Government of South Australia
Department for Infrastructure and Transport

In reply please quote *2022/04385/01*

[redacted]

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Dear [redacted]

NOTICE OF DETERMINATION - REQUEST FOR ACCESS TO DOCUMENTS UNDER THE FREEDOM OF INFORMATION ACT 1991

I refer to your application made under the *Freedom of Information Act 1991* (the Act) which was received by the Department for Infrastructure and Transport (the department) on 08 March 2022.

You have requested access to:

> *"1. Preliminary Noise Assessment undertaken for Ovingham level crossing removal project as detailed in section 4.1 of PC-ENV4 Noise Assessment, Treatment Design and Implementation. 2. Project Design Report for the Ovingham Level Crossing Removal project. From 1/01/2020 to 7/03/2022."*

There are two documents which have been located that are within the scope of your request. I have determined to partially release both documents in accordance with Section 20(1)(a), and Clauses 6(1) and 9(1) of Schedule 1 of the Act which states:

20—Refusal of access

(1) An agency may refuse access to a document—

(a) if it is an exempt document

6—Documents affecting personal affairs

(1) A document is an exempt document if it contains matter the disclosure of which would involve the unreasonable disclosure of information concerning the personal affairs of any person (living or dead).

9—Internal working documents

(1) A document is an exempt document if it contains matter—

(a) that relates to—

(i) any opinion, advice or recommendation that has been obtained, prepared or recorded; or

(ii) any consultation or deliberation that has taken place, in the course of, or for the purpose of, the decision-making functions of the Government, a Minister or an agency; and

(b) the disclosure of which would, on balance, be contrary to the public interest.

Clause 6(1)

Documents 001 and 002 contain information that this department considers to be the personal affairs of an individual, the release of which would involve the unreasonable disclosure of their personal affairs. I therefore determine the information to be exempt from disclosure under clause 6(1) of Schedule 1 of the Act.

Clause 9(1)

The information contained in document 002, appendix B, involves the exchange of opinion, advice and recommendations between the Department for Infrastructure and Transport and the Public Transport Projects Alliance. This information was utilised in the decision-making functions of the department. I therefore determine the information to be exempt from disclosure under clause 9(1) of Schedule 1 of the Act.

In considering the grounds of exemption for Clause 9(1), I am required to consider the public interest in disclosure or non-disclosure of the information.

Factors in favour of release include:

- The public interest in fulfilling the objects of the FOI Act and promoting openness and accountability within government.
- The public interest in scrutiny of government decision making.
- The public interest in ensuring that public infrastructure needs are being met in the long term.

Factors against release include:

- The public interest in ensuring the effective conduct of the agency's functions.
- The need for some confidentiality to allow government to consider, consult and otherwise measure the feasibility of projects.
- The need to ensure that more senior public servants are able to provide frank and candid opinions and advice without fear their opinions and advice will be disclosed.
- The public interest in encouraging the free exchange of ideas during deliberative processes, including through the frank and candid assessment of information.

Upon weighing these factors, I consider that the disclosure of the information would, on balance, be contrary to the public interest.

Attached is an explanation of the provisions of the Act which details your rights to review this determination, and the process to be followed.

In accordance with Premier and Cabinet Circular PC045, if you are given access to documents as a result of this FOI application, details of your application, and the documents to which access is given, may be published in the agency's disclosure log within 90 days from the date of this determination. Any private information will be removed.

A copy of PC045 can be found at https://www.dpc.sa.gov.au/resources-and-publications/premier-and-cabinet-circulars. If you have any objection to this publication, please contact us within 30 days of receiving this determination.

Should you have any enquiries concerning your application please contact [redacted] Freedom of Information Officer, on telephone [redacted]

Yours sincerely

Graeme Jackson
Accredited Freedom of Information Officer

06 May 2022

FREEDOM OF INFORMATION ACT 1991

YOUR RIGHTS TO REVIEW

INTERNAL REVIEW

If you are dissatisfied or concerned with the decision of this Agency regarding access to documents or the request for amendment to your personal records, you can apply for an Internal Review of that decision.

To apply for an Internal Review you must write a letter addressed to the Principal Officer or lodge an Internal Review application form with the Principal Officer of this Agency. The legislated application fee must accompany all applications, unless the fee was waived in the original Freedom of Information application, in which case there would be no fee payable for the application. The application must be lodged within 30 days after being notified of the decision.

The Agency will undertake the Internal Review and advise you of its decision within 14 days of receipt of the application.

Where the decision was made by the Minister or Principal Officer of the Agency, you are unable to request an Internal Review but you can apply for an External Review by the Ombudsman, or the South Australian Civil and Administrative Tribunal.

You are unable to apply for an Internal Review regarding a decision to extend the time limit for dealing with an application but you can apply for an External Review.

EXTERNAL REVIEW BY THE OMBUDSMAN

If the Agency does not deal with your Internal Review application within 14 calendar days (or you remain unhappy with the outcome of the Internal Review) you are entitled to an External Review by the Ombudsman SA.

You may also request an External Review by the Ombudsman if you have no right to an Internal Review.

The application for review by the Ombudsman should be lodged within 30 days after the date of a determination. The Ombudsman's Office, at their discretion, may extend this time limit.

Investigations by the Ombudsman are free. Further information is available from the Office of the Ombudsman by telephone on 8226 8699 or toll free 1800 182 150 (within SA).

APPEAL TO THE SOUTH AUSTRALIAN CIVIL AND ADMINISTRATIVE TRIBUNAL (SACAT)

If you are still dissatisfied with the decision made by this Agency after an Internal Review or after a review by the Ombudsman, you can request a review from SACAT.

You must exercise your right of review to SACAT within 30 calendar days after being advised of the determination or the results of any other Internal or Ombudsman Review. Any costs will be determined by SACAT, where applicable. For more information, contact;

South Australian Civil and Administrative Tribunal (SACAT)
Phone: 1800 723 767
Email: sacat@sacat.sa.gov.au

SCHEDULE OF DOCUMENTS - FREEDOM OF INFORMATION APPLICATION NUMBER					2022/04385/01
Document Number	Description of Document	Date of Document	Author	Determination Release / Refuse Access	Schedule Clause Applied
001	Ovingham Level Crossing Preliminary Noise and Vibration Assessment Concept Design	06-March-2020	Public Transport Projects Alliance	Release	6(1) Personal affairs
002	109-30 NOISE AND VIBRATION MODELLING DESIGN REPORT	10-June-2021	Public Transport Projects Alliance	Partial Release	6(1) Personal affairs, 9(1)(a)(i) Opinion, advice or recommendation, 9(1)(a)(ii) Consultation or deliberation

PTP ALLIANCE

PUBLIC TRANSPORT PROJECTS ALLIANCE – LEVEL CROSSING REMOVAL PROJECT

Ovingham Level Crossing

Preliminary Noise and Vibration Assessment

Concept Design

Doc No:	PTPA-LXRP-121410-REP-0000-PLN-0006
Program:	Public Transport Projects Alliance
Location:	Ovingham, Adelaide, South Australia
Revision:	B
Date:	6 March 2020

Document Control

Document Description

Project:	Level Crossing Removal Program
Document Title:	**Ovingham Level Crossing- Preliminary Noise and Vibration Assessment**
Document No	**PTPA-LXRP-121410-REP-0000-PLN-0006**
General Description	Concept Design

Document Development:

		Prepared by	Reviewed by	Approved by
Revision	A	6(1) Personal affairs		6(1) Personal affairs
Date	26/02/2020			

		Prepared by	Reviewed by	Approved by
Revision	B	6(1) Personal affairs		6(1) Personal affairs
Date	06/03/2020			

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Revision				
Date				

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Revision				
Date				

Revision History:

Rev	Date	Description	Distribution
A	26/02/2020	Draft	DPTI
B	06/03/2020	Final	DPTI

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Glossary

A-weighting	A frequency spectrum adaptation representing the human hearing response
AS	Australian Standards
AS 2107-2016	Australian Standard AS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors
AS 2670.2-1990	Australian Standard AS 2670.2-1990: Evaluation of human exposure to whole-body vibration, Part 2 - Continuous and shock-induced vibration in buildings (1 to 80 Hz)
Average noise level	Energy averaged equivalent noise level over a given measurement/assessment period.
CoRTN	Calculation of Road Traffic Noise (United Kingdom Department of Environment, 1988)
Day	Period between 7am and 10pm, as defined by RTNG
dB	Decibel. A unit of measurement used to express sound level and is based on a logarithmic scale.
dB(A)	A-weighted noise level in decibel
DGA	Dense Grade Asphalt
DIN 4150-3	German Standard DIN 4150-3 Structural vibration - Effects of vibration on structures
DPTI	Department of Planning, Transport and Infrastructure
EP Act	Environment Protection Act 1993
EPA	Environment Protection Authority
FTP	Façade treatment package
GANRI	EPA Guidelines for the assessment of noise from rail infrastructure
Insertion loss	Insertion loss of a barrier is the difference in noise levels at a specified receiver position before and after the installation of the barrier, provided that the noise source, terrain profiles, interfering obstructions and reflecting surface, if any, have not changed.
L_{10}	Noise level that is exceeded for 10% of the time in a given measurement period
$L_{eq,\ T}$	Average noise level over the period T
$L_{eq,15hr}$ ($L_{eq\ day}$)	Day period average noise level
$L_{eq,9hr}$ ($L_{eq\ night}$)	Night period average noise level
NAB	Noise Assessment Boundary
Night	Period between 10pm and 7am, as defined by RTNG
PCMS	Project Controls Master Specification
PPV	Peak particle velocity
Project	Ovingham Level Crossing Removal Project
PTPA	Public Transport Projects Alliance
Residual exceedance	The remaining noise level exceedance of a noise assessment criterion following the application of noise mitigation measures.
RIC	Relative Increase Criterion
RTNG	DPTI Road Traffic Noise Guidelines
R_W	Weighted sound reduction index which is a laboratory measured value of the acoustic separation provided by a single building element
$R_W + C_{tr}$	R_W with a C_{tr} adaptation term placing greater emphasis on low frequency performance.
Sensitive receiver	Noise sensitive receiver as defined in the RTNG
Significant	Under the RTNG, when used in context with a change in noise level, the term ‘significant’ relates to an increase in level of greater than 2 dB(A) (i.e. ≥ 2.1 dB(A))

1. Introduction

1.1. Project Background

The Torrens Road Level Crossing is located near the fringe of the Adelaide CBD on Torrens Road, Ovingham, approximately 100 metres from the Churchill Road Junction.

Torrens Road is an arterial road with an approximate 6% downhill grade on the westbound approach to the current level crossing. At the level crossing the road crosses three rail lines, two for the Adelaide to Gawler passenger line and one for the Australian Rail Track Corporation (ARTC) Adelaide to Dry Creek freight line.

The existing Level Crossing imposes high safety risks and traffic delays with an average of 23,000 vehicles passing through the level crossing each day. Long queues and relative delays occur on Torrens Road, with boom gates being active approximately 22% of the time during the combined AM and PM peak periods.

The Ovingham Level Crossing Removal Project is being jointly funded by the Australian and State Governments, with the site identified by the State Governments 'Keeping Metro Traffic Moving Report', as a priority location for treatments to address road congestion and keep traffic flowing.

The Public Transport Projects Alliance (PTPA) was invited by the Department of Planning, Transport and Infrastructure (DPTI) to collaboratively develop a Concept Design and provide a solution that improves safety for all road users and eases traffic congestion at this intersection. As part of level crossing removal works, Torrens Road is proposed to become an overpass to allow for unimpeded traffic flow and improved safety.

The final Concept Design is a level crossing removal through road over rail grade separation which provides the following design outcomes:

- Substantially offline road alignment from the existing Torrens Road
- A signalised intersection at Torrens Road / Churchill Road
- Two dedicated right turn movements on Churchill Road into Torrens Road
- Right turn movement provided on Torrens Road into Chief Street
- Proposed service road between Gilbert Street – Guthrie Street with an 8.8m service vehicle turnaround
- Property access maintained on the south western side of Torrens Road via proposed service road between Drayton Street and Hayman Street
- 8.8m service vehicle turnaround on Exeter Terrace

The Project General Arrangement based on the Concept Design is provided in Figure 1.

Figure 1: Ovingham Crossing General Arrangement

The project interfaces with existing residential and commercial land uses and therefore has the potential to have environmental noise and vibration impact at sensitive receivers when operational.

1.2. Scope of the Assessment

The assessment considers environmental noise and vibration from operation of the Project Concept Design, against the requirements of the relevant policy, guidelines and standards.

1.2.1. Noise

The assessment considers the following:

- road traffic noise from the redeveloped Torrens Road, in accordance with the DPTI Road Traffic Noise Guidelines (RTNG);
- noise from potential new or upgraded noise sources at Ovingham Station (such as public address system or mechanical plant), in accordance with the *Environment Protection (Noise) Policy 2007*.

The assessment approach and requirements above are consistent with the requirements of DPTI Project Controls Master Specification (PCMS) PC-ENV4 Noise Assessment, Treatment and Implementation.

No new rail lines or upgrade works to the existing railway lines is proposed for the project and therefore the Environment Protection Authority (EPA) *Guidelines for the assessment of noise from rail infrastructure* (GANRI) are not applicable (refer Appendix A). Noise from train operations within the rail corridor is excluded in the assessment.

Noise from new safety devices associated with the railway operation (such as pedestrian crossing alarm) is also excluded from the assessment as they are necessary to ensure public and railway employee safety. These devices will be designed such that the noise from them is minimised as much as practicably safe.

The assessment includes the following:

- establishment of relevant noise requirements;
- description of the existing noise environment;
- determination of existing noise levels in the environment;
- establishment of a noise prediction model for the project;
- prediction of existing and project noise levels at relevant sensitive receivers; and,
- determination of noise mitigation requirements to achieve the relevant noise requirements.

It is noted that the noise from road and rail has not been assessed cumulatively as each noise component has separate guidelines that specify different assessment requirements and criteria. This assessment has considered the noise impact of the road (and rail) separately in accordance with the relevant guidelines.

1.2.2. Vibration

Vibration impact from road traffic during operation of the project is not expected to be significant considering there is a reasonable (existing or greater than 10m) buffer provided between the sensitive receivers and the roads. Notwithstanding, the assessment considers measurements of existing vibration levels from Torrens Road traffic and compares them with relevant vibration criteria recommended in the standards referenced in DPTI PCMS Part PC – ENV3 Environmental Design, which are:

- the Australian Standard *AS 2670.2–1990: Evaluation of human exposure to whole-body vibration Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz)* - for human comfort; and,
- structural damage criteria in German Standard *DIN 4150-3 Effects of Vibration on Structures* - for prevention of building damage.

Vibration impact from the rail corridor has been excluded as the project does not change the existing rail alignment or rail track form (apart from the rail section at the existing level crossing which is located at a significant distance away from the closest dwelling, refer Appendix A).

It is noted that the vibration criteria above exclude cumulative vibration impact from road and rail, and therefore cumulative vibration impact has been excluded from the assessment. Nevertheless, the cumulative impact is expected to be no greater than the existing impact.

2. Existing Environment and Land Uses

The project area consists of the area surrounding the Torrens Road railway level crossing and the junction between Churchill Road and Torrens Road.

The acoustic environment of the project area is mainly controlled by noise from road traffic on Torrens Road and Churchill Road, and rail traffic on the existing passenger (Gawler line) and freight rail lines.

A number of different land uses are located along Torrens Road and Churchill Road, including residential, commercial, light industry, educational and place of worship. The noise contribution from the activities associated with these land uses are not considered significant within the context of the overall acoustic environment.

Baseline noise monitoring has been conducted by PTPA at three representative locations within the project area in January and February 2020. The monitoring occurred over seven days and outside of school or public holidays, and therefore provides measurements of typical daytime and night-time road activity during weekdays and the weekend. The monitoring included periods with rainfall, however the corresponding data has been excluded from the results based on weather data from the Bureau of Meteorology.

Details of the noise monitoring including the monitoring locations, periods and results are provided in Appendix B. A summary of the measured daytime and night-time average noise levels (L_{eq}) is provided in Table 1.

Table 1:Summary of Measured Existing Noise Levels.

Monitoring Location			Measured Noise Level*, dB(A)	
ID	**Address**	**Description**	**Day, $L_{eq,15hr}$**	**Night, $L_{eq,9hr}$**
ML1	7 McEwin Street	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing. Located behind an existing boundary fence with no direct line of sight to the railway or Torrens Road.	52	49
ML2	35-37 Torrens Road	20m from Torrens Road, 30m from rail tracks and 60 from Ovingham Crossing. Line of sight to the railway is generally blocked by existing fence, whilst line of sight to Torrens Road is partially blocked by the existing fence.	64	60
ML3	1 Devonport Terrace	30m from Torrens Road, 35m from rail tracks and 40 from Ovingham Crossing. Location has line of sight to railway and Torrens Road.	60	55

* The measured average noise levels are for weekdays only and exclude the weekend. Daytime is considered between 7am to 10pm, whilst night-time is between 10pm and 7am.

The measured noise levels in Table 1 and in Appendix B indicate the dominance of the noise from road traffic and rail operation at the surrounding receivers, and the expected variance between day and night periods due to changes in traffic volumes. The measured noise levels have been used to calibrate the noise model and the predicted noise levels at the relevant position.

Baseline vibration monitoring has also been conducted within the project area to provide an indication of vibration levels from the existing Torrens Road. The monitoring comprised continuous vibration monitoring at a dwelling over a seven-day period, and short-term manual vibration measurements during peak traffic at a location along Torrens Road. The vibration monitoring included a mix of vehicle pass-bys on Torrens Road, comprising light (passenger cars) and heavy vehicles, and therefore is considered representative of Torrens Road traffic. The results of the vibration monitoring are summarised in Appendix B.

There are a number of local and state heritage places, including premises fronting Torrens Road and Fitzroy / Park Terraces and in close proximity to the railway corridor, as well as a significant number of contributory items contained within adjacent or nearby historic conservation zones/areas. It is understood that some of these properties were built circa 1860 without foundations. The long-term operation of the existing rail corridor and roads without vibration related issues indicate that vibration from the transport corridors does not have an adverse impact on the properties. It is understood that there no existing vibration issues in the area associated with the typical road traffic on Torrens Road and the operation of Gawler rail line.

3. Noise Assessment

The assessment considers noise from road traffic and any potential new or upgraded noise sources at Ovingham Station. Noise from the rail operation has been excluded as no change is proposed to the existing rail alignment (refer Appendix A). Noise from any new safety devices associated with the railway operation (such as pedestrian crossing alarm) also has been excluded from the assessment as they are necessary to ensure public and railway employee safety.

3.1. Assessment Criteria

3.1.1. General Environmental Duty

The relevant legislation with respect to environmental noise (and vibration) is the *Environment Protection Act 1993* (the EP Act) which includes "Section 25 - General Environmental Duty" that states the following:

> *A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm.*

DPTI has a General Environmental Duty to take all reasonable and practicable measures that reduce the noise impact of the construction and operation of the project.

3.1.2. Road Traffic Noise

The DPTI Road Traffic Noise Guidelines (RTNG) were established to provide guidance in addressing road traffic noise as a key part of infrastructure projects, in order to satisfy the General Environmental Duty provision of the EP Act. Achieving the requirements of the RTNG, including implementing all noise mitigation measures determined in accordance with the RTNG, ensures that the EP Act is satisfied.

Section 3.1.1 of the RTNG provides the scope of application of the RTNG. A noise assessment (and potentially noise mitigation) as outlined in the RTNG should normally be considered for new or substantially upgraded or redevelopment roads adjacent to noise sensitive receivers, under the following circumstances:

New Road

- *Where a new road is built, where no road previously existed (eg Northern Connector).*

Redeveloped Road

- *Where one or more lanes is added to an existing road, for the purpose of increasing the traffic carrying capacity of the road.*
- *Where an existing road is realigned such that traffic is moved closer to sensitive receivers by at least one lane width (ie 3.0m), resulting in a 'significant' increase in received noise levels.*
- *Where widening/ realignment of an existing road requires the demolition of building structures or existing roadside noise walls that results in receivers previously shielded from traffic noise becoming exposed.*
- *Where realignment produces noise at a receptor from a different direction that makes a 'significant' contribution to existing noise (eg elevated section of South Road Superway).*
- *Where the function of a road is changed, resulting in a 'significant' increase in received noise levels. For example, increasing the number of heavy vehicles by 50 per cent or more on the road where the works are located.*

The RTNG defines a 'significant' increase in noise level as an increase greater than 2 dB(A) (ie ≥ 2.1 dB(A)). It is noted that a noise level increase of 2 dB(A) or less is not noticeable and will not have an impact on an average person. Therefore, under such circumstances, the General Environmental Duty of the EP Act is deemed to be satisfied.

Where applicable, the RTNG sets out the assessment process including the noise sensitive receivers to be considered; the assessment criteria; and the approach in determining reasonable and practicable mitigation for addressing road traffic noise associated with new road and/or major upgrade of existing road projects.

The project includes the realignment of an existing road (Torrens Road) such that traffic is moved closer to sensitive receiver by at least one lane and noise is produced from a different direction (elevated Torrens Road). On the basis of the above and the project resulting in a 'significant' increase to the existing noise levels, a noise assessment and noise mitigation in accordance with the RTNG for a 'redeveloped road' should be considered.

The RTNG specifies daytime (7am to 10pm) and night-time (10pm to 7am) average noise level (L_{eq}) criteria to be achieved at relevant noise sensitive receiver locations. For a redeveloped road, the RTNG provides noise criteria as summarised in Table 2.

Table 2: RTNG Noise Criteria for Redeveloped Road.

Situation	Noise Criteria, dB(A)	
	Day, $L_{eq,15hr}$	Night, $L_{eq,9hr}$
Existing receivers affected by noise from a redeveloped road	60	55
Existing receivers affected by noise from a redeveloped road and where demolition of building structures or existing roadside noise walls results in receivers previously shielded from traffic noise becoming exposed.	57	52

Since the project does not include the demolition of existing building structures or roadside noise walls that increase noise exposure at other existing receivers, the 60 dB(A) $L_{eq,15hr}$ daytime and 55 dB(A) $L_{eq,9hr}$ night-time criteria are most relevant.

In addition to the criteria in Table 2, the RTNG also specifies a Relative Increase Criterion (RIC) as defined in Table 3.

Table 3:RTNG Relative Increase Criterion (RIC).

Period	Relative Increase Criterion, dB(A)
Day	Existing $L_{eq,15hr}$ + 12
Night	Existing $L_{eq,9hr}$ + 12

The RIC is designed to ensure that there is no large increase in existing noise levels and is applied to receivers where it is more stringent than the noise criteria in Table 1. The RIC is typically relevant for infrastructure development in areas where there is no or low levels of existing traffic noise. Based on the existing Annual Average Daily Traffic (AADT) on Torrens Road being in excess of 25000 vehicles, it is expected that the redeveloped road noise criteria in Table 1 will be more stringent for this project than the RIC.

3.1.3. Other Noise Sources

For any new or upgraded noise sources introduced at Ovingham Station (such as public address system or mechanical plant) as part of the project, the relevant noise criteria are provided by the Environment Protection (Noise) Policy 2007 (the EPNP).

The EPNP provides objective criteria which were established to prevent adverse impacts and unreasonable interference to amenity at sensitive receivers. Compliance with the EPNP ensures that the General Environmental Duty of the EP Act is satisfied.

The EPNP establishes goal noise levels to be achieved at noise sensitive receivers based on the land uses that are principally promoted in the Development Plan for the locality of the noise source and the receivers. Where the noise source and receiver are not within the same locality, the goal noise levels of the source and receiver localities are averaged. For a locality that promotes multiple uses, the goal noise levels for each use are averaged (Clause 5 of the EPNP).

For new noise sources, the goal noise levels are set 5 dB(A) below the goal noise levels that would normally apply for an existing noise source, in accordance with Clause 20 of the EPNP.

The goal noise levels in Table 4 have been derived based on the noise source (Ovingham Station) being located within the project area in an Urban Corridor Zone of the Prospect Council Development Plan. The Urban Corridor Zone is considered as principally promoting residential and commercial land uses. The surrounding sensitive receivers are located in either an Urban Corridor (UrC), Residential Character (RC), Historic Conservation (HC) or Mixed-Use (MU) Zones of the Charles Sturt Council or Prospect Council Development Plans, as shown in Figure 2.

Figure 2: Development Plan Zoning of the Project Area.

Table 4: EPNP Goal Noise Levels for Noise Sources in Urban Corridor Zone.

Receiver Locality	Land Uses Principally Promoted in the Locality	Noise Criteria, dB(A)			
		New Noise Source		Upgraded Noise Source	
		Day	Night	Day	Night
Urban Corridor[i]	Residential and commercial	52 L_{Aeq}	45 L_{Aeq}	57 L_{Aeq}	50 L_{Aeq}
Residential Character[i,ii] Historic Conservation[i]	Residential	50 L_{Aeq} 60 L_{Amax}	43 L_{Aeq} 60 L_{Amax}	55 L_{Aeq}	48 L_{Aeq}
Mixed-Use[ii]	Residential, commercial, and light industry	52 L_{Aeq}	45 L_{Aeq}	57 L_{Aeq}	50 L_{Aeq}

Notes:

1. Day is between 7am and 10pm, night is between 10pm and 7am.
2. Noise levels (L_{Aeq} and L_{Amax}) are are considered over a 15-minute period, which is the default assessment period under the EPNP.
3. i – within the Charles Sturt Council Development Plan, ii – within Prospect Council Development Plan.

When measuring or predicting noise levels for comparison with the average noise levels of the EPNP, a penalty adjustment is applied to the noise level for any annoying noise characteristics, such as tonality, modulation, impulsiveness and/or low frequency. A 5 dB(A) penalty is applied for one characteristic; 8 dBA) for two characteristics; and 10 dB(A) for three or four characteristics. To apply a penalty, consideration must be made to the existing noise sources and levels in the environment.

3.2. Assessment of Road Traffic Noise

3.2.1. Assessed Noise Sensitive Receivers

Under the RTNG, noise sensitive receivers include:

- Existing dwellings in a zone where dwellings are contemplated as defined by the relevant Development Plan;
- Aged care facilities;
- Hospital wards;
- Caravan parks that accommodate existing long-term residential use;
- Churches/places of worship, assessed on a case-by-case basis;
- Parks, assessed on a case-by-case basis with protection considered for areas used for passive recreation;
- Existing educational institutions, childcare centres and kindergartens, assessed on a case-by-case basis for daytime criteria only and only to protect teaching areas.

The noise sensitive receivers surrounding the project have been identified based on desktop review of land uses information and aerial photography available via the Department for Environment and Water online portal and Google Maps, respectively. The noise sensitive receivers surrounding the project are shown in Appendix C.

3.2.2. Assessment Position

In accordance with the RTNG, the road traffic noise levels have been assessed outside at a position 1m from the most exposed window and at a height of 1.5m above floor level for each noise sensitive receiver building façade. At this location, the noise levels are influenced by reflection from the building façade, and therefore all predictions have included a façade reflection factor of +2.5 dB.

For multi-storey buildings, the noise level at each floor level has been assessed. The noise modelling predicted the noise levels at each façade of noise sensitive receiver buildings.

3.2.3. Noise Assessment Boundary

The Noise Assessment Boundary (NAB) is the area where noise impact from the project is to be assessed and noise mitigation is to be considered where necessary to satisfy the RTNG. The extent of the NAB is defined in *Section 5.3* of the RTNG, as follows:

- The area in which physical works associated with the project occurs and extends to close-by landmarks or cadastral boundaries to provide a logical endpoint.
- The width either side of the project is to be set to the extent where the predicted noise level without noise mitigation equals the lowest applicable noise assessment criteria. The width may be reduced where the noise levels from the project contribute no more than 2.0 dB(A) to the total traffic noise level, for example, where the assessed road project intersects other Arterial Roads.
- In any case, the width either side of the project should be no more than 600 meters from the centre line of the outermost traffic lane on each side of the road project.
- The NAB should be defined using property boundaries obtained from a current cadastral map.

The NAB of the project has been established based on the above and is shown in Appendix C.

3.2.4. Noise Model

A three-dimensional noise prediction model has been established based on the United Kingdom Department of Environment *Calculation of Road Traffic Noise* (CoRTN) algorithm, as implemented in SoundPLAN Version 8.1 noise modelling software. CoRTN has been accepted by DPTI as an appropriate traffic noise modelling methodology and referenced in the RTNG.

The noise model takes into account the following:

- Topographical features;
- Road alignment;
- Traffic volume and split between light and heavy vehicles;
- Vehicle speeds;
- Road surface types;
- Ground absorption;
- Shielding from buildings and relevant structures (eg, existing fences);
- Receiver height.

3.2.4.1. Noise Model Calibration and Validation

Calibration factors that were used for noise modelling of road traffic in South Australia and validated with site measurements have been used in the noise modelling. The calibration factors are provided below and are typical for Australian Conditions (based on a study conducted by the Australian Road Research Board):

- Daytime predictions : - 1.7 dB
- Night-time predictions : + 0.5 dB

The calibrated noise model was used to predict the noise levels at the monitored location, ML1, at 7 McEwin Street, Renown Park. At this location, the measured noise levels were dominated by noise from Torrens Road. The measured noise levels at ML2 and ML3 (refer Table 1) were not used as they were influenced by noise from the railway and provide poor correlation with the predicted noise levels from road traffic. The prediction was based on estimated traffic volumes for year 2020, derived based on the DPTI Vehicle Turning Movement Survey at Torrens Road/Churchill Road, TG793355, dated 11 December 2018. A comparison between the predicted and measured (weekday) noise levels at ML1 has been made and summarised in Table 5.

Table 5: Comparison of Predicted and Measured Existing Noise Levels at ML1.

Level	Day Noise Level ($L_{eq,15hr}$), dB(A)	Night Noise Level ($L_{eq,9hr}$), dB(A)
Predicted (i)	53.6	50.5
Measured (ii)	52.4	48.7
Difference (i) – (ii)	+1.2	+1.8

The comparison indicates that the predicted noise levels at ML1 are within 2 dB of the measured noise levels, which is a reasonable level of accuracy for a road traffic noise model that is slightly conservative. As stated in *Section 5.4.1* of the RTNG, the model is deemed to be validated if the average difference between the measured and predicted no levels is no more than ± 2.0 dB. Therefore, the noise model is considered to be valid and an accurate prediction tool for the project.

3.2.4.2. Modelled Scenarios

In accordance with the RTNG, the noise modelling included the following scenarios:

- Existing scenario – at year 2022 (1 year before project opening) with no build;
- Project-opening scenario – at year 2023 with build; and,
- Project-future scenario – 10 years after project operation, at year 2022 with build.

3.2.4.3. ModelledTraffic Volumes and Vehicle Speeds

The traffic volumes for each modelled scenario have been estimated based on survey data (TG793355, dated 11 December 2018) provided by DPTI. For future traffic volumes, a growth of 1% per annum has been assumed (based on the project business case assumption) and is considered conservative as some movements within the network are already at capacity. The estimated traffic volumes used in the noise model are summarised in Table 6.

Table 6: Estimated Traffic Volumes used in the Noise Model.

Road	Section	Direction*	Daily Average Volume (AADT)	% CVs	Daytime (15-hour) Average Volume)	Night-time (9-hour) Average Volume
Year 2022 – 1 Year before Project Opening						
Torrens Road	Churchill Road Junction to Fitzroy Terrace	NWB	17352	8	14749	2603
		SEB	19486	8	16563	2923
	Churchill Road Junction to South Road	NWB	10548	6	8966	1582
		SEB	11617	6	9874	1743
Churchill Road	Intersection at Torrens Road	NB	12527	8	10648	1879
		SB	13592	8	11553	2039
Year 2023 - At Project Opening						
Torrens Road	Churchill Road Junction to Fitzroy Terrace	NEB	17525	8	14896	2629
		SEB	19681	8	16729	2952
	Churchill Road Junction to South Road	NEB	10653	6	9055	1598
		SEB	11733	6	9973	1760
Churchill Road	Intersection at Torrens Road	NB	12653	8	10755	1898
		SB	13728	8	11669	2059
Year 2033 – 10 Years After Project Opening						
Torrens Road	Churchill Road Junction to Fitzroy Terrace	NEB	19359	8	16455	2904
		SEB	21740	8	18479	3261
	Churchill Road Junction to South Road	NEB	11768	6	10003	1765
		SEB	12961	6	11017	1944
Churchill Road	Intersection at Torrens Road	NB	13976	8	11880	2096
		SB	15164	8	12889	2275

* NWB – Northwest bound, SEB – Southeast bound, NB – north bound, SB – south bound.

The noise modelling has been based on a posted speed limit of 60km/h for existing and future Torrens Road and Churchill Road.

3.2.4.4. Noise Model Inputs and Assumptions

The noise model inputs and assumptions are summarised in Table 7.

Table 7: Noise Model Input and Assumptions.

Aspect	Noise Model Input
Topography	Existing topographical contours available in OpenStreetMap database and project Design Survey model. Project topographical contours based on future site arrangements, taking into account project civil works.
Road alignment	Existing road alignment based on design drawings and aerial photography (Google Earth). Project road alignment design (Concept Design DP 1211.20).
Road surface	Dense Graded Asphalt (DGA) surface for all roads.
Traffic data	Traffic volumes and vehicle speeds as provided in Section 3.2.4.3.
Ground	Hard/reflective ground for roads and 50% absorptive ground for all other areas.
Buildings	Building footprints available in OpenStreetMap database and adjusted based on desktop review and site observations (in general during baseline monitoring, a detailed site survey was not undertaken).
Barriers	Extent and height of existing barriers/fences as determined based on desktop review and site observations (in general during baseline monitoring, a detailed site survey was not undertaken).

Aspect	Noise Model Input
	Modelling of the project concept design only considered standard Jersey barriers (0.8m high) on the bridge, as indicated on drawings.
Receiver Height	The receiver height was set to be 1.5m above the height of each floor level. For multi-storey buildings, the floor heights are taken to be 3m. Hence, for a single-storey building, the receiver height was set to be 1.5m above ground level, whilst for a two-storey building, the receiver height was set to be 4.5m above ground level.
L_{10} to L_{eq} conversion	A factor of -3 dB applied to convert L_{10} noise levels (output of the CoRTN methodology) to L_{eq} noise levels (the noise level descriptor assessed under the RTNG). Corrections for site specific conditions are taken into consideration in the noise model calibration process.

3.2.5. Prediced Noise Levels

Using the established noise model, the daytime ($L_{eq,15hr}$) and night-time ($L_{eq,9hr}$) noise levels at all noise sensitive receivers have been predicted for the three scenarios (existing, project-opening and project-future).

Based on the predicted noise levels for the project-opening year, the NAB for the project was established, in accordance with *Section 5.3* of the RTNG and is shown in Appendix D.

The predicted noise levels at sensitive receivers within the NAB for all three scenarios are tabulated in Appendix D. Predicted noise level contours have been generated and provided in Appendix D.

The predicted noise levels at sensitive receivers within the NAB, for the project-opening and existing scenarios were compared to determine if the project results in a 'significant' noise level. The comparison (refer tabulated values and noise contour map in Appendix D) indicates a noise level increase of no greater than 1.6 dB(A) at any sensitive receivers, which is less than 2 dB(A) and considered not 'significant' under the RTNG.

Under the circumstances above, the RTNG is not strictly applicable[1] and the General Environmental Duty of the EP Act is satisfied without noise mitigation. Notwithstanding, potential noise mitigation determined in accordance with the RTNG has been considered below (as requested by DPTI).

3.2.6. Eligibility for Consideration of Noise Mitigation

The predicted noise levels at each receiver façade (within NAB) from the project at opening year have been assessed against the assessment criteria. The noise level increases due to operational changes associated with the project at opening year were also determined.

For receivers that exceed the assessment criteria (i.e. with residual exceedances), their eligibility for consideration of noise mitigation is assessed in accordance with *Section 3.2.6* of the RTNG. A receiver is eligible (at the project-opening year) for consideration of noise mitigation, when one of either of the following conditions is satisfied:

- The predicted noise level is greater than the RIC, if it is the most stringent noise assessment criteria; or,
- The project predicted noise level is more than 2 dB(A) (i.e. ≥ 2.1 dB(A)) above the existing predicted noise level for the same year (or an earlier year as elected by the project) and above the Noise Criteria; or,
- The project predicted noise level is greater than or equal to 5 dB(A) (i.e. ≥ 5.0 dB(A)) above the Noise Criteria.

When evaluating a receiver's eligibility, the predicted noise level at project opening year is considered. Once a receiver is eligible for consideration of noise mitigation, the mitigation measures should be designed to meet the assessment criteria for the predicted traffic volume 10 years post project opening, where reasonable and practicable.

[1] In accordance with *Section 3.1* of the RTNG. Therefore, the General Environmental Duty of the EP Act is deemed to be satisfied without the need for noise mitigation. The approach and outcome are consistent with the Oaklands Level Crossing Project.

Based on the above, the eligible receivers for consideration of noise mitigation has been evaluated and summarised in Appendix E. A total of 27 receivers within the NAB have been identified to be eligible for consideration of noise mitigation (at project opening year), of which, 23 are residential receivers and 4 are non-residential receivers. These receivers were determined to be eligible based on the project predicted noise levels which exceeded the assessment criteria by more than 5 dB(A).

The eligible receivers for consideration of mitigation are located near Churchill Road, and at the southeast and northwest end of the Torrens Road. Four of the eligible receivers are educational and place of worship buildings (ie non-residential). The receivers on the southern side of Torrens Road, at the south-eastern end already have the benefit of an existing 2.4m high noise barrier.

It is noted that the assessment of receiver eligibility for noise mitigation has indicated that the night-time noise levels will control the noise mitigation requirements for the project (i.e. greater number of receivers eligible for noise mitigation based on the night-time noise level). Therefore, further considerations of noise mitigation for the project have been conducted based on the night-time predicted noise levels.

3.2.7. Noise Mitigation Design

3.2.7.1. Noise Mitigation Process

Figure 3: has been reproduced from the RTNG and outlines the process that is to be used to consider reasonable and practicable noise mitigation at each eligible receiver to meet the RTNG requirements.

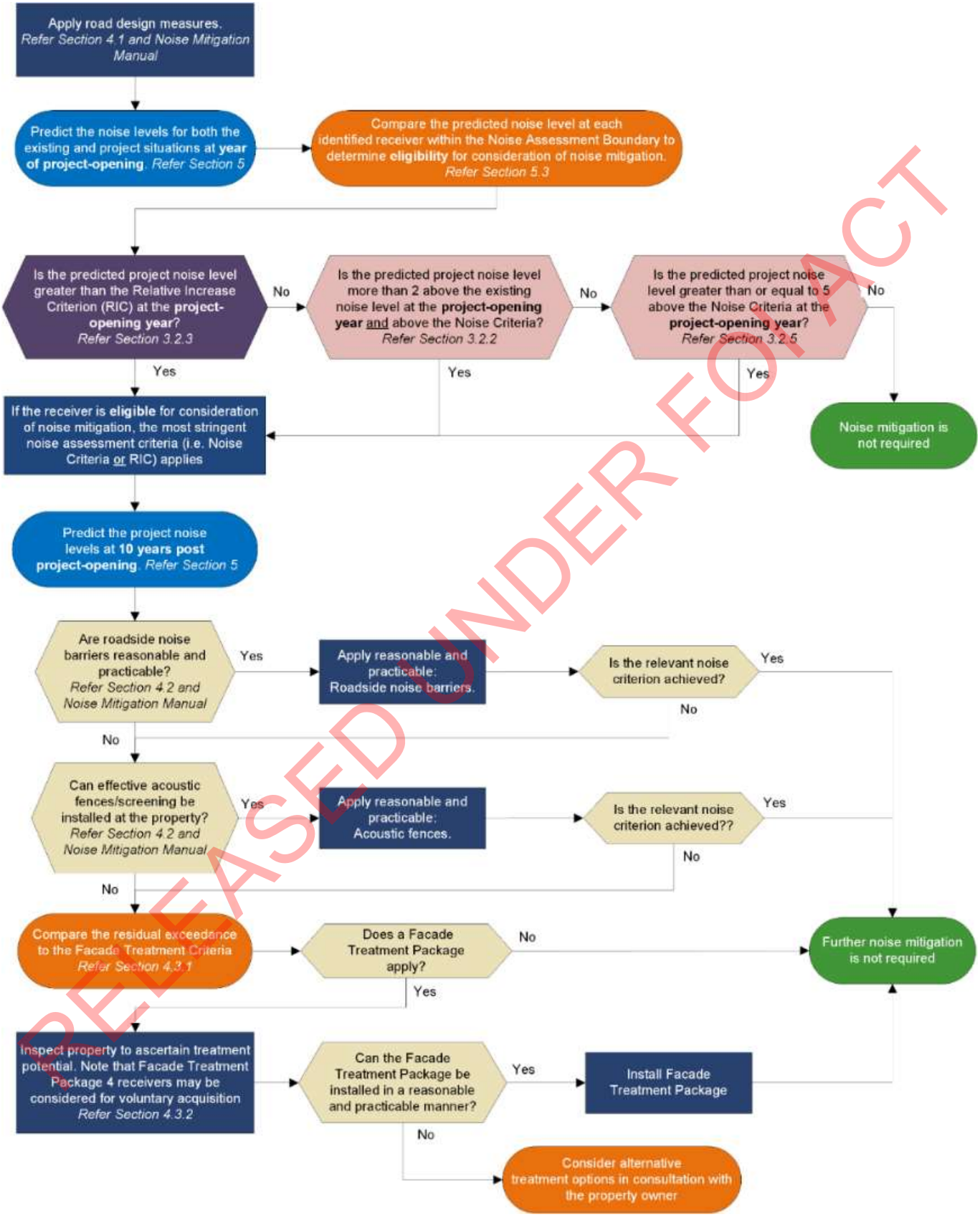


Figure 3: RTNG noise mitigation design process.

3.2.7.2. Road Design

Road design measures may include adjustment to the vertical and horizontal alignments, low noise pavement surfaces, road gradient modifications, speed limit reduction, traffic management measures, jersey style barriers and the like. As the RTNG notes, these measures should only be implemented where there are no significant impacts on other road design considerations such as cost, access, security, community acceptance and safety.

Road design measures incorporated into the project concept design include the following:

- a DGA road surface type for all roads;
- roadside barriers (jersey style) on the overpass bridge.

3.2.7.3. Noise Barriers

The RTNG provides the following objectives which should be considered in determining the design of noise barriers for the project:

- Communities should receive reasonable and equitable outcomes.
- Noise mitigation should be designed to reduce noise levels to the criteria.
- Noise barrier evaluation processes must:
    - Give preference to reducing outdoor noise levels and the number of property treatments.
    - Provide efficient barrier heights and extents without disregarding lengths of effective noise barrier in front of eligible groups of receivers.
    - The average barrier length per property should typically be restricted to 50 metres. Noise mitigation should be evaluated and installed where reasonable and practicable.

The RTNG provides guidance on the expected insertion losses of barriers. Noise barriers are considered to be a reasonable noise mitigation option where they are capable of providing an insertion loss of:

- more than 5 dB(A) at the most affected receiver, for noise barriers more than 3m high; or
- 10 dB(A) at representative receivers, for noise barriers above 5m and up to 7m high.

When considering the above insertion loss requirements, the following provides additional clarification:

- Where a location exceeds the noise assessment criteria by less than 5 dB(A) this could lead to designing to achieve an insertion loss of less than 5 dB(A). Under these circumstances, where two-thirds of the noise sensitive receivers no longer require property treatment a noise barrier should not be abandoned because it did not provide 5 dB(A) insertion loss.
- Small barriers that are low cost to install, such as jersey barriers, but do not provide an insertion loss of 5 dB(A), may also form part of an overall noise mitigation strategy.
- Where noise barriers greater than 5m in height do not provide 10 dB(A) of noise reduction, additional consideration needs to be given to the number of receivers that benefit, any unusual topography and whether the barrier placement could be improved. If it is not reasonable to provide a barrier with height above 5m then lower heights should be considered.

3.2.7.4. Property Treatment

In accordance with the RTNG, property noise mitigation measures may replace road corridor mitigation, subject to a reasonable and practicable assessment, and only in the following circumstances:

- Isolated single residences or isolated groups of closely spaced residences.
- Where the affected community expresses a preference for at-property treatment and the cost is less than a combination of a barrier and at-property treatment.
- Where noise barriers cannot achieve the level of noise mitigation (insertion loss) required.
- Where other noise mitigation measures have been shown not to be reasonable or practicable.

Where property noise mitigation is considered for a receiver, Façade Treatment Package (FTPs) are determined for the relevant habitable spaces, as defined under the National Construction Code (NCC) Class 1, 2, 3 and 4

buildings and 9c aged care buildings. Receivers that do not fall under the NCC categories are typically assessed on a case-by-case basis (eg. educational institutions or hospital wards). In these instances, the Australian Standard *AS 2107-2016 – Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107-2016) may be referred to as the basis for acoustic design.

For residential receivers that have been identified as eligible for consideration of noise mitigation, the applicable FTPs for each receiver is determined based on the residual exceedances, as summarised in Table 8.

Table 8: Applicable FTP for level of residual exceedance.

Habitable Space	Applicable FTP based on Level of Residual Exceedance			
	>2 - 5 dB(A)	6 - 9 dB(A)	10 - 13 dB(A)	14 dB(A)
Bedrooms	1	2	3	4
Other habitable rooms	n/a	1	2	3

Notes:

1. Predictions must be at 1m from the façade and include the 2.5 dB(A) facade reflection correction. FTP is not considered if the residual exceedance is 2 dB(A) or less (i.e. ≤ 2.1 dB(A))). For residual exceedances greater than 2 dB(A), the figure is rounded to the nearest decibel to ensure correct determination of the FTP.
2. For Facade Treatment Package 3 and 4, alternative ventilation in addition to openable windows must be provided in accordance with the requirements of *Section 4.3.4* of the RTNG.
3. Non-habitable rooms include walk-in wardrobes, en-suites and enclosed kitchens. However, where these spaces are part of an open plan arrangement with adjoining habitable rooms, such as a living/dining area or bedroom, they need to be treated as part of the habitable room.
4. Treatments to residential dwellings will be restricted to bedrooms, studies, living, dining and kitchen areas that have windows or doors in the façade being treated. Corridors, laundries, bathrooms, garages, sheds and workshops will not be treated.
5. When the assessment criteria are less than 50 dB(A), treatments to residential dwellings will be restricted to bedrooms that have windows or doors in the façade being treated.

Table 9 outlines the FTP requirements, which are provided as a deemed-to-satisfy solution to meet the requirements of the RTNG. An alternative solution is not required to be designed by an acoustic engineer. However, an acoustic engineer may design alternative treatment options to achieve an equivalent acoustic performance to the specified package treatments.

Table 9: FTP requirements in accordance with RTNG.

FTP	Acoustic Performance Requirements
1	***Windows* and *external glass doors*** *Window = $R_W + C_{tr}$ 31* For example, the acoustic equivalent of an existing window system incorporating 3 mm thick glass, with the addition of a 4.5 mm thick acrylic panel separated by a 150mm air gap or a single window system incorporating at least 6 mm thick laminated glass. *Door = $R_W + C_{tr}$ 28* For example, the acoustic equivalent of a glass door system incorporating at least 6 mm thick laminated glass. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the above secondary or replacement window or door systems.
	External doors* other than *external glass doors *Door = R_W 30* For example, the acoustic equivalent of a solid timber core door with acoustic grade seals to head and jamb.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that

FTP	Acoustic Performance Requirements
	have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
2	***Windows* and *external glass doors*** *Window = R_W + C_{tr} 34* For example, the acoustic equivalent of an existing window system incorporating 3 mm thick glass, with the addition of a 10 mm thick acrylic panel separated by a 100 mm air gap or a single window system incorporating at least 10 mm thick laminated glass. *Door = R_W + C_{tr} 31* For example, the acoustic equivalent of a sliding glass door system incorporating at least 10 mm thick laminated glass. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the above secondary or replacement window or door systems.
	External doors* other than *external glass doors *Door = R_W 30* For example, the acoustic equivalent of a solid timber core door with acoustic grade seals to head and jamb.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
3	***Windows* and *external glass doors*** *Window = R_W + C_{tr} 37* For example, an acoustically rated single or double-glazed window system that can achieve the acoustic performance requirement. It is likely that a new window system will be required. *Door = R_W + C_{tr} 34* For example, an acoustically rated single or double-glazed door system that can achieve the acoustic performance requirement. It is likely that a new door system will be required. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the window or door system.
	External doors* other than *external glass doors *Door = R_W 32* For example, the acoustic equivalent of a solid timber core door of not less than 28 kg/m^2 surface density, acoustic grade seals around the head and jamb acoustically equivalent to Kilargo IS1212/1515 or Raven RP120/150 (batwing seals) and a dropdown seal at the bottom acoustically equivalent to Kilargo IS8090si or Raven RP38. Double doors to also have meeting stile seals acoustically equivalent to Kilargo 2xIS7060si or IS7071si, or Raven 2xRP16 or 2xRP71Si.
	Roof and Ceiling Provide insulation batts to ceiling cavity if no insulation present on inspection.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
	Ventilation Mechanical ventilation is required in accordance with *Section 4.3.4* of the RTNG and should be designed such that the facade acoustic performance is not degraded.
4	***Package 3 architectural treatments (above) are applicable.*** An offer for voluntary acquisition of the property may also be considered on a case-by-case basis.

The treatments above are limited to the facades of habitable rooms being used at the time of the project. Future habitable rooms, non-habitable rooms, or rooms not habitable will not be considered for treatment.

3.2.8. Preliminary Noise Mitigation Strategy

The noise mitigation design process and measures above have been considered to determine a preliminary noise mitigation strategy that is reasonable and practicable, taking into account factors including but not limited to the following:

- the level of residual exceedances and the appropriate measures to achieve the required noise reduction;
- the distribution of eligible receivers, whether isolated single or closely grouped together;
- the receiver floor level that the exceedances occur;
- the topographical features of the area and effectiveness of a reasonable noise barrier (such as on the northern side of Torrens Road, between Churchill Road and Fitzroy Terrace);
- the existing road traffic noise mitigation already implemented in the area (such as the existing barrier on the southern side of Torrens Road, between Churchill Road and Fitzroy Terrace);
- the requirements for access to the properties and reserve areas;
- the cost benefit and potential visual impacts.

A discussion with the project design team has been conducted to consider the factors above and the reasonable and practicable mitigation, including potential implementation of noise barriers (taking into account existing extent of barriers, the affected property frontages to the road and topographical features of the area). It was determined that property treatment was the reasonable and practicable mitigation solution for the Concept Design.

Therefore, the FTPs for residential receivers eligible for property treatment have been determined and detailed in Appendix E. Further analysis has been conducted to determine whether receivers with similar noise impact can be grouped together and be considered for application of a common noise mitigation approach, as described in Section 3.1.3 of the RTNG. Based on the analysis, dwelling 401 has been changed to no FTP, whilst dwelling 718 has been changed to FTP 2, in order to match the FTPs applied to the adjacent dwellings.

Table 10 summarises the FTPs. It is noted that the FTPs are the maximum possible FTPs based on the highest predicted residual exceedance at any façade of the receivers. The final FTP to be implemented at each receiver will be subject to a site inspection to determine the location of bedrooms and living rooms with respect of the most impacted facade at each identified receiver.

Table 10: Number of FTPs (Residential Receivers).

FTP	Number of Receivers for Consideration of FTPs
1	0
2	16
3	7
4	0
Total	**23**

Four non-residential receiver buildings have been identified as being eligible for property treatment. As mentioned in Section 3.2.7.4, noise treatment will need to be determined based on satisfying the recommended internal noise levels of AS 2107-2016). The noise treatment requirements can be determined at the next stage of works, following further site investigation to ascertain building layout, façade construction and space uses.

The receivers eligible for consideration of FTPs are summarised in Table 11. Appendix E provides a map showing the receivers and the FTPs.

Table 11: Summary of receiver eligible for consideration of FTPs.

No	Receiver ID	Address	Floor	FTP
1	10	3 Torrens Rd Ovingham 5082	First	3
2	14	1/5 Churchill Rd Ovingham 508	Ground	3
3	728	3 Toronto St Ovingham 5082	Ground	3
4	904	1A Torrens Rd Ovingham 5082	First	3
			Ground	2
5	905	1 Torrens Rd Ovingham 5082	First	3
			Ground	2
6	906	63A Park Tce Ovingham 5082	Ground	3
			First	
7	924	16 Hansen Cct Renown Park 5008	Ground	3
8	7	8 Toronto St Ovingham 5082	First	2
			Ground	1
9	385	2/5 Torrens Rd Ovingham 5082	First	2
10	398	19 Torrens Rd Ovingham 5082	First	2
11	428	3 Cotton St Fitzroy 5082	Ground	2
12	480	23 Napier St Renown Park 5008	Ground	2
13	695	7 Churchill Rd Ovingham 5082	Ground	2
14	696	11 Churchill Rd Ovingham 5082	Ground	2
15	697	11A Churchill Rd Ovingham 5082	Ground	2
16	698	13 Churchill Rd Ovingham 5082	Ground	2
17	699	17 Churchill Rd Ovingham 5082	Ground	2
18	700	19 Churchill Rd Ovingham 5082	Ground	2
19	718	6 Toronto St Ovingham 5082	Ground	2
20	719	4 Toronto St Ovingham 5082	Ground	2
21	720	2 Toronto St Ovingham 5082	Ground	2
22	729	5 Toronto St Ovingham 5082	Ground	2
23	730	9 Toronto St Ovingham 5082	Ground	2
24	BBCS1	Bowden Brompton Community School 11 Napier St Renown Park 5008	Ground	TBD
25	BBCS2			
26	PC	Prospect Chapel 27-28 Fitzroy Tce Fitzroy 5082	Ground	TBD
27	HMC	Holy Methodist Church (CMCA) 7 Churchill Rd Ovingham 5082	Ground	TBD

Note: TBD – treatment to be determined following detailed site investigations.

3.2.9. Conclusion

Based on the noise predictions for the existing and project-opening scenarios, the increase in noise levels at any noise sensitive receiver from road traffic will be no greater than 1.6 dB(A). At some sensitive receivers, the noise levels are predicted to decrease.

Given that the increase in noise levels is less than 2 dB(A), the increase is not considered "significant' under the RTNG. Therefore, a noise assessment (and potential noise mitigation) in accordance with the RTNG is normally not considered (as per Section 3.1.1 of the RTNG), and the project (concept design) satisfies the General Environmental Duty of the EP Act without implementation of noise mitigation.

Notwithstanding, an assessment and noise mitigation in accordance with the RTNG has been considered. Based on the assessment, 27 properties have been identified as being eligible for consideration of mitigation, of which, 23 are residential receivers and 4 are non-residential (educational and place of worship buildings). A discussion with the project design team and consideration of the factors outlined in Section 3.2.8 determined that property treatment is the reasonable and practicable noise mitigation strategy.

A total of 16 residential properties requiring FTP 2 and 7 residential properties requiring FTP 3 have been identified. Requirements for the non-residential buildings can be determined following further detailed site investigation at the next stage of the works.

3.3. Assessment of New or Upgraded Noise Sources at Ovingham Station

At this stage of the development, detailed information of any proposed new or upgraded noise sources at Ovingham Station is not yet available.

For any new or upgraded noise sources (such as public address system and mechanical plant) at Ovingham Station that is considered during detailed design, the systems will be designed to achieve the relevant EPNP goal noise levels, as established in Section 3.1.3). It is expected that the EPNP goal noise level can be achieved with typical mitigation measures that are reasonable and practicable such as selection of low-noise plant, localised noise barriers around mechanical plant areas, implementation of acoustic silencers and/or lined ductwork where required; appropriate sound volume setting on the publics address system, etc.

PTPA have previously conducted observations and measurements of the public address system and mechanical plant at Oaklands Station in 2018 prior to the redevelopment works. From observations, the only audible noise in the existing environment from the station was from the public address systems. The noise levels from the public address system were measured, as summarised in Table 12.

Table 12: Measured Public Address Noise Levels

Measurement Location	Distance, m	Short-term Noise Level, dB(A)
Near station towards 12 Murray Terrace, Oaklands Park	12	52
Near station towards 5 Crozier Terrace, Oaklands Park	10	50

Based on the observations and measurements above; the separation distance between Ovingham Station and the closest noise sensitive receiver being no closer than 36m; and the assumption that Ovingham Station will have equipment similar to the Oaklands Station, the EPNP goal noise levels are expected to be achieved without specific mitigation measures, which will be confirmed during the detailed design stage.

4. Vibration Assessment

Vibration impact from road traffic during operation of the project is not expected to be significant considering there is a reasonable (existing or greater than 10m) buffer provided between the sensitive receivers and the roads.

Notwithstanding, an assessment has been conducted that considered measurements of existing vibration levels from Torrens Road traffic and compared them with relevant vibration criteria referenced in DPTI Project Controls Master Specification Part PC – ENV3 Environmental Design (PC-ENV3).

Vibration impact from the rail corridor is excluded as the project does not change the existing rail alignment nor track form (apart from the rail section at the existing level crossing which is located at a significant distance away from the closest dwelling).

4.1. Assessment Criteria

PC-ENV3 requires that the project design achieves the following requirements at all sensitive receivers:

- the evaluation criteria for intermittent vibration sources provided in Annex A of the Australian Standard *AS 2670.2–1990: Evaluation of human exposure to whole-body vibration Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz)* (AS 2670.2-1990) - for human comfort; and,
- structural damage criteria in German Standard *DIN 4150-3 Effects of Vibration on Structures* (DIN 4150-3) - for prevention of building damage.

AS 2670.2-1990 provides guidance on human response to building vibrations and includes values in terms of vibration acceleration and velocity for satisfactory magnitudes of building vibration. Vibration values are provided for different vibration source types, building type and the time of the day (daytime or night-time).

For intermittent vibration sources impacting on residential and commercial buildings, the most conservative interpretation of AS 2670.2-1990 for satisfactory magnitudes of building vibration are as provided in Table 13.

Table 13: AS 2670.2-1990 Vibration Criteria.

Building	Peak Particle Velocity (PPV), in mm/s	
	Day	Night
Residential	0.3	0.2
Commercial - office	0.6	
Commercial - workshop	1.1	

It is noted that exceedance of the vibration levels in Table 13 does not necessary indicate unsatisfactory vibration impact but rather warrants further detailed investigation in accordance with AS 2670.2-1990.

DIN 4150-3 provides guidance on vibration levels that will not result in structural damage to buildings and structures. DIN 4150-3 is typically used when assessing vibration that is significantly above the human perception level to the extent that there is the potential for structural damage (eg, from nearby significant construction activity).

To prevent structural damage, DIN 4150-3 provides the short-term and long-term vibration level criteria in Table 14 for vibration on structures and buildings.

Table 14: DIN 4150-3 Vibration Criteria.

Type of Structure	Short-Term				Long-Term
	PPV (mm/s) at the Foundation of a Building at a Particular Frequency			PPV (mm/s) in Horizontal Plane of highest floor at all frequencies	PPV (mm/s) in Horizontal Plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz		
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	10
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	5
Structures that, because of their particular sensitivity to vibration, cannot be classified under the above categories, and are of great intrinsic value (e.g. heritage listed buildings)	3	3 to 8	8 to 10	8	2.5

It is noted that achieving the AS2670.2-1990 would easily achieve the DIN 4150-3 requirements, and therefore the AS2670.2-1990 criteria in Table 13 are typically used to assess operational vibration.

4.2. Assessment

4.2.1. Measured Vibration Levels from Torrens Road

Vibration level measurements have been undertaken by PTPA at a distance of approximately 10m from the centre of the closest lane to Torrens Road, during peak afternoon traffic conditions. The measured vibration levels at this setback distance from Torrens Road were no greater than PPV 0.2mm/s, which would achieve the most stringent night-time PPV criterion in AS2670.2-1990.

The design of the project (ie the realigned Torrens Road) provides a separation distance greater than 10m between any sensitive receiver and the centre of the closest road lane. Therefore, based on the vibration measurements that were conducted at 10m, the vibration levels from operation of the project are expected to satisfy the AS2670.2-1990 criteria, and consequently the DIN 4150-3 criteria at all sensitive receivers.

