AURA DEVELOPMENT – PRECINCT 15 (EAST)

Bruce Highway and Bells Creek Road, Caloundra South QLD 4551

Road Traffic Noise Assessment

Stockland

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

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Prepared by: Trinity Consultants Australia
ABN 62 630 202 201
A: Level 3, 43 Peel Street
South Brisbane, QLD 4101
T: +61 7 3255 3355
E: brisbane@trinityconsultants.com

Reference	Date	Description	Prepared	Checked
227401.0008.R01V01_draft	09/05/2022	Draft	Alex Lagodzki	Stephen Pugh
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Document Approval	
Approver Signature	
Name	Stephen Pugh
Title	Senior Engineer

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APPENDICES

1. INTRODUCTION

Trinity Consultants Australia has been commissioned by Stockland Development Pty Ltd to provide a road and rail traffic noise assessment for Precinct 15 - East of the Aura residential development, located within the Caloundra South Priority Development Area (PDA).

Similar reports were prepared and lodged with EDQ as part of the ROL applications for residential lots within Precincts 2 (Baringa), 7 to 10 (Town Centre), 11 to 14 (Banya, Nirimbia) and 18 (Part).

The initial 1036 lots in Precinct 15 – East will be predominately affected by road traffic noise from the CAMCOS rail corridor to the north, a higher order internal road (Council controlled) which passes through the precinct and the existing Bruce Highway (TMR controlled) to a lesser extent. The current assessment only considers Precinct 15 – East with future work to address impact on amenity for residential use in Precinct 15 – West. Any subsequent bunding and / or noise barriers specified for Precinct 15 - West will reduce the traffic noise levels and barrier requirements outlined in this report for Precinct 15 – East. Should bunding and barrier development for Precinct 15 – West affect Precinct 15 – East, a revision to this report will be prepared.

The following bunding and barriers are modelled for this road and rail traffic noise assessment:

- A barrier located on the eastern side of the Council road reserve.
- 2.4m barrier located to both (northern and southern) sides of the CAMCOS rail corridor.
- Bund adjacent Bruce Highway to the north of the CAMCOS rail corridor, which has been endorsed by EDQ and assumed to be fully constructed prior to P15 dwellings being occupied.
- No bund is present south of the CAMCOS rail corridor along the reserve boundary of the Bruce Highway. There will ultimately be a bund along the Bruce Highway, however the bund dimensions for this section will be specified at a later date when traffic noise is assessed for Precinct 15 – West.

The purpose of this report is as follows:

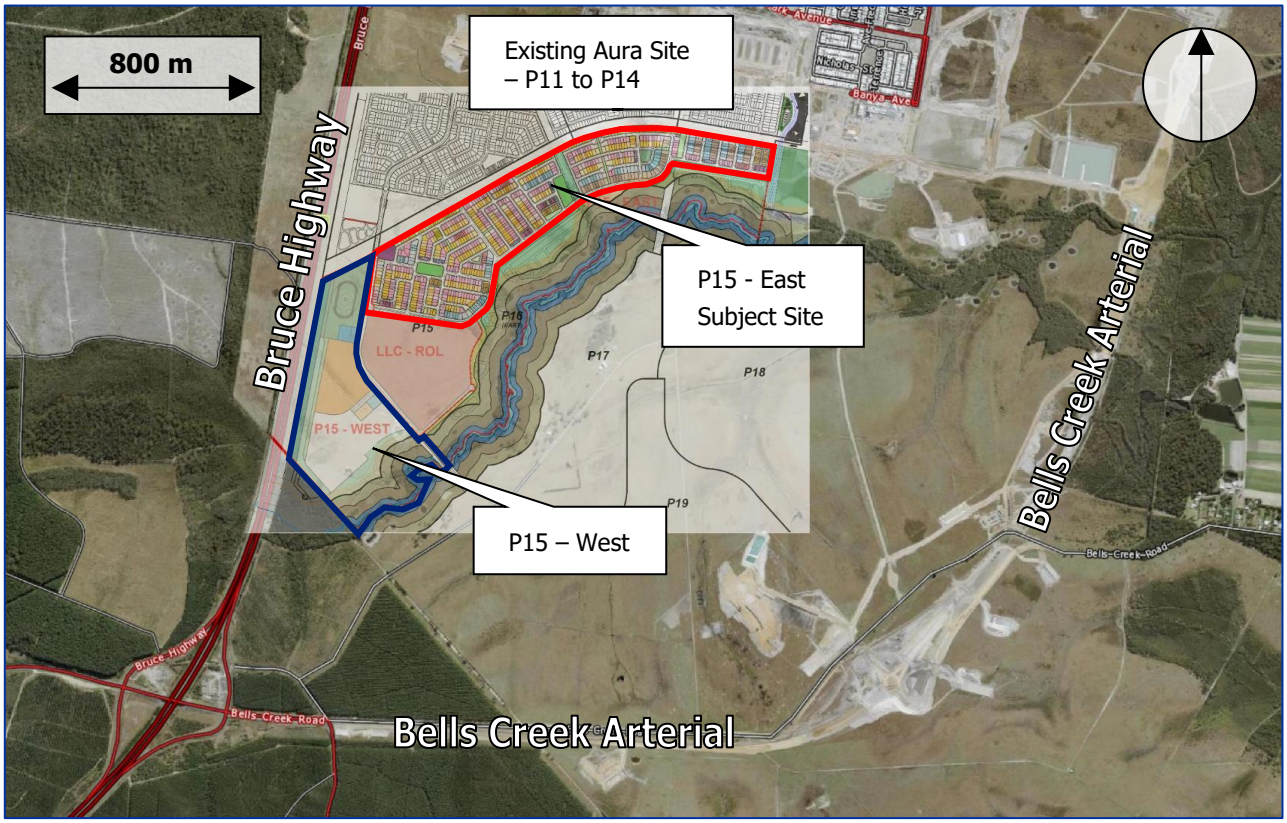
- Outline the relevant project noise criteria.
- Predict and assess the road and rail traffic noise impact onto Precinct 15 - East.
- Describe noise mitigation requirements.

To aid in the understanding of the terms in this report, a glossary is included in **Appendix A**.

2. STUDY AREA DESCRIPTION

The development is within the existing Aura estate and will form part of the Caloundra South PDA on the Sunshine Coast. The site location of Precinct 15 – East is shown in **Figure 2.1** (source: Queensland Globe).

Figure 2.1: Site Location



The site is currently vacant, and generally consists of cleared land.

The proposed development is surrounded by the following uses (refer **Figure 2.1**):

- CAMCOS rail corridor along the northern side of the site, and existing and future development further to the north on the opposite side of the CAMCOS corridor.
- Trunk connector road immediately west of the site, between Precinct 15 – East and adjoining future Precinct 15 – West, and Bruce Highway further to the west of the site.
- Land Lease Retirement Community (LLC) to the south of the Precinct 15 – East allotments.
- Aura development and Bells Creek Arterial further to the south and east. Due to the significant distance, the Bells Creek Arterial is not addressed in this report for P15 - East.

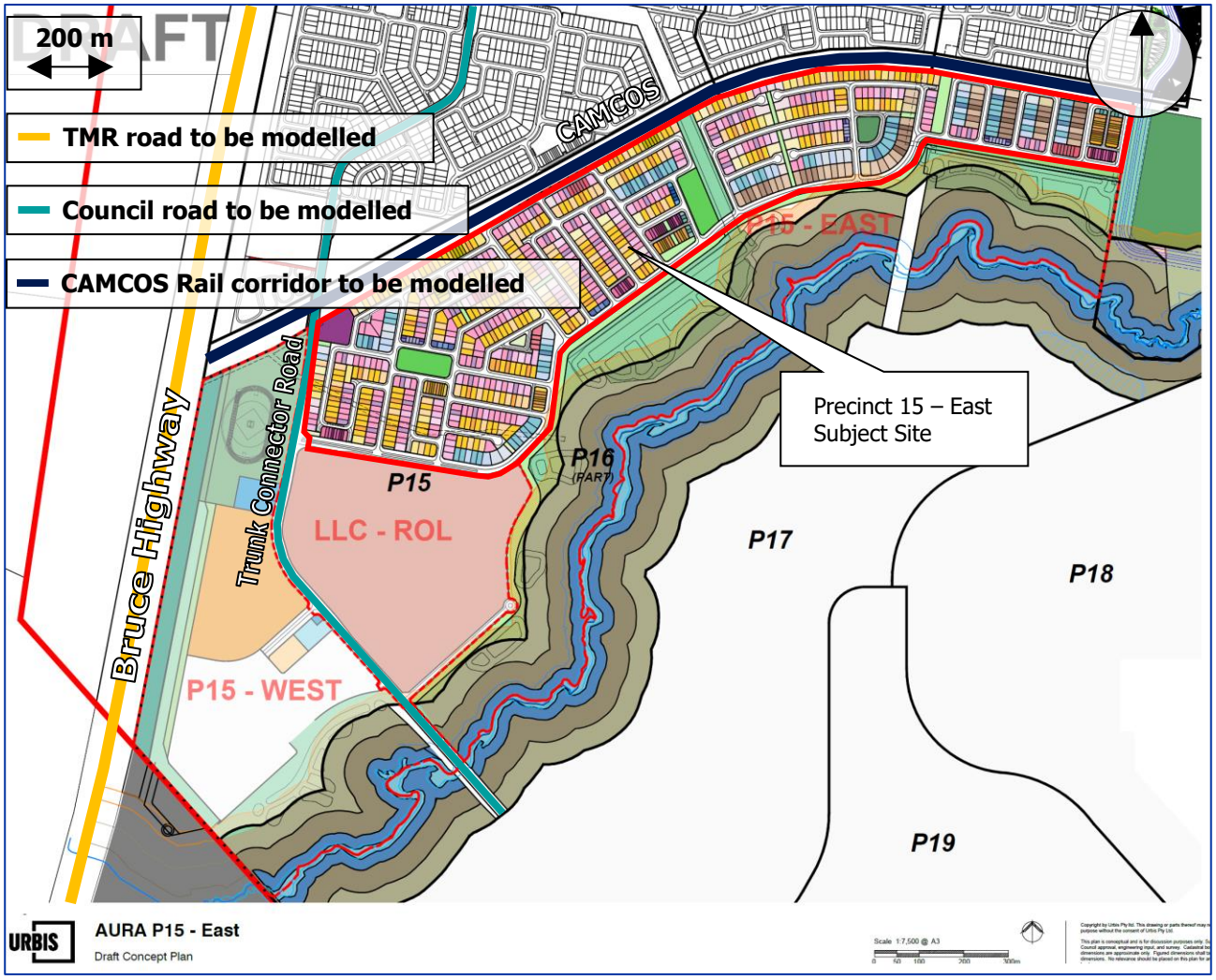
Noise impacts onto the approved site for Precinct 15 – East (demarcated in a red line in **Figure 2.1**), is expected to be influenced by noise mitigation measures proposed for Precinct 15 – West in a future assessment (demarcated in a blue line in **Figure 2.1**).

As per the proposed ROL Plan (**Figure 2.2**), Precinct 15 is located west of the other proposed precincts and lies immediately south of the CAMCOS corridor. A trunk connector road passes through Precinct 15 which connects Precincts to the north and south of the subject site. This assessment will consider the internal trunk connector road (Council controlled), Bruce Highway (TMR controlled) and CAMCOS corridor (future Queensland Rail controlled) shown in **Figure 2.2** below. The trunk connector road will follow the western boundary of Precinct 15 – East (highlighted in red) and is required to be considered in the project design.

Road traffic noise from the Bruce Highway is assessed separately in this report for the purpose of identifying residences which require acoustic treatment under MP4.4[1], see **Section 4.3.** The applicable MP4.4 category for these residences is determined by the total contribution from both Council and TMR controlled roads. Sections of housing which are affected by the Council road and lie outside the MP4.4 band are instead assessed against the Sunshine Coast Council criteria, see **Section 4.4**.

Rail noise from the CAMCOS corridor is presented separately with 2.4m tall barriers specified at rail level along either side of the corridor as per precedent set in Trinity report 197401.0141.R01V04 (dated 8/07/2021) addressing Precincts 11 to 14 to the north. No additional mitigation measures are provided at this stage noting the uncertainty around the rail corridor and likelihood of future changes.

Figure 2.2: Caloundra South Structure Plan



Mitigation measures, e.g. barriers, considered in this report will only consider traffic noise from the Bruce Highway and trunk connector onto the Precinct 15 – East subject site shown in **Figure 2.2** above. This will consist of proposing barriers along the trunk connecter reserve boundary to ameliorate road noise from the Highway and internal road to these lots.

[1] Queensland Development Code (QDC) Mandatory Part 4.4 (MP4.4).

3. PROPOSED DEVELOPMENT

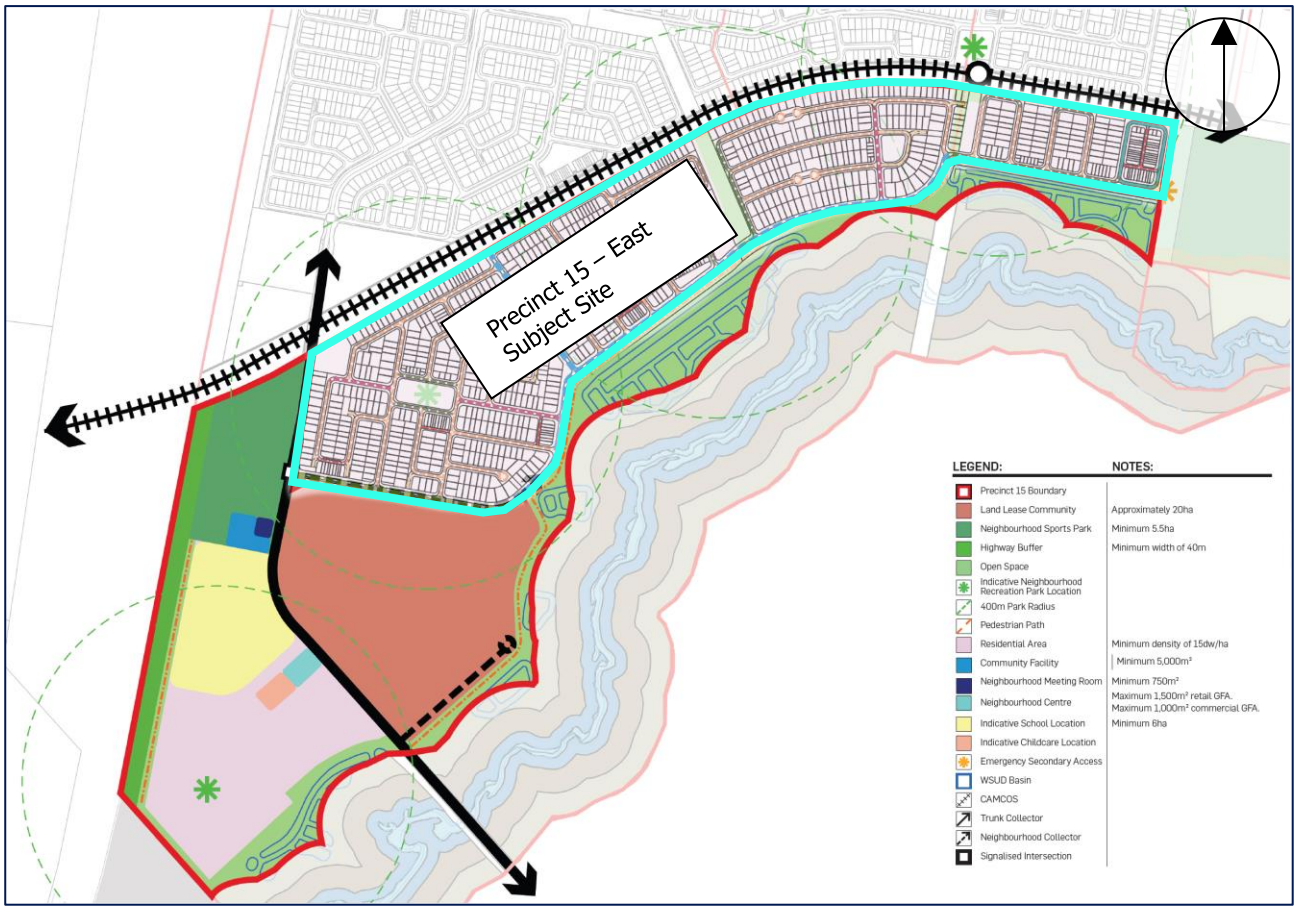
The site plan is shown in **Figure 3.1**. A full-size site layout is included as **Figure B.1** in **Appendix B**.

The proposed Precinct 15 – East development includes the following components:

- Residential allotments of various sizes (approximately 1036 lots total).
- Park areas.
- Land Lease residential community (LLC) to the south. This site is not addressed in this report, but will be addressed in a separate report in due course.

The area under assessment in this report is the area in **Figure 3.1** which is contained within the teal boundaries.

Figure 3.1: Site Layout



4. NOISE CRITERIA

4.1 Overview

Acoustic criteria for the project are required to assess the impact of both road traffic and rail noise onto the various lots of the proposed development.

The acoustic assessment will be undertaken in accordance with the following relevant criteria:

- Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) State Assessment and Referral Agency (SARA) – State Development Assessment Provisions (SDAP).
- Department of Transport and Main Roads (TMR) – Road Traffic Noise Management: Code of Practice.
- Department of Housing and Public Works (HPW) – Queensland Development Code (QDC) Mandatory Part 4.4 (MP4.4) 'Buildings in transport noise corridors'.
- Queensland Rail (QR) – Code of Practice – Railway Noise Management
- Department of Environment and Science (DES) – Environmental Protection Policy (Noise) and Environmental Protection Act.
- Sunshine Coast Council Planning Scheme 2014.
- Australian Standard AS/NZS 2107–2016: Acoustics— Recommended design sound levels and reverberation times for building interiors.

4.2 State Code 1: Development in a State-Controlled Road Environment

The development is subject to road traffic noise from the Bruce Highway, which is a State-controlled Road. Acoustic criteria for the project will need to address noise intrusion into the development in accordance with 'Module 1: Community Amenity' of SDAP. The current version of the SDAP is v3.0, effective 18 February, 2022.

