APPENDIX 7. INVESTIGATIONS - ACOUSTIC ASSESSMENT

Morphettville Code Amendment

Acoustic Assessment

S7295C2

July 2022

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Document Title	Morphettville Code Amendment Acoustic Assessment
Client	Future Urban Group
Document Reference	S7295C2
Date	July 2022
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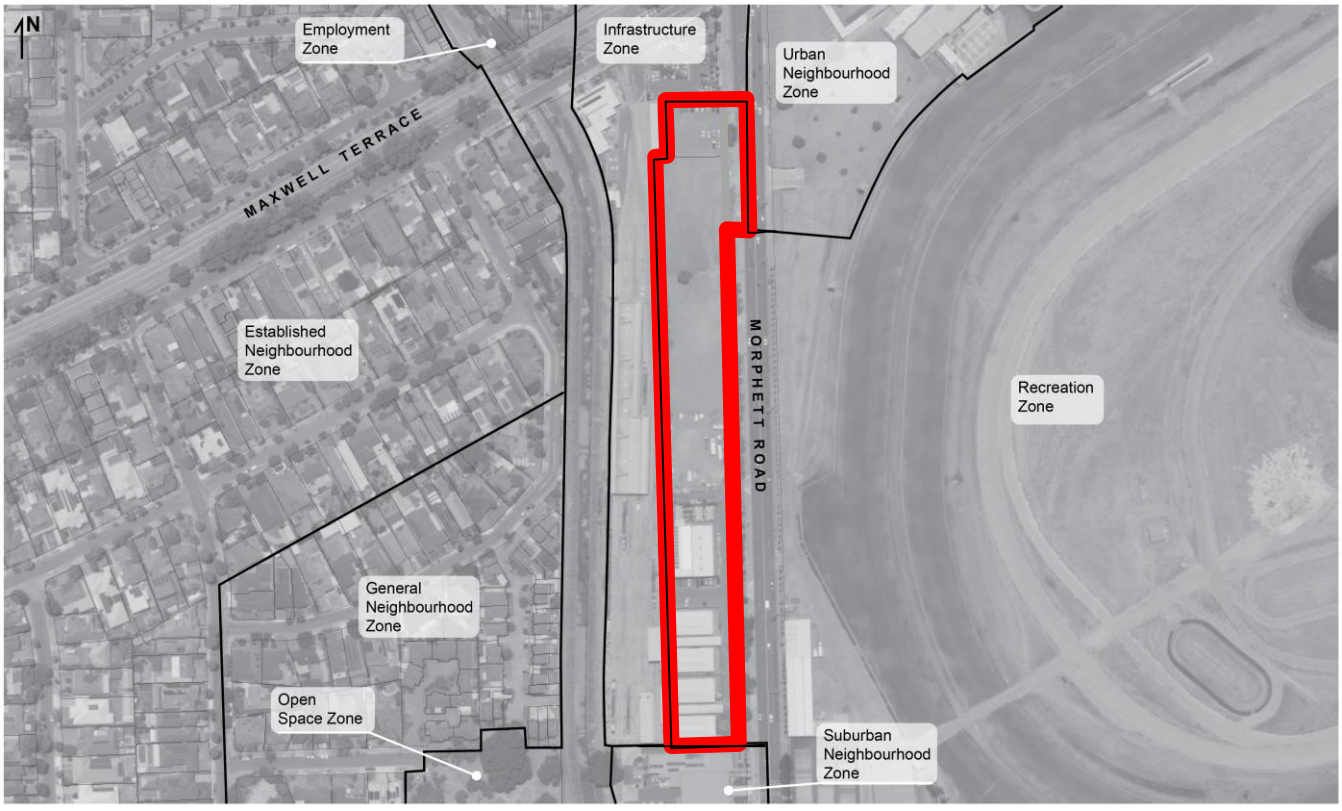
1 INTRODUCTION

A Planning and Design Code Amendment (the **Amendment**) is being considered for land on 86 and 88 Morphett Road, Glengowrie, opposite the Morphettville Race Course (the **Affected Area**). The land currently includes a car park and other commercial usage.