4.2.2. Estimated Vibration Levels from Project

Based on the buffer distance provided between sensitive receivers and the closest lane of the realigned Torrens road being greater than 10m, and that the road will be new and generally free from potholes or cracks, vibration levels from traffic on the road are expected to achieve both structural damage and human comfort criteria levels. No change in vibration impact is expected from vehicles on other roads within the project area.

The design of the realignment road provides greater than 10m separation between a sensitive receiver and the centre of the closest Torrens Road lane. The closest sensitive receiver to the realigned Torrens Road is the existing residential block at 5 Churchill Road (noting the dwelling at 1 Devonport Terrace will be acquired by the project and demolished), which is approximately 14m from the centre of the closest lane.

Based on the above and a separation distance of greater than 6m provided between all sensitive receivers and the centre of the closest road lanes, the vibration levels from operation of the project are expected to satisfy AS2670.2-1990 criteria, and consequently DIN 4150-3 criteria.

4.2.3. Conclusion

Based on the assessment, operational vibration from the project is expected to satisfy AS 2670.2-1990 criteria for human response to intermittent vibration and DIN 4150-3 criteria for structural damage, at all sensitive receivers.

5. Conclusions

The following are the conclusion of the preliminary noise and vibration assessment for the project based on the Concept Design (10%). The outcomes and conclusions of this assessment and should be confirmed during detailed design stage of the project based on the final design.

5.1. Noise

5.1.1. Road Traffic

Predictions indicate that the project will increase the existing road traffic noise level by no more than 1.6 dB(A). As the increase is less than 2 dB(A), it is considered not 'significant' under RTNG and consequently, a noise assessment (and noise mitigation) in accordance with the RTNG is normally not considered (as per Section 3.1.1 of the RTNG). The project satisfies the General Environmental Duty of the EP Act without implementation of noise mitigation.

Notwithstanding, an assessment and potential noise mitigation in accordance with the RTNG has been considered. Based on the assessment, 27 properties have been identified as being eligible for consideration of mitigation, of which, 23 are residential receivers and 4 are non-residential (educational and place of worship buildings). A discussion with the project design team and consideration of the factors outlined in Section 3.2.8 determined that property treatment is the reasonable and practicable noise mitigation strategy.

A total of 16 residential properties requiring FTP 2 and 7 residential properties requiring FTP 3 have been identified. Requirements for the non-residential buildings can be determined following further site investigation at the next stage of the works.

5.1.2. New or Upgraded Noise Sources at Ovingham Station

At this stage of the development, information and details of any proposed new or upgraded noise sources (such as public address system and mechanical plant) at Ovingham Station is not yet available.

For any new or upgraded noise sources (such as public address system and mechanical plant) at Ovingham Station that is considered during detailed design, the systems will be designed to achieve the relevant EPNP goal noise levels, as established in Section 3.1.3). It is expected that the EPNP goal noise level can be achieved with typical mitigation measures that are reasonable and practicable.

Observations and measurements conducted at another similar station, and a review of the Ovingham Station site indicate that no specific acoustic treatment is likely required if similar systems are utilised.

5.2. Vibration

Based on a separation buffer of more than 10m provided between the realigned Torrens Road and the closest sensitive receivers, the AS 2670.2-1990 human response criteria for intermittent vibration sources, and the DIN 4150-3 criteria for structural damage, are expected to be achieved at all sensitive receivers.

6. References

- Australian Standard *AS 2670.2–1990: Evaluation of human exposure to whole-body vibration Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz)*
- Charles Sturt Council Development Plan
- DPTI Project Controls Master Specification Part PC – ENV3 Environmental Design
- DPTI Project Controls Master Specification PC-ENV4 Noise Assessment, Treatment and Implementation
- DPTI Road Traffic Noise Guidelines
- EPA Guidelines for the assessment of noise from rail infrastructure
- *Environment Protection Act 1993*
- *Environment Protection (Noise) Policy 2007*
- German Standard *DIN 4150-3 Effects of Vibration on Structures*
- Prospect Council Development Plan

Appendix A: Noise and Vibration from the Rail Corridor

Requirements

In South Australia, noise and vibration from rail developments are assessed in accordance with the EPA released Guidelines for the assessment of noise from rail infrastructure (GANRI).

GANRI outlines the assessment process, the relevant requirements and the approaches for minimising and managing noise and vibration impacts from rail developments, in order to satisfy the General Environmental Duty of the *Environment Protection Act 1993.*

In accordance with *Section 1.3* of GANRI, the guidelines are only applicable to noise and vibration from rail developments in the following situations:

- new railway lines
- upgrades to existing railway lines

and are not applicable to:

- existing railway lines, facilities and stations where no upgrade or new noise and/or vibration sensitive development is taking place
- noise from safety warning devices during rail operations (eg warning horns on locomotives and bells at level crossings)
- noise and vibration during construction of rail infrastructure
- general maintenance of the rail network
- noise from rail-yards, rail freight terminals, intermodal facilities and stations
- occupational noise and vibration due to rail operations, which are governed by the *Work Health and Safety Regulations 2012*.

Under GANRI, a proposed development is considered as a 'new railway line' if:

> *A new railway is being constructed in a new rail corridor where nearby noise sensitive receivers are not already exposed to rail noise; or,*
>
> *An additional railway line is being constructed within an existing corridor, and noise levels generated by existing rail operations in the corridor meet the criteria for new railway lines outlined in Section 2 of GANRI; or,*
>
> *A substantial realignment of an existing railway within an existing corridor. Normally it involves change of the corridor boundaries or significant alteration of separation distances to the nearest sensitive receivers within the existing corridor;*

whilst for an 'upgraded existing railway line', GANRI states the following:

> *Upgrade works to railway lines would typically involve works within the rail corridor such as extension of the railway line or alteration to the alignment of the rail line. This may include minor widening or realignment of the rail corridor, which would likely result in an increase in noise levels at sensitive receivers. It would not apply to reactivation of a previously non-operational rail line.*

Project Consideration

Considering that the project does not include any new rail lines nor upgrade works to the existing railway lines as defined above, GANRI is considered not applicable to the project. Therefore, an assessment of the noise and vibration impacts of the existing railway, in accordance with GANRI, has been excluded.

Notwithstanding, the potential change in noise and vibration impact from the Gawler line operation following completion of the project has been considered.

The noise impact of the rail operation after project completion is not expected to be greater than the existing impact, rather there is the potential for noise levels to be reduced. The project does not change the existing rail alignment however the existing fixed track formation at the existing level crossing will be replaced with standard

ballasted formation. The formation type change can result in a noise level reduction of up to 6 dB from that section of rail.

The construction of an overpass bridge structure over the existing railway has the potential to result in additional noise reflections in close proximity to the bridge. Given that the bridge design has limited reflecting surface (mainly the underside of the bridge with no significant vertical walls under the bridge near the rail line), and that there is reasonable separation distance between the bridge and the closest receivers, the potential for any noise increase due to reflections off the bridge structure is not expected to be noticeable at the receivers.

It is noted that the removal of the level crossing bells following completion of the project will eliminate the existing noise impact associated with the bells.

The vibration impact of the rail operation following project completion is not expected to be greater than the existing impact. The vibration impact in close proximity to the existing level crossing is expected to reduce following the replacement of the existing fixed track formation with standard ballasted track formation (ballasted track will provide better isolation of ground-borne vibration compared to fixed/slab track).

Appendix B: Baseline Noise and Vibration Monitoring

Noise Monitoring

Noise monitoring was undertaken by PTPA at three representative locations within the project area, between 29 January and 5 February 2020. The monitoring locations were selected to measure different levels of noise exposure from Torrens Road, Churchill Road, taking into account factors such as separation distance from the road/rail, existing structure or fences and line of sight to the road/rail.

The monitoring occurred over seven days to capture the daytime and night-time noise level variation, and outside of school or public holidays for representative data of typical road activity during weekdays and the weekend. The monitoring included some days with rain, however the collected data that corresponded to periods of rainfall (based on weather data from the Bureau of Meteorology) have been excluded from the results. The monitoring was undertaken in general accordance with the requirements of Australian Standard *AS 1055-2018 Acoustics – Description and measurement of environmental noise*.

The monitoring locations relative to the project are shown in Figure 4 and in Table 15. Details of the noise monitoring are provided in Table 16.

Figure 4: Noise monitoring locations.

Table 15: Summary of noise monitoring locations.

Monitoring Location		Aerial Photograph
ID	Description	
ML1	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing. Located behind an existing boundary fence with no direct line of sight to the railway or Torrens Road.	
ML2	20m from Torrens Road, 30m from rail tracks and 60 from Ovingham Crossing. Line of sight to the railway is generally blocked by existing fence, whilst line of sight to Torrens Road is partially blocked by the existing fence.	

Monitoring Location		Aerial Photograph
ID	Description	
ML3	30m from Torrens Road, 35m from rail tracks and 40 from Ovingham Crossing. Location has line of sight to railway and Torrens Road.	

Table 16: Details of the noise monitoring.

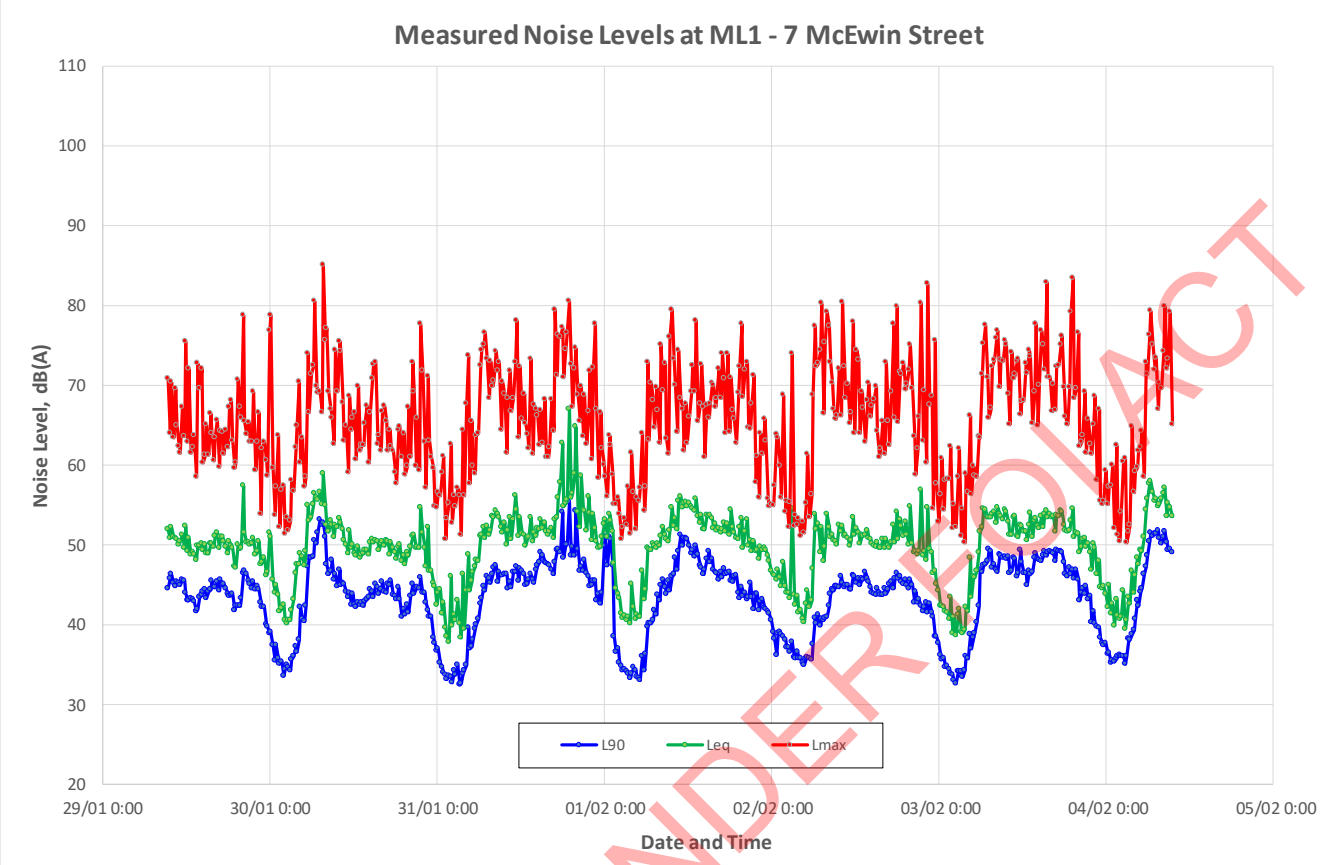
ID	Address	Description	Comments
ML1	7 McEwin Street	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing. Located behind an existing boundary fence with no direct line of sight to the railway or Torrens Road.	Measurements provide a good indication of Torrens Road traffic noise levels and the performance of the existing boundary fence at the dwellings.
ML2	35-37 Torrens Road	20m from Torrens Road, 30m from rail tracks and 60 from Ovingham Crossing. Line of sight to the railway is generally blocked by existing fence, whilst line of sight to Torrens Road is partially blocked by the existing fence.	Measurements include contribution from the rail lines and level crossing bells, Torrens Road and Churchill Road. Potentially included some noise from nearby construction activity associated with the Gawler Rail Electrification Project.
ML3	1 Devonport Terrace	30m from Torrens Road, 35m from rail tracks and 40 from Ovingham Crossing. Location has line of sight to railway and Torrens Road.	Measurements include contribution from the rail lines and level crossing bells, Torrens Road and some contribution from Churchill Road. Potentially included some noise from nearby construction activity associated with the Gawler Rail Electrification Project.

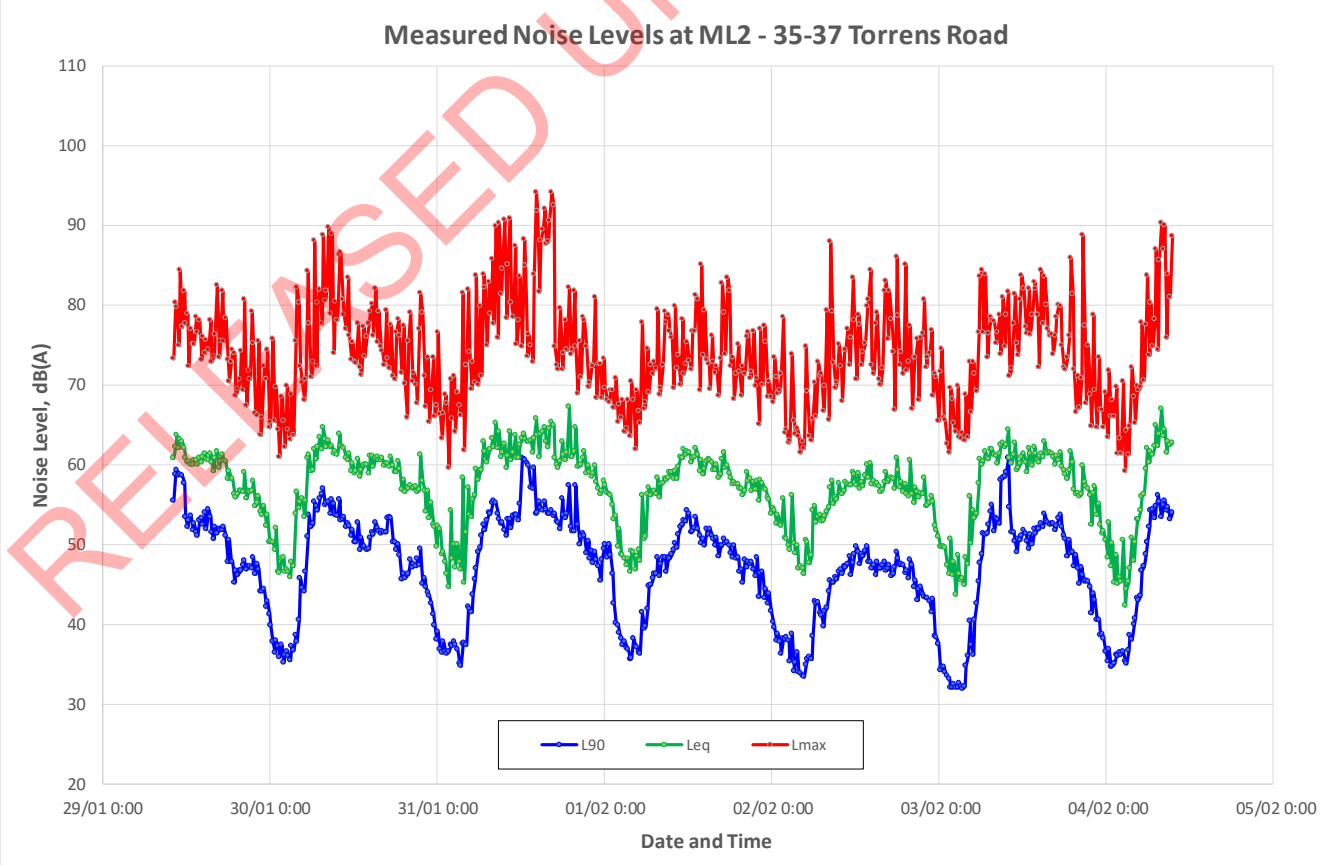
The measured average (L_{eq}), maximum (L_{max}) and background (L_{90}) noise levels are provided in the graphs below. The measured daytime and night-time average noise levels for weekdays are summarised in Table 17.

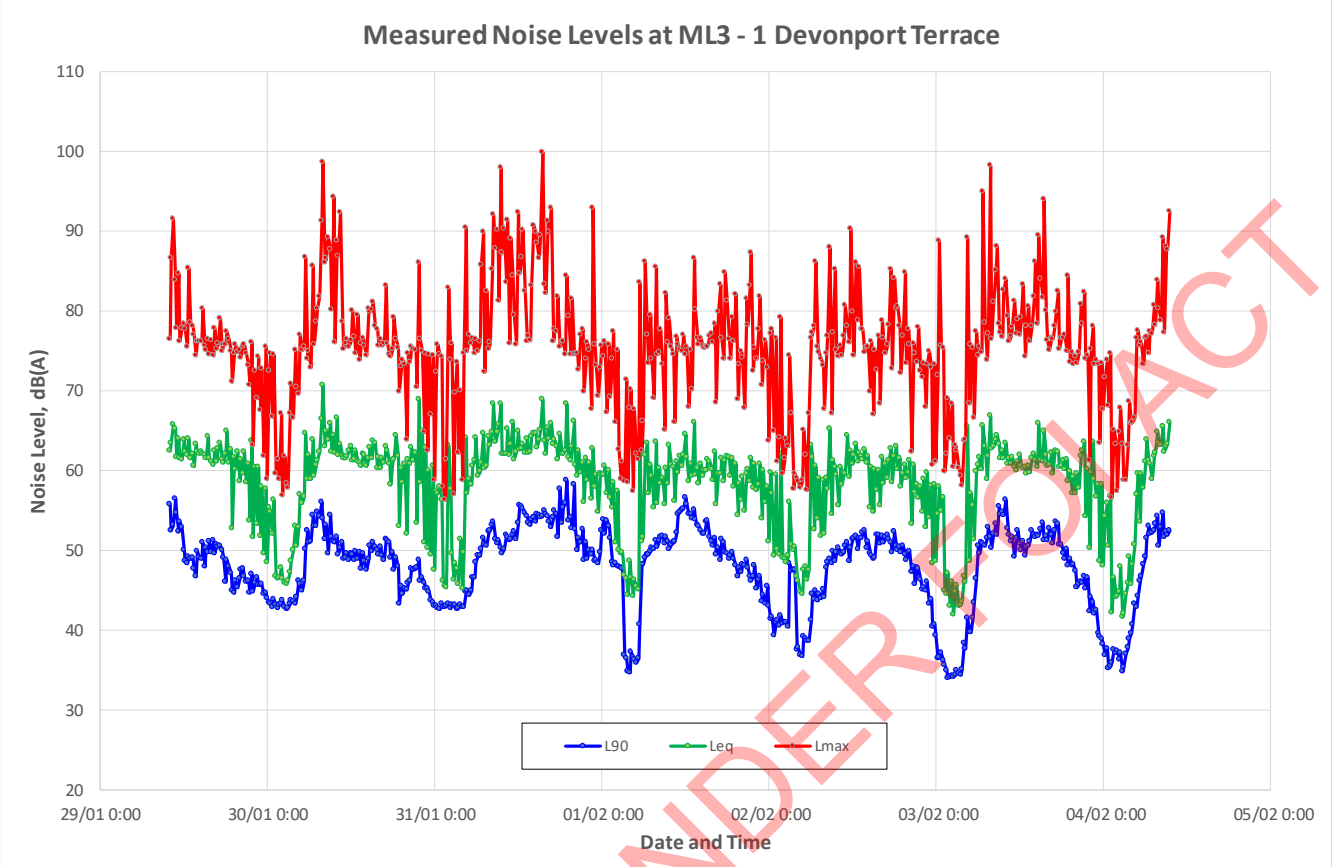
Table 17: Summary of measured average noise levels.

Monitoring Location		Measured Noise Level*, dB(A)	
ID	Address	Day, $L_{eq,15hr}$	Night, $L_{eq,9hr}$
ML1	7 McEwin Street	52	49
ML2	35-37 Torrens Road	64	60
ML3	1 Devonport Terrace	60	55

* The measured average noise levels are for weekdays and exclude the weekend. Daytime is between 7am to 10pm, whilst night-time is between 10pm and 7am, as defined under the RTNG.







The variation in noise levels over the monitoring period and between the monitoring locations with different line of sight to Torrens Road, Churchill Road and the railway indicate the dominance of road and rail traffic influence on the noise environment.

Vibration Monitoring

Baseline vibration monitoring was undertaken by PTPA at a dwelling within the project area for a continuous period of seven days, between 29 January and 5 February 2020.

Short-term manual vibration measurements during peak traffic activity were also undertaken at a position approximately 10m from the existing Torrens Road on 25 February 2020, to obtain an indication of vibration levels from road traffic on Torrens Road.

The monitoring locations relative to the project are shown in Figure 5 and in Table 18. Details of the vibration monitoring are provided in Table 19.

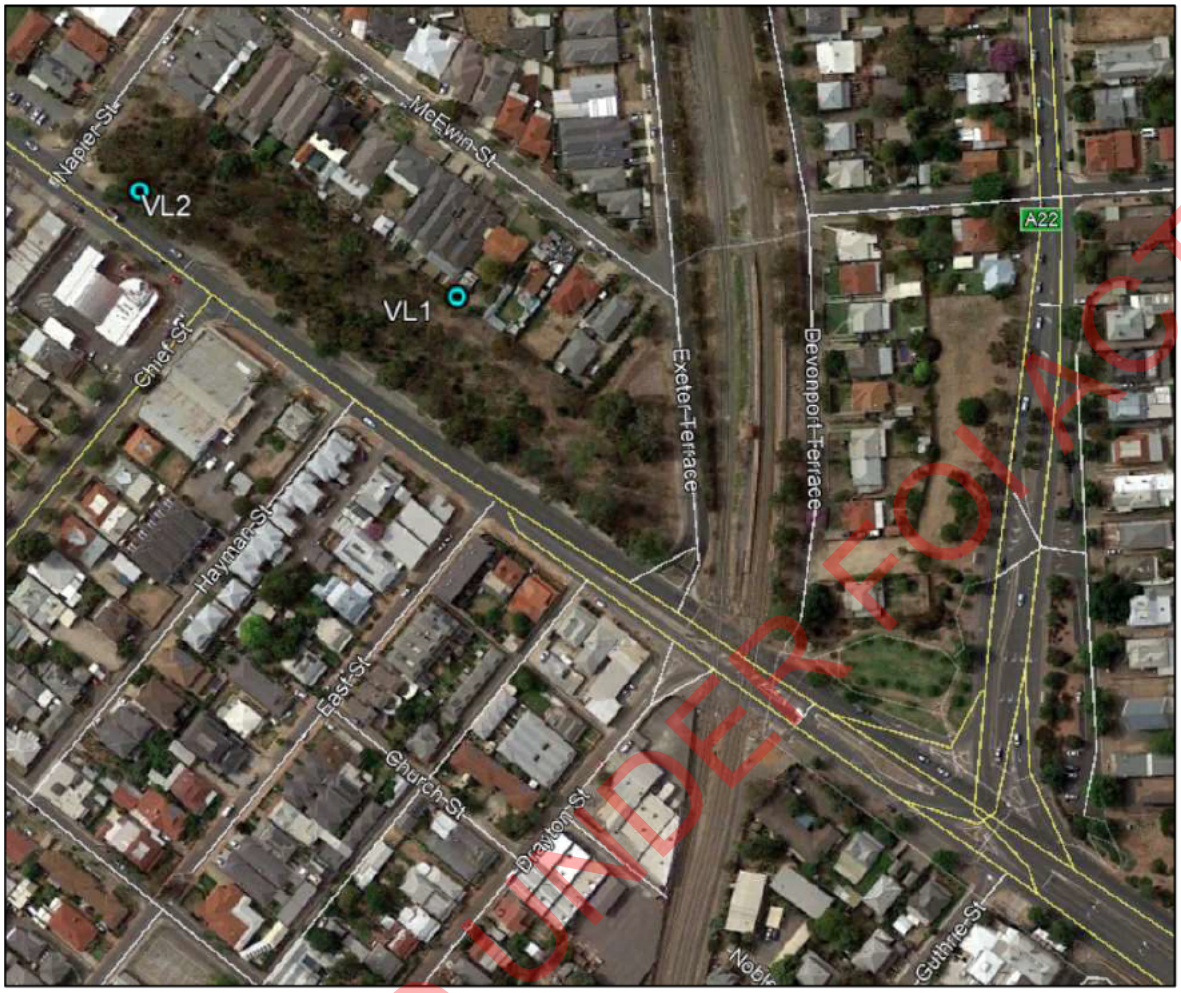
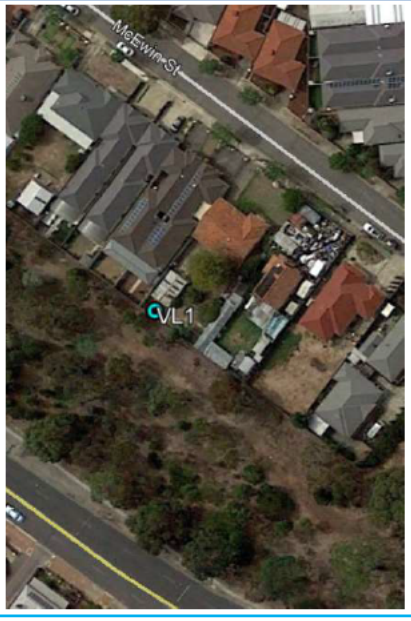


Figure 5: Vibration monitoring locations.

Table 18: Summary of vibration monitoring locations.

Monitoring Location		Aerial Photograph
ID	Description	
VL1	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing.	

Monitoring Location		Aerial Photograph
ID	Description	
VL2	10m from Torrens Road, smooth surfaced section of the road.	

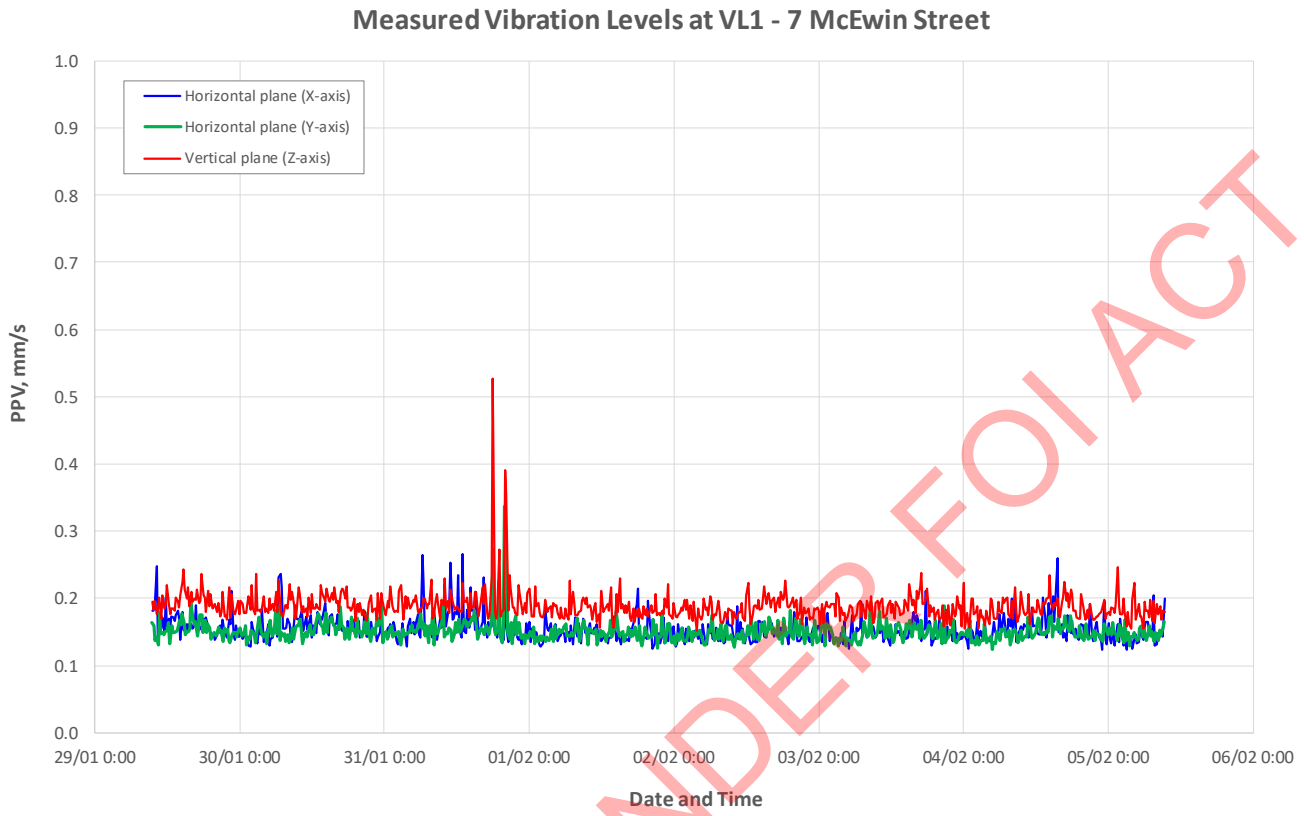
Table 19: Details of the vibration monitoring.

ID	Address	Description	Comments
VL1	7 McEwin Street	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing.	Unattended measurements. The high vibration levels measured at this position are influenced by local activity rather than road traffic.
VL2	Ovingham reserve	10m from Torrens Road, smooth surfaced section of the road.	Attended measurements of vehicle pass-by comprising a good mix of cars and heavy vehicles, including vehicles accelerating, slowing down and travelling at speed. The measurements are representative of typical road traffic vibration levels.

The measured peak particle velocity (PPV) vibration levels at VL1 (continuous long-term) are provided in the graphs below. The measured average and maximum PPV vibration levels at VL1 and VL2 (short-term) are summarised in Table 20.

Table 20: Summary of measured average noise levels.

Monitoring Location		Measured PPV, mm/s	
ID	Address	Average	Maximum
VL1	7 McEwin Street	0.2	0.5
VL2	Ovingham reserve	0.1	0.2



The unattended vibration measurements at VL1, as indicated in the graph above include a period of elevated vibration levels. These vibration levels are likely due to local sources (such as domestic activity) rather than vibration from Torrens Road traffic. The low vibration levels measured during the majority of the monitoring period when there was traffic activity on Torrens Road indicate that the elevated vibration levels are not influenced by road traffic.

The attended measurements at VL2, which were conducted during peak traffic activity, indicated that the maximum vibration levels from Torrens Road traffic are no greater than 0.2 mm/s at approximately10m from the road.

Appendix C: Noise Sensitive Receivers and Noise Assessment Boundary

Table 21: Noise Sensitive Receivers within the Noise Assessment Boundary

Receiver ID	Address
7	8 Toronto St Ovingham 5082
10	3 Torrens Rd Ovingham 5082
11	62 Park Tce Ovingham 5082
13	3/25 Fitzroy Tce Fitzroy 5082
14	1/5 Churchill Rd Ovingham 508
15	51 Torrens Rd Bowden 5007
17	55 Torrens Rd Brompton 5007
20	55 Torrens Rd Brompton 5007
21	61 Torrens Rd Brompton 5007
23	67 Torrens Rd Brompton 5007
59	26 Fitzroy Tce Fitzroy 5082
121	101 Chief St Brompton 5007
181	2/65 Torrens Rd Brompton 5007
195	4/65 Torrens Rd Brompton 5007
196	2/65 Torrens Rd Brompton 5007
197	126 East St Brompton 5007
198	4/65 Torrens Rd Brompton 5007
200	6/65 Torrens Rd Brompton 5007
369	5/37 Torrens Rd Ovingham 5082
370	31 Torrens Rd Ovingham 5082
371	14 Guthrie St Ovingham 5082
372	33 Torrens Rd Ovingham 5082
375	33 Torrens Rd Ovingham 5082
382	7-9 Torrens Rd Ovingham 5082
383	7-9 Torrens Rd Ovingham 5082
385	2/5 Torrens Rd Ovingham 5082
398	19 Torrens Rd Ovingham 5082
399	23 Torrens Rd Ovingham 5082
400	23 Torrens Rd Ovingham 5082
401	27 Torrens Rd Ovingham 5082
402	25 Torrens Rd Ovingham 5082
403	21 Torrens Rd Ovingham 5082
425	47 Elderslie Ave Fitzroy 5082
428	3 Cotton St Fitzroy 5082
480	23 Napier St Renown Park 5008
481	23 Napier St Renown Park 5008
482	19 Napier St Renown Park 5008
483	23 Napier St Renown Park 5008
548	57 Torrens Rd Brompton 5007
695	7 Churchill Rd Ovingham 5082
696	11 Churchill Rd Ovingham 5082

Receiver ID	Address
697	11A Churchill Rd Ovingham 5082
698	13 Churchill Rd Ovingham 5082
699	17 Churchill Rd Ovingham 5082
700	19 Churchill Rd Ovingham 5082
710	1 Devonport Tce Ovingham 5082
711	5 Devonport Tce Ovingham 5082
712	9 Devonport Tce Ovingham 5082
717	7 Devonport Tce Ovingham 5082
718	6 Toronto St Ovingham 5082
719	4 Toronto St Ovingham 5082
720	2 Toronto St Ovingham 5082
728	3 Toronto St Ovingham 5082
729	5 Toronto St Ovingham 5082
730	9 Toronto St Ovingham 5082
731	11-13 Toronto St Ovingham 5082
732	15 Toronto St Ovingham 5082
733	17 Toronto St Ovingham 5082
734	19 Toronto St Ovingham 5082
889	19 Fitzroy Tce Fitzroy 5082
890	1A Braund Rd Fitzroy 5082
891	12 Exeter Tce Renown Park 5008
892	1C Gosport St Renown Park 5008
902	7-9 Torrens Rd Ovingham 5082
904	1A Torrens Rd Ovingham 5082
905	1 Torrens Rd Ovingham 5082
906	63A Park Tce Ovingham 5082
907	63 Park Tce Ovingham 5082
924	16 Hansen Cct Renown Park 5008
BBCS	Bowden Brompton Community School 11 Napier St Renown Park 5008
HMC	Prospect Chapel 7 Churchill Rd Ovingham 5082
PC	Holy Methodist Church (CMCA) 27-28 Fitzroy Tce Fitzroy 5082

Noise Assessment Boundary and Noise Sensitive Receivers

Appendix D: Noise Modelling Results

Table 22: Predicted Road Traffic Noise Levels at Sensitive Receivers within the NAB.

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
7-GF-E	279479	6135664	53.3	50.2	53	49.9	53.4	50.3	-0.3	-0.3
7-F 1-E	279479	6135664	57.6	54.5	57.5	54.4	57.9	54.8	-0.1	-0.1
7-GF-S	279482	6135666	55.9	52.8	55.2	52.1	55.6	52.5	-0.7	-0.7
7-F 1-S	279482	6135666	59.7	56.6	59.2	56.1	59.7	56.6	-0.5	-0.5
7-GF-S	279492	6135667	51.6	48.5	51.5	48.4	51.9	48.8	-0.1	-0.1
7-F 1-S	279492	6135667	56.8	53.7	56.6	53.5	57	53.9	-0.2	-0.2
7-GF-E	279498	6135672	48.4	45.3	48.5	45.4	48.9	45.8	0.1	0.1
7-F 1-E	279498	6135672	53.8	50.7	54	50.9	54.4	51.3	0.2	0.2
7-GF-E	279498	6135677	48.8	45.7	48.9	45.8	49.3	46.2	0.1	0.1
7-F 1-E	279498	6135677	53.5	50.4	53.7	50.7	54.2	51.1	0.2	0.3
7-GF-N	279491	6135680	51	47.9	52.4	49.3	52.9	49.8	1.4	1.4
7-F 1-N	279491	6135680	55.1	52	55.5	52.4	55.9	52.8	0.4	0.4
7-GF-N	279480	6135679	53.5	50.4	54.5	51.4	54.9	51.8	1.0	1.0
7-F 1-N	279480	6135679	57.8	54.7	57.8	54.7	58.2	55.1	0.0	0.0
7-GF-W	279474	6135675	55.8	52.7	56.5	53.4	56.9	53.8	0.7	0.7
7-F 1-W	279474	6135675	60.5	57.4	60.5	57.4	61	57.9	0.0	0.0
7-GF-N	279471	6135672	55.8	52.7	56.7	53.6	57.1	54.1	0.9	0.9
7-F 1-N	279471	6135672	60.1	57	60.3	57.2	60.7	57.6	0.2	0.2
7-GF-W	279467	6135666	63.1	60	63.1	60	63.5	60.4	0.0	0.0
7-F 1-W	279467	6135666	66.4	63.3	66.8	63.7	67.2	64.1	0.4	0.4
7-GF-S	279473	6135660	62.2	59.1	61.8	58.7	62.2	59.1	-0.4	-0.4
7-F 1-S	279473	6135660	66.1	63	66	62.9	66.4	63.3	-0.1	-0.1
10-GF-NE	279533	6135503	60.1	57	60.4	57.3	60.8	57.7	0.3	0.3
10-F 1-NE	279533	6135503	66.7	63.6	67.2	64.1	67.6	64.5	0.5	0.5
10-GF-NE	279532	6135504	59.7	56.6	59.9	56.8	60.4	57.3	0.2	0.2
10-F 1-NE	279532	6135504	65.9	62.8	66.3	63.2	66.7	63.6	0.4	0.4
10-GF-NE	279529	6135508	61	57.9	61.3	58.2	61.7	58.6	0.3	0.3
10-F 1-NE	279529	6135508	67.6	64.5	67.8	64.8	68.3	65.2	0.2	0.3
10-GF-NW	279517	6135502	52.4	49.3	52.4	49.3	52.8	49.7	0.0	0.0
10-F 1-NW	279517	6135502	57.2	54.1	57.2	54.1	57.6	54.5	0.0	0.0
10-GF-SW	279514	6135487	44.9	41.8	45	41.9	45.4	42.3	0.1	0.1
10-F 1-SW	279514	6135487	49.8	46.7	49.8	46.7	50.3	47.2	0.0	0.0
10-GF-SE	279528	6135492	50.4	47.3	50.6	47.5	51	47.9	0.2	0.2
10-F 1-SE	279528	6135492	54.8	51.7	54.9	51.8	55.3	52.2	0.1	0.1
11-GF-NE	279547	6135466	44.9	41.8	44.9	41.8	45.3	42.3	0.0	0.0
11-GF-NW	279534	6135467	52.9	49.8	53.7	50.6	54.1	51	0.8	0.8
11-GF-SW	279535	6135454	48.5	45.4	49.2	46.1	49.6	46.5	0.7	0.7
11-GF-SE	279549	6135453	56.9	53.8	56.9	53.8	57.3	54.2	0.0	0.0
13-GF-W	279674	6135533	48.3	45.2	48.5	45.4	48.9	45.8	0.2	0.2
14-GF-S	279440	6135680	57.4	54.3	57.7	54.6	58.1	55	0.3	0.3
14-GF-E	279443	6135686	53.7	50.6	54.1	51	54.6	51.5	0.4	0.4
14-GF-N	279427	6135690	54.9	51.8	55.8	52.7	56.2	53.1	0.9	0.9
14-GF-W	279412	6135687	63.9	60.9	65	61.9	65.4	62.3	1.1	1.0
14-GF-N	279412	6135686	64	60.9	65.1	62	65.6	62.5	1.1	1.1
14-GF-W	279410	6135682	68	64.9	69.3	66.2	69.7	66.6	1.3	1.3
14-GF-S	279424	6135679	62.1	59	62.6	59.5	63	59.9	0.5	0.5
15-GF-NE	279197	6135746	68.4	65.3	55.9	52.8	56.3	53.3	-12.5	-12.5
15-GF-NW	279188	6135744	62	58.9	52.6	49.5	53	49.9	-9.4	-9.4
15-GF-SW	279189	6135735	49.5	46.4	48.5	45.4	49	45.9	-1.0	-1.0
17-GF-NE	279181	6135758	69.3	66.2	56.9	53.7	57.3	54.2	-12.4	-12.5
17-GF-NW	279170	6135756	57.3	54.1	50.8	47.6	51.2	48.1	-6.5	-6.5
17-GF-SW	279171	6135744	49.4	46.3	48.6	45.5	49.1	46	-0.8	-0.8
17-GF-SE	279182	6135747	61.4	58.3	52.9	49.8	53.4	50.3	-8.5	-8.5
20-GF-NE	279169	6135766	68.9	65.8	56.3	53.2	56.8	53.7	-12.6	-12.6
20-GF-NW	279161	6135765	59.8	56.7	50.9	47.8	51.3	48.3	-8.9	-8.9
20-GF-SW	279162	6135757	49.3	46.2	48.5	45.4	48.9	45.8	-0.8	-0.8
20-GF-SE	279171	6135758	58.7	55.6	50.8	47.7	51.3	48.2	-7.9	-7.9
21-GF-NE	279120	6135798	69.7	66.6	58.4	55.3	58.8	55.8	-11.3	-11.3
21-GF-NW	279110	6135796	63	59.9	54	50.9	54.4	51.3	-9.0	-9.0
21-GF-SW	279111	6135786	49	45.9	48.4	45.3	48.8	45.7	-0.6	-0.6
21-GF-SE	279121	6135788	62.3	59.2	53.6	50.4	54	50.9	-8.7	-8.8
23-GF-NE	279084	6135822	69.4	66.3	60.1	57	60.6	57.5	-9.3	-9.3
23-GF-NW	279076	6135820	63.8	60.7	57.6	54.4	58	54.9	-6.2	-6.3
23-GF-SW	279077	6135812	49.4	46.3	48.7	45.6	49.2	46.1	-0.7	-0.7
23-GF-SE	279086	6135813	63.5	60.4	55	51.8	55.4	52.3	-8.5	-8.6
59-GF-N	279653	6135533	43.1	40	42.6	39.5	43	39.9	-0.5	-0.5

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
59-GF-W	279648	6135528	41.2	38.1	40.7	37.6	41.1	38	-0.5	-0.5
59-GF-W	279649	6135520	59.3	56.2	58.2	55.1	58.6	55.5	-1.1	-1.1
59-GF-S	279653	6135516	59.4	56.3	58.3	55.2	58.7	55.6	-1.1	-1.1
59-GF-S	279658	6135516	58.6	55.5	57.5	54.4	57.9	54.8	-1.1	-1.1
59-GF-E	279662	6135518	44.8	41.7	44.4	41.3	44.8	41.7	-0.4	-0.4
59-GF-S	279664	6135518	55.2	52.1	53.8	50.7	54.2	51.1	-1.4	-1.4
59-GF-E	279668	6135522	44.2	41.1	43.8	40.7	44.2	41.1	-0.4	-0.4
59-GF-E	279668	6135528	44.1	41	43.7	40.7	44.2	41.1	-0.4	-0.3
59-GF-N	279662	6135532	44.6	41.5	44.3	41.2	44.7	41.6	-0.3	-0.3
59-GF-E	279658	6135531	44.2	41.1	43.7	40.6	44.1	41	-0.5	-0.5
121-GF-NE	279026	6135810	47.2	44.1	47.2	44.1	47.7	44.6	0.0	0.0
181-GF-NE	279102	6135810	69.5	66.4	58.9	55.8	59.4	56.3	-10.6	-10.6
181-F 1-NE	279102	6135810	70.4	67.3	61.6	58.5	62.1	59	-8.8	-8.8
181-GF-NW	279095	6135810	64.9	61.8	56.4	53.2	56.8	53.7	-8.5	-8.6
181-F 1-NW	279095	6135810	66.2	63.1	59.9	56.7	60.3	57.2	-6.3	-6.4
181-GF-SE	279101	6135801	57.3	54.2	50.2	47.1	50.6	47.5	-7.1	-7.1
181-F 1-SE	279101	6135801	59.8	56.7	53.6	50.5	54	50.9	-6.2	-6.2
181-GF-SW	279101	6135801	56.6	53.5	49.8	46.7	50.2	47.2	-6.8	-6.8
181-F 1-SW	279101	6135801	59.3	56.2	53.3	50.2	53.7	50.6	-6.0	-6.0
181-GF-SE	279105	6135803	65.2	62.1	54.9	51.8	55.4	52.3	-10.3	-10.3
181-F 1-SE	279105	6135803	66.6	63.5	57.3	54.2	57.7	54.7	-9.3	-9.3
195-GF-NE	279093	6135792	53	49.9	50.4	47.3	50.9	47.8	-2.6	-2.6
195-F 1-NE	279093	6135792	56.2	53.1	54.3	51.2	54.7	51.6	-1.9	-1.9
195-GF-SE	279092	6135794	48.5	45.4	48.6	45.4	49	45.9	0.1	0.0
195-F 1-SE	279092	6135794	53.6	50.5	52.9	49.8	53.3	50.2	-0.7	-0.7
195-GF-NE	279090	6135798	46.1	43	45.2	42.1	45.7	42.6	-0.9	-0.9
195-F 1-NE	279090	6135798	50.1	47	49.7	46.5	50.1	47	-0.4	-0.5
195-GF-NW	279084	6135797	57.4	54.3	52.3	49.2	52.8	49.7	-5.1	-5.1
195-F 1-NW	279084	6135797	59.1	55.9	56.4	53.3	56.9	53.8	-2.7	-2.6
195-GF-SE	279095	6135787	56.3	53.2	52.2	49.1	52.6	49.5	-4.1	-4.1
195-F 1-SE	279095	6135787	58.4	55.3	55.3	52.2	55.8	52.7	-3.1	-3.1
196-GF-NW	279090	6135803	60.5	57.4	53.2	50.1	53.7	50.6	-7.3	-7.3
196-F 1-NW	279090	6135803	62.1	58.9	57.4	54.3	57.8	54.8	-4.7	-4.6
196-GF-SW	279091	6135796	45.9	42.8	45.3	42.2	45.7	42.6	-0.6	-0.6
196-F 1-SW	279091	6135796	50.2	47.1	49.6	46.5	50.1	47	-0.6	-0.6
196-GF-SE	279097	6135795	48.8	45.7	48.8	45.6	49.2	46.1	0.0	-0.1
196-F 1-SE	279097	6135795	54.6	51.5	53.4	50.3	53.8	50.7	-1.2	-1.2
196-GF-SW	279098	6135795	48	44.9	47.5	44.3	47.9	44.8	-0.5	-0.6
196-F 1-SW	279098	6135795	54	50.9	52.3	49.2	52.7	49.7	-1.7	-1.7
196-GF-SE	279101	6135796	60.4	57.3	53	49.9	53.5	50.4	-7.4	-7.4
196-F 1-SE	279101	6135796	62.2	59.1	56.3	53.1	56.7	53.6	-5.9	-6.0
197-GF-NE	279120	6135764	51.7	48.6	52.2	49.1	52.6	49.5	0.5	0.5
197-GF-SE	279117	6135767	50.5	47.4	50.6	47.5	51.1	48	0.1	0.1
197-GF-NE	279112	6135774	55.4	52.3	52.9	49.8	53.3	50.3	-2.5	-2.5
197-GF-NW	279101	6135773	53.2	50.1	50.8	47.7	51.2	48.2	-2.4	-2.4
197-GF-SW	279107	6135759	46.9	43.8	46.7	43.6	47.2	44.1	-0.2	-0.2
197-GF-SE	279121	6135756	52.6	49.5	52	48.9	52.4	49.3	-0.6	-0.6
198-GF-NW	279080	6135791	55.7	52.6	52	48.9	52.5	49.4	-3.7	-3.7
198-F 1-NW	279080	6135791	57.4	54.3	55.6	52.4	56	52.9	-1.8	-1.9
198-GF-SW	279080	6135785	46.1	43	45.6	42.5	46	42.9	-0.5	-0.5
198-F 1-SW	279080	6135785	51.9	48.8	51	47.9	51.5	48.4	-0.9	-0.9
198-GF-SE	279084	6135784	43.4	40.3	43	39.9	43.4	40.3	-0.4	-0.4
198-F 1-SE	279084	6135784	48.8	45.7	48.3	45.2	48.8	45.7	-0.5	-0.5
198-GF-SW	279086	6135783	44.4	41.3	44	40.9	44.4	41.4	-0.4	-0.4
198-F 1-SW	279086	6135783	51.2	48.1	50.5	47.4	50.9	47.8	-0.7	-0.7
198-GF-SE	279091	6135783	55	51.9	52	48.9	52.4	49.3	-3.0	-3.0
198-F 1-SE	279091	6135783	57.4	54.3	55.2	52.1	55.6	52.5	-2.2	-2.2
200-GF-NE	279083	6135779	49	45.9	49.9	46.8	50.4	47.3	0.9	0.9
200-F 1-NE	279083	6135779	54.3	51.2	54.1	51	54.5	51.4	-0.2	-0.2
200-GF-SE	279082	6135781	47.5	44.4	48	44.9	48.5	45.4	0.5	0.5
200-F 1-SE	279082	6135781	53.3	50.2	52.9	49.8	53.3	50.3	-0.4	-0.4
200-GF-NE	279080	6135785	42.2	39.1	41.7	38.6	42.1	39	-0.5	-0.5
200-F 1-NE	279080	6135785	46.3	43.2	45.8	42.7	46.3	43.2	-0.5	-0.5
200-GF-NW	279075	6135784	54.7	51.6	52.2	49.1	52.6	49.6	-2.5	-2.5
200-F 1-NW	279075	6135784	56.3	53.2	55.1	52	55.5	52.4	-1.2	-1.2
200-GF-SE	279085	6135774	53	49.9	51.5	48.4	52	48.9	-1.5	-1.5
200-F 1-SE	279085	6135774	56.3	53.2	55	51.9	55.5	52.4	-1.3	-1.3
369-GF-SE	279279	6135672	61.6	58.5	54.9	51.8	55.3	52.3	-6.7	-6.7
369-GF-NE	279278	6135679	63.6	60.5	56.4	53.3	56.8	53.7	-7.2	-7.2
369-GF-NW	279268	6135676	61.9	58.8	53.5	50.4	53.9	50.9	-8.4	-8.4
369-GF-SW	279275	6135660	49.3	46.2	48.4	45.3	48.8	45.7	-0.9	-0.9

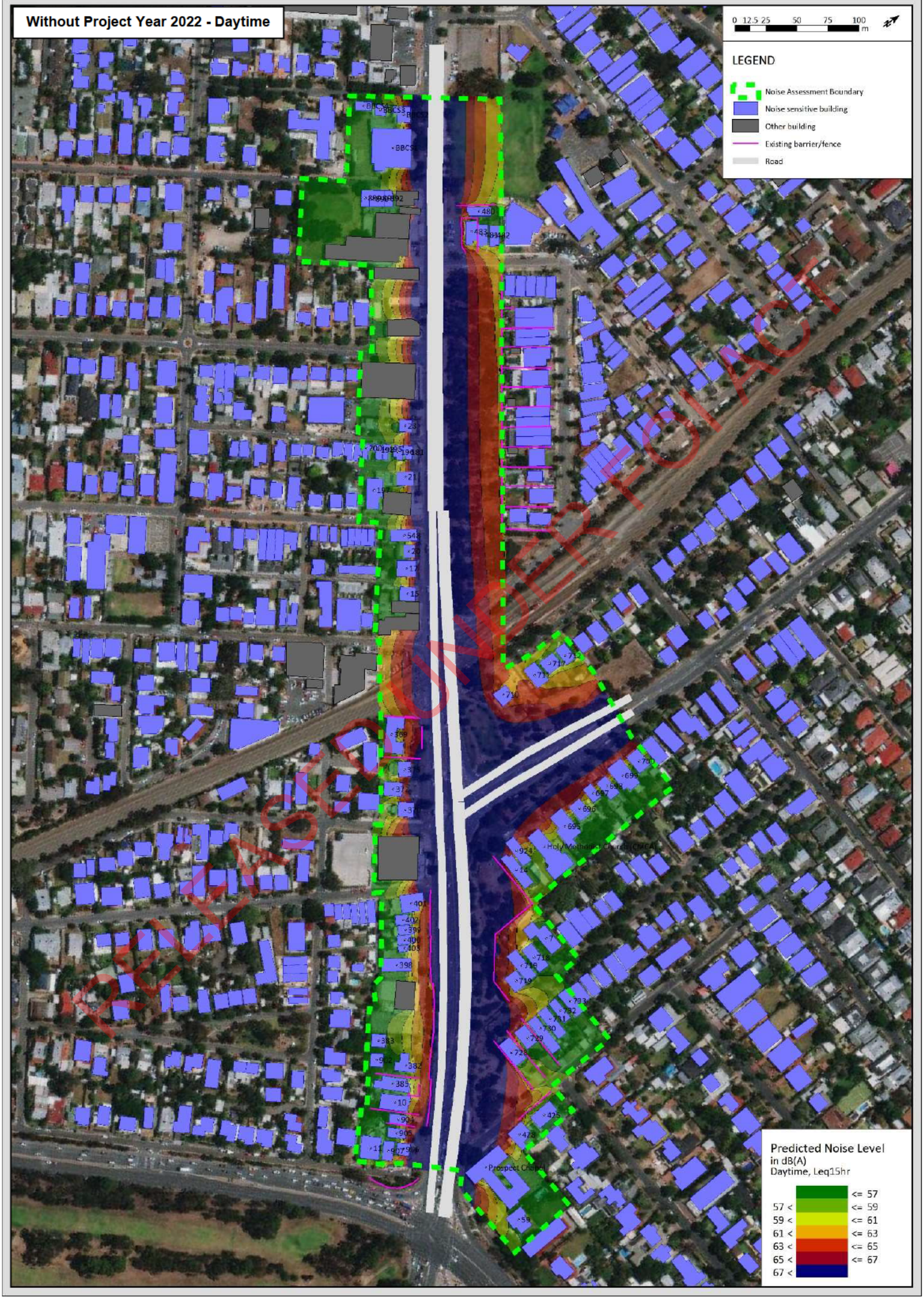
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
369-GF-SE	279292	6135657	57.2	54.1	52.3	49.2	52.7	49.6	-4.9	-4.9
369-GF-NE	279293	6135667	62.8	59.7	55.9	52.8	56.3	53.2	-6.9	-6.9
369-GF-NW	279286	6135667	59.5	56.4	53.6	50.5	54.1	51	-5.9	-5.9
369-GF-NE	279282	6135668	61.1	58	54.3	51.2	54.8	51.7	-6.8	-6.8
370-GF-NE	279339	6135645	69.2	66.1	60.3	57.2	60.7	57.7	-8.9	-8.9
370-GF-NW	279329	6135644	65.3	62.2	56.2	53.1	56.7	53.6	-9.1	-9.1
370-GF-SW	279330	6135634	50.5	47.5	49.2	46.1	49.6	46.5	-1.3	-1.4
370-GF-SE	279340	6135635	63.3	60.2	56.1	53	56.6	53.5	-7.2	-7.2
371-GF-NE	279318	6135626	58.4	55.3	53	49.9	53.4	50.3	-5.4	-5.4
371-F 1-NE	279318	6135626	61.2	58.1	57.6	54.5	58	54.9	-3.6	-3.6
372-GF-NE	279320	6135647	65.7	62.6	56.8	53.7	57.3	54.2	-8.9	-8.9
372-GF-NW	279310	6135644	60	56.9	53.4	50.3	53.8	50.8	-6.6	-6.6
372-GF-SW	279310	6135634	49.6	46.5	48.6	45.5	49.1	46	-1.0	-1.0
372-GF-SE	279320	6135636	58.7	55.6	52.6	49.5	53	49.9	-6.1	-6.1
375-GF-NE	279311	6135662	67.3	64.2	58.4	55.3	58.9	55.8	-8.9	-8.9
375-GF-NW	279301	6135661	61.3	58.2	54.3	51.2	54.7	51.6	-7.0	-7.0
375-GF-SW	279304	6135652	50.6	47.5	49.4	46.3	49.8	46.7	-1.2	-1.2
375-GF-SE	279313	6135653	65.2	62.1	56.6	53.5	57.1	54	-8.6	-8.6
382-GF-NW	279494	6135527	59.8	56.7	60	57	60.5	57.4	0.2	0.3
382-GF-SW	279495	6135521	53	49.9	53.2	50.1	53.7	50.6	0.2	0.2
382-GF-NW	279496	6135518	53.7	50.6	54	50.9	54.4	51.3	0.3	0.3
382-GF-SW	279498	6135513	52	48.9	52.2	49.1	52.6	49.5	0.2	0.2
382-GF-SE	279508	6135517	55.6	52.5	55.7	52.7	56.2	53.1	0.1	0.2
382-GF-NE	279510	6135528	61.1	58	61.1	58	61.5	58.4	0.0	0.0
382-GF-NW	279504	6135528	60.1	57	60.2	57.1	60.6	57.5	0.1	0.1
382-GF-NE	279501	6135528	60.7	57.6	60.8	57.7	61.2	58.1	0.1	0.1
383-GF-NE	279479	6135520	56.8	53.7	56.8	53.7	57.2	54.2	0.0	0.0
383-GF-NW	279470	6135518	55.4	52.3	55.4	52.3	55.8	52.7	0.0	0.0
383-GF-SW	279470	6135509	49.4	46.3	49.5	46.4	49.9	46.8	0.1	0.1
383-GF-SE	279479	6135511	52.8	49.7	52.9	49.8	53.3	50.2	0.1	0.1
385-GF-NW	279506	6135509	55.8	52.7	55.9	52.8	56.3	53.2	0.1	0.1
385-F 1-NW	279506	6135509	61.5	58.4	61.9	58.8	62.3	59.2	0.4	0.4
385-GF-SW	279500	6135499	51.6	48.5	52	48.9	52.4	49.3	0.4	0.4
385-F 1-SW	279500	6135499	55	51.9	55.8	52.7	56.3	53.2	0.8	0.8
385-GF-NW	279500	6135497	52.9	49.8	53.2	50.1	53.6	50.6	0.3	0.3
385-F 1-NW	279500	6135497	56.4	53.3	57.1	54	57.5	54.4	0.7	0.7
385-GF-SW	279500	6135491	48	44.9	48.5	45.4	48.9	45.8	0.5	0.5
385-F 1-SW	279500	6135491	52	49	53	49.9	53.4	50.3	1.0	0.9
385-GF-SE	279514	6135499	48.8	45.7	48.9	45.8	49.3	46.2	0.1	0.1
385-F 1-SE	279514	6135499	52.7	49.6	52.7	49.6	53.2	50.1	0.0	0.0
385-GF-NE	279521	6135514	58.5	55.4	58.7	55.6	59.1	56	0.2	0.2
385-F 1-NE	279521	6135514	65.3	62.2	65.4	62.3	65.9	62.8	0.1	0.1
385-GF-NW	279516	6135515	58.1	55	58.2	55.1	58.6	55.5	0.1	0.1
385-F 1-NW	279516	6135515	64.5	61.4	64.6	61.5	65	61.9	0.1	0.1
385-GF-NE	279515	6135515	58.1	55	58.3	55.2	58.7	55.6	0.2	0.2
385-F 1-NE	279515	6135515	64.5	61.4	64.6	61.5	65.1	62	0.1	0.1
398-GF-NE	279440	6135572	61.4	58.3	61.1	58	61.5	58.5	-0.3	-0.3
398-F 1-NE	279440	6135572	66.5	63.4	66.3	63.2	66.8	63.7	-0.2	-0.2
398-GF-NW	279428	6135565	55.3	52.2	54.9	51.9	55.4	52.3	-0.4	-0.3
398-F 1-NW	279428	6135565	61.2	58.1	61.5	58.4	61.9	58.8	0.3	0.3
398-GF-SE	279438	6135558	53.7	50.6	53.6	50.5	54	50.9	-0.1	-0.1
398-F 1-SE	279438	6135558	57.7	54.6	57.6	54.5	58.1	55	-0.1	-0.1
399-GF-NE	279419	6135590	62.1	59	61.4	58.3	61.8	58.7	-0.7	-0.7
399-GF-NW	279414	6135589	59.2	56.1	58.6	55.5	59	55.9	-0.6	-0.6
399-GF-NE	279414	6135589	58.4	55.3	57.7	54.6	58.1	55	-0.7	-0.7
399-GF-SW	279410	6135578	51.1	48	50.6	47.5	51	47.9	-0.5	-0.5
400-GF-NE	279426	6135586	62.3	59.2	61.8	58.7	62.2	59.1	-0.5	-0.5
400-GF-NW	279422	6135585	60	56.9	59.6	56.5	60	56.9	-0.4	-0.4
400-GF-NE	279421	6135585	59.4	56.3	58.9	55.8	59.3	56.2	-0.5	-0.5
400-GF-SW	279417	6135572	50.9	47.8	50.4	47.3	50.8	47.7	-0.5	-0.5
401-GF-NE	279405	6135604	61	57.9	60.2	57.1	60.6	57.5	-0.8	-0.8
401-GF-SE	279403	6135606	60.5	57.4	59.7	56.6	60.1	57	-0.8	-0.8
401-GF-NE	279401	6135611	67.1	64	64.1	61	64.5	61.4	-3.0	-3.0
401-GF-NW	279392	6135604	65	61.9	62.6	59.5	63	59.9	-2.4	-2.4
401-GF-SW	279394	6135591	51.5	48.4	50.8	47.7	51.3	48.2	-0.7	-0.7
401-GF-SE	279405	6135595	57.7	54.6	57	53.9	57.5	54.4	-0.7	-0.7
402-GF-NE	279412	6135594	61.2	58.1	60.5	57.4	60.9	57.8	-0.7	-0.7
402-GF-NW	279407	6135593	57.8	54.7	57.1	54	57.5	54.4	-0.7	-0.7
402-GF-NE	279406	6135592	57.4	54.3	56.6	53.5	57.1	54	-0.8	-0.8
402-GF-NE	279401	6135588	54.4	51.3	53.8	50.7	54.2	51.2	-0.6	-0.6
402-GF-SW	279402	6135580	50.9	47.8	50.4	47.3	50.8	47.7	-0.5	-0.5

