.2 Assigned Noise Levels

The base assigned noise levels defined in the Regulations are given in Table 3-1.

Table 3-1: Environmental Protection (Noise) Regulations - Assigned Noise Levels

Sensitive Receiver	Time of day			
Noise Sensitive Premises	DAY 0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	DAY (Sundays and public holidays) 0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor

⁴**Representative assessment period** means a period of time of not less than 15 minutes, and not exceeding 4 hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Sensitive Receiver	Time of day			
	EVENING 1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	NIGHT 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Industry Boundary	all times	65	80	90

3.2.1 Influencing Factors

The Influencing Factor (IF) is based on the surrounding land use adjacent to each of the noise sensitive receivers, including the amount (%) of industrial and commercial premises as well as the number and proximity of major and secondary roads.

The following steps were taken to calculate IF for each receiver assessed:

1. Two circles of radius 100m and 450m centred on each of the identified receivers were drawn.
2. The circles were used to determine and calculate the area of industrial and commercial premises and the presence major/secondary roads within the circles.

There are no major or secondary roads, industrial or commercial premise near the noise sensitive receivers and the IF for all receivers is therefore 0.

3.2.2 Significant Contributor

The Regulations require that *“noise emitted from any premises when received at other premises – (a) must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind”*. A noise emission is taken to significantly contribute to a level of noise if the received noise exceeds a value which is 5 dB below the assigned level at the point of reception.

The NRRP will be located adjacent to an existing power generation plant which operates at all times of day and is expected to contribute to received noise levels of greater than 35 dB(A). As a result, a significant contributor adjustment of -5dB has been applied to the assigned levels for this assessment.

3.2.3 Adjustments for intrusive or dominant characteristics

As a significant contributor penalty has been applied (see section 3.2.2), no additional adjustments have been made for characteristic noise such as tonality.

3.2.4 Applicable Noise Criteria

Table 3-2 presents the applicable assigned noise levels, for both day and night-time^{2,3}, including IF's and adjustments.

Table 3-2: Applicable assigned noise levels

Receiver Ref	Receiver	Daytime			Night-time		
		LA10	LA1	LAMax	LA10	LA1	LAMax
R1	Residential Property #1	40	50	60	30	40	50
R2	Residential Property #2	40	50	60	30	40	50
R3	Residential Property #3	40	50	60	30	40	50
R4	Residential Property #4	40	50	60	30	40	50
R5	Residential Property #5	40	50	60	30	40	50

4 Noise Modelling Overview

4.1 Modelling Software

A desktop environmental noise model was created to simulate the NRRP operations using the SoundPlan v9 software program. This software package calculates sound pressure levels at nominated receiver locations and produces noise contours over a defined area of interest. SoundPlan can be used to model industrial noise, traffic noise and aircraft noise.

The inputs required by the SoundPlan modelling software are noise sources, ground topographical and absorption data, meteorological data and sensitive receiver point locations. For this study the ISO9613⁵ and the CONCAWE^{6,7} prediction algorithm were utilised. ISO9613 has been applied for the absorption of sound by the atmosphere.

The model has been used to predict received noise levels at noise sensitive receiver locations and to generate noise contour maps for the surrounding area.

4.2 Model Inputs

4.2.1 Noise Sources

Noise source Sound Power Levels (SWLs) have been calculated and allocated to the model using a combination of equipment lists provided which contain the type, make, model and quantities, as well as allocating SWLs from previous noise measurements of similar equipment from waste facilities and other operations.

Noise generating equipment on-site is associated with vehicle movements (waste trucks, heavy vehicles), front end loaders operating inside the buildings, forklift operations, light vehicles doing waste drop-off and people dropping off material in CRC bins.

For heavy vehicles on-site, the total acoustic energy of traffic during peak times (see Table 2-2) with traffic travelling at slow speeds (10km/hr speed limit) has been distributed evenly across the site roads as a line source (Figure 2-2). This approach has the effect of distributing the vehicle noise emissions across site during the peak traffic volumes periods (i.e. worst case for day and night-time periods).