The Affected Area, shown in Figure 1 below, is currently located in a *Recreation* zone of the South Australian Planning and Design Code (the **Code**). The Amendment proposes to rezone the Affected area to an *Urban Neighbourhood* Zone. The amendment would effectively represent an extension of the existing *Urban Neighbourhood* Zone (located North East of the Affected Area) to the West.



Legend

Zone Boundary

Proposed Addition to *Urban Neighbourhood* Zone

Figure 1: Site Locality

This assessment has been conducted to determine if the pathways of the Code can be used to protect the ongoing operation of existing noise sources in the vicinity and to achieve a suitable level of amenity for future residents.

The noise emissions into the Affected Area are considered in the following way:

- The noise criteria that would apply as a result of the Amendment are determined, for the following sources;
    - Mixed Use Noise (e.g. commercial use of the Affected Area)
    - Road Traffic Noise
    - Tram Depot Noise (e.g. maintenance activities)
    - Tram Noise
- The suitability of the resulting noise criteria are considered in the context of established standards and guidelines; and,
- The likely acoustic treatment measures that would be required for development within the site are considered.

The assessment has been based on:

- Noise measurements conducted between 1 June and 10 June 2022;
- South Australian Planning and Design Code;
- The South Australia Environment Protection (Noise) Policy 2007;
- The South Australian Environment Protection Authority "Guidelines for the assessment of noise from rail infrastructure", released April 2013; and,
- Ministerial Building Standard MBS 010 – Construction requirements for the control of external sound, released March 2021.

2 EXISTING NOISE ENVIRONMENT

A site inspection and background noise monitoring has been conducted to gain an understanding of the existing noise environment and the noise sources that may impact the Affected Area.

Continuous noise monitoring was conducted adjacent to the tram depot between 1 June and 10 June 2022, with the purpose to gain an understanding of how any tram movements and maintenance activities conducted at the site might impact the noise levels experienced by future noise sensitive receivers at the Affected Area. The noise monitoring location is shown in Figure 2.

Figure 2: Monitoring Location

Based upon the monitoring and the site inspection, the following assumptions have been made about the existing noise environment.

- Noise at the site primarily consists of:
    - Road traffic noise from Morphett Road
    - Noise from the tram depot including maintenance activities and rolling stock noise
- Trams predominantly depart and arrive back at the depot during the night time period (10pm to 7am).
- Noise from the tram depot maintenance facility includes the following noise sources:
    - A tram wash facility, which operates infrequently between the hours of 7am and 10pm
    - A tram paint booth, which operates infrequently between the hours of 7am and 10pm
    - Maintenance and servicing activity within the main shed, with a grinder being the dominant noise source

It is noted that as no noise from maintenance activities was observed, a previous assessment of a tram maintenance facility has been used.

3 CRITERIA

3.1 PLANNING AND DESIGN CODE

The Amendment will result in the Affected Area being rezoned from a *Recreation* Zone to an *Urban Neighbourhood* zone. A *Recreation* zone principally promotes "a range of accessible recreational facilities", while the *Urban Neighbourhood* zone is a mixed use area which includes the promotion of noise sensitive (residential) land use. The Amendment creates the potential for new noise sensitive receivers to be located in an area where noise may create a conflict with existing land uses in the vicinity, such as noise from the adjacent *Infrastructure* Zone, if not correctly treated.

The Planning and Design Code (the **Code**) has been reviewed, and the following provisions considered relevant.

Part 4 – General Development Policies – Interface between Land Uses

Desired Outcomes	
DO 1	Development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses.

Performance Outcome (PO)	Deemed-to-Satisfy Criteria / Designated Performance Feature (DTS/DPF)
General Land Use Compatibility	
PO 1.1 Sensitive receivers are designed and sited to protect residents and occupants from adverse impacts generated by lawfully existing land uses (or lawfully approved land uses) and land uses desired in the zone.	DTS/DPF 1.1 None are applicable.