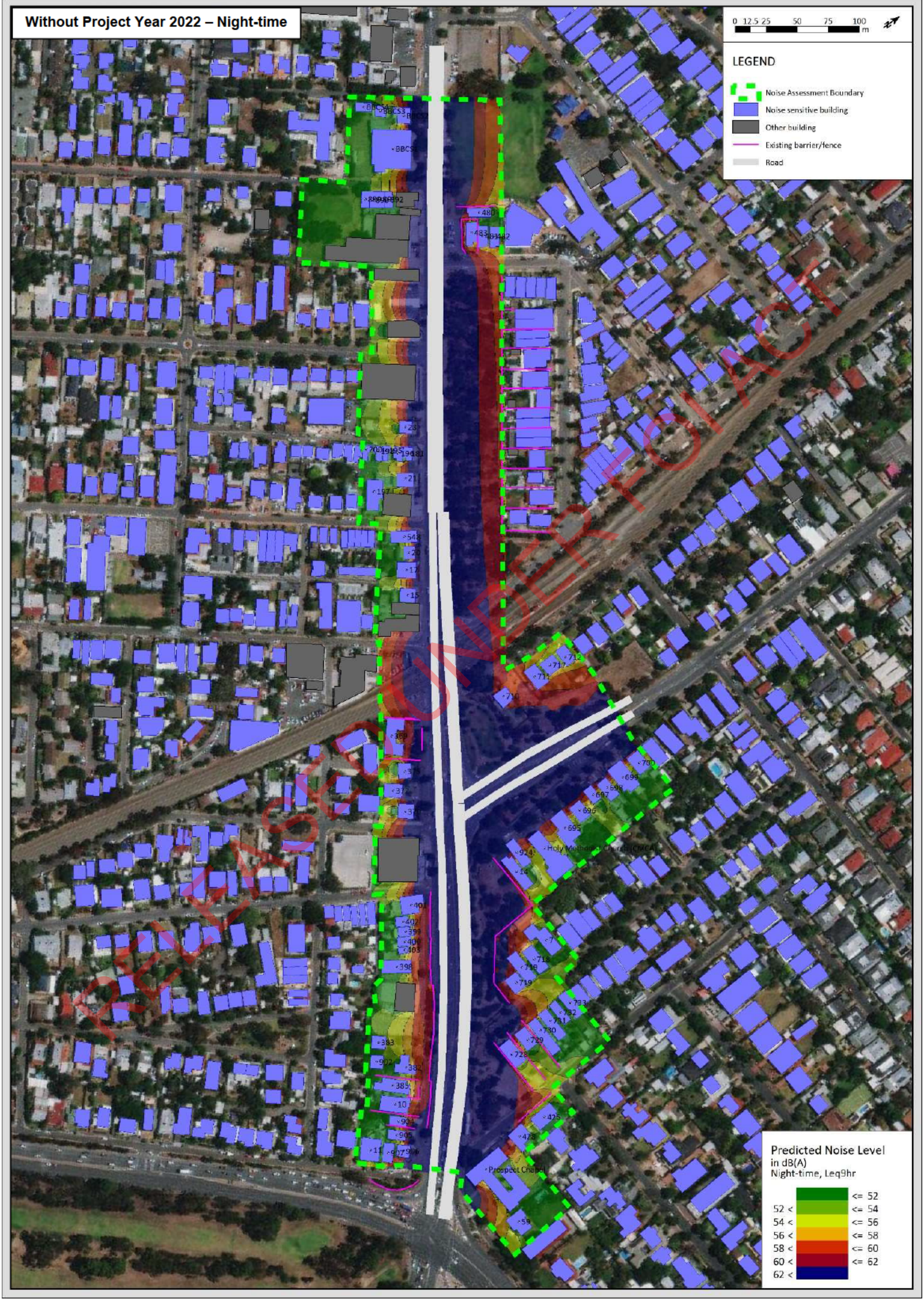
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
403-GF-NE	279428	6135579	60.4	57.3	60	56.9	60.4	57.3	-0.4	-0.4
403-GF-SW	279423	6135569	50.6	47.5	50.1	47.1	50.6	47.5	-0.5	-0.4
403-GF-SE	279429	6135572	57	53.9	56.7	53.6	57.1	54	-0.3	-0.3
425-GF-N	279597	6135601	51.9	48.8	51.9	48.8	52.4	49.3	0.0	0.0
425-GF-W	279593	6135589	60.7	57.6	60.6	57.5	61	57.9	-0.1	-0.1
425-GF-S	279601	6135579	56.7	53.6	56.5	53.4	57	53.9	-0.2	-0.2
425-GF-E	279607	6135590	47.7	44.6	47.7	44.6	48.1	45	0.0	0.0
425-GF-N	279604	6135600	47.5	44.4	47.5	44.4	47.9	44.8	0.0	0.0
425-GF-E	279603	6135600	47.4	44.3	47.4	44.3	47.8	44.7	0.0	0.0
428-GF-N	279599	6135573	57.5	54.3	57.3	54.2	57.7	54.6	-0.2	-0.1
428-GF-W	279593	6135564	65.3	62.2	64.8	61.7	65.2	62.1	-0.5	-0.5
428-GF-S	279604	6135557	61.4	58.3	61.2	58.1	61.6	58.5	-0.2	-0.2
428-GF-E	279614	6135562	47.4	44.3	47.2	44.1	47.7	44.6	-0.2	-0.2
428-GF-N	279610	6135565	48.4	45.3	48.3	45.2	48.8	45.7	-0.1	-0.1
428-GF-E	279609	6135567	47.9	44.8	47.8	44.7	48.3	45.2	-0.1	-0.1
428-GF-N	279606	6135571	48.2	45.1	48.1	45	48.5	45.4	-0.1	-0.1
428-GF-E	279606	6135572	48.2	45.1	48.1	45	48.5	45.5	-0.1	-0.1
480-GF-NE	278979	6135973	48.2	45.1	48.6	45.5	49	46	0.4	0.4
480-GF-NW	278969	6135967	56.2	53.1	56.4	53.3	56.8	53.8	0.2	0.2
480-GF-SW	278966	6135956	64.7	61.6	65.1	62	65.5	62.4	0.4	0.4
480-GF-SW	278969	6135956	63.2	60.1	63.4	60.3	63.9	60.8	0.2	0.2
480-GF-SW	278970	6135956	63.4	60.3	63.7	60.6	64.1	61.1	0.3	0.3
480-GF-SE	278977	6135962	54.5	51.4	54.6	51.5	55.1	52	0.1	0.1
481-GF-SW	278993	6135948	61.1	58	61.6	58.5	62	59	0.5	0.5
481-GF-SE	278998	6135949	59.7	56.6	60.1	57	60.5	57.5	0.4	0.4
481-GF-SE	278999	6135952	59.5	56.4	59.6	56.5	60.1	57	0.1	0.1
481-GF-SE	278999	6135953	60.2	57.1	60.2	57.1	60.7	57.6	0.0	0.0
481-GF-NE	278993	6135960	52.4	49.3	50.3	47.2	50.7	47.6	-2.1	-2.1
481-GF-NW	278983	6135961	50.7	47.6	50.9	47.8	51.3	48.3	0.2	0.2
482-GF-SE	279004	6135960	59.1	56	58.8	55.7	59.3	56.2	-0.3	-0.3
482-GF-SE	279005	6135960	59.9	56.8	59.7	56.5	60.1	57	-0.2	-0.3
482-GF-NE	278999	6135967	51.6	48.5	49.3	46.2	49.7	46.6	-2.3	-2.3
482-GF-NW	278989	6135969	50.5	47.3	50.6	47.4	51	47.9	0.1	0.1
482-GF-SW	278994	6135959	51.4	48.3	49.6	46.5	50.1	47	-1.8	-1.8
482-GF-SE	279003	6135957	60.4	57.3	60.3	57.2	60.7	57.7	-0.1	-0.1
483-GF-NW	278975	6135955	56.1	53	56.3	53.2	56.8	53.7	0.2	0.2
483-GF-SW	278981	6135945	60.9	57.8	61.4	58.3	61.8	58.8	0.5	0.5
483-GF-SE	278991	6135942	61.8	58.7	62.5	59.4	62.9	59.9	0.7	0.7
483-GF-NE	278991	6135946	59.2	56.1	60.1	56.9	60.5	57.4	0.9	0.8
483-GF-SE	278991	6135948	59.9	56.8	60.4	57.3	60.9	57.8	0.5	0.5
548-GF-NE	279159	6135774	69.8	66.7	57.4	54.3	57.8	54.7	-12.4	-12.4
548-F 1-NE	279159	6135774	70.4	67.3	59.2	56.1	59.7	56.6	-11.2	-11.2
548-GF-NW	279148	6135768	62.2	59	53.2	50.1	53.7	50.6	-9.0	-8.9
548-F 1-NW	279148	6135768	64	60.9	55.8	52.7	56.3	53.2	-8.2	-8.2
548-GF-SW	279146	6135755	47.3	44.2	46.9	43.8	47.3	44.2	-0.4	-0.4
548-F 1-SW	279146	6135755	53.4	50.3	51.8	48.7	52.2	49.1	-1.6	-1.6
548-GF-SE	279157	6135762	57	53.9	50.1	47	50.6	47.5	-6.9	-6.9
548-F 1-SE	279157	6135762	60.8	57.7	55.9	52.8	56.3	53.3	-4.9	-4.9
695-GF-N	279418	6135745	58	54.9	58	54.9	58.4	55.4	0.0	0.0
695-GF-W	279405	6135736	65.8	62.8	65.6	62.5	66	63	-0.2	-0.3
695-GF-S	279412	6135730	62.3	59.2	62.1	59	62.5	59.5	-0.2	-0.2
695-GF-W	279417	6135730	60.8	57.7	60.8	57.7	61.3	58.2	0.0	0.0
695-GF-S	279427	6135728	57	53.9	57.7	54.6	58.1	55	0.7	0.7
695-GF-E	279437	6135733	46.6	43.5	46.8	43.7	47.2	44.1	0.2	0.2
695-GF-N	279433	6135737	48	44.9	48.2	45.1	48.6	45.6	0.2	0.2
695-GF-E	279432	6135740	47.5	44.4	47.6	44.5	48	44.9	0.1	0.1
696-GF-E	279423	6135755	48.4	45.3	48.5	45.4	48.9	45.8	0.1	0.1
696-GF-N	279415	6135761	58.8	55.7	58.8	55.8	59.3	56.2	0.0	0.1
696-GF-W	279407	6135753	65.1	62.1	65	61.9	65.4	62.4	-0.1	-0.2
696-GF-S	279416	6135748	58	55	58.5	55.4	58.9	55.9	0.5	0.4
697-GF-E	279417	6135770	49	45.9	49	45.9	49.4	46.3	0.0	0.0
697-GF-N	279409	6135775	59.6	56.6	59.6	56.5	60	56.9	0.0	-0.1
697-GF-W	279402	6135769	65.8	62.8	65.6	62.5	66	63	-0.2	-0.3
697-GF-S	279410	6135765	61.7	58.6	61.7	58.6	62.2	59.1	0.0	0.0
698-GF-E	279423	6135784	48.6	45.5	48.6	45.5	49	45.9	0.0	0.0
698-GF-N	279413	6135788	57.3	54.3	57	53.9	57.4	54.4	-0.3	-0.4
698-GF-W	279404	6135782	65.5	62.4	65.3	62.2	65.7	62.7	-0.2	-0.2
698-GF-S	279414	6135777	56.5	53.4	56.5	53.4	56.9	53.8	0.0	0.0
699-GF-E	279423	6135794	48.6	45.5	48.6	45.5	49	45.9	0.0	0.0
699-GF-S	279424	6135795	49.2	46.1	49.2	46.1	49.6	46.5	0.0	0.0
699-GF-E	279426	6135801	48.3	45.2	48.3	45.2	48.7	45.6	0.0	0.0

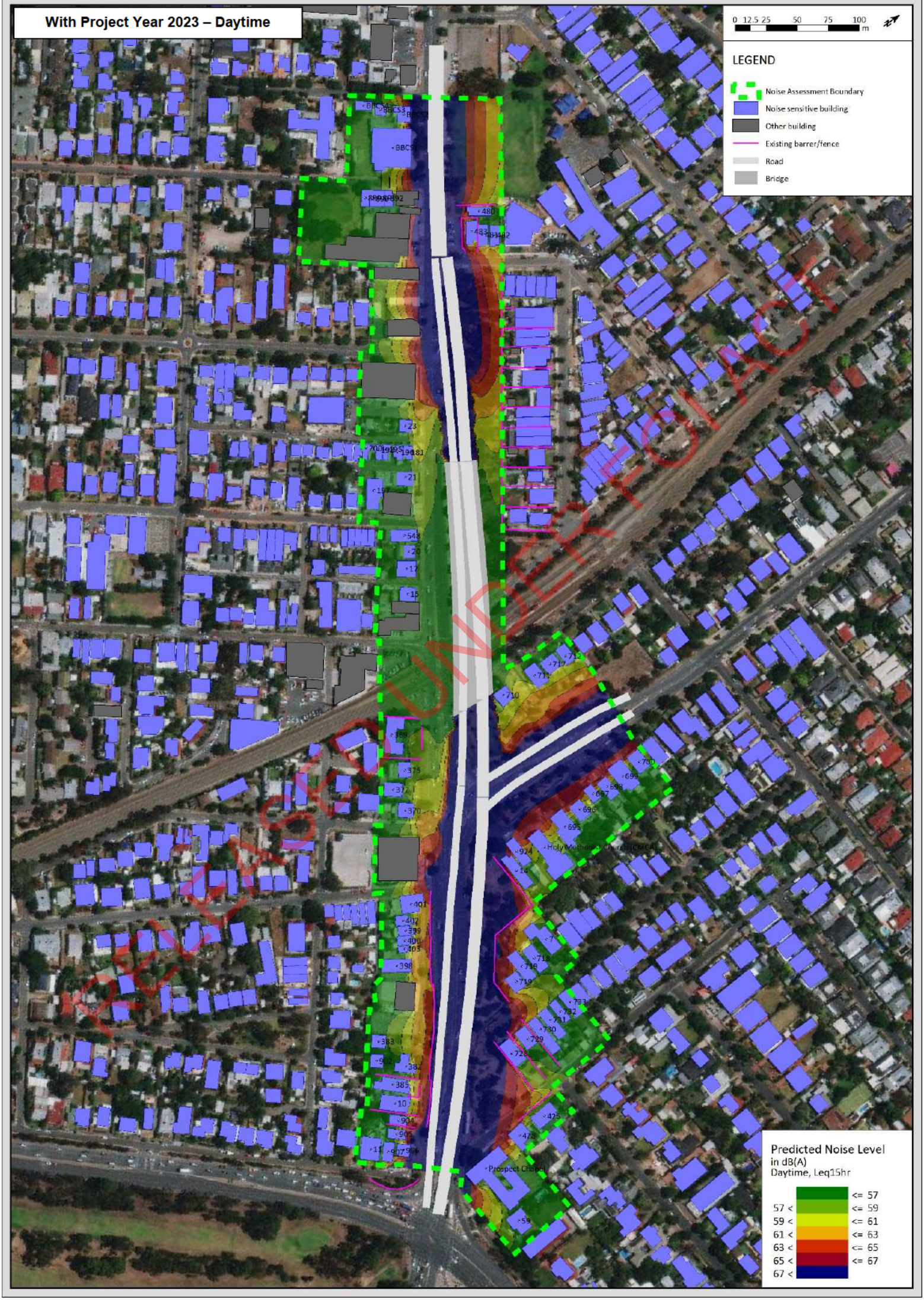
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
699-GF-N	279412	6135806	57.2	54.1	57.1	54	57.5	54.4	-0.1	-0.1
699-GF-W	279399	6135798	66.3	63.2	66.1	63	66.5	63.4	-0.2	-0.2
699-GF-S	279412	6135790	58.3	55.3	58.2	55.1	58.6	55.5	-0.1	-0.2
700-GF-E	279419	6135816	48.1	45	48.1	45	48.5	45.4	0.0	0.0
700-GF-N	279409	6135822	58.5	55.5	58.5	55.4	58.9	55.9	0.0	-0.1
700-GF-W	279401	6135814	65.3	62.3	65.3	62.2	65.7	62.6	0.0	-0.1
700-GF-S	279410	6135809	57	54	56.9	53.9	57.4	54.3	-0.1	-0.1
710-GF-E	279312	6135757	63.9	60.8	Demolished		Demolished		N/A	
710-GF-N	279304	6135764	60.3	57.2	Demolished		Demolished		N/A	
710-GF-W	279298	6135756	63	59.9	Demolished		Demolished		N/A	
710-GF-S	279305	6135750	65.5	62.4	Demolished		Demolished		N/A	
711-GF-E	279316	6135788	62.3	59.2	60.3	57.2	60.7	57.6	-2.0	-2.0
711-GF-N	279306	6135794	56.3	53.2	55.5	52.4	55.9	52.9	-0.8	-0.8
711-GF-W	279296	6135787	60.4	57.3	55.2	52.1	55.6	52.6	-5.2	-5.2
711-GF-S	279306	6135781	62.8	59.7	58.4	55.3	58.8	55.7	-4.4	-4.4
712-GF-E	279314	6135817	60.2	57.1	59.5	56.4	59.9	56.8	-0.7	-0.7
712-GF-N	279305	6135822	54.8	51.7	54.9	51.8	55.3	52.2	0.1	0.1
712-GF-W	279297	6135816	57.9	54.8	54.2	51.1	54.6	51.6	-3.7	-3.7
712-GF-S	279306	6135811	56.5	53.4	56	52.9	56.4	53.3	-0.5	-0.5
717-GF-E	279312	6135803	60.5	57.4	59.6	56.5	60	56.9	-0.9	-0.9
717-GF-N	279305	6135810	55.8	52.7	55	51.9	55.5	52.4	-0.8	-0.8
717-GF-W	279298	6135802	58.5	55.4	54.3	51.2	54.8	51.7	-4.2	-4.2
717-GF-S	279305	6135795	55.3	52.3	54.5	51.4	54.9	51.8	-0.8	-0.9
718-GF-E	279504	6135657	55.2	52.1	55.7	52.6	56.2	53.1	0.5	0.5
718-GF-N	279492	6135662	51	47.9	51	47.9	51.4	48.3	0.0	0.0
718-GF-W	279480	6135656	62.3	59.2	61.8	58.7	62.2	59.1	-0.5	-0.5
718-GF-S	279492	6135650	54.3	51.2	54	50.9	54.5	51.4	-0.3	-0.3
719-GF-E	279505	6135644	56.2	53.1	56.9	53.8	57.3	54.2	0.7	0.7
719-GF-N	279491	6135649	55	51.9	54.6	51.5	55	51.9	-0.4	-0.4
719-GF-W	279477	6135643	67.3	64.2	67	64	67.5	64.4	-0.3	-0.2
719-GF-S	279491	6135638	58.9	55.8	58.3	55.2	58.7	55.6	-0.6	-0.6
720-GF-E	279507	6135633	58.2	55.1	58.9	55.7	59.3	56.2	0.7	0.6
720-GF-N	279498	6135639	54.5	51.4	54.1	51	54.5	51.4	-0.4	-0.4
720-GF-W	279490	6135632	65.9	62.8	65.4	62.3	65.8	62.7	-0.5	-0.5
720-GF-S	279499	6135626	63.1	60	63	59.9	63.4	60.3	-0.1	-0.1
728-GF-E	279555	6135599	54	50.9	53.8	50.7	54.2	51.2	-0.2	-0.2
728-GF-N	279543	6135604	58.6	55.5	58.4	55.3	58.8	55.7	-0.2	-0.2
728-GF-W	279532	6135597	67.8	64.7	67.9	64.8	68.4	65.3	0.1	0.1
729-GF-E	279550	6135614	51.4	48.3	51.3	48.2	51.8	48.7	-0.1	-0.1
729-GF-N	279540	6135620	55.5	52.4	55.4	52.3	55.8	52.7	-0.1	-0.1
729-GF-W	279531	6135613	65.6	62.5	65.6	62.5	66	62.9	0.0	0.0
729-GF-S	279540	6135607	59.5	56.4	59.4	56.3	59.8	56.7	-0.1	-0.1
730-GF-E	279564	6135628	51.1	48	51.1	48	51.5	48.4	0.0	0.0
730-GF-N	279547	6135632	50.5	47.4	50.5	47.4	50.9	47.8	0.0	0.0
730-GF-W	279530	6135626	63.9	60.8	63.9	60.8	64.3	61.2	0.0	0.0
730-GF-S	279547	6135621	53.7	50.6	53.4	50.3	53.8	50.7	-0.3	-0.3
731-GF-E	279557	6135638	49.1	46	49.1	46	49.6	46.5	0.0	0.0
731-GF-N	279542	6135642	50.5	47.4	50.4	47.3	50.8	47.7	-0.1	-0.1
731-GF-W	279528	6135637	61.6	58.5	61.6	58.5	62	59	0.0	0.0
731-GF-S	279543	6135632	51.2	48.1	51	47.9	51.4	48.3	-0.2	-0.2
732-GF-E	279549	6135649	48.9	45.8	48.9	45.8	49.4	46.3	0.0	0.0
732-GF-N	279538	6135652	50.5	47.4	50.4	47.3	50.8	47.7	-0.1	-0.1
732-GF-W	279527	6135647	59.8	56.7	59.8	56.7	60.2	57.1	0.0	0.0
732-GF-S	279539	6135643	50.5	47.4	50.4	47.3	50.8	47.7	-0.1	-0.1
733-GF-E	279551	6135660	49.2	46.1	49.2	46.2	49.7	46.6	0.0	0.1
733-GF-W	279526	6135658	58.3	55.2	58.4	55.3	58.8	55.7	0.1	0.1
733-GF-S	279539	6135654	50.6	47.5	50.5	47.4	50.9	47.9	-0.1	-0.1
734-GF-S	279536	6135664	47.5	44.5	47.5	44.4	48	44.9	0.0	-0.1
889-GF-NW	278906	6135900	54.3	51.2	54.3	51.2	54.7	51.6	0.0	0.0
889-F 1-NW	278906	6135900	55.7	52.6	55.6	52.5	56	53	-0.1	-0.1
889-GF-SE	278918	6135891	48.4	45.3	48.8	45.6	49.2	46.1	0.4	0.3
889-F 1-SE	278918	6135891	52.4	49.3	54	50.9	54.4	51.4	1.6	1.6
889-GF-SW	278910	6135892	42.2	39.1	42.1	39	42.5	39.5	-0.1	-0.1
889-F 1-SW	278910	6135892	47.5	44.4	47.3	44.1	47.7	44.6	-0.2	-0.3
890-GF-NW	278909	6135905	55.6	52.5	55.6	52.4	56	52.9	0.0	-0.1
890-F 1-NW	278909	6135905	56.9	53.8	56.9	53.7	57.3	54.2	0.0	-0.1
890-GF-SE	278922	6135896	47.9	44.8	48.3	45.2	48.7	45.6	0.4	0.4
890-F 1-SE	278922	6135896	53	49.9	54.5	51.4	55	51.9	1.5	1.5
891-GF-NW	278913	6135910	57.1	54	57	53.9	57.5	54.4	-0.1	-0.1
891-F 1-NW	278913	6135910	58.4	55.3	58.3	55.2	58.7	55.7	-0.1	-0.1
891-GF-SE	278926	6135901	48.2	45.1	48.5	45.4	48.9	45.9	0.3	0.3

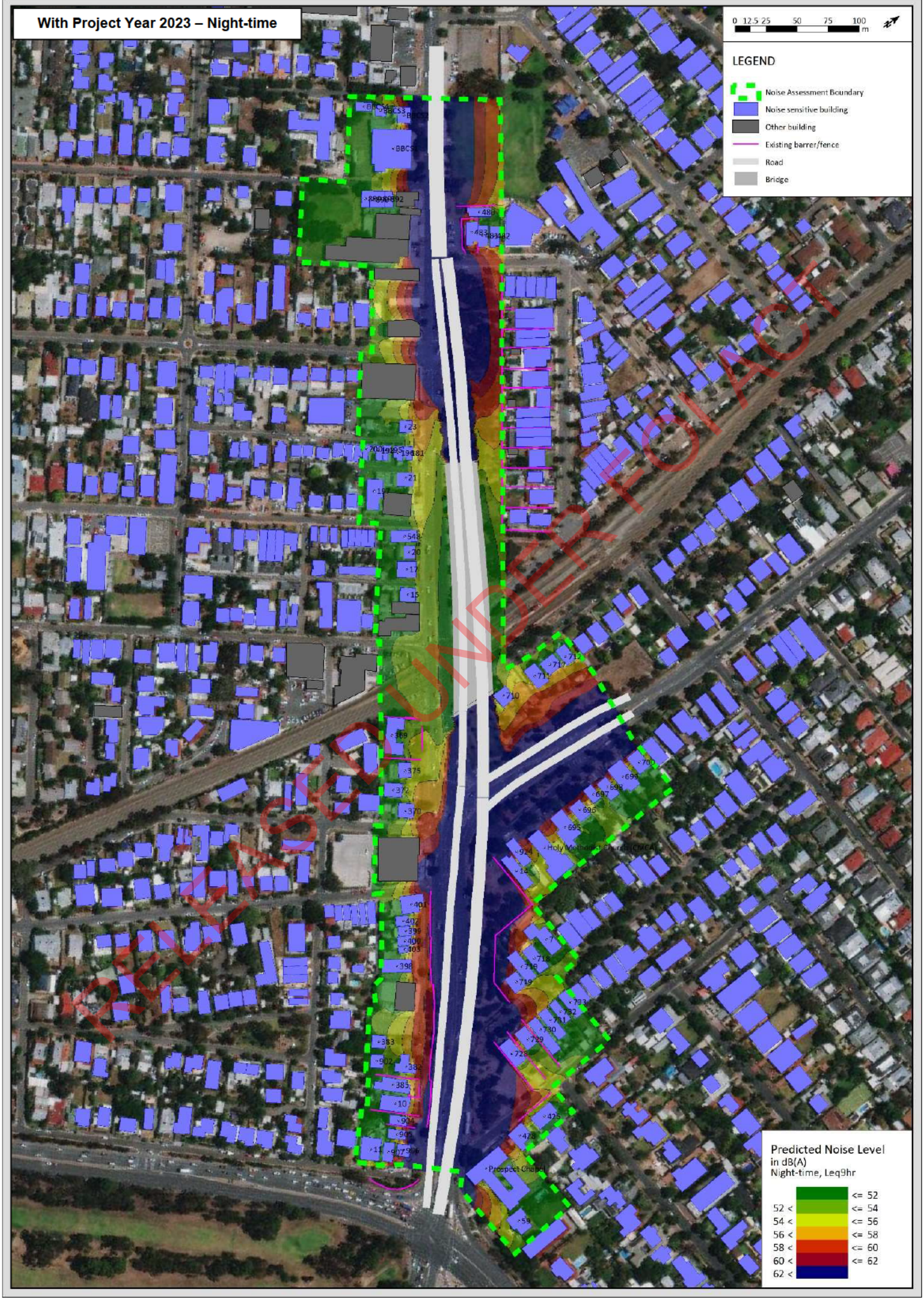
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
891-F 1-SE	278926	6135901	53.8	50.7	55.1	52	55.5	52.5	1.3	1.3
892-GF-NW	278917	6135915	58.9	55.8	58.8	55.7	59.2	56.1	-0.1	-0.1
892-F 1-NW	278917	6135915	60.2	57.1	60	56.9	60.4	57.4	-0.2	-0.2
892-GF-NE	278925	6135914	49.5	46.4	49.5	46.4	49.9	46.9	0.0	0.0
892-F 1-NE	278925	6135914	57.9	54.8	58.5	55.3	58.9	55.8	0.6	0.5
892-GF-SE	278929	6135906	49.1	46	49.3	46.2	49.7	46.6	0.2	0.2
892-F 1-SE	278929	6135906	55	51.9	56.2	53.1	56.6	53.6	1.2	1.2
902-GF-NE	279490	6135509	55.3	52.2	55.4	52.3	55.8	52.7	0.1	0.1
902-GF-NW	279481	6135508	54.9	51.8	54.9	51.9	55.4	52.3	0.0	0.1
902-GF-SW	279483	6135500	51.2	48.1	51.2	48.1	51.6	48.5	0.0	0.0
902-GF-SE	279491	6135501	52.4	49.3	52.5	49.4	52.9	49.8	0.1	0.1
904-GF-NW	279532	6135494	53.5	50.4	53.6	50.5	54.1	51	0.1	0.1
904-F 1-NW	279532	6135494	57.6	54.5	57.5	54.4	58	54.9	-0.1	-0.1
904-GF-NE	279541	6135497	62.4	59.3	63.1	60	63.5	60.5	0.7	0.7
904-F 1-NE	279541	6135497	67.6	64.5	68.2	65.1	68.6	65.5	0.6	0.6
904-GF-SE	279539	6135488	58	54.9	58.7	55.6	59.1	56	0.7	0.7
904-F 1-SE	279539	6135488	59.9	56.8	60.4	57.3	60.9	57.8	0.5	0.5
904-GF-SW	279530	6135485	45.5	42.4	45.6	42.5	46	42.9	0.1	0.1
904-F 1-SW	279530	6135485	50.2	47.1	50.3	47.2	50.7	47.6	0.1	0.1
905-GF-NW	279540	6135487	57	53.9	57.8	54.7	58.2	55.1	0.8	0.8
905-F 1-NW	279540	6135487	59.4	56.3	59.8	56.8	60.3	57.2	0.4	0.5
905-GF-NE	279549	6135490	64.9	61.8	65.6	62.5	66	62.9	0.7	0.7
905-F 1-NE	279549	6135490	67.8	64.6	68.5	65.4	68.9	65.8	0.7	0.8
905-GF-SE	279547	6135481	57.1	54	57.8	54.7	58.2	55.1	0.7	0.7
905-F 1-SE	279547	6135481	58.9	55.8	59.7	56.6	60.1	57.1	0.8	0.8
905-GF-SW	279538	6135478	45.4	42.3	45.5	42.4	45.9	42.8	0.1	0.1
905-F 1-SW	279538	6135478	50	46.9	50.1	47	50.5	47.4	0.1	0.1
906-GF-SW	279553	6135476	46.1	43	46.3	43.2	46.7	43.6	0.2	0.2
906-F 1-SW	279553	6135476	50.8	47.7	50.9	47.8	51.3	48.2	0.1	0.1
906-GF-NW	279553	6135485	62.9	59.8	63.7	60.6	64.1	61	0.8	0.8
906-F 1-NW	279553	6135485	65.4	62.3	66	62.9	66.4	63.3	0.6	0.6
906-GF-NE	279561	6135485	67.7	64.6	68.6	65.5	69	66	0.9	0.9
906-F 1-NE	279561	6135485	69.8	66.7	70.6	67.6	71.1	68	0.8	0.9
906-GF-SE	279562	6135477	63.4	60.3	64	60.9	64.4	61.3	0.6	0.6
906-F 1-SE	279562	6135477	65.2	62.1	65.7	62.6	66.1	63	0.5	0.5
907-GF-SW	279548	6135466	44.9	41.8	45	41.9	45.4	42.3	0.1	0.1
907-F 1-SW	279548	6135466	49.5	46.4	49.6	46.5	50	46.9	0.1	0.1
907-GF-NW	279545	6135476	55.7	52.6	56.7	53.6	57.1	54.1	1.0	1.0
907-F 1-NW	279545	6135476	57.7	54.6	58.4	55.3	58.8	55.7	0.7	0.7
907-GF-NE	279555	6135474	47.3	44.2	47.5	44.5	48	44.9	0.2	0.3
907-F 1-NE	279555	6135474	52.1	49	52.3	49.2	52.7	49.6	0.2	0.2
907-GF-SE	279558	6135464	60	56.9	60.3	57.2	60.7	57.6	0.3	0.3
907-F 1-SE	279558	6135464	62.2	59.1	62.3	59.2	62.7	59.6	0.1	0.1
924-GF-N	279414	6135699	61.4	58.4	62.3	59.2	62.7	59.6	0.9	0.8
924-GF-E	279427	6135695	50.6	47.5	50.9	47.8	51.3	48.2	0.3	0.3
924-GF-S	279415	6135689	61	57.9	60.8	57.7	61.3	58.2	-0.2	-0.2
924-GF-W	279401	6135694	67.9	64.9	68.4	65.3	68.9	65.8	0.5	0.4
BBCS1-GF-NE	278903	6135923	57.8	54.7	58	54.8	58.4	55.3	0.2	0.1
BBCS1-GF-SE	278908	6135931	60.6	57.5	60.6	57.5	61	58	0.0	0.0
BBCS1-GF-NE	278901	6135949	68.8	65.7	69.1	66	69.5	66.5	0.3	0.3
BBCS1-GF-NW	278877	6135946	56.1	53	56.3	53.2	56.7	53.6	0.2	0.2
BBCS1-GF-SW	278880	6135923	40.3	37.2	40.2	37.1	40.6	37.6	-0.1	-0.1
BBCS1-GF-SE	278893	6135916	41.1	38	40.9	37.8	41.4	38.3	-0.2	-0.2
BBCS1-GF-SW	278895	6135915	41.4	38.3	41.2	38.1	41.6	38.5	-0.2	-0.2
BBCS1-GF-SE	278902	6135917	56.5	53.4	56.7	53.6	57.1	54	0.2	0.2
BBCS2-GF-NE	278878	6135965	68.3	65.2	68.7	65.5	69.1	66	0.4	0.3
BBCS2-GF-NW	278867	6135962	62.1	59	62.3	59.2	62.7	59.7	0.2	0.2
BBCS2-GF-SW	278866	6135954	47.1	44	47.1	44	47.6	44.5	0.0	0.0
BBCS2-GF-SE	278870	6135954	47.9	44.8	48	44.9	48.4	45.4	0.1	0.1
BBCS2-GF-SW	278873	6135953	47.5	44.4	47.4	44.3	47.8	44.8	-0.1	-0.1
BBCS2-GF-SE	278880	6135955	60.8	57.7	61	57.9	61.4	58.3	0.2	0.2
BBCS3-GF-NE	278864	6135950	51.2	48.1	51.3	48.2	51.7	48.6	0.1	0.1
BBCS3-GF-NW	278857	6135950	56.8	53.7	57	53.8	57.4	54.3	0.2	0.1
BBCS3-GF-SW	278857	6135942	45.2	42.1	45.1	41.9	45.5	42.4	-0.1	-0.2
BBCS3-GF-SE	278865	6135943	50.1	47	50.1	47	50.6	47.5	0.0	0.0
HMC-GF-E	279450	6135720	49.4	46.3	49.3	46.2	49.8	46.7	-0.1	-0.1
HMC-GF-N	279442	6135726	54.8	51.7	55.7	52.6	56.1	53	0.9	0.9
HMC-GF-W	279435	6135723	56.3	53.2	57.1	54	57.5	54.4	0.8	0.8
HMC-GF-N	279434	6135723	56.6	53.5	57	53.9	57.5	54.4	0.4	0.4
HMC-GF-N	279430	6135721	57.3	54.2	57.7	54.6	58.1	55.1	0.4	0.4
HMC-GF-N	279420	6135720	59.9	56.8	60.1	57	60.5	57.5	0.2	0.2

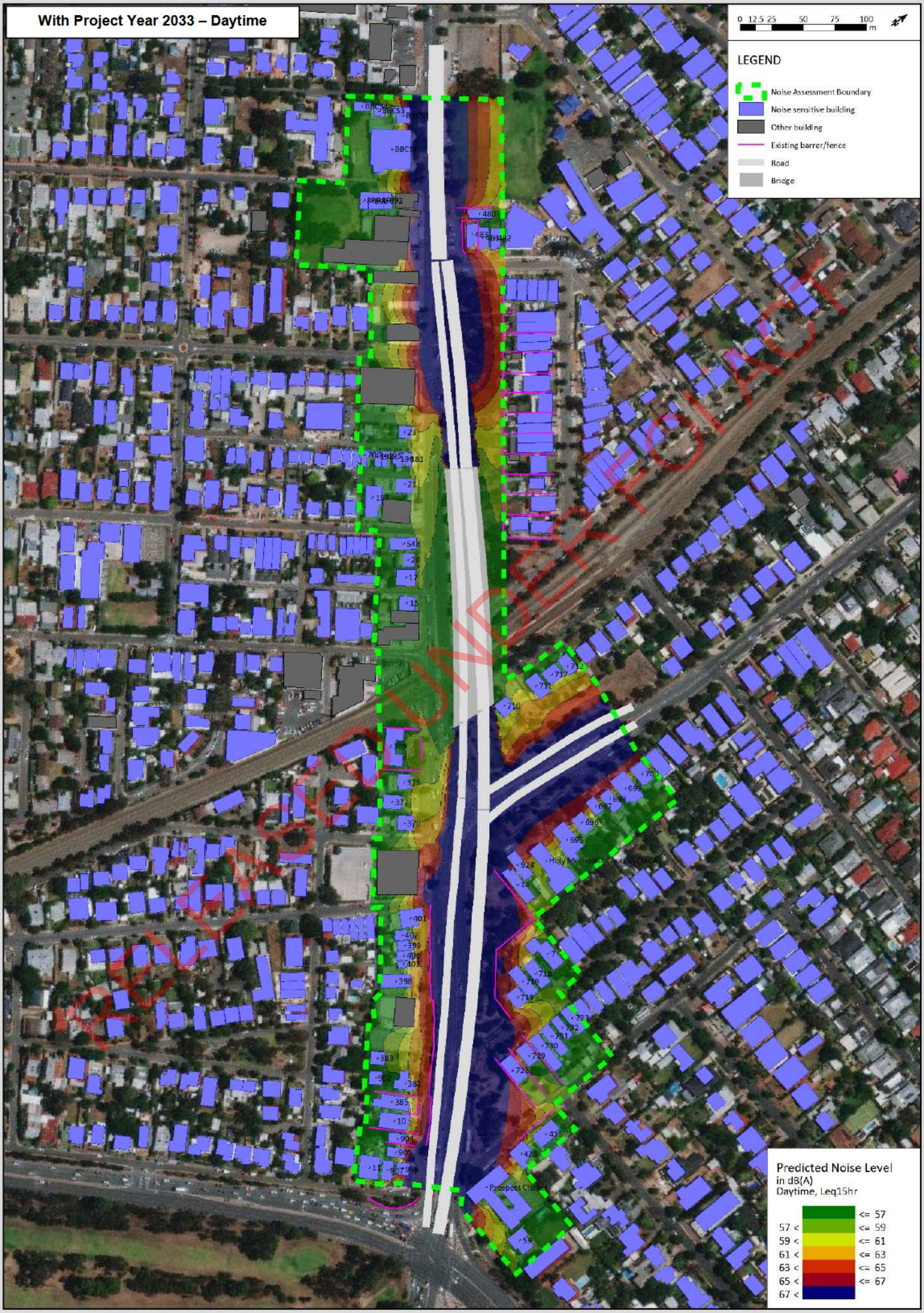
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)							
			Without Project 2022		With Project 2023		With Project 2033		Project Difference (with project 2023 – without project 2022)	
	Easting, m	Northing, m	Day	Night	Day	Night	Day	Night	Day	Night
HMC-GF-W	279408	6135715	65.9	62.8	66	62.9	66.4	63.4	0.1	0.1
HMC-GF-W	279408	6135709	65.8	62.7	65.9	62.8	66.3	63.2	0.1	0.1
HMC-GF-S	279421	6135707	59.2	56.1	59.8	56.7	60.2	57.1	0.6	0.6
HMC-GF-S	279432	6135708	56.9	53.9	57.6	54.5	58.1	55	0.7	0.6
HMC-GF-S	279435	6135707	56.7	53.6	57.5	54.4	57.9	54.8	0.8	0.8
HMC-GF-W	279437	6135706	56.6	53.6	57.4	54.3	57.8	54.8	0.8	0.7
HMC-GF-S	279444	6135704	56.4	53.3	57.1	54	57.5	54.4	0.7	0.7
HMC-GF-E	279450	6135710	50.8	47.7	50.9	47.8	51.3	48.2	0.1	0.1
PC-GF-N	279604	6135547	62.9	59.8	62.2	59.1	62.6	59.5	-0.7	-0.7
PC-GF-W	279598	6135542	67.6	64.5	67.1	64	67.6	64.5	-0.5	-0.5
PC-GF-W	279599	6135524	69.7	66.6	68.9	65.8	69.3	66.3	-0.8	-0.8
PC-GF-S	279608	6135510	68.7	65.6	67.1	64	67.5	64.4	-1.6	-1.6
PC-GF-E	279614	6135516	58.3	55.2	53.9	50.8	54.3	51.2	-4.4	-4.4
PC-GF-S	279620	6135520	60.6	57.5	58.3	55.2	58.8	55.7	-2.3	-2.3
PC-GF-S	279637	6135521	59.5	56.4	58.3	55.2	58.7	55.6	-1.2	-1.2
PC-GF-E	279647	6135528	39.1	36	38.7	35.6	39.2	36.1	-0.4	-0.4
PC-GF-E	279644	6135534	39.1	36	38.7	35.6	39.1	36	-0.4	-0.4
PC-GF-E	279644	6135540	39.1	36	38.8	35.7	39.2	36.1	-0.3	-0.3
PC-GF-N	279629	6135546	56	52.9	55.5	52.4	55.9	52.8	-0.5	-0.5
PC-GF-W	279615	6135539	43	39.9	42.6	39.5	43.1	40	-0.4	-0.4
PC-GF-S	279625	6135534	43	39.9	42.7	39.6	43.2	40.1	-0.3	-0.3
PC-GF-W	279632	6135534	42.5	39.4	42.3	39.2	42.7	39.6	-0.2	-0.2
PC-GF-N	279623	6135531	42.3	39.2	42	38.9	42.5	39.4	-0.3	-0.3
PC-GF-E	279612	6135538	42	38.9	41.5	38.4	42	38.9	-0.5	-0.5
						Any Receiver	**Maximum**		1.6	1.6
							Minimum		-12.6	-12.6

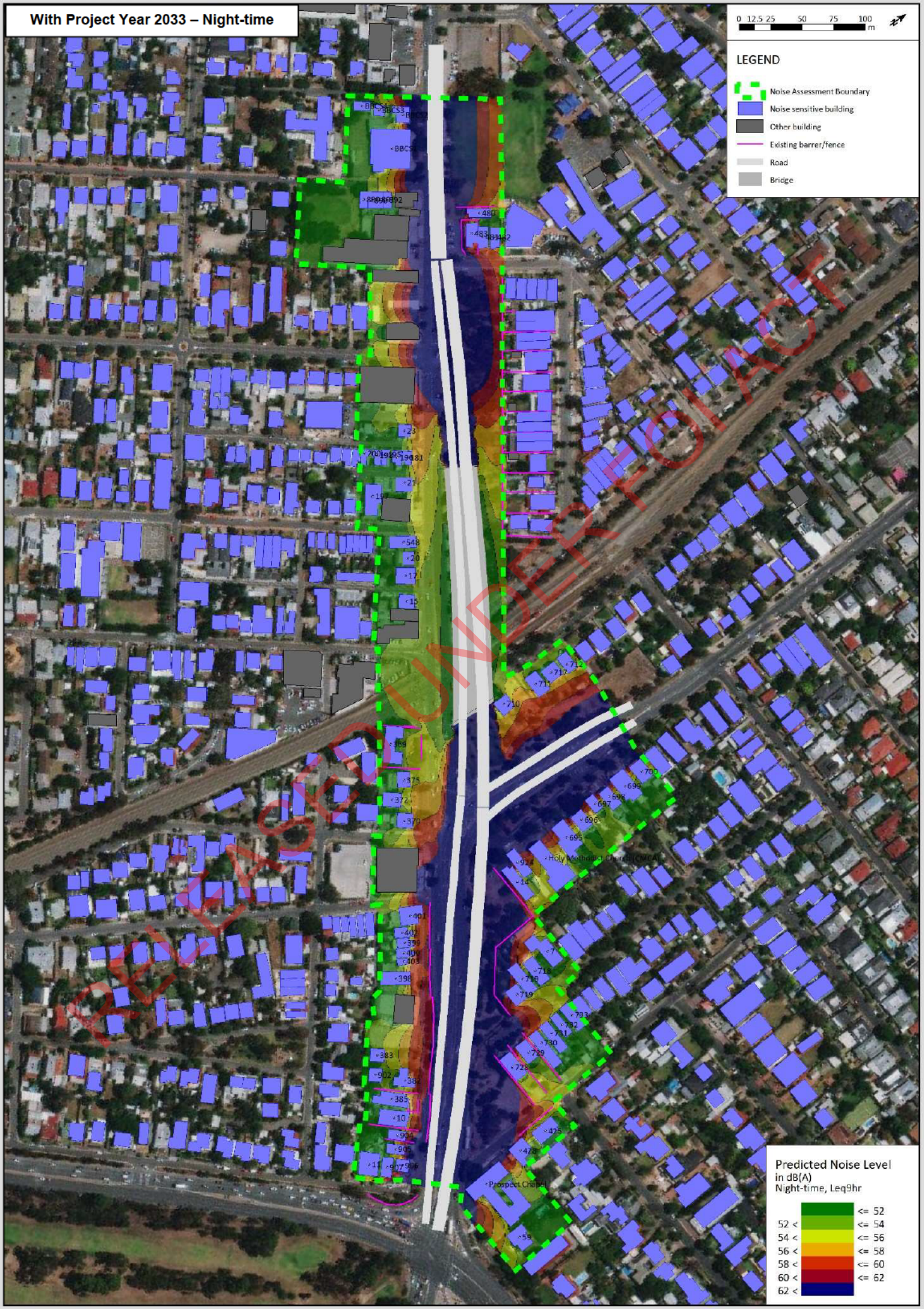

Without Project Year 2022 - Daytime
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Predicted Noise Level in dB(A) Daytime, Leq15hr
<= 57
57 < <= 59
59 < <= 61
61 < <= 63
63 < <= 65
65 < <= 67
67 <
RELEASED UNDER FOI ACT

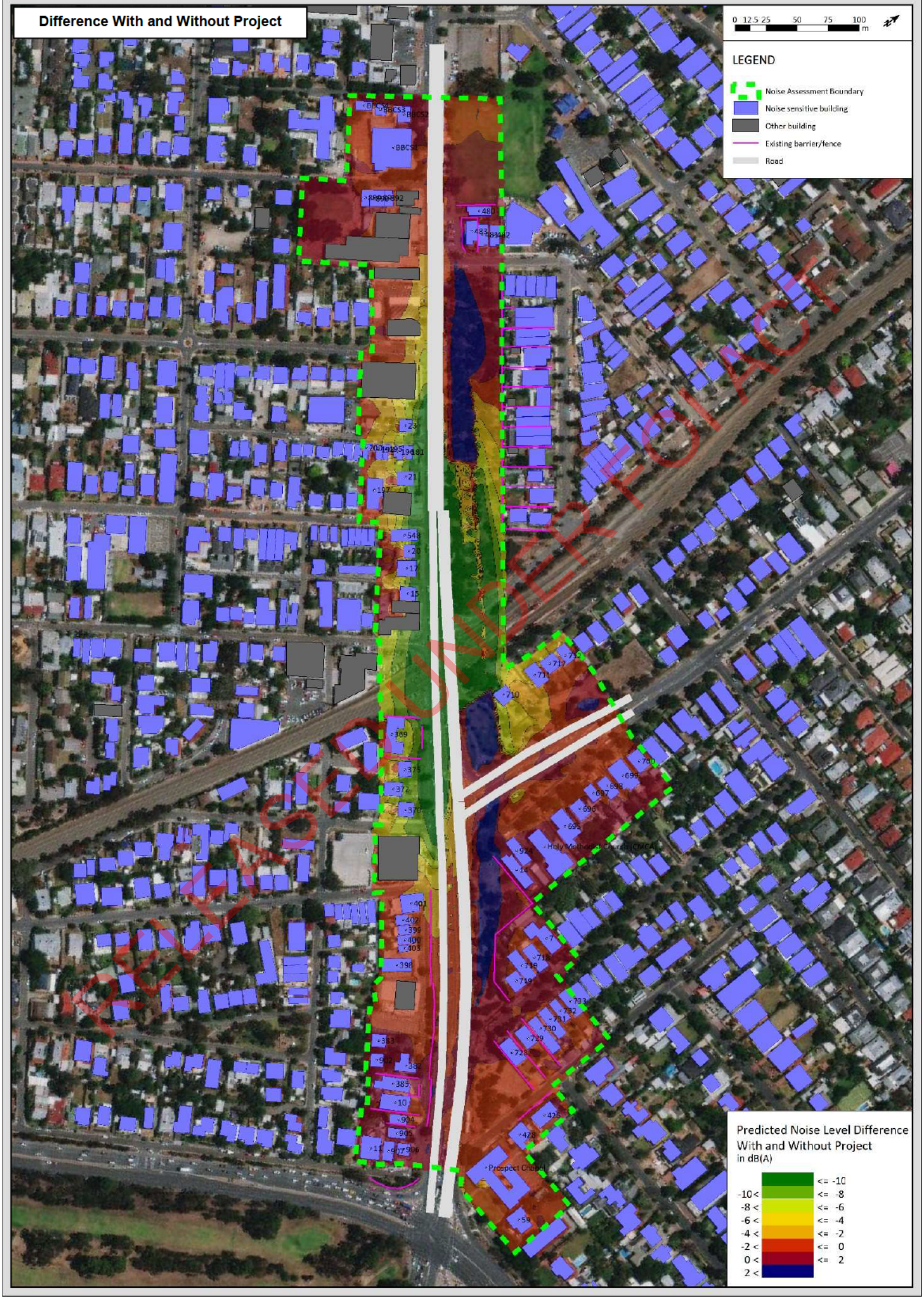

Without Project Year 2022 – Night-time
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Holy Mothers Church (CMCA)
Prospect Chapel
Predicted Noise Level in dB(A) Night-time, Leq9hr
<= 52
52 < <= 54
54 < <= 56
56 < <= 58
58 < <= 60
60 < <= 62
62 <
RELEASED UNDER FOI ACT


With Project Year 2023 – Daytime
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Bridge
Predicted Noise Level
in dB(A)
Daytime, Leq15hr
<= 57
57 < <= 59
59 < <= 61
61 < <= 63
63 < <= 65
65 < <= 67
67 <
RELEASED UNDER FOI ACT


With Project Year 2023 – Night-time
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Bridge
Predicted Noise Level in dB(A) Night-time, Leq9hr
<= 52
52 < <= 54
54 < <= 56
56 < <= 58
58 < <= 60
60 < <= 62
62 <
Holy Motherhood Church (CMCA)
Prospect Chapel
RELEASED UNDER FOI ACT


With Project Year 2033 – Daytime
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Bridge
Predicted Noise Level in dB(A) Daytime, Leq15hr
<= 57
57 < <= 59
59 < <= 61
61 < <= 63
63 < <= 65
65 < <= 67
67 <
RELEASED UNDER FOI ACT


With Project Year 2033 – Night-time
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Bridge
Predicted Noise Level in dB(A)
Night-time, Leq9hr
<= 52
52 < <= 54
54 < <= 56
56 < <= 58
58 < <= 60
60 < <= 62
62 <
Holy Methodist Church (CMCA)
Prospect Chapel
RELEASED UNDER FOI ACT


Difference With and Without Project
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Predicted Noise Level Difference With and Without Project in dB(A)
<= -10
-10 < <= -8
-8 < <= -6
-6 < <= -4
-4 < <= -2
-2 < <= 0
0 < <= 2
2 <
RELEASED UNDER FOI ACT

Appendix E: Eligibility for Consideration of Property Treatment and FTP

Table 23: Determination of Eligibility for Consideration of Property Treatment and FTP.