A summary of SWL's used in the modelling is provided in Table 4-1 and spectral data for each source can be found in Appendix A. The facility layout, including the modelled source positions, is shown in Figure 4-1.

⁵ ISO9613 is used for calculating the absorption of sound during propagation.

⁶ CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

⁷ The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981.

Table 4-1: SWL's used in modelling

Equipment	Operating time	SWL per item, dBA	Quantity	Location
Front End Loader	Day and Night	105	1	WTS - Building
			1	MRF - Building
	Day		1	CRC - CRC Drop-off
			1	Green Waste Area
Conveyor	Day	74 (dBA/m)	1	MRF - Building
Comag Compactor	Day	112	1	MRF - Building
Cardboard Compactor	Day	81	1	MRF - Building
Haulage Vehicle 19M	Day	97	Table 2-2	Vehicle access roads
Wate Collection Truck - Remondis Large Rear Load	Day	94	Table 2-2	Vehicle access roads
Forklift	Day	103	1	CRC – HHW Shed
			1	Storage Shed
Front End Loader transferring glass to waste bin	Day (LAMax)	121	1	CRC Drop-off
Front End Loader transferring metal to waste bin	Day	115	1	CRC Drop-off

4.2.2 Noise Sensitive Receivers

The noise sensitive receivers used in the model are provided in Table 2-3.

4.2.3 Buildings

Industrial buildings have been developed for the WTS, MRF and storage shed buildings, which contain noise sources. Each building is enclosed using standard colorbond sheeting, includes insulation batts on the roof and automatic roller doors.

All other buildings on-site have been developed as building structures only (i.e. no sources inside). No buildings off-site (such as residential dwellings and off-site commercial buildings) have been included.

4.2.4 Topography and Ground Absorption

Topographical information was imported into the noise model to create a Digital Ground Map (DGM). The acoustic properties of the ground surface influence the propagation of noise. Flat non-porous surfaces such as concrete, asphalt and water are more reflective whereas soft, porous surfaces such as foliage and grass are more absorptive. A ground factor of 0.7 was applied to the model.

4.2.5 Meteorological Conditions

The CONCAWE algorithm has been used to calculate noise levels for user defined meteorological conditions. Table 4-2 defines the worst-case meteorological conditions applied to the model for the daytime and night-time scenarios, which are defined in the Department of Water and Environment Regulation (DWER) “Draft Guideline on Environmental Noise for Prescribed Premises” [3].

Table 4-2: Weather conditions applied to the model

Scenario	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Pasquil Stability Class (PSC)
Day time	20	50	4	Worst case (source to receiver)	D
Night-time	15	50	3		F

4.3 Noise Modelling Scenarios

Three model scenarios have been developed to predict the NRRP operations, as follows:

- **Scenario 1:** Daytime operations (L_{A10})– all Table 4-1 items.
- **Scenario 2:** Night-time operations (L_{A10}) – 2 front end loaders operating inside the MRF and WTS buildings.
- **Scenario 3:** Daytime operations (L_{A1})– all Table 4-1 items plus glass being dumped into bins at the CRC by front end loader.

The noise model layouts are shown in Figure 4-1 (Scenario 1), Figure 4-2 (Scenario 2) and Figure 4-3 (Scenario 3). The model assumes all equipment is operating simultaneously and has been run under worst case weather conditions defined in Table 4-2.