<table>
<tr><th colspan="2">Hours of Operation</th></tr>
<tr><td>PO 2.1
Non-residential development does not unreasonably impact the amenity of sensitive receivers (or lawfully approved sensitive receivers) or an adjacent zone primarily for sensitive receivers through its hours of operation having regard to:

(a) the nature of the development
(b) measures to mitigate off-site impacts
(c) the extent to which the development is desired in the zone
(d) measures that might be taken in an adjacent zone primarily for sensitive receivers that mitigate adverse impacts without unreasonably compromising the intended use of that land.</td><td>DTS/DPF 2.1
Development operating within the following hours:
<table><tr><th>Class of Development</th><th>Hours of operation</th></tr><tr><td>Consulting room</td><td>7am to 9pm, Monday to Friday
8am to 5pm, Saturday</td></tr><tr><td>Office</td><td>7am to 9pm, Monday to Friday
8am to 5pm, Saturday</td></tr><tr><td>Shop, other than any one or combination of the following:
(a) restaurant
(b) cellar door in the Productive Rural Landscape Zone, Rural Zone or Rural Horticulture Zone</td><td>7am to 9pm, Monday to Friday
8am to 5pm, Saturday and Sunday</td></tr></table></td></tr>
<tr><th colspan="2">Activities Generating Noise or Vibration</th></tr>
<tr><td>PO 4.1
Development that emits noise (other than music) does not unreasonably impact the amenity of sensitive receivers (or lawfully approved sensitive receivers).</td><td>DTS/DPF 4.1
Noise that affects sensitive receivers achieves the relevant Environment Protection (Noise) Policy criteria.</td></tr>
<tr><td>PO 4.4
External noise into bedrooms is minimised by separating or shielding these rooms from service equipment areas and fixed noise sources located on the same or an adjoining allotment.</td><td>DTS/DPF 4.4
Adjacent land is used for residential purposes.</td></tr>
</table>

3.1.1 Urban Neighbourhood Zone

The proposed zone for the site is an extension of an existing *Urban Neighbourhood* Zone, which has the following Desired Outcome:

A mixed use area that:

(a) provides a flexible policy framework for the redevelopment of urban areas in close proximity to high frequency public transport corridors or adjacent primary road corridors that have the potential to become activity generators

(b) provides for the high-quality design and integration of buildings and public realm in mixed use areas with walkable urban form, excellent provision for walking and cycling and active street frontages that encourage social interaction, positively contribute to public safety and vibrancy and promote active movement and public transport use

(c) provides a concentration of mixed use activity close to community focal points, such as a high frequency fixed transit stop, activity centre or high quality open space

(d) provides adaptable and flexible buildings that can accommodate changes in land use and respond to changing economic and social conditions and advances in technology

(e) transitions to a reduced scale and intensity at the zone boundary to maintain the amenity of residential properties located within adjoining zones.

3.1.2 *Infrastructure* Zone

To the west of the Affected Area is an *Infrastructure* Zone, with a tram depot (the **Depot**). The *Infrastructure* Zone has the following Desired Outcomes:

- *DO 1: The protection, provision, maintenance and expansion of infrastructure services and facilities that support orderly development and vehicular movements.*
- *DO 2: Infrastructure services and facilities manage environmental impacts.*

3.2 ENVIRONMENT PROTECTION (NOISE) POLICY 2007

The *Environment Protection (Noise) Policy 2007* (the **Policy**) provides goal noise levels to be achieved at residences from general activity at a site. Where the goal noise levels are achieved, the noise source is protected from action under the *Environment Protection Act 1993*. Further, the Policy is based on the World Health Organisation *Guidelines for Community Noise* to prevent annoyance, sleep disturbance and unreasonable interference on the amenity of an area. Therefore, compliance with the Policy is considered to be sufficient to achieve an appropriate level of amenity for future residents.

The Policy establishes goal noise levels to be achieved at dwellings based on the Planning and Design Code zones in which the noise sources (the Depot) and the noise sensitive receivers (future residents) are located, and the land use that the zones principally promote.

The Infrastructure Zone promotes both Special Industry and General Industry land uses. For the purpose of this assessment, a conservative approach has been taken whereby the General Industry land use has been adopted. Adopting the General Industry land use for this assessment will provide greater protection for the future ongoing use of the Depot and a higher level of amenity for future residents. It is therefore considered to be appropriate in this circumstance.