The relevant performance outcomes and acceptable outcomes for developments (including sensitive uses not contained within Precinct 15 – East) in a state-controlled road or type 1 multi modal corridor environment are presented in **Table 4.1** and reference tables **Table 4.2, 4.3** and **4.4.**

Table 4.1: SDAP State Code 1 Performance and Acceptable Outcomes

Performance Outcomes	Acceptable Outcomes
Reconfiguring a lot	
Involving the creation of 5 or fewer new residential lots adjacent to a state-controlled road or type 1 multi-modal corridor	
PO37 Development minimises free field noise intrusion from a state-controlled road.	AO37.1 Development provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum free field acoustic levels in reference table 2 (item 2.1); 2. in accordance with: a. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019;

Performance Outcomes	Acceptable Outcomes
	c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO37.2 Development achieves the maximum free field acoustic levels in reference table 2 (item 2.1) by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound. OR AO37.3 Development provides a solid gap-free fence or other solid gap-free structure along the full extent of the boundary closest to the state-controlled road.
Involving the creation of 6 or more new residential lots adjacent to a state-controlled road or type 1 multi-modal corridor	
PO38 Reconfiguring a lot minimises free field noise intrusion from a state-controlled road.	AO38.1 Development provides noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum free field acoustic levels in reference table 2 (item 2.1); 2. in accordance with: a. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO38.2 Development achieves the maximum free field acoustic levels in reference table 2 (item 2.1) by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
Material change of use (accommodation activity)	
Ground floor level requirements adjacent to a state-controlled road or type 1 multi-modal corridor	
PO39 Development minimises noise intrusion from a state-controlled road in private open space.	AO39.1 Development provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum free field acoustic levels in reference table 2 (item 2.2) for private open space at the ground floor level; 2. in accordance with: a. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume

Performance Outcomes	Acceptable Outcomes
	1 (Road Traffic Noise), Department of Transport and Main Roads, 2013 b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO39.2 Development achieves the maximum free field acoustic level in reference table 2 (item 2.2) for private open space by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO40 Development (excluding a relevant residential building or relocated building) minimises noise intrusion from a state-controlled road in habitable rooms at the facade.	AO40.1 Development (excluding a relevant residential building or relocated building) provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum building façade acoustic level in reference table 1 (item 1.1) for habitable rooms; 2. in accordance with: a. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO40.2 Development (excluding a relevant residential building or relocated building) achieves the maximum building façade acoustic level in reference table 1 (item 1.1) for habitable rooms by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO41 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in reference table 3 (item 3.1).	No acceptable outcome is provided.
Above ground floor level requirements (accommodation activity) adjacent to a state-controlled road or type 1 multi-modal corridor	
PO42 Balconies, podiums, and roof decks include: 1. a continuous solid gap-free structure or balustrade (excluding gaps required for	No acceptable outcome is provided.

Performance Outcomes	Acceptable Outcomes
drainage purposes to comply with the Building Code of Australia); 2. highly acoustically absorbent material treatment for the total area of the soffit above balconies, podiums, and roof decks.	
PO43 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in reference table 3 (item 3.1).	No acceptable outcome is provided.
Material change of use (other uses)	
Ground floor level requirements (childcare centre, educational establishment, hospital) adjacent to a state-controlled road or type 1 multi-modal corridor	
PO44 Development: 1. provides a noise barrier or earth mound that is designed, sited and constructed: a. to achieve the maximum free field acoustic level in reference table 2 (item 2.3) for all outdoor education areas and outdoor play areas; b. in accordance with: i. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; ii. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; iii. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020; or 2. achieves the maximum free field acoustic level in reference table 2 (item 2.3) for all outdoor education areas and outdoor play areas by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.	No acceptable outcome is provided.
PO45 Development involving a childcare centre or educational establishment: 1. provides a noise barrier or earth mound that is designed, sited and constructed: 2. to achieve the maximum building facade acoustic level in reference table 1 (item 1.2); 3. in accordance with: a. Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume	No acceptable outcome is provided.

Performance Outcomes	Acceptable Outcomes
1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020; or 4. achieves the maximum building facade acoustic level in reference table 1 (item 1.2) by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.	
PO46 Development involving: 1. indoor education areas and indoor play areas; or 2. sleeping rooms in a childcare centre; or 3. patient care areas in a hospital achieves the maximum internal acoustic level in reference table 3 (items 3.2-3.4)	No acceptable outcome is provided.
Above ground floor level requirements (childcare centre, educational establishment, hospital) adjacent to a state-controlled road or type 1 multi-modal corridor	
PO47 Development involving a childcare centre or educational establishment which have balconies, podiums or elevated outdoor play areas predicted to exceed the maximum free field acoustic level in reference table 2 (item 2.3) due to noise from a state-controlled road are provided with: 1. a continuous solid gap-free structure or balustrade (excluding gaps required for drainage purposes to comply with the Building Code of Australia); 2. highly acoustically absorbent material treatment for the total area of the soffit above balconies or elevated outdoor play areas.	No acceptable outcome is provided.

Table 4.2: Reference Table 1 - Maximum Building Façade Acoustic Levels

Applicable use	Acoustic levels
1.1: Accommodation activity	a. ≤60 dB(A) L10 (18 hour) façade corrected (measured L90 (8 hour) free field between 10pm and 6am ≤40 dB(A)) OR b. ≤63 dB(A) L10 (18 hour) façade corrected (measured L90 (8 hour) free field between 10pm and 6am > 40 dB(A))
1.2: Childcare centre or educational establishment	≤58 dB(A) L10 (1 hour) façade corrected (maximum hour during normal opening hours)

Table 4.3: Reference Table 2 - Maximum free field acoustic levels

Applicable use	Acoustic levels
2.1: Private open space for residential lots	a. ≤57 dB(A) L10 (18 hour) free field (measured L90 (18 hour) free field between 6am and 12 midnight ≤45 dB(A)) OR b. ≤60 dB(A) L10 (18 hour) free field (measured L90 (18 hour) free field between 6am and 12 midnight >45 dB(A))
2.2: Private open space for an accommodation activity (including lots created for a future accommodation activity)	
2.3: Outdoor education areas and outdoor play areas in a childcare centre or educational establishment	≤63 dB(A) L10 (12 hour) free field (between 6am and 6pm)

Table 4.4: Reference Table 3 - Maximum internal acoustic levels

Applicable use	Acoustic levels
3.1: Habitable rooms in an accommodation activity (excluding uses addressed in QDC MP4.4)	≤35 dB(A) Leq (1 hour) (maximum hour over 24 hours)
3.2: Indoor education areas and indoor play areas in a childcare centre or education establishment	
3.3: Sleeping rooms in a childcare centre	
3.4: Patient care areas in a hospital	

4.3 State Code 2: Development in a Railway Environment

The development is subject to rail traffic noise from the future CAMCOS rail corridor, which would be a State-controlled rail line. Acoustic criteria for the project will need to address noise intrusion into the development in accordance with 'Module 1: Community Amenity' of SDAP. The current version of the SDAP is v3.0, effective 18 February, 2022.

The relevant performance outcomes and acceptable outcomes for developments (including sensitive uses not contained within Precinct 15 – East) in a state-controlled rail or type 2 multi modal corridor environment are presented in **Table 4.5**.

Table 4.5: SDAP State Code 2 Performance and Acceptable Outcomes (Partial Copy Table 2.4)

Statutory note: Where development is adjacent to a **railway** with 15 or fewer passing trains per day, compliance with table 2.4 (4.5) is not required.

Performance outcomes	Acceptable outcomes
Material change of use (accommodation activity)	
Ground floor level requirements adjacent to a railway or type 2 multi-modal corridor	
PO41 Development minimises noise intrusion from a railway in private open space at the ground floor.	AO41.1 Development provides a noise barrier or earth mound which is designed, sited and constructed: to achieve the maximum free field acoustic levels in reference table 2 (item 2.2) for private open space at the ground floor level; 3. in accordance with: a. Civil Engineering Standard Specification QRCTS-Part 41 – Part 41, Design and Construction of Noise Fences/Barriers, Queensland Rail, 2018; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019;

Performance outcomes	Acceptable outcomes
	c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO41.2 Development achieves the maximum free field acoustic level in reference table 2 (item 2.2) for private open space at the ground floor level by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO42 Development (excluding a relevant residential building or relocated building) minimises noise intrusion from the railway in habitable rooms at the facade of the ground floor level.	AO42.1 Development (excluding a relevant residential building or relocated building) provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum building facade acoustic level in reference table 1 (item 1.1) for habitable rooms at the ground floor level; 2. in accordance with: a. Civil Engineering Standard Specification QR-CTS-Part 41 – Part 41, Design and Construction of Noise Fences/Barriers, Queensland Rail, 2018; b. Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO42.2 Development (excluding a relevant residential building or relocated building) achieves the maximum building facade acoustic level in reference table 1 (item 1.1) for habitable rooms at the ground floor level by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO43 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in Table 3 (item 3.1).	No acceptable outcome is prescribed.
Above ground floor level requirements (accommodation activity) adjacent to a railway or type 2 multi-modal corridor	
PO44 Balconies, podiums and roof decks include: 1. a continuous solid gap-free structure or balustrade (excluding gaps required for drainage purposes to comply with the Building Code of Australia); 2. highly acoustically absorbent material treatment for the total area of the soffit above balconies, podiums and roof decks	No acceptable outcome is prescribed.
PO45 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in reference table 3 (item 3.1).	No acceptable outcome is prescribed.
Material change of use (other uses)	
Ground floor level requirements (childcare centre, educational establishment, hospital) adjacent to a railway or type 2 multi-modal corridor	
PO46 Development: 1. provides a noise barrier or earth mound that is	No acceptable outcome is prescribed.

Performance outcomes	Acceptable outcomes
designed, sited and constructed: a. to achieve the maximum free field acoustic level in reference table 2 (item 2.3) for all outdoor education areas and outdoor play areas; b. in accordance with: i Civil Engineering Standard Specification QR-CTS-Part 41 – Part 41, Design and Construction of Noise Fences/Barriers, Queensland Rail, 2018; ii Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; iii Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020; or 2. achieves the maximum free field acoustic level in reference table (item 2.3) for all outdoor education areas and outdoor play areas by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.	
PO47 Development involving a childcare centre or educational establishment: 1. provides a noise barrier or earth mound that is designed, sited and constructed: a. to achieve the maximum building facade acoustic level in reference table 1 (item 1.2); b. in accordance with: i Civil Engineering Standard Specification QR-CTS-Part 41 – Part 41, Design and Construction of Noise Fences/Barriers, Queensland Rail, 2018; or 2. achieves the maximum building facade acoustic level in reference table 1 (item 1.2) by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.	No acceptable outcome is prescribed
PO48 Development involving: 1. indoor education areas and indoor play areas; or 2. sleeping rooms in a childcare centre; or 3. patient care areas in a hospital; achieves the maximum internal acoustic level in reference table 3 (items 3.2, 3.3 and 3.4).	No acceptable outcome is prescribed
Above ground floor level requirements (childcare centre, educational establishment, hospital) adjacent to a railway or type 2 multi-modal corridor	
PO49 Development involving a childcare centre; or educational establishment which have balconies, podiums or elevated outdoor play areas predicted to exceed the maximum free	No acceptable outcome is prescribed

Performance outcomes	Acceptable outcomes
field acoustic level in reference table 2 (item 2.3) due to noise from the railway are provided with: 1. a continuous solid gap-free structure or balustrade (excluding gaps required for drainage purposes to comply with the Building Code of Australia); and 2. highly acoustically absorbent material treatment for the total area of the soffit above balconies, podiums and elevated outdoor play areas.	
PO50 Development including: 1. indoor education areas and indoor play areas in a childcare centre or educational establishment; or 2. sleeping rooms in a childcare centre; or 3. patient care areas in a hospital located above ground level, is designed and constructed to achieve the maximum internal acoustic level in reference table 3 (items 3.2-3.4).	No acceptable outcome is prescribed

Table 4.6: Reference Table 1 - Maximum Building Façade Acoustic Levels

Applicable use	Acoustic levels
1.1: Accommodation activity	a. ≤65 dB(A) Leq (24 hour) façade corrected AND b. ≤87 dB(A) (single event maximum sound pressure level) facade corrected
1.2: Childcare centre or educational establishment	a. ≤65 dB(A) Leq (1 hour) facade corrected (maximum hour during opening hours) AND b. ≤87 dB(A) (single event maximum sound pressure level) facade corrected

Table 4.7: Reference Table 2 - Maximum free field acoustic levels

Applicable use	Acoustic levels
2.1: Private open space for residential lots 2.2: Private open space for an accommodation activity (including lots created for a future accommodation activity)	a. ≤62 dB(A) Leq (24 hour) free field AND b. ≤84 dB(A) (single event maximum sound pressure level) free field
2.3: Outdoor education areas and outdoor play areas in a childcare centre or educational establishment	c. ≤62 dB(A) Leq (12 hour) free field (between 6am and 6pm) AND d. ≤84 dB(A) (single event maximum sound pressure level) free field

Table 4.8: Reference Table 3 - Maximum internal acoustic levels

Applicable use	Acoustic levels
3.1: Habitable rooms in an accommodation activity (excluding uses addressed in QDC MP4.4)	≤45 dB(A) single event maximum sound pressure level
3.2: Indoor education areas and indoor play areas in a childcare centre or education establishment	≤50 dB(A) single event maximum sound pressure level
3.3: Sleeping rooms in a childcare centre	≤45 dB(A) single event maximum sound pressure level
3.4: Patient care areas in a hospital	

4.4 Queensland Development Code MP4.4

The Queensland Government has a number of mandatory codes that must be complied with at the building application stage for a home. These are referred to as Queensland Development Codes (QDC).

QDC Mandatory Part (MP) 4.4 relates to new buildings in transport noise corridors. This mandatory Code deals with buildings within residential developments close to gazetted roads and railways, which includes the Bruce Highway but excludes the Council controlled trunk connector road. Advice from Sunshine Coast Council is that the MP4.4 category should be based on the combined noise level from the Bruce Highway and Council road, as discussed further in **Section 4.5**.

MP4.4 sets mandatory construction standards for new residential development, or additions to existing residential development, within a Transport Noise Corridor.

The noise level categories extend out to 57 dBA L_{10}(18 hour) for road traffic noise and 69 dBA L_{max} for rail noise. The road noise categories and corresponding noise levels from Schedule 3, Table 1 of MP4.4 as follows:

- Road Noise:
  - Category 0: ≤ 57 dBA L_{10}(18 hour)
  - Category 1: 58 – 62 dBA L_{10}(18 hour)
  - Category 2: 63 – 67 dBA L_{10}(18 hour)
  - Category 3: 68 – 72 dBA L_{10}(18 hour)
  - Category 4: ≥ 73 dBA L_{10}(18 hour)
- Rail Noise
  - Category 0: ≤ 69 dBA L_{max}
  - Category 1: 70 – 74 dBA L_{max}
  - Category 2: 75 – 79 dBA L_{max}
  - Category 3: 80 – 84 dBA L_{max}
  - Category 4: ≥ 85 dBA L_{max}

4.5 Sunshine Coast Council

On 14 April 2014 the Sunshine Coast Council (SCC) adopted the Sunshine Coast Planning Scheme 2014 and the associated planning scheme policies. The planning scheme and the planning scheme policies were gazetted on 2 May 2014 and commenced on 21 May 2014. The Sunshine Coast Planning Scheme 2014 replaces the Caloundra City Plan 2004 and Maroochydore City Plan 2000 planning schemes with one plan for the region.

With regards to the assessment of noise impacts, the relevant sections of the planning scheme are the Nuisance Code (Section 9.4.3) and the Planning Scheme Policy for the Nuisance Code (Section SC6.15). The Nuisance Code presents Performance Outcomes and Acceptable Outcomes for assessable development for acoustic amenity and noise but does not specifically nominate noise limits or assessment criteria. The Planning Scheme Policy for the Nuisance Code provides guidance for the assessment of road and rail noise, live

entertainment, amplified music and voices (patrons). The policy does not specify noise limits but references the following guidelines to achieve the nuisance code outcomes:

- Australian Standard AS/NZS2107–2000: Acoustics— Recommended design sound levels and reverberation times for building interiors. This document is superseded by the 2016 version.
- Department of Housing and Public Works (HPW) – Queensland Development Code (QDC) Mandatory Part 4.4 (MP4.4) 'Buildings in transport noise corridors'.
- Department of Environment and Science (DES) (formerly Department of Environment and Heritage Protection) – Environmental Protection Policy (Noise) and Environmental Protection Act.
- Department of Transport and Main Roads (TMR) – Road Traffic Noise Management: Code of Practice.

On 29th September 2014 Council advised that at the present time, road traffic noise intrusion into buildings should still be assessed against the criteria previously applied by Caloundra City Council and Maroochy Shire Council. Caloundra City Council and Maroochy Shire Council specified an external building facade limit of 63 dBA L_{10}(18 hour) (façade corrected) on residential land. For those instances where this external noise limit was predicted to be exceeded, the internal noise levels within habitable rooms were required to be designed to meet the recommended design sound levels stated in Table 1 of AS/NZS 2107-2016 entitled "Acoustics - Recommended design sound levels and reverberation times for building interiors".

On 10th March 2021 Council provided advice on their recommended approach to assessing allotments or residences affected by transport noise from both State and Council roads. The approach is outlined as follows:

- Where the noise from the State controlled road/s is of a sufficient level to trigger QDC MP4.4 (i.e. 58 dBA L_{10}(18 hour) or higher) at a building façade, then determine the MP4.4 categories for the building facades based on the total noise from all (State and Council) roads;
- Where the noise from the State controlled road/s is not of a sufficient level to trigger QDC MP4.4 (i.e. 57 dBA L_{10}(18 hour) or lower), but the noise from all (State and Council) roads is greater than 63 dBA L_{10}(18 hour) (i.e. the Council traffic noise limit) then determine the building requirements using AS3671 and AS2107 based on the noise from all (State & Council) roads; and
- Where the noise from the State controlled road/s is not of a sufficient level to trigger QDC MP4.4 (i.e. 57 dBA L_{10}(18 hour) or lower), and the noise from all (State and Council) roads is not greater than 63 dBA L_{10}(18 hour) (i.e. the Council traffic noise limit) then no building upgrades are required. Note: If a room has multiple facades and requires AS3671/AS2107 assessment, as per dot point above, then the overall room is assessed per that method.

4.6 Australian Standard AS 2107:2016

For road traffic noise, Council recommends the most applicable assessment methodology would be the application of indoor noise levels specified in AS 2107:2016 "Acoustics - Recommended design sound levels and reverberation times for building interiors" (AS 2107). AS 2107 lists recommended internal noise levels for various building and room types, including residential bedrooms and other areas. For development near major and minor roads, the recommended design levels are as listed in **Table 4.9**.