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
7-GF-E	279479	6135664	50.2	49.9	62.2	55	0	50.3	-4.7	0
7-F 1-E	279479	6135664	54.5	54.4	66.5	55	0	54.8	-0.2	0
7-GF-S	279482	6135666	52.8	52.1	64.8	55	0	52.5	-2.5	0
7-F 1-S	279482	6135666	56.6	56.1	68.6	55	0	56.6	1.6	0
7-GF-S	279492	6135667	48.5	48.4	60.5	55	0	48.8	-6.2	0
7-F 1-S	279492	6135667	53.7	53.5	65.7	55	0	53.9	-1.1	0
7-GF-E	279498	6135672	45.3	45.4	57.3	55	0	45.8	-9.2	0
7-F 1-E	279498	6135672	50.7	50.9	62.7	55	0	51.3	-3.7	0
7-GF-E	279498	6135677	45.7	45.8	57.7	55	0	46.2	-8.8	0
7-F 1-E	279498	6135677	50.4	50.7	62.4	55	0	51.1	-3.9	0
7-GF-N	279491	6135680	47.9	49.3	59.9	55	0	49.8	-5.2	0
7-F 1-N	279491	6135680	52	52.4	64	55	0	52.8	-2.2	0
7-GF-N	279480	6135679	50.4	51.4	62.4	55	0	51.8	-3.2	0
7-F 1-N	279480	6135679	54.7	54.7	66.7	55	0	55.1	0.1	0
7-GF-W	279474	6135675	52.7	53.4	64.7	55	0	53.8	-1.2	0
7-F 1-W	279474	6135675	57.4	57.4	69.4	55	0	57.9	2.9	0
7-GF-N	279471	6135672	52.7	53.6	64.7	55	0	54.1	-0.9	0
7-F 1-N	279471	6135672	57	57.2	69	55	0	57.6	2.6	0
7-GF-W	279467	6135666	60	60	72	55	1	60.4	5.4	1
7-F 1-W	279467	6135666	63.3	63.7	75.3	55	1	64.1	9.1	2
7-GF-S	279473	6135660	59.1	58.7	71.1	55	0	59.1	4.1	0
7-F 1-S	279473	6135660	63	62.9	75	55	1	63.3	8.3	2
10-GF-NE	279533	6135503	57	57.3	69	55	0	57.7	2.7	0
10-F 1-NE	279533	6135503	63.6	64.1	75.6	55	1	64.5	9.5	2
10-GF-NE	279532	6135504	56.6	56.8	68.6	55	0	57.3	2.3	0
10-F 1-NE	279532	6135504	62.8	63.2	74.8	55	1	63.6	8.6	2
10-GF-NE	279529	6135508	57.9	58.2	69.9	55	0	58.6	3.6	0
10-F 1-NE	279529	6135508	64.5	64.8	76.5	55	1	65.2	10.2	3
10-GF-NW	279517	6135502	49.3	49.3	61.3	55	0	49.7	-5.3	0
10-F 1-NW	279517	6135502	54.1	54.1	66.1	55	0	54.5	-0.5	0
10-GF-SW	279514	6135487	41.8	41.9	53.8	55	0	42.3	-12.7	0
10-F 1-SW	279514	6135487	46.7	46.7	58.7	55	0	47.2	-7.8	0
10-GF-SE	279528	6135492	47.3	47.5	59.3	55	0	47.9	-7.1	0
10-F 1-SE	279528	6135492	51.7	51.8	63.7	55	0	52.2	-2.8	0
11-GF-NE	279547	6135466	41.8	41.8	53.8	55	0	42.3	-12.7	0
11-GF-NW	279534	6135467	49.8	50.6	61.8	55	0	51	-4.0	0
11-GF-SW	279535	6135454	45.4	46.1	57.4	55	0	46.5	-8.5	0
11-GF-SE	279549	6135453	53.8	53.8	65.8	55	0	54.2	-0.8	0
13-GF-W	279674	6135533	45.2	45.4	57.2	55	0	45.8	-9.2	0
14-GF-S	279440	6135680	54.3	54.6	66.3	55	0	55	0.0	0
14-GF-E	279443	6135686	50.6	51	62.6	55	0	51.5	-3.5	0
14-GF-N	279427	6135690	51.8	52.7	63.8	55	0	53.1	-1.9	0
14-GF-W	279412	6135687	60.9	61.9	72.9	55	1	62.3	7.3	2
14-GF-N	279412	6135686	60.9	62	72.9	55	1	62.5	7.5	2
14-GF-W	279410	6135682	64.9	66.2	76.9	55	1	66.6	11.6	3
14-GF-S	279424	6135679	59	59.5	71	55	0	59.9	4.9	0
15-GF-NE	279197	6135746	65.3	52.8	77.3	55	0	53.3	-1.7	0
15-GF-NW	279188	6135744	58.9	49.5	70.9	55	0	49.9	-5.1	0
15-GF-SW	279189	6135735	46.4	45.4	58.4	55	0	45.9	-9.1	0
17-GF-NE	279181	6135758	66.2	53.7	78.2	55	0	54.2	-0.8	0
17-GF-NW	279170	6135756	54.1	47.6	66.1	55	0	48.1	-6.9	0
17-GF-SW	279171	6135744	46.3	45.5	58.3	55	0	46	-9.0	0
17-GF-SE	279182	6135747	58.3	49.8	70.3	55	0	50.3	-4.7	0
20-GF-NE	279169	6135766	65.8	53.2	77.8	55	0	53.7	-1.3	0
20-GF-NW	279161	6135765	56.7	47.8	68.7	55	0	48.3	-6.7	0
20-GF-SW	279162	6135757	46.2	45.4	58.2	55	0	45.8	-9.2	0
20-GF-SE	279171	6135758	55.6	47.7	67.6	55	0	48.2	-6.8	0
21-GF-NE	279120	6135798	66.6	55.3	78.6	55	0	55.8	0.8	0
21-GF-NW	279110	6135796	59.9	50.9	71.9	55	0	51.3	-3.7	0
21-GF-SW	279111	6135786	45.9	45.3	57.9	55	0	45.7	-9.3	0
21-GF-SE	279121	6135788	59.2	50.4	71.2	55	0	50.9	-4.1	0
23-GF-NE	279084	6135822	66.3	57	78.3	55	0	57.5	2.5	0
23-GF-NW	279076	6135820	60.7	54.4	72.7	55	0	54.9	-0.1	0
23-GF-SW	279077	6135812	46.3	45.6	58.3	55	0	46.1	-8.9	0
23-GF-SE	279086	6135813	60.4	51.8	72.4	55	0	52.3	-2.7	0
59-GF-N	279653	6135533	40	39.5	52	55	0	39.9	-15.1	0
59-GF-W	279648	6135528	38.1	37.6	50.1	55	0	38	-17 0	0
59-GF-W	279649	6135520	56.2	55.1	68.2	55	0	55.5	0.5	0

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
59-GF-S	279653	6135516	56.3	55.2	68.3	55	0	55.6	0.6	0
59-GF-S	279658	6135516	55.5	54.4	67.5	55	0	54.8	-0.2	0
59-GF-E	279662	6135518	41.7	41.3	53.7	55	0	41.7	-13 3	0
59-GF-S	279664	6135518	52.1	50.7	64.1	55	0	51.1	-3.9	0
59-GF-E	279668	6135522	41.1	40.7	53.1	55	0	41.1	-13 9	0
59-GF-E	279668	6135528	41	40.7	53	55	0	41.1	-13 9	0
59-GF-N	279662	6135532	41.5	41.2	53.5	55	0	41.6	-13.4	0
59-GF-E	279658	6135531	41.1	40.6	53.1	55	0	41	-14 0	0
121-GF-NE	279026	6135810	44.1	44.1	56.1	55	0	44.6	-10.4	0
181-GF-NE	279102	6135810	66.4	55.8	78.4	55	0	56.3	1.3	0
181-F 1-NE	279102	6135810	67.3	58.5	79.3	55	0	59	4.0	0
181-GF-NW	279095	6135810	61.8	53.2	73.8	55	0	53.7	-1.3	0
181-F 1-NW	279095	6135810	63.1	56.7	75.1	55	0	57.2	2.2	0
181-GF-SE	279101	6135801	54.2	47.1	66.2	55	0	47.5	-7.5	0
181-F 1-SE	279101	6135801	56.7	50.5	68.7	55	0	50.9	-4.1	0
181-GF-SW	279101	6135801	53.5	46.7	65.5	55	0	47.2	-7.8	0
181-F 1-SW	279101	6135801	56.2	50.2	68.2	55	0	50.6	-4.4	0
181-GF-SE	279105	6135803	62.1	51.8	74.1	55	0	52.3	-2.7	0
181-F 1-SE	279105	6135803	63.5	54.2	75.5	55	0	54.7	-0.3	0
195-GF-NE	279093	6135792	49.9	47.3	61.9	55	0	47.8	-7.2	0
195-F 1-NE	279093	6135792	53.1	51.2	65.1	55	0	51.6	-3.4	0
195-GF-SE	279092	6135794	45.4	45.4	57.4	55	0	45.9	-9.1	0
195-F 1-SE	279092	6135794	50.5	49.8	62.5	55	0	50.2	-4.8	0
195-GF-NE	279090	6135798	43	42.1	55	55	0	42.6	-12.4	0
195-F 1-NE	279090	6135798	47	46.5	59	55	0	47	-8.0	0
195-GF-NW	279084	6135797	54.3	49.2	66.3	55	0	49.7	-5.3	0
195-F 1-NW	279084	6135797	55.9	53.3	67.9	55	0	53.8	-1.2	0
195-GF-SE	279095	6135787	53.2	49.1	65.2	55	0	49.5	-5.5	0
195-F 1-SE	279095	6135787	55.3	52.2	67.3	55	0	52.7	-2.3	0
196-GF-NW	279090	6135803	57.4	50.1	69.4	55	0	50.6	-4.4	0
196-F 1-NW	279090	6135803	58.9	54.3	70.9	55	0	54.8	-0.2	0
196-GF-SW	279091	6135796	42.8	42.2	54.8	55	0	42.6	-12.4	0
196-F 1-SW	279091	6135796	47.1	46.5	59.1	55	0	47	-8.0	0
196-GF-SE	279097	6135795	45.7	45.6	57.7	55	0	46.1	-8.9	0
196-F 1-SE	279097	6135795	51.5	50.3	63.5	55	0	50.7	-4.3	0
196-GF-SW	279098	6135795	44.9	44.3	56.9	55	0	44.8	-10 2	0
196-F 1-SW	279098	6135795	50.9	49.2	62.9	55	0	49.7	-5.3	0
196-GF-SE	279101	6135796	57.3	49.9	69.3	55	0	50.4	-4.6	0
196-F 1-SE	279101	6135796	59.1	53.1	71.1	55	0	53.6	-1.4	0
197-GF-NE	279120	6135764	48.6	49.1	60.6	55	0	49.5	-5.5	0
197-GF-SE	279117	6135767	47.4	47.5	59.4	55	0	48	-7.0	0
197-GF-NE	279112	6135774	52.3	49.8	64.3	55	0	50.3	-4.7	0
197-GF-NW	279101	6135773	50.1	47.7	62.1	55	0	48.2	-6.8	0
197-GF-SW	279107	6135759	43.8	43.6	55.8	55	0	44.1	-10 9	0
197-GF-SE	279121	6135756	49.5	48.9	61.5	55	0	49.3	-5.7	0
198-GF-NW	279080	6135791	52.6	48.9	64.6	55	0	49.4	-5.6	0
198-F 1-NW	279080	6135791	54.3	52.4	66.3	55	0	52.9	-2.1	0
198-GF-SW	279080	6135785	43	42.5	55	55	0	42.9	-12.1	0
198-F 1-SW	279080	6135785	48.8	47.9	60.8	55	0	48.4	-6.6	0
198-GF-SE	279084	6135784	40.3	39.9	52.3	55	0	40.3	-14.7	0
198-F 1-SE	279084	6135784	45.7	45.2	57.7	55	0	45.7	-9.3	0
198-GF-SW	279086	6135783	41.3	40.9	53.3	55	0	41.4	-13.6	0
198-F 1-SW	279086	6135783	48.1	47.4	60.1	55	0	47.8	-7.2	0
198-GF-SE	279091	6135783	51.9	48.9	63.9	55	0	49.3	-5.7	0
198-F 1-SE	279091	6135783	54.3	52.1	66.3	55	0	52.5	-2.5	0
200-GF-NE	279083	6135779	45.9	46.8	57.9	55	0	47.3	-7.7	0
200-F 1-NE	279083	6135779	51.2	51	63.2	55	0	51.4	-3.6	0
200-GF-SE	279082	6135781	44.4	44.9	56.4	55	0	45.4	-9.6	0
200-F 1-SE	279082	6135781	50.2	49.8	62.2	55	0	50.3	-4.7	0
200-GF-NE	279080	6135785	39.1	38.6	51.1	55	0	39	-16 0	0
200-F 1-NE	279080	6135785	43.2	42.7	55.2	55	0	43.2	-11 8	0
200-GF-NW	279075	6135784	51.6	49.1	63.6	55	0	49.6	-5.4	0
200-F 1-NW	279075	6135784	53.2	52	65.2	55	0	52.4	-2.6	0
200-GF-SE	279085	6135774	49.9	48.4	61.9	55	0	48.9	-6.1	0
200-F 1-SE	279085	6135774	53.2	51.9	65.2	55	0	52.4	-2.6	0
369-GF-SE	279279	6135672	58.5	51.8	70.5	55	0	52.3	-2.7	0
369-GF-NE	279278	6135679	60.5	53.3	72.5	55	0	53.7	-1.3	0
369-GF-NW	279268	6135676	58.8	50.4	70.8	55	0	50.9	-4.1	0
369-GF-SW	279275	6135660	46.2	45.3	58.2	55	0	45.7	-9.3	0
369-GF-SE	279292	6135657	54.1	49.2	66.1	55	0	49.6	-5.4	0
369-GF-NE	279293	6135667	59.7	52.8	71.7	55	0	53.2	-1.8	0
369-GF-NW	279286	6135667	56.4	50.5	68.4	55	0	51	-4.0	0
369-GF-NE	279282	6135668	58	51.2	70	55	0	51.7	-3.3	0

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
370-GF-NE	279339	6135645	66.1	57.2	78.1	55	0	57.7	2.7	0
370-GF-NW	279329	6135644	62.2	53.1	74.2	55	0	53.6	-1.4	0
370-GF-SW	279330	6135634	47.5	46.1	59.5	55	0	46.5	-8.5	0
370-GF-SE	279340	6135635	60.2	53	72.2	55	0	53.5	-1.5	0
371-GF-NE	279318	6135626	55.3	49.9	67.3	55	0	50.3	-4.7	0
371-F 1-NE	279318	6135626	58.1	54.5	70.1	55	0	54.9	-0.1	0
372-GF-NE	279320	6135647	62.6	53.7	74.6	55	0	54.2	-0.8	0
372-GF-NW	279310	6135644	56.9	50.3	68.9	55	0	50.8	-4.2	0
372-GF-SW	279310	6135634	46.5	45.5	58.5	55	0	46	-9.0	0
372-GF-SE	279320	6135636	55.6	49.5	67.6	55	0	49.9	-5.1	0
375-GF-NE	279311	6135662	64.2	55.3	76.2	55	0	55.8	0.8	0
375-GF-NW	279301	6135661	58.2	51.2	70.2	55	0	51.6	-3.4	0
375-GF-SW	279304	6135652	47.5	46.3	59.5	55	0	46.7	-8.3	0
375-GF-SE	279313	6135653	62.1	53.5	74.1	55	0	54	-1.0	0
382-GF-NW	279494	6135527	56.7	57	68.7	55	0	57.4	2.4	0
382-GF-SW	279495	6135521	49.9	50.1	61.9	55	0	50.6	-4.4	0
382-GF-NW	279496	6135518	50.6	50.9	62.6	55	0	51.3	-3.7	0
382-GF-SW	279498	6135513	48.9	49.1	60.9	55	0	49.5	-5.5	0
382-GF-SE	279508	6135517	52.5	52.7	64.5	55	0	53.1	-1.9	0
382-GF-NE	279510	6135528	58	58	70	55	0	58.4	3.4	0
382-GF-NW	279504	6135528	57	57.1	69	55	0	57.5	2.5	0
382-GF-NE	279501	6135528	57.6	57.7	69.6	55	0	58.1	3.1	0
383-GF-NE	279479	6135520	53.7	53.7	65.7	55	0	54.2	-0.8	0
383-GF-NW	279470	6135518	52.3	52.3	64.3	55	0	52.7	-2.3	0
383-GF-SW	279470	6135509	46.3	46.4	58.3	55	0	46.8	-8.2	0
383-GF-SE	279479	6135511	49.7	49.8	61.7	55	0	50.2	-4.8	0
385-GF-NW	279506	6135509	52.7	52.8	64.7	55	0	53.2	-1.8	0
385-F 1-NW	279506	6135509	58.4	58.8	70.4	55	0	59.2	4.2	0
385-GF-SW	279500	6135499	48.5	48.9	60.5	55	0	49.3	-5.7	0
385-F 1-SW	279500	6135499	51.9	52.7	63.9	55	0	53.2	-1.8	0
385-GF-NW	279500	6135497	49.8	50.1	61.8	55	0	50.6	-4.4	0
385-F 1-NW	279500	6135497	53.3	54	65.3	55	0	54.4	-0.6	0
385-GF-SW	279500	6135491	44.9	45.4	56.9	55	0	45.8	-9.2	0
385-F 1-SW	279500	6135491	49	49.9	61	55	0	50.3	-4.7	0
385-GF-SE	279514	6135499	45.7	45.8	57.7	55	0	46.2	-8.8	0
385-F 1-SE	279514	6135499	49.6	49.6	61.6	55	0	50.1	-4.9	0
385-GF-NE	279521	6135514	55.4	55.6	67.4	55	0	56	1.0	0
385-F 1-NE	279521	6135514	62.2	62.3	74.2	55	1	62.8	7.8	2
385-GF-NW	279516	6135515	55	55.1	67	55	0	55.5	0.5	0
385-F 1-NW	279516	6135515	61.4	61.5	73.4	55	1	61.9	6.9	2
385-GF-NE	279515	6135515	55	55.2	67	55	0	55.6	0.6	0
385-F 1-NE	279515	6135515	61.4	61.5	73.4	55	1	62	7.0	2
398-GF-NE	279440	6135572	58.3	58	70.3	55	0	58.5	3.5	0
398-F 1-NE	279440	6135572	63.4	63.2	75.4	55	1	63.7	8.7	2
398-GF-NW	279428	6135565	52.2	51.9	64.2	55	0	52.3	-2.7	0
398-F 1-NW	279428	6135565	58.1	58.4	70.1	55	0	58.8	3.8	0
398-GF-SE	279438	6135558	50.6	50.5	62.6	55	0	50.9	-4.1	0
398-F 1-SE	279438	6135558	54.6	54.5	66.6	55	0	55	0.0	0
399-GF-NE	279419	6135590	59	58.3	71	55	0	58.7	3.7	0
399-GF-NW	279414	6135589	56.1	55.5	68.1	55	0	55.9	0.9	0
399-GF-NE	279414	6135589	55.3	54.6	67.3	55	0	55	0.0	0
399-GF-SW	279410	6135578	48	47.5	60	55	0	47.9	-7.1	0
400-GF-NE	279426	6135586	59.2	58.7	71.2	55	0	59.1	4.1	0
400-GF-NW	279422	6135585	56.9	56.5	68.9	55	0	56.9	1.9	0
400-GF-NE	279421	6135585	56.3	55.8	68.3	55	0	56.2	1.2	0
400-GF-SW	279417	6135572	47.8	47.3	59.8	55	0	47.7	-7.3	0
401-GF-NE	279405	6135604	57.9	57.1	69.9	55	0	57.5	2.5	0
401-GF-SE	279403	6135606	57.4	56.6	69.4	55	0	57	2.0	0
401-GF-NE	279401	6135611	64	61	76	55	1	61.4	6.4	2
401-GF-NW	279392	6135604	61.9	59.5	73.9	55	0	59.9	4.9	0
401-GF-SW	279394	6135591	48.4	47.7	60.4	55	0	48.2	-6.8	0
401-GF-SE	279405	6135595	54.6	53.9	66.6	55	0	54.4	-0.6	0
402-GF-NE	279412	6135594	58.1	57.4	70.1	55	0	57.8	2.8	0
402-GF-NW	279407	6135593	54.7	54	66.7	55	0	54.4	-0.6	0
402-GF-NE	279406	6135592	54.3	53.5	66.3	55	0	54	-1.0	0
402-GF-NW	279401	6135588	51.3	50.7	63.3	55	0	51.2	-3.8	0
402-GF-SW	279402	6135580	47.8	47.3	59.8	55	0	47.7	-7.3	0
403-GF-NE	279428	6135579	57.3	56.9	69.3	55	0	57.3	2.3	0
403-GF-SW	279423	6135569	47.5	47.1	59.5	55	0	47.5	-7.5	0
403-GF-SE	279429	6135572	53.9	53.6	65.9	55	0	54	-1.0	0
425-GF-N	279597	6135601	48.8	48.8	60.8	55	0	49.3	-5.7	0
425-GF-W	279593	6135589	57.6	57.5	69.6	55	0	57.9	2.9	0
425-GF-S	279601	6135579	53.6	53.4	65.6	55	0	53.9	-1.1	0

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
425-GF-E	279607	6135590	44.6	44.6	56.6	55	0	45	-10 0	0
425-GF-N	279604	6135600	44.4	44.4	56.4	55	0	44.8	-10 2	0
425-GF-E	279603	6135600	44.3	44.3	56.3	55	0	44.7	-10 3	0
428-GF-N	279599	6135573	54.3	54.2	66.3	55	0	54.6	-0.4	0
428-GF-W	279593	6135564	62.2	61.7	74.2	55	1	62.1	7.1	2
428-GF-S	279604	6135557	58.3	58.1	70.3	55	0	58.5	3.5	0
428-GF-E	279614	6135562	44.3	44.1	56.3	55	0	44.6	-10.4	0
428-GF-N	279610	6135565	45.3	45.2	57.3	55	0	45.7	-9.3	0
428-GF-E	279609	6135567	44.8	44.7	56.8	55	0	45.2	-9.8	0
428-GF-N	279606	6135571	45.1	45	57.1	55	0	45.4	-9.6	0
428-GF-E	279606	6135572	45.1	45	57.1	55	0	45.5	-9.5	0
480-GF-NE	278979	6135973	45.1	45.5	57.1	55	0	46	-9.0	0
480-GF-NW	278969	6135967	53.1	53.3	65.1	55	0	53.8	-1.2	0
480-GF-SW	278966	6135956	61.6	62	73.6	55	1	62.4	7.4	2
480-GF-SW	278969	6135956	60.1	60.3	72.1	55	1	60.8	5.8	2
480-GF-SW	278970	6135956	60.3	60.6	72.3	55	1	61.1	6.1	2
480-GF-SE	278977	6135962	51.4	51.5	63.4	55	0	52	-3.0	0
481-GF-SW	278993	6135948	58	58.5	70	55	0	59	4.0	0
481-GF-SE	278998	6135949	56.6	57	68.6	55	0	57.5	2.5	0
481-GF-SE	278999	6135952	56.4	56.5	68.4	55	0	57	2.0	0
481-GF-SE	278999	6135953	57.1	57.1	69.1	55	0	57.6	2.6	0
481-GF-NE	278993	6135960	49.3	47.2	61.3	55	0	47.6	-7.4	0
481-GF-NW	278983	6135961	47.6	47.8	59.6	55	0	48.3	-6.7	0
482-GF-SE	279004	6135960	56	55.7	68	55	0	56.2	1.2	0
482-GF-SE	279005	6135960	56.8	56.5	68.8	55	0	57	2.0	0
482-GF-NE	278999	6135967	48.5	46.2	60.5	55	0	46.6	-8.4	0
482-GF-NW	278989	6135969	47.3	47.4	59.3	55	0	47.9	-7.1	0
482-GF-SW	278994	6135959	48.3	46.5	60.3	55	0	47	-8.0	0
482-GF-SE	279003	6135957	57.3	57.2	69.3	55	0	57.7	2.7	0
483-GF-NW	278975	6135955	53	53.2	65	55	0	53.7	-1.3	0
483-GF-SW	278981	6135945	57.8	58.3	69.8	55	0	58.8	3.8	0
483-GF-SE	278991	6135942	58.7	59.4	70.7	55	0	59.9	4.9	0
483-GF-NE	278991	6135946	56.1	56.9	68.1	55	0	57.4	2.4	0
483-GF-SE	278991	6135948	56.8	57.3	68.8	55	0	57.8	2.8	0
548-GF-NE	279159	6135774	66.7	54.3	78.7	55	0	54.7	-0.3	0
548-F 1-NE	279159	6135774	67.3	56.1	79.3	55	0	56.6	1.6	0
548-GF-NW	279148	6135768	59	50.1	71	55	0	50.6	-4.4	0
548-F 1-NW	279148	6135768	60.9	52.7	72.9	55	0	53.2	-1.8	0
548-GF-SW	279146	6135755	44.2	43.8	56.2	55	0	44.2	-10 8	0
548-F 1-SW	279146	6135755	50.3	48.7	62.3	55	0	49.1	-5.9	0
548-GF-SE	279157	6135762	53.9	47	65.9	55	0	47.5	-7.5	0
548-F 1-SE	279157	6135762	57.7	52.8	69.7	55	0	53.3	-1.7	0
695-GF-N	279418	6135745	54.9	54.9	66.9	55	0	55.4	0.4	0
695-GF-W	279405	6135736	62.8	62.5	74.8	55	1	63	8.0	2
695-GF-S	279412	6135730	59.2	59	71.2	55	0	59.5	4.5	0
695-GF-W	279417	6135730	57.7	57.7	69.7	55	0	58.2	3.2	0
695-GF-S	279427	6135728	53.9	54.6	65.9	55	0	55	0.0	0
695-GF-E	279437	6135733	43.5	43.7	55.5	55	0	44.1	-10 9	0
695-GF-N	279433	6135737	44.9	45.1	56.9	55	0	45.6	-9.4	0
695-GF-E	279432	6135740	44.4	44.5	56.4	55	0	44.9	-10.1	0
696-GF-E	279423	6135755	45.3	45.4	57.3	55	0	45.8	-9.2	0
696-GF-N	279415	6135761	55.7	55.8	67.7	55	0	56.2	1.2	0
696-GF-W	279407	6135753	62.1	61.9	74.1	55	1	62.4	7.4	2
696-GF-S	279416	6135748	55	55.4	67	55	0	55.9	0.9	0
697-GF-E	279417	6135770	45.9	45.9	57.9	55	0	46.3	-8.7	0
697-GF-N	279409	6135775	56.6	56.5	68.6	55	0	56.9	1.9	0
697-GF-W	279402	6135769	62.8	62.5	74.8	55	1	63	8.0	2
697-GF-S	279410	6135765	58.6	58.6	70.6	55	0	59.1	4.1	0
698-GF-E	279423	6135784	45.5	45.5	57.5	55	0	45.9	-9.1	0
698-GF-N	279413	6135788	54.3	53.9	66.3	55	0	54.4	-0.6	0
698-GF-W	279404	6135782	62.4	62.2	74.4	55	1	62.7	7.7	2
698-GF-S	279414	6135777	53.4	53.4	65.4	55	0	53.8	-1.2	0
699-GF-E	279423	6135794	45.5	45.5	57.5	55	0	45.9	-9.1	0
699-GF-S	279424	6135795	46.1	46.1	58.1	55	0	46.5	-8.5	0
699-GF-E	279426	6135801	45.2	45.2	57.2	55	0	45.6	-9.4	0
699-GF-N	279412	6135806	54.1	54	66.1	55	0	54.4	-0.6	0
699-GF-W	279399	6135798	63.2	63	75.2	55	1	63.4	8.4	2
699-GF-S	279412	6135790	55.3	55.1	67.3	55	0	55.5	0.5	0
700-GF-E	279419	6135816	45	45	57	55	0	45.4	-9.6	0
700-GF-N	279409	6135822	55.5	55.4	67.5	55	0	55.9	0.9	0
700-GF-W	279401	6135814	62.3	62.2	74.3	55	1	62.6	7.6	2
700-GF-S	279410	6135809	54	53.9	66	55	0	54.3	-0.7	0
710-GF-E	279312	6135757	60.8	Demolished						

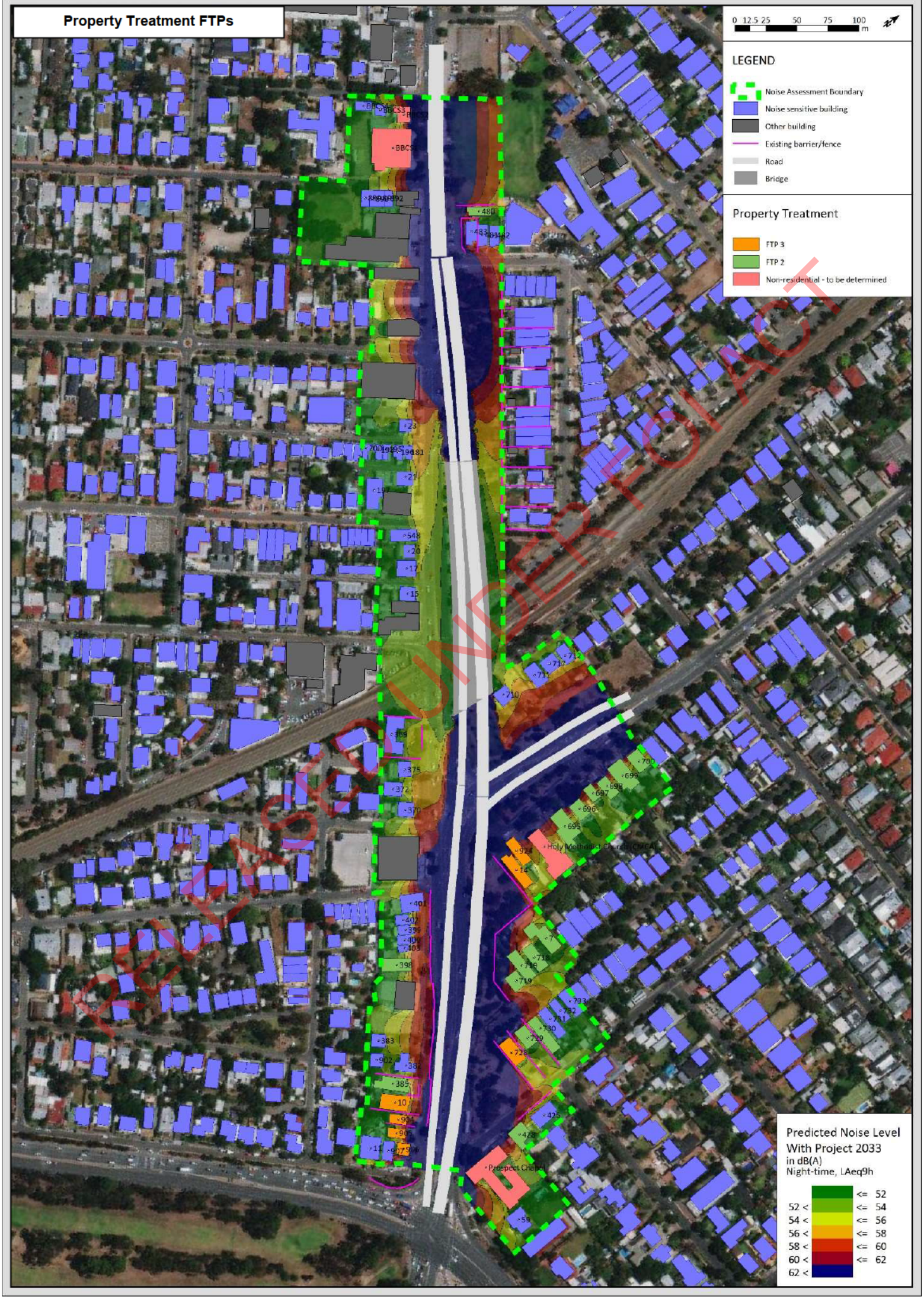
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
710-GF-N	279304	6135764	57.2				Demolished			
710-GF-W	279298	6135756	59.9				Demolished			
710-GF-S	279305	6135750	62.4				Demolished			
711-GF-E	279316	6135788	59.2	57.2	71.2	55	0	57.6	2.6	0
711-GF-N	279306	6135794	53.2	52.4	65.2	55	0	52.9	-2.1	0
711-GF-W	279296	6135787	57.3	52.1	69.3	55	0	52.6	-2.4	0
711-GF-S	279306	6135781	59.7	55.3	71.7	55	0	55.7	0.7	0
712-GF-E	279314	6135817	57.1	56.4	69.1	55	0	56.8	1.8	0
712-GF-N	279305	6135822	51.7	51.8	63.7	55	0	52.2	-2.8	0
712-GF-W	279297	6135816	54.8	51.1	66.8	55	0	51.6	-3.4	0
712-GF-S	279306	6135811	53.4	52.9	65.4	55	0	53.3	-1.7	0
717-GF-E	279312	6135803	57.4	56.5	69.4	55	0	56.9	1.9	0
717-GF-N	279305	6135810	52.7	51.9	64.7	55	0	52.4	-2.6	0
717-GF-W	279298	6135802	55.4	51.2	67.4	55	0	51.7	-3.3	0
717-GF-S	279305	6135795	52.3	51.4	64.3	55	0	51.8	-3.2	0
718-GF-E	279504	6135657	52.1	52.6	64.1	55	0	53.1	-1.9	0
718-GF-N	279492	6135662	47.9	47.9	59.9	55	0	48.3	-6.7	0
718-GF-W	279480	6135656	59.2	58.7	71.2	55	0	59.1	4.1	0
718-GF-S	279492	6135650	51.2	50.9	63.2	55	0	51.4	-3.6	0
719-GF-E	279505	6135644	53.1	53.8	65.1	55	0	54.2	-0.8	0
719-GF-N	279491	6135649	51.9	51.5	63.9	55	0	51.9	-3.1	0
719-GF-W	279477	6135643	64.2	64	76.2	55	1	64.4	9.4	2
719-GF-S	279491	6135638	55.8	55.2	67.8	55	0	55.6	0.6	0
720-GF-E	279507	6135633	55.1	55.7	67.1	55	0	56.2	1.2	0
720-GF-N	279498	6135639	51.4	51	63.4	55	0	51.4	-3.6	0
720-GF-W	279490	6135632	62.8	62.3	74.8	55	1	62.7	7.7	2
720-GF-S	279499	6135626	60	59.9	72	55	0	60.3	5.3	0
728-GF-E	279555	6135599	50.9	50.7	62.9	55	0	51.2	-3.8	0
728-GF-N	279543	6135604	55.5	55.3	67.5	55	0	55.7	0.7	0
728-GF-W	279532	6135597	64.7	64.8	76.7	55	1	65.3	10.3	3
729-GF-E	279550	6135614	48.3	48.2	60.3	55	0	48.7	-6.3	0
729-GF-N	279540	6135620	52.4	52.3	64.4	55	0	52.7	-2.3	0
729-GF-W	279531	6135613	62.5	62.5	74.5	55	1	62.9	7.9	2
729-GF-S	279540	6135607	56.4	56.3	68.4	55	0	56.7	1.7	0
730-GF-E	279564	6135628	48	48	60	55	0	48.4	-6.6	0
730-GF-N	279547	6135632	47.4	47.4	59.4	55	0	47.8	-7.2	0
730-GF-W	279530	6135626	60.8	60.8	72.8	55	1	61.2	6.2	2
730-GF-S	279547	6135621	50.6	50.3	62.6	55	0	50.7	-4.3	0
731-GF-E	279557	6135638	46	46	58	55	0	46.5	-8.5	0
731-GF-N	279542	6135642	47.4	47.3	59.4	55	0	47.7	-7.3	0
731-GF-W	279528	6135637	58.5	58.5	70.5	55	0	59	4.0	0
731-GF-S	279543	6135632	48.1	47.9	60.1	55	0	48.3	-6.7	0
732-GF-E	279549	6135649	45.8	45.8	57.8	55	0	46.3	-8.7	0
732-GF-N	279538	6135652	47.4	47.3	59.4	55	0	47.7	-7.3	0
732-GF-W	279527	6135647	56.7	56.7	68.7	55	0	57.1	2.1	0
732-GF-S	279539	6135643	47.4	47.3	59.4	55	0	47.7	-7.3	0
733-GF-E	279551	6135660	46.1	46.2	58.1	55	0	46.6	-8.4	0
733-GF-W	279526	6135658	55.2	55.3	67.2	55	0	55.7	0.7	0
733-GF-S	279539	6135654	47.5	47.4	59.5	55	0	47.9	-7.1	0
734-GF-S	279536	6135664	44.5	44.4	56.5	55	0	44.9	-10.1	0
889-GF-NW	278906	6135900	51.2	51.2	63.2	55	0	51.6	-3.4	0
889-F 1-NW	278906	6135900	52.6	52.5	64.6	55	0	53	-2.0	0
889-GF-SE	278918	6135891	45.3	45.6	57.3	55	0	46.1	-8.9	0
889-F 1-SE	278918	6135891	49.3	50.9	61.3	55	0	51.4	-3.6	0
889-GF-SW	278910	6135892	39.1	39	51.1	55	0	39.5	-15 5	0
889-F 1-SW	278910	6135892	44.4	44.1	56.4	55	0	44.6	-10.4	0
890-GF-NW	278909	6135905	52.5	52.4	64.5	55	0	52.9	-2.1	0
890-F 1-NW	278909	6135905	53.8	53.7	65.8	55	0	54.2	-0.8	0
890-GF-SE	278922	6135896	44.8	45.2	56.8	55	0	45.6	-9.4	0
890-F 1-SE	278922	6135896	49.9	51.4	61.9	55	0	51.9	-3.1	0
891-GF-NW	278913	6135910	54	53.9	66	55	0	54.4	-0.6	0
891-F 1-NW	278913	6135910	55.3	55.2	67.3	55	0	55.7	0.7	0
891-GF-SE	278926	6135901	45.1	45.4	57.1	55	0	45.9	-9.1	0
891-F 1-SE	278926	6135901	50.7	52	62.7	55	0	52.5	-2.5	0
892-GF-NW	278917	6135915	55.8	55.7	67.8	55	0	56.1	1.1	0
892-F 1-NW	278917	6135915	57.1	56.9	69.1	55	0	57.4	2.4	0
892-GF-NE	278925	6135914	46.4	46.4	58.4	55	0	46.9	-8.1	0
892-F 1-NE	278925	6135914	54.8	55.3	66.8	55	0	55.8	0.8	0
892-GF-SE	278929	6135906	46	46.2	58	55	0	46.6	-8.4	0
892-F 1-SE	278929	6135906	51.9	53.1	63.9	55	0	53.6	-1.4	0
902-GF-NE	279490	6135509	52.2	52.3	64.2	55	0	52.7	-2.3	0
902-GF-NW	279481	6135508	51.8	51.9	63.8	55	0	52.3	-2.7	0
902-GF-SW	279483	6135500	48.1	48.1	60.1	55	0	48.5	-6.5	0

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
902-GF-SE	279491	6135501	49.3	49.4	61.3	55	0	49.8	-5.2	0
904-GF-NW	279532	6135494	50.4	50.5	62.4	55	0	51	-4.0	0
904-F 1-NW	279532	6135494	54.5	54.4	66.5	55	0	54.9	-0.1	0
904-GF-NE	279541	6135497	59.3	60	71.3	55	1	60.5	5.5	2
904-F 1-NE	279541	6135497	64.5	65.1	76.5	55	1	65.5	10.5	3
904-GF-SE	279539	6135488	54.9	55.6	66.9	55	0	56	1.0	0
904-F 1-SE	279539	6135488	56.8	57.3	68.8	55	0	57.8	2.8	0
904-GF-SW	279530	6135485	42.4	42.5	54.4	55	0	42.9	-12.1	0
904-F 1-SW	279530	6135485	47.1	47.2	59.1	55	0	47.6	-7.4	0
905-GF-NW	279540	6135487	53.9	54.7	65.9	55	0	55.1	0.1	0
905-F 1-NW	279540	6135487	56.3	56.8	68.3	55	0	57.2	2.2	0
905-GF-NE	279549	6135490	61.8	62.5	73.8	55	1	62.9	7.9	2
905-F 1-NE	279549	6135490	64.6	65.4	76.6	55	1	65.8	10.8	3
905-GF-SE	279547	6135481	54	54.7	66	55	0	55.1	0.1	0
905-F 1-SE	279547	6135481	55.8	56.6	67.8	55	0	57.1	2.1	0
905-GF-SW	279538	6135478	42.3	42.4	54.3	55	0	42.8	-12 2	0
905-F 1-SW	279538	6135478	46.9	47	58.9	55	0	47.4	-7.6	0
906-GF-SW	279553	6135476	43	43.2	55	55	0	43.6	-11.4	0
906-F 1-SW	279553	6135476	47.7	47.8	59.7	55	0	48.2	-6.8	0
906-GF-NW	279553	6135485	59.8	60.6	71.8	55	1	61	6.0	2
906-F 1-NW	279553	6135485	62.3	62.9	74.3	55	1	63.3	8.3	2
906-GF-NE	279561	6135485	64.6	65.5	76.6	55	1	66	11.0	3
906-F 1-NE	279561	6135485	66.7	67.6	78.7	55	1	68	13.0	3
906-GF-SE	279562	6135477	60.3	60.9	72.3	55	1	61.3	6.3	2
906-F 1-SE	279562	6135477	62.1	62.6	74.1	55	1	63	8.0	2
907-GF-SW	279548	6135466	41.8	41.9	53.8	55	0	42.3	-12.7	0
907-F 1-SW	279548	6135466	46.4	46.5	58.4	55	0	46.9	-8.1	0
907-GF-NW	279545	6135476	52.6	53.6	64.6	55	0	54.1	-0.9	0
907-F 1-NW	279545	6135476	54.6	55.3	66.6	55	0	55.7	0.7	0
907-GF-NE	279555	6135474	44.2	44.5	56.2	55	0	44.9	-10.1	0
907-F 1-NE	279555	6135474	49	49.2	61	55	0	49.6	-5.4	0
907-GF-SE	279558	6135464	56.9	57.2	68.9	55	0	57.6	2.6	0
907-F 1-SE	279558	6135464	59.1	59.2	71.1	55	0	59.6	4.6	0
924-GF-N	279414	6135699	58.4	59.2	70.4	55	0	59.6	4.6	0
924-GF-E	279427	6135695	47.5	47.8	59.5	55	0	48.2	-6.8	0
924-GF-S	279415	6135689	57.9	57.7	69.9	55	0	58.2	3.2	0
924-GF-W	279401	6135694	64.9	65.3	76.9	55	1	65.8	10.8	3
BBCS1-GF-NE	278903	6135923	54.7	54.8	66.7	55	0	55.3	0.3	TBD
BBCS1-GF-SE	278908	6135931	57.5	57.5	69.5	55	0	58	3.0	TBD
BBCS1-GF-NE	278901	6135949	65.7	66	77.7	55	1	66.5	11.5	TBD
BBCS1-GF-NW	278877	6135946	53	53.2	65	55	0	53.6	-1.4	TBD
BBCS1-GF-SW	278880	6135923	37.2	37.1	49.2	55	0	37.6	-17.4	TBD
BBCS1-GF-SE	278893	6135916	38	37.8	50	55	0	38.3	-16.7	TBD
BBCS1-GF-SW	278895	6135915	38.3	38.1	50.3	55	0	38.5	-16 5	TBD
BBCS1-GF-SE	278902	6135917	53.4	53.6	65.4	55	0	54	-1.0	TBD
BBCS2-GF-NE	278878	6135965	65.2	65.5	77.2	55	1	66	11.0	TBD
BBCS2-GF-NW	278867	6135962	59	59.2	71	55	0	59.7	4.7	TBD
BBCS2-GF-SW	278866	6135954	44	44	56	55	0	44.5	-10 5	TBD
BBCS2-GF-SE	278870	6135954	44.8	44.9	56.8	55	0	45.4	-9.6	TBD
BBCS2-GF-SW	278873	6135953	44.4	44.3	56.4	55	0	44.8	-10 2	TBD
BBCS2-GF-SE	278880	6135955	57.7	57.9	69.7	55	0	58.3	3.3	TBD
BBCS3-GF-NE	278864	6135950	48.1	48.2	60.1	55	0	48.6	-6.4	TBD
BBCS3-GF-NW	278857	6135950	53.7	53.8	65.7	55	0	54.3	-0.7	TBD
BBCS3-GF-SW	278857	6135942	42.1	41.9	54.1	55	0	42.4	-12.6	TBD
BBCS3-GF-SE	278865	6135943	47	47	59	55	0	47.5	-7.5	TBD
HMC-GF-E	279450	6135720	46.3	46.2	58.3	55	0	46.7	-8.3	TBD
HMC-GF-N	279442	6135726	51.7	52.6	63.7	55	0	53	-2.0	TBD
HMC-GF-W	279435	6135723	53.2	54	65.2	55	0	54.4	-0.6	TBD
HMC-GF-N	279434	6135723	53.5	53.9	65.5	55	0	54.4	-0.6	TBD
HMC-GF-N	279430	6135721	54.2	54.6	66.2	55	0	55.1	0.1	TBD
HMC-GF-N	279420	6135720	56.8	57	68.8	55	0	57.5	2.5	TBD
HMC-GF-W	279408	6135715	62.8	62.9	74.8	55	1	63.4	8.4	TBD
HMC-GF-W	279408	6135709	62.7	62.8	74.7	55	1	63.2	8.2	TBD
HMC-GF-S	279421	6135707	56.1	56.7	68.1	55	0	57.1	2.1	TBD
HMC-GF-S	279432	6135708	53.9	54.5	65.9	55	0	55	0.0	TBD
HMC-GF-S	279435	6135707	53.6	54.4	65.6	55	0	54.8	-0.2	TBD
HMC-GF-W	279437	6135706	53.6	54.3	65.6	55	0	54.8	-0.2	TBD
HMC-GF-S	279444	6135704	53.3	54	65.3	55	0	54.4	-0.6	TBD
HMC-GF-E	279450	6135710	47.7	47.8	59.7	55	0	48.2	-6.8	TBD
PC-GF-N	279604	6135547	59.8	59.1	71.8	55	0	59.5	4.5	TBD
PC-GF-W	279598	6135542	64.5	64	76.5	55	1	64.5	9.5	TBD
PC-GF-W	279599	6135524	66.6	65.8	78.6	55	1	66.3	11.3	TBD
PC-GF-S	279608	6135510	65.6	64	77.6	55	1	64.4	9.4	TBD

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment [1= Yes]	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2022	Opening 2023	RIC	Redeveloped Road		Future 2033	Exceedance	
PC-GF-E	279614	6135516	55.2	50.8	67.2	55	0	51.2	-3.8	TBD
PC-GF-S	279620	6135520	57.5	55.2	69.5	55	0	55.7	0.7	TBD
PC-GF-S	279637	6135521	56.4	55.2	68.4	55	0	55.6	0.6	TBD
PC-GF-E	279647	6135528	36	35.6	48	55	0	36.1	-18 9	TBD
PC-GF-E	279644	6135534	36	35.6	48	55	0	36	-19 0	TBD
PC-GF-E	279644	6135540	36	35.7	48	55	0	36.1	-18 9	TBD
PC-GF-N	279629	6135546	52.9	52.4	64.9	55	0	52.8	-2.2	TBD
PC-GF-W	279615	6135539	39.9	39.5	51.9	55	0	40	-15 0	TBD
PC-GF-S	279625	6135534	39.9	39.6	51.9	55	0	40.1	-14 9	TBD
PC-GF-W	279632	6135534	39.4	39.2	51.4	55	0	39.6	-15.4	TBD
PC-GF-N	279623	6135531	39.2	38.9	51.2	55	0	39.4	-15.6	TBD
PC-GF-E	279612	6135538	38.9	38.4	50.9	55	0	38.9	-16.1	TBD

Notes:

1. TBD – to be determined following detailed site investiga ions.
2. Predicted noise levels are for the night-time period, which is the worst-case assessment period and determine the overall noise mitigation requirements.


Property Treatment FTPs
0 12.5 25 50 75 100 m
LEGEND
Noise Assessment Boundary
Noise sensitive building
Other building
Existing barrier/fence
Road
Bridge
Property Treatment
FTP 3
FTP 2
Non-residential - to be determined
Predicted Noise Level
With Project 2033
in dB(A)
Night-time, LAeq9h
<= 52
52 < <= 54
54 < <= 56
56 < <= 58
58 < <= 60
60 < <= 62
62 <
Holy Methodist Church (OWCA)
Prospect Chapel
RELEASED UNDER FOI ACT

PTP ALLIANCE OVINGHAM

OVINGHAM LEVEL CROSSING GRADE SEPARATION

109-30 NOISE AND VIBRATION MODELLING DESIGN REPORT ISSUED FOR USE

Doc No: **PTPA-OVX-10930-REP-0000-33-0002**
Client: Rail Commissioner
Project: Ovingham Level Crossing Grade Separation
Location: Adelaide, South Australia
Revision: 0
Date: 10 June 2021

Revision History

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Date				

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Date				

		Prepared by	Reviewed by	Approved by
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Date				

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GLOSSARY

AMPRN	Adelaide Metropolitan Passenger Rail Network
ARTC	Australian Rail Track Corporation
AS	Australian Standards
AS 2107-2016	Australian Standard AS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors
AS 2670.2-1990	Australian Standard AS 2670.2-1990: Evaluation of human exposure to whole-body vibration, Part 2 - Continuous and shock-induced vibration in buildings (1 to 80 Hz)
AS ISO 2631.2-2014	Australian Standard AS ISO 2631.2-2014: Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration Part 2: Vibration in buildings (1 Hz to 80 Hz)
Average noise level	Energy averaged equivalent noise level over a given measurement/assessment period.
A-weighting	"A" frequency spectrum adaption representing the human hearing response.
CEMP	Construction Environment Management Plan
CNVMP	Construction Noise and Vibration Management Plan
CoRTN	Calculation of Road Traffic Noise (United Kingdom Department of Environment, 1988)
CSCR	Contract Scope & Contract Requirements
Daytime	Period between 7am and 10pm, as defined by RTNG.
dB	Decibel. A unit of measurement used to express sound level and is based on a logarithmic scale.
dB(A)	A-weighted noise level in decibel.
DBR	Design Basis Report
DGA	Dense Grade Asphalt
DIN 4105-3	German Standard DIN 4150-3 Structural vibration - Effects of vibration on structures
DIT	The Department for Infrastructure and Transport
EDMP	Engineering Design Management Plan
EP Act	Environment Protection Act 1993
EPA	Environment Protection Authority
EPNP	Environment Protection (Noise) Policy 2007
FOR	Functional and Operational Requirements
FTP	Facade treatment package
GANRI	EPA Guidelines for the assessment of noise from rail infrastructure.
GIS	Geographic Information System
GREP	Gawler Line Electrification Project
GSR	Guideline Scoping Report
IDC	Independent Design Certifier
Insertion Loss	Insertion loss of a barrier is the difference in noise levels at a specified receiver position before and after the installation of the barrier, provided that the noise source, terrain profiles, interfering obstructions and reflecting surface, if any, have not changed.
L_{10}	Noise level that is exceeded for 10% of the time within a given measurement period.
$L_{eq,\ 15hr}$ ($L_{eq,\ Day}$)	Day period average noise level
$L_{eq,\ 9hr}$ ($L_{eq,\ Night}$)	Night period average noise level
$L_{eq,\ T}$	Average noise level over the time period, T.
NAB	Noise Assessment Boundary

Night-time	Period between 10pm and 7am, as defined by RTNG.
PAA	Project Alliance Agreement
PNVA	Preliminary Noise and Vibration Assessment, commissioned by DIT at the Planning Study stage for the Concept Design
PPV	Peak Particle Velocity
Project	Ovingham Level Crossing Grade Separation
PTPAO	PTP Alliance Ovingham
Residual exceedance	The remaining noise level exceedance of a noise assessment criterion following the application of noise mitigation measures.
RIC	Relative Increase Criterion
RTNG	DIT Road Traffic Noise Guidelines
R_W	Weighted sound reduction index which is a laboratory measured value of the acoustic separation provided by a single building element
$R_W + C_{tr}$	R_W with a C_{tr} adaptation term placing greater emphasis on low frequency performance.
SA 78B	Minister's Specification SA 78B Construction requirements for the control of external sound.
Sensitive receiver	Noise sensitive receiver as defined in the RTNG.
Significant	Under the RTNG, when used in the context of a change in noise level, the term 'significant' relates to an increase in level of greater than 2 dB(A) (i.e. ≥2.1 dB(A)).
SiD	Safety in Design
ToC	Target Outturn Cost
ToC Design	Project design developed at the ToC development phase.

1. PROJECT DESCRIPTION

1.1. Project Background

The Ovingham Level Crossing is located near the fringe of the Adelaide CBD on Torrens Road at Ovingham. Torrens Road crosses both the Adelaide Metropolitan Passenger Rail Network (AMPRN) Gawler rail line and the interstate Adelaide-Melbourne rail line.

An average of 23,000 vehicles pass through this level crossing each day. The boom gates at Torrens Road, Ovingham are down for approximately 22% of the time during the combined AM and PM peak periods. The junction of Torrens Road and Churchill Road is approximately 100 metres from the level crossing.

Removal of the Torrens Road Level Crossing, via grade-separation of the AMPRN Gawler passenger and Adelaide-Melbourne freight rail services from Torrens Road traffic, has been identified in the State Governments level crossing strategy.

Figure 1 Artist's Impression

1.1.1. Project Location

The Ovingham Level Crossing is located approximately 4km from the Adelaide CBD. The level crossing is located approximately 70 metres south of Ovingham Railway Station on the Gawler Rail AMPRN line and approximately 100 metres to the north-west of Torrens Road / Churchill Road intersection.

Torrens Road is an arterial road with approximately 6% downhill grade on the westbound approach to the current level crossing location. At the level crossing the road crosses three of rail lines, two AMPRN Gawler lines and one line for the Australian Rail Track Corporation (ARTC) Adelaide to Dry Creek freight line (connecting to the interstate rail corridors).

The area surrounding the Ovingham Level Crossing is primarily residential and is located near Brompton Primary School, Adelaide Aquatic Centre, and North Adelaide Golf Links. The level crossing has existing state-owned land on the northern side of Torrens Road, on either side of the level crossing.

1.1.2. Project Benefits

The Ovingham Level Crossing Grade Separation Project is expected to improve the safety and overall efficiency of transport movements at the level crossing by removing transport conflict points and providing travel time reliability for Torrens Road and Churchill Road users including private vehicles, public transport vehicles, freight transport vehicles, pedestrians, and cyclists.

In removing the level crossing, the project is expected to provide a significant benefit to the local area movements and therefore contribute to the development of a stronger connected community currently severed by the transport infrastructure.

1.1.3. Project Objectives

The project objectives are outlined in the Contract Scope and Contract Requirements (CSCR) documents in the Project Alliance Agreement (PAA) Attachment 1 in Appendix Part E and include the primary and secondary objectives outlined below.

The primary project objective is to:

- improve safety and efficiency for road traffic, passenger, and freight rail services, pedestrians, and cyclists by replacement of the Torrens Road level crossing with a grade separated crossing.

The supporting (secondary) objectives of this project are to:

- improve customer satisfaction and strengthen strategic transport linkages by improving the reliability of the road and rail network operations;
- support the North-West Corridor urban growth opportunities by providing infrastructure that is complimentary to the Corridor land use plans; and
- provide appropriate access for the residential and business community by integrating pedestrian and cyclist transport with public transport services.

1.2. Scope of this Design Report

This design report has been developed to cover the scope of the following Design Package:

109-30 Noise and Vibration Modelling

This report identifies the design inputs and interfaces to the design package and the design solution adopted to address the project scope of works.

The purpose of this report is to provide the Rail Commissioner, the Department for Infrastructure and Transport (DIT), the Independent Design Certifier (IDC) and other stakeholders supporting information to allow for the review of this package as it goes through the design development process.

1.3. Description of Design Package

Design package 109-30 Noise and Vibration Modelling includes the following elements:

- guideline scoping assessment to determine the applicability or otherwise of the relevant environmental noise guidelines for the main noise sources associated with the project. The assessment is detailed in the separate Guideline Scoping Report (GSR, PTPA-OVX-10930-REP-0000-33-0001).
- operational noise modelling and assessment in accordance with the CSCR requirements and DIT guidelines, and the development of a noise mitigation plan. The assessment is detailed in this report.
- operational vibration impact assessment in accordance with the CSCR requirements with respect to human comfort from intermittent vibration sources and the prevention of structural damage. The assessment is detailed in this report.

2. STATUS

2.1. Hold Points

Table 1 outlines the hold points relevant to this design package.

Table 1: Hold Points

Hold Point	Status
PC-ENV4 Clause 3.3 Guideline Scoping Report	Report has been prepared separately and Issued for Acceptance. Hold point release pending.
PC-ENV4 Clause 5.2 Design Basis Report	The design basis for this package is provided in this report in Section 5. Hold point release is sought with this report.
PC-ENV4 Clause 6.1 Noise Modelling Report	Subject to this report.

2.2. Changes from previous revision

Sections below outline the changes to this design package as it has developed.

2.2.1. Differences from ToC Design to Detailed Design

Table 2: Differences from ToC Design to Detailed Design

Element	ToC Design	Detailed Design
Rear boundary fencing of properties along McEwin Street and Devonport Terrace.	Existing fencing arrangement	A new 2.4 m high sheet metal fence for the extent shown in the Fencing Plan (PTPA-OVX-10550-SKT-9999-61-0003).
Road design alignment	ToC Design Alignment	Detailed Design (70%) Alignment, minor changes to the alignment which does not affect the modelled noise levels.
Traffic volumes	Traffic volume and %CV as per dataset, dated 09092020	Traffic volume and %CV as per dataset, dated 07102020

2.2.2. Differences from Detailed Design to Final Design

Table 3: Differences from Detailed Design to Final Design

Element	Detailed Design	Final Design
Road design alignment	Detailed Design (70%) Alignment Napier Street re-aligned to join Torrens Road at Chief Street intersection	Final Design (100%) Existing Napier Street alignment retained with left-in and left-out traffic movement only
Traffic volumes	Traffic volume and %CV as per dataset, dated 07102020	Detailed Design traffic volume adjusted for opening year at 2023, assuming 1% growth

2.2.3. Differences from Final Design to Issued for Acceptance

Table 4: Differences from Final Design to Issued for Acceptance

Element	Final Design	Issued for Acceptance
Extent of the solid anti-gawk screen on the northern side of the overpass bridge	Extends from northeast between midway of piers 1 and 2 on the bridge, to the northwest, aligning with the boundary of 9 and 9A McEwin Street.	Extends from northeast, from the rear boundary of 5 Devonport Terrace, to the northwest, aligning with the boundary of 11 and 13 McEwin Street.
New access road between Chief Street and Hayman Street (Top Cut Link Road). Includes demolition of properties on 67 and 71 Torrens Road and 101 Chief Street.	Not included in Final Design Assessment.	Noise modelling and Noise Assessment Boundary extended to address the potential noise impact from increased noise exposure from Torrens Road (following demolitions of the buildings) and the new link road. As a result, an additional 10 properties became eligible for consideration of noise mitigation.

3. PROJECT DECISION RECORDS

Project Decision Records (PDRs) are a mechanism for capturing significant changes or decision making in the design development process. Where applicable these obtain Alliance Management Team (AMT) approval and Alliance General Manager (AGM) endorsement accordingly after quantifying the cost and/or program impacts and whole-of-life considerations.

The list of PDRs associated with this Design Package can be seen in Table 5 below.

Table 5: Project Decision Records

Ref No.	Title	Status
Nil		

4. INTERPRETATIONS, ASSUMPTIONS AND DEPARTURES

The design has been developed to comply with the CSCR but as the design develops, there may be instances where substantial project benefits are evident from insignificant deviations from design standards or specifications. If deemed required, a Design Departure / Extended Design Domain (DD/EDD) is raised in accordance with the Engineering Design Management Plan (EDMP) to identify the details of any departures from the CSCR or associated design standards including the reason for or proposed action to mitigate these departures paired with the status of approval.

All Design Departures are to be submitted via a DIT Design Departure Application Form for formal review and acceptance by DIT and are to be entered in the Design Departures Register for tracking.

In accordance with the hierarchy of documents, departures from standards that are already covered through the development of the CSCR have not been listed.

It is noted that there are no Design Departures that are directly related to this design package 109-30 Noise and Vibration Modelling.

5. BASIS OF DESIGN

This section outlines the design basis and the relevant requirements for design package 109-30 Noise and Vibration Modelling, as required by PC-EDM1 Design Management of the CSCR.

The section identifies the relevant design standards and performance requirements; design methodology; and design input and assumptions for the noise and vibration modelling work and forms the basis for further formal design submissions under this design package.

It is noted that design package 109-30 Noise and Vibration Modelling only considers operational noise and vibration impacts. Construction noise and vibration impacts are outside the scope of this design package and will be addressed in a Construction Noise and Vibration Management Plan (CNVMP) that forms part of the Construction Environment Management Plan (CEMP).

5.1. Standards and References

5.1.1. Project Requirements

The 109-30 Noise and Vibration Modelling design requirements for the project have been based on the following:

- The CSCR (see Table 6)
- All relevant legislative requirements
- Any clarifications or interpretations of standards, codes and guidelines contained within the CSCR.

Table 6 Contract Scope and Contract Requirements

Title	Document Reference	Revision | Date
Contract Scope	[19C861] – Knet Number #15124736	Rev I | 21/12/2020
Functional & Operational Requirements (FOR)	[19C861] – Knet Number #14813931	Rev H | 21/12/2020
Master Specification – Project Controls	[19C861] – Knet Number #15424364	Rev B | 21/09/2020

5.1.2. Reference Documents and Order of Preference

The design will comply with the requirements of the following Referenced Documents, with the hierarchy of Reference Documents in the following order:

1) The CSCR;
2) DIT Design Standards and Design Guidelines and Codes of Practice;
3) Any relevant published standards of other South Australian government authorities;
4) AUSTROADS Publications;
5) the relevant standards, codes and guides of Standards Australia and Standards New Zealand (or, where an Australian Standard or a New Zealand Standard does not exist, the relevant British or international standard);
6) the standards, codes and guides published by the National Occupational Health and Safety Commission; and,
7) all other publications, codes, references, guidelines, manuals and other technical documents which are relevant to the performance of the Works.

For the avoidance of doubt, any changes that may occur to corresponding sections of the DIT master specification available from http://www.dpti.sa.gov.au/contractor_documents from time to time will not be considered in the context of the Master Specification for the purposes of this Agreement.

5.1.3. Discipline Requirements

The noise and vibration requirements for the project are provided by the following legislations, standards and documentation:

- The *Environment Protection Act 1993* (EP Act)
- The CSCR, including all standards, guidelines and codes referenced therein, specifically in:

- *Clause 2.9.1* of FOR, which states that the Department's Road Traffic Road Traffic Noise Guidelines (RTNG) is applicable and therefore an assessment in accordance with the RTNG is required
- 'PC-ENV4 Noise Assessment, Treatment Design and Implementation' (PC-ENV4) which references:
  - the Department's RTNG – for road traffic noise
  - the EPA's Guidelines for the assessment of noise from railway infrastructure (GANRI) – for rail noise
  - the EP Act and the Environment Protection (Noise) Policy 2007 (SA) (EPNP) – for other noise sources
  - Australian / New Zealand Standard AS/NZS ISO 717.1–2004: Acoustics – Rating of sound insulation in buildings and of building elements Airborne sound insulation – for noise barrier panel construction
- Part 7 – Vibration of 'PC-ENV3 Environmental Design' (PC-ENV3) which references:
  - Australian Standard AS 2670.2-1990: Evaluation of human exposure to whole-body vibration, Part 2 – Continuous and shock-induced vibration in buildings (1 to 80 Hz) (AS 2670.2-1990) [1] – for intermittent vibration sources,
  - German Standard DIN 4150-3 Structural Vibration – Effects of vibration on structures (DIN 4150-3) – for structural damage,
  - GANRI for rail vibration

This design package considers only operational noise and vibration impacts. Construction noise and vibration impacts are outside the scope of this design package and will be addressed in a CNVMP that forms part of the CEMP. The CNVMP will stipulate the relevant construction noise and vibration requirements and mitigation measures.

The tables below summarise the legislation, guidelines, standards, publications and documentation that are relevant to the noise and vibration requirements under this design package.

Table 7 Legislation and Guidelines

Legislation and Guidelines	
Title	**Jurisdiction**
Environment Protection Act 1993	South Australia
Environment Protection (Noise) Policy 2007	South Australia
Guidelines for the Assessment of Noise from Rail Infrastructure (April 2013)	South Australia

Table 8 DIT Publications

DIT Publications			
Title	**Revision**	**Reference No.**	**Date**
Road Traffic Noise Guidelines	5	1791402	October 2016
Noise Mitigation Manual	3	4993696	May 2016

[1] AS 2670.2-1990 has been superseded by Australian Standard *AS ISO 2631.2-2014 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration Part 2: Vibration in buildings (1Hz to 80Hz)*, which excludes the objective guidelines for acceptable vibration levels with respect to impact on humans. However, the vibration curves in AS 2670.2-1990 still provide useful guidance on human response to building vibrations not contained in AS ISO 2631.2-2014.