Based on the principally promoted land use of the Depot (General Industry), and the Amendment's proposed change in land use at the Affected Area (a mix between Commercial and Residential), the Policy provides the following goal noise levels to be achieved at future noise sensitive locations in any 15-minute period:

- an average noise level ($L_{Aeq,15min}$) of 61 dB(A) during the day (7:00am to 10:00pm); and,
- an average noise level ($L_{Aeq,15min}$) of 53 dB(A) at night (10:00pm to 7:00am).

Where acoustic treatment is applied at the facade, the appropriate measurement location is indoors, with the following criteria:

- an average noise level ($L_{Aeq,15min}$) of 41 dB(A) during the day (7:00am to 10:00pm); and,
- an average noise level ($L_{Aeq,15min}$) of 33 dB(A) at night (10:00pm to 7:00am).

When measuring or predicting noise levels for comparison with the Policy, adjustments may be made to the average goal noise levels for each "annoying" characteristic of tone, impulse, low frequency, and modulation of the noise source. The characteristic must be dominant in the existing acoustic environment and therefore the application of a penalty varies depending on the assessment location, time of day, the noise source being assessed, and the predicted noise level.

3.3 MINISTERIAL BUILDING STANDARD MBS 010

The *Ministerial Building Standard MBS 010 Construction requirements for the control of external sound* (**MBS 010**) is a Ministerial Building Standard under the *Planning, Development and Infrastructure Act 2016* (the Act). MBS 010 *"contains provisions for reducing the intrusion of unacceptable levels of sound into habitable rooms of residential buildings"*. It is predominantly applied to residential development adjacent transport corridors but also applies to residential development in a mixed-use environment.

MBS 010 establishes requirements for the building facade to adequately reduce noise inside the building, and is applicable to *"a Class 1, 2 or 3 building, a Class 4 part of a building and a Class 9c residential care building located within a noise attenuation area or an Australian Noise Exposure Forecast (ANEF) contour band of 20 or more."*

The Deemed-to-Satisfy approach of MBS 010 specifies acoustic treatment to dwellings based on the Sound Exposure Category (**SEC**), which the various facades of the dwelling fall under. The SECs range from 1 to 5, with SEC 1 requiring a minor level of acoustic treatment and SEC 5 requiring extensive treatment. The SEC is typically determined based on the type of road or a rail line, the separation distance of the building from the road or rail line, and line of sight of the facade to the road or rail line.

In accordance with MBS 010, where a building is exposed to differing levels of external airborne sound arising from a variety of activities permitted in mixed land use areas, and the building is not exposed to external airborne sound from Type A, B or R roads, rail or aircraft noise sources, the minimum sound exposure category to be applied to the building envelope is SEC 1.

3.4 GUIDELINES FOR THE ASSESSMENT OF NOISE FROM RAIL INFRASTRUCTURE

The Guidelines for the assessment of noise from rail infrastructure (**GANRI**) provides a method of assessing noise for rail related projects. It is applicable to:

- New railway lines;
- Upgrades to existing railway lines; and,
- New noise and/or vibration sensitive development adjacent to existing railway lines

However, GANRI is not applicable to noise from rail-yards, rail freight terminals, intermodal facilities and stations. Therefore, the criteria within GANRI are only appropriate for the noise from the tram movements (the rolling stock noise). GANRI states that noise sensitive developments proposed within 35m of a tram line must assess the impact of noise. The airborne noise criteria for residential receivers are shown in Table 1.

Table 1: GANRI Noise Criteria

Period	**Noise Criteria, dB(A)** **New sensitive developments near existing railway line**
Day, 7 am to 10 pm	60 $L_{eq,\ 15h}$ 80 L_{max}
Night, 10 pm to 7 am	55 $L_{eq,\ 9h}$ 80 L_{max}

In addition, GANRI states the following (note that the Minister's Specification has been replaced with the MBS010):

> *The EPA recognises that in some situations meeting the external noise criteria may not be practicable. In these cases it is appropriate to provide protection to internal areas of the receiver in order to achieve compliance with the design sound levels indicated in the Minister's Specification.*

3.5 ASSESSMENT CRITERIA SUMMARY

A summary of the applicable noise assessment criteria are provided in Table 2.