Table 4.9: Recommended Internal Noise Levels from AS 2107:2106

Road Type	Type of Occupancy / Activity	Design Sound Level L_{eq} dBA
Minor Road	Living areas	30 to 40
	Sleeping areas	30 to 35
	Work areas	35 to 40
Major Road	Living areas	35 to 45
	Sleeping areas	35 to 40
	Work areas	35 to 45

Of the above criteria, we would generally recommend the following internal design levels:

- Living rooms: 40 dBA (assessed using peak hour day/evening noise level).
- Work rooms: 40 dBA (assessed using peak hour day/evening noise level).
- Bedrooms: 35 dBA (assessed using peak hour night noise level).

4.7 Summary and Noise Limits

Based on the noise criteria prescribed by SDAP (Road and Rail) and Sunshine Coast Council, the road traffic noise criteria nominated for the development are as follows:

Road traffic noise – Bruce Highway (State controlled road):

- Residential lots:
  - At 1m outside buildings 63 dBA L_{10}(18 hour) including façade reflection.
  - For outdoor recreation areas 60 dBA L_{10}(18 hour) excluding façade reflection.
    - Note: The free-field noise criteria of 60 dBA corresponds to a noise limit of 62.5 dBA including façade reflection, which is similar to the 63 dBA façade noise limit. However, the modelling corrections (refer **Section 5.3.2**) are 1 dB different for free-field and façade corrected receivers, therefore making the free-field (outdoor area) noise limit more stringent. However, the free-field calculation point is determined at a height of 1.5 metres, whereas the calculation at a façade is determined at a height of 1.8 metres. For receivers protected by a barrier the noise level, the noise level at 1.5 metres height will be lower than at 1.8 metres height, and this difference approximately offsets the 1 dB different modelling correction factors. Ultimately, the two noise limits (63 dBA including façade, and 60 dBA excluding façade) result in similar noise levels, and therefore the 63 dBA limit will be used in this report for assessment of residential allotments. This approach is consistent with previous Aura noise assessments.
  - Application of MP4.4 to achieve acceptable internal noise levels.

Road traffic noise – Internal trunk connector road (Council controlled roads):

- Residential lots:
  - External facade noise limit: 63 dBA L_{10}(18 hour) (facade corrected).
  - Internal noise limit (if external limit exceeded): internal design noise levels from AS/NZS 2107:2016, specifically:
    - 35 dBA L_{eq}(1 hour) for bedrooms in residences.
    - 40 dBA L_{eq}(1 hour) for other habitable rooms in residences.

Road traffic noise – Both Bruce Highway (State controlled road) and internal trunk connector road (Council controlled roads):

- Road traffic noise from both State and Council controlled roads – follow the process advised by Council in **Section 4.5**.

Rail noise – CAMCOS (State controlled rail):

- Residential lots:
  - L_{max} 87 dBA (single event maximum) and L_{eq} (24 hour) average 65 dBA external level 1m from the façade.
  - L_{max} 84 dBA (single event maximum) and L_{eq} (24 hour) average 62 dBA external free field level in private open space and passive recreation areas.
    - Note: The free-field noise criteria of 84/62 dBA correspond to noise limit of 86.5/64.5 dBA including +2.5 dB façade reflection, which is similar to the 87/65 dBA façade noise limits. The free-field calculation point is determined at a height of 1.5 metres, whereas the calculation at a façade is determined at a height of 1.8 metres. For receivers protected by a barrier the noise

level, the noise level at 1.5 metres height will be lower than at 1.8 metres height, and this difference approximately offsets the 0.5 dB difference between the criteria. Ultimately, the two noise limits (87/65 dBA including façade, and 84/62 dBA excluding façade) result in similar noise levels, and therefore the 87/65 dBA limit will be used in this report for assessment of residential allotments. This approach is consistent with previous Aura rail noise assessments.

- Application of MP4.4 to achieve acceptable internal noise levels.

- Childcare centres and educational establishments:
  - L_{max} 87 dBA and L_{eq} (1 hour) average 65 dBA external level 1m from the façade.
  - L_{max} 84 dBA and L_{eq} (24 hour) average 62 dBA external free field level in outdoor education areas and outdoor play areas
  - L_{max} 45 dBA in habitable rooms including sleeping areas in child-care centres and patient care areas in a hospital
  - L_{max} 50 dBA in indoor education areas and indoor play areas.

5. ROAD TRAFFIC NOISE ASSESSMENT

5.1 Overview

Lots assessable under QDC MP4.4 are determined by assessing the contributions from the Bruce Highway separately while applicable MP4.4 categories and Council mitigation measures are determined from the total contribution from all State and Council controlled roads as per the relevant criteria presented in **Section 4**. The extent of lots assessable under QDC MP4.4 is determined from the online MP4.4 contour information which has previously been obtained from the Queensland Department of Transport and Main Roads, and is presented in this report.

5.2 Noise Modelling

For the purposes of the assessment, predictions were undertaken in accordance with the methodology described in the United Kingdom, Department of Transport (1988) procedure, Calculation of Road Traffic Noise (CoRTN). CoRTN is commonly adopted in Australia for the assessment of road traffic noise impacts and has been subject to scientific studies to determine its performance in Queensland conditions (see Section 4.3.2.1 of the TMR Code of Practice).

The calculation method considers the influence of various elements of the road design including traffic flows, traffic fleet composition, road gradient, acoustic shielding by other buildings and elevations, and road surface type. The method predicts L_{10}(18hour) noise level which is the arithmetic average of the hourly noise levels exceeded 10% of the time between the hours of 6:00 am and midnight.

The SoundPLAN 8.2 computer model has been used to undertake the noise predictions in accordance with the CoRTN methodology. The following sections discuss the modelling inputs, assumptions and results.

5.3 Model Input Data

5.3.1 Traffic Data

Traffic volumes were provided by PricewaterhouseCoopers (PwC) and are based on forecasted volumes using the Aura Visum Model. This model assumes an ultimate road network in 2037 for assessment purposes given expected completion of development by 2027, i.e. 10 year future impact.

The traffic data for the Bruce Highway was provided for the year 2031, and Trinity was advised by Stocklands to assume an annual growth rate of 3.5% for Bruce Highway traffic. The 18-hour (6am to midnight) traffic volume is estimated as 92% of the daily (AADT) volume, as advised by PWC. The Bruce Highway traffic data for Year 2037 is included in **Table 5.1**.

Table 5.1: Bruce Highway Year 2037 Traffic Data

Segment	Road / Section	Direction	Year 2037 Traffic Volumes		Heavy Vehicles (HV%)	Speed (km/h)
			AADT	18 hours (6am to midnight)		
B1	Bruce Highway – South of interchange	Northbound	53208	48951	15.1	110
B2	Bruce Highway – South of interchange	Southbound	45597	41949	17.0	110
*B3	Bruce Highway – North of interchange	Northbound	46729	42991	15.1	110
*B4	Bruce Highway – North of interchange	Southbound	41559	38234	17.0	110

Note: *Northern sections of the Bruce Highway are unlikely to materially affect modelled results for P15 – East unlike those closer to the precinct (B1 and B2), but are modelled for sake of completeness

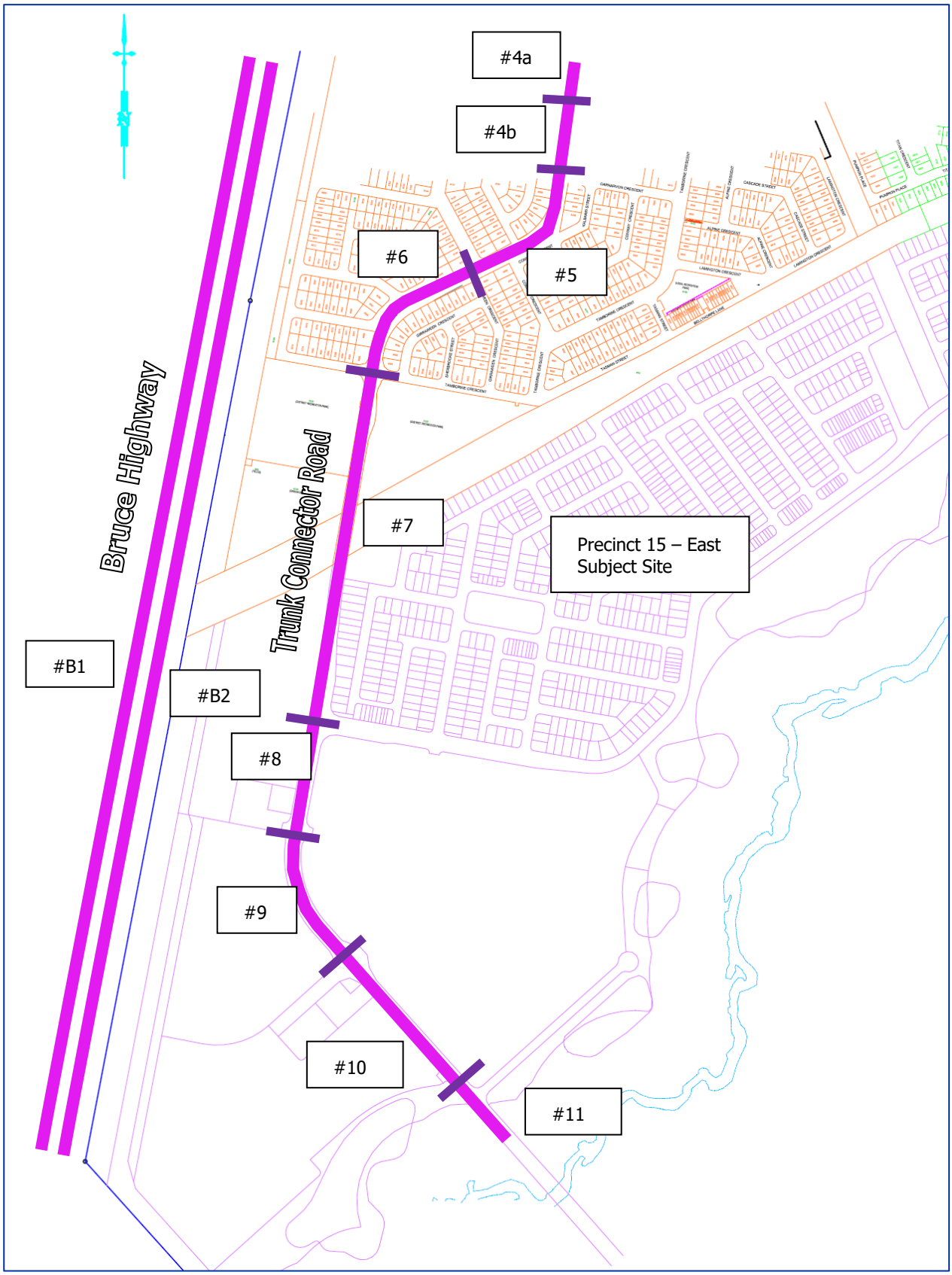
The predicted 2031 traffic volumes along the Council controlled internal road were provided by PwC and Trinity was advised by Stocklands to assume an annual growth rate of 3.5% for this traffic. The calculated 2037 volumes are summarised in **Table 5.2** and relates to the road segments shown in **Figure 5.1**. Note: The road segment number is consistent with that used for the assessment of Precincts 11 to 14 of Aura to the north.

The 18-hour (6am to midnight) traffic volume is estimated as 92% of the daily (AADT) volume, as advised by PWC. The percentage of heavy vehicles is assumed as 3% as was used for the assessment of Precincts 11 to 14 of Aura to the north.

Table 5.2: Council Trunk Connector Year 2037 Traffic Data

Segment	Road / Section	Direction	Predicted Year 2037 Traffic Volumes		Heavy Vehicles (HV%)	Speed (km/h)
			AADT	18 hours (6am to midnight)		
4a	Internal (Trunk Connector) Road – Section 4a	Both	13352	12284	3	60
4b	Internal (Trunk Connector) Road – Section 4b	Both	9929	9134	3	60
5	Internal (Trunk Connector) Road – Section 5	Both	10570	9724	3	60
6	Internal (Trunk Connector) Road – Section 6	Both	9700	8924	3	60
7	Internal (Trunk Connector) Road – Section 7	Both	8761	8060	3	60
8	Internal (Trunk Connector) Road – Section 8	Both	7971	7333	3	60
9	Internal (Trunk Connector) Road – Section 9	Both	8305	7640	3	60
10	Internal (Trunk Connector) Road – Section 10	Both	9191	8456	3	60
11	Internal (Trunk Connector) Road – Section 11	Both	9929	9134	3	60

Figure 5.1: Trunk Connector Modelled Road Sections 4a to 11



5.3.2 Other Model Data

In addition to traffic flow data given above, the following assumptions and inputs were considered:

- Noise source height of 0.5m as per CoRTN methodology.
- Road surface corrections:
  - Bruce Highway: 0 dBA for Dense Graded Asphalt.
  - Internal (Trunk Connector) Road: 0 dBA for Dense Graded Asphalt.
- Ground absorption of 1, i.e. fully absorptive, in model except for major roads which are fully reflective.
- Ground contours for the site and the surrounding area were obtained from Urbis on 20/04/2022. The ground contours include the CAMCOS corridor earthworks, and the noise bund adjacent the Bruce Highway to the north of the CAMCOS corridor. A noise bund adjacent the Bruce Highway was not included south of the CAMCOS corridor.
- Receiver heights for the proposed lots were 1.8m above ground for ground floors and 4.6 m for the first floors.
- A +2.5 dBA facade reflection allowance is included in the noise level predictions at a facade.
- A - 1.7 dBA façade and – 0.7 dBA free-field calibration factor regarding CoRTN accuracy for Queensland Conditions (as presented in Section 4.3.2.1 of the TMR Code of Practice).

5.4 Model Verification

Model verification for the Bruce Highway was presented in the previous Precinct 11 to 14 report (197401.0141.R01V04, dated 8/07/2021). No additional noise monitoring has been conducted, and therefore that previous verification remains valid.

It is not possible to verify the trunk connector road as it has not been constructed.

5.5 Calculations, Barriers and Assessment

5.5.1 Overview

Road traffic noise levels have been predicted for the year 2037 for the following scenarios:

- Noise from Bruce Highway only – no road barriers but including Highway bunding to north of CAMCOS corridor.
- Noise from Bruce Highway and trunk connector road:
  - No road barriers but including Highway bunding to north of CAMCOS corridor.
  - Barriers to trunk connector road, and Highway bunding to north of CAMCOS corridor.

Results are presented and assessed in the following sections.

5.5.2 Noise from Bruce Highway Only (2037) without Noise Barriers

Predicted noise level contours from the Bruce Highway are shown in **Figure C.1a** (ground floor) and **C.1b** (first floor) in **Appendix C**.

From these contour results it can be seen that the Precinct 15 – East lots are subject to compliant noise levels (refer to the magenta external noise 63 dBA SDAP limit line) at the ground and first floor.

A noise bund adjacent the Highway is not required for Precinct 15 – East, but such a noise bund is however likely for Precinct 15 – West, but that does not form part of this report.

Also shown on these figures is the extent of MP4.4 requirements adjacent the highway (represented as a teal coloured line). Building upgrades for dwellings under QDC MP4.4 are not required for lots east of the MP4.4 extent, unless affected by excessive noise from the Council trunk connector road, as addressed later in this report. It can be seen that Precinct 15 – East is outside the extent of the Bruce Highway MP4.4.

5.5.3 Noise from All Roads (2037) without Noise Barriers

Predicted noise level contours from all roads (Bruce Highway and trunk connector road) are shown in **Figure D.1a** (ground floor) and **D.1b** (first floor) in **Appendix D**.

From these contour results it can be seen that Precinct 15 – East lots closest to the trunk connector road are subject to excessive noise levels (refer to the magenta external noise 63 dBA limit line) at both the ground and first floors.

Due to the non-compliance at ground floor receivers, it is proposed to design noise barriers on the eastern side of the trunk connector road to achieve compliance with the 63 dBA Council noise limit.

5.5.4 Proposed Noise Barriers

Based on the noise level results, noise barriers are proposed adjacent to this section of the Council controlled truck collector road.

The barriers are shown in **Figures D.2a** (overall) and **D.2b** (zoomed) in **Appendix D** and are described as follows:

- 2.5m high barrier (approximately 265 metres long) to the eastern side of the northern section of the trunk connector road (dark green in **Figures D.2a** and **D.2b**).
- 2m high barrier (approximately 10 metres long) return along CAMCOS reserve boundary (red in **Figures D.2a** and **D.2b**).

Also shown on these figures, and included in the modelling, are the rail noise barriers, which are addressed later in this report.

5.5.5 Noise from All Roads (2037) with Noise Barriers

Predicted noise level contours from all roads (Bruce Highway and trunk connector road) with the proposed noise barriers from **Section 5.5.4** are shown in **Figure D.3a** (ground floor) and **D.3b** (first floor) in **Appendix D**.

Note: Barriers previously specified for Precincts 11-14 are not considered in the modelling results shown as they are not considered to have an effect on P15 – East.

From these contour results it can be seen that the Precinct 15 – East lots are subject to compliant noise levels (refer to the magenta external noise 63 dBA SDAP limit line) at the ground floor, but excessive levels at some lots (1000 to 1015) on the first floor.

Due to the non-compliance at a number of first-floor receivers, residences in these affected lots (i.e. Lots 8000, 9001 and 1000 to 1015) will be required to be assessed against Council's criteria for acceptable internal noise levels, and this is addressed later in **Section 5.6**.

5.5.6 Non-Residential Receivers

The model assumes all lots are residential near the trunk connector road and no allowance has been made for non-residential sensitive receivers at these locations (e.g. schools).

5.6 Building Construction Requirements

5.6.1 Overview

Acoustic requirements for building construction differ for residences adjacent to the State-controlled Bruce Highway versus the Council-controlled trunk connector road. The requirements are summarised as follows:

- Adjacent to the State-controlled Bruce Highway: Class 1 to 4 residences (e.g. houses) subject to road traffic noise levels above 57 dBA L_{10}(18hour) will require design and construction to QDC MP4.4.
- Adjacent to the Council-controlled trunk connector road: Residences subject to road traffic noise levels above 63 dBA L_{10}(18hour) will require design and construction to AS2107 and AS3671.
- Adjacent both State and Council-controlled roads: Refer to discussion in **Section 4.5**. Effectively, these residences are subject to MP4.4 requirements if within the extent of MP4.4, or subject to Council requirements if outside the extent of MP4.4.