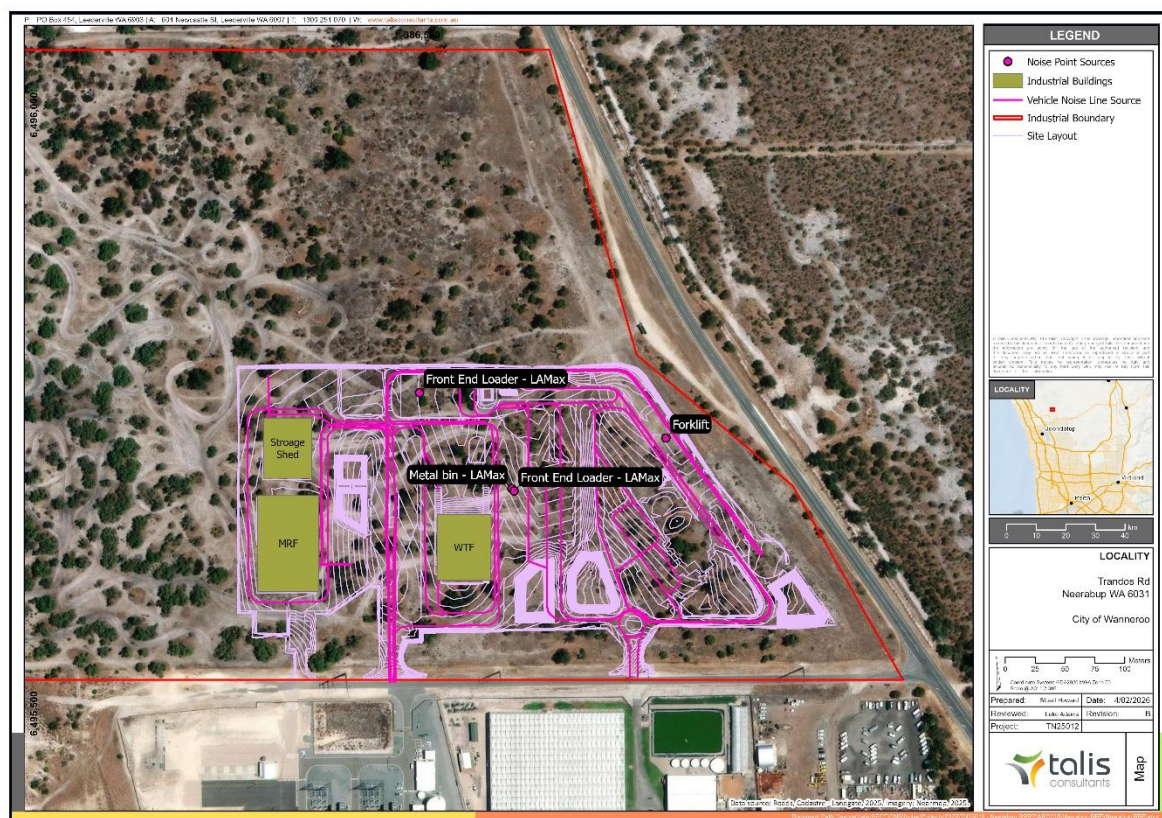


Figure 4-1: Model Layout Scenario 1

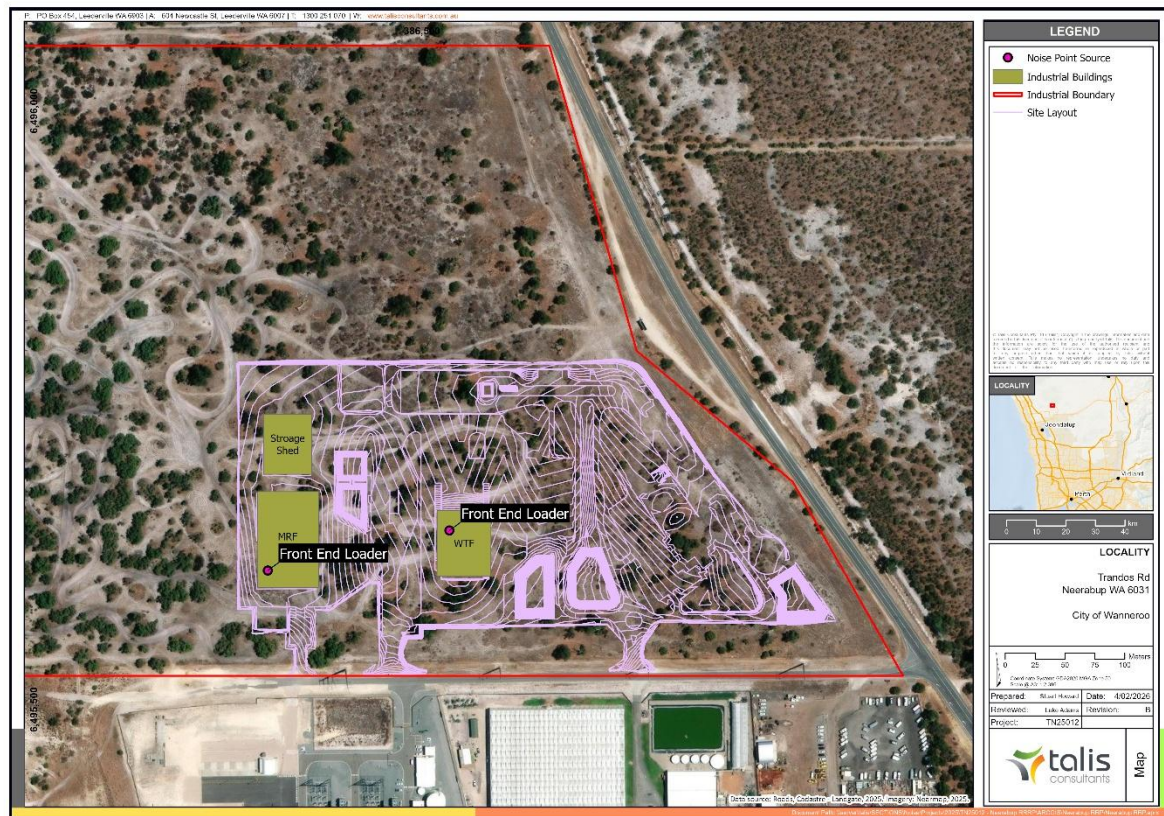


Figure 4-2: Model Layout Scenario 2

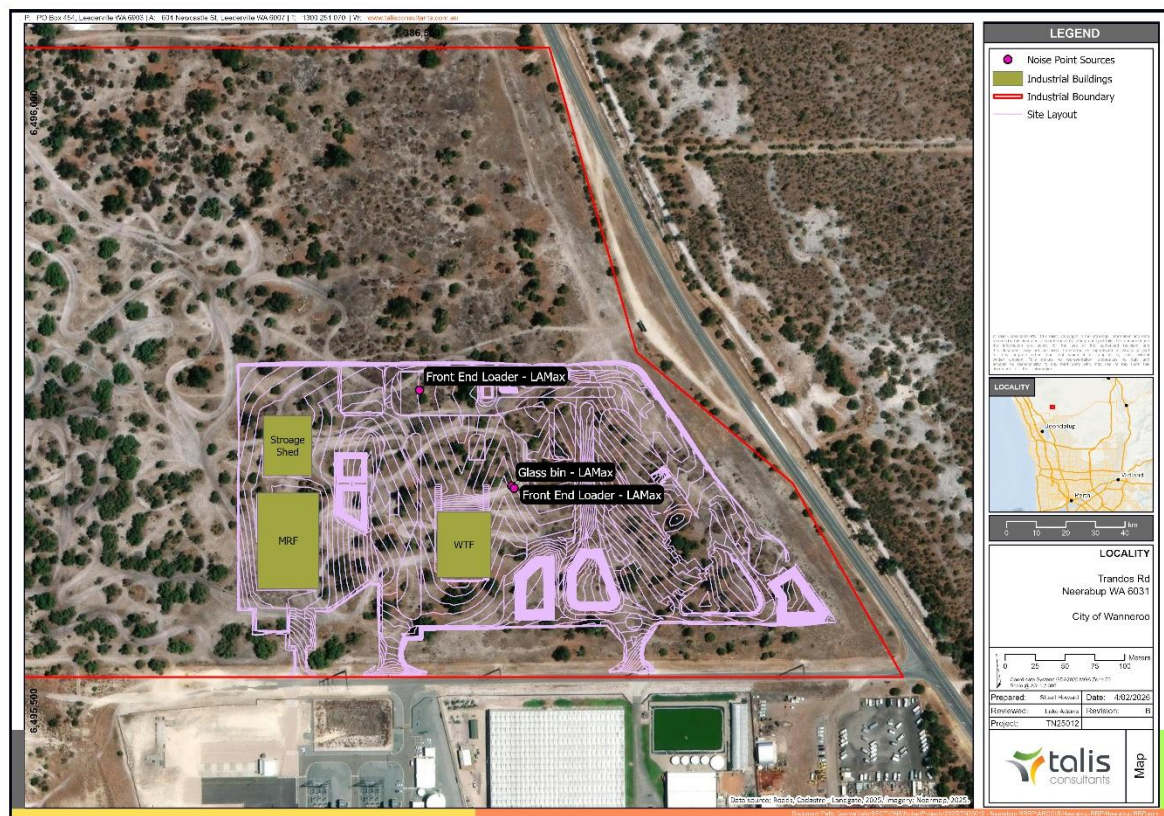


Figure 4-3: Model Layout Scenario 3

5 Noise Modelling Results

Table 5-1 shows the daytime and Table 5-2 the nighttime model results. Noise contour maps are provided in Figure 5-1 to Figure 5-3, and a zoomed in contour for Scenario 1 can be found in Figure 5-4 showing the industry boundary with the adjacent power plant.

From the results, the following has been found:

- The NRRP operations comply with the assigned levels for both daytime and nighttime operations at all assessed noise sensitive receivers.
- The noise levels at the Southern boundary comply with the industry boundary assigned level, except for the truck entry point, where traffic enters the site. At this point there is a very small, localised spot >65dBA which cannot practicably be shielded because it is the entry point and it only affects the power station entry road which is not expected to be occupied (other than cars entering), no noise control is proposed.

Table 5-1: Daytime Operations Model Results

Ref	Receiver	LA10		LA1	
		Assigned LA10 ⁸	Predicted LA10	Assigned LA1	Predicted LA1
R1	Residential Property #1	40	39.6	50	43.2
R2	Residential Property #2		33.0		36.9
R3	Residential Property #3		36.5		40.4
R4	Residential Property #4		33.4		37.3
R5	Residential Property #5		33.0		36.7
IB	Industry Boundary	65	55.4 - 64.9	N/A	N/A

Table 5-2: Night-time Operations Model Results

Ref	Receiver	LA10	
		Assigned LA10	Predicted LA10
R1	Residential Property #1	30	29.4
R2	Residential Property #2	30	20.5
R3	Residential Property #3	30	24
R4	Residential Property #4	30	23
R5	Residential Property #5	30	22.7

⁸ Includes 5dB significant contributor adjustment.