Table 2: Noise Criteria Summary

Noise Source	Applicable Policy / Guideline	Noise Criteria
Commercial (mixed-use) noise Road traffic noise	MBS 010	Maximum internal noise levels: Bedrooms - 35 dB(A) $L_{eq,\ night}$ Other Habitable Rooms - 40 dB(A) $L_{eq,\ night}$
Tram depot (maintenance activities)	The Policy	Outdoors • 61 dB(A) $L_{eq,15min}$ day • 53 dB(A) $L_{eq,15min}$ night or Indoors (where facade is upgraded) • 41 dB(A) $L_{eq,15min}$ day • 33 dB(A) $L_{eq,15min}$ night
Tram depot (rolling stock noise)	GANRI outdoors	• 60 dB(A)(A) $L_{eq,15h}$ day • 55 dB(A) $L_{eq,9h}$ night • 80 dB(A) L_{max} day and night
	or MBS 010 indoors with facade upgraded	Maximum internal noise levels: Bedrooms - 35 dB(A) $L_{eq,\ night}$ Other Habitable Rooms - 40 dB(A) $L_{eq,\ night}$

4 ASSESSMENT

4.1 MIXED USE NOISE

The Amendment seeks to rezone the Affected Area as an *Urban Neighbourhood* Zone within the Code, which is a mixed use zone. It is recommended that the Affected Area be designated in the Noise and Air Emission Overlay, so that treatment of mixed use noise will be assessed through the requirements of MBS 010, which states:

"Where a building is exposed to differing levels of external airborne sound arising from a variety of activities permitted in mixed land use areas, and the building is not exposed to external airborne sound from Type A, B or R roads, rail or aircraft, the sound exposure category for the building envelope is to be taken as sound exposure category 1."

The Noise and Air Emissions Overlay within the Code mandates MBS 010 as part of Building Rules Consent (refer Appendix A for the performance outcomes). By applying the Noise and Air Emissions Overlay to the Affected Area, in line with the existing adjoining *Urban Neighbourhood* Zone, an MBS 010 assessment must be conducted, therefore requiring building facade treatment for mixed use noise. Example treatments are shown in Table 3.

Table 3: Mixed Use Zone Example Treatment

Category	Requirement	Example of Acoustic Treatment for Mixed Use Zone
External Walls	$R_W + C_{tr} \geq 40$ for all habitable rooms	• 150mm thick precast concrete outer wall • 90mm thick timber studs with 11kg/m^3 insulation between the studs • 1x layer of 10mm thick plasterboard
Glazing	Dependent on Area of window and external glass doors as a percentage of the floor area of the room. For the purposes of the example treatments, a glazing to floor area percentage of 30% has been used: $R_W + C_{tr} \geq 28$ for Bedrooms $R_W + C_{tr} \geq 25$ for other habitable rooms	Windows: 6mm thick monolithic or laminated glass with awning type opening Glass Doors: 10mm thick monolithic or laminated glass sliding door

Ventilation	$R_W \geq 25$	Openable windows

4.2 ROAD TRAFFIC NOISE

Designated roads integrate with MBS 010 to assist in determining the extent of acoustic treatment for a building exposed to traffic noise. The closest designated road to the site is Anzac Highway, which is a Type B road within the Code. The Affected Area is sufficiently far from Anzac Highway to not warrant any treatment in accordance with MBS 010.

Morphett Road is not currently classified as a designated road within the Code, and therefore noise associated with traffic from Morphett Road does not trigger the requirement for acoustic treatment under the Code. If Morphett Road were classed as a designated road in the future, treatments would be required in accordance with MBS 010 by application of the Noise and Air Emissions Overlay to the site.

Notwithstanding, the treatments required to achieve MBS 010 for mixed use, will also result in reduced road traffic noise in future residences.