5.6.2 QDC MP4.4 Requirements

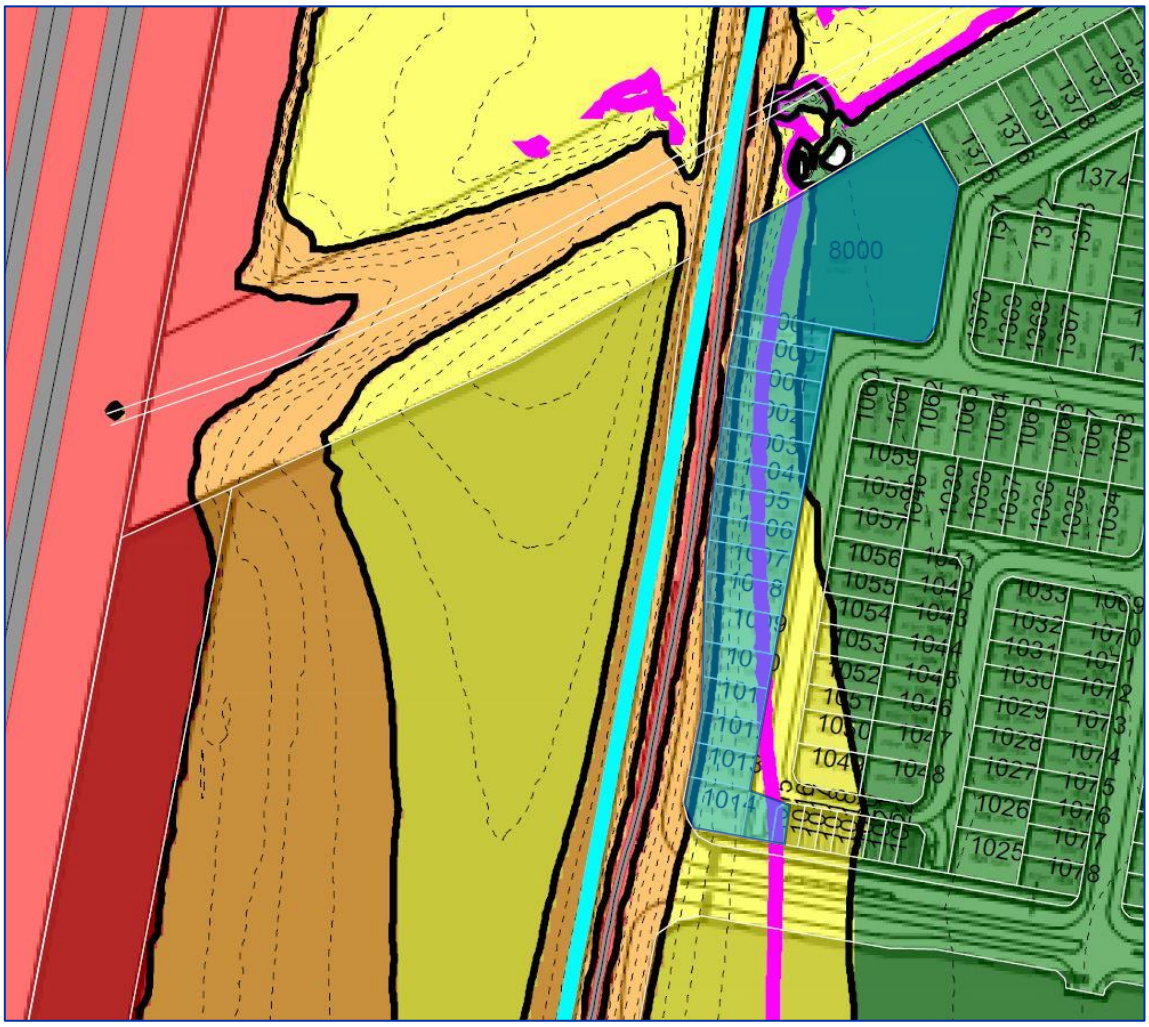
Residential lots requiring treatment under MP4.4 lie within the area bounded by the cyan line and road as seen in **Figures C.1a** and **C.1b** in **Appendix C** and **Figures D.3a** and **D.3b** in **Appendix D**. In this instance it can be seen that P15 – East is not affected by QDC MP4.4 from the Bruce Highway as it lies outside its assessable extent.

5.6.3 Council AS2107 Requirements

The residential lots subject to AS2107 criteria requirements by the Sunshine Coast Council are those subject to noise levels in excess of 63 dBA L_{10}(18hour) in **Figures D.3a** and **D.3b** but are outside the extent of MP4.4 (refer to cyan line in these figures).

These affected residences are to be designed to AS2107 internal noise levels (refer recommended internal criteria in **Section 4.7**) based on the methods of AS3671. Due to the proposed noise barrier, only first floors of dwellings are affected. Specifically, the affected lots are those between the trunk connector road and magenta limit line in **Figure D.3b**, which are shown shaded blue in **Figure 5.2**. The affected lots are the upper floors of two storey residences in Lots 8000, 9001 and 1000 to 1015 (note: not all of these lots may contain residences).

Figure 5.2: Residences where Upper Floors Require Design to AS2107 using AS3671 (Shaded Blue)



5.6.4 General

Achieving the MP4.4 target noise reductions across a building façade requires construction details to be of an appropriate acoustic standard and that all exterior openings are to be closed when these habitable rooms are occupied. Therefore, an air-conditioning/mechanical ventilation system that does not degrade the internal acoustic environment or the building envelope's sound isolation while still meeting the ventilation requirements of the Building Code of Australia may need to be installed.

6. RAIL NOISE ASSESSMENT

6.1 Overview

Rail noise from the CAMCOS corridor has been assessed onto the proposed development. The relevant assessment criteria are presented in **Section 4**.

At present, there is limited information available in relation to the CAMCOS corridor, and it is understood that the timing of the service is unknown. However, potential noise levels from rail traffic have been assessed using indicative information from the following documents:

- ARUP, Caboolture to Maroochydore Corridor Study Stage 3 Caloundra Options Assessment Report, date: March 1999.
- ARUP, Caboolture to Maroochydore Corridor Study Final Impact Assessment and Land Use Transport Strategy, Chapter 5 Environmental Setting, date: February 2001.

Rail traffic noise levels across the site have been predicted using the SoundPLAN computer model, based on the Kilde rail noise prediction method, which is approved by Queensland Rail.

6.2 Data

The following rail specific data has been used for rail noise calculations:

- Due to the location of the corridor, it is assumed that only electric passenger trains will utilise the CAMCOS rail line. A noise source height of 0.5m above the ground level has been applied for electric passenger trains.
- The height of the rail line is based on the finished earthworks level of the corridor as provided by Calibre Consulting. The application of this height is considered acceptable for the purposes of this assessment.
- Ground contours for the site and the area of the CAMCOS corridor were provided by Calibre Consulting, as per the road traffic noise modelling. The ground contours for the CAMCOS corridor did not include detailed consideration of the rail lines or required civil works.
- Stockland has previously advised that the corridor has been designed to support train travel speeds up to 100 km/h. Modelling of rail noise has applied this speed.
- Stockland has previously advised that frequency of train travel for the corridor is unknown, however rail traffic is forecast to be running at a 30-minute headway by 2050. It is therefore assumed that there will be at least 15 train movements per day.
- Based on experience with similar rail noise assessments, maximum (L_{max}) rail noise predictions typically determine the required mitigation measures rather than daily average noise levels, and therefore due to absence of information regarding train frequencies, the assessment has been undertaken using L_{max} noise predictions only.
- Noise predictions have been undertaken using both the west and eastbound rail lines, with an assumed track separation distance of 4.5m. The setback distance from the westbound rail line to the boundary of Precinct 15 – East is approximately 14-metres along its narrowest sections.

The following input data is consistent with the road traffic noise modelling:

- Receiver heights for the allotments were placed 1.8m and 4.6m above ground contour height for the ground and first floors respectively.
- A +2.5 dBA facade reflection allowance is included in the rail noise level predictions.

6.3 Limitations & Assumptions

The assessment of rail noise impacts has been undertaken with information available at the time of the assessment. Detailed design of the CAMCOS corridor has not yet been undertaken.

The rail noise MP4.4 category has been determined by two methods:

(a) Based on Plan of Development (POD) documents, which include MP4.4 categories agreed between Stockland and EDQ based on rail noise level information; and

(b) Based on the modelled rail noise level for future State Transport Corridor.

As the State Transport Corridor does not yet exist, purchasers are required to construct their homes in accordance with categories nominated within the approved Plan of Development (POD) (i.e. method (a) above).

Purchasers may choose to construct their homes in accordance with the modelled rail noise level (i.e. Method (b) above) however there is no statutory requirement to do so, i.e. it is a voluntary rating.

6.4 Verification

As the CAMCOS rail corridor has not been constructed, noise measurements of rail pass-bys cannot be undertaken.

Verification of the rail noise model has been undertaken using the generic passenger train sound exposure level (SEL) data provided by QR, and the corrections included in the SoundPLAN model under the Kilde method, as required by QR. This method is considered suitable for the purposes of this assessment.

6.5 Rail Noise Assessment at Residential Lots

Based on advice from Stockland, a 2.4m high noise barrier has been modelled along either side of the rail corridor. The CAMCOS noise barrier has been modelled to be constructed along lot boundaries until a point where the CAMCOS rail line (and associated finished earthworks level) starts to rise above the finished earthworks levels of the residential lots. The CAMCOS noise barrier are shown in **Figures D.2a, D.2b, E.1a** and **Figure E.1b**.

The resulting rail noise levels are shown in **Figure E.1a** and **Figure E.1b** for the ground and first floors respectively. The contours in **Figure E.1a** are shown in more detail in **Figures E.1a.1** to **E.1a.3**, and the contours in **Figure E.1b** are shown in more detail in **Figures E.1b.1** to **E.1b.3**.

With the rail noise barrier, predicted noise level at the ground floor comply with the external noise limit of 87 dBA L_{max} (facade corrected) at all lots as seen in **Figure E.1a**. However, the upper floor of some two storey residences directly adjacent to the rail corridor exceed the limit as shown in **Figure E.1b**.

Voluntary QDC MP4.4 categories (i.e. method (b) in **Section 6.3**) can be determined from the rail noise level contours shown in **Figure E.1a** (ground floor, and including **Figures E.1a.1** to **E.1a.3**) and **Figure E.1b** (upper floor, and including **Figures E.1b.1** to **E.1b.3**), with the following rail noise level ranges:

- MP4.4 Category 0: ≤ 69 dBA L_{max} (No colour in Figures)
- MP4.4 Category 1: 70 – 74 dBA L_{max} (Green colour in Figures)
- MP4.4 Category 2: 75 – 79 dBA L_{max} (Yellow colour in Figures)
- MP4.4 Category 3: 80 – 84 dBA L_{max} (Orange colour in Figures)
- MP4.4 Category 4: ≥ 85 dBA L_{max} (Red colour in Figures)

As agreed between EDQ and Stocklands, residences adjacent to the railway have reduced MP4.4 Categories which are considered compulsory (i.e. method (a) in **Section 6.3**). That is, the residents have to build their houses to these compulsory MP4.4 categories, but can chose to build their houses to the higher voluntary ratings described above as method (b). Based on the approach used north of the CAMCOS railway line in

Precincts 11 to 14, the first row of lots adjacent the CAMCOS are deemed to be compulsory Category 2, whilst all lots within the voluntary MP4.4 categories are deemed to be compulsory Category 1. It is not known if the extent of the rail MP4.4 categories is limited by distance from the railway line, as occurs with the Bruce Highway (refer **Section 5.6.2**), and therefore the extent of rail MP4.4 has not been limited by distance from the railway line. The lots deemed to be compulsory Categories 2 and 1 are shown in **Figures E.1a.1** to **E.1a.3** and repeated in **Figures E.1b.1** to **E.1b.3** with brown/orange and light green borders respectively.

As per the road noise assessment, it would be recommended that potential purchasers of a lot listed as requiring MP4.4 Category 1 or higher construction be advised that the lot is predicted to be rail noise affected. The purchaser may then choose to accept the compulsory or voluntary MP4.4 categories (there may be different categories for the ground and upper floor of a two-storey dwelling) nominated in this report, or to undertake a specific assessment of their house design to determine the MP4.4 categories on each façade, roof and exposed floor. A specific assessment typically results in lower categories due to the consideration of screening from the proposed residence and any intervening buildings between the residence and the railway line. The general construction requirements in **Section 5.6.4** would be equally applicable to rail noise.

As note in **Section 6.3** rail purchasers are required to construct their homes in accordance with categories nominated within the approved Plan of Development (POD), as the State Transport Corridor does not yet exist. Purchasers, however, may choose to construct their homes in accordance with the modelled rail noise level however there is no statutory requirement to do so.

6.6 Rail Noise Assessment at Other Non-Residential Lots

There are no School and childcare centres within Precinct 15 – East and as such, no assessment is provided.

There are no regulatory noise limits for the assessment of rail traffic noise impact onto commercial development.

7. BARRIER CONSTRUCTION REQUIREMENTS

The noise barriers may be constructed using timber, brick, concrete block, sheet metal or earth mound. The acoustic barrier may comprise a combination of an earth mound or crib lock wall and a timber fence on top. A solid timber barrier with overlapping palings is usually the most economical. The minimum acoustic requirement of the noise barrier is that it be solid and continuous with negligible holes and gaps between palings or panels or near the ground. The barrier is to be constructed with a material with minimum mass of 12.5 kg/m^2 or minimum acoustic rating of Rw 23.

The barriers adjacent to the trunk connector road in **Appendix D** are not adjacent to a State-controlled Road or specifically address noise from a State-controlled road. It is thus understood that the barriers do not need to comply with Department of Transport and Main Road barrier requirements.

The barriers adjacent to the CAMCOS rail line in **Appendices D** and **E** are adjacent to a rail line and must be designed, sited and constructed in accordance with Queensland Rail requirements. It was previously noted that the construction of noise barriers adjacent to the CAMCOS corridor is the not the responsibility of Stockland but rather State Government at the time of construction of the rail along the CAMCOS corridor.

8. RECOMMENDATIONS AND CONCLUSION

A road and rail noise assessment has been conducted for Precinct 15 – East of the Aura development. The results and recommendations of the assessment are as follows:

- The assessment of road and rail traffic noise impacts has been undertaken with project design information current at the time of the assessment. Overall, the level of design information is considered appropriate for the current stage of assessment. The modelling output can be further refined following progression of the design of the development.
- Road traffic noise
  - Road traffic noise from the Bruce Highway and internal trunk connector road have been assessed within this report.
  - The assessment of road traffic noise is presented in **Section 5** for the year 2037 for the following scenarios:
    - Noise from Bruce Highway only – no barriers but including Highway bunding to north of CAMCOS corridor.
    - Noise from Bruce Highway and trunk connector road:
      - No barriers but including Highway bunding to north of CAMCOS corridor.
      - Barriers to trunk connector road, and Highway bunding to north of CAMCOS corridor.
  - Predicted road traffic levels from the Bruce Highway only (no barriers) are presented in **Section 5.5.2** and **Figures C.1a** and **C.1b** in **Appendix C**. From these contour results it can be seen that the Precinct 15 – East lots are subject to compliant noise levels (refer to the magenta external noise 63 dBA SDAP limit line) at the ground and first floor. A noise bund adjacent the Highway is not required for Precinct 15 – East, but such a noise bund is however likely for Precinct 15 – West, but that does not form part of this report.
  - The extent of area affected by QDC MP4.4 building upgrades due to road traffic noise is shown as a teal line in **Figures C.1a** and **C.1b** in **Appendix C** and **Figures D.1a** and **D.1b** in **Appendix D**. From this information it can be seen that P15 – East is not affected by QDC MP4.4 from road noise due to lying outside the MP4.4 assessable extent of the Bruce Highway.
  - Predicted road traffic levels from the "All roads with no barriers" scenario are presented in **Section 5.5.3** as seen in Figures **D.1a** and **D.1b** in **Appendix D**. From these contour results it can be seen that some residences along the trunk connector road are affected at ground and upper floors (refer to the magenta external noise 63 dBA limit line). Therefore, noise barriers are proposed.
  - Due to the predicted non-compliance from road traffic noise from the trunk connector road at Precinct 15 – East, noise barriers were proposed. Barrier details are shown in **Figures D.2a** (overall) and **D.2b** (zoomed) in **Appendix D** which specified the following:
    - 2.5m high barrier (approximately 265 metres long) to northern section of the trunk connector road.
    - 2m high barrier (approximately 10 metres long) return along CAMCOS reserve boundary.
  - Predicted road traffic levels from the "All roads with barriers" scenario with the proposed noise barriers are presented in **Section 5.5.4** and Figures **D.3a** and **D.3b** in **Appendix D**. From these contour results it can be seen that some upper floors within residences along the trunk connector road are subject to excessive noise levels (refer to the magenta external noise 63 dBA limit line). Therefore building upgrades may be required as per AS2107 and AS3671. The affected lots where first floors are affected are shown in **Section 5.6.3** and **Figure 5.2**, and are numbered as Lots 8000, 9001 and 1000 to 1015 (note: not all of these lots may contain residences).
  - General MP4.4 construction requirements are included in **Section 5.6.4**.

- Rail traffic noise
  - Rail traffic noise from the proposed future CAMCOS rail corridor has been assessed within this report. The calculations include 2.4m high noise barriers adjacent to the railway lines.
  - Predicted rail traffic levels from the CAMCOS corridor are presented in **Section 6.5** and **Figures E.1a** and **E.1b** in **Appendix E**. The contours in **Figure E.1a** are shown in more detail in **Figures E.1a.1** to **E.1a.3**, and the contours in **Figure E.1b** are shown in more detail in **Figures E.1b.1** to **E.1b.3**. From these contour results it can be seen that the predicted noise level at the ground floor comply with the external noise limit of 87 dBA L_{max} (facade corrected) at all lots , however, the upper floor of some two storey residences directly adjacent to the rail corridor exceed the limit as shown in **Figure E.1b**. Ultimately, Queensland Rail may choose to construct higher noise barriers along some of these sections, and rail noise levels would thus be lower than presented in this report.
  - Rail noise MP4.4 categories for residences can be determined by two methods:
    - Based on Plan of Development (POD) documents, which include compulsory minimum MP4.4 categories agreed between Stockland and EDQ and as recommended in this report based on rail noise level information. The lots deemed to be compulsory MP4.4 Categories 2 and 1 are shown in **Figures E.1a.1** to **E.1a.3** and repeated in **Figures E.1b.1** to **E.1b.3** with brown/orange and light green borders respectively.
    - Based on the modelled rail noise level for future State Transport Corridor in **Figure E.1a** (ground floor, and including **Figures E.1a.1** to **E.1a.3**) and **Figure E.1b** (upper floor, and including **Figures E.1b.1** to **E.1b.3**), and using the guidance in **Section 6.5**.
  - General MP4.4 construction requirements are included in **Section 5.6.4**.
- Road and rail barrier construction requirements are included in **Section 7**.