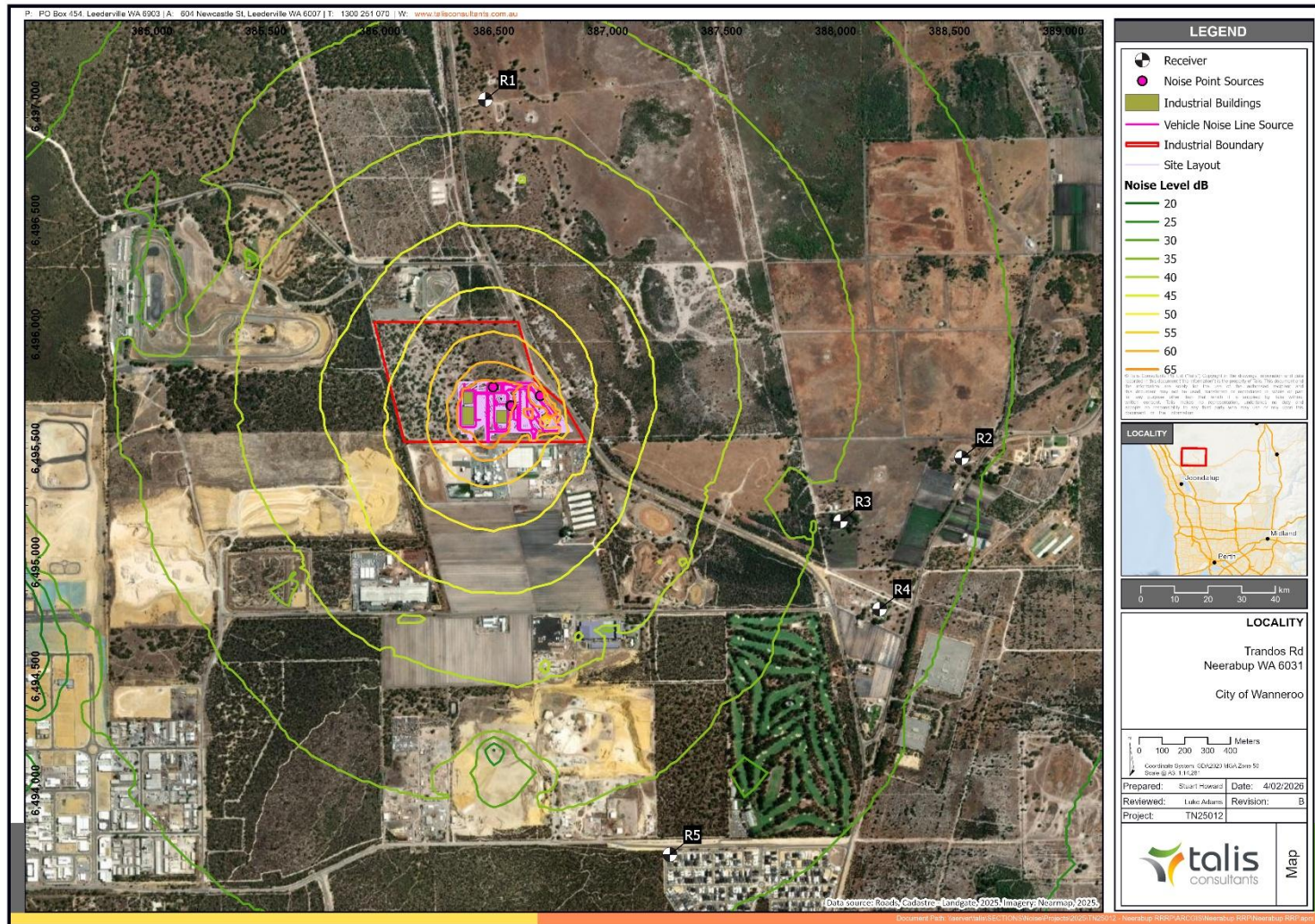


Figure 5-1: Noise Contour Map – Scenario 1 Daytime (LA10)



Figure 5-2: Noise Contour Map – Scenario 2 Nighttime (LA10)