4.3 TRAM DEPOT

Two types of noise sources are considered for the tram depot, the tram movements (rolling stock noise) and the maintenance activities conducted at the facility. The tram movements occur during the day and night time periods, while the maintenance occur during day time hours only.

Table 4: Tram Depot Noise Sources

Period	Sources
Day - 7:00am to 10:00pm	Tram movements and maintenance
Night - 10:00pm to 7:00am	Tram movements

4.3.1 Tram Movements

The night time tram movements have been considered as the controlling noise case, based upon review of the Adelaide Metro tram timetable and the existing noise levels obtained from the noise monitoring. The outdoor criteria are therefore 55 dB(A) $L_{eq, 9h}$ and 80 dB(A) L_{max} between the hours of 10pm and 7am, as set by GANRI.

Noise modelling has been undertaken for the assessment within SoundPLAN, using previous measurements of tram noise. The noise model has been calibrated using the noise measurements from the site between 1 June and 10 June 2022. The predictions are shown in Appendix B. The predictions indicate that the 55 dB(A) $L_{eq, 9h}$ criterion is achieved at all locations within the Affected Area, but the 80 dB(A) L_{max} criterion is exceeded for a small portion of the site.

Therefore, based upon the noise modelling, acoustic treatments are required for the small portion of the Affected Area. As discussed in Section 3.4, GANRI uses MBS 010 to address noise levels above the recommended outdoor levels. As per MBS 010, the following treatment is required for tram lines:

Separation distance between a building and a tram line	Sound Exposure Category
10m < 20m	1
Less than 10m	2

This treatment will be triggered by the application of the Noise and Air Emissions Overlay. It is recommended that the tram lines within the depot be designated as tram lines in the Code, to ensure that future assessment of noise sensitive receivers is conducted appropriately against the requirements of MBS 010.

4.3.2 Tram Maintenance

Tram maintenance has been assessed in accordance with the Policy. As the Affected Area has been recommended to be incorporated within a Noise and Air Emissions Overlay, an upgrade of the facade will be required at building rules consent stage. The indoor goal noise levels therefore apply. Further, as maintenance is only conducted during the daytime hours (i.e. between 7am and 10pm), the daytime goal noise level applies.

Based on the above, the relevant goal noise level is 41 dB(A) $L_{eq,15min}$ indoors during the day.

The noise monitoring conducted within the Affected Area adjacent to the tram depot, between 1 June and 10 June 2022, did not detect any significant noise from maintenance activities. Notwithstanding, a noise model has been prepared in the SoundPLAN noise prediction software, to assess possible noise from the Depot. The assessment is based on a previous assessment of maintenance at a tram depot.

Based on the assessment, predictions of the indoor noise level have been made. The indoor noise contours, shown in Appendix C, include a 5 dB(A) penalty for the character of the noise. The figure shows indoor 41 dB(A) contours taking into account the facade noise reduction achieved by the various SECs. That is, the contours show the SEC required to achieve 41 dB(A) at a future sensitive receiver. The figure shows that SEC2 acoustic facade treatments applied within 25m of a tram line and SEC1 applied for the remainder of the Affected Area, the indoor criterion of 41 dB(A) will be achieved.

That is, with the inclusion of the mandatory MBS 010 facade upgrades applied for the tram movements and mixed use noise, the predictions show that the relevant goal noise level of the Policy is achieved at all areas within the Affected Area. This will result in the Depot being protected from action relating to environmental noise and a suitable acoustic environment will be achieved for future residents.

5 CONCLUSION

A Planning and Design Code Amendment has been considered for land on Morphett Road, opposite the Morphettville Racecourse. The land currently includes a car park and other commercial usage. The amendment seeks to rezone the land from a *Recreation* Zone to an *Urban Neighbourhood* Zone which supports medium rise mixed use development comprising commercial/retail and residential land uses.