APPENDIX A GLOSSARY

Parameter or Term	Description
dB	The decibel (dB) is the unit measure of sound. Most noises occur in a range of 20 dB (quiet rural area at night) to 120 dB (nightclub dance floor or concert).
dBA	Noise levels are most commonly expressed in terms of the 'A' weighted decibel scale, dBA. This scale closely approximates the response of the human ear, thus providing a measure of the subjective loudness of noise and enabling the intensity of noises with different frequency characteristics (e.g. pitch and tone) to be compared.
Day	The period between 7am and 6pm.
Evening	The period between 6pm and 10pm.
Night	The period between 10pm and 7am.
Free-field	The description of a noise receiver or source location which is away from any significantly reflective objects (e.g. buildings, walls).
L_1	The noise level exceeded for 1% of the measurement period.
L_{10}	The noise level exceeded for 10% of the measurement period. It is sometimes referred to as the average maximum noise level.
L_{90}	The noise level exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.
L_{eq}	The equivalent continuous sound level, which is the constant sound level over a given time period, which is equivalent in total sound energy to the time-varying sound level, measured over the same time period.
$L_{eq,1hour}$	As for Leq except the measurement intervals are defined as 1 hour duration.
L_{max}	Maximum A-weighted sound pressure level.
L_{eq}(24 hour)	The average Leq noise level over the 24-hour period from midnight to midnight.
L_{10}(18 hour)	The arithmetic average of the one-hour L10 values between 6am and midnight. This parameter is used in the assessment of road traffic noise.
R_w	Weighted Sound Reduction Index – is a single number evaluation of the property of a partition to attenuate sounds. For the majority of partitions, the value of Rw will be similar to the value for STC. Partitions with particularly poor performance at 100 Hz may have lower values for Rw than for STC. Conversely, partitions with poor performance at 4000 Hz may have higher Rw than for STC. (As per AS1276.1-1999).
Habitable Rooms	According to the "Building Code of Australia" a Habitable Room is: " a room used for normal domestic activities and Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre, and sunroom, but Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods."

APPENDIX B DRAWINGS

LEGEND

GENERAL
- Precinct Boundary
- Application Boundary
- 3m Wide Shared Path (Indicative Location Only)

LAND USE
- Multiple Residential Sites

OPEN SPACE
- District Sports Park
- Neighbourhood Recreation Park
- Local Recreation Park
- District Linear Park
- Local Linear Park
- Landscape Buffer (Road Reserve)
- Drainage
- Drainage (WSUD)
- Conservation

YIELD SUMMARY

32 Deep Lots
- 10.0m - Villa
- 12.5m - Premium Villa
- 14.0m-14.5m - Courtyard
- 16.0m - Traditional
- 18.0m - Premium Traditional

30 Deep Lots
- 10.0m - Villa
- 12.5m - Premium Villa
- 14.0m-14.5m - Courtyard
- 16.0m - Traditional
- 18.0m - Premium Traditional

28 Deep Lots
- 4.6m - Terrace
- 6.6m - Terrace
- 7.6m - End Terrace
- 7.5m - Front Loaded Terrace
- 9.0m+ - Front Loaded End Terrace
- 10.0m - Villa
- 12.5m - Premium Villa
- 14.0m - Courtyard
- 16.0m - Traditional
- 18.0m - Premium Traditional

25 Deep Lots
- 4.6m - Terrace
- 6.6m - Terrace
- 7.6m - End Terrace
- 7.5m - Front Loaded Terrace
- 9.0m+ - Front Loaded End Terrace
- 10.0m - Villa
- 12.5m - Premium Villa
- 14.0m - Courtyard
- 16.0m - Traditional
- 18.0m - Premium Traditional

21 Deep Lots
- 10.0m - Urban Villa

16.5 Deep Lots
- 4.6m - Town Terrace
- 6.6m - Town Terrace
- 7.6m - End Town Terrace

Urban Lots
- Urban Lot Type A
- Urban Lot Type B
- Urban Lot Type C & D
- Urban Lot Type E
- Urban Lot Type F
- Urban Loft Type A
- Urban Loft Type B
- Urban Loft Type C
- Urban Warehouse A
- Urban Warehouse B

URBIS

AURA P15 - East

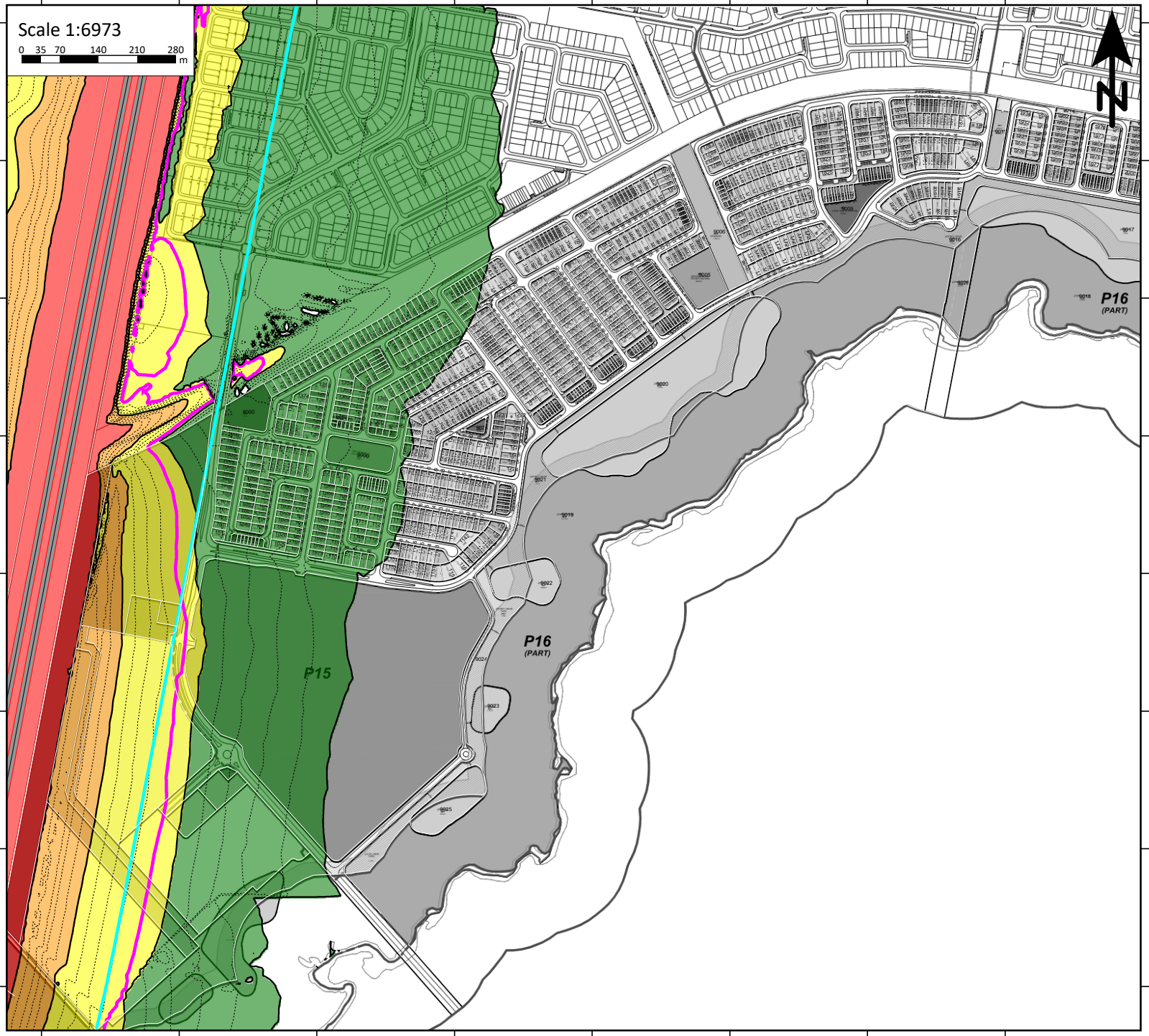
Concept Plan

Scale 1:7,500 @ A3

0 50 100 200 300m

PROJECT NO: P0035656
DATE: 10.06.2022
DRAWING NO: DA-01
REV: 8

APPENDIX C ROAD NOISE (FUTURE YEAR 2037, BRUCE HIGHWAY ONLY, WITHOUT BARRIERS)



Bruce Highway
Final Scenario (2037)
Ground Floor (GF) - Without Barriers
Calculation Height = 1.8 m

Figure

C1a

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour)
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

- <= 57
- 58 - 62 Cat 1
- 63 - 67 Cat 2
- 68 - 72 Cat 3
- >= 73 Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line

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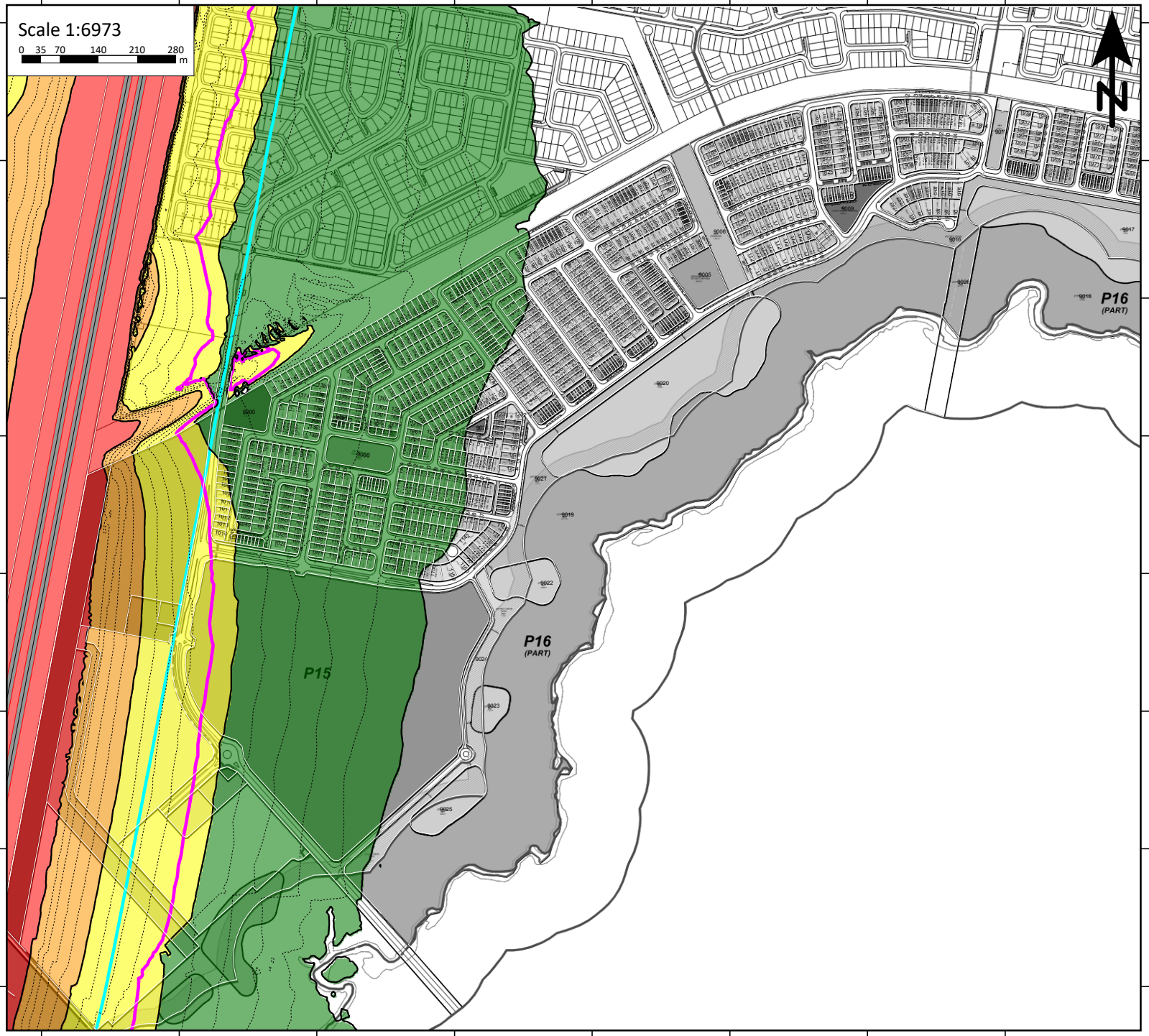
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure C1a.sgs



Bruce Highway
Final Scenario (2037)
First Floor (FF) - Without Barriers
Calculation Height = 4.6 m

Figure

C1b

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour)
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

- <= 57
- 58 - 62 Cat 1
- 63 - 67 Cat 2
- 68 - 72 Cat 3
- >= 73 Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line

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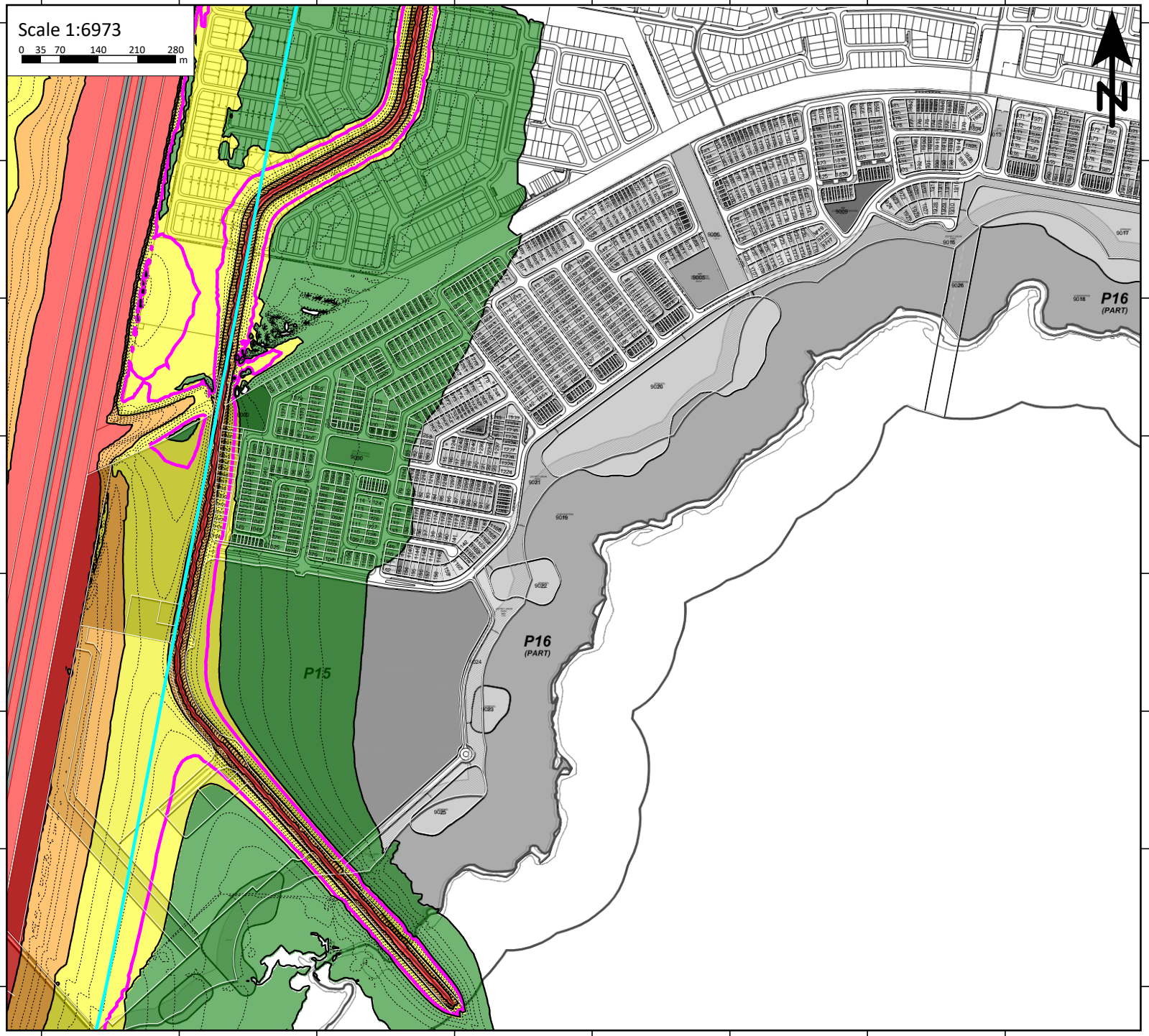
APPENDIX D ROAD NOISE CONTOURS AND BARRIERS (FUTURE YEAR 2037, ALL ROADS, WITH AND WITHOUT BARRIERS)



All roads
Final Scenario (2037)
Ground Floor (GF) - Without Barriers
Calculation Height = 1.8 m

Figure

D1a

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour)
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

- <= 57
- 58 - 62 Cat 1
- 63 - 67 Cat 2
- 68 - 72 Cat 3
- >= 73 Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line