Table 9 Australian and International Standards

Australian and International Standards		
Standard No.	**Year**	**Title**
AS 1055	2018	Acoustics – Description and measurement of environmental noise
AS 2670.2	1990	Evaluation of human exposure to whole-body vibration, Part 2 – Continuous and shock-induced vibration in buildings (1 to 80 Hz)
AS ISO 2631.2-2014	2014	Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration Part 2: Vibration in buildings (1Hz to 80Hz)
AS/NZS ISO 717.1	2004	Acoustics – Rating of sound insulation in buildings and of building elements Airborne sound insulation
DIN 4150-3	1999	Structural Vibration – Effects of vibration on structures

Table 10 Other Documentation

Other Documentation			
Title	**Revision**	**Reference No.**	**Date**
Ovingham Level Crossing – Preliminary Noise and Vibration Assessment – Concept Design	B	PTPA-LXRP-121410-REP-0000-PLN-0006	6 March 2020
PTP Alliance Ovingham Level Crossing Grade Separation Project – 109-30 Noise and Vibration Guideline Scoping Report – Issued for Acceptance	C	PTPA-OVX-10930-REP-0000-33-0001	16 March 2021
Ovingham Level Crossing Grade Separation Project – ToC Design Operational Vibration Impact	-	PTPA-OVX-10930-MEM-0000-33-0001	15 October 2020
Minister's Specification SA 78B Construction requirements for the control of external sound	-	-	February 2013

5.2. Performance Requirements

5.2.1. General Requirements

The following requirements are relevant to the Noise and Vibration Modelling works for the project:

Assessment and Design Approach

- All noise assessment and treatment design shall be undertaken in accordance with PC-ENV4.
- Vibration assessment associated with the design of the project shall be undertaken based on the evaluation criteria for intermittent vibration sources in AS 2670.2-1990 and structural damage criteria in DIN 4150-3.
- All modelling and design works shall be undertaken by a suitably qualified Acoustic Specialist.

Mitigation Design

- Noise barriers/walls and/or facade treatment packages (FTP) at sensitive receiver properties are to be determined by noise modelling in accordance with the RTNG and as detailed in PC-ENV4.

Deliverables

- Noise Modelling and Mitigation Design Report. At a minimum, the report shall include the following items:
  - noise assessment boundary;
  - all identified assumptions (including calibration factors and existing and proposed pavement type, rail fixing type, rail / traffic volumes);
  - monitoring and modelling inputs, results and outputs;
  - details of the existing noise levels. Predicted noise levels (at opening and 10 years post opening), the relevant noise targets / criteria and the noise achieved at each noise sensitive property (each property to be identified by an ID number that corresponds to a plan);

- details of the noise mitigation to be implemented to achieve the noise criteria (e.g. barriers and / or facade treatments);
- details of the level of facade treatment requirements for each sensitive receiver; and
- noise contour plots and treatment plans (including noise barriers and/or facade treatments).

- Detailed design drawings for all noise mitigation and attenuation treatments identified within the Noise Modelling and Mitigation Design Report. This includes, where relevant, details of barrier locations, heights, materials, finishes, urban design, typical construction details, start and end chainage, and total length. Detailed design of the specific noise facade treatment at each eligible property will be subject to a property inspection and will be undertaken under design package 109-31 Noise Facade Treatment.

5.2.2. Technical Requirements

Assessment Criteria

- Noise criteria at sensitive receivers shall be established in accordance with the RTNG.
- Vibration criteria shall be established in accordance with AS 2650.2-1990 for intermittent vibration sources and DIN 4150-3 for structural damage.

Noise Model

- An appropriate road traffic noise prediction software that correctly implements the United Kingdom, Department of Environment (1988), Calculation of Road Traffic Noise (CoRTN) algorithm shall be used. An alternative model can be used subject to agreement by DPTI.
- Noise model shall be corrected for Australia Conditions and validated by comparing measured and predicted noise levels, or using calibration factors from previous project verification assessments. The noise model is deemed validated if the average difference between the measured and predicted levels is no more than ± 2 dB(A).
- Noise modelling under different meteorological conditions is not required.

Noise Mitigation Design

- Noise barriers/walls are required to be:
  - limited a maximum height of 3.5 metres (as per *Section 2.9.3* of FOR),
  - designed solid for the full height (with overlapping as required for openings, etc), and
  - installed within the finished road reserve.
- Noise barriers/walls are required to minimise the creation of visual barriers that may restrict passive surveillance of pedestrians and are subject to Crime Protection through Environmental Design (CPTED) reviews.
- Noise barriers/walls are required to be designed in accordance with the aesthetic design measures provided in the Urban Design Principles.
- FTPs in addition to or instead of noise barriers/walls are to be determined in accordance with the RTNG.

5.3. Design Methodology

5.3.1. Noise

- The GSR identified the guidelines that are applicable to the project with respect to noise. The GSR determined that the RTNG is applicable to the project, which is to be assessed as a redeveloped road project.
- The noise assessment and treatment design methodology will be in accordance with PC-ENV4 and the RTNG.
- The applicable noise assessment criteria will be determined in accordance with *Section 3.2.2* and *Section 3.2.3* of the RTNG.

- The Noise Assessment Boundary (NAB) for the project shall be determined in accordance with *Section 5.3* of the RTNG. The NAB established during the ToC phase works and discussed with DIT and the IDC on 5 November 2020 will be reviewed and confirmed with modelling conducted at the current stage of works. The NAB has been accepted in principle by PTPAO, DIT and the IDC.
- The noise sensitive receivers (as defined in *Section 3.1.2* of the RTNG) identified in the Preliminary Noise and Vibration Assessment (PNVA, PTPA-LXRP-121410-REP-0000-PLN-0006, Rev. B, date 06/03/2020) will be considered. The noise levels at sensitive receivers within the NAB will be predicted and assessed. Noise mitigation will only be considered at eligible sensitive receivers within the NAB.
- The SoundPLAN noise prediction model established as part of the PNVA and provided by DIT [OLX_Raw_Vibration_Modelling_Data_PTPA-LXRP-121410-MOD-000-PLN, PNVA Model] will be used as a basis to develop the noise prediction model for the works under this design package. The noise model will be updated with the latest information/design input as the design progresses.
- CoRTN algorithm implemented in SoundPLAN version 8.2 noise modelling software package will be used, consistent with the RTNG and the PNVA SoundPLAN Model.
- The noise model will include ground topography, ground absorption, existing buildings and fences (where relevant), traffic volume and speed, road surface corrections, and any roadside noise barriers (e.g. jersey barriers).
- To convert the CoRTN L_{A10} predicted noise levels into L_{Aeq} noise levels, a conversion factor of -3 dB(A) will be used.
- Predictions of the daytime ($L_{Aeq(15hr)}$) and night-time ($L_{Aeq(9hr)}$) traffic noise levels will be conducted.
- Calibration factors that are typical for South Australian arterial road network which have been applied to other similar projects will initially be applied to the noise model. These factors are -1.7 dB for daytime and +0.5 dB for night-time periods. The factors are consistent with the “Australia Conditions” corrections recommended by the Australia Road Research Board. The calibrated noise model output will be compared with measured existing noise levels and further adjustments may be applied to improve the accuracy of the noise model.
- Building footprints and heights from the PNVA Model will be adopted and modified as required. For buildings not included in the PNVA Model, the footprints will be determined based on Google Earth; heights for single storey buildings will be taken to be 4m high, whilst two-storey buildings 7m. The building heights will be updated if it is clearly identifiable on site that the actual heights are significantly different.
- All predictions will include a 2.5 dB(A) facade reflection factor in accordance with the RTNG.
- Predictions will be made for the existing scenario (year 2023 without build), project-opening scenario (year 2023 with build) and project-future scenario (year 2033 with build, i.e.10 years after project completion).
- Evaluation of the eligibility of sensitive receivers (as defined in the RTNG) for noise mitigation will be undertaken in accordance with *Section 3.2.6* of the RTNG.
- The noise mitigation assessment will follow the process outlined in *Section 3.2.7* of the RTNG will be used to determine reasonable and practicable noise mitigation for eligible sensitive receivers.
- The approach to determining noise mitigation is to first consider road design measures, then roadside noise barriers, fences/screening at the property boundary and finally property noise treatment (FTPs).
- Where relevant, noise walls at property boundaries will be limited to a maximum height of 3.5m, whilst noise wall/barriers on the overpass bridge and approach ramps will be limited to a maximum height of 3.0m. The noise wall/barrier will be integrated with Urban Design.
- The extent of noise mitigation measures to satisfy the RTNG comprising noise barriers/walls and FTPs will be summarised in a Noise Mitigation Plan.

5.3.2. Vibration

Operational vibration impact from the project has been assessed at the ToC phase and determined to be compliant with all the relevant requirements in Section 5.1.3. The assessment is summarised in the PTPA Technical Note PTPA-OVX-10930-MEM-0000-33-0001 (refer Appendix E). Minor changes to the project alignment design during the detailed design phase will not change the assessment outcome. Therefore, no further vibration impact assessment will be conducted under this design package, unless there is a significant change to the project alignment design.

Based on review of design package 102-10 Road Alignment, the design has not changed significantly to affect the vibration impact at surrounding receivers and therefore further vibration impact assessment is considered not necessary.

5.4. Design Input and Assumptions

The noise model input and assumptions are summarised in Table 11.

Table 11: Noise Model Input and Assumptions

Scenario	Noise Model Input
All scenarios	Building footprints from PNVA noise model (sourced from OpenStreetMap database and adjusted based on desktop review and site observations during baseline monitoring).
	The receiver height is set to be 1.5m above the height of each floor level. For multi-storey buildings, the floor heights are taken to be 3m. Hence, for a single-storey building, the receiver height is set to be 1.5m above ground level, whilst for a two-storey building, the receiver heights are set to be 1.5 and 4.5m above ground level.
	Existing fences and fence heights from PNVA noise model (sourced from OpenStreetMap database and adjusted based on desktop review and site observations during baseline monitoring).
	Hard/reflective ground for roads and 50% absorptive ground for all other areas.
	Dense Graded Asphalt (DGA) surface for all roads. Note that DGA road surface type has no road surface correction factor based on the typical values provided in Section 5.4.3 of the RTNG.
	Modelled traffic speeds have been based on the following posted speed limits: ▪ 60 km/h: Torrens Road and Churchill Road ▪ 50 km/h: Napier Street ▪ 40 km/h: Chief Street, Hayman Street and new access road (Top Cut link road)
	Traffic volume data as detailed in Table 12 and Table 13 for the respective scenarios.
Existing scenario	Ground contours based on existing survey data of the project area.
	Existing road alignment based on design drawings and aerial photography (Google Earth).
Project scenario (opening and future)	Combined existing and project topographical contours, including project civil works.
	Project Road Alignment design drawings (70% Design)
	Roadside jersey style barriers on ramp and overpass bridge as indicated on Civil Structures design drawings (70% Design). Replacement of existing fences as indicated on the Fencing Plan (PTPA-OVX-10550-SKT-9999-61-0003).

Estimated traffic volumes were sourced from the transport design team. Table 12 summarises the data source origin and calculations conducted to estimate the traffic volume data for each modelled scenario.

Where future traffic volume estimates were required, an annual traffic volume growth rate of 1% was assumed, which is understood to be a conservative approach (i.e. annual traffic volume growth is likely to be less).

To estimate the daytime and night-time traffic volumes, an 87.5% daytime and 12.5% night-time traffic volume split of the Average Annual Daily Traffic (AADT) volumes was assumed for all vehicle types (passenger and commercial vehicles) for all scenarios.

The resultant estimated traffic volumes that were input into the noise model are summarised in Table 13.

Table 12: Modelled Traffic Scenario and Associated Traffic Volume Data

Scenario	Traffic Volume Data Source / Estimation Method
Existing Scenario (year 2020) (for noise model validation only)	Traffic volumes for Churchill Road and Torrens Road were based on August 2020 Traffic Survey Data, which provided two-way flow data supplied by DIT. Traffic volumes for Park Terrace and Fitzroy Terrace were estimated based on December 2018 Traffic Survey Data with an assumed traffic annual growth rate of 1%.
Existing Scenario (year 2023)	Based on the AIMSUN Model Data provided by the transport design team (sourced from DIT) for year 2022 and extrapolated based on an assumed annual traffic volume growth rate of 1%.
Project Opening Scenario (year 2023)	Based on the AIMSUN Model Data provided by the transport design team (sourced from DIT) for year 2022 and extrapolated based on an assumed annual traffic volume growth rate of 1%. It is assumed that 70% of traffic on Picton, East and Drayton Streets will use the new access road to access Chief Street, with 4.7% being commercial vehicles (as per Napier Street, for conservatism). The remaining 30% of the traffic is assumed to use Fifth Street.
Project Future Scenario (year 2033)	Estimated based on the 2023 Project Opening Scenario extrapolated based on an assumed annual traffic volume growth rate of 1%.

Table 13: Estimated Traffic Volumes used in the Noise Model

Road	Section	Direction[1]	Estimated AADT	% CVs	Daytime (15-hour) Average Volume)[2]	Night-time (9-hour) Average Volume[2]
Existing Scenario at Year 2020 – without Build (for noise model validation only)						
Torrens Road	Between Churchill Road and Fitzroy/Park Terrace	NWB	17664	6.4%	15456	2208
		SEB	19836	6.4%	17357	2480
	Between Churchill Road and Chief Street	NWB	9684	4.8%	8473	1210
		SEB	10665	4.8%	9332	1333
	Between Chief Street and South Road	NWB	11278	5.0%	9869	1410
		SEB	12422	5.0%	10869	1553
Churchill Road	Road section at intersection with Torrens Road	NB	12374	6.3%	10827	1547
		SB	13426	6.3%	11748	1678
Fitzroy Terrace	Road section at intersection with Torrens Road	NEB	25843	4.7%	22613	3230
		SWB	27102	4.7%	23714	3388
Park Terrace	Road section at intersection with Torrens Road	NEB	27577	5.1%	24130	3447
		SWB	28632	5.1%	25053	3579
Chief Street	Road section at intersection with Torrens Road	2 way	5500	3.8%	4813	688
Napier Street	Road section at intersection with Torrens Road	2 way	650	4.7%	569	81
Hayman Street	Road section at intersection with Torrens Road	2 way	80	3.2%	70	10

Road	Section	Direction[1]	Estimated AADT	% CVs	Daytime (15-hour) Average Volume)[2]	Night-time (9-hour) Average Volume[2]
Existing Scenario at Year 2023 – without Build						
Torrens Road	Between Churchill Road and Fitzroy/Park Terrace	NWB	18649	7.9%	16318	2331
		SEB	20943	7.9%	18325	2618
	Between Churchill Road and Chief Street	NWB	12256	4.9%	10724	1532
		SEB	13499	4.9%	11811	1687
	Between Chief Street and South Road	NWB	11439	5.0%	10009	1430
		SEB	12599	5.0%	11024	1575
Churchill Road	Road section at intersection with Torrens Road	NB	11868	8.0%	10385	1484
		SB	12877	8.0%	11267	1610
Fitzroy Terrace	Road section at intersection with Torrens Road	NEB	26625	4.7%	23297	3328
		SWB	27923	4.7%	24432	3490
Park Terrace	Road section at intersection with Torrens Road	NEB	28412	5.1%	24861	3552
		SWB	29499	5.1%	25812	3687
Chief Street	Road section at intersection with Torrens Road	2 way	5959	3.8%	5214	745
Napier Street	Road section at intersection with Torrens Road	2 way	670	4.7%	586	84
Hayman Street	Road section at intersection with Torrens Road	2 way	82	3.2%	72	10
Project-Opening Scenario at Year 2023 – with Build at Project Completion						
Torrens Road	Between Churchill Road and Fitzroy/Park Terrace	NWB	18649	7.9%	16318	2331
		SEB	20943	7.9%	18325	2618
	Between Churchill Road and Chief Street	NWB	12256	4.9%	10724	1532
		SEB	13499	4.9%	11811	1687
	Between Chief Street and South Road	NWB	11439	5.0%	10009	1430
		SEB	12599	5.0%	11024	1575
Churchill Road	Road section at intersection with Torrens Road	NB	11868	8.0%	10385	1484
		SB	12877	8.0%	11267	1610
Fitzroy Terrace	Road section at intersection with Torrens Road	NEB	26625	4.7%	23297	3328
		SWB	27923	4.7%	24432	3490
Park Terrace	Road section at intersection with Torrens Road	NEB	28412	5.1%	24861	3552
		SWB	29499	5.1%	25812	3687
Chief Street	Road section at intersection with Torrens Road	2 way	5959	3.8%	5214	745
Napier Street	Road section at intersection with Torrens Road	2 way	1313	4.7%	1149	164
Hayman Street	Road section accessed by new Access Road from Chief	2 way	82	3.2%	72	10
Access road (Top Cut link road)	Road section from Chief Street to Drayton Street	2 way	805	4.7%	704	101

Road	Section	Direction[1]	Estimated AADT	% CVs	Daytime (15-hour) Average Volume)[2]	Night-time (9-hour) Average Volume[2]
Project-Future Scenario at Year 2033 – with Build at 10 Years after Project Opening						
Torrens Road	Between Churchill Road and Fitzroy/Park Terrace	NWB	20600	7.9%	18025	2575
		SEB	23134	7.9%	20242	2892
	Between Churchill Road and Chief Street	NWB	13539	4.9%	11846	1692
		SEB	14911	4.9%	13047	1864
	Between Chief Street and South Road	NWB	12636	5.0%	11057	1580
		SEB	13917	5.0%	12177	1740
Churchill Road	Road section at intersection with Torrens Road	NB	13110	8.0%	11471	1639
		SB	14224	8.0%	12446	1778
Fitzroy Terrace	Road section at intersection with Torrens Road	NEB	29120	4.7%	25480	3640
		SWB	30539	4.7%	26722	3817
Park Terrace	Road section at intersection with Torrens Road	NEB	31074	5.1%	27190	3884
		SWB	32263	5.1%	28230	4033
Chief Street	Road section at intersection with Torrens Road	2 way	6582	3.8%	5760	823
Napier Road	Road section at intersection with Torrens Road	2 way	1450	4.7%	1269	181
Hayman Street	Road section accessed by new Access Road from Chief	2 way	91	3.2%	80	11
Access road (Top Cut link road)	Road section from Chief Street to Drayton Street	2 way	889	4.7%	778	111

Notes:

1. NWB – Northwest bound, SEB – Southeast bound, NB – north bound, SB – south bound.
2. Estimated based on an 87.5% Day / 12.5% Night split of the AADT.

6. EXISTING ACOUSTIC ENVIRONMENT AND LAND USES

6.1. Noise

The existing acoustic environment within the project area is controlled by noise from road traffic on Torrens Road and Churchill Road, and rail traffic on the Adelaide Metropolitan Passenger Rail Network (AMPRN) Gawler Line passenger and Adelaide-Melbourne freight rail lines.

Several different land uses are located along Torrens Road and Churchill Road, primarily residential but also commercial, light industry, educational and place of worship. The noise contribution from the activities associated with these land uses are not considered significant within the context of the overall acoustic environment of the project area.

The PNVA included baseline noise monitoring at three locations within the project area, as shown on Figure 2 (reproduced from the PNVA). A summary of the measured daytime and night-time average noise levels (L_{eq}) are provided in Table 14.

Table 14: Summary of Measured Existing Noise Levels

Monitoring Location			Measured Noise Level*, dB(A)	
ID	Address	Description	Day, $L_{eq,15hr}$	Night, $L_{eq,9hr}$
ML1	7 McEwin Street	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing. Located behind an existing boundary fence with no direct line of sight to the railway or Torrens Road.	52 (52)	49 (48)
ML2	35-37 Torrens Road	20m from Torrens Road, 30m from rail tracks and 60 from Ovingham Crossing. Line of sight to the railway is generally blocked by existing fence, whilst line of sight to Torrens Road is partially blocked by the existing fence.	61 (61)	55 (55)
ML3	1 Devonport Terrace	30m from Torrens Road, 35m from rail tracks and 40 from Ovingham Crossing. Location has line of sight to railway and Torrens Road.	63 (62)	58 (57)

* The measured average noise levels are for weekdays only and exclude the weekend. The measured average noise levels that include the weekend are provided in the brackets. Daytime is considered between 7am to 10pm, whilst night-time is between 10pm and 7am.

Figure 2 Baseline noise monitoring locations.

6.2. Vibration

In general, vibration from road or rail traffic is not a significant issue in comparison to road noise related impacts. Vibration is often only perceived at a road edge adjacent an imperfection (such as a pothole, access cover, rail line, or similar) with heavy vehicular traffic travelling at high speeds. Where vibration is observed in lightweight elements (such as rattling windows) at buildings near road/rail corridors, it is often caused by transmission of low frequency noise through the air rather than transmission of vibration via the ground.

There are a number of local and state heritage places, including premises fronting Torrens Road, Fitzroy Terrace and Park Terrace and in close proximity to the railway corridor, as well as a significant number of contributory items contained within adjacent or nearby historic conservation zones/areas. It is understood that some of these properties were built circa 1860 without foundations. The long-term operation of the existing rail corridor and roads without vibration related issues indicate that vibration from the transport corridors does not have an adverse impact on the properties. It is understood that there no existing vibration issues in the area associated with the typical road traffic on Torrens Road and the operation of the AMPRN Gawler passenger and Adelaide-Melbourne freight rail lines.

The PNVA included baseline vibration monitoring conducted at two locations within the project area along Torrens Road, shown in Figure 3. The monitoring comprised unattended continuous vibration monitoring at a dwelling over a seven-day period and attended short-term manual vibration measurements during peak traffic at a location along Torrens Road. The vibration monitoring included a mix of vehicle pass-bys on Torrens Road, comprising light (passenger cars) and heavy vehicles, and which is considered representative of Torrens Road traffic. A summary of the average and maximum measured vibration levels is provided in Table 15.

Figure 3 Vibration Monitoring Locations

Table 15 Summary of Measured Vibration Levels

Monitoring Location			Measured PPV, mm/s	
ID	Address	Description	Average	Maximum
VL1	7 McEwin Street	50m from Torrens Road, 100m from rail tracks and 170 from Ovingham Crossing. Continuous long-term unattended measurements. The high vibration levels at this position are influenced by local activity rather than road traffic.	0.2	0.5
VL2	Ovingham reserve	10m from Torrens Road, smooth surfaced section of the road. Attended measurements of vehicle pass-by comprising a good mix of cars and heavy vehicles, including vehicles accelerating, slowing down and travelling at speed. The measurements are representative of typical road traffic vibration levels.	0.1	0.2

The baseline vibration monitoring indicated that the existing average vibration levels from Torrens Road are below the relevant human response criteria for intermittent vibration sources at the measurement locations and at the surrounding sensitive receivers.

7. NOISE MODELLING AND IMPACT ASSESSMENT

7.1. Scope of Assessment

This assessment includes:

- A review of the GSR to confirm the applicable guidelines and requirements for the assessment;
- Noise modelling and assessment in accordance with the methodology and requirements of the applicable guidelines; and,
- Establishment of a noise mitigation plan.

The GSR has assessed the applicability of the RTNG (for road traffic noise); GANRI (for rail traffic noise); and EPNP (for other project associated noise sources) to the project. The GSR concluded the following:

- RTNG is applicable and the project is categorised as a Redeveloped Road.
- GANRI is not applicable as the project does not include the addition of new rail lines nor upgrade works to the existing railway lines.
- EPNP requirements are not applicable as there are no relevant new nor upgraded noise sources as part of the project.

Therefore, the noise assessment and noise mitigation design in this report only address operational noise impact from road traffic in accordance with the RTNG. Noise from construction of the project is outside the scope of this design package and will be addressed in the CNVMP. The sound setting design of the pedestrian crossing warning alarms at the crossing is also excluded from the scope of this design package (this will be part of the rail signalling package).

Note that while GANRI is not applicable, there is the General Environmental Duty under the EP Act to ensure that any works conducted as part of this project does not result in adverse impact from the existing rail operation. This is particularly relevant at noise sensitive receivers near the rail corridor which may have existing intervening fences, structures, or buildings that shield the receivers from the rail corridor being demolished. The assessment has considered the rail noise impact at these relevant sensitive receivers in Appendix F, using the methodology provided by Minister's Specification SA 78B Construction requirements for the control of external sound (SA 78B). The assessment ensures that the noise impact from the existing rail corridor operation does not cause environmental harm at the sensitive receivers following demolition of buildings or structures as part of this project.

7.2. Assessment Criteria

The RTNG specifies daytime (7am to 10pm) and night-time (10pm to 7am) average noise level (L_{eq}) criteria to be achieved at relevant noise sensitive receiver locations. For a redeveloped road, the RTNG provides noise criteria as summarised in Table 16.

Table 16: RTNG Noise Assessment Criteria for Redeveloped Road

Situation	Noise Criteria, dB(A)	
	Daytime, $L_{eq,15hr}$	Night-time, $L_{eq,9hr}$
Existing receivers affected by noise from a redeveloped road	60	55
Existing receivers affected by noise from a redeveloped road where demolition of building structures or existing roadside noise walls results in receivers previously shielded from traffic noise becoming exposed	57	52
Existing receivers with a potentially large increase in traffic noise levels – Relative Increase Criterion (RIC) above existing noise levels	Existing $L_{eq,15hr}$ + 12	Existing $L_{eq,9hr}$ + 12

The project area between Chief Street and Hayman Street will be affected by the demolition of existing buildings on the Top Cut site and adjacent dwellings (67 Torrens Road and 101 Chief Street). The site will provide a new access road that links Chief Street with Hayman, East, Picton and Drayton Streets. As the demolition works has the potential to increase the noise exposure from Torrens Road at sensitive receivers located behind that were

previously shielded, the reduced redeveloped road noise criteria, i.e., 57 dB(A) $L_{eq,15hr}$ daytime and 52 dB(A) $L_{eq,9hr}$ night-time, have been applied at these sensitive receivers.

The remainder of the project area does not include the demolition of existing building structures or roadside noise walls that increase noise exposure at other existing receivers[2], therefore the 60 dB(A) $L_{eq,15hr}$ daytime and 55 dB(A) $L_{eq,9hr}$ night-time criteria for redeveloped road have been applied to all other sensitive receivers. The RIC criterion at each sensitive receiver has also been considered, however the criterion is generally much higher than the amenity based criteria above, given that that the project area is currently exposed to high noise levels from road traffic (more than 20,000 vehicles using Torrens Road and Churchill Road daily on average).

The applied noise criteria at each assessed sensitive receivers are provided in Appendix J.

7.3. Assessment

7.3.1. Noise Sensitive Receivers

The relevant noise sensitive receivers (as defined in *Section 3.1.2* of the RTNG) that surround the project have been identified in the PNVA noise model which were based on a desktop review of land use information and aerial photography available via the Department for Environment and Water online portal and Google Maps, respectively. Receiver input (height, extent, etc) in the noise model was updated following a detailed review of 3D geospatial information from Google Maps. The noise sensitive receivers surrounding the project are shown in Appendix H.

Commercial accommodation such as motels, hotels and short-term rentals (e.g. the Bowden Holiday House at 47C-47F Torrens Road) are considered as noise sensitive receivers and have been included in the assessment.

7.3.2. Assessment Position

In accordance with the RTNG, the road traffic noise levels have been assessed outside at a position 1 m from the most exposed window and at a height of 1.5 m above floor level for each noise sensitive receiver building facade. At this location, the noise levels are influenced by reflection from the building facade, and therefore all predictions have included a facade reflection factor of +2.5 dB.

For multi-storey buildings, the noise level at each floor level has been assessed (i.e. for a 2-storey building, noise level assessed at 1.5 m and 4.5 m above ground level). The noise level at each facade of all the relevant noise sensitive receiver buildings has been predicted and assessed.

7.3.3. Noise Assessment Boundary

The Noise Assessment Boundary (NAB) is the area where noise impact from the project is to be assessed and noise mitigation is to be considered where applicable and required to satisfy the RTNG. The extent of the NAB is defined in *Section 5.3* of the RTNG, as follows:

- The area in which physical works associated with the road project occur which may extend to close-by landmarks or cadastral boundaries to provide a logical endpoint. However, physical works does not include pavement reseals, or discrete elements of the project that fall outside the scope of the guidelines (as described in *Section 3.1.1* of the RTNG).
- The width either side of the project is to be set to the extent where the predicted noise level without noise mitigation equals the lowest applicable noise assessment criteria. The width may be reduced where the

[2] The demolition of properties as part of this project (at 159 Drayton Street, 161 Drayton Street, 163 Drayton Street, 157 Drayton Street, 25 Seventeenth Street, 28 Seventeenth Street and 1 Devonport Terrace) and the construction of the project will not result in an increase in noise exposure at the nearby sensitive receivers from Torrens Road traffic (refer the Noise Difference contours in Appendix I). Noise from the rail corridor at the sensitive receivers fronting Drayton Street has the potential to increase with the removal of the buildings that previously shielded the receivers from the corridor. However, given the separation distance between the receiver and corridor is more than 30m(also further away from the corridor than some dwellings in the area that have direct line of sight to trains), the noise from the rail corridor is expected to be within the relevant requirements. The noise impact from the rail corridor at these receivers are discussed further in Appendix F.

noise levels from the project contribute no more than 2.0 dB(A) to the total traffic noise level, for example, where the assessed road project intersects other Arterial Roads.

- In any case, the width either side of the project should be no more than 600 meters from the centre line of the outermost traffic lane on each side of the road project.
- The NAB should be defined using property boundaries obtained from a current cadastral map.

The area outlined orange on Figure 4 shows the entire extent of the physical works associated with the project which has been considered in determining the NAB. As stated in the RTNG, areas of physical works associated with pavement reseals or discrete elements of the project that fall outside the scope of the RTNG (in *Section 3.1.1*) shall be excluded from the NAB.

A meeting was held on 5 November 2020 between PTPAO, DIT and IDC to discuss and define the appropriate extent of the NAB. In principle, it was agreed that the NAB shall, as a minimum, include the extent of Torrens Road and Churchill Road with geometry changes that result in significant noise level increase. On that basis and the considerations above, the following extent of Torrens Road and Churchill Road associated with the realignment works is considered relevant for inclusion in the NAB:

- the extent of Torrens Road from the intersection of West Street and Torrens Road (85B Torrens Road on the Southern side and 64 Torrens Road on the Northern side) to 19 Torrens Road (2 Toronto Street on the Northern side of Torrens Road)
- the extent of Churchill Road from the intersection with Torrens Road to 13 Churchill Road (5 Devonport Terrace on the Eastern side of Churchill Road).
- the extent of the new access road (Top Cut link road) that provides access to Chief Street from Hayman, East, Picton and Drayton Streets.

Figure 4 Project General Arrangement

The width of the NAB (on either side of the project road) is determined from where the predicted noise level from traffic equals the lowest applicable noise assessment criteria. For this project (as per the noise criteria in Section 7.2), the lowest applicable noise criteria are 60 dB(A) $L_{eq,15hr}$ during the daytime and 55 dB(A) $L_{eq,9hr}$ during the night-time. The exception to this is the area between Chief Street and Hayman Street, where existing buildings are

demolished and a new access road is constructed. For receivers in this area, the lowest applicable noise criteria are 57 dB(A) $L_{eq,15hr}$ during daytime and 52 dB(A) $L_{eq,9hr}$ during night-time.

The NAB of the project has been established based on the above and is shown in Appendix H.

7.3.4. Noise Prediction Model and Inputs

Noise Modelling Methodology

The three-dimensional noise prediction model established as part of the PNVA has been used and updated with the latest road alignment design and latest traffic volume information. The noise model is based on the CoRTN algorithm, as implemented in SoundPLAN Version 8.2 noise modelling software. CoRTN has been accepted by the Department as an appropriate traffic noise modelling methodology and referenced in the RTNG.

The noise model includes the following features:

- Topographical features;
- Road alignment;
- Traffic volume and split between light and heavy vehicles;
- Vehicle speeds;
- Road surface types;
- Ground absorption;
- Shielding from buildings and relevant structures (e.g., existing fences);
- Receiver height.

Further details of the noise prediction model and calculation methods are provided in Section 5.4.

Noise Model Calibration and Validation

The calibration factors used in the PNVA noise model have been initially applied to the noise model. The calibration factors are based on previous noise modelling works of road projects in South Australia which have been validated with site measurements. The calibration factors are -1.7 dB for daytime predictions and +0.5 dB for night-time predictions.

The calibrated noise model with the existing road alignment and traffic volumes input was used to predict the noise levels at the monitoring location that was considered in the PNVA, which is ML1 at 7 McEwin Street (as shown on Figure 2). The PNVA noted that the noise levels at ML1 were mainly influenced by noise from road traffic and therefore is an appropriate noise model validation point. The prediction was based on the estimated traffic volumes for year 2020, derived using August 2020 Traffic Survey Data (as detailed in Table 12 and Table 13).

The noise levels at the two other monitoring locations indicated in the PNVA, i.e. ML2 at 35-37 Torrens Road and ML3 at 1 Devonport Terrace as shown on Figure 2, were also predicted. The PNVA noted that the noise levels at locations ML2 and ML3 include noise contribution from the rail corridor which would provide poor correlation with predicted road traffic noise levels. The measured noise levels at ML2 and ML3 were also likely influenced by construction activity associated with the Gawler Line Electrification Project (GREP). These noise sources are expected to have more of an influence on the daytime noise levels.

Notwithstanding the above, a comparison of the predicted and measured noise levels at ML2 and ML3 has been conducted and is used with caution for validation of the noise model. The comparison of the predicted and the measured noise levels (average weekdays[3] noise levels) at ML1, ML2 and ML3 are summarised in Table 17.

[3] The weekday average noise levels have been used given the predictions are based on AADT traffic volumes derived from traffic survey data collected on a weekday. The approach has been confirmed appropriate by the transport modelling team.

Table 17: Comparison of Predicted and Measured Noise Levels for the existing conditions.

Location		Day Noise Level (Leq,15hr), dB(A)			Night Noise Level (Leq,9hr), dB(A)		
ID	Address	(i) Measured	(ii) Predicted	(ii) – (i) Difference	(i) Measured	(ii) Predicted	(ii) – (i) Difference
ML1	7 McEwin Street	52.4	54.1	+ 1.7	48.7	50.1	+ 1.4
ML2	35-37 Torrens Road	61.3	60.9	- 0.4	55.1	56.9	+ 1.8
ML3	1 Devonport Terrace	62.8	61.1	- 1.7	57.7	57.2	- 0.5
All three locations		Average		- 0.1	Average		+ 0.9

The comparison in Table 17 indicates the following:

- the noise model overpredicts the noise levels at ML1 by 1.7 dB and 1.4 dB for the daytime and night-time periods, respectively. The night-time predicted noise level is within the ± 2.0 dB range for which a noise model is considered validated (*Section 5.4.1* of the RTNG).
- the noise model underpredicts the daytime noise levels at ML2 and ML3, by 0.4 dB and 1.7 dB respectively. As noted above, the measured noise levels at ML2 and ML3 include noise contribution from other noise sources than road traffic (i.e. rail activity and likely construction works associated with GREP). Therefore, the comparison between the predicted road traffic noise levels and the measured noise level is expected to indicate an underprediction as the noise contributions from the other noise sources are not included.
- the noise model overpredicts the night-time noise level at ML2 by +1.8 dB whilst underpredicts the night-time noise level at ML3 by 0.5 dB. The difference in noise levels (i.e. predicted minus measured) at ML2 is higher than the difference in noise levels at ML3, likely due to the shielding effect of the brush fence and parked cars at the front of the property at night, which are not accounted for in the noise model.
- the average differences between the measured and predicted noise levels are within the acceptable ± 2.0 dB range provided in *Section 5.4.1* of the RTNG.

Additional background noise monitoring was originally planned at the commencement of the Detailed Design stage works to enable further calibration and validation of the noise model. In accordance with PC-SI2, the noise monitoring was to be undertaken for a minimum of 7 days and outside of school holidays, to obtain representative noise levels of the typical road traffic conditions.

However, given the movement restrictions due to COVID-19 outbreak in November 2020; the State Government's recommendation to work from home where possible; and the end of year School Holidays (December to January), a suitable period for noise monitoring that provided representative noise data of typical road traffic conditions was not available. Therefore, the additional background noise monitoring was not conducted.

Nevertheless, as the noise model is overpredicting the traffic noise levels, and the project design remains compliant with the RTNG requirements as the use of the noise model provides a conservative outcome (i.e. potentially more noise mitigation identified than required).

Modelled Scenarios

In accordance with the RTNG, the following scenarios have been modelled for the assessment:

- Existing scenario (without build) – at project completion year 2023;
- Project-opening scenario (with build) – at project completion year 2023; and,
- Project-future scenario (with build) – at 10 years after project completion, at year 2033.

Noise Model Input and Assumptions

The traffic volumes, vehicle type percentage composition and vehicle speeds input into the noise model are provided in Section 5.4. Other noise input and assumptions, such as ground topography and absorption, buildings and barriers arrangements are also provided in Section 5.4.

7.3.5. Modelled Noise Levels

The daytime ($L_{eq,15hr}$) and night-time ($L_{eq,9hr}$) noise levels at all noise sensitive receivers have been predicted for the three scenarios (existing, project-opening and project-future).

Based on the predicted noise levels for the project-opening scenario, the established NAB as shown in Appendix H, was confirmed to be consistent with *Section 5.3* of the RTNG.

The predicted noise level contours are provided in Appendix I and the predicted noise levels at each of the sensitive receiver within the NAB for the three scenarios are tabulated in Appendix J.

A comparison between the predicted noise levels for the project-opening and existing scenarios indicates that the highest noise level increase at any sensitive receiver is 1.7 dB(A) which is less than 2 dB(A), and therefore is considered not significant. Nevertheless, the requirement for the consideration of noise mitigation has been triggered at a number of receivers due to exposure to existing high noise levels from Torrens Road and Churchill Road traffic.

7.3.6. Eligibility for Consideration of Noise Mitigation

The predicted noise levels at each receiver facade (within NAB) from the project at opening year have been assessed against the assessment criteria. For receivers that exceed the assessment criteria (i.e. with residual exceedances), their eligibility for consideration of noise mitigation has been determined in accordance with *Section 3.2.6* of the RTNG.

A receiver is eligible (at the project-opening year) for consideration of noise mitigation, when either one of the conditions provided in *Section 3.2.6* of the RTNG, which are listed in Table 18, is satisfied. Table 18 summarises the eligibility conditions and the number or receivers that have been determined to be eligible for consideration of noise mitigation under each condition.

Table 18: Eligibility Condition and Number of Receivers Affected

Condition	Number of Receivers Eligible for Consideration of Noise Mitigation
The predicted noise level is greater than the RIC, if it is the most stringent noise assessment criteria	0 (not he most stringent noise assessment criteria)
The project predicted noise level is more than 2 dB(A) (i.e. ≥ 2.1 dB(A)) above the existing predicted noise level for the same year (or an earlier year as elected by the project) and above the Noise Criteria	6
The project predicted noise level is greater than or equal to 5 dB(A) (i.e. ≥ 5.0 dB(A)) above the Noise Criteria	18
Total Number of Receivers Eligible for Consideration of Noise Mitigation	**24**

* A Noise Mitigation Plan is provided in Appendix K which indicates the properties that are eligible for consideration of noise mitigation, following catchment analysis (refer Section 7.5).

Based on the above, a total of 24 receivers within the NAB have been identified to be eligible for consideration of noise mitigation (at project opening year). Of the 24 eligible receivers, 23 are residential receivers and one is a non-residential receiver (i.e. Place of Worship).

The receivers that are eligible for consideration of noise mitigation are generally located near Churchill Road intersection; at the eastern and western end of Torrens Road; and near the new access link road at the Top Cut site. Note that the receivers on the southern side of Torrens Road at the eastern end of the works (between 1 Torrens Road and 27 Torrens Road) already benefit from an existing 2.4m high noise wall that was constructed in the early 1990's as part of the Churchill Road and Torrens Road intersection upgrade works.

Further catchment analysis has been conducted and summarised in Section 7.5. The extent of properties determined to the eligible for consideration of property treatment following the analysis is shown on the Noise Mitigation Map, in Appendix K.

7.4. Noise Mitigation Design

Once a receiver is eligible for consideration of noise mitigation, the mitigation measures are designed to meet the assessment criteria for the project future scenario (10 years after project opening).

Section 3.2.7 of the RTNG outlines the process to consider reasonable and practicable noise mitigation at each eligible receiver to satisfy the RTNG requirements.

The approach to determining noise mitigation is to first consider road design measures, followed by roadside barriers, and finally property noise treatment. Property noise treatment may replace road corridor mitigation, subject to a reasonable and practicable assessment, and only in the following circumstances:

- Isolated single residences or isolated groups of closely spaced residences.
- Where the affected community expresses a preference for at-property treatment and the cost is less than a combination of a barrier and at-property treatment.
- Where noise barriers cannot achieve the level of noise mitigation (insertion loss) required.
- Where other noise mitigation measures have been shown not to be reasonable or practicable.

7.4.1. Road Design Measures

Road design measures incorporated into the project design include the following:

- a DGA road surface type for all roads;
- a minimum 1.2m high roadside barriers (jersey style) on both sides of the ramp and overpass bridge; and,
- a solid anti-gawk screen on top of the jersey barrier on the northern side of the ramp and overpass bridge. The extent of the anti-gawk screen that is solid is shown in Appendix D (remaining extent being perforated and acoustically transparent). The total height of the screen is 2.1m high relative to the pedestrian path surface height (with jersey barriers as a base). Note that there is an expansion gap between the ramp and the bridge to allow for movement. The expansion gap between the jersey barrier ramp and bridge sections will be managed with a sliding solid sheet metal cover. However, for the solid anti-gawk screen on the north-western corner, a maximum 150mm gap has been allowed at the ramp-bridge interface. It is noted that the assumed maximum size of the gap in the noise model (i.e. 150mm) is conservative, as the design team intends to reduce the gap size further, as far as practicable.

7.4.2. Roadside Noise Barriers

The potential for implementation of road corridor noise barriers have been considered. The following factors were considered in determining whether noise barriers would be a reasonable and practicable mitigation option for eligible sensitive receivers:

- the receivers' frontage and driveway access via Torrens Road or fronting Churchill Road. For these, receivers, a noise barrier is not practical as it would disrupt property access
- the local topography and ground elevation at the receivers relative to the road surface. For these receivers, the topography limits the effectiveness of a reasonable height noise barrier at the roadside or make it impracticable to install a noise barrier closer to the property boundary due to the required civil works associated with the steep ground.
- the location of the receivers behind an existing noise wall (on the western side of Torrens Road, from 1 Torrens Road to 27 Torrens Road), which was constructed for road traffic noise mitigation as part of road Churchill Road and Torrens Road intersection upgrade works in the early 1990's. The replacement of the existing noise barrier will likely not be practical due to high cost for a small benefit.
- the receivers are exposed to traffic noise from different directions (e.g. Torrens Road and Churchill which are nearly perpendicular to each other and are at different elevations/gradient). Noise barriers are typically effective when treating noise from a single source or noise from a single direction.
- the receivers include two-storey dwellings. It is impracticable to treat noise impacts on the second storey with a noise barrier due to the significant barrier height that would be required.

- the receivers are not all grouped together and/or are isolated. Barriers are more cost effective when a single barrier mitigates noise impacts on a group of properties, and/or extend at one receiver to also shield neighbouring receivers.

With consideration to the above, the reasonable and practicable solution to reduce the noise impact at the receivers fronting Torrens Road and Churchill Road that are eligible is to consider implementation of facade noise treatment.

The implementation of barriers on the ramp/bridge was investigated during the ToC phase works to determine the benefit of having a barrier with an extended height (beyond the standard 1.2m high jersey barrier height) on the ramp/bridge. The analysis indicated limited acoustic benefit to the sensitive receivers in close proximity to the ramp/bridge. The analysis also indicated limited or no noise reduction benefit provided by extended barriers on the ramp/bridge, at the receivers where residual exceedances were predicted (i.e. receivers fronting Churchill Road and Torrens Road). The analysis is summarised in Appendix F. Notwithstanding, a solid anti-gawk screen on the northern side of the ramp and bridge that extends 2.1m high above the pedestrian footpath surface (as shown in Appendix D) has been incorporated in the Bridge Architecture and Urban Design to minimise the noise impact at the sensitive receivers to the north as much as practicable. This solid anti-gawk screen has been included in the noise modelling.

7.4.3. Property Treatment

Where property noise mitigation is considered for a receiver, Facade Treatment Package (FTPs) are determined for the relevant habitable spaces, as defined under the National Construction Code (NCC) Class 1, 2, 3 and 4 buildings and 9c aged care buildings. Sensitive Receivers that do not fall under the NCC categories are typically assessed on a case-by-case basis (e.g. Educational institutions or hospital wards). In these instances, the Australian Standard *AS 2107-2016 – Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107-2016) may be referred to as the basis for acoustic design.

For residential receivers that have been identified as eligible for consideration of noise mitigation, the applicable FTPs is determined based on the residual exceedances as summarised in Table 19.

Table 19 Applicable FTP for Level of Residual Exceedance

Habitable Space	Applicable FTP based on Level of Residual Exceedance			
	>2 - 5 dB(A)	6 - 9 dB(A)	10 - 13 dB(A)	14 dB(A)
Bedrooms	1	2	3	4
Other habitable rooms	n/a	1	2	3

Notes:

1. Predictions must be at 1m from the façade and include the 2.5 dB(A) facade reflection correction. FTP is not considered if the residual exceedance is 2 dB(A) or less (i.e. ≤ 2.0 dB(A))). For residual exceedances greater than 2 dB(A), the figure is rounded to the nearest decibel to ensure correct determination of the FTP.
2. For Facade Treatment Package 3 and 4, alternative ventilation in addition to openable windows must be provided in accordance with the requirements of Section 4.3.4 of the RTNG.
3. Non-habitable rooms include walk-in wardrobes, en-suites, and enclosed kitchens. However, where these spaces are part of an open plan arrangement with adjoining habitable rooms, such as a living/dining area or bedroom, they need to be treated as part of the habitable room.
4. Treatments to residential dwellings will be restricted to bedrooms, studies, living, dining, and kitchen areas that have windows or doors in the façade being treated. Corridors, laundries, bathrooms, garages, sheds, and workshops will not be treated.
5. When the assessment criteria are less than 50 dB(A), treatments to residential dwellings will be restricted to bedrooms that have windows or doors in the façade being treated.

Table 20 outlines the FTP requirements, which are provided as a deemed-to-satisfy solution to meet the requirements of the RTNG for residential receivers. An alternative solution is not required to be designed by an acoustic engineer. However, an acoustic engineer may design alternative treatment options to achieve an equivalent acoustic performance to the specified package treatments.

Table 20: FTP requirements in accordance with RTNG

FTP	Acoustic Performance Requirements
1	***Windows* and *external glass doors*** *Window = R_W + C_{tr} 31* For example, the acoustic equivalent of an existing window system incorporating 3 mm thick glass, with the addition of a 4.5 mm thick acrylic panel separated by a 150mm air gap or a single window system incorporating at least 6 mm thick laminated glass. *Door = R_W + C_{tr} 28* For example, the acoustic equivalent of a glass door system incorporating at least 6 mm thick laminated glass. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the above secondary or replacement window or door systems.
	External doors* other than *external glass doors *Door = R_W 30* For example, the acoustic equivalent of a solid timber core door with acoustic grade seals to head and jamb.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
2	***Windows* and *external glass doors*** *Window = R_W + C_{tr} 34* For example, the acoustic equivalent of an existing window system incorporating 3 mm thick glass, with the addition of a 10 mm thick acrylic panel separated by a 100 mm air gap or a single window system incorporating at least 10 mm thick laminated glass. *Door = R_W + C_{tr} 31* For example, the acoustic equivalent of a sliding glass door system incorporating at least 10 mm thick laminated glass. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the above secondary or replacement window or door systems.
	External doors* other than *external glass doors *Door = R_W 30* For example, the acoustic equivalent of a solid timber core door with acoustic grade seals to head and jamb.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
3	***Windows* and *external glass doors*** *Window = R_W + C_{tr} 37* For example, an acoustically rated single or double-glazed window system that can achieve the acoustic performance requirement. It is likely that a new window system will be required. *Door = R_W + C_{tr} 34* For example, an acoustically rated single or double-glazed door system that can achieve the acoustic performance requirement. It is likely that a new door system will be required. *Acoustic Seals* In order to achieve the acoustic performance, acoustic grade seals will need to be incorporated into the window or door system.

FTP	Acoustic Performance Requirements
	External doors* other than *external glass doors *Door* = R_W 32 For example, the acoustic equivalent of a solid timber core door of not less than 28 kg/m^2 surface density, acoustic grade seals around the head and jamb acoustically equivalent to Kilargo IS1212/1515 or Raven RP120/150 (batwing seals) and a dropdown seal at the bottom acoustically equivalent to Kilargo IS8090si or Raven RP38. Double doors to also have meeting stile seals acoustically equivalent to Kilargo 2xIS7060si or IS7071si, or Raven 2xRP16 or 2xRP71Si.
	Roof and Ceiling Provide insulation batts to ceiling cavity if no insulation present on inspection.
	External Flanking Paths Inspect the facade for external noise flanking paths that could potentially degrade the installed treatment. Rectify where reasonable and practicable. For example, block internal wall vents that have a direct path to the external wall facade. Note that external wall or floor cavity vents required for moisture control do not need to be treated.
	Ventilation Mechanical ventilation is required in accordance with *Section 4.3.4* of the RTNG and should be designed such that the facade acoustic performance is not degraded.
4	***Package 3 architectural treatments (above) are applicable.*** An offer for voluntary acquisition of the property by the Department may also be considered on a case-by-case basis.

The treatment in Table 20 is limited to the facades of habitable rooms being used at the time of the project. Future habitable rooms, non-habitable rooms, or rooms not habitable will not be considered for treatment.

At this stage, it is not known if property treatment at receivers near the Churchill Road and Torrens Road intersection was implemented as part of the previous intersection upgrade works. In the absence of further information, the property treatment requirements for these receivers and other receiver identified as being eligible for treatment will be determined following property inspections under design package 109-31 Noise Facade Treatment.

For the single non-residential receiver building that have been identified as being eligible for consideration of property treatment (i.e. the Holy Methodist Church), the noise treatment requirements will be determined using AS 2107-2016 under design package 109-31 Noise Facade Treatment, following further site investigation to ascertain the building layout, facade construction and space uses.

7.5. Noise Mitigation Plan

The noise mitigation design process and potential noise mitigation measures have been considered to determine a noise mitigation strategy that is reasonable and practicable. The noise mitigation strategy includes acoustic design features (i.e. the solid anti-gawk screen on the ramp/bridge) to address community expectation and perception towards noise from an overpass bridge; and specific treatment to address residual exceedances at properties and achieve the objective requirements.

The following factors have been taken into consideration in determining the appropriate mitigation measures:

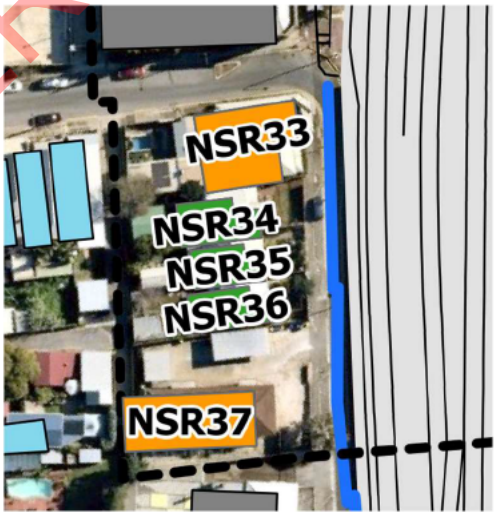
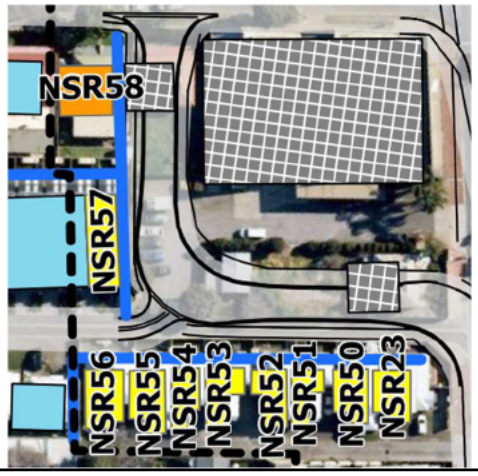
- the community expectation and perception towards noise from an overpass bridge;
- the level of residual exceedances and the mitigation options for the required noise reduction;
- the distribution of eligible receivers, whether isolated single or closely grouped together;
- the receiver floor level that the exceedances occur;
- the topographical features of the area and effectiveness of a reasonable noise barrier (such as on the northern side of Torrens Road, between Churchill Road and Fitzroy Terrace);
- the existing road traffic noise mitigation implemented in the area (such as the existing barrier on the western side of Torrens Road, from 1 Torrens Road to 27 Torrens Road ace);
- the requirements for access to the properties and reserve areas; and,
- the cost benefit and potential visual impacts.

Based on the above and the Noise Mitigation Design consideration in Section 7.4, the extent of reasonable and practicable noise mitigation for the project shall comprise a solid anti-gawk screen that extends 2.1m high on the northern side of the ramp and overpass bridge (for the extent shown in Appendix D), and property facade treatment at eligible receivers to meet RTNG requirements.

A total of 24 receivers (23 residential and one place of worship) within the NAB have been identified to be eligible for consideration of noise mitigation as determined in Section7.3.6. Further catchment analysis has been conducted to determine whether receivers located in close proximity to each other and with similar noise impact can be grouped together and be considered for application of a common noise mitigation approach, as described in *Section 3.1.3* of the RTNG. The analysis is summarised in Table 21.

Table 21: Number of FTPs for the Project – residential properties.

Receivers	FTP before analysis	FTP after analysis	Analysis Consideration	Results ORANGE = FTP1 GREEN = No FTP
NSR48 NSR46 NSR47 NSR49	0 2 2 2	2 2 2 2	NSR48 changed to FTP2 to match the adjacent dwellings which are considered for FTP2. The dwellings are located at similar proximity to the road.	
NSR1 NSR2 NSR3 NSR4	2 0 0 0	2 0 0 0	Although NSR1 is located near the other three receivers, it is the only dwelling with frontage to Torrens Road and has direct line of sight to Torrens Road traffic. NSR1 has higher noise exposure than the other three receivers fronting Napier Street. Therefore, FTP2 is considered for NSR1 and not the other three receivers.	

Receivers	FTP before analysis	FTP after analysis	Analysis Consideration	Results ORANGE = FTP1 GREEN = No FTP
NSR32 NSR31 NSR30 NSR29	2 2 0 0	2 2 0 0	NSR32 is a single storey dwelling fronting Torrens Road. NSR31 is a two-storey dwelling where treatment is trigger on the upper level. NSR32 and NSR31 (at the upper level) have similar noise exposure. NSR29 and NSR30 are single storey buildings and are located on lower ground level relative to the future Torrens Road. These dwellings have lower sound exposure than NSR32 and NSR31. Therefore, these four receivers have not been grouped together and FTP2 treatment will only be considered for NSR32 and NSR31 (as per the noise modelling results).	
NSR37 NSR33 NSR34 NSR35 NSR36	2 2 0 0 0	2 2 0 0 0	NSR33 is single storey dwelling, located behind the existing noise wall towards the northern end and has some line of sight to Torrens Road which triggers FTP2. NSR37 is a two-storey building, located behind the existing noise wall, and has line of sight to Torrens Road at the upper level which trigger FTP2. NSR34, NSR35 and NSR36 are single storey dwellings, located behind the existing noise wall, have no line of sight to Torrens Road traffic, and therefore lower sound exposure than NSR33 and NSR37(at the upper level). Therefore, these five receivers have not been grouped together and FTP2 treatment will only be considered for NSR33 and NSR37 (as per the noise modelling results).	
NSR23 NSR50 NSR51 NSR58	0 2 2 2	1 1 1 2	NSR23 is within a group of townhouse development with similar noise impact from the new access link road and therefore noise treatment is proposed for the property façades facing the road (triggered for the other adjacent townhouses). NSR50 and NSR51 downgraded to FTP1 for consistency across the townhouse development. NSR58 remained as FTP2 to address additional noise from Chief Street.	

Following the analysis as summarised in Table 21, the resulting number of eligible residential properties for consideration of noise treatment is 25 (an increase from 23 residential receivers determined from the noise modelling). Table 22 summarises the FTPs at the 25 eligible residential receivers.

Table 22: Number of FTPs for the Project – residential properties.

FTP Category	Number of Receivers for Consideration of FTPs
1	9
2	14
3	2
4	0
Total	**25**

A single non-residential (i.e. Place of Worship) receiver building has been identified as being eligible for noise mitigation. As mentioned in Section 7.4.3, the noise mitigation requirements will be determined using AS 2107-2016 under design package 109-31 Noise Facade Treatment, following further site investigation to ascertain building layout, facade construction and space uses.

The receivers eligible for consideration of noise mitigation and the preliminary FTPs are summarised in Table 23. Appendix K provides Noise Mitigation Plan showing the receivers determined to be eligible for consideration of property treatment and the preliminary FTPs.

Table 23: Summary of receiver eligible for consideration of FTPs – residential and non-residential properties.

No	Receiver ID	Address	Floor / Level	FTP
1	NSR40	U1-8/5 Churchill Rd Ovingham 5082	First	3
			Ground	
2	NSR41	U9-10/5 Churchill Rd Ovingham 5082	Ground	3
3	NSR1	62 Torrens Rd Ovingham 5082	Ground	2
4	NSR23	U1/65 Torrens Rd Brompton 5007	First	1
5	NSR31	31B Torrens Rd Ovingham 5082	First	2
6	NSR32	31A Torrens Rd Ovingham 5082	Ground	2
7	NSR33	27 Torrens Rd Ovingham 5082	Ground	2
7	NSR37	U4/19 Torrens Rd Ovingham 5082	First	2
8		U1/19 Torrens Rd Ovingham 5082	Ground	
9	NSR42	9 Churchill Rd Ovingham 5082	Ground	2
10	NSR43	11 Churchill Rd Ovingham 5082	Ground	2
11	NSR44	11A Churchill Rd Ovingham 5082	Ground	2
12	NSR45	13 Churchill Rd Ovingham 5082	Ground	2
13	NSR46	2 Toronto St Ovingham 5082	Ground	2
14	NSR47	4 Toronto St Ovingham 5082	Ground	2
15	NSR48	6 Toronto St Ovingham 5082	Ground	2
16	NSR49	8 Toronto St Ovingham 5082	First	2
17	NSR50	U2/65 Torrens Rd Brompton 5007	First	1
18	NSR51	U3/65 Torrens Rd Brompton 5007	First	1
19	NSR52	U4/65 Torrens Rd Brompton 5007	First	1
20	NSR53	U5/65 Torrens Rd Brompton 5007	First	1
21	NSR54	U6/65 Torrens Rd Brompton 5007	First	1
22	NSR55	U7/65 Torrens Rd Brompton 5007	First	1
23	NSR56	U8/65 Torrens Rd Brompton 5007	First	1

No	Receiver ID	Address	Floor / Level	FTP
24	NSR57	26 Hayman St Brompton 5007	First	1
25	NSR58	99 Chief St Brompton 5007	Ground	2
26	HMC	Holy Methodist Church (CMCA) 7 Churchill Rd Ovingham 5082	All	TBD*

* TBD – To be determined following site inspection under design package 109-31 Noise Facade Treatment.

It is noted that the FTP indicated in Table 23 are the maximum possible FTPs based on the highest predicted residual exceedance at any facade of the receivers and are preliminary in nature. The final FTP to be applied at each receiver will be subject to a site inspection (under design package 109-31 Noise Facade Treatment), to determine the location of bedrooms and living rooms with respect of the most impacted facade at each identified receiver.

The design of the noise facade treatment at each property, where eligible, will be determined in accordance the RTNG under design package 109-31 Noise Facade Treatment.

7.6. Post-Construction Verification

Noise monitoring will be conducted at a number of locations (minimum 5 locations) within the defined Noise Assessment Boundary (refer Section 7.3.3), with preference given to the locations where pre-construction noise monitoring has been undertaken.

Simultaneous monitoring of traffic flows and composition shall also be undertaken (by traffic consultant) during the noise monitoring, where possible.

The monitoring results will be used to validate the predicted noise levels for the project opening year and to confirm that the implemented extent of noise mitigation measures satisfy the requirements of the RTNG.

The post-construction monitoring and validation works will be summarised in a separate report.

7.7. Conclusion

The noise modelling and assessment of the project design indicate that the requirements of the RTNG can be achieved with the established noise mitigation strategy implemented. For this project, the noise mitigation strategy comprises a solid anti-gawk screen on the northern side of the ramp and overpass bridge, and property treatments at properties where there is residual exceedance. The approach is reasonable and practicable, and satisfies the RTNG noise mitigation requirements.

8. VIBRATION MODELLING AND IMPACT ASSESSMENT

As noted in Section 5.3.2, operational vibration impact from the project has been assessed at the ToC phase and determined to be compliant with all the relevant requirements. The assessment is summarised in the PTPA Technical Note PTPA-OVX-10930-MEM-0000-33-0001 (refer Appendix E).