The assessment for the Amendment has been based upon ensuring a reasonable and practical level of acoustic treatment will provide adequate acoustic amenity (indoors) for residents exposed to:

1. Any commercial noise sources due to the proposed mixed-use land use
2. Traffic Noise
3. Noise from the Tram Depot (both maintenance and tram movements), thereby ensuring the residents on the site will not prejudice the continuing operation of the Depot

It is recommended that noise from the commercial noise sources is addressed by applying the Noise and Air Emissions Overlay to the Affected Area within the Planning and Design Code. A minimum level of acoustic treatment is required in accordance with the Ministerial Building Standard MBS 010 where the Noise and Air Emissions Overlay is applied in Mixed Use Zones. Example treatments which may be appropriate have been provided.

The traffic from Morphett Road has been assessed, and no further acoustic treatment is recommended as it is not currently a “Designated Road” within the Planning and Design Code. Should it be designated in the future, road traffic noise would be assessed using the “Deemed-to-Satisfy” approach of MBS 010.

The maximum tram movement noise levels exceed the recommended outdoor noise levels of GANRI, close to the boundary. In these circumstances, GANRI recommends MBS 010 for the upgrade of facades. It is recommended that the tram lines within the Depot be designated rail lines within the Planning and Design Code, to ensure the future assessment of noise sensitive receivers in accordance with MBS 010.

Although no significant noise was recorded from maintenance activities, the potential noise has been predicted based on previous studies. Through application of the Noise and Air Emissions Overlay to the site, appropriate treatments will be accommodated through the proximity of the sensitive receivers to the tram line as per MBS 010. With the treatments incorporated, the noise will achieve the goal noise level of the Policy, protecting the Depot from future action.

APPENDIX A – NOISE AND AIR EMISSIONS OVERLAY PERFORMANCE OUTCOMES

Desired Outcomes	
DO 1	Community health and amenity is protected from adverse impacts of noise and air emissions.

Performance Outcome (PO)	Deemed-to-Satisfy Criteria / Designated Performance Feature (DTS/DPF)
Land Use and Intensity	
PO 1.1 Sensitive receivers adjoining high noise and/or air pollution sources are designed and sited to shield sensitive receivers from the emission source using measures such as: (a) placing buildings containing non-sensitive receivers (such as retail and commercial) between the emission source and sensitive receivers (b) within individual buildings, placing rooms more sensitive to air quality and noise impacts (such as living rooms and bedrooms) further away from the emission source (c) providing appropriate separation or erecting noise attenuation barriers, provided the requirements for safety, urban design and access can be met (d) the use of building design elements such as podiums and jutting, deep or enclosed balconies (including with solid balustrades).	DTS/DPF 1.1 Sensitive receivers satisfy all of the following: (a) do not adjoin a: (i) Designated Road: Type A (ii) Designated Road Corridor: Type B (iii) Designated Road: Type R (iv) Train Corridor (v) Tram Corridor (b) adjoining development incorporating music includes noise attenuation measures to achieve a noise level in any bedroom exposed to music noise (L10) less than: (i) 8 dB above the level of background noise (L90,15 min) in any octave band of the sound spectrum; and (ii) 5 dB(A) above the level of background noise (LA90,15 min) for the overall (sum of all octave bands) A-weighted levels.
PO 1.2 Development incorporating a sensitive receiver adjoining high air pollution sources use building design elements such as varying building heights, widths, articulation, setbacks and shapes to increase wind turbulence and the dispersion of air pollutants.	DTS/DPF 1.2 Sensitive receivers do not adjoin any of the following: (a) Designated Road: Type A (b) Designated Road: Type B (c) Designated Road: Type R (d) Train Corridor (e) Tram Corridor.
PO 1.3 Development incorporating a sensitive receiver adjoining high noise and/or air pollution sources locates private open space (including ground level courtyards and balconies), common open space and outdoor play areas within educational establishments and pre-schools away from the emission source.	DTS/DPF 1.3 Open space associated with a sensitive receiver is not adjoining any of the following: (a) Designated Road: Type A (b) Designated Road: Type B (c) Designated Road: Type R (d) Train Corridor (e) Tram Corridor (f) Development incorporating music.