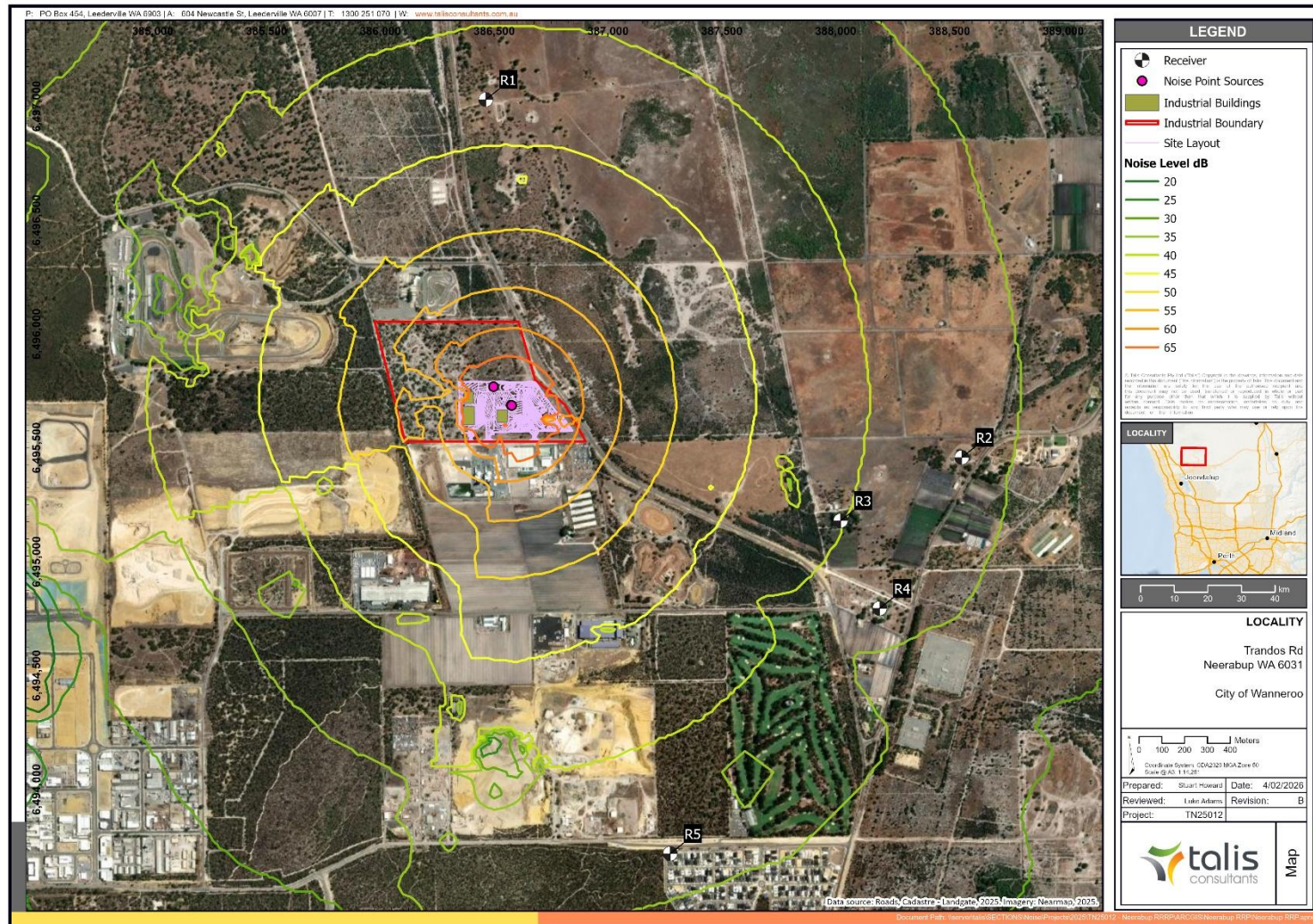


Figure 5-3: Noise Contour Map – Scenario 3 Daytime (LA1)