Changes to the project design during detailed design, as summarised in Section 2.2, are not significant to affect change to the expected operational vibration levels from the project.. Therefore, outcomes of the operational vibration impact assessment conducted at the ToC phase remain valid, that is, the project complies with all the CSCR requirements that are related to operational vibration.

9. INTEGRATION

9.1. Digital Engineering

Throughout the design development process, the design team will utilise a BIM workflow to integrate the 3D design modelling across each of the design disciplines. A project Digital Engineering Execution Plan (DEXP) will be developed and is to be used through the design phase to detail the processes to incrementally develop a fully integrated 3D model.

Table 24: Digital Engineering Documentation

Reference	Description
PTPA-OVX-10060-PLN-0000-ENG-0001	Digital Engineering Execution Plan

9.2. Site Assessment Report

The Site Assessment Report will ensure that the design considers all physical features that would be reasonably apparent during a field inspection. The report will detail existing site conditions providing a description of the existing physical features. In tandem with the detailed survey, aerial photography and site visits of the project areas, the report will provide a multi-strand information set of the existing site conditions accounted for in the project design. This report has been provided as an initial submission with the TOC Design.

Table 25: Site Assessment Documentation

Reference	Description
PTPA-OVX-10030-REP-0000-ENG-0001	Site Assessment Report

9.3. Design Interfaces

The 109-30 Noise and Vibration Modelling is integrated into the overall design through inter-discipline co-ordination including the design interface process as set out in the EDMP.

The design packages in Table 26 below should be read in conjunction with this package. Where other packages are due to be issued after this package, it is confirmed that the interdisciplinary reviews will continue to occur such that any potential impacts on this package are identified and addressed as appropriate. Interfacing packages are shown on drawings in magenta for information.

Table 26: Design packages and interfaces

Design Package	Interface	Description of interface	Design Package Status
Utilities & Services			
DP – 101-10– SA Power Networks	No		
DP – 101-20 – APA Gas	No		
DP – 101-30 - SA Water (Potable – Stage 1)	No		
DP – 101-31 - SA Water (Potable – Stage 2)	No		
DP – 101-40 – SA Water (Sewer)	No		
DP – 101-50 – Communications	No		
DP – 101-60 – Common Services Trench	No		

Design Package	Interface	Description of interface	Design Package Status
Civil Design			
DP – 102-10 – Road Alignment	Yes	Road alignment design	100% Design
DP – 102-11 – Local Roads & Public Realm	Yes	Road alignment design	100% Design
DP – 102-20 – Road Drainage	No		
DP – 102-21 – Flood Modelling & Hydrology	No		
DP – 102-50 – Traffic Control	No		
DP – 102-51 – Local Roads Traffic Control	No		
DP – 102-60 Pavements	Yes	Road surface type	100% Design
DP – 102-70 – Road Lighting & Electrical	No		
DP – 102-71 – Road Lighting & Electrical – Public Realm & Local Roads	No		
Rail			
DP – 103-20 – Rail Civil, Pedestrian Crossing, Common Services Route and Corridor Fencing	No		
DP – 103-30 OHLE	No		
DP – 103-60 Earthing and Bonding	No		
DP – 103-90 Signalling	No		
Civil Structures			
DP – 104-10 Torrens Road Bridge	Yes	Bridge arrangement and extent and design of any barriers	100% Design
DP – 104-20 Approach Ramps & Retaining Walls	Yes	Ramp arrangement and extent and design of any barriers	100% Design
DP – 104-50 – Miscellaneous Structures & Barriers	Yes	Extent and design of miscellaneous barriers	100% Design
DP – 104-60 – Durability Report	No		
Urban Design & Landscaping			
DP – 105-10 – Bridge Architecture and Urban Design	Yes	Construction details around barrier/fencing design	100% Design
DP – 105-50 – Landscaping	No		
Geotechnical & Pavements			
DP – 106-10 – Geotechnical Interpretive Report	No		
Transport & Traffic			
DP – 107-10 – Traffic Modelling Performance	Yes	Road traffic volumes and percentage commercial vehicles	100% Design
DP – 107-20 – Traffic Signals	No		

Design Package	Interface	Description of interface	Design Package Status
DP – 107-30 – Pedestrian / Cyclist Movement Study	No		
Environmental & Sustainability			
DP – 109-10 – Environmental Impacts	No		
DP – 109-30 – Noise and Vibration Modelling	N/A	This package	100% Design
DP – 109-31 – Noise Facade Treatment	Yes	109-31 requires output of this package.	Work in progress - 70% Design
DP – 109-50 – Sustainability	No		
DP – 109-60 – Ecology	No		
DP – 109-70 – Air Quality Modelling	Yes	109-70 requires noise barrier/wall arrangement (if relevant) for air quality modelling purposes.	100% Design
DP – 109-80 – Site Contamination Investigation	No		

9.4. Interdisciplinary Review

Prior to external issue this Design Package has undergone an Interdisciplinary Review with evidence of these reviews presented in Appendix A.

9.5. Local Industry Participation

The Design Team has a responsibility to maximise the Project's performance against the South Australian Industry Participation Policy (IPP). The Design Development process is to have due regard for Local Industry involvement when selecting products specified for incorporation into the works. Where possible, the design has selected products that have a high utilisation of South Australian based labour to fabricate elements or to produce the raw materials that make up the prefabricated elements. Conversely, the design team is to avoid disadvantaging South Australian suppliers by specifying brands or products that are only produced outside of South Australia when a suitable alternative is produced locally.

9.6. Sustainability in Design

Sustainability design requirements for the project are outlined in the project 'Functional & Operational Requirements' and Part PC-ST1 'Sustainability in Design' of the Project Controls Master Specification. As part of these requirements the project is required to achieve a minimum 10% reduction in whole-of-life greenhouse gas (GHG) emissions, relative to the reference design with business as usual (BAU) design and construction approach, including investigation of strategies to reduce embodied emissions from the project's concrete and asphalt use. The project must also identify and investigate initiative to reduce whole-of-life GHG emissions, water use, and waste disposed to landfill.

For this design package, potential concrete noise walls along the road corridor were initially identified as an opportunity for further investigation, to determine alternative construction materials that could meet the Sustainability in Design target above. However, as concrete noise walls have not been included in the final design (nor were there any in the reference design) and noise facade treatment will implement, there has been no other specific sustainability initiatives under this design package. Sustainability in Design relating to the design and implementation of noise facade treatment at eligible properties is discussed in design package 109-31 Noise Facade Treatment (PTPA-OVX-10931-REP-0000-33-0001).

9.7. Maintenance in Design

In line with the requirements of the PC-EDM1, Maintenance in Design assessments will be included to efficiently and safely maintain the infrastructure. This will be undertaken in accordance with the EDMP and undertaken in conjunction with DIT nominated maintenance personnel.

Maintenance in Design is not directly applicable to 109-30 Noise and Vibration Modelling package. The design outcomes of this package are integrated with the packages in Table 26 and Maintenance in Design is considered under those specific packages.

9.8. Safety Management in Design

Safety in Design (SiD) is not directly applicable to 109-30 Noise and Vibration Modelling. The design outcomes of this package are integrated with the packages in Table 26 and SiD is considered under those specific packages.

9.9. Constructability

Constructability and quantity surveyor reviews are undertaken by the construction team during their programmed review stages for each individual package throughout the design process. The Construction Team provided comments on both design and construction issues and, where required, feedback received from these reviews was incorporated into the design. In addition to this process, reviewing constructability is an ongoing task within the Alliance through informal correspondence and routine meetings during the design development stages.

10. CONSULTATION AND AUTHORITY APPROVALS

Nil.

11. DESIGN VERIFICATION

11.1. Internal Verification

As outlined in the EDMP, Interdisciplinary Design Reviews (IDR), Construction Reviews (CR), internal verification, and technical reviews are required to be undertaken for each Design Package. These reviews have been completed in accordance with the procedures outlined within the EDMP by both independent and internal project team members. Copies of comments and associated responses have been saved and filed electronically.

Records of IDR reviews are included in Appendix A with Final Design Certificates to be included in Appendix C.

11.2. External Verification

As per PC-EDM3 'Independent Design Certification', a Review or Analysis by the Independent Design Certifier (IDC) is to be undertaken at later design stages. Refer to Independent Design Report and Comments Register in Appendix B, that will be populated at 100% design stage.

11.3. DIT and External Stakeholder

DIT comments will be coordinated with the IDC review and consolidated into a single comments register included in Appendix B.

12. OUTSTANDING ISSUES

The outstanding issues for this package are listed in Table 27 below.

Table 27: Outstanding issues

Issue	Description	Status
Nil		

APPENDIX A INTERNAL REVIEWS AND VERIFICATION RECORDS

PTP ALLIANCE OVINGHAM	Ovingham Level Crossing Grade Separation			
	Interdisciplinary Review Checklist			
	Doc No.	PTPA-OVX-10930-QAR-9999-QA-0001	**Rev**	B1

Package Number	109-30			**Date**	17/03/2021
Package Title	Noise and Vibration Modelling				
Package Owner	6(1) Personal affairs		**Design Lead**	6(1) Personal affairs	
Design Coordinator			**Engineering Manager**		
Design Manager			**Construction Manager**		
Technical Reviewer					
Design Stage	☐ 30% Design *Preliminary Design*	☐ 70% Design *Detailed Design*	☒ 100% Design *Final Design*	☐ IFC *Issued for Construction (IFC)*	

Discipline/ Reviewer Name	Response Type *(See Note 1)*	Initial to confirm review completed	Date
Design Manager (Strikethrough Not Required)			
6(1) Personal affairs			
	V		22/03/21

Civil Structures			
6(1) Personal affairs			
	D		18/03/21

Cross Discipline Review Completed *(Package Owner to Sign)*		**Target Date**	**Actual Date**
Name 6(1) Personal affairs		**19/03/21**	**22/03/2021**

1) *Response type to be entered as*
D = Drawing set mark-up,
V = Verbal,
N = Refer to notes or report (please attach).

APPENDIX B EXTERNAL REVIEWS

Ovingham Alliance

Review Comments Report

Bundle Name: **109.30 - Noise and Vibration Modelling & Report** **Bundle Stage:** **Issued For Approval (IFA)**

03 Jun 2021

Review Comments and Responses Register						
Review Comments					Response History & Status	
Comment ID	Reviewer's Name	Comment Title	Comment Description	Category	Status History	Current Status

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

9(1)(a)(i) Opinion or advice, 9(1)(a)(ii) Consultation or deliberation

APPENDIX C CERTIFICATES OF COMPLIANCE

Certificate of Compliance - dNOP

Doc No.	PTPA-OVX-10930-CER-0000-33-0001	Rev	A

PAA:	19C861
Certificate Number:	PTPA-OVX-10930-CER-0000-33-0001
Design Package:	109.30 - Noise and Vibration Modelling
dNOP:	PTP Alliance Ovingham Design Joint Venture (Arup and Mott MacDonald)

In accordance with the PAA the dNOP(s) certifies that the Design Documents:

- comply with the Contract and Project Requirements;
- comply with Legislative and Authority Requirements; and
- Design Verification and Quality Assurance review has been completed.

Design Documents:

Document Number	Rev	Document Title
PTPA-OVX-10930-REP-0000-33-0001	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING GUIDELINE SCOPING REPORT
PTPA-OVX-10930-REP-0000-33-0002	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING DESIGN REPORT
PTPA-OVX-10930-RCO-0000-33-0001	IFA	CIT COMMENTS – 109.30 NOISE AND VIBRATION MODELLING (IFA)

Conditions of Certification:*

* Note: Written approval from the Principal's Representative of any conditions to certification must be submitted with the Certificate

Authorised Representative (NER, CPEng, etc)

Name:	6(1) Personal affairs	Qualifications	BSc Civil Engineering CPEng
Position:	PTP Alliance Ovingham Design Technical Manager	Signed:	6(1) Personal affairs
Date:			

Certificate of Compliance - cNOP

Doc No.	PTPA-OVX-10930-CER-0000-33-0002	Rev	A

VPAA:	19C861
Certificate Number:	PTPA-OVX-10930-CER-0000-33-0002
Design Package:	109.30 - Noise and Vibration Modelling
cNOP:	McConnell Dowell Constructors (Aust) Pty Ltd

The cNOP has undertaken a review of the design in accordance with its responsibilities under the PAA, the Engineering and Design Management Plan and in particular clause 8.3, Part PC-EDM1 of the Master Specification and certifies that the design packages listed below have been reviewed to consider constructability and integration of the design with construction staging or any temporary works.

Design Documents:

Document Number	Rev	Document Title
PTPA-OVX-10930-REP-0000-33-0001	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING GUIDELINE SCOPING REPORT
PTPA-OVX-10930-REP-0000-33-0002	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING DESIGN REPORT
PTPA-OVX-10930-RCO-0000-33-0001	IFA	CIT COMMENTS – 109.30 NOISE AND VIBRATION MODELLING (IFA)

Conditions of Certification:*

* Note: Written approval from the Principal's Representative of any conditions to certification must be submitted with the Certificate

cNOP Authorised Representative (NER or CPEng)

Name:	6(1) Personal affairs	Qualifications	FIEAust CPEng NER
Position:	PTP Alliance Ovingham Engineering Manager	Signed:	6(1) Personal affairs
Date:	3/06/2021		

Independent Design Certificate

Project:	Ovingham Level Crossing Grade Separation Project – Ovingham Alliance
Design Certifier:	Wallbridge Gilbert Aztec (WGA)
Certificate Number:	WGA-OVX-10930-CER-0000-33-0001[0]
Design Package:	109.30 – Noise & Vibration

Independent Design Certification has been undertaken on the design documents listed below. In undertaking the Independent Design Certification review I certify in my professional assessment:

- Independent Design Certification Services as defined in the Independent Design Certifier's Scope has been completed;
- the drawings, reports and specifications that have been Checked by the Independent Design Certifier accurately describe the Works;
- the design documents that have been Checked by the Independent Design Certifier comply with the Principals' or legislative requirements.

Design Documents:

Document Number	Rev	Document Title
Resonate-OVX-10930-CER-0000-33-0001	0	Refer to attached Independent Design Certifier's Sub Consultant Certificate Resonate-OVX-10930-CER-0000-33-0001[0]

Conditions of Certification:*

* Note: Written approval from the Principal's Representative of any conditions to certification must be submitted with the Certificate.

Independent Design Certifier Representative (NER, CPEng, etc)

Name:	6(1) Personal affairs	Qualifications	B.Eng CPEng 1457571
Position:	Technical Director	Signed:	6(1) Personal affairs
Date:	02/06/2021		

WGA
WALLBRIDGE GILBERT AZTEC

Independent Design Certificate

Project:	Ovingham Level Crossing Grade Separation Project – Ovingham Alliance
Design Certifier:	Resonate
Certificate Number:	Resonate-OVX-10930-CER-0000-33-0001[0]
Design Package:	109.30 – Noise and Vibration

Independent Design Certification has been undertaken on the design documents listed below. In undertaking the Independent Design Certification review I certify in my professional assessment:

- Independent Design Certification Services as defined in the Independent Design Certifier's Scope has been completed;
- the drawings, reports and specifications that have been Checked by the Independent Design Certifier accurately describe the Works;
- the design documents that have been Checked by the Independent Design Certifier comply with the Principals' or legislative requirements.

Design Documents:

Document Number	Rev	Document Title
PTPA-OVX-10930-REP-0000-33-0001	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING GUIDELINE SCOPING REPORT
PTPA-OVX-10930-REP-0000-33-0002	C	OVINGHAM LEVEL CROSSING GRADE SEPARATION 109-30 NOISE AND VIBRATION MODELLING DESIGN REPORT

Conditions of Certification:*

* Note: Written approval from the Principal's Representative of any conditions to certification must be submitted with the Certificate.

Independent Design Certifier Representative (NER, CPEng, etc)

Name:	6(1) Personal affairs	Qualifications	B. Tech, MAAS
Position:	Managing Director	Signed: 6(1) Personal affairs	
Date:	31/05/2021		

APPENDIX D PROJECT ALIGNMENT AND BARRIER DESIGN


NSR1
NSR3
NSR2
NSR4
NSR5
NSR6
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NSR8
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BHH
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NSR29
NSR30
NSR31
NSR32
NSR45
NSR44
NSR43
NSR42
NSR41
HMC
NSR40
NSR33
NSR34
NSR35
NSR36
NSR37
NSR49
NSR48
NSR47
NSR46
Date: 7/05/2021
Datum: MGA Zone 54
SCALE 1:1,750 @ A3
0
50
100 m
Noise Assessment Boundary
Noise Sensitive Buildings
Other Buildings
Buildings to be demolished
Design String
Fence/Barrier Height
1.2m Jersey Barrier
2.1m Solid Anti-Gawk Screen*
*Screen on top of jersey barrier for total 2.1m height.
2.4m Fence Upgrade
Existing Fencing
Ovingham Level Crossing Grade Separation
Project Design and Extent of Project Fences, Barriers and Screens
PTP ALLIANCE OVINGHAM

APPENDIX E OPERATIONAL VIBRATION IMPACT ASSESSMENT

Technical Note

Project Name:	Ovingham Level Crossing Grade Separation Project		
Package Number:	109-30	**Prepared By:**	6(1) Personal affairs
Package:	Noise and Vibration	**Reviewed By:**	
Subject:	ToC Design Operational Vibration Impact		
Approved by:	6(1) Personal affairs	**Date:**	15/10/2020

1. Introduction

This document summarises a review of the ToC estimate design (ToC Design) with respect to operational vibration impact and confirms compliance with the relevant project Functional and Operational Requirements (FOR) and Project Controls Master Specification (PCMS).

The review has been based on the approach and findings of the of the PTPA Preliminary Noise and Vibration Assessment (PNVA) conducted during the Planning Stage and detailed in the report PTPA-LXRP-121410-REP-0000-PLN-0006 (Revision B, dated 6 March 2020).

2. Project Requirements

The FOR includes the following requirements:

> ***10.1 Environmental Requirements***
>
> ***Noise & Vibration***
>
> *10.1.11 Noise and vibration mitigation measures shall be provided to ensure there is no additional environmental harm to the local community (sensitive receivers, other buildings), heritage features, fauna and flora.*

Part PC-ENV3 Environmental Design of the PCMS includes the following requirements:

> ***7 Vibration assessment***
>
> *7.1 The Contractor must undertake an operational assessment associated with the design to demonstrate compliance at all sensitive receivers with:*
>
> *7.2 the evaluation criteria for intermittent vibration sources provided in Annex A of Australian Standard AS 2670.2–1990: Evaluation of human exposure to whole-body vibration,*
>
> - *Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz) and structural damage criteria in German Standard DIN 4150-3 Effects of Vibration on Structures; and*
> - *EPA: Guidelines for the assessment of noise from railway infrastructure.*
>
> *7.3 The implications of structure borne vibration shall be included in the assessment.*

3. Preliminary Works

The PNVA conducted an objective assessment of the potential vibration impact from road traffic associated with the redeveloped Torrens Road based on vibration measurements of existing vibration levels from Torrens Road traffic. The PNVA compared the measured vibration levels with the following vibration criteria established based on the standards referenced in Part PC-ENV3 of the PCMS (Clause 7.2):

- the evaluation criteria for intermittent vibration sources provided in Annex A of the Australian Standard *AS 2670.2–1990: Evaluation of human exposure to whole-body vibration Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz)* (AS 2670.2-1990) - for human comfort. The criteria are provided in Table 1; and,
- structural damage criteria in German Standard *DIN 4150-3 Effects of Vibration on Structures* (DIN 4150-3) - for prevention of building damage. The criteria are provided in Table 2.

It is noted that the AS2670.2-1990 criteria for human response are more stringent than the DIN 4150-3 criteria for prevention of building damage, and therefore the AS2670.2-1990 criteria in Table 1 was used to assess operational vibration from the redeveloped Torrens Road.

Table 1: AS 2670.2-1990 Vibration Criteria.

Building	Peak Particle Velocity (PPV), in mm/s	
	Day	Night
Residential	0.3	0.2
Commercial - office	0.6	
Commercial - workshop	1.1	

Table 2: DIN 4150-3 Vibration Criteria.

Type of Structure	Short-Term				Long-Term
	PPV (mm/s) at the Foundation of a Building at a Particular Frequency			PPV (mm/s) in Horizontal Plane of highest floor at all frequencies	PPV (mm/s) in Horizontal Plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz		
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	10
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	5
Structures that, because of their particular sensitivity to vibration, cannot be classified under the above categories, and are of great intrinsic value (e.g. heritage listed buildings)	3	3 to 8	8 to 10	8	2.5

The PNVA indicated that vibration from Torrens Road traffic will achieve the most stringent night-time PPV criterion in AS 2670.2-1990 (i.e. PPV of 0.2 mm/s) if a minimum buffer of 10m is established between the centre of the closest realigned road lane and the sensitive receivers. The PNVA concluded that operational vibration from the project concept design is expected to satisfy PC-ENV3 requirements given that a buffer distance greater than 10m is provided between sensitive receivers and centre of the closest realigned Torrens Road lane.

The PNVA excluded vibration impact from rail operation as the project does not change the existing rail design. The vibration impact associated with the rail operation will be no greater than the existing impact at the surrounding sensitive receivers.

4. ToC Design Review

The General Arrangement of the ToC Design is provided in Figure 1.

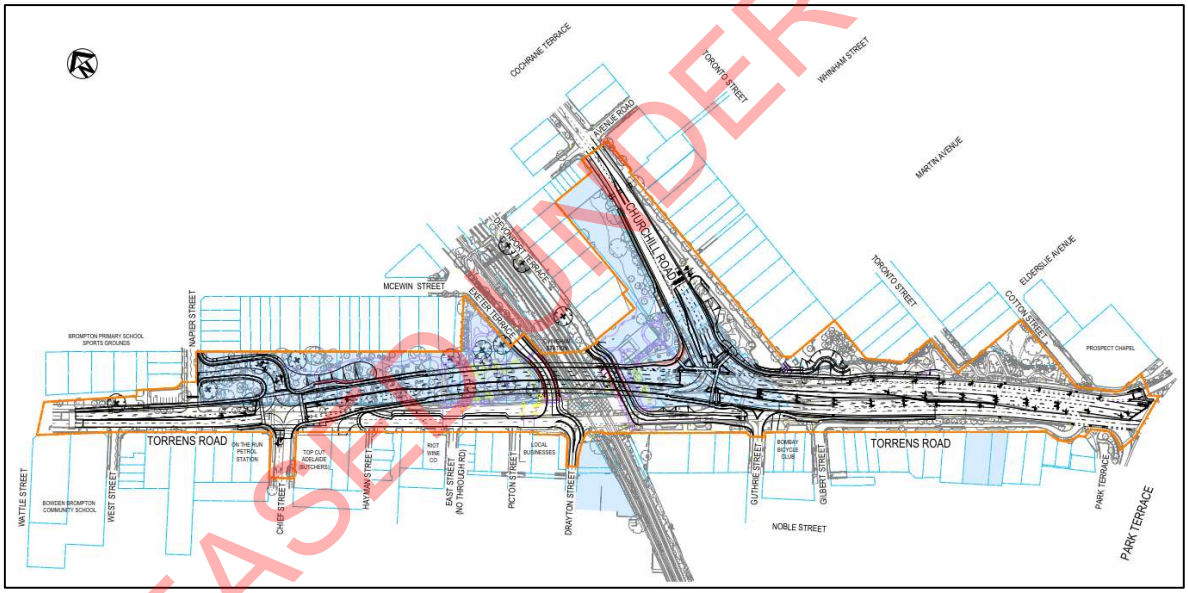


Figure 1: Ovingham Crossing General Arrangement

The ToC Design includes the realignment of Torrens Road and Napier Street. Both road realignments provide a buffer of at least 10m between sensitive receivers and the centre of the closest realigned lane, and/or no closer than the existing alignment.

Therefore, based on the findings of the PNVA:

- the operational vibration levels from the project ToC Design is expected to achieve the AS2670.2-1990 criteria at the sensitive receivers that are located 10m or more from the centre of the closest lane of the realigned road.
- the operational vibration impact from the project ToC Design at other sensitive receivers (where receivers are within 10m of the centre of the nearest existing road lane and there will be no reduction in separation distance) will be no greater than the existing impact.

5. Conclusion

Based on a minimum buffer of no less than 10m provided between sensitive receivers and the realigned Torrens Road and Napier Street, or a buffer of no less than the existing for sensitive receivers within 10m of the project, the vibration impact from the project ToC Design is expected to meet the relevant requirements of Part PC-ENV3 of the PCMS and Section 10.1 of the FOR.

6. References

- Australian Standard *AS 2670.2–1990: Evaluation of human exposure to whole-body vibration Part 2–Continuous and shock-induced vibration in buildings (1 to 80Hz)*
- DIT Functional and Operational Requirements, 19C861 – Ovingham Level Crossing Grade Separation (K Net Number 14813931, Revision F, dated 28 May 2020)
- DIT Project Controls Master Specification, 19C861 – Ovingham Level Crossing Grade Separation Project Alliance (K Net Number 15424364, Revision A, dated 30 April 2020)
- German Standard *DIN 4150-3 Effects of Vibration on Structures*
- PTPA Preliminary Noise and Vibration Assessment report (PTPA-LXRP-121410-REP-0000-PLN-0006, Revision B, dated 6 March 2020).
- ToC Design drawing PTPA-OVX-00000-SKT-1200-01-0009, dated 8 October 2020.

APPENDIX F HIGH LEVEL REVIEW OF RAIL NOISE IMPACT

Introduction

The potential change in the existing rail noise impact at sensitive receivers located along Drayton Street following the demolition of buildings adjacent to the rail corridor on Drayton Street and Seventeenth Street has been considered and summarised below.

The site will be used as a construction compound area during the construction phase. It is not known at this stage the intended future use of the site following completion of the project (though it is most likely that the site will be developed for residential and/or commercial uses). For the purpose of conservatism in this assessment, the site has been assumed to remain vacant.

To quantify the potential noise impact from the rail corridor, the prediction methodology and assessment criteria provided in Minister's Specification SA 78B 'Construction requirements for the control of external sound' (SA 78B) have been considered. Although not strictly applicable, the noise criteria provided by GANRI for a redeveloped rail project have also been considered.

Criteria

Table 2 of SA 78B provides the following maximum allowable levels for individual rooms in the building:

- 35dB(A) $L_{eq,9hr}$ during night-time (10pm to 7am) inside bedrooms;
- 40dB(A) $L_{eq,15hr}$ during daytime (7am to 10pm) inside living spaces.

For comparison, *Table 1* of GANRI provides the following external noise level criteria for new and redeveloped rail infrastructure projects:

New rail

- 55dB(A) $L_{eq,9hr}$ during night-time (10pm to 7am)
- 60dB(A) $L_{eq,15hr}$ during daytime (7am to 10pm)

Redevelopment rail

- 60dB(A) $L_{eq,9hr}$ during night-time (10pm to 7am)
- 65dB(A) $L_{eq,15hr}$ during daytime (7am to 10pm)

It is noted that SA 78B internal noise criteria aligns with the GANRI external noise criteria for new rail project align, based on a 20 dB(A) noise reduction assumed across a typical building facade with standard building construction and windows closed. Given the project situation is better described as development of an exisitng rail corridor, consideration of noise criteria associated with a new railway (as provided by SA 78B) is considered a conservative approach.

Methodology

A three-dimensional noise prediction model has been established in SoundPLAN Version 8.2, with the implementation of ISO 9613 noise propagation algorithm. The noise model includes the following features:

- Topographical features;
- Rail alignment;
- Ground absorption;
- Shielding from buildings and relevant structures (e.g., existing fences);
- Receiver height.

The rail corridor noise was modelled with the existing buildings at 159 Drayton Street, 161 Drayton Street, 163 Drayton Street, 157 Drayton Street, 25 Seventeenth Street and 28 Seventeenth Street demolished, and the existing 1.8m high sheet metal fence at the property boundary interface with the rail corridor retained.

Rail Noise Source

Using the source levels in *Table 4* of SA 78B, the rail line source in the noise model was calibrated to the following:

- $L_{eq,9hr}$ 62dB(A) during night-time, referenced at 10m from the corridor; and,
- $L_{eq,15hr}$ 67dB(A) during daytime, referenced at 10m from the corridor.

Other Inputs and Assumptions

The other inputs and assumptions for the noise model include:

- 0.5m rail source above ground level;
- 1.5m receiver height above ground level;
- 50% soft and 50% hard ground;
- rail line source placed within the rail corridor on the northern side closest to Drayton Street (given the assessment is related to the noise impact near the receivers fronting Drayton Street);
- the demolition site remains vacant/not built up during project construction and after project completion.

Results

With the existing building at 159 Drayton Street, 161 Drayton Street, 163 Drayton Street, 157 Drayton Street, 25 Seventeenth Street and 28 Seventeenth Street demolished, the predicted rail noise levels at the closest sensitive receiver to the rail corridor, at 47C-47F Drayton Street (i.e. Bowden Holiday House) were 60 dB(A) during the day and 55 dB(A) during the night.

Based on the above predicted external noise levels, and typical noise reduction of 20 dB(A) across a building facade with standard construction and windows closed, the average noise levels from the rail corridor achieve the SA 78B internal noise criteria. The predicted external noise levels also achieve the GANRI noise criteria for redeveloped rail corridor. Therefore, the noise impact from the rail corridor following the demolition works is considered to be acceptable at the closest noise sensitive receivers.

The noise levels before the demolition works were also predicted to quantify the noise level increase at the nearby noise sensitive receivers. The highest predicted[4] noise level increase at any receiver was 5 dB, at 47C-47F Drayton Street, on the southern facade. The predicted noise level increase on the most exposed facades at 47C-47F Drayton Street, which are to the east and north, is no greater than 1 dB.

It is noted that a 5 dB noise level change is a noticeable change, although not to the extent typically described as doubling of the sound (which typically occurs when there is a 10 dB noise level change). A noise level increase of 2 dB or less is typically not noticeable. Given the presence of other significant transient noise sources in the area (ie road traffic) and the associated existing noise levels (e.g. 58 dB(A) night-time noise level at 47C-47F Drayton Street from Torrens Road), the change in rail noise level following the demolition works is not expected to have a significant noise impact at the closest receivers.

The following results are presented below:

- Tabulated highest predicted external and internal night-time noise levels at the four closest noise sensitive receiver, indicating the change in noise levels at these locations. The predicted noise levels at the façade with the highest predicted change in noise levels are also provided It is noted that given the difference between daytime and night-time source noise levels and criteria are both 5 dB(A) (with the daytime levels being higher) which results in a similar assessment outcome, only the night-time levels are presented for brevity.
- A noise contour map of the predicted night-time external noise level at 1.5m above ground.
- A noise contour map of the difference in predicted night-time external noise level between the future and existing scenario at 1.5m above ground (i.e. +1 dB indicates at 1 dB increase in noise level in the future scenario in comparison to the existing scenario).

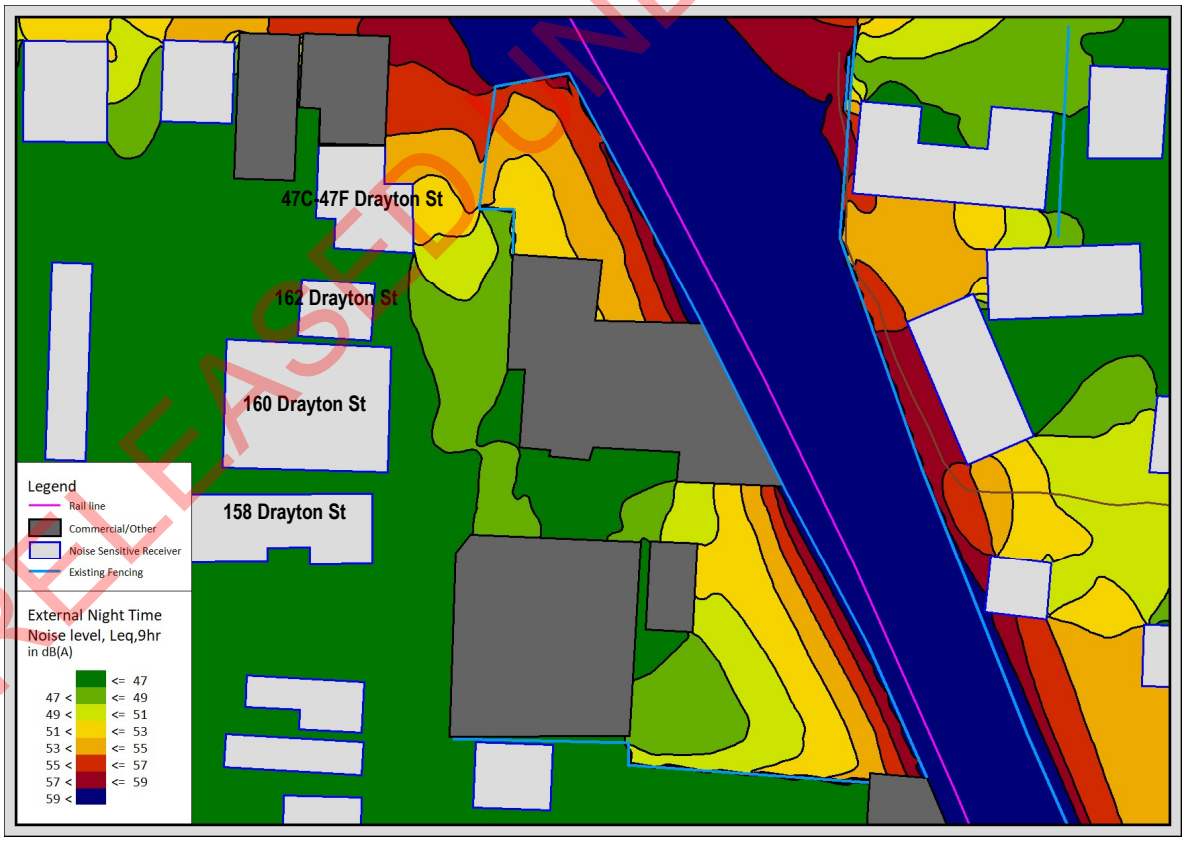
[4] It is noted that the prediction assumes that the site will remain vacant during and following completion of the project, which is not likely the case as site office buildings and the like will be located on the site. Following completion of the project, development of the site is expected to occur which will, to some extent or more, reinstate the shielding provided by the demolished buildings. However, the nature of the future development at the site post-project completion is not known at this stage.

Comparison of Existing and Future Night-time Noise Levels from the Rail Operation.

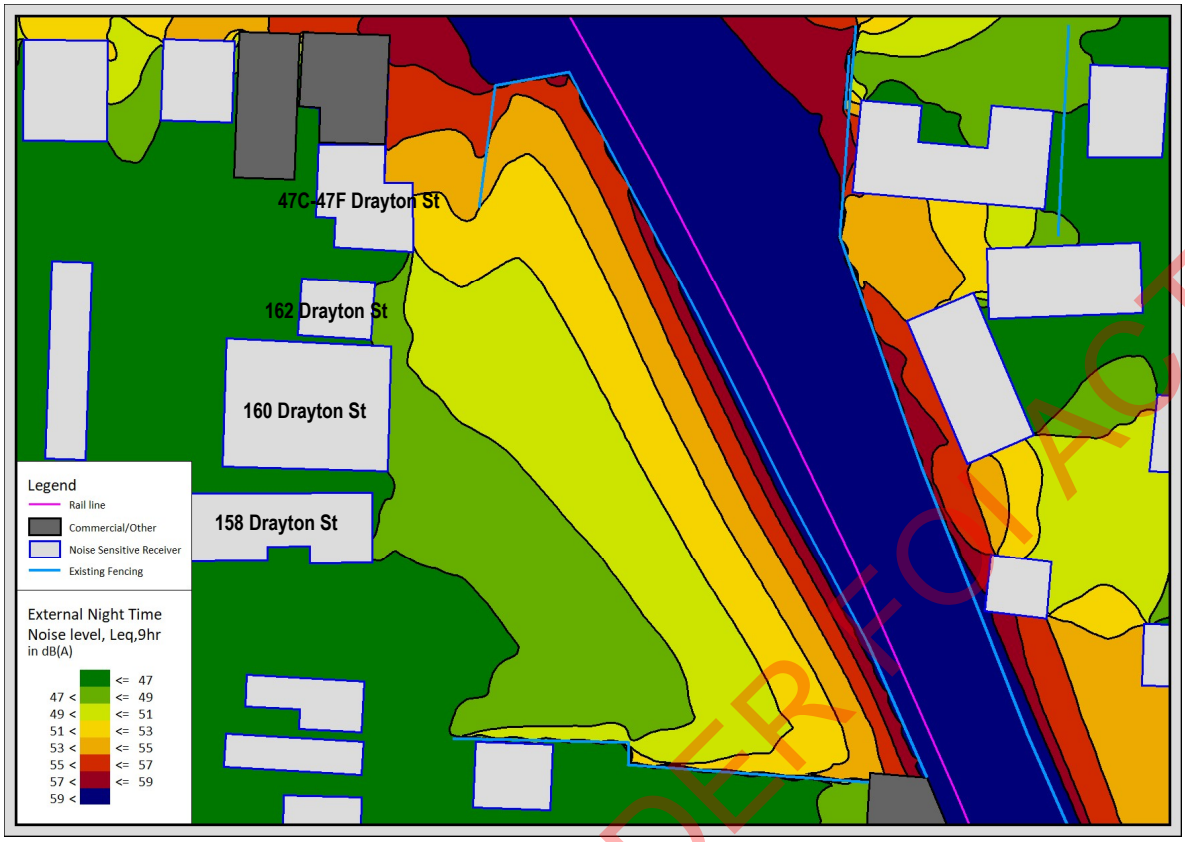
Address (refer contour maps)	Night-time Predicted Existing External / Internal Noise Level[1], $L_{eq,9hr}$dB(A)	Night-time Predicted Future External / Internal Noise Level[1], $L_{eq,9hr}$ dB(A)	Change in Rail Noise Level, dB(A) *(positive indicates increase)*	Compliance with SA78B Internal and GANRI External Noise Criteria[2]
Highest Predicted Noise Levels at any Facade				
47C-47F Drayton Street (Bowden Holiday House)	55 / 35	55 / 35	0	Yes
162 Drayton Street	47 / 27	49 / 29	+ 2	Yes
160 Drayton Street	47 / 27	49 / 29	+ 2	Yes
158 Drayton Street	45 / 23	48 / 26	+ 3	Yes
Predicted Noise Levels at the Facade with the Highest Predicted Change in Rail Noise				
47C-47F Drayton Street (Bowden Holiday House)	42 / 22	47 / 27	+ 5	Yes
162 Drayton Street	45 / 25	48 / 28	+ 3	Yes
160 Drayton Street	47 / 27	49 / 29	+ 2	Yes
158 Drayton Street	38 / 18	42 / 22	+ 4	Yes

Note:

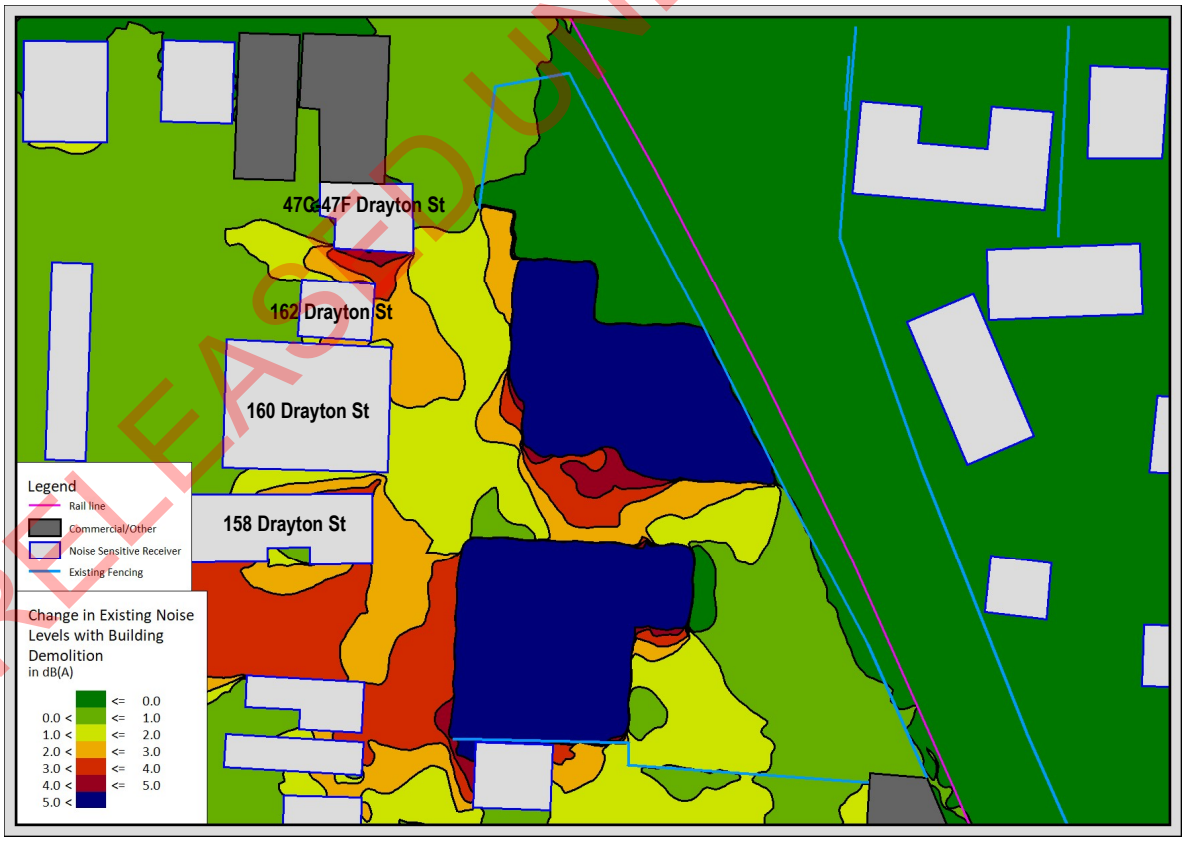
1. The predicted internal noise level is derived from the predicted external noise level and the application of a 20 dB(A) noise reduction from the external sound level at the facade to the internal sound level which is considered reasonable for standard building constructions.
2. 35 dB(A) $L_{eq,9hr\ (transport)}$ maximum allowable night-time internal noise level for any individual bedroom in the building.



Noise Contour Map - External Night-time Noise Level, $L_{Aeq,9hr}$ before demolition works.



Noise Contour Map - External Night-time Noise Level, $L_{Aeq,9hr}$ after demolition works.



Noise Contour Map - Change in External Night-time Noise Level, $L_{eq,9hr}$ after demolition works.

It is noted that the construction of an overpass bridge structure over the existing railway has the potential to add noise reflections which may impact on the overall noise level at receivers. However, given the project bridge design has limited reflecting surfaces near receivers (mainly the underside of the bridge with no significant vertical walls under the bridge near the rail line), any potential noise increase due to reflections off the bridge structure is not expected to be noticeable at the nearby receivers.

APPENDIX G PRELIMINARY ANALYSIS OF BARRIERS ON THE RAMP AND OVERPASS BRIDGE.

Introduction

A preliminary analysis of the acoustic benefit of installing a solid anti-throw screen on the northern side of the ramp and overpass bridge was conducted at the ToC phase of the project.

The analysis considered solid screens along the northern pedestrian footpath, with a maximum height of 3m above the footpath surface (i.e. 3.2m relative to the road surface). Three different spans of solid screens on the ramp and bridge were considered. The maximum height of the barrier on the ramp and bridge was initially restricted to 3m, as was considered on other road projects (e.g. R2P).

The solid screening material is assumed to be minimum 10mm thick Perspex panel (or other solid material having minimum surface density of 10kg/m^2.

Analysis Results

The predicted noise level reduction with a solid anti-throw screen incorporated to the ramp and bridge are provided in the contours below (refer Contours H1 to H3).

With a 3.0m high solid anti-throw screen on the northern side of the bridge, an additional traffic noise level reduction of up to 4 dB was predicted at the residences along McEwin Street with a 230m long barrier. With the shorter extents of barriers, i.e., 170m and 120m long, a noise level reduction of up to 3 dB at the residences along McEwin Street is predicted.

Subjectively, a noise level reduction of 3 to 4 dB is a noticeable noise level change to the average person.

Based on the above, it was recommended that a solid screen construction be provided on the northern side of the ramp and overpass bridge extending up to 3.0m high to minimise the noise from the overpass bridge as much as practicable to the receivers at the north. Consideration shall be given to other factors such as stakeholder expectations, urban design principles, build cost and maintenance requirements

It is noted that the benefit of constructing the anti-throw screen on the southern side of the bridge is limited, given the limited extent of the screen (only across the rail corridor), the number and distance of the closest residences, and the closest residences already benefiting from existing property fencing and future elevation difference with project.

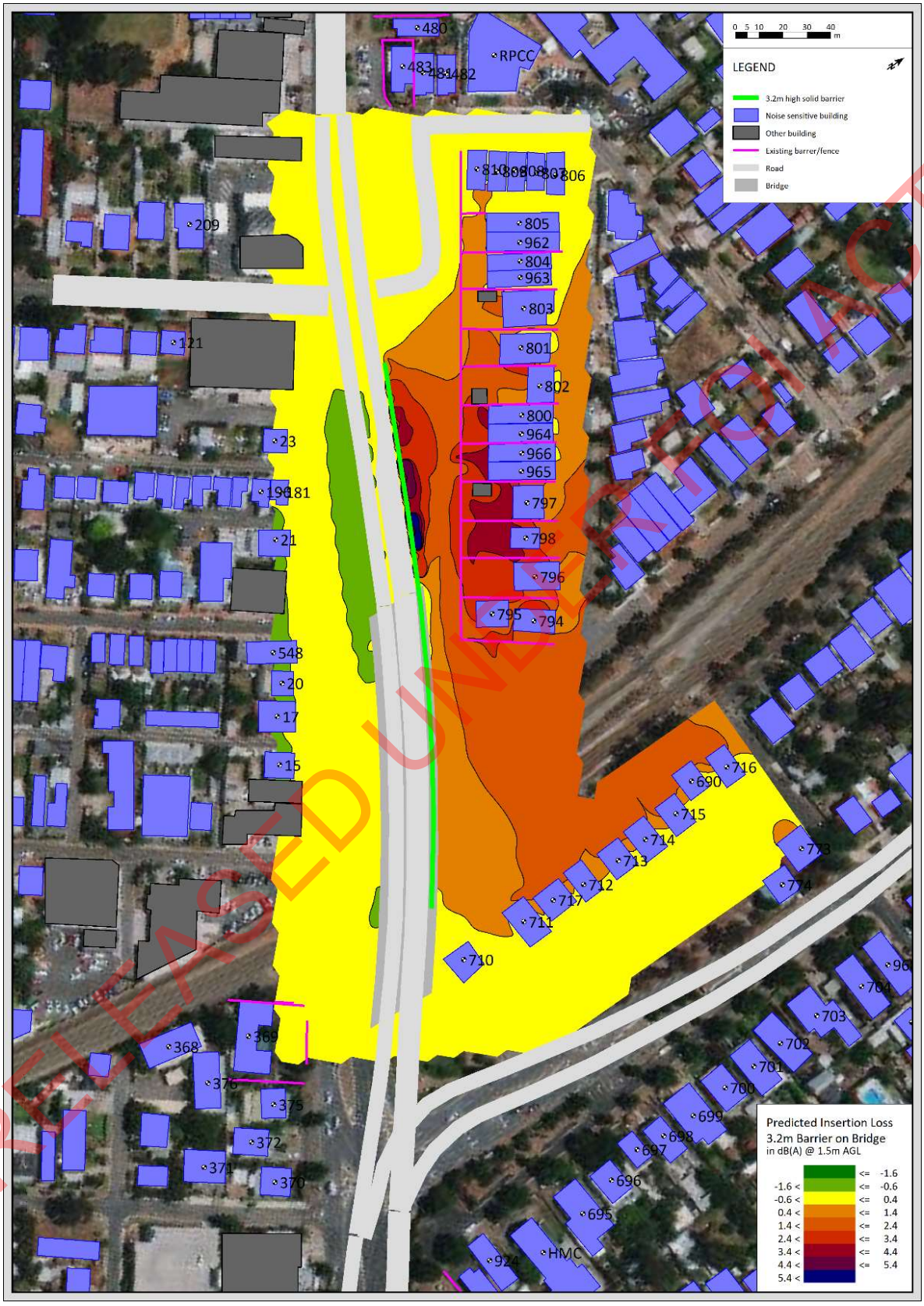
Project Design

Since the ToC phase works, additional noise modelling with a 2.0m high anti-throw screen on the northern side of the bridge has been conducted. The modelling indicated a noise level reduction of 2 to 3 dB at the residences along McEwin Street, as shown in Contour H4. Subjectively, a noise level reduction of 2 to 3 dB is a just noticeable noise level change to the average person.

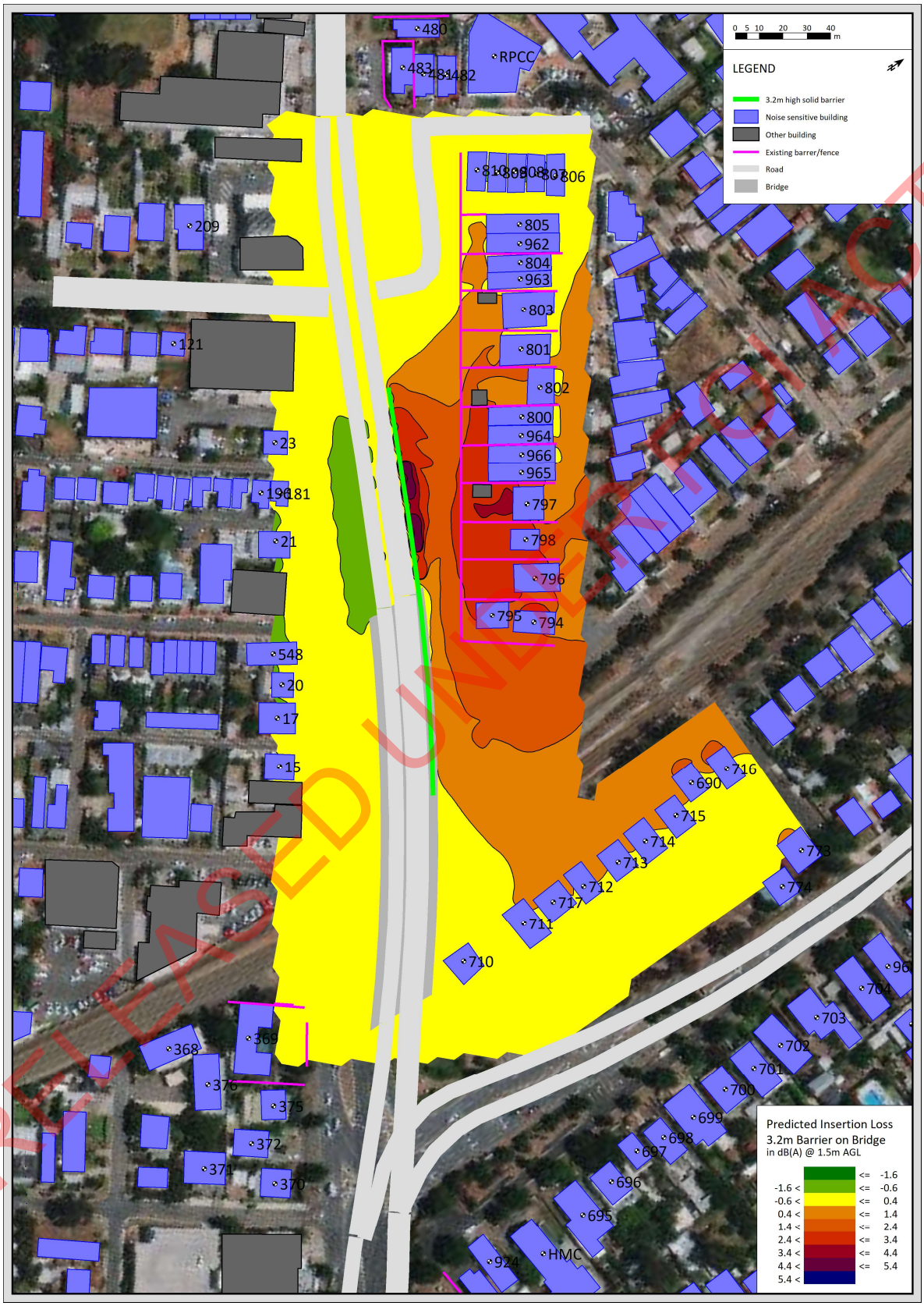
With consideration to relevant factors such as stakeholder expectations, urban design principles, bridge design, build cost and maintenance requirements, a 2.1m high solid anti-throw screen has been incorporated on the ramp and bridge for the extent indicated in Appendix D. The existing 2m high boundary fence along the rear boundary of the dwellings fronting McEwin Street will also be upgraded to 2.4m high as part of the works.

The predicted additional noise level reduction with the extended 2.1m high barrier on the ramp/bridge and the 2.4m high boundary fence, in comparison to a 1.2m high standard jersey barrier on the ramp/bridge and the existing boundary fence, is approximately 2 dB. Increasing the height of the barrier on the ramp/bridge to 3.0m high will only provide a small amount of additional noise level reduction benefit (in comparison to the 2.1m barrier), which was predicted to be less than 1 dB.