APPENDIX B – TRAM MOVEMENT NOISE PREDICTIONS

Figure 4: Tram Movement $L_{Aeq,\ 9\ hour}$ Predictions

Figure 5: Tram Movement L_{Amax} Predictions

APPENDIX C – DEPOT NOISE PREDICTIONS

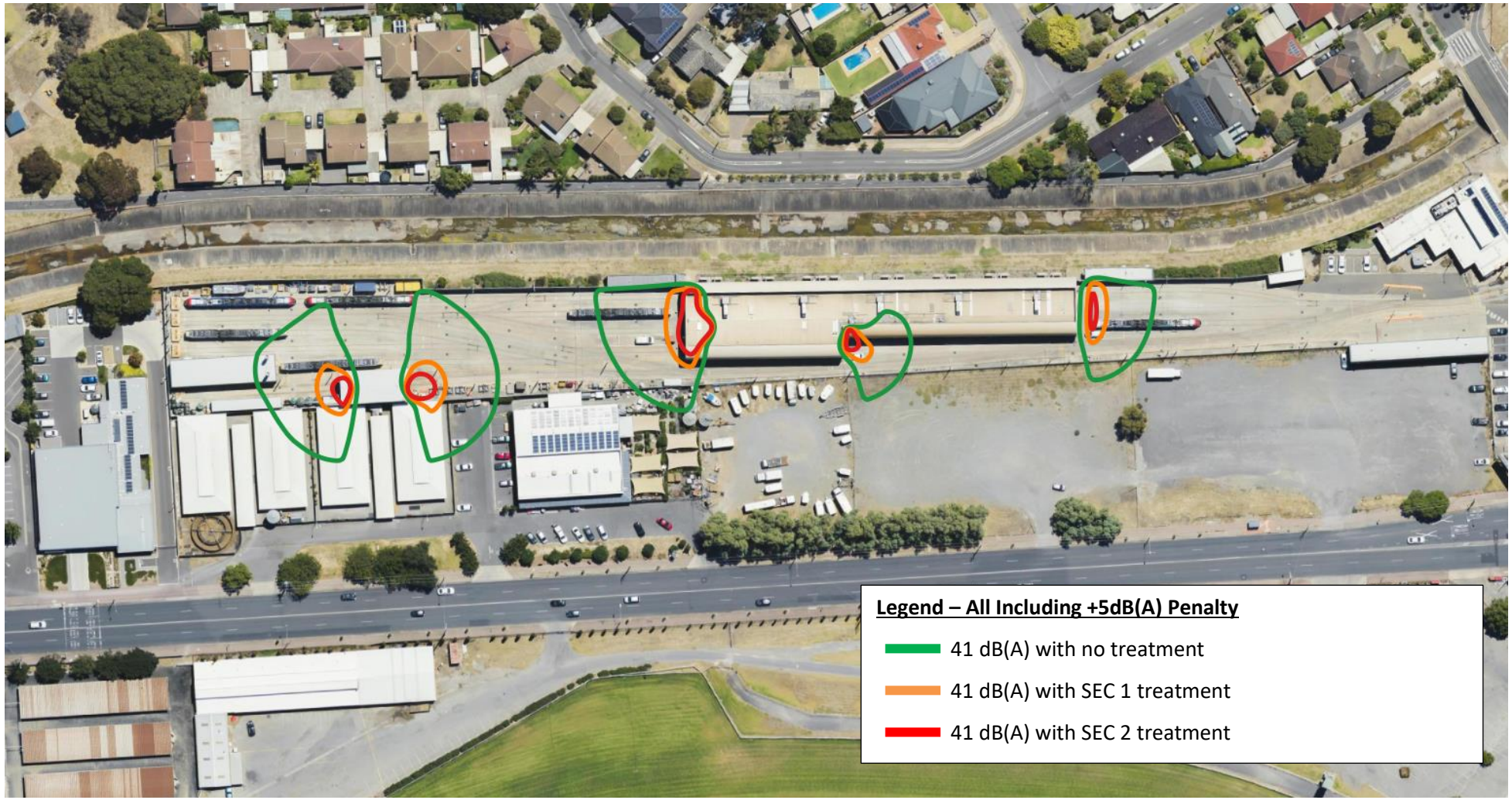


Figure 6: Depot Indoor Noise Predictions - Including 5dB(A) Penalty