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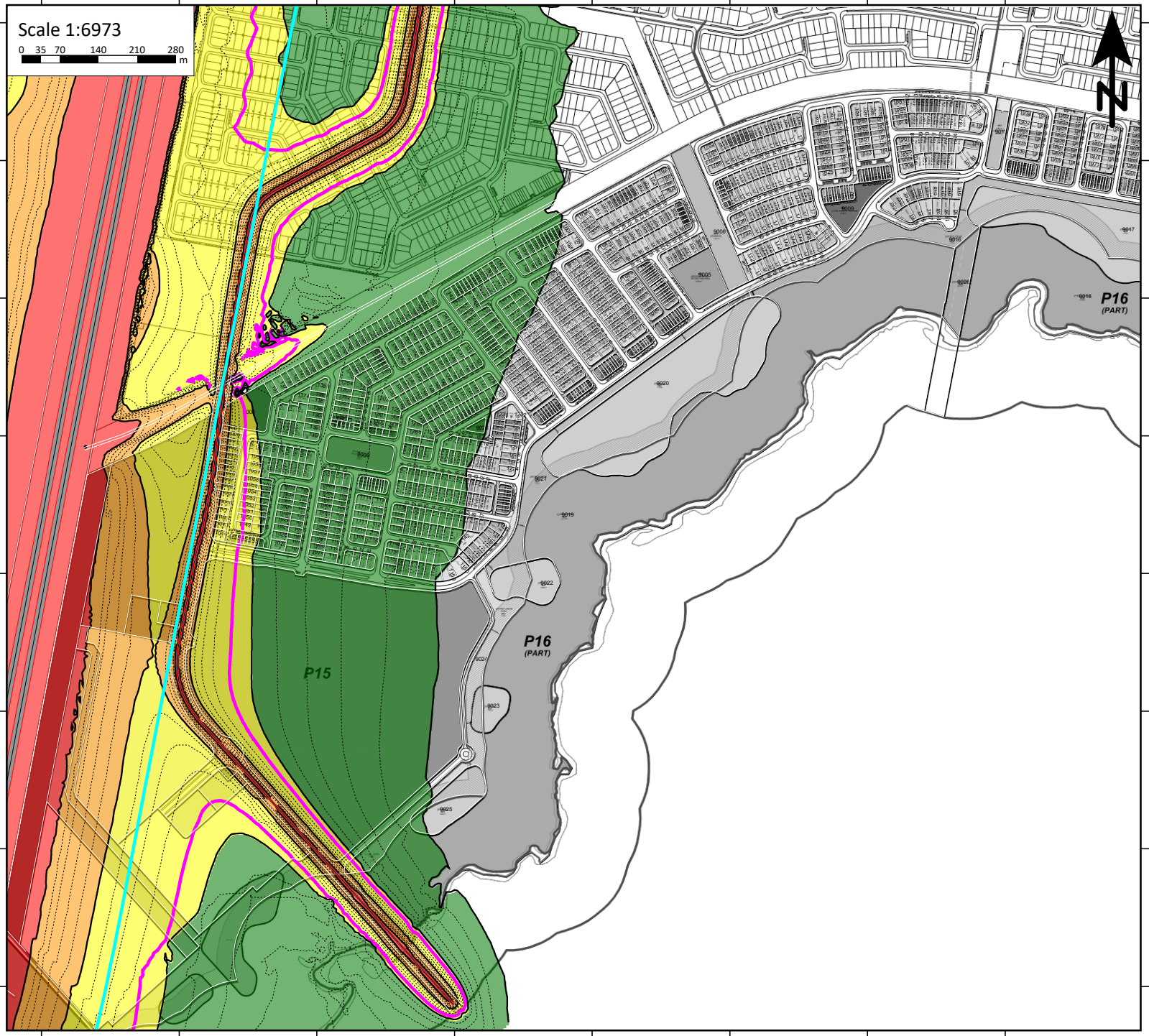
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure D1a.sgs



All roads
Final Scenario (2037)
First Floor (FF) - Without Barriers
Calculation Height = 4.6 m

Figure

D1b

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour)
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

- <= 57
- 58 - 62 Cat 1
- 63 - 67 Cat 2
- 68 - 72 Cat 3
- >= 73 Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line

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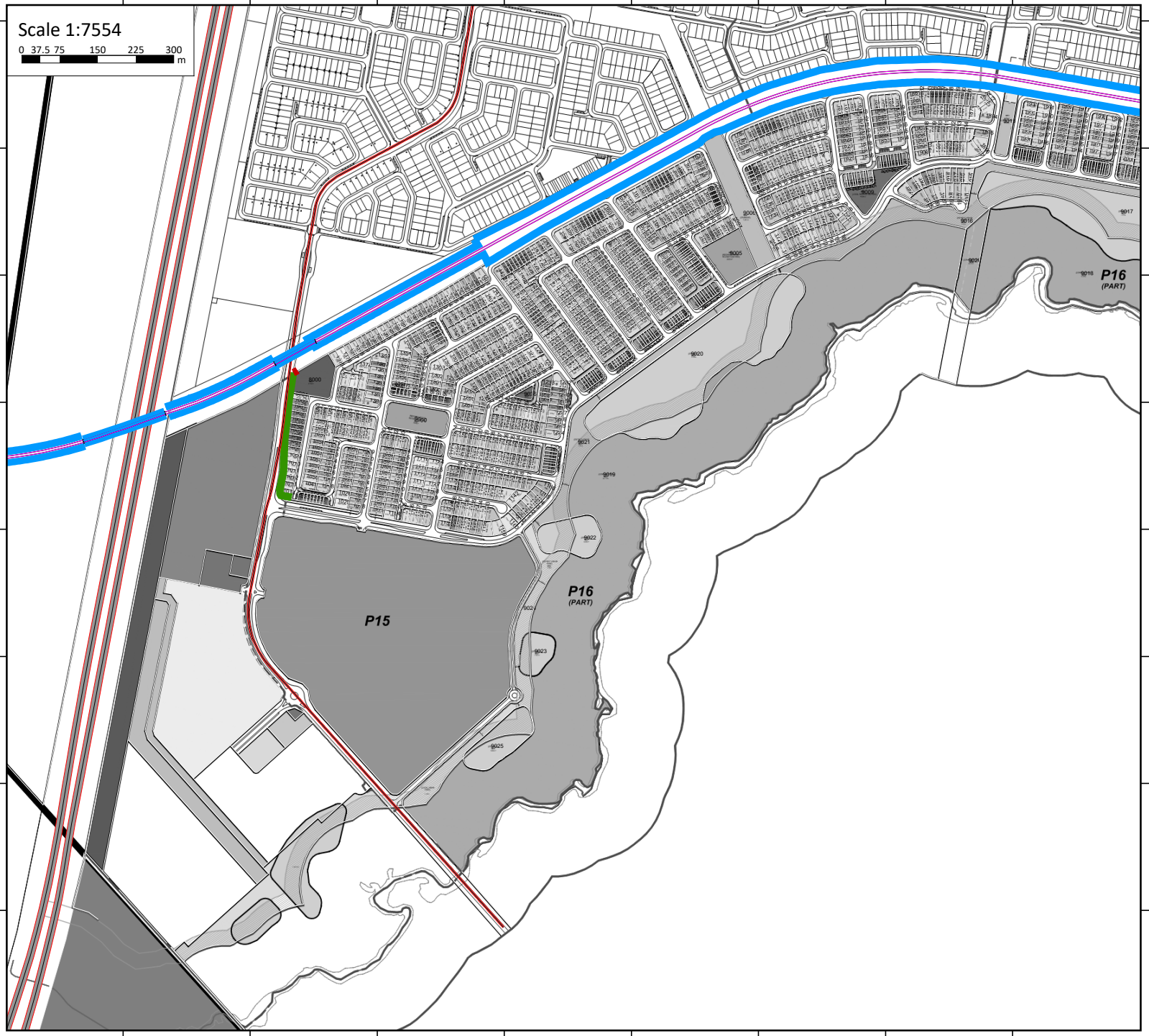
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure D1b.sgs



Barrier placement
Final Scenario (2037)

Figure

D2a

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Signs and symbols

- Road
- Railway
- Emission line
- Bridge
- Bridge wall
- Barrier (2m high)
- Barrier (2.4m high)
- Barrier (2.5m high)

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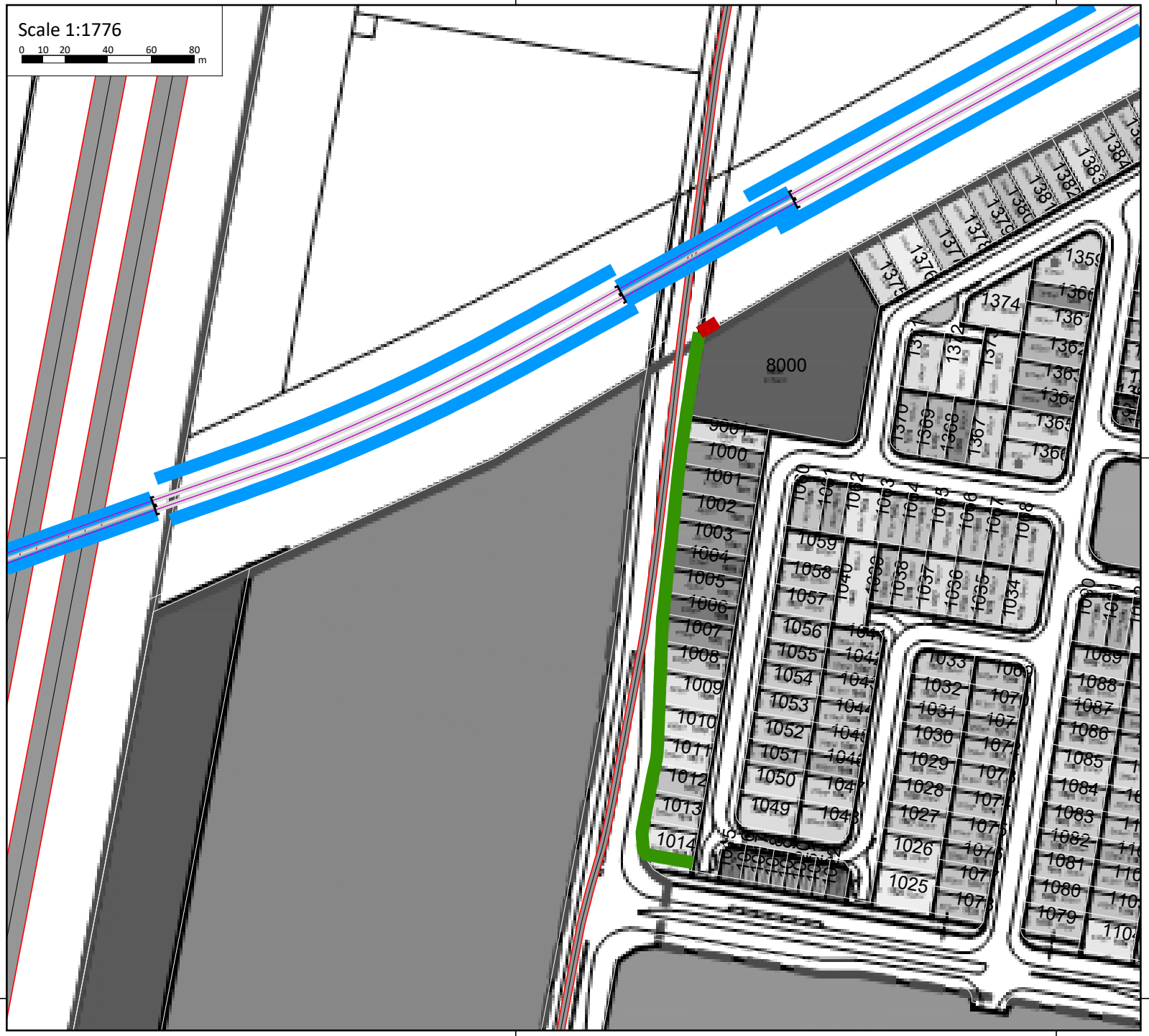
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure D2a.sgs



Barrier placement
Final Scenario (2037)

Figure

D2b

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Signs and symbols

- Road
- Railway
- Emission line
- Bridge
- Bridge wall
- Barrier (2m high)
- Barrier (2.4m high)
- Barrier (2.5m high)

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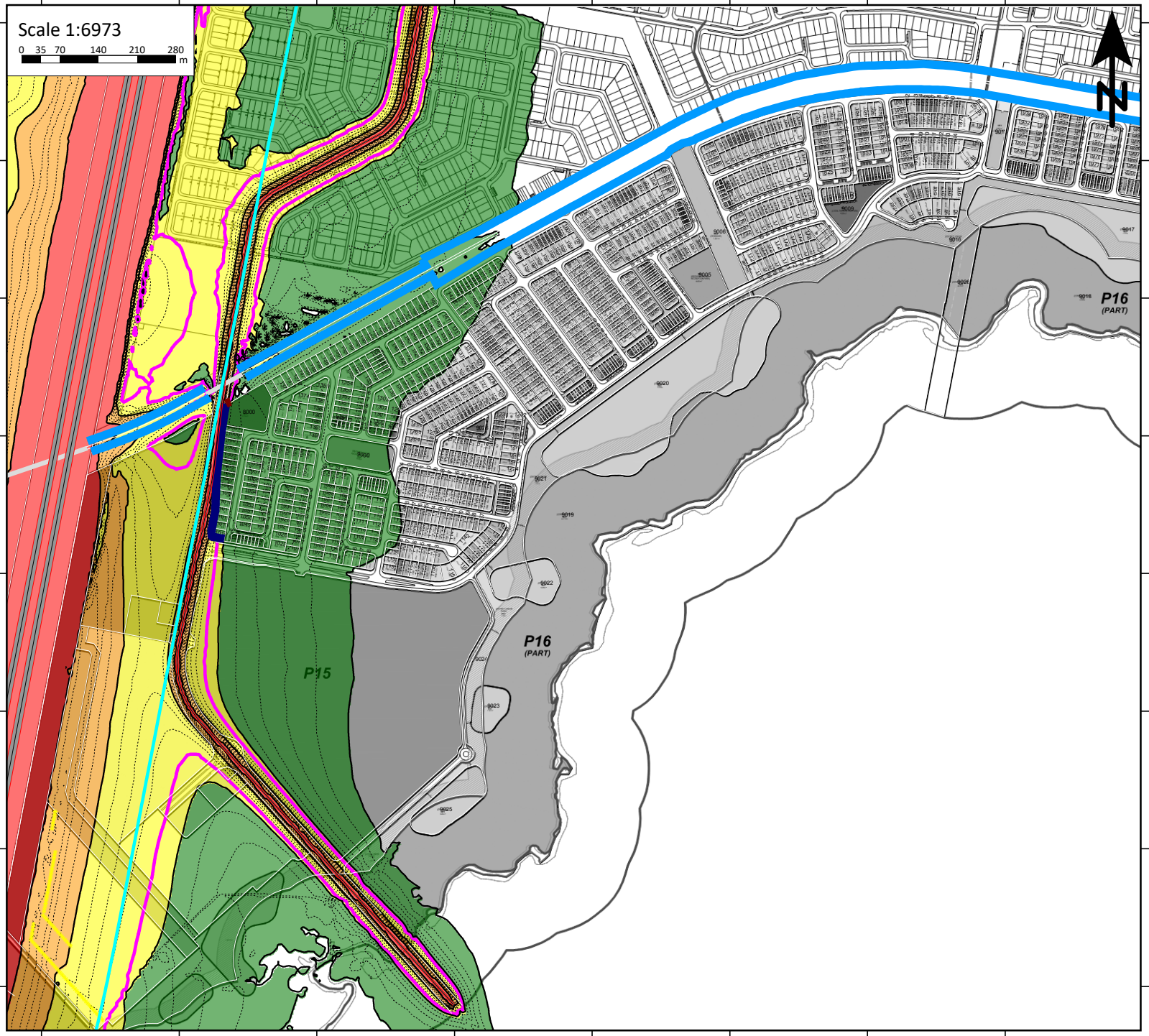

All roads
Final Scenario (2037)
Ground Floor (GF) - With Barriers
Calculation Height = 1.8 m

Figure

D3a

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour)
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

<= 57	
58 - 62	Cat 1
63 - 67	Cat 2
68 - 72	Cat 3
>= 73	Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line
- Barrier (2m high)
- Barrier (2.4m high)
- Barrier (2.5m high)

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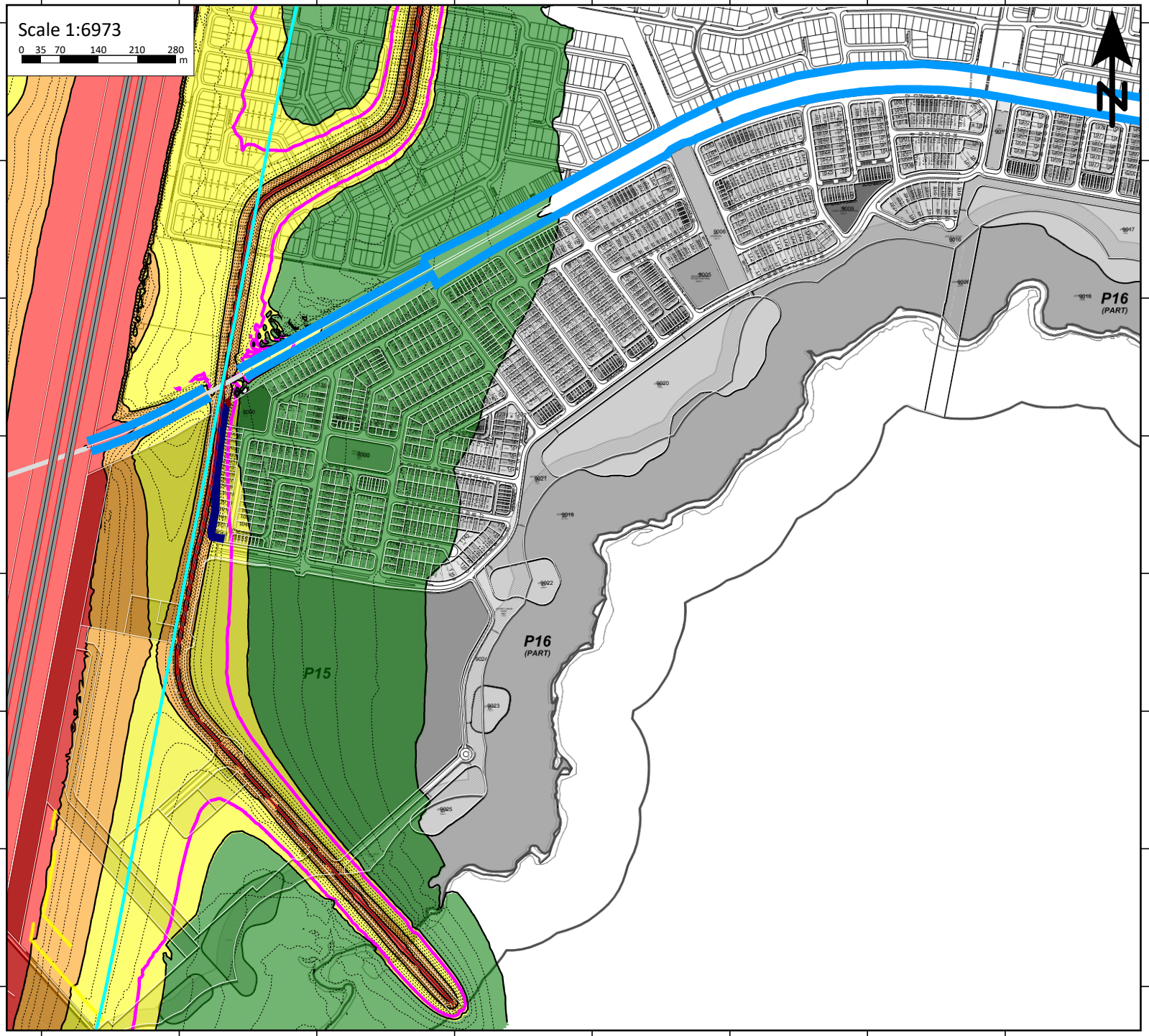
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure D3a.sgs