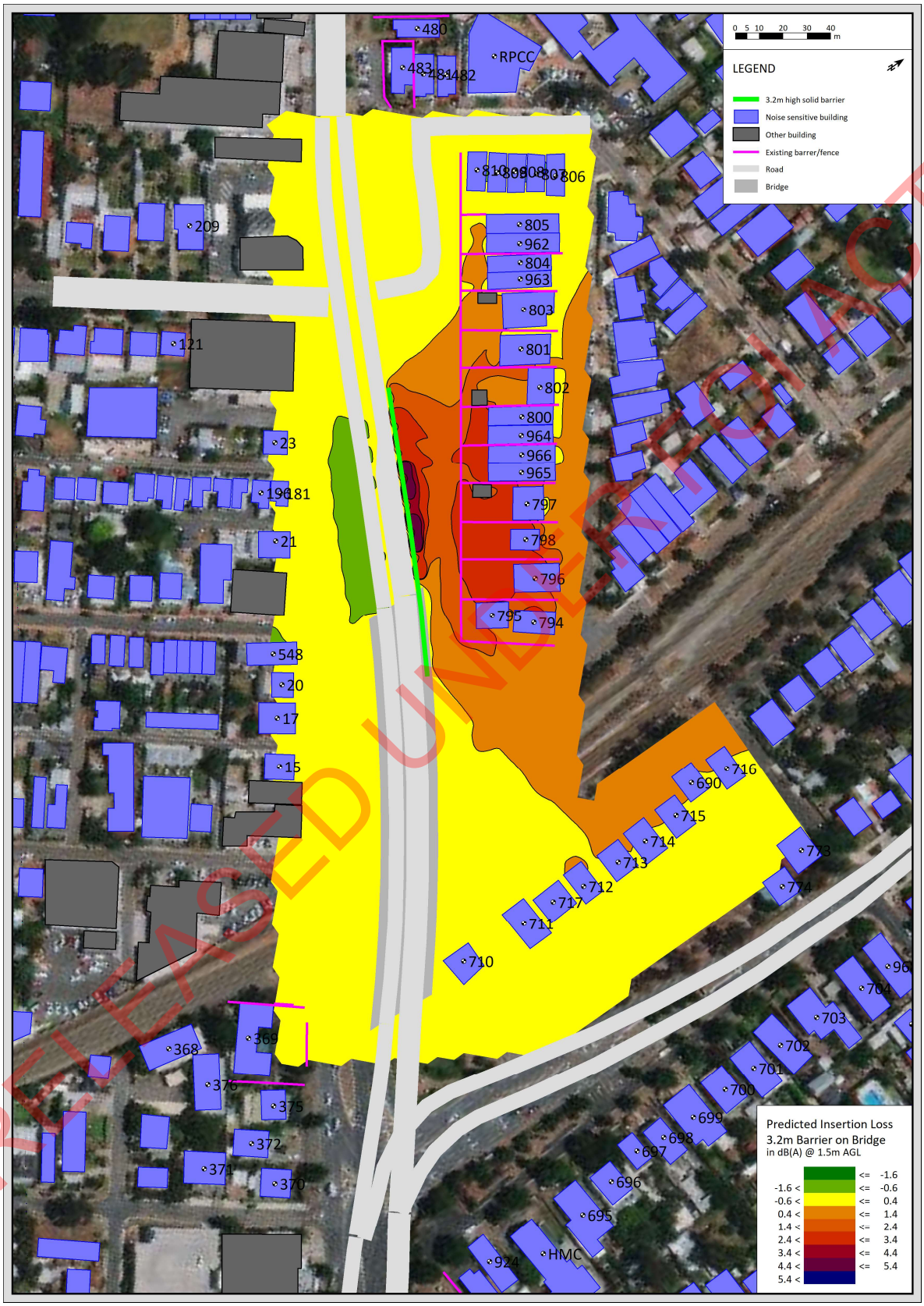
Contour H1: The full extent anti-throw screen constructed 3.0m high and solid (approximately 230m length)



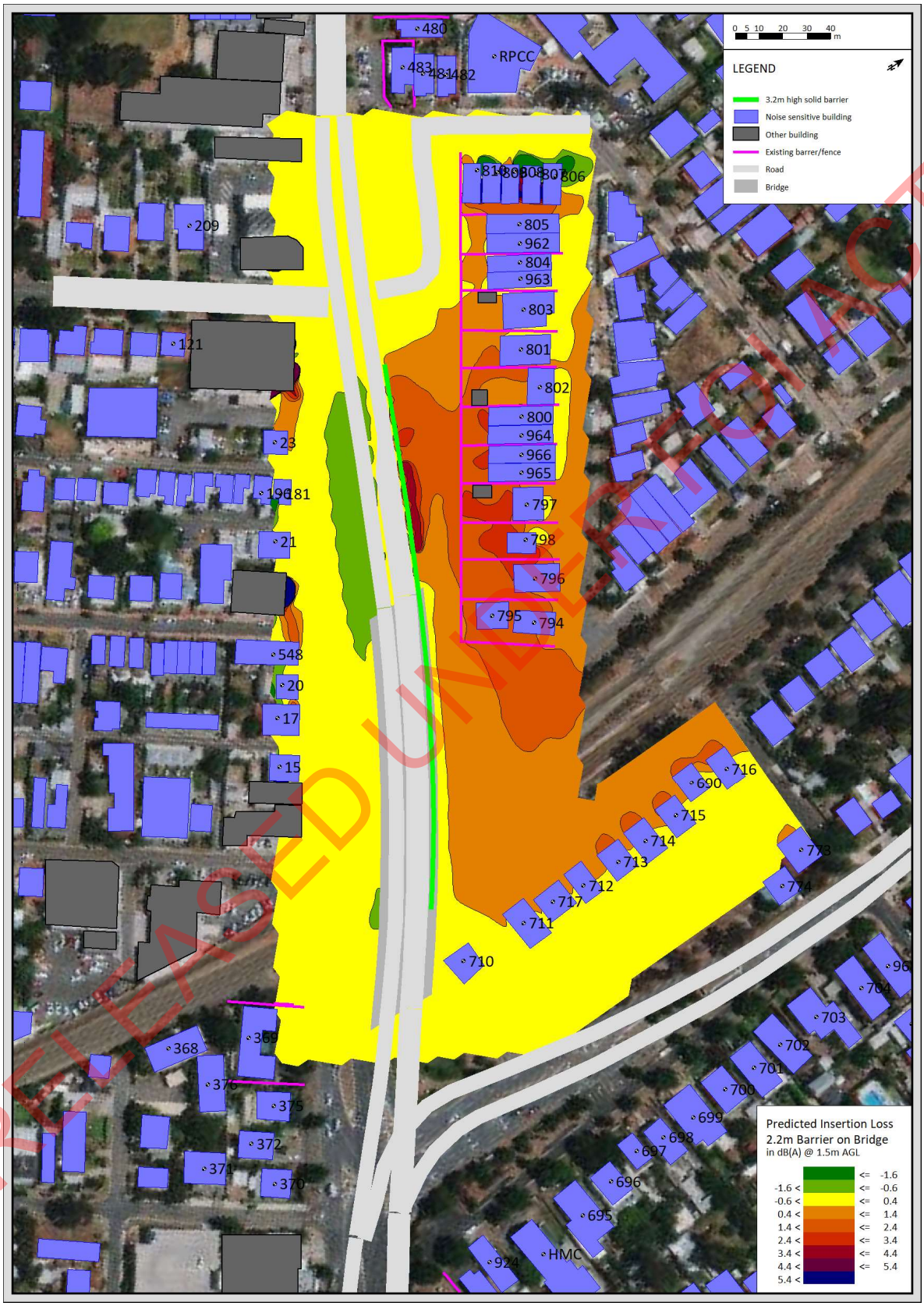
Contour H2: A section of the anti-throw screen constructed 3.0m high and solid (approximately 170m length)



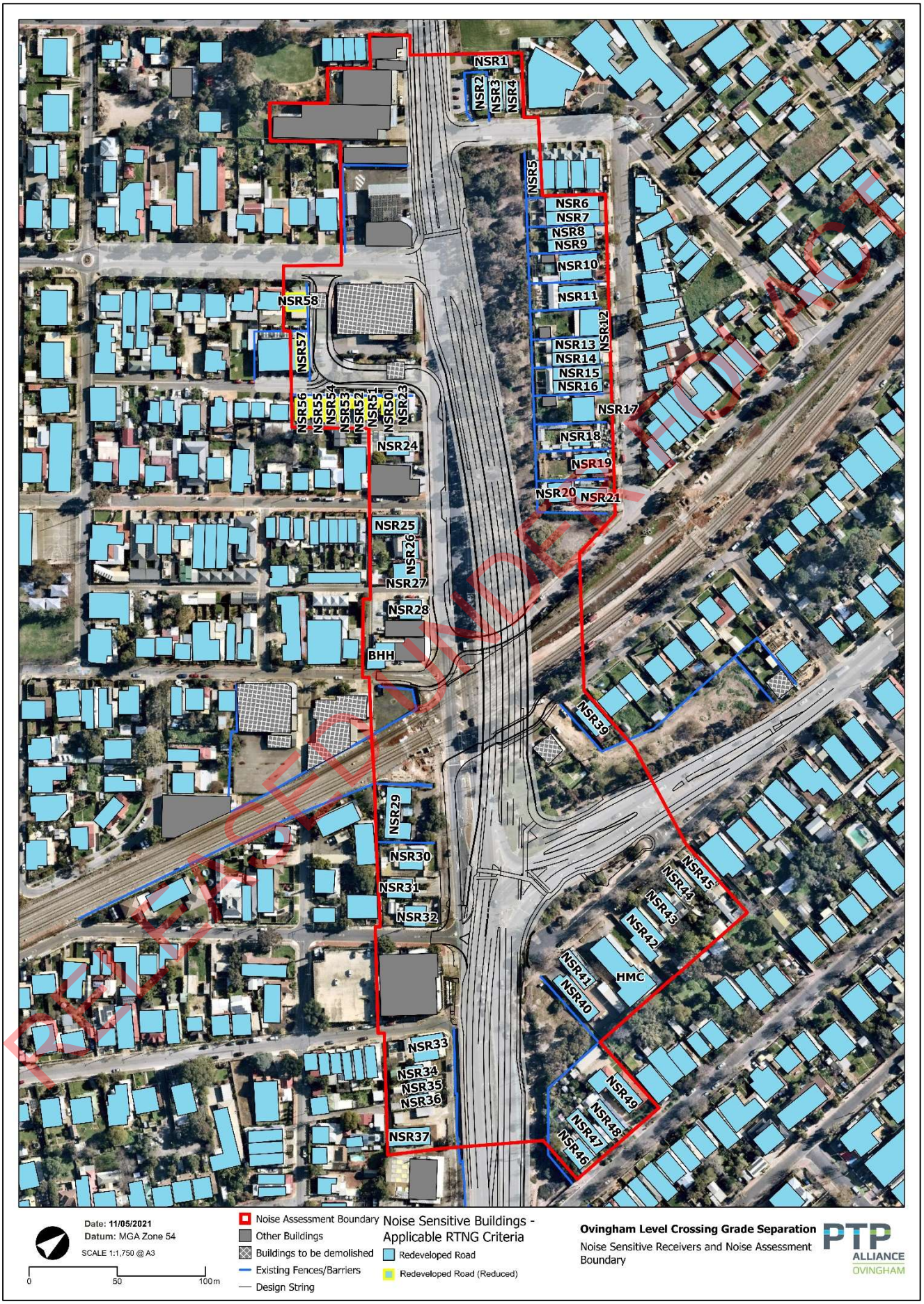
Contour H3: A section of the anti-throw screen constructed 3.0m high and solid (approximately 120m length)



Contour H4: The full extent anti-throw screen constructed 2.0m high and solid (approximately 230m length)



APPENDIX H NOISE SENSITIVE RECEIVERS AND NOISE ASSESSMENT BOUNDARY


NSR1
NSR2
NSR3
NSR4
NSR5
NSR6
NSR7
NSR8
NSR9
NSR10
NSR11
NSR12
NSR13
NSR14
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NSR16
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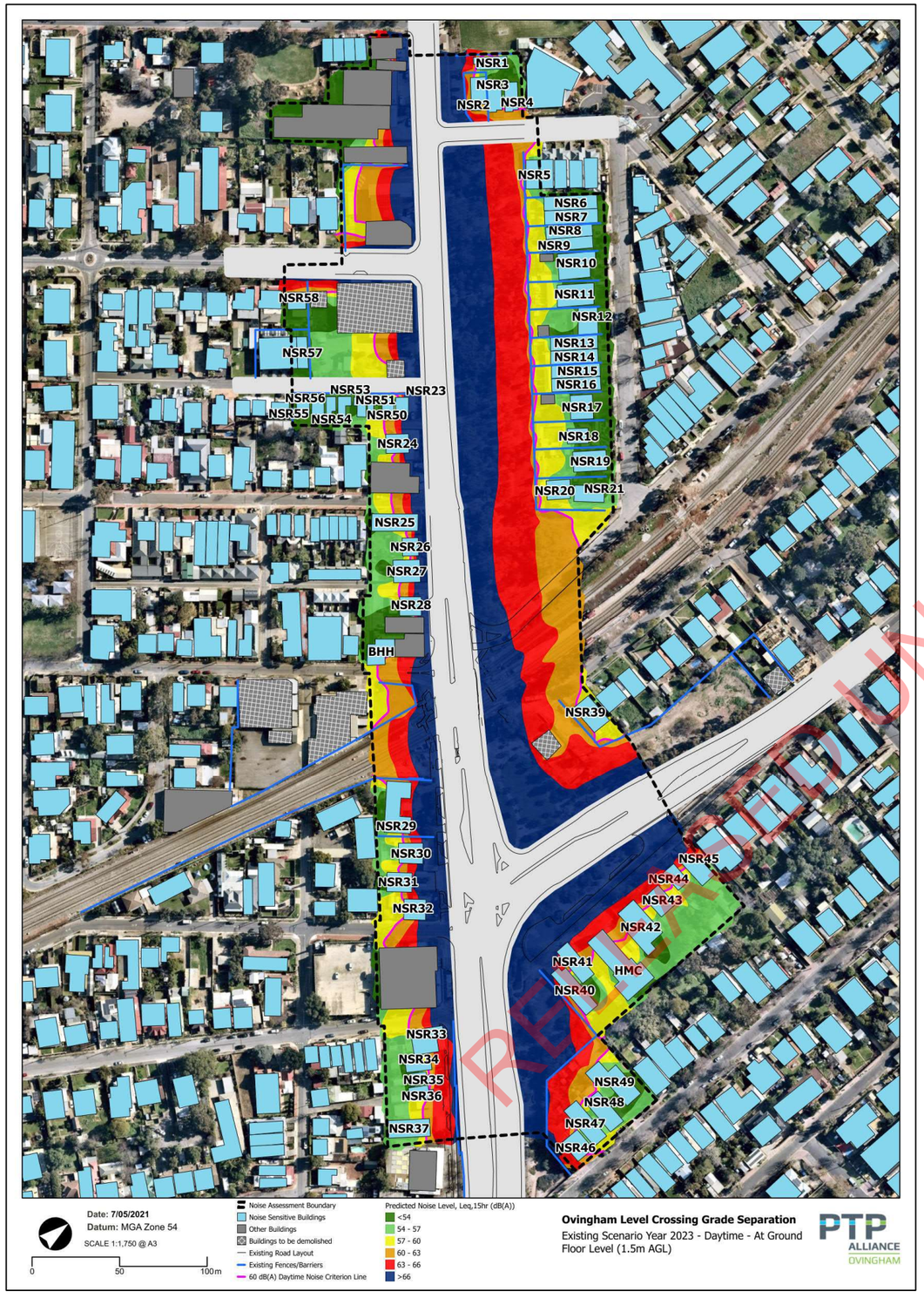
NSR24
NSR25
NSR26
NSR27
NSR28
BHH
NSR29
NSR30
NSR31
NSR32
NSR33
NSR34
NSR35
NSR36
NSR37
NSR39
NSR40
NSR41
HMC
NSR42
NSR43
NSR44
NSR45
NSR46
NSR47
NSR48
NSR49
NSR50
NSR51
NSR52
NSR53
NSR54
NSR55
NSR56
NSR57
NSR58
Date: 11/05/2021
Datum: MGA Zone 54
SCALE 1:1,750 @ A3
0
50
100m
Noise Assessment Boundary
Other Buildings
Buildings to be demolished
Existing Fences/Barriers
Design String
Noise Sensitive Buildings - Applicable RTNG Criteria
Redeveloped Road
Redeveloped Road (Reduced)
Ovingham Level Crossing Grade Separation
Noise Sensitive Receivers and Noise Assessment Boundary
PTP ALLIANCE OVINGHAM

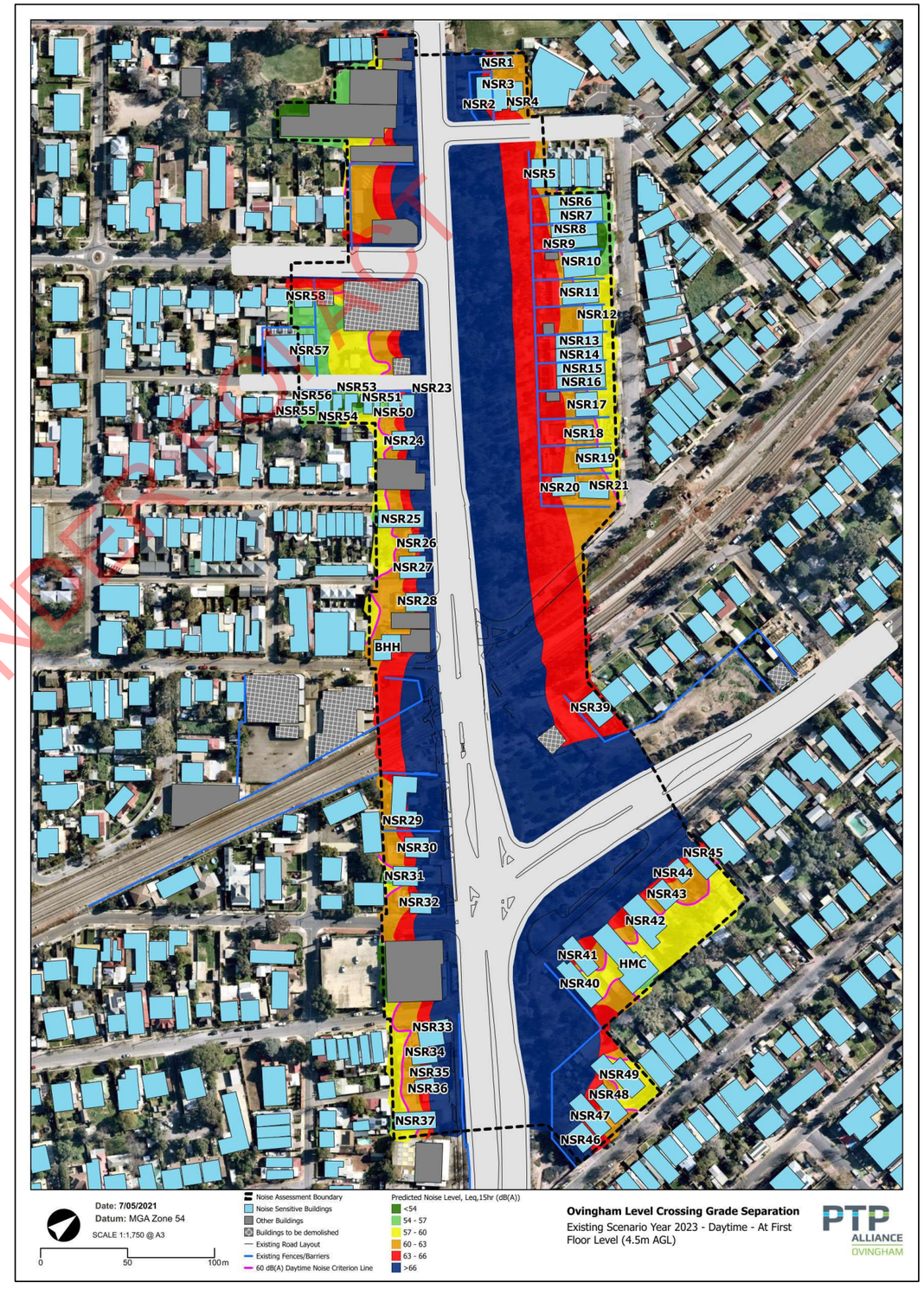
Table 28 Noise Sensitive Receivers within the Noise Assessment Boundary

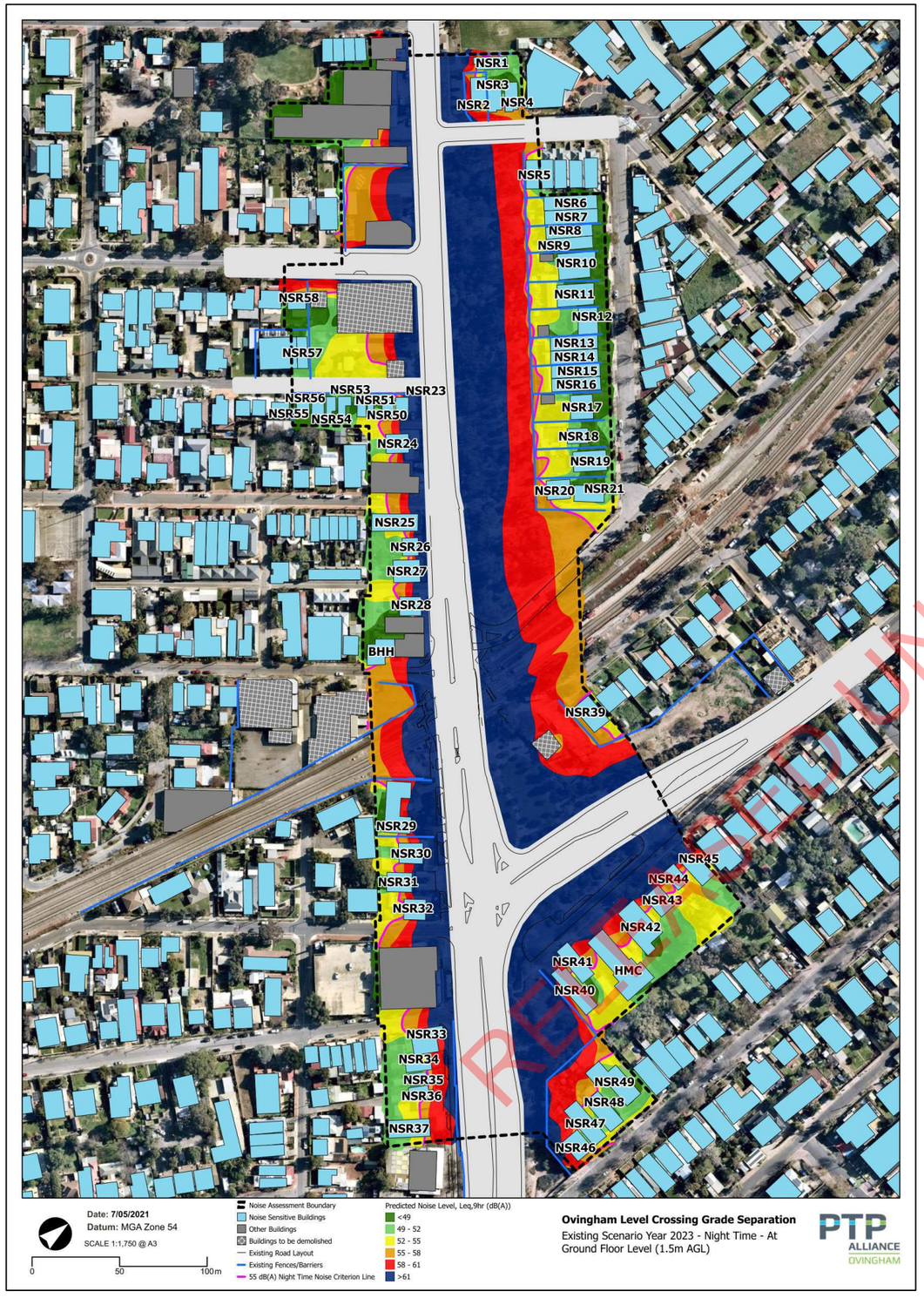
Receiver ID	Address
NSR1	62 Torrens Rd Renown Park 5008
NSR2	23 Napier St Renown Park 5008
NSR3	21 Napier St Renown Park 5008
NSR4	19 Napier St Renown Park 5008
NSR5	20 Napier St Renown Park 5008
NSR6	21A McEwin St Renown Park 5008
NSR7	21 McEwin St Renown Park 5008
NSR8	19A McEwin St Renown Park 5008
NSR9	19 McEwin St Renown Park 5008
NSR10	17 McEwin St Renown Park 5008
NSR11	15 McEwin St Renown Park 5008
NSR12	13 McEwin St Renown Park 5008
NSR13	11A McEwin St Renown Park 5008
NSR14	11 McEwin St Renown Park 5008
NSR15	9A McEwin St Renown Park 5008
NSR16	9 McEwin St Renown Park 5008
NSR17	7 McEwin St Renown Park 5008
NSR18	5 McEwin St Renown Park 5008
NSR19	3 McEwin St Renown Park 5008
NSR20	1 McEwin St Renown Park 5008
NSR21	1A McEwin St Renown Park 5008
NSR22	67 Torrens Rd Brompton 5007
NSR23	U1/65 Torrens Rd Brompton 5007
NSR24	61 Torrens Rd Brompton 5007
NSR25	57 Torrens Rd Brompton 5007
NSR26	55 Torrens Rd Brompton 5007
NSR27	53 Torrens Rd Brompton 5007
NSR28	51 Torrens Rd Bowden 5007
NSR29	U5/37 Torrens Rd Ovingham 5082
NSR30	33 Torrens Rd Ovingham 5082
NSR31	31B Torrens Rd Ovingham 5082
NSR32	31A Torrens Rd Ovingham 5082
NSR33	27 Torrens Rd Ovingham 5082
NSR34	25 Torrens Rd Ovingham 5082
NSR35	23 Torrens Rd Ovingham 5082
NSR36	21 Torrens Rd Ovingham 5082
NSR37	19 Torrens Rd Ovingham 5082
NSR38	1 Devonport Tce Ovingham 5082
NSR39	5 Devonport Tce Ovingham 5082
NSR40	U1-8/5 Churchill Rd Ovingham 5082
NSR41	U9-10/5 Churchill Rd Ovingham 5082
NSR43	11 Churchill Rd Ovingham 5082
NSR42	9 Churchill Rd Ovingham 5082
NSR44	11A Churchill Rd Ovingham 5082
NSR45	13 Churchill Rd Ovingham 5082

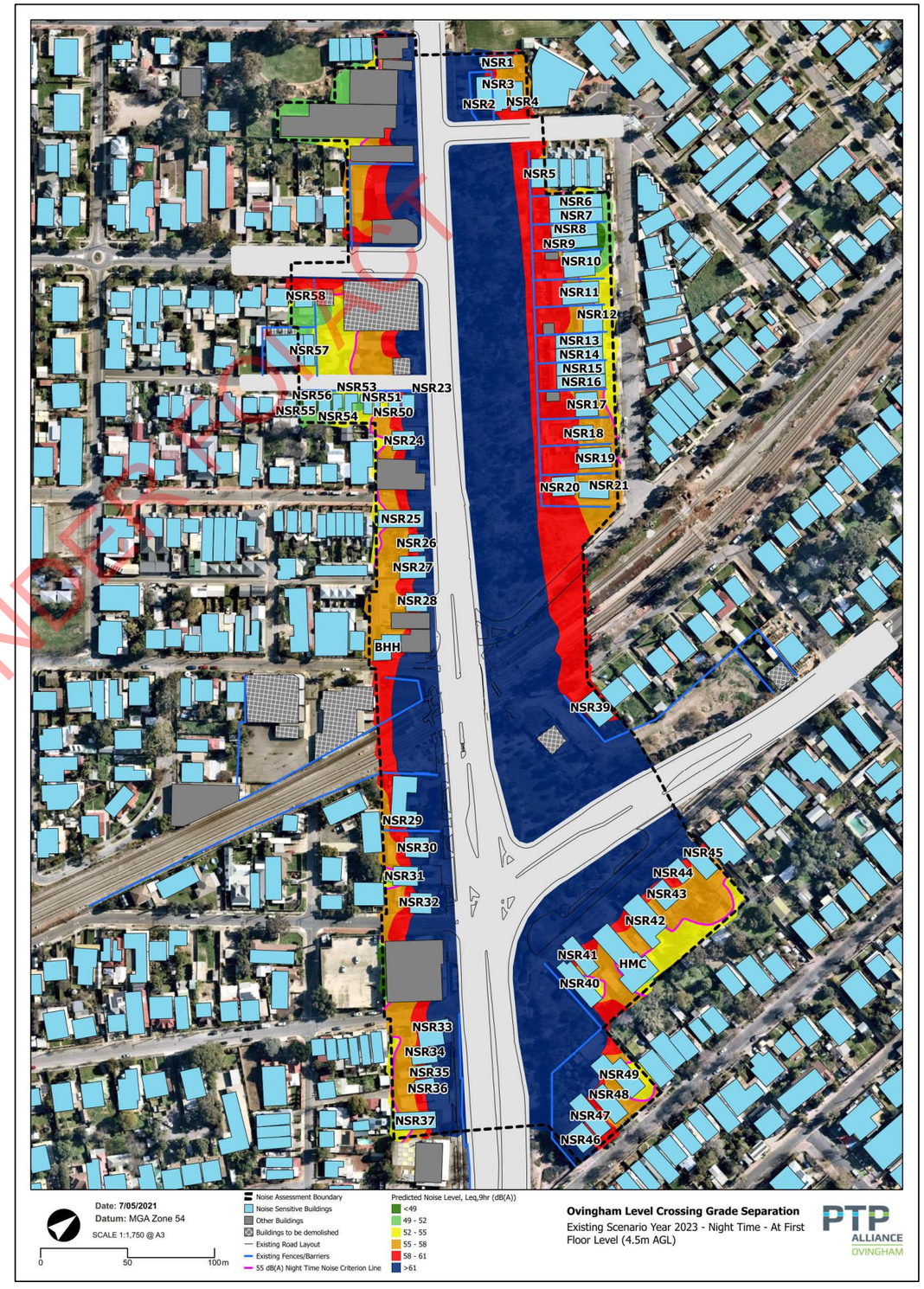
Receiver ID	Address
NSR46	2 Toronto St Ovingham 5082
NSR47	4 Toronto St Ovingham 5082
NSR48	6 Toronto St Ovingham 5082
NSR49	8 Toronto St Ovingham 5082
NSR50	U2/65 Torrens Rd Brompton 5007
NSR51	U3/65 Torrens Rd Brompton 5007
NSR52	U4/65 Torrens Rd Brompton 5007
NSR53	U5/65 Torrens Rd Brompton 5007
NSR54	U6/65 Torrens Rd Brompton 5007
NSR55	U7/65 Torrens Rd Brompton 5007
NSR56	U8/65 Torrens Rd Brompton 5007
NSR57	26 Hayman St Brompton 5007
NSR58	99 Chief St Brompton 5007
HMC	Holy Methodist Church (CMCA) 27-28 Fitzroy Tce Fitzroy 5082
BHH	Bowden Holiday House 47C-47F Torrens Rd Bowden 5007

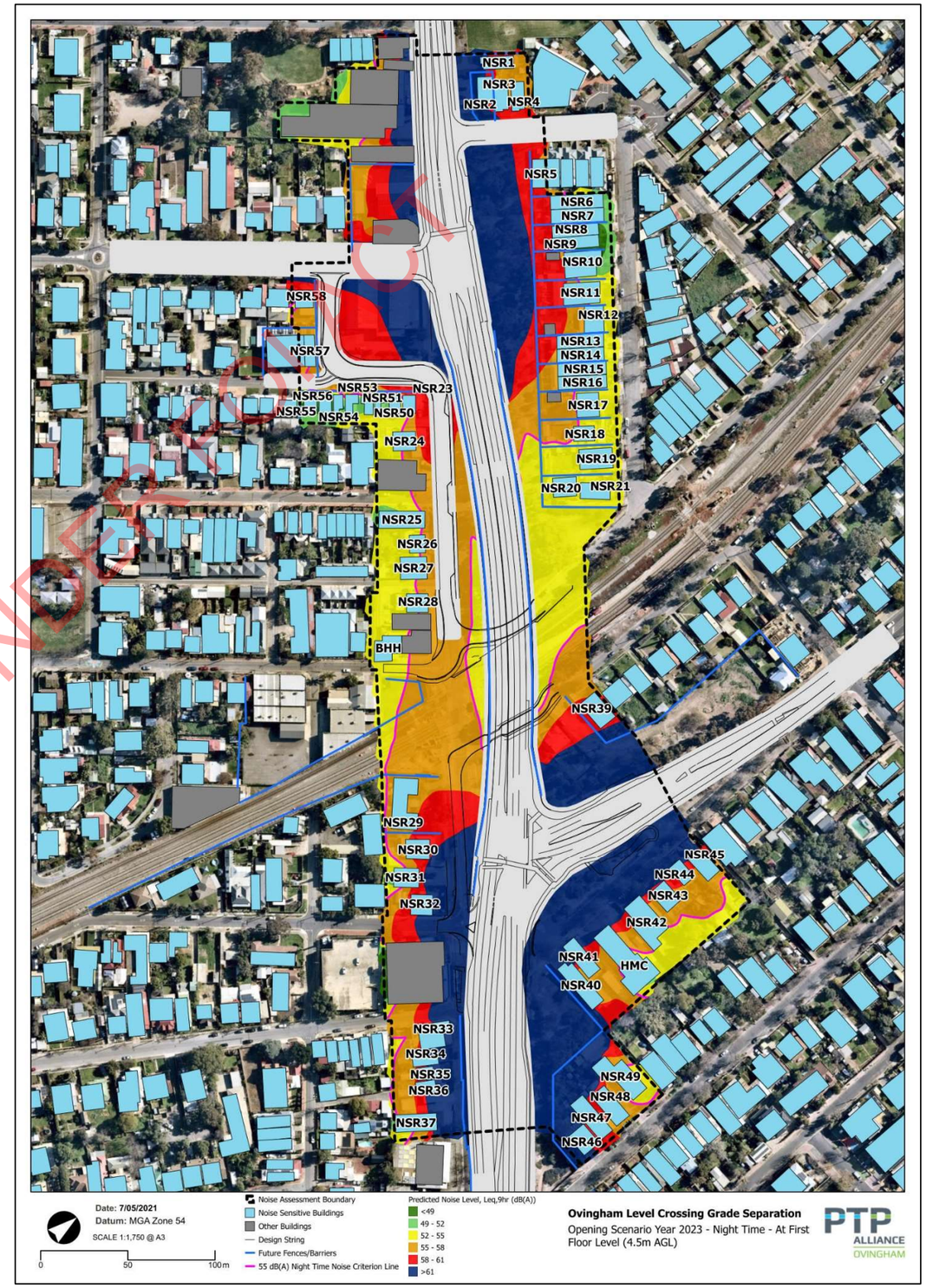
APPENDIX I PREDICTED NOISE LEVEL CONTOURS

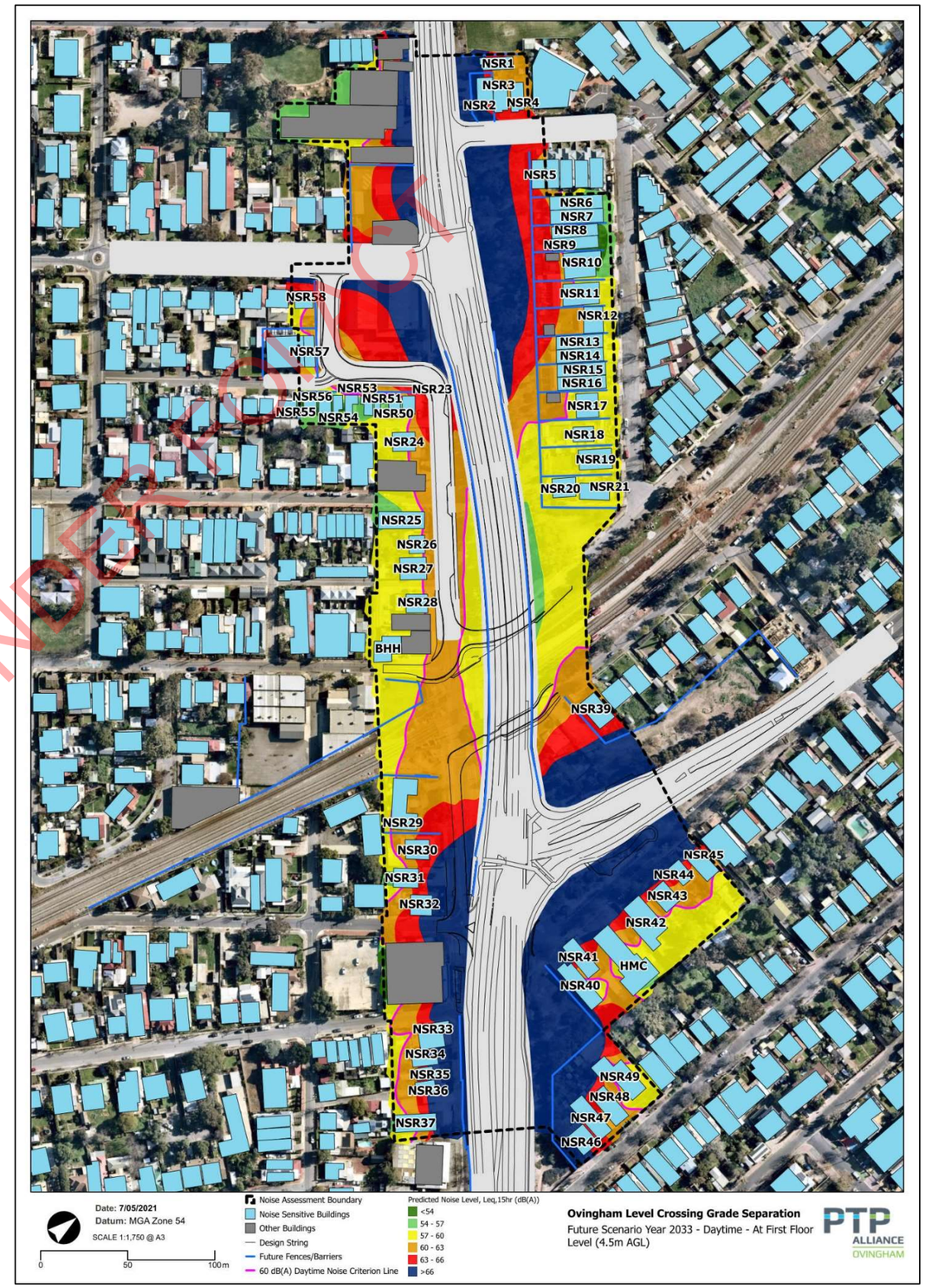


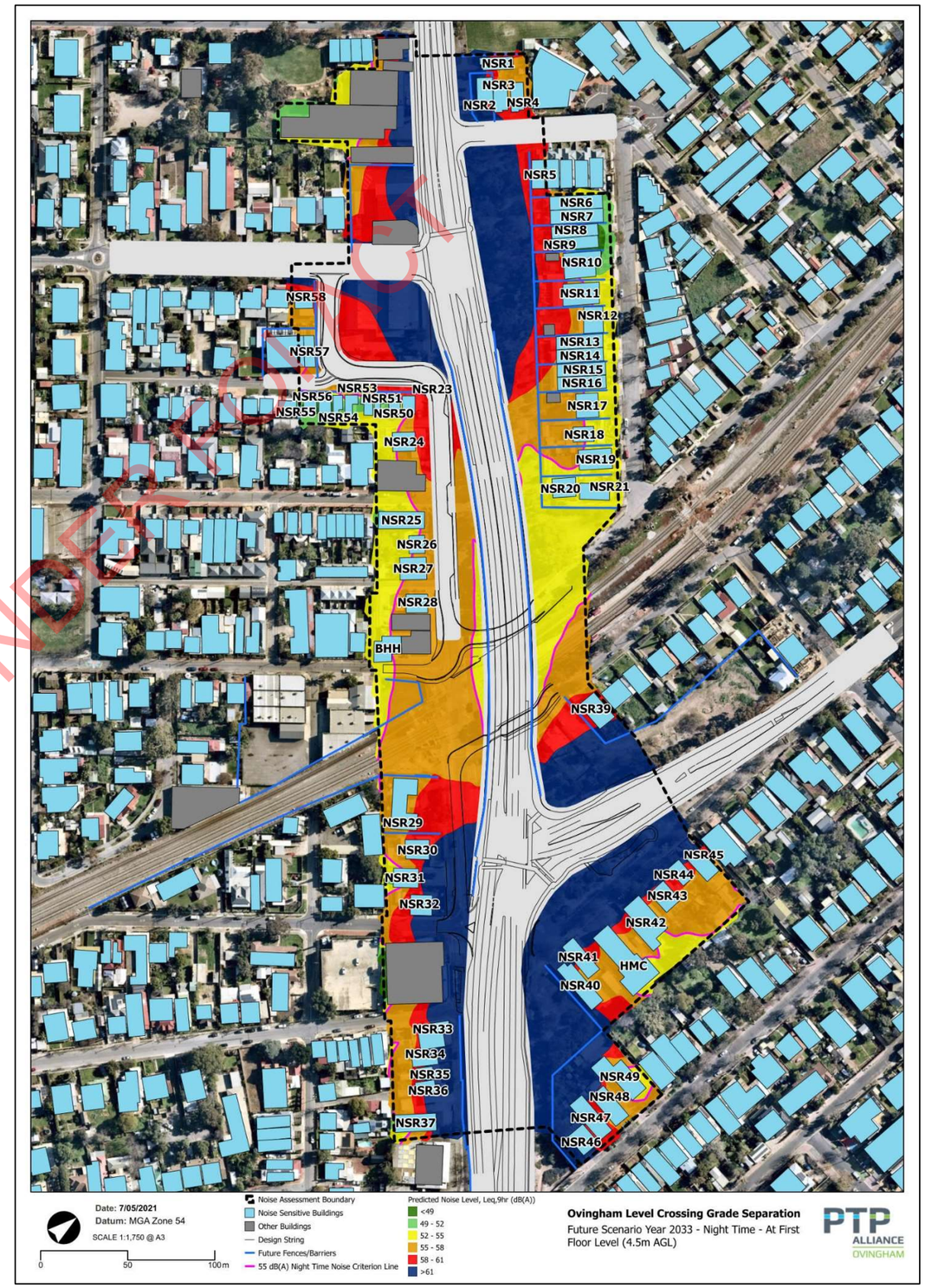


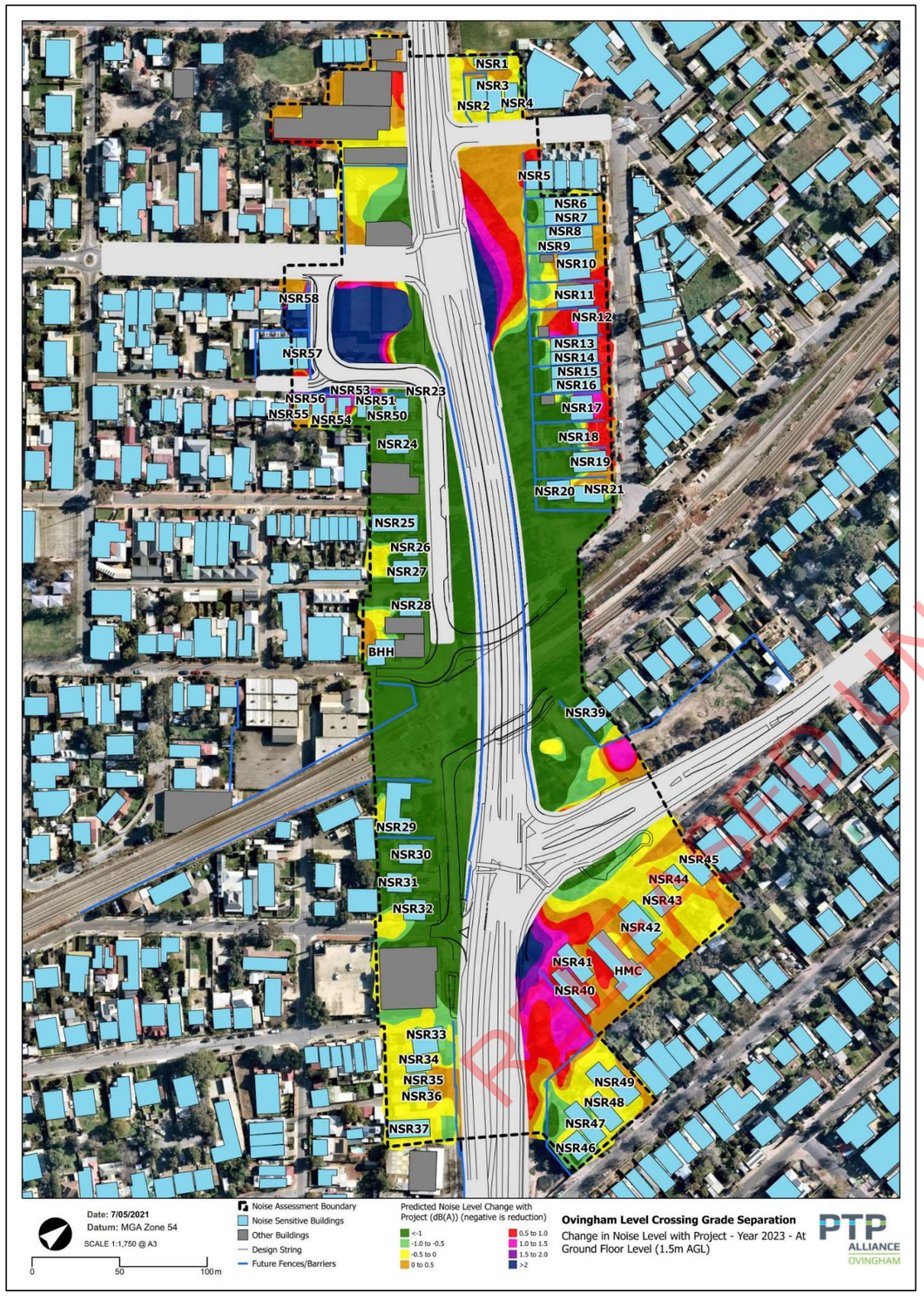












APPENDIX J PREDICTED NOISE LEVELS AND DETERMINATION OF FTP

Table 29: Daytime Predicted Noise Levels and Determination of Eligibility for Consideration of Property Treatment and FTP.

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR1-GF-NE	278980	6135974	49.2	49.5	61.2	60	0	49.9	-10	
NSR1-GF-NW	278970	6135968	57.0	57.0	69.0	60	0	57.4	-3	
NSR1-GF-SW	278967	6135957	64.2	64.3	76.2	60	0	64.7	5	
NSR1-GF-SW	278970	6135957	62.7	62.7	74.7	60	0	63.1	3	
NSR1-GF-SW	278970	6135957	62.9	63.0	74.9	60	0	63.4	3	
NSR1-GF-SE	278978	6135963	54.7	54.8	66.7	60	0	55.2	-5	
NSR2-GF-NW	278975	6135955	57.3	57.4	69.3	60	0	57.8	-2	
NSR2-GF-SW	278981	6135945	61.8	61.8	73.8	60	0	62.2	2	
NSR2-GF-SE	278991	6135942	62.4	62.5	74.4	60	0	62.9	3	
NSR2-GF-NE	278991	6135946	59.9	59.9	71.9	60	0	60.4	0	
NSR2-GF-SE	278991	6135948	60.6	60.4	72.6	60	0	60.8	1	
NSR3-GF-SW	278993	6135948	61.7	61.6	73.7	60	0	62.0	2	
NSR3-GF-SE	278998	6135949	60.7	61.3	72.7	60	0	61.7	2	
NSR3-GF-SE	278999	6135952	60.6	60.9	72.6	60	0	61.4	1	
NSR3-GF-SE	278999	6135953	61.2	61.5	73.2	60	0	61.9	2	
NSR3-GF-NE	278993	6135960	53.3	52.3	65.3	60	0	52.7	-7	
NSR3-GF-NW	278983	6135961	51.5	51.6	63.5	60	0	52.0	-8	
NSR4-GF-SE	279004	6135960	60.2	60.7	72.2	60	0	61.2	1	
NSR4-GF-SE	279005	6135960	60.9	61.4	72.9	60	0	61.9	2	
NSR4-GF-NE	278999	6135967	53.1	51.7	65.1	60	0	52.1	-8	
NSR4-GF-NW	278989	6135969	51.0	51.1	63.0	60	0	51.5	-9	
NSR4-GF-SW	278994	6135959	52.7	51.3	64.7	60	0	51.8	-8	
NSR4-GF-SE	279003	6135957	61.4	62.1	73.4	60	0	62.5	3	
NSR5-GF-NW	279032	6135952	55.7	58.9	67.7	60	0	59.3	-1	
NSR5-GF-SW	279036	6135942	62.4	62.5	74.4	60	0	62.9	3	
NSR5-GF-SE	279047	6135941	56.7	55.1	68.7	60	0	55.5	-5	
NSR6-GF-NE	279074	6135967	48.6	49.3	60.6	60	0	49.7	-10	
NSR6-GF-SW	279056	6135940	57.9	56.9	69.9	60	0	57.3	-3	
NSR7-GF-NE	279081	6135963	48.4	48.9	60.4	60	0	49.3	-11	
NSR7-GF-SW	279063	6135936	58.0	56.7	70.0	60	0	57.2	-3	
NSR7-GF-SE	279076	6135946	46.6	46.5	58.6	60	0	47.0	-13	
NSR8-GF-NW	279074	6135946	46.2	46.2	58.2	60	0	46.6	-13	
NSR8-F 1-NW	279074	6135946	55.5	55.4	67.5	60	0	55.8	-4	
NSR8-GF-SW	279070	6135931	57.7	57.0	69.7	60	0	57.4	-3	
NSR8-F 1-SW	279070	6135931	63.1	63.0	75.1	60	0	63.5	4	
NSR8-GF-NE	279086	6135955	46.3	46.7	58.3	60	0	47.1	-13	
NSR8-F 1-NE	279086	6135955	49.3	49.7	61.3	60	0	50.2	-10	
NSR9-GF-SW	279076	6135927	57.2	56.6	69.2	60	0	57.0	-3	
NSR9-F 1-SW	279076	6135927	63.2	63.2	75.2	60	0	63.6	4	
NSR9-GF-SE	279087	6135937	46.8	46.4	58.8	60	0	46.8	-13	
NSR9-F 1-SE	279087	6135937	53.3	53.1	65.3	60	0	53.5	-7	
NSR9-GF-NE	279091	6135951	45.7	46.2	57.7	60	0	46.6	-13	
NSR9-F 1-NE	279091	6135951	49.2	49.7	61.2	60	0	50.1	-10	
NSR10-GF-NE	279104	6135940	46.6	47.0	58.6	60	0	47.4	-13	
NSR10-F 1-NE	279104	6135940	54.1	52.6	66.1	60	0	53.0	-7	
NSR10-GF-SE	279103	6135941	47.2	47.5	59.2	60	0	48.0	-12	
NSR10-F 1-SE	279103	6135941	54.2	52.9	66.2	60	0	53.3	-7	
NSR10-GF-NE	279100	6135947	48.0	48.1	60.0	60	0	48.6	-11	
NSR10-F 1-NE	279100	6135947	53.4	52.5	65.4	60	0	53.0	-7	
NSR10-GF-NW	279089	6135940	45.4	45.7	57.4	60	0	46.1	-14	
NSR10-F 1-NW	279089	6135940	50.7	51.0	62.7	60	0	51.5	-9	
NSR10-GF-SW	279090	6135925	56.4	56.3	68.4	60	0	56.7	-3	
NSR10-F 1-SW	279090	6135925	62.7	62.1	74.7	60	0	62.6	3	
NSR10-GF-SE	279102	6135929	49.2	50.1	61.2	60	0	50.5	-10	
NSR10-F 1-SE	279102	6135929	58.5	58.0	70.5	60	0	58.4	-2	
NSR11-GF-NW	279103	6135929	50.1	50.3	62.1	60	0	50.7	-9	
NSR11-GF-SW	279103	6135915	57.4	57.1	69.4	60	0	57.5	-3	
NSR11-GF-SE	279115	6135920	51.2	52.1	63.2	60	0	52.5	-8	
NSR11-GF-NE	279115	6135934	48.7	49.2	60.7	60	0	49.7	-10	
NSR12-GF-NW	279118	6135926	48.6	49.8	60.6	60	0	50.3	-10	
NSR12-GF-SW	279121	6135916	54.3	55.1	66.3	60	0	55.5	-5	
NSR12-GF-NE	279129	6135927	49.4	50.1	61.4	60	0	50.5	-10	
NSR13-GF-NW	279127	6135910	53.1	53.8	65.1	60	0	54.2	-6	
NSR13-GF-SW	279122	6135895	58.4	56.6	70.4	60	0	57.0	-3	
NSR13-GF-NE	279139	6135919	49.7	50.3	61.7	60	0	50.7	-9	
NSR14-GF-SW	279129	6135891	58.6	56.8	70.6	60	0	57.2	-3	
NSR14-GF-NE	279145	6135915	49.4	50.1	61.4	60	0	50.5	-10	
NSR15-GF-SW	279135	6135886	58.7	56.5	70.7	60	0	56.9	-3	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR15-GF-NE	279152	6135911	50.0	50.6	62.0	60	0	51.0	-9	
NSR16-GF-SW	279142	6135882	58.4	56.3	70.4	60	0	56.7	-3	
NSR16-GF-SE	279154	6135891	50.8	51.0	62.8	60	0	51.4	-9	
NSR16-GF-NE	279159	6135906	50.9	51.4	62.9	60	0	51.8	-8	
NSR17-GF-NW	279156	6135893	49.8	50.4	61.8	60	0	50.8	-9	
NSR17-GF-SW	279158	6135883	56.5	54.3	68.5	60	0	54.8	-5	
NSR17-GF-SE	279169	6135884	52.9	52.0	64.9	60	0	52.5	-8	
NSR17-GF-NE	279167	6135895	50.2	50.9	62.2	60	0	51.4	-9	
NSR18-GF-NW	279170	6135880	53.3	52.0	65.3	60	0	52.4	-8	
NSR18-GF-SW	279170	6135871	57.1	54.8	69.1	60	0	55.2	-5	
NSR18-GF-SE	279179	6135874	53.1	51.8	65.1	60	0	52.2	-8	
NSR18-GF-NE	279178	6135883	49.1	50.0	61.1	60	0	50.4	-10	
NSR19-GF-NW	279184	6135878	51.2	50.7	63.2	60	0	51.2	-9	
NSR19-GF-SW	279184	6135865	56.4	54.2	68.4	60	0	54.6	-5	
NSR19-GF-SE	279196	6135870	51.9	51.8	63.9	60	0	52.2	-8	
NSR19-GF-NE	279196	6135883	51.3	51.9	63.3	60	0	52.3	-8	
NSR20-GF-NE	279196	6135856	51.6	51.4	63.6	60	0	51.8	-8	
NSR20-GF-NW	279187	6135853	53.8	52.7	65.8	60	0	53.1	-7	
NSR20-GF-SW	279188	6135843	59.2	54.0	71.2	60	0	54.4	-6	
NSR20-GF-SE	279197	6135846	57.0	53.3	69.0	60	0	53.7	-6	
NSR21-GF-NW	279200	6135866	51.3	51.1	63.3	60	0	51.5	-9	
NSR21-GF-SW	279199	6135855	53.1	51.4	65.1	60	0	51.8	-8	
NSR21-GF-SE	279209	6135859	56.2	52.9	68.2	60	0	53.4	-7	
NSR21-GF-NE	279210	6135870	52.8	52.6	64.8	60	0	53.1	-7	
NSR23-GF-NE	279103	6135811	70.6	60.5	82.6	60	0	60.9	1	
NSR23-F 1-NE	279103	6135811	71.4	63.5	83.4	60	1	63.9	4	1**
NSR23-GF-NW	279095	6135811	62.5	57.5	74.5	60	0	58.0	-2	
NSR23-F 1-NW	279095	6135811	67.4	62.6	79.4	60	1	63.1	3	1**
NSR23-GF-SW	279097	6135804	48.1	49.7	60.1	60	0	50.2	-10	
NSR23-F 1-SW	279097	6135804	53.0	54.9	65.0	60	0	55.3	-5	
NSR23-GF-SE	279102	6135802	59.7	52.1	71.7	60	0	52.5	-8	
NSR23-F 1-SE	279102	6135802	61.6	55.1	73.6	60	0	55.5	-5	
NSR23-GF-SW	279102	6135802	59.2	51.8	71.2	60	0	52.2	-8	
NSR23-F 1-SW	279102	6135802	61.3	54.8	73.3	60	0	55.3	-5	
NSR23-GF-SE	279106	6135804	66.7	56.6	78.7	60	0	57.0	-3	
NSR23-F 1-SE	279106	6135804	67.8	58.8	79.8	60	0	59.3	-1	
NSR24-GF-NE	279120	6135798	70.3	59.7	82.3	60	0	60.1	0	
NSR24-GF-NW	279110	6135796	63.4	55.2	75.4	60	0	55.7	-4	
NSR24-GF-SW	279111	6135786	50.5	50.5	62.5	60	0	51.0	-9	
NSR24-GF-SE	279121	6135788	61.9	54.9	73.9	60	0	55.3	-5	
NSR25-GF-NE	279159	6135775	70.9	59.4	82.9	60	0	59.9	-0	
NSR25-F 1-NE	279159	6135775	71.3	61.0	83.3	60	0	61.4	1	
NSR25-GF-NW	279146	6135767	60.3	53.7	72.3	60	0	54.1	-6	
NSR25-F 1-NW	279146	6135767	62.3	56.3	74.3	60	0	56.8	-3	
NSR25-GF-SW	279142	6135752	48.3	48.3	60.3	60	0	48.7	-11	
NSR25-F 1-SW	279142	6135752	52.0	52.0	64.0	60	0	52.4	-8	
NSR25-GF-SE	279155	6135760	57.2	52.5	69.2	60	0	52.9	-7	
NSR25-F 1-SE	279155	6135760	60.8	57.4	72.8	60	0	57.8	-2	
NSR26-GF-NE	279170	6135767	70.6	59.4	82.6	60	0	59.8	-0	
NSR26-GF-NW	279162	6135766	62.2	52.8	74.2	60	0	53.3	-7	
NSR26-GF-SW	279164	6135758	51.2	50.7	63.2	60	0	51.1	-9	
NSR26-GF-SE	279172	6135759	60.0	52.3	72.0	60	0	52.7	-7	
NSR27-GF-NE	279182	6135759	70.7	59.6	82.7	60	0	60.1	0	
NSR27-GF-NW	279171	6135757	58.1	51.9	70.1	60	0	52.3	-8	
NSR27-GF-SW	279172	6135745	51.5	51.2	63.5	60	0	51.6	-8	
NSR27-GF-SE	279183	6135748	62.3	54.3	74.3	60	0	54.7	-5	
NSR28-GF-NE	279199	6135748	70.5	59.3	82.5	60	0	59.8	-0	
NSR28-GF-NW	279189	6135746	63.3	53.9	75.3	60	0	54.3	-6	
NSR28-GF-SW	279190	6135736	51.1	50.5	63.1	60	0	50.9	-9	
NSR29-GF-SE	279282	6135673	63.9	57.2	75.9	60	0	57.7	-2	
NSR29-GF-NE	279280	6135679	65.7	58.9	77.7	60	0	59.3	-1	
NSR29-GF-NW	279270	6135677	62.4	54.3	74.4	60	0	54.7	-5	
NSR29-GF-SW	279277	6135661	50.8	50.4	62.8	60	0	50.8	-9	
NSR29-GF-SE	279294	6135657	57.2	53.5	69.2	60	0	53.9	-6	
NSR29-GF-NE	279296	6135667	65.0	57.3	77.0	60	0	57.7	-2	
NSR29-GF-NW	279288	6135668	62.9	54.7	74.9	60	0	55.1	-5	
NSR29-GF-NE	279284	6135669	63.6	55.8	75.6	60	0	56.2	-4	
NSR30-GF-NE	279312	6135663	67.9	61.7	79.9	60	0	62.2	2	
NSR30-GF-NW	279302	6135661	62.5	55.4	74.5	60	0	55.9	-4	
NSR30-GF-SW	279303	6135651	51.3	50.8	63.3	60	0	51.3	-9	
NSR30-GF-SE	279313	6135653	64.2	60.2	76.2	60	0	60.7	1	
NSR31-GF-NE	279322	6135648	66.1	61.1	78.1	60	0	61.5	2	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR31-F 1-NE	279322	6135648	68.1	64.1	80.1	60	0	64.5	5	
NSR31-GF-NW	279312	6135646	60.2	54.6	72.2	60	0	55.0	-5	
NSR31-F 1-NW	279312	6135646	63.0	58.7	75.0	60	0	59.1	-1	
NSR31-GF-SW	279312	6135635	48.0	47.7	60.0	60	0	48.1	-12	
NSR31-F 1-SW	279312	6135635	51.9	51.3	63.9	60	0	51.7	-8	
NSR31-GF-SE	279322	6135638	58.0	55.0	70.0	60	0	55.4	-5	
NSR31-F 1-SE	279322	6135638	60.8	58.6	72.8	60	0	59.0	-1	
NSR32-GF-NE	279339	6135645	69.1	64.9	81.1	60	0	65.4	5	
NSR32-GF-NW	279329	6135644	65.5	58.9	77.5	60	0	59.4	-1	
NSR32-GF-SW	279330	6135634	51.7	51.2	63.7	60	0	51.6	-8	
NSR32-GF-SE	279340	6135635	62.9	61.6	74.9	60	0	62.1	2	
NSR33-GF-NE	279405	6135604	61.8	61.7	73.8	60	0	62.1	2	
NSR33-GF-SE	279403	6135606	61.4	61.3	73.4	60	0	61.7	2	
NSR33-GF-NE	279401	6135611	67.5	66.7	79.5	60	1	67.1	7	2
NSR33-GF-NW	279392	6135604	65.0	64.5	77.0	60	0	65.0	5	
NSR33-GF-SW	279394	6135591	53.4	53.3	65.4	60	0	53.7	-6	
NSR33-GF-SE	279405	6135595	58.4	58.3	70.4	60	0	58.7	-1	
NSR34-GF-NE	279412	6135594	61.9	61.8	73.9	60	0	62.2	2	
NSR34-GF-NW	279407	6135593	58.5	58.4	70.5	60	0	58.8	-1	
NSR34-GF-NE	279406	6135592	58.1	58.0	70.1	60	0	58.4	-2	
NSR34-GF-NW	279401	6135588	55.3	55.2	67.3	60	0	55.6	-4	
NSR34-GF-SW	279402	6135580	53.2	53.1	65.2	60	0	53.5	-7	
NSR35-GF-NE	279419	6135590	62.7	63.0	74.7	60	0	63.5	4	
NSR35-GF-NW	279414	6135589	60.0	60.0	72.0	60	0	60.4	0	
NSR35-GF-NE	279414	6135589	59.1	59.1	71.1	60	0	59.5	-1	
NSR35-GF-SW	279410	6135578	53.2	53.2	65.2	60	0	53.6	-6	
NSR36-GF-NE	279426	6135586	62.9	63.1	74.9	60	0	63.5	4	
NSR36-GF-NW	279422	6135585	60.7	60.6	72.7	60	0	61.1	1	
NSR36-GF-NE	279421	6135585	60.1	60.0	72.1	60	0	60.5	1	
NSR36-GF-SW	279417	6135572	53.0	52.9	65.0	60	0	53.3	-7	
NSR36-GF-SE	279424	6135577	58.8	58.7	70.8	60	0	59.1	-1	
NSR37-GF-NE	279440	6135572	61.7	62.0	73.7	60	0	62.4	2	
NSR37-F 1-NE	279440	6135572	66.8	66.9	78.8	60	1	67.3	7	2
NSR37-GF-NW	279428	6135565	56.8	56.8	68.8	60	0	57.2	-3	
NSR37-F 1-NW	279428	6135565	61.6	62.1	73.6	60	0	62.5	3	
NSR37-GF-SE	279438	6135558	55.4	55.3	67.4	60	0	55.8	-4	
NSR37-F 1-SE	279438	6135558	59.1	59.0	71.1	60	0	59.4	-1	
NSR39-GF-E	279316	6135788	57.6	56.5	69.6	60	0	57.0	-3	
NSR39-GF-N	279306	6135794	55.2	53.5	67.2	60	0	54.0	-6	
NSR39-GF-W	279296	6135787	60.1	53.6	72.1	60	0	54.0	-6	
NSR39-GF-S	279306	6135781	60.3	55.2	72.3	60	0	55.6	-4	
NSR40-GF-S	279440	6135680	57.3	57.3	69.3	60	0	57.8	-2	
NSR40-F 1-S	279440	6135680	66.3	66.7	78.3	60	1	67.1	7	2
NSR40-GF-E	279443	6135686	53.5	53.6	65.5	60	0	54.0	-6	
NSR40-F 1-E	279443	6135686	61.3	61.5	73.3	60	0	62.0	2	
NSR40-GF-N	279427	6135690	53.6	54.5	65.6	60	0	54.9	-5	
NSR40-F 1-N	279427	6135690	58.5	59.4	70.5	60	0	59.8	-0	
NSR40-GF-W	279412	6135687	63.5	64.4	75.5	60	0	64.9	5	
NSR40-F 1-W	279412	6135687	65.8	66.3	77.8	60	1	66.7	7	2
NSR40-GF-N	279412	6135686	63.6	64.6	75.6	60	0	65.0	5	
NSR40-F 1-N	279412	6135686	65.8	66.3	77.8	60	1	66.7	7	2
NSR40-GF-W	279410	6135682	68.1	68.6	80.1	60	1	69.0	9	2
NSR40-F 1-W	279410	6135682	69.5	70.1	81.5	60	1	70.5	11	3
NSR40-GF-S	279424	6135679	62.1	62.4	74.1	60	0	62.8	3	
NSR40-F 1-S	279424	6135679	68.3	68.6	80.3	60	1	69.1	9	2
NSR41-GF-N	279414	6135699	61.7	61.9	73.7	60	0	62.3	2	
NSR41-GF-E	279427	6135695	49.2	49.4	61.2	60	0	49.8	-10	
NSR41-GF-S	279415	6135689	60.0	61.4	72.0	60	0	61.8	2	
NSR41-GF-W	279401	6135694	68.0	68.7	80.0	60	1	69.2	9	2
NSR42-GF-N	279418	6135745	58.3	57.4	70.3	60	0	57.9	-2	
NSR42-GF-W	279405	6135736	66.2	65.9	78.2	60	1	66.3	6	2
NSR42-GF-S	279412	6135730	62.1	62.5	74.1	60	0	62.9	3	
NSR42-GF-W	279417	6135730	60.7	61.1	72.7	60	0	61.5	2	
NSR42-GF-S	279427	6135728	57.3	57.9	69.3	60	0	58.4	-2	
NSR42-GF-E	279437	6135733	48.9	48.9	60.9	60	0	49.3	-11	
NSR42-GF-N	279433	6135737	49.9	49.9	61.9	60	0	50.4	-10	
NSR42-GF-E	279432	6135740	49.7	49.7	61.7	60	0	50.1	-10	
NSR43-GF-E	279423	6135755	50.5	50.5	62.5	60	0	50.9	-9	
NSR43-GF-N	279415	6135761	59.1	58.2	71.1	60	0	58.7	-1	
NSR43-GF-W	279407	6135753	65.3	65.0	77.3	60	1	65.4	5	1
NSR43-GF-S	279416	6135748	58.4	58.3	70.4	60	0	58.7	-1	
NSR44-GF-E	279417	6135770	51.0	50.9	63.0	60	0	51.3	-9	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR44-GF-N	279409	6135775	59.8	59.1	71.8	60	0	59.5	-1	
NSR44-GF-W	279402	6135769	66.4	66.0	78.4	60	1	66.4	6	2
NSR44-GF-S	279410	6135765	61.8	61.4	73.8	60	0	61.9	2	
NSR45-GF-E	279423	6135784	50.8	50.8	62.8	60	0	51.2	-9	
NSR45-GF-W	279404	6135782	65.9	65.5	77.9	60	1	65.9	6	2
NSR45-GF-S	279414	6135777	56.9	56.3	68.9	60	0	56.7	-3	
NSR46-GF-E	279507	6135633	59.5	59.0	71.5	60	0	59.4	-1	
NSR46-GF-N	279498	6135639	54.2	54.1	66.2	60	0	54.5	-6	
NSR46-GF-W	279490	6135632	64.8	64.5	76.8	60	0	65.0	5	
NSR46-GF-S	279499	6135626	64.4	64.4	76.4	60	0	64.8	5	
NSR47-GF-E	279505	6135644	57.3	57.3	69.3	60	0	57.7	-2	
NSR47-GF-N	279491	6135649	55.6	55.1	67.6	60	0	55.6	-4	
NSR47-GF-W	279477	6135643	65.3	65.2	77.3	60	1	65.6	6	2
NSR47-GF-S	279491	6135638	56.7	56.5	68.7	60	0	57.0	-3	
NSR48-GF-E	279504	6135657	56.4	56.4	68.4	60	0	56.8	-3	
NSR48-GF-N	279492	6135662	52.4	52.2	64.4	60	0	52.6	-7	
NSR48-GF-W	279480	6135656	62.0	61.7	74.0	60	0	62.1	2	2**
NSR48-GF-S	279492	6135650	55.0	54.8	67.0	60	0	55.2	-5	
NSR49-GF-E	279479	6135664	52.1	52.1	64.1	60	0	52.5	-8	
NSR49-F 1-E	279479	6135664	56.3	56.3	68.3	60	0	56.7	-3	
NSR49-GF-S	279482	6135666	53.9	53.9	65.9	60	0	54.3	-6	
NSR49-F 1-S	279482	6135666	58.0	57.9	70.0	60	0	58.3	-2	
NSR49-GF-S	279492	6135667	51.9	51.8	63.9	60	0	52.2	-8	
NSR49-F 1-S	279492	6135667	56.5	56.3	68.5	60	0	56.7	-3	
NSR49-F 1-E	279498	6135672	54.1	54.0	66.1	60	0	54.4	-6	
NSR49-F 1-E	279498	6135677	54.1	53.8	66.1	60	0	54.3	-6	
NSR49-GF-N	279491	6135680	50.5	51.2	62.5	60	0	51.6	-8	
NSR49-F 1-N	279491	6135680	54.5	54.9	66.5	60	0	55.3	-5	
NSR49-GF-N	279480	6135679	52.3	52.7	64.3	60	0	53.2	-7	
NSR49-F 1-N	279480	6135679	57.3	57.2	69.3	60	0	57.6	-2	
NSR49-GF-W	279474	6135675	54.4	54.4	66.4	60	0	54.8	-5	
NSR49-F 1-W	279474	6135675	59.9	60.0	71.9	60	0	60.4	0	
NSR49-GF-N	279471	6135672	53.7	53.7	65.7	60	0	54.1	-6	
NSR49-F 1-N	279471	6135672	59.3	59.4	71.3	60	0	59.8	-0	
NSR49-GF-W	279467	6135666	61.2	61.1	73.2	60	0	61.6	2	
NSR49-F 1-W	279467	6135666	66.0	66.0	78.0	60	1	66.4	6	2
NSR49-GF-S	279473	6135660	60.1	59.9	72.1	60	0	60.4	0	
NSR49-F 1-S	279473	6135660	65.4	65.2	77.4	60	1	65.6	6	2
NSR50-GF-NE	279098	6135804	46.1	46.4	58.1	57	0	46.8	-10	
NSR50-F 1-NE	279098	6135804	50.0	50.5	62.0	57	0	50.9	-6	
NSR50-GF-NW	279090	6135804	58.2	56.9	70.2	57	0	57.3	0	
NSR50-F 1-NW	279090	6135804	63.1	61.8	75.1	57	0	62.3	5	
NSR50-GF-SW	279092	6135797	48.3	49.3	60.3	57	0	49.7	-7	
NSR50-F 1-SW	279092	6135797	52.2	53.5	64.2	57	0	53.9	-3	
NSR50-GF-SE	279098	6135796	50.3	50.3	62.3	57	0	50.8	-6	
NSR50-F 1-SE	279098	6135796	55.4	54.5	67.4	57	0	54.9	-2	
NSR50-GF-SW	279098	6135796	49.9	49.7	61.9	57	0	50.1	-7	
NSR50-F 1-SW	279098	6135796	55.0	53.9	67.0	57	0	54.3	-3	
NSR50-GF-SE	279101	6135798	61.4	54.6	73.4	57	0	55.0	-2	
NSR50-F 1-SE	279101	6135798	63.1	57.5	75.1	57	0	57.9	1	
NSR51-GF-NE	279093	6135793	55.5	52.5	67.5	57	0	52.9	-4	
NSR51-F 1-NE	279093	6135793	57.9	55.9	69.9	57	0	56.3	-1	
NSR51-GF-SE	279092	6135795	50.3	50.7	62.3	57	0	51.1	-6	
NSR51-F 1-SE	279092	6135795	54.8	54.5	66.8	57	0	54.9	-2	
NSR51-GF-NE	279090	6135799	48.3	50.7	60.3	57	0	51.2	-6	
NSR51-F 1-NE	279090	6135799	52.2	55.5	64.2	57	0	55.9	-1	
NSR51-GF-NW	279085	6135797	55.8	56.3	67.8	57	0	56.7	-0	
NSR51-F 1-NW	279085	6135797	60.2	61.2	72.2	57	0	61.6	5	
NSR51-GF-SE	279095	6135788	57.6	53.8	69.6	57	0	54.2	-3	
NSR51-F 1-SE	279095	6135788	59.6	56.8	71.6	57	0	57.2	0	
NSR52-GF-NW	279081	6135791	54.2	55.8	66.2	57	0	56.2	-1	
NSR52-F 1-NW	279081	6135791	58.3	60.5	70.3	57	1	61.0	4	1
NSR52-GF-SW	279081	6135786	47.8	49.5	59.8	57	0	50.0	-7	
NSR52-F 1-SW	279081	6135786	51.6	54.0	63.6	57	0	54.4	-3	
NSR52-GF-SE	279085	6135785	47.0	47.0	59.0	57	0	47.5	-10	
NSR52-F 1-SE	279085	6135785	51.1	51.2	63.1	57	0	51.6	-5	
NSR52-GF-SW	279086	6135784	47.5	47.6	59.5	57	0	48.0	-9	
NSR52-F 1-SW	279086	6135784	51.6	51.7	63.6	57	0	52.1	-5	
NSR52-GF-SE	279092	6135784	56.4	53.5	68.4	57	0	53.9	-3	
NSR52-F 1-SE	279092	6135784	58.5	56.4	70.5	57	0	56.8	-0	
NSR53-GF-NE	279084	6135780	50.4	51.6	62.4	57	0	52.0	-5	
NSR53-F 1-NE	279084	6135780	54.7	55.1	66.7	57	0	55.6	-1	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR53-GF-SE	279082	6135782	49.2	49.8	61.2	57	0	50.2	-7	
NSR53-F 1-SE	279082	6135782	53.3	53.5	65.3	57	0	54.0	-3	
NSR53-GF-NE	279081	6135786	46.3	48.1	58.3	57	0	48.5	-9	
NSR53-F 1-NE	279081	6135786	49.9	52.6	61.9	57	0	53.0	-4	
NSR53-GF-NW	279075	6135785	53.0	54.8	65.0	57	0	55.2	-2	
NSR53-F 1-NW	279075	6135785	57.1	59.9	69.1	57	1	60.4	3	1
NSR53-GF-SW	279078	6135776	45.1	45.8	57.1	57	0	46.2	-11	
NSR53-F 1-SW	279078	6135776	49.1	50.1	61.1	57	0	50.5	-7	
NSR53-GF-SE	279086	6135775	54.5	53.3	66.5	57	0	53.7	-3	
NSR53-F 1-SE	279086	6135775	57.6	56.6	69.6	57	0	57.1	0	
NSR54-GF-NE	279081	6135772	50.0	50.9	62.0	57	0	51.3	-6	
NSR54-F 1-NE	279081	6135772	54.4	54.5	66.4	57	0	54.9	-2	
NSR54-GF-SE	279080	6135773	48.1	48.6	60.1	57	0	49.0	-8	
NSR54-F 1-SE	279080	6135773	53.3	53.0	65.3	57	0	53.4	-4	
NSR54-GF-NE	279077	6135778	44.6	45.7	56.6	57	0	46.1	-11	
NSR54-F 1-NE	279077	6135778	48.4	50.5	60.4	57	0	50.9	-6	
NSR54-GF-NW	279071	6135778	52.3	54.3	64.3	57	0	54.7	-2	
NSR54-F 1-NW	279071	6135778	56.4	59.3	68.4	57	1	59.7	3	1
NSR54-GF-SW	279074	6135771	44.5	45.3	56.5	57	0	45.7	-11	
NSR54-F 1-SW	279074	6135771	48.6	50.0	60.6	57	0	50.5	-7	
NSR54-GF-SE	279082	6135768	53.7	53.1	65.7	57	0	53.5	-4	
NSR54-F 1-SE	279082	6135768	56.1	55.7	68.1	57	0	56.1	-1	
NSR55-GF-NE	279075	6135771	43.7	44.8	55.7	57	0	45.2	-12	
NSR55-F 1-NE	279075	6135771	47.5	49.5	59.5	57	0	49.9	-7	
NSR55-GF-NW	279066	6135772	51.6	53.9	63.6	57	0	54.3	-3	
NSR55-F 1-NW	279066	6135772	55.6	58.7	67.6	57	1	59.1	2	1
NSR55-GF-SW	279068	6135765	44.9	45.7	56.9	57	0	46.1	-11	
NSR55-F 1-SW	279068	6135765	48.8	50.5	60.8	57	0	50.9	-6	
NSR55-GF-SE	279074	6135763	48.6	48.9	60.6	57	0	49.3	-8	
NSR55-F 1-SE	279074	6135763	52.0	52.2	64.0	57	0	52.6	-4	
NSR55-GF-SW	279075	6135763	48.5	48.7	60.5	57	0	49.1	-8	
NSR55-F 1-SW	279075	6135763	51.9	52.0	63.9	57	0	52.4	-5	
NSR55-GF-SE	279079	6135765	53.2	52.8	65.2	57	0	53.2	-4	
NSR55-F 1-SE	279079	6135765	55.5	55.3	67.5	57	0	55.7	-1	
NSR56-GF-SE	279072	6135760	50.2	51.5	62.2	57	0	52.0	-5	
NSR56-F 1-SE	279072	6135760	53.3	54.3	65.3	57	0	54.8	-2	
NSR56-GF-SE	279073	6135760	50.2	51.7	62.2	57	0	52.1	-5	
NSR56-F 1-SE	279073	6135760	53.3	54.5	65.3	57	0	54.9	-2	
NSR56-GF-NE	279069	6135765	44.0	44.4	56.0	57	0	44.8	-12	
NSR56-F 1-NE	279069	6135765	47.7	48.3	59.7	57	0	48.7	-8	
NSR56-GF-NW	279061	6135765	50.9	53.1	62.9	57	0	53.5	-4	
NSR56-F 1-NW	279061	6135765	54.9	57.9	66.9	57	1	58.4	1	
NSR56-GF-SW	279064	6135757	46.3	46.4	58.3	57	0	46.8	-10	
NSR56-F 1-SW	279064	6135757	50.1	50.3	62.1	57	0	50.7	-6	
NSR56-GF-SE	279071	6135756	51.8	52.3	63.8	57	0	52.7	-4	
NSR56-F 1-SE	279071	6135756	54.3	54.8	66.3	57	0	55.2	-2	
NSR57-GF-NE	279044	6135783	52.2	55.8	64.2	57	0	56.3	1	
NSR57-F 1-NE	279044	6135783	56.0	60.4	68.0	57	1	60.9	-4	1
NSR57-GF-NW	279033	6135786	51.3	55.6	63.3	57	0	56.0	1	
NSR57-F 1-NW	279033	6135786	54.3	59.3	66.3	57	1	59.8	-3	
NSR57-GF-SE	279050	6135774	52.1	53.3	64.1	57	0	53.7	3	
NSR57-F 1-SE	279050	6135774	55.4	56.4	67.4	57	0	56.8	0	
NSR58-GF-NE	279019	6135800	52.3	56.8	64.3	57	0	57.2	0	
NSR58-GF-NW	279011	6135799	62.0	62.3	74.0	57	1	62.7	6	2
NSR58-GF-SW	279012	6135790	54.2	54.3	66.2	57	0	54.6	-2	
NSR58-GF-SE	279021	6135792	50.3	55.0	62.3	57	0	55.5	-2	
BHH-GF-NE	279211	6135712	61.6	55.8	73.6	60	0	56.2	-4	
BHH-GF-SE	279211	6135715	62.0	55.9	74.0	60	0	56.3	-4	
BHH-GF-NW	279200	6135720	51.1	50.9	63.1	60	0	51.3	-9	
BHH-GF-SW	279198	6135713	49.8	49.8	61.8	60	0	50.2	-10	
BHH-GF-NW	279197	6135712	50.4	50.6	62.4	60	0	51.0	-9	
BHH-GF-SW	279201	6135705	50.4	50.8	62.4	60	0	51.2	-9	
BHH-GF-SE	279210	6135705	60.2	55.5	72.2	60	0	55.9	-4	
HMC-GF-E	279450	6135720	51.0	51.0	63.0	60	0	51.4	-9	
HMC-F 1-E	279450	6135720	53.9	53.9	65.9	60	0	54.3	-6	
HMC-GF-N	279442	6135726	55.3	55.8	67.3	60	0	56.2	-4	
HMC-F 1-N	279442	6135726	57.5	57.6	69.5	60	0	58.0	-2	
HMC-GF-W	279435	6135723	56.7	56.8	68.7	60	0	57.2	-3	
HMC-F 1-W	279435	6135723	58.7	58.4	70.7	60	0	58.8	-1	
HMC-GF-N	279434	6135723	56.9	57.0	68.9	60	0	57.4	-3	
HMC-F 1-N	279434	6135723	58.9	58.6	70.9	60	0	59.0	-1	
HMC-GF-N	279430	6135721	57.6	57.3	69.6	60	0	57.7	-2	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
HMC-F 1-N	279430	6135721	59.3	58.8	71.3	60	0	59.2	-1	
HMC-GF-N	279420	6135720	60.1	59.7	72.1	60	0	60.1	0	
HMC-F 1-N	279420	6135720	61.4	60.9	73.4	60	0	61.3	1	
HMC-GF-W	279408	6135715	66.0	66.1	78.0	60	1	66.5	7	TBD
HMC-F 1-W	279408	6135715	66.9	66.9	78.9	60	1	67.3	7	TBD
HMC-GF-W	279408	6135709	65.9	66.0	77.9	60	1	66.4	6	TBD
HMC-F 1-W	279408	6135709	66.9	66.9	78.9	60	1	67.3	7	TBD
HMC-GF-S	279421	6135707	58.7	59.2	70.7	60	0	59.6	-0	
HMC-F 1-S	279421	6135707	60.8	60.8	72.8	60	0	61.2	1	
HMC-GF-S	279432	6135708	56.5	57.0	68.5	60	0	57.4	-3	
HMC-F 1-S	279432	6135708	58.8	58.9	70.8	60	0	59.4	-1	
HMC-GF-S	279435	6135707	56.4	56.9	68.4	60	0	57.3	-3	
HMC-F 1-S	279435	6135707	58.9	59.0	70.9	60	0	59.5	-1	
HMC-GF-W	279437	6135706	56.4	56.9	68.4	60	0	57.3	-3	
HMC-F 1-W	279437	6135706	59.1	59.3	71.1	60	0	59.7	-0	
HMC-GF-S	279444	6135704	56.5	56.9	68.5	60	0	57.3	-3	
HMC-F 1-S	279444	6135704	59.7	59.8	71.7	60	0	60.3	0	
HMC-GF-E	279450	6135710	51.9	52.0	63.9	60	0	52.4	-8	
HMC-F 1-E	279450	6135710	55.5	55.6	67.5	60	0	56.0	-4	