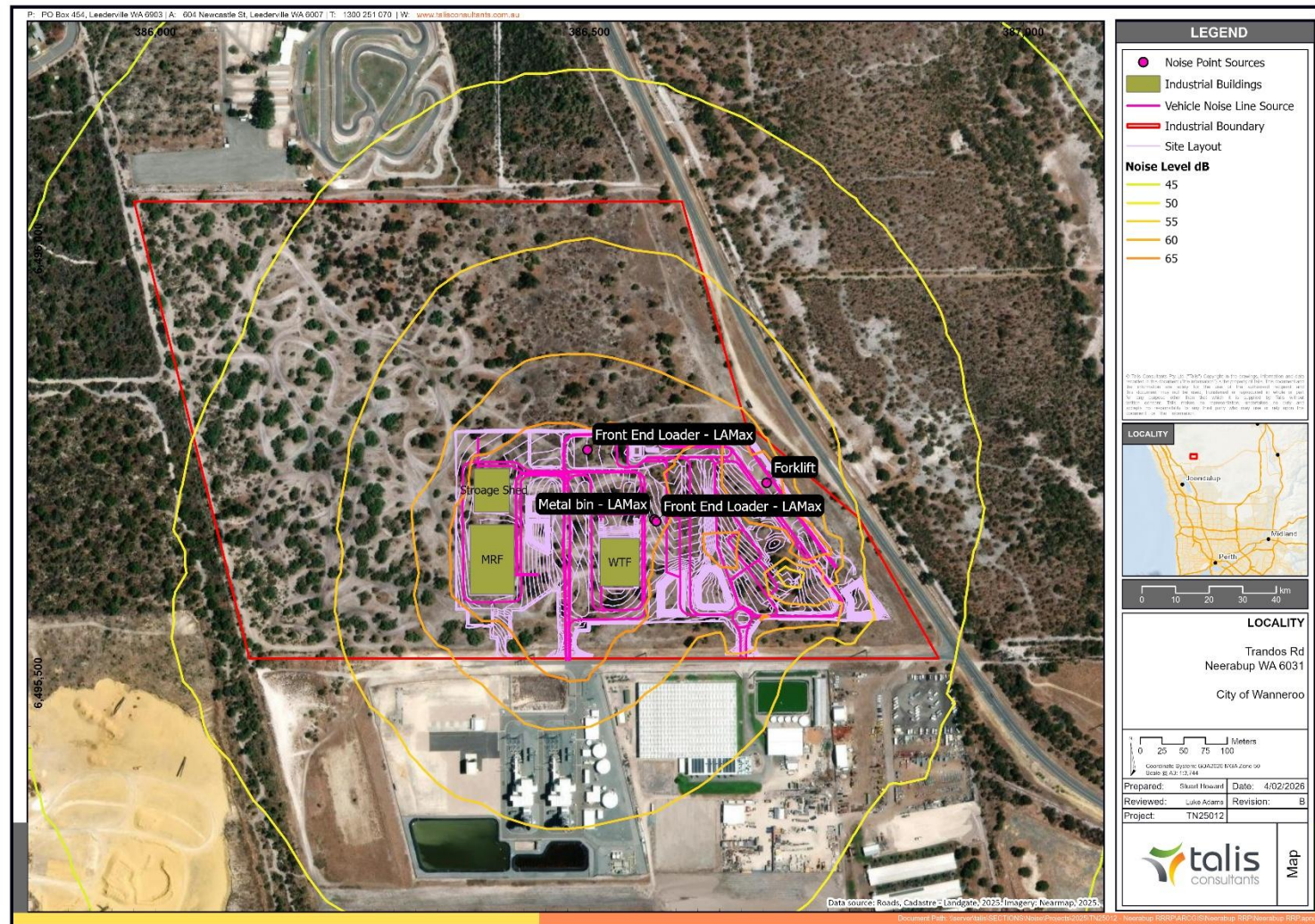


Figure 5-4: Noise Contour Map – Scenario 1 Daytime (LA10) Zoomed

6 Conclusions

Based on the outcomes of the noise modelling and analysis, the proposed NRRP operations comply with the assigned noise levels at all noise sensitive receivers under worst case conditions. As a result, no additional noise control is proposed for the facility.

APPENDIX A

Noise Source Levels

Noise source	Octave Band Levels, dBA									O/A
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8KHz	
Haulage Vehicles	58	77	84	85	91	93	91	86	79	97
Waste Collection Vehicles	55	74	81	82	88	90	88	83	76	94
Light Vehicles	47	61	62	64	77	78	75	68	60	82
Front End Loader	47	68	88	103	92	95	94	89	83	105
Compactor	82	96	99	106	107	107	100	93	93	112
Conveyor (1m/s)	10	35	49	56	68	69	67	62	52	74
Waste bin disposal (Glass)	69	74	82	99	108	113	117	115	107	121
Waste bin disposal (Metal)	61	77	82	88	92	91	91	87	79	97
Hook lift truck	68	81	86	89	93	93	93	87	76	99
Forklift	44	65	85	100	89	92	91	86	80	102



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