All roads
Final Scenario (2037)
First Floor (FF) - With Barriers
Calculation Height = 4.6 m

Figure

D3b

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels L10 (18 hour
(Facade Corrected) dB(A)
(+2.5 Facade Correction)
(-1.7 TMR Correction)

<= 57	
58 - 62	Cat 1
63 - 67	Cat 2
68 - 72	Cat 3
>= 73	Cat 4

Signs and symbols

- External Noise Limit (63 dBA L10 (18 Hour))
- Road
- Emission line
- TMR MP4.4 extent line
- Barrier (2m high)
- Barrier (2.4m high)
- Barrier (2.5m high)

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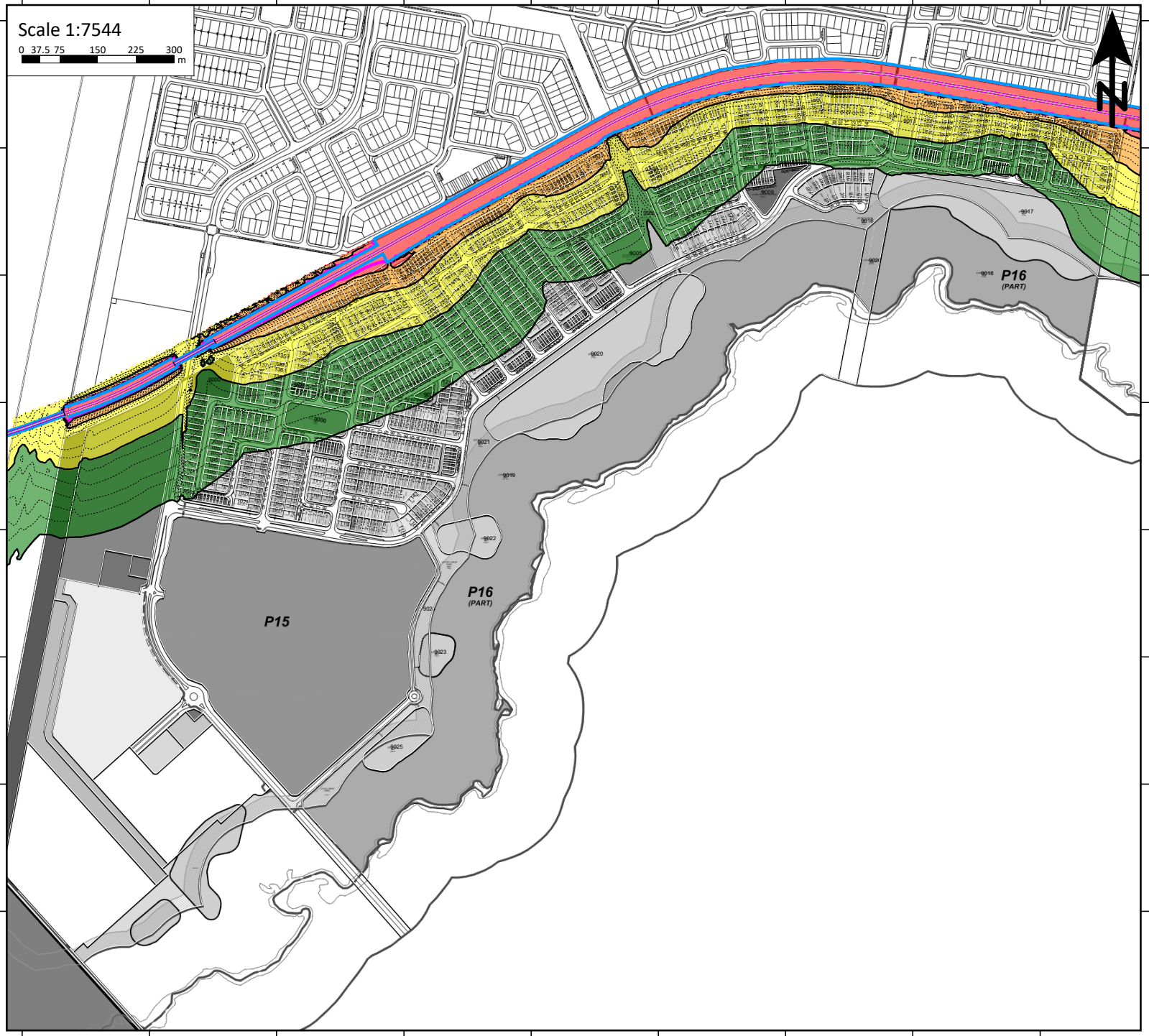
APPENDIX E RAIL NOISE CONTOURS, MP4.4 CATEGORIES AND BARRIERS



CAMCOS Rail Corridor
Final Scenario (2037)
Ground Floor (GF) - With Barriers
Calculation Height = 1.8 m

Figure

E1a

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- External Noise Limit (87 dBA L10 (18 Hour))
- Railway
- Emission line
- Bridge
- Barrier (2.4m high)

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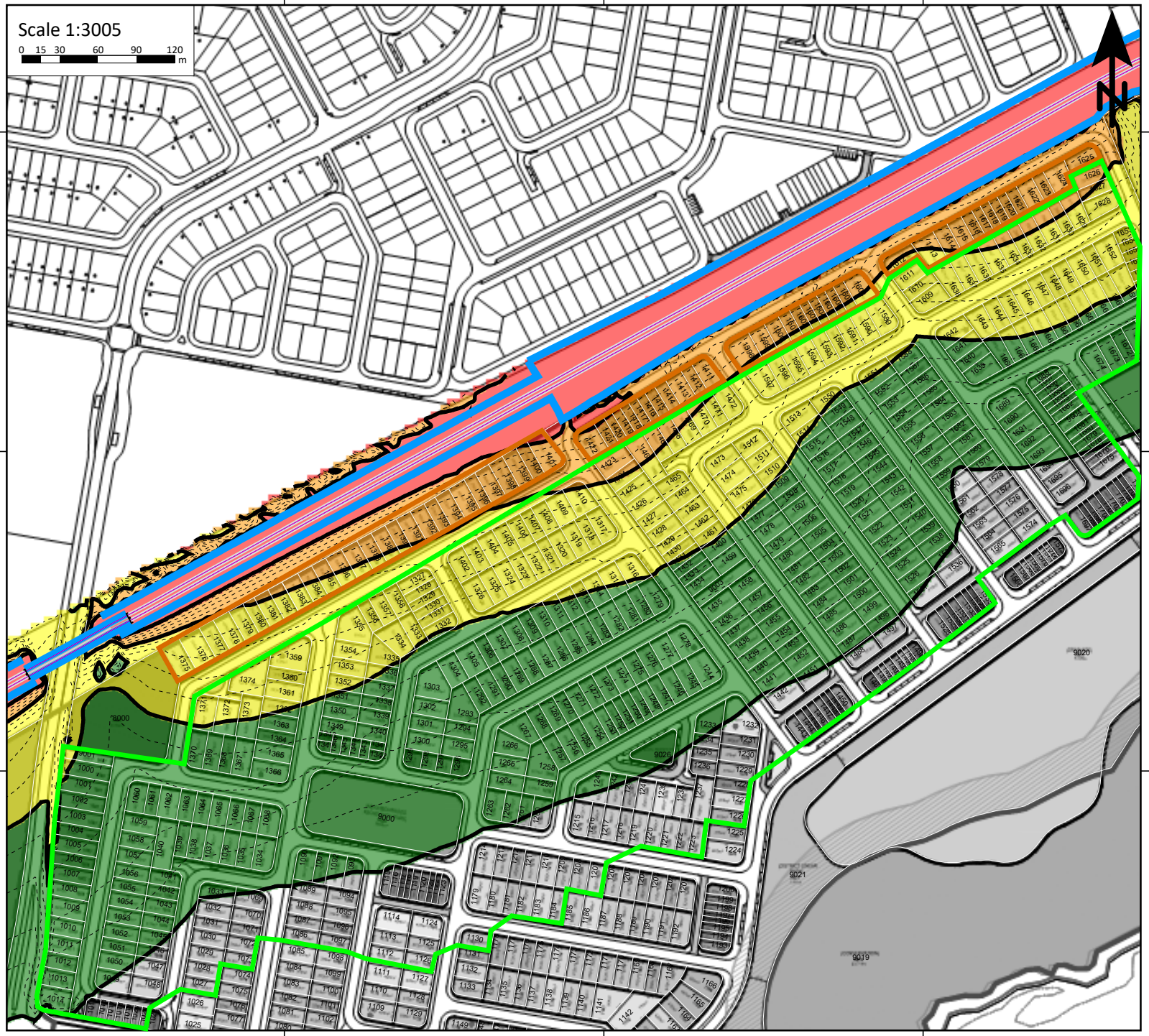
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure E1a.sgs



CAMCOS Rail Corridor
Final Scenario (2037)
Ground Floor (GF) - With Barriers
Calculation Height = 1.8 m

Figure

E1a.1

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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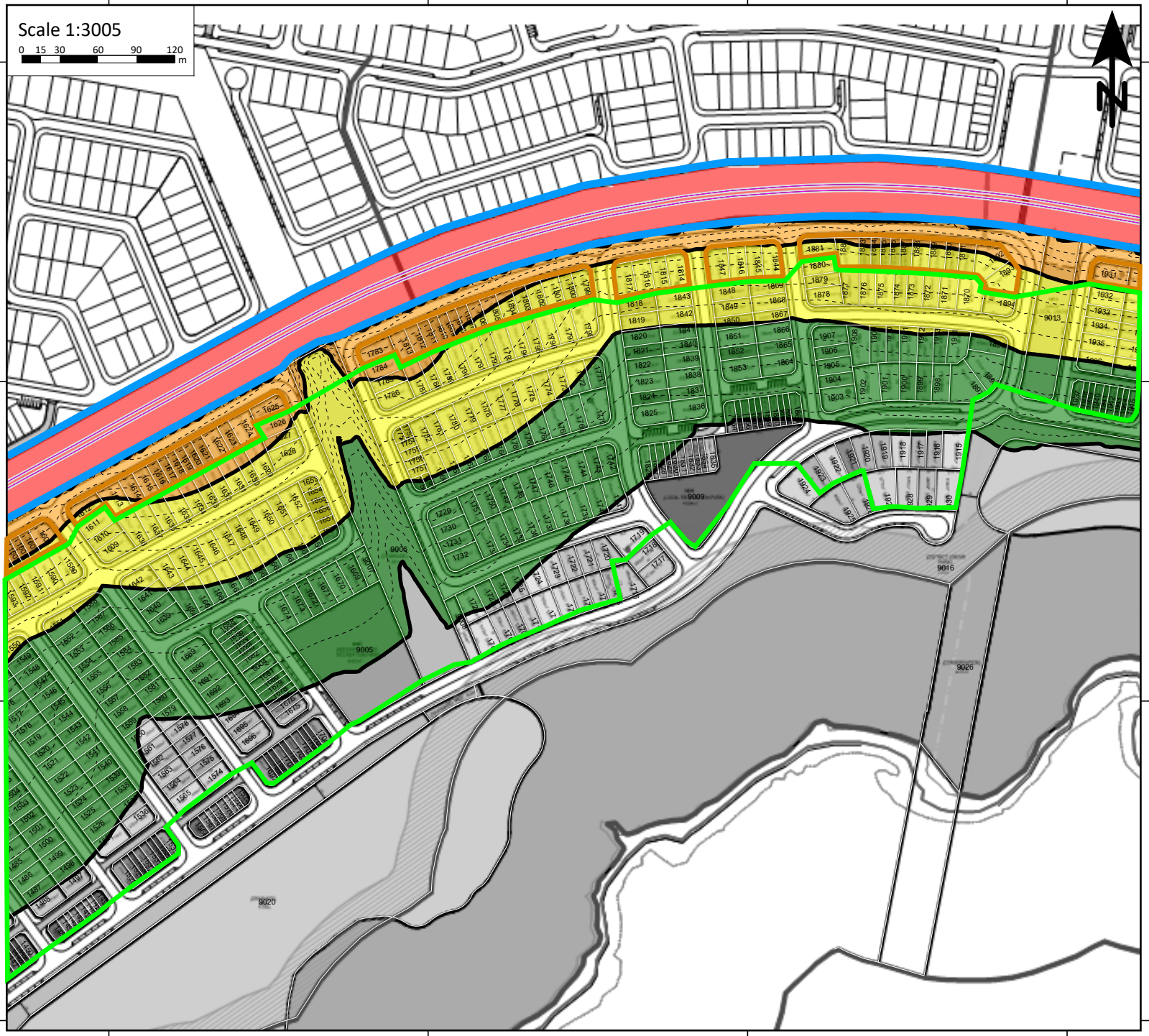
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure E1a1.sgs



CAMCOS Rail Corridor
Final Scenario (2037)
Ground Floor (GF) - With Barriers
Calculation Height = 1.8 m

Figure

E1a.2

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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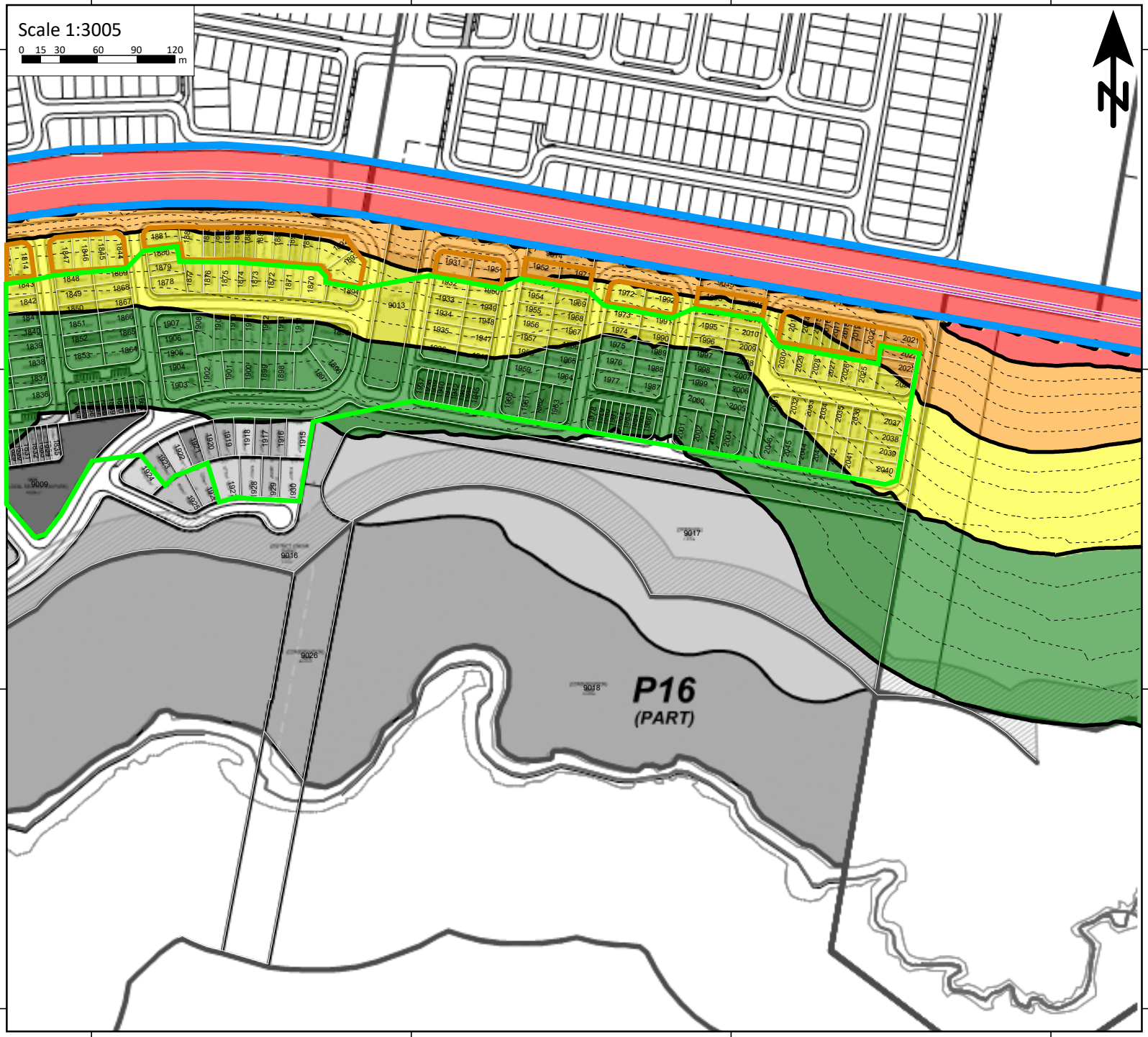
Z:\Large project files\227401\0008 - Aura Subdivision, Precinct 15, SC - Noise\V2_Figure E1a2.sgs



CAMCOS Rail Corridor
Final Scenario (2037)
Ground Floor (GF) - With Barriers
Calculation Height = 1.8 m