* TBD – To be determined following site inspection under design package 109-31 Noise Facade Treatment.
** Changed following further grouping/catchment analysis (refer Section 7.5)

Table 30: Night-time Predicted Noise Levels and Determination of Eligibility for Consideration of Property Treatment and FTP.

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR1-GF-NE	278980	6135974	45.2	45.5	57.2	55	0	45.9	-9	
NSR1-GF-NW	278970	6135968	52.9	53.0	64.9	55	0	53.4	-2	
NSR1-GF-SW	278967	6135957	60.2	60.3	72.2	55	1	60.7	6	2
NSR1-GF-SW	278970	6135957	58.6	58.7	70.6	55	0	59.1	4	
NSR1-GF-SW	278970	6135957	58.9	59.0	70.9	55	0	59.4	4	
NSR1-GF-SE	278978	6135963	50.7	50.8	62.7	55	0	51.2	-4	
NSR2-GF-NW	278975	6135955	53.3	53.4	65.3	55	0	53.8	-1	
NSR2-GF-SW	278981	6135945	57.8	57.8	69.8	55	0	58.2	3	
NSR2-GF-SE	278991	6135942	58.4	58.4	70.4	55	0	58.8	4	
NSR2-GF-NE	278991	6135946	56.0	55.8	68.0	55	0	56.3	1	
NSR2-GF-SE	278991	6135948	56.6	56.3	68.6	55	0	56.7	2	
NSR3-GF-SW	278993	6135948	57.7	57.5	69.7	55	0	57.9	3	
NSR3-GF-SE	278998	6135949	56.8	56.9	68.8	55	0	57.3	2	
NSR3-GF-SE	278999	6135952	56.8	56.6	68.8	55	0	57.0	2	
NSR3-GF-SE	278999	6135953	57.3	57.1	69.3	55	0	57.5	3	
NSR3-GF-NE	278993	6135960	49.3	48.2	61.3	55	0	48.7	-6	
NSR3-GF-NW	278983	6135961	47.5	47.6	59.5	55	0	48.0	-7	
NSR4-GF-SE	279004	6135960	56.3	56.2	68.3	55	0	56.7	2	
NSR4-GF-SE	279005	6135960	57.0	57.0	69.0	55	0	57.4	2	
NSR4-GF-NE	278999	6135967	49.2	47.5	61.2	55	0	47.9	-7	
NSR4-GF-NW	278989	6135969	47.0	47.1	59.0	55	0	47.5	-8	
NSR4-GF-SW	278994	6135959	48.8	47.3	60.8	55	0	47.7	-7	
NSR4-GF-SE	279003	6135957	57.5	57.6	69.5	55	0	58.0	3	
NSR5-GF-NW	279032	6135952	52.1	54.3	64.1	55	0	54.7	-0	
NSR5-GF-SW	279036	6135942	58.4	58.5	70.4	55	0	58.9	4	
NSR5-GF-SE	279047	6135941	52.7	51.1	64.7	55	0	51.6	-3	
NSR6-GF-NE	279074	6135967	44.8	45.4	56.8	55	0	45.8	-9	
NSR6-GF-SW	279056	6135940	54.0	52.9	66.0	55	0	53.3	-2	
NSR7-GF-NE	279081	6135963	44.5	44.9	56.5	55	0	45.3	-10	
NSR7-GF-SW	279063	6135936	54.0	52.8	66.0	55	0	53.2	-2	
NSR7-GF-SE	279076	6135946	42.6	42.5	54.6	55	0	43.0	-12	
NSR8-GF-NW	279074	6135946	42.2	42.2	54.2	55	0	42.6	-12	
NSR8-F 1-NW	279074	6135946	51.5	51.4	63.5	55	0	51.8	-3	
NSR8-GF-SW	279070	6135931	53.7	53.0	65.7	55	0	53.4	-2	
NSR8-F 1-SW	279070	6135931	59.1	59.1	71.1	55	0	59.5	5	
NSR8-GF-NE	279086	6135955	42.3	42.7	54.3	55	0	43.1	-12	
NSR8-F 1-NE	279086	6135955	45.3	45.8	57.3	55	0	46.2	-9	
NSR9-GF-SW	279076	6135927	53.2	52.6	65.2	55	0	53.0	-2	
NSR9-F 1-SW	279076	6135927	59.2	59.2	71.2	55	0	59.6	5	
NSR9-GF-SE	279087	6135937	42.7	42.4	54.7	55	0	42.8	-12	
NSR9-F 1-SE	279087	6135937	49.1	48.9	61.1	55	0	49.4	-6	
NSR9-GF-NE	279091	6135951	41.8	42.2	53.8	55	0	42.6	-12	
NSR9-F 1-NE	279091	6135951	45.2	45.7	57.2	55	0	46.1	-9	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR10-GF-NE	279104	6135940	42.6	43.0	54.6	55	0	43.4	-12	
NSR10-F 1-NE	279104	6135940	50.1	48.6	62.1	55	0	49.0	-6	
NSR10-GF-SE	279103	6135941	43.2	43.6	55.2	55	0	44.0	-11	
NSR10-F 1-SE	279103	6135941	50.2	48.9	62.2	55	0	49.3	-6	
NSR10-GF-NE	279100	6135947	44.0	44.2	56.0	55	0	44.6	-10	
NSR10-F 1-NE	279100	6135947	49.4	48.6	61.4	55	0	49.0	-6	
NSR10-GF-NW	279089	6135940	41.4	41.7	53.4	55	0	42.1	-13	
NSR10-F 1-NW	279089	6135940	46.6	47.0	58.6	55	0	47.4	-8	
NSR10-GF-SW	279090	6135925	52.4	52.3	64.4	55	0	52.8	-2	
NSR10-F 1-SW	279090	6135925	58.7	58.2	70.7	55	0	58.6	4	
NSR10-GF-SE	279102	6135929	45.2	46.2	57.2	55	0	46.6	-8	
NSR10-F 1-SE	279102	6135929	54.5	54.0	66.5	55	0	54.4	-1	
NSR11-GF-NW	279103	6135929	46.1	46.3	58.1	55	0	46.8	-8	
NSR11-GF-SW	279103	6135915	53.4	53.1	65.4	55	0	53.5	-2	
NSR11-GF-SE	279115	6135920	47.3	48.1	59.3	55	0	48.5	-7	
NSR11-GF-NE	279115	6135934	44.7	45.3	56.7	55	0	45.7	-9	
NSR12-GF-NW	279118	6135926	44.6	45.9	56.6	55	0	46.3	-9	
NSR12-GF-SW	279121	6135916	50.3	51.2	62.3	55	0	51.6	-3	
NSR12-GF-NE	279129	6135927	45.5	46.1	57.5	55	0	46.5	-9	
NSR13-GF-NW	279127	6135910	49.2	49.8	61.2	55	0	50.3	-5	
NSR13-GF-SW	279122	6135895	54.4	52.7	66.4	55	0	53.1	-2	
NSR13-GF-NE	279139	6135919	45.7	46.3	57.7	55	0	46.7	-8	
NSR14-GF-SW	279129	6135891	54.6	52.9	66.6	55	0	53.3	-2	
NSR14-GF-NE	279145	6135915	45.5	46.2	57.5	55	0	46.5	-9	
NSR15-GF-SW	279135	6135886	54.8	52.6	66.8	55	0	53.0	-2	
NSR15-GF-NE	279152	6135911	46.1	46.7	58.1	55	0	47.1	-8	
NSR16-GF-SW	279142	6135882	54.4	52.4	66.4	55	0	52.8	-2	
NSR16-GF-SE	279154	6135891	46.8	47.1	58.8	55	0	47.5	-8	
NSR16-GF-NE	279159	6135906	46.9	47.4	58.9	55	0	47.8	-7	
NSR17-GF-NW	279156	6135893	45.8	46.4	57.8	55	0	46.9	-8	
NSR17-GF-SW	279158	6135883	52.5	50.4	64.5	55	0	50.8	-4	
NSR17-GF-SE	279169	6135884	49.0	48.1	61.0	55	0	48.5	-7	
NSR17-GF-NE	279167	6135895	46.3	47.0	58.3	55	0	47.4	-8	
NSR18-GF-NW	279170	6135880	49.3	48.1	61.3	55	0	48.5	-7	
NSR18-GF-SW	279170	6135871	53.1	50.9	65.1	55	0	51.3	-4	
NSR18-GF-SE	279179	6135874	49.1	47.9	61.1	55	0	48.3	-7	
NSR18-GF-NE	279178	6135883	45.1	46.0	57.1	55	0	46.4	-9	
NSR19-GF-NW	279184	6135878	47.3	46.8	59.3	55	0	47.2	-8	
NSR19-GF-SW	279184	6135865	52.4	50.3	64.4	55	0	50.7	-4	
NSR19-GF-SE	279196	6135870	48.0	47.9	60.0	55	0	48.3	-7	
NSR19-GF-NE	279196	6135883	47.3	47.9	59.3	55	0	48.3	-7	
NSR20-GF-NE	279196	6135856	47.7	47.4	59.7	55	0	47.8	-7	
NSR20-GF-NW	279187	6135853	49.8	48.8	61.8	55	0	49.2	-6	
NSR20-GF-SW	279188	6135843	55.3	50.0	67.3	55	0	50.5	-5	
NSR20-GF-SE	279197	6135846	53.0	49.4	65.0	55	0	49.8	-5	
NSR21-GF-NW	279200	6135866	47.3	47.1	59.3	55	0	47.6	-7	
NSR21-GF-SW	279199	6135855	49.1	47.5	61.1	55	0	47.9	-7	
NSR21-GF-SE	279209	6135859	52.2	49.0	64.2	55	0	49.4	-6	
NSR21-GF-NE	279210	6135870	48.8	48.7	60.8	55	0	49.1	-6	
NSR23-GF-NE	279103	6135811	66.6	56.5	78.6	55	0	56.9	2	
NSR23-F 1-NE	279103	6135811	67.4	59.5	79.4	55	0	59.9	5	1**
NSR23-GF-NW	279095	6135811	58.5	53.6	70.5	55	0	54.0	-1	
NSR23-F 1-NW	279095	6135811	63.5	58.7	75.5	55	0	59.1	4	1**
NSR23-GF-SW	279097	6135804	44.1	45.8	56.1	55	0	46.2	-9	
NSR23-F 1-SW	279097	6135804	49.0	50.9	61.0	55	0	51.3	-4	
NSR23-GF-SE	279102	6135802	55.7	48.2	67.7	55	0	48.6	-6	
NSR23-F 1-SE	279102	6135802	57.7	51.2	69.7	55	0	51.6	-3	
NSR23-GF-SW	279102	6135802	55.3	47.9	67.3	55	0	48.3	-7	
NSR23-F 1-SW	279102	6135802	57.3	50.9	69.3	55	0	51.3	-4	
NSR23-GF-SE	279106	6135804	62.7	52.7	74.7	55	0	53.0	-2	
NSR23-F 1-SE	279106	6135804	63.9	54.9	75.9	55	0	55.3	0	
NSR24-GF-NE	279120	6135798	66.3	55.7	78.3	55	0	56.1	1	
NSR24-GF-NW	279110	6135796	59.4	51.4	71.4	55	0	51.8	-3	
NSR24-GF-SW	279111	6135786	46.6	46.6	58.6	55	0	47.0	-8	
NSR24-GF-SE	279121	6135788	57.9	51.0	69.9	55	0	51.4	-4	
NSR25-GF-NE	279159	6135775	66.9	55.4	78.9	55	0	55.8	1	
NSR25-F 1-NE	279159	6135775	67.4	57.0	79.4	55	0	57.4	2	
NSR25-GF-NW	279146	6135767	56.3	49.8	68.3	55	0	50.2	-5	
NSR25-F 1-NW	279146	6135767	58.3	52.5	70.3	55	0	52.9	-2	
NSR25-GF-SW	279142	6135752	44.4	44.4	56.4	55	0	44.8	-10	
NSR25-F 1-SW	279142	6135752	48.0	48.0	60.0	55	0	48.4	-7	
NSR25-GF-SE	279155	6135760	53.2	48.6	65.2	55	0	49.0	-6	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR25-F 1-SE	279155	6135760	56.9	53.4	68.9	55	0	53.8	-1	
NSR26-GF-NE	279170	6135767	66.6	55.4	78.6	55	0	55.7	1	
NSR26-GF-NW	279162	6135766	58.3	48.9	70.3	55	0	49.3	-6	
NSR26-GF-SW	279164	6135758	47.2	46.8	59.2	55	0	47.2	-8	
NSR26-GF-SE	279172	6135759	56.0	48.3	68.0	55	0	48.7	-6	
NSR27-GF-NE	279182	6135759	66.7	55.5	78.7	55	0	55.9	1	
NSR27-GF-NW	279171	6135757	54.1	48.0	66.1	55	0	48.3	-7	
NSR27-GF-SW	279172	6135745	47.5	47.2	59.5	55	0	47.6	-7	
NSR27-GF-SE	279183	6135748	58.3	50.4	70.3	55	0	50.8	-4	
NSR28-GF-NE	279199	6135748	66.5	55.3	78.5	55	0	55.7	1	
NSR28-GF-NW	279189	6135746	59.4	50.0	71.4	55	0	50.4	-5	
NSR28-GF-SW	279190	6135736	47.1	46.6	59.1	55	0	47.0	-8	
NSR29-GF-SE	279282	6135673	59.9	53.2	71.9	55	0	53.7	-1	
NSR29-GF-NE	279280	6135679	61.7	54.9	73.7	55	0	55.4	0	
NSR29-GF-NW	279270	6135677	58.5	50.3	70.5	55	0	50.7	-4	
NSR29-GF-SW	279277	6135661	46.8	46.4	58.8	55	0	46.8	-8	
NSR29-GF-SE	279294	6135657	53.3	49.6	65.3	55	0	50.0	-5	
NSR29-GF-NE	279296	6135667	61.1	53.4	73.1	55	0	53.8	-1	
NSR29-GF-NW	279288	6135668	59.0	50.8	71.0	55	0	51.2	-4	
NSR29-GF-NE	279284	6135669	59.7	51.9	71.7	55	0	52.3	-3	
NSR30-GF-NE	279312	6135663	64.0	57.8	76.0	55	0	58.2	3	
NSR30-GF-NW	279302	6135661	58.5	51.5	70.5	55	0	51.9	-3	
NSR30-GF-SW	279303	6135651	47.3	46.9	59.3	55	0	47.3	-8	
NSR30-GF-SE	279313	6135653	60.2	56.3	72.2	55	0	56.7	2	
NSR31-GF-NE	279322	6135648	62.1	57.1	74.1	55	0	57.6	3	
NSR31-F 1-NE	279322	6135648	64.1	60.1	76.1	55	1	60.5	6	2
NSR31-GF-NW	279312	6135646	56.2	50.6	68.2	55	0	51.0	-4	
NSR31-F 1-NW	279312	6135646	59.1	54.8	71.1	55	0	55.2	0	
NSR31-GF-SW	279312	6135635	44.0	43.7	56.0	55	0	44.1	-11	
NSR31-F 1-SW	279312	6135635	47.9	47.3	59.9	55	0	47.7	-7	
NSR31-GF-SE	279322	6135638	54.0	51.1	66.0	55	0	51.5	-4	
NSR31-F 1-SE	279322	6135638	56.8	54.6	68.8	55	0	55.0	0	
NSR32-GF-NE	279339	6135645	65.2	61.0	77.2	55	1	61.4	6	2
NSR32-GF-NW	279329	6135644	61.5	55.0	73.5	55	0	55.4	0	
NSR32-GF-SW	279330	6135634	47.7	47.2	59.7	55	0	47.6	-7	
NSR32-GF-SE	279340	6135635	58.9	57.7	70.9	55	0	58.1	3	
NSR33-GF-NE	279405	6135604	57.8	57.6	69.8	55	0	58.1	3	
NSR33-GF-SE	279403	6135606	57.4	57.3	69.4	55	0	57.7	3	
NSR33-GF-NE	279401	6135611	63.5	62.7	75.5	55	1	63.1	8	2
NSR33-GF-NW	279392	6135604	61.0	60.5	73.0	55	1	61.0	6	2
NSR33-GF-SW	279394	6135591	49.4	49.2	61.4	55	0	49.7	-5	
NSR33-GF-SE	279405	6135595	54.4	54.2	66.4	55	0	54.7	-0	
NSR34-GF-NE	279412	6135594	57.9	57.8	69.9	55	0	58.2	3	
NSR34-GF-NW	279407	6135593	54.5	54.4	66.5	55	0	54.8	-0	
NSR34-GF-NE	279406	6135592	54.1	53.9	66.1	55	0	54.4	-1	
NSR34-GF-NW	279401	6135588	51.3	51.2	63.3	55	0	51.6	-3	
NSR34-GF-SW	279402	6135580	49.2	49.1	61.2	55	0	49.5	-6	
NSR35-GF-NE	279419	6135590	58.7	59.0	70.7	55	0	59.5	5	
NSR35-GF-NW	279414	6135589	56.0	56.0	68.0	55	0	56.4	1	
NSR35-GF-NE	279414	6135589	55.1	55.1	67.1	55	0	55.6	1	
NSR35-GF-SW	279410	6135578	49.2	49.2	61.2	55	0	49.6	-5	
NSR36-GF-NE	279426	6135586	58.9	59.1	70.9	55	0	59.5	5	
NSR36-GF-NW	279422	6135585	56.6	56.6	68.6	55	0	57.1	2	
NSR36-GF-NE	279421	6135585	56.1	56.0	68.1	55	0	56.5	2	
NSR36-GF-SW	279417	6135572	49.0	48.9	61.0	55	0	49.3	-6	
NSR36-GF-SE	279424	6135577	54.7	54.7	66.7	55	0	55.1	0	
NSR37-GF-NE	279440	6135572	57.7	58.0	69.7	55	0	58.4	3	
NSR37-F 1-NE	279440	6135572	62.8	62.9	74.8	55	1	63.3	8	2
NSR37-GF-NW	279428	6135565	52.8	52.8	64.8	55	0	53.2	-2	
NSR37-F 1-NW	279428	6135565	57.6	58.1	69.6	55	0	58.5	4	
NSR37-GF-SE	279438	6135558	51.4	51.3	63.4	55	0	51.8	-3	
NSR37-F 1-SE	279438	6135558	55.0	55.0	67.0	55	0	55.4	0	
NSR39-GF-E	279316	6135788	53.6	52.6	65.6	55	0	53.0	-2	
NSR39-GF-N	279306	6135794	51.2	49.6	63.2	55	0	50.0	-5	
NSR39-GF-W	279296	6135787	56.2	49.7	68.2	55	0	50.1	-5	
NSR39-GF-S	279306	6135781	56.4	51.3	68.4	55	0	51.7	-3	
NSR40-GF-S	279440	6135680	53.3	53.3	65.3	55	0	53.8	-1	
NSR40-F 1-S	279440	6135680	62.3	62.7	74.3	55	1	63.2	8	2
NSR40-GF-E	279443	6135686	49.5	49.6	61.5	55	0	50.0	-5	
NSR40-F 1-E	279443	6135686	57.3	57.5	69.3	55	0	58.0	3	
NSR40-GF-N	279427	6135690	49.7	50.5	61.7	55	0	50.9	-4	
NSR40-F 1-N	279427	6135690	54.5	55.4	66.5	55	0	55.8	1	

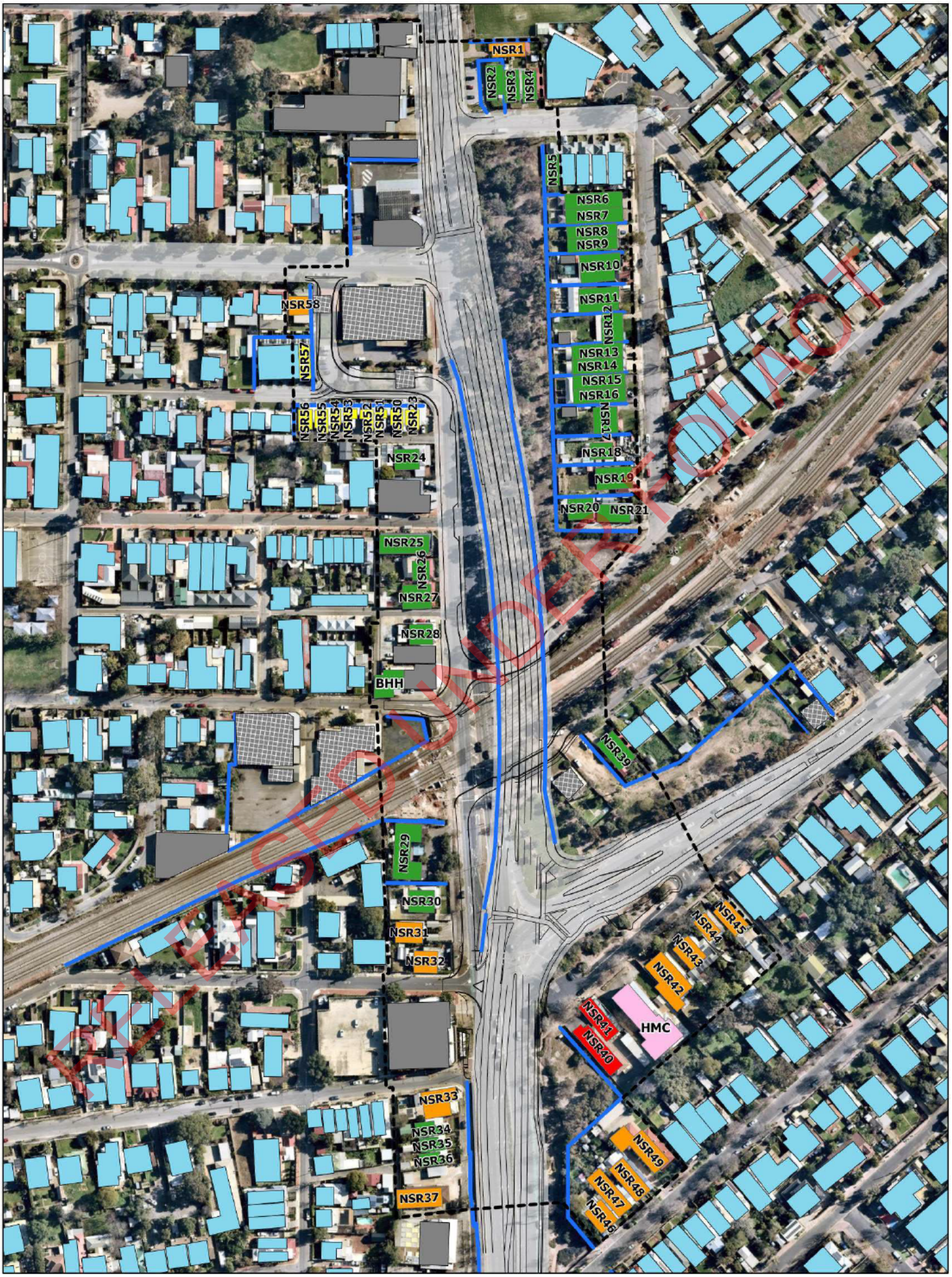
Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR40-GF-W	279412	6135687	59.5	60.5	71.5	55	1	60.9	6	2
NSR40-F 1-W	279412	6135687	61.8	62.3	73.8	55	1	62.7	8	2
NSR40-GF-N	279412	6135686	59.6	60.6	71.6	55	1	61.0	6	2
NSR40-F 1-N	279412	6135686	61.8	62.3	73.8	55	1	62.7	8	2
NSR40-GF-W	279410	6135682	64.1	64.6	76.1	55	1	65.0	10	3
NSR40-F 1-W	279410	6135682	65.5	66.1	77.5	55	1	66.5	12	3
NSR40-GF-S	279424	6135679	58.1	58.4	70.1	55	0	58.8	4	
NSR40-F 1-S	279424	6135679	64.3	64.6	76.3	55	1	65.1	10	3
NSR41-GF-N	279414	6135699	57.7	57.9	69.7	55	0	58.3	3	
NSR41-GF-E	279427	6135695	45.3	45.4	57.3	55	0	45.8	-9	
NSR41-GF-S	279415	6135689	56.0	57.4	68.0	55	0	57.8	3	
NSR41-GF-W	279401	6135694	64.0	64.8	76.0	55	1	65.2	10	3
NSR42-GF-N	279418	6135745	54.4	53.5	66.4	55	0	53.9	-1	
NSR42-GF-W	279405	6135736	62.2	61.9	74.2	55	1	62.3	7	2
NSR42-GF-S	279412	6135730	58.1	58.5	70.1	55	0	58.9	4	
NSR42-GF-W	279417	6135730	56.7	57.1	68.7	55	0	57.5	3	
NSR42-GF-S	279427	6135728	53.4	54.0	65.4	55	0	54.4	-1	
NSR42-GF-E	279437	6135733	44.9	44.9	56.9	55	0	45.3	-10	
NSR42-GF-N	279433	6135737	45.9	46.0	57.9	55	0	46.4	-9	
NSR42-GF-E	279432	6135740	45.7	45.8	57.7	55	0	46.2	-9	
NSR43-GF-E	279423	6135755	46.5	46.5	58.5	55	0	46.9	-8	
NSR43-GF-N	279415	6135761	55.1	54.3	67.1	55	0	54.7	-0	
NSR43-GF-W	279407	6135753	61.4	61.0	73.4	55	1	61.4	6	2
NSR43-GF-S	279416	6135748	54.4	54.3	66.4	55	0	54.7	-0	
NSR44-GF-E	279417	6135770	47.0	46.9	59.0	55	0	47.3	-8	
NSR44-GF-N	279409	6135775	55.8	55.1	67.8	55	0	55.5	1	
NSR44-GF-W	279402	6135769	62.4	62.0	74.4	55	1	62.4	7	2
NSR44-GF-S	279410	6135765	57.8	57.5	69.8	55	0	57.9	3	
NSR45-GF-E	279423	6135784	46.9	46.8	58.9	55	0	47.2	-8	
NSR45-GF-W	279404	6135782	61.9	61.5	73.9	55	1	61.9	7	2
NSR45-GF-S	279414	6135777	52.9	52.3	64.9	55	0	52.7	-2	
NSR46-GF-E	279507	6135633	55.4	55.0	67.4	55	0	55.4	0	
NSR46-GF-N	279498	6135639	50.2	50.1	62.2	55	0	50.5	-5	
NSR46-GF-W	279490	6135632	60.8	60.5	72.8	55	1	61.0	6	2
NSR46-GF-S	279499	6135626	60.4	60.3	72.4	55	1	60.8	6	2
NSR47-GF-E	279505	6135644	53.3	53.3	65.3	55	0	53.7	-1	
NSR47-GF-N	279491	6135649	51.6	51.1	63.6	55	0	51.6	-3	
NSR47-GF-W	279477	6135643	61.3	61.2	73.3	55	1	61.6	7	2
NSR47-GF-S	279491	6135638	52.7	52.5	64.7	55	0	53.0	-2	
NSR48-GF-E	279504	6135657	52.4	52.3	64.4	55	0	52.8	-2	
NSR48-GF-N	279492	6135662	48.4	48.2	60.4	55	0	48.6	-6	
NSR48-GF-W	279480	6135656	57.9	57.6	69.9	55	0	58.1	3	2**
NSR48-GF-S	279492	6135650	51.0	50.8	63.0	55	0	51.2	-4	
NSR49-GF-E	279479	6135664	48.1	48.1	60.1	55	0	48.5	-7	
NSR49-F 1-E	279479	6135664	52.3	52.2	64.3	55	0	52.7	-2	
NSR49-GF-S	279482	6135666	49.9	49.9	61.9	55	0	50.3	-5	
NSR49-F 1-S	279482	6135666	54.0	53.9	66.0	55	0	54.3	-1	
NSR49-GF-S	279492	6135667	47.9	47.8	59.9	55	0	48.2	-7	
NSR49-F 1-S	279492	6135667	52.4	52.3	64.4	55	0	52.7	-2	
NSR49-F 1-E	279498	6135672	50.1	50.0	62.1	55	0	50.4	-5	
NSR49-F 1-E	279498	6135677	50.1	49.8	62.1	55	0	50.3	-5	
NSR49-GF-N	279491	6135680	46.5	47.2	58.5	55	0	47.6	-7	
NSR49-F 1-N	279491	6135680	50.5	50.9	62.5	55	0	51.3	-4	
NSR49-GF-N	279480	6135679	48.3	48.8	60.3	55	0	49.2	-6	
NSR49-F 1-N	279480	6135679	53.3	53.2	65.3	55	0	53.6	-1	
NSR49-GF-W	279474	6135675	50.4	50.4	62.4	55	0	50.8	-4	
NSR49-F 1-W	279474	6135675	55.9	55.9	67.9	55	0	56.4	1	
NSR49-GF-N	279471	6135672	49.7	49.7	61.7	55	0	50.1	-5	
NSR49-F 1-N	279471	6135672	55.2	55.4	67.2	55	0	55.8	1	
NSR49-GF-W	279467	6135666	57.2	57.1	69.2	55	0	57.6	3	
NSR49-F 1-W	279467	6135666	62.0	62.0	74.0	55	1	62.4	7	2
NSR49-GF-S	279473	6135660	56.1	55.9	68.1	55	0	56.4	1	
NSR49-F 1-S	279473	6135660	61.4	61.1	73.4	55	1	61.6	7	2
NSR50-GF-NE	279098	6135804	42.2	42.5	54.2	52	0	42.9	-9	
NSR50-F 1-NE	279098	6135804	46.1	46.6	58.1	52	0	47.0	-5	
NSR50-GF-NW	279090	6135804	54.3	53.0	66.3	52	0	53.4	1	
NSR50-F 1-NW	279090	6135804	59.4	58.0	71.4	52	1	58.4	6	1
NSR50-GF-SW	279092	6135797	44.4	45.4	56.4	52	0	45.7	-6	
NSR50-F 1-SW	279092	6135797	48.3	49.6	60.3	52	0	50.0	-2	
NSR50-GF-SE	279098	6135796	46.4	46.4	58.4	52	0	46.8	-5	
NSR50-F 1-SE	279098	6135796	51.5	50.5	63.5	52	0	50.9	-1	
NSR50-GF-SW	279098	6135796	45.9	45.8	57.9	52	0	46.2	-6	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR50-F 1-SW	279098	6135796	51.1	49.9	63.1	52	0	50.3	-2	
NSR50-GF-SE	279101	6135798	57.5	50.7	69.5	52	0	51.1	-1	
NSR50-F 1-SE	279101	6135798	59.1	53.6	71.1	52	0	54.0	2	
NSR51-GF-NE	279093	6135793	51.5	48.6	63.5	52	0	49.0	-3	
NSR51-F 1-NE	279093	6135793	54.0	52.0	66.0	52	0	52.4	0	
NSR51-GF-SE	279092	6135795	46.4	46.7	58.4	52	0	47.1	-5	
NSR51-F 1-SE	279092	6135795	50.8	50.6	62.8	52	0	51.0	-1	
NSR51-GF-NE	279090	6135799	44.5	46.8	56.5	52	0	47.2	-5	
NSR51-F 1-NE	279090	6135799	48.6	51.6	60.6	52	0	51.9	-0	
NSR51-GF-NW	279085	6135797	51.9	52.4	63.9	52	0	52.8	1	
NSR51-F 1-NW	279085	6135797	56.6	57.3	68.6	52	1	57.7	6	1
NSR51-GF-SE	279095	6135788	53.6	49.9	65.6	52	0	50.3	-2	
NSR51-F 1-SE	279095	6135788	55.6	52.9	67.6	52	0	53.3	1	
NSR52-GF-NW	279081	6135791	50.5	51.9	62.5	52	0	52.3	0	
NSR52-F 1-NW	279081	6135791	55.0	56.7	67.0	52	0	57.1	5	
NSR52-GF-SW	279081	6135786	44.0	45.6	56.0	52	0	46.0	-6	
NSR52-F 1-SW	279081	6135786	48.0	50.1	60.0	52	0	50.5	-2	
NSR52-GF-SE	279085	6135785	43.0	43.1	55.0	52	0	43.5	-9	
NSR52-F 1-SE	279085	6135785	47.1	47.2	59.1	52	0	47.6	-4	
NSR52-GF-SW	279086	6135784	43.5	43.6	55.5	52	0	44.0	-8	
NSR52-F 1-SW	279086	6135784	47.7	47.8	59.7	52	0	48.2	-4	
NSR52-GF-SE	279092	6135784	52.4	49.6	64.4	52	0	50.0	-2	
NSR52-F 1-SE	279092	6135784	54.5	52.5	66.5	52	0	52.9	1	
NSR53-GF-NE	279084	6135780	46.5	47.7	58.5	52	0	48.1	-4	
NSR53-F 1-NE	279084	6135780	50.7	51.2	62.7	52	0	51.6	-0	
NSR53-GF-SE	279082	6135782	45.2	45.9	57.2	52	0	46.3	-6	
NSR53-F 1-SE	279082	6135782	49.4	49.6	61.4	52	0	50.0	-2	
NSR53-GF-NE	279081	6135786	42.6	44.2	54.6	52	0	44.6	-7	
NSR53-F 1-NE	279081	6135786	46.4	48.8	58.4	52	0	49.1	-3	
NSR53-GF-NW	279075	6135785	49.4	51.0	61.4	52	0	51.4	-1	
NSR53-F 1-NW	279075	6135785	53.9	56.2	65.9	52	1	56.5	5	1
NSR53-GF-SW	279078	6135776	41.2	41.9	53.2	52	0	42.3	-10	
NSR53-F 1-SW	279078	6135776	45.3	46.3	57.3	52	0	46.6	-5	
NSR53-GF-SE	279086	6135775	50.6	49.4	62.6	52	0	49.8	-2	
NSR53-F 1-SE	279086	6135775	53.6	52.7	65.6	52	0	53.1	1	
NSR54-GF-NE	279081	6135772	46.1	47.0	58.1	52	0	47.4	-5	
NSR54-F 1-NE	279081	6135772	50.4	50.5	62.4	52	0	51.0	-1	
NSR54-GF-SE	279080	6135773	44.2	44.6	56.2	52	0	45.0	-7	
NSR54-F 1-SE	279080	6135773	49.3	49.0	61.3	52	0	49.4	-3	
NSR54-GF-NE	279077	6135778	40.8	41.9	52.8	52	0	42.3	-10	
NSR54-F 1-NE	279077	6135778	44.7	46.8	56.7	52	0	47.1	-5	
NSR54-GF-NW	279071	6135778	48.7	50.5	60.7	52	0	50.9	-1	
NSR54-F 1-NW	279071	6135778	53.3	55.6	65.3	52	1	56.0	4	1
NSR54-GF-SW	279074	6135771	40.6	41.5	52.6	52	0	41.9	-10	
NSR54-F 1-SW	279074	6135771	44.8	46.4	56.8	52	0	46.7	-5	
NSR54-GF-SE	279082	6135768	49.7	49.2	61.7	52	0	49.6	-2	
NSR54-F 1-SE	279082	6135768	52.1	51.7	64.1	52	0	52.1	0	
NSR55-GF-NE	279075	6135771	39.9	41.0	51.9	52	0	41.4	-11	
NSR55-F 1-NE	279075	6135771	43.7	45.8	55.7	52	0	46.1	-6	
NSR55-GF-NW	279066	6135772	48.1	50.2	60.1	52	0	50.5	-2	
NSR55-F 1-NW	279066	6135772	52.7	55.2	64.7	52	1	55.5	4	1
NSR55-GF-SW	279068	6135765	41.0	41.9	53.0	52	0	42.3	-10	
NSR55-F 1-SW	279068	6135765	45.1	46.7	57.1	52	0	47.0	-5	
NSR55-GF-SE	279074	6135763	44.6	44.9	56.6	52	0	45.3	-7	
NSR55-F 1-SE	279074	6135763	48.0	48.2	60.0	52	0	48.6	-3	
NSR55-GF-SW	279075	6135763	44.5	44.8	56.5	52	0	45.2	-7	
NSR55-F 1-SW	279075	6135763	47.9	48.0	59.9	52	0	48.4	-4	
NSR55-GF-SE	279079	6135765	49.2	48.9	61.2	52	0	49.3	-3	
NSR55-F 1-SE	279079	6135765	51.5	51.4	63.5	52	0	51.8	-0	
NSR56-GF-SE	279072	6135760	46.2	47.6	58.2	52	0	48.0	-4	
NSR56-F 1-SE	279072	6135760	49.3	50.4	61.3	52	0	50.8	-1	
NSR56-GF-SE	279073	6135760	46.3	47.8	58.3	52	0	48.2	-4	
NSR56-F 1-SE	279073	6135760	49.4	50.5	61.4	52	0	50.9	-1	
NSR56-GF-NE	279069	6135765	40.3	40.7	52.3	52	0	41.0	-11	
NSR56-F 1-NE	279069	6135765	44.0	44.7	56.0	52	0	45.0	-7	
NSR56-GF-NW	279061	6135765	47.4	49.5	59.4	52	0	49.8	-2	
NSR56-F 1-NW	279061	6135765	52.1	54.6	64.1	52	1	54.9	3	1
NSR56-GF-SW	279064	6135757	42.8	42.9	54.8	52	0	43.3	-9	
NSR56-F 1-SW	279064	6135757	47.0	47.2	59.0	52	0	47.5	-5	
NSR56-GF-SE	279071	6135756	47.8	48.4	59.8	52	0	48.8	-3	
NSR56-F 1-SE	279071	6135756	50.3	50.9	62.3	52	0	51.3	-1	
NSR57-GF-NE	279044	6135783	48.6	52.0	60.6	52	0	52.3	0	

Receiver (ID-Level-Orientation)	Coordinates		Predicted Noise Level, dB(A)		Criteria		Eligible for Treatment	Predicted Noise Level, dB(A)		FTP
	Easting, m	Northing, m	Existing 2023	Opening 2023	RIC	Redeveloped Road	[1= Yes]	Future 2033	Exceedance	
NSR57-F 1-NE	279044	6135783	52.5	56.6	64.5	52	1	56.9	5	1
NSR57-GF-NW	279033	6135786	47.3	51.6	59.3	52	0	52.0	0	
NSR57-F 1-NW	279033	6135786	50.4	55.5	62.4	52	1	55.8	4	1
NSR57-GF-SE	279050	6135774	50.1	50.8	62.1	52	0	51.0	-1	
NSR57-F 1-SE	279050	6135774	52.8	53.4	64.8	52	0	53.7	2	
NSR58-GF-NE	279019	6135800	48.2	52.8	60.2	52	1	53.1	1	
NSR58-GF-NW	279011	6135799	57.4	57.7	69.4	52	1	58.2	6	2
NSR58-GF-SW	279012	6135790	50.0	50.1	62.0	52	0	50.5	-2	
NSR58-GF-SE	279021	6135792	46.4	51.1	58.4	52	0	51.5	-1	
BHH-GF-NE	279211	6135712	57.7	51.8	69.7	55	0	52.3	-3	
BHH-GF-SE	279211	6135715	58.1	51.9	70.1	55	0	52.4	-3	
BHH-GF-NW	279200	6135720	47.2	47.0	59.2	55	0	47.4	-8	
BHH-GF-SW	279198	6135713	45.9	45.9	57.9	55	0	46.3	-9	
BHH-GF-NW	279197	6135712	46.5	46.6	58.5	55	0	47.0	-8	
BHH-GF-SW	279201	6135705	46.4	46.9	58.4	55	0	47.3	-8	
BHH-GF-SE	279210	6135705	56.2	51.5	68.2	55	0	51.9	-3	
HMC-GF-E	279450	6135720	47.0	47.0	59.0	55	0	47.4	-8	
HMC-F 1-E	279450	6135720	49.9	49.8	61.9	55	0	50.3	-5	
HMC-GF-N	279442	6135726	51.4	51.9	63.4	55	0	52.3	-3	
HMC-F 1-N	279442	6135726	53.6	53.6	65.6	55	0	54.0	-1	
HMC-GF-W	279435	6135723	52.7	52.8	64.7	55	0	53.2	-2	
HMC-F 1-W	279435	6135723	54.7	54.5	66.7	55	0	54.9	-0	
HMC-GF-N	279434	6135723	53.0	53.1	65.0	55	0	53.4	-2	
HMC-F 1-N	279434	6135723	55.0	54.6	67.0	55	0	55.0	0	
HMC-GF-N	279430	6135721	53.7	53.3	65.7	55	0	53.7	-1	
HMC-F 1-N	279430	6135721	55.3	54.8	67.3	55	0	55.2	0	
HMC-GF-N	279420	6135720	56.1	55.7	68.1	55	0	56.1	1	
HMC-F 1-N	279420	6135720	57.4	57.0	69.4	55	0	57.4	2	
HMC-GF-W	279408	6135715	62.1	62.2	74.1	55	1	62.5	8	TBD
HMC-F 1-W	279408	6135715	62.9	62.9	74.9	55	1	63.3	8	TBD
HMC-GF-W	279408	6135709	61.9	62.0	73.9	55	1	62.4	7	TBD
HMC-F 1-W	279408	6135709	63.0	62.9	75.0	55	1	63.3	8	TBD
HMC-GF-S	279421	6135707	54.8	55.2	66.8	55	0	55.6	1	
HMC-F 1-S	279421	6135707	56.8	56.8	68.8	55	0	57.2	2	
HMC-GF-S	279432	6135708	52.5	53.0	64.5	55	0	53.4	-2	
HMC-F 1-S	279432	6135708	54.8	55.0	66.8	55	0	55.4	0	
HMC-GF-S	279435	6135707	52.5	52.9	64.5	55	0	53.3	-2	
HMC-F 1-S	279435	6135707	54.9	55.1	66.9	55	0	55.5	1	
HMC-GF-W	279437	6135706	52.4	52.9	64.4	55	0	53.3	-2	
HMC-F 1-W	279437	6135706	55.2	55.3	67.2	55	0	55.7	1	
HMC-GF-S	279444	6135704	52.6	52.9	64.6	55	0	53.3	-2	
HMC-F 1-S	279444	6135704	55.7	55.9	67.7	55	0	56.3	1	
HMC-GF-E	279450	6135710	47.9	47.9	59.9	55	0	48.4	-7	
HMC-F 1-E	279450	6135710	51.5	51.6	63.5	55	0	52.0	-3	

* TBD – To be determined following site inspection under design package 109-31 Noise Facade Treatment.
** Changed following further grouping/catchment analysis (refer Section 7.5)

APPENDIX K NOISE MITIGATION PLAN



Date: **24/05/2021**
Datum: MGA Zone 54
SCALE 1:1,750 @ A3

0 50 100 m

- Noise Assessment Boundary
- Noise Sensitive Buildings
- Other Buildings
- Buildings to be demolished
- Design String
- Fences/Barriers

RTNG Property Treatment

- FTP 1
- FTP 2
- FTP 3
- No FTP
- FTP Subject to Inspection

Ovingham Level Crossing Grade Separation

Noise Sensitive Receivers and Noise Assessment Boundary

PTP ALLIANCE OVINGHAM