Figure

E1a.3

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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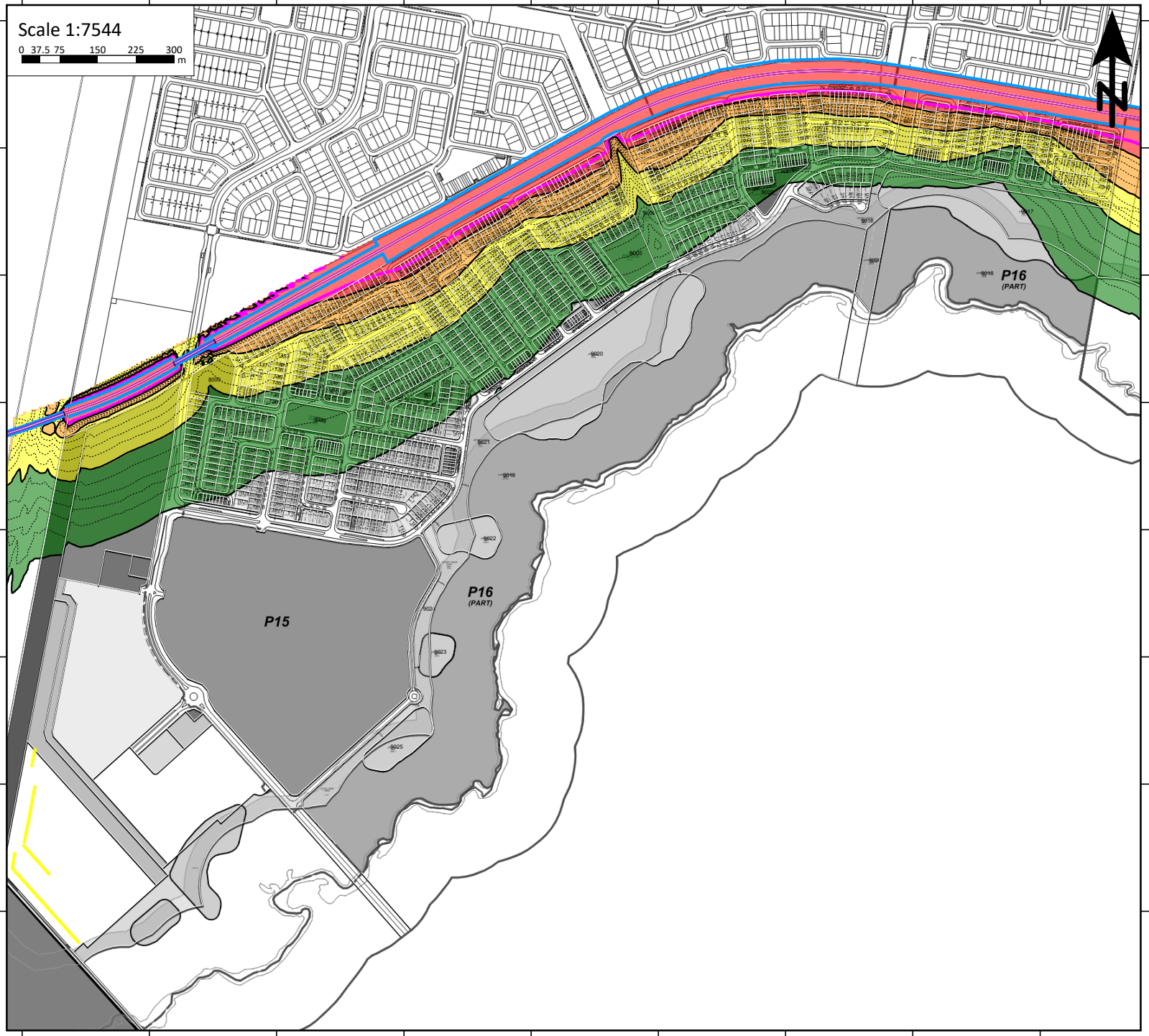

CAMCOS Rail Corridor
Final Scenario (2037)
First Floor (FF) - With Barriers
Calculation Height = 4.6 m

Figure

E1b

Project Number: 227401.0008
Date: 14/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- External Noise Limit (87 dBA Lmax)
- Railway
- Emission line
- Bridge
- Barrier (2.4m high)

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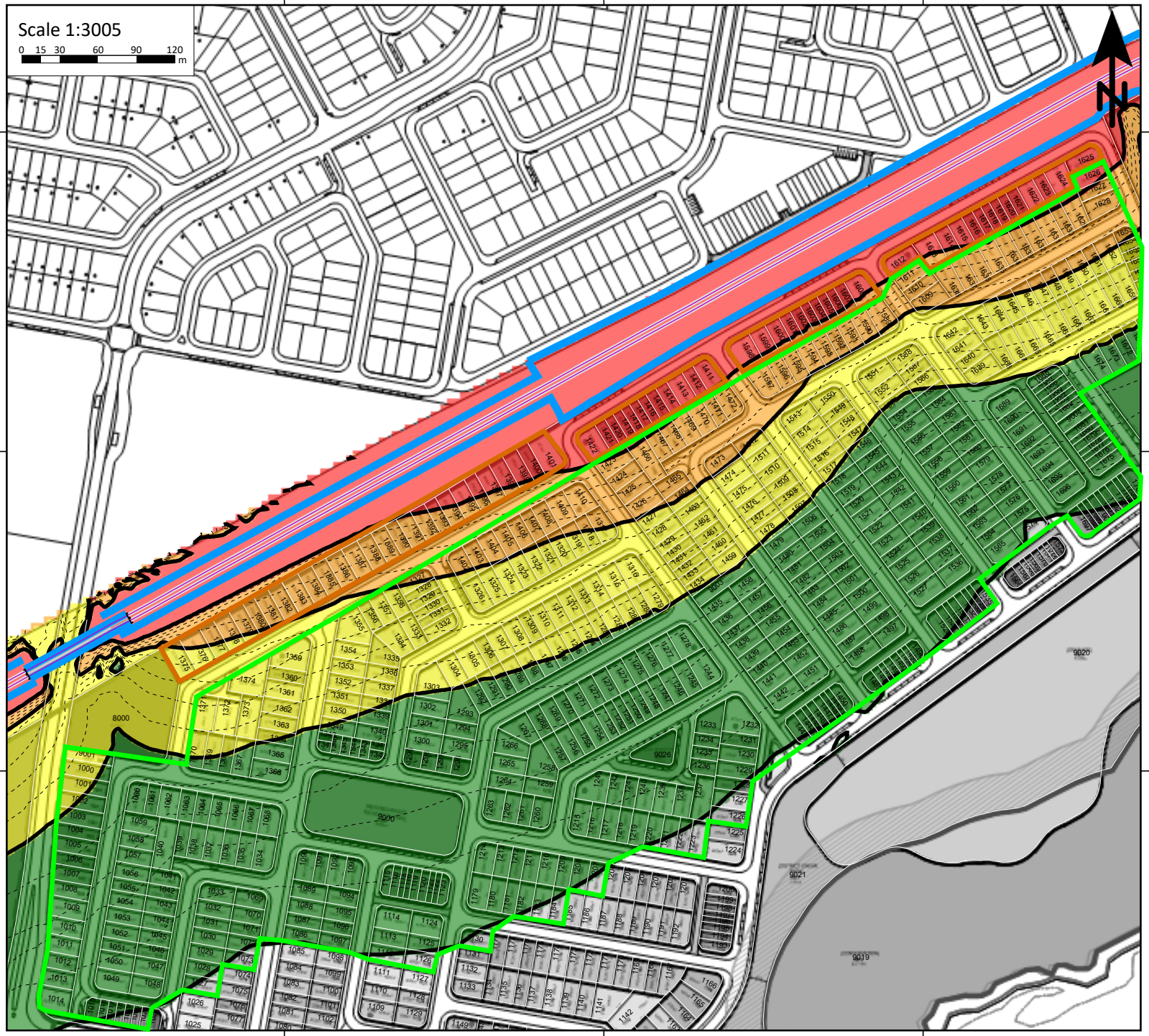

CAMCOS Rail Corridor
Final Scenario (2037)
First Floor (FF) - With Barriers
Calculation Height = 4.6 m

Figure

E1b.1

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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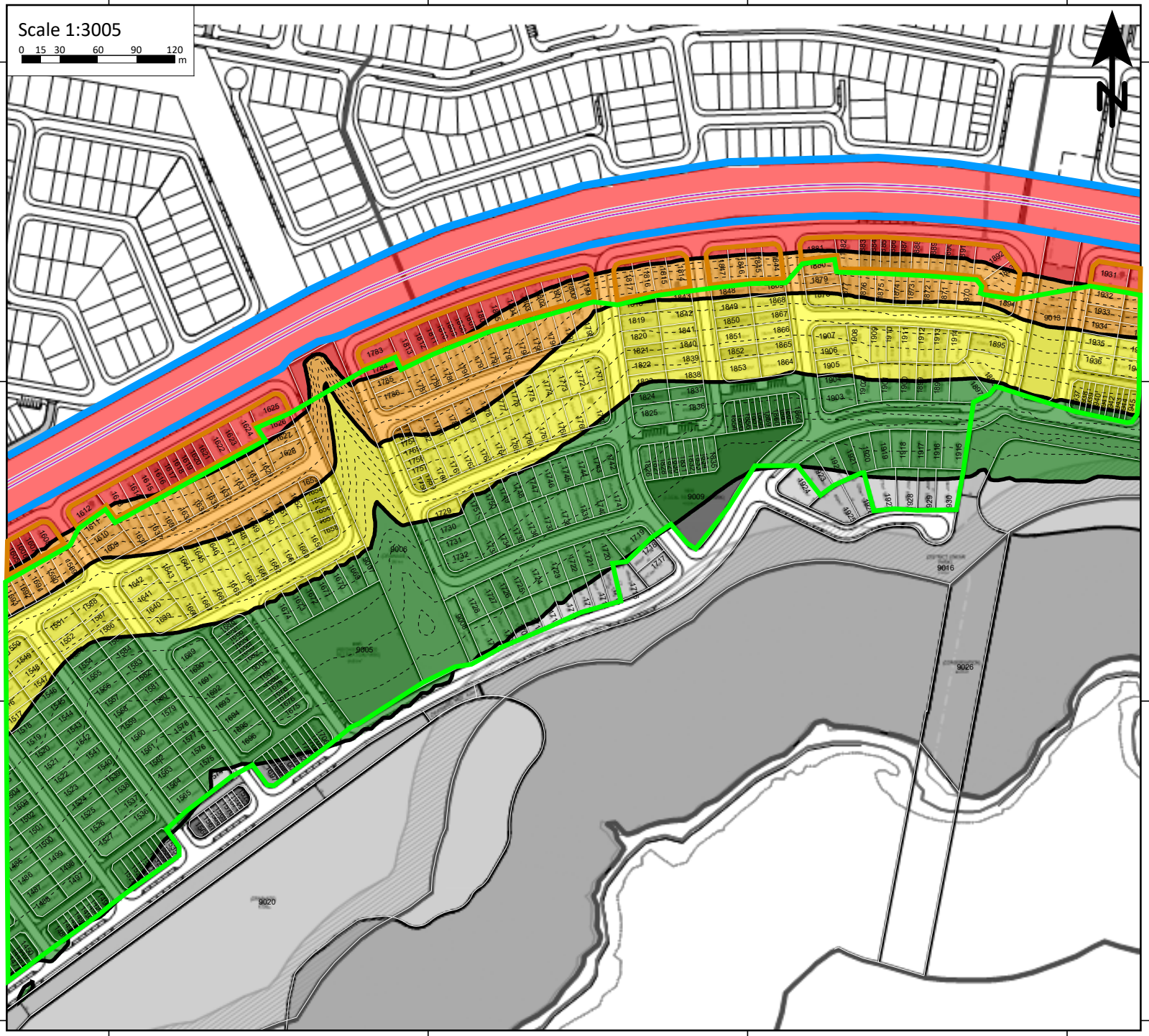

CAMCOS Rail Corridor
Final Scenario (2037)
First Floor (FF) - With Barriers
Calculation Height = 4.6 m

Figure

E1b.2

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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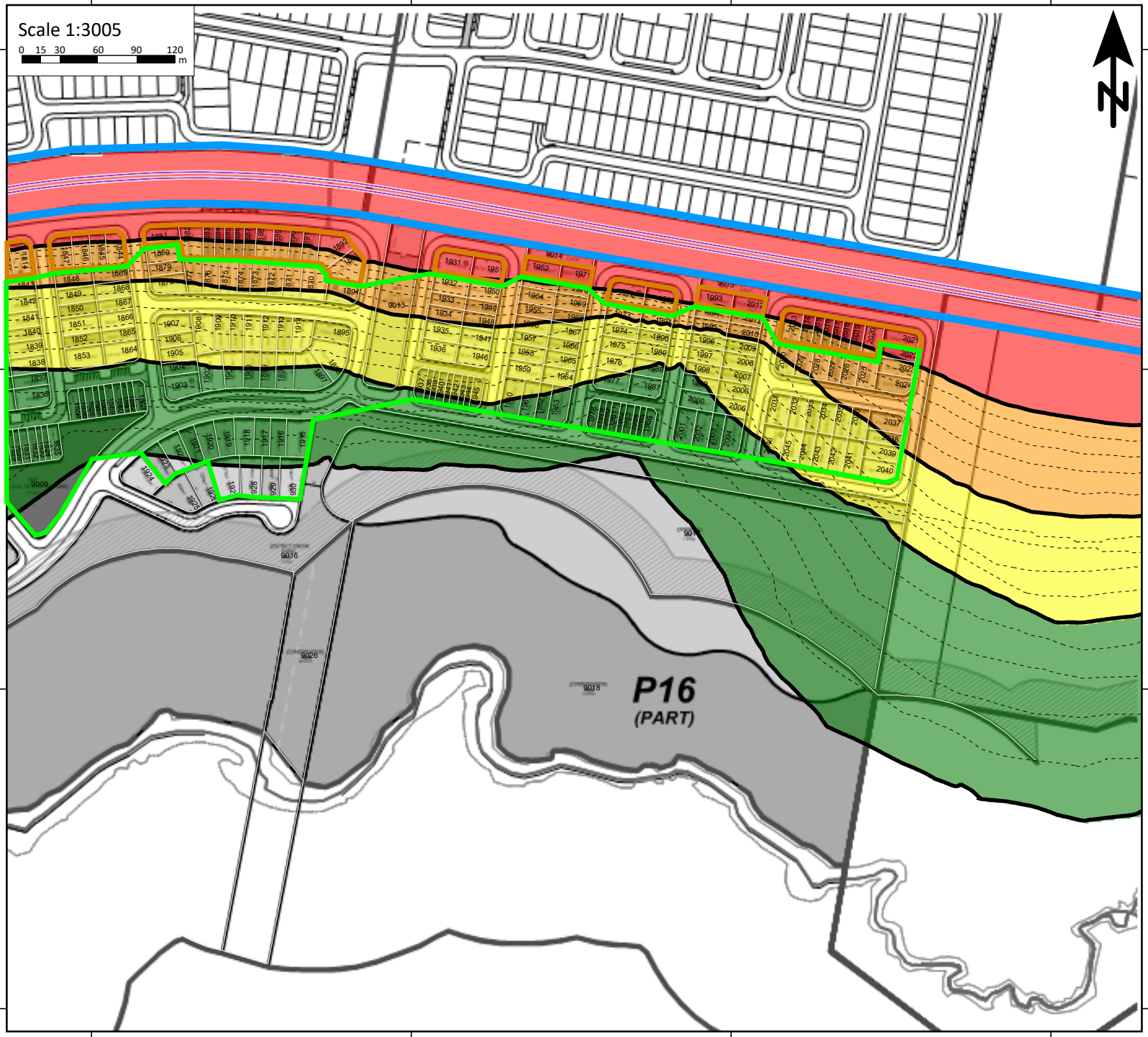

CAMCOS Rail Corridor
Final Scenario (2037)
First Floor (FF) - With Barriers
Calculation Height = 4.6 m

Figure

E1b.3

Project Number: 227401.0008
Date: 15/06/2022
Drawn By: PJ
Prepared For: Stocklands Development

Levels Lmax
(Facade Corrected) dB(A)
(+2.5 Facade Correction)

<= 69	
70 - 74	Cat 1
75 - 79	Cat 2
80 - 84	Cat 3
>= 85	Cat 4

Signs and symbols

- Railway
- Emission line
- Bridge
- Barrier (2.4m high)
- Mandatory MP4.4. Cat 1
- Mandatory MP4.4. Cat 2

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APPENDIX F QDC MP4.4 CONSTRUCTION REQUIREMENTS

Component of Building External Envelope	Minimum Acoustic Rating (R_w)	Acceptable Forms of Construction
Noise Category 4		
Glazing	43	Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter acoustically rated seals.
External walls	52	Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators.
Roof	45	Concrete or terracotta tile or sheet metal roof with sarking, acoustically rated plasterboard ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m^3 in the cavity. OR Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of acoustically rated plasterboard at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m^3 or polyester insulation at least 50mm thick with a density of at least 20kg/m^3 in the cavity.
Floors	51	Concrete slab at least 150mm thick.
Entry doors	35	Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter acoustically rated seals.
Noise Category 3		
Glazing	38 (where total area of glazing for a habitable room is greater than 1.8m^2)	Minimum 14.38mm thick laminated glass, with full perimeter acoustically rated seals; OR Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter acoustically rated seals
	35 (where total area of glazing for a habitable room is less than or equal to 1.8m^2)	Minimum 10.38mm thick laminated glass, with full perimeter acoustically rated seals.
External walls	47	Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m^3 or 50mm thick polyester insulation with a density of 20kg/m^3 in the cavity. OR Two leaves of clay brick masonry at last 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face OR Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and

Component of Building External Envelope	Minimum Acoustic Rating (R_w)	Acceptable Forms of Construction
		(ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m^3 positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. OR Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.
Roof	41	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m^3 or polyester insulation at least 50mm thick with a density of at least 20kg/m^3 in the cavity. OR Concrete suspended slab at least 100mm thick.
Floors	45	Concrete slab at least 100mm thick OR Tongued and grooved boards at least 19mm thick with: (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m^3 positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m^3 laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.
Entry doors	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter acoustically rated seals and constructed of - (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.
Noise Category 2		
Glazing	35 (where total area of glazing for a habitable room is greater than 1.8m^2)	Minimum 10.38mm thick laminated glass, with full perimeter acoustically rated seals.
	32 (where total area of glazing for a habitable room is less than or equal to 1.8m^2)	Minimum 6.38mm thick laminated glass with full perimeter acoustically rated seals.
External walls	41	Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves OR Single leaf of clay brick masonry at last 110mm thick with:

Component of Building External Envelope	Minimum Acoustic Rating (R_w)	Acceptable Forms of Construction
		(i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m3 positioned between studs; and (iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs OR Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face OR Concrete brickwork at least 110mm thick OR In-situ concrete at least 100mm thick OR Precast concrete at least 100mm thick and without joints.
Roof	38	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m^3.
Floors	45	Concrete slab at least 100mm thick OR Tongued and grooved boards at least 19mm thick with: (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m^3 positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m^3 laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.
Entry doors	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter acoustically rated seals and constructed of - (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.
Noise Category 1		
Glazing	27 (where total area of glazing for a habitable room is greater than 1.8m^2)	Minimum 4mm thick glass with full perimeter acoustically rated seals
	24 (where total area of glazing for a habitable room is	Minimum 4mm thick glass with standard weather seals

Component of Building External Envelope	Minimum Acoustic Rating (R_w)	Acceptable Forms of Construction
	less than or equal to 1.8m^2)	
External walls	35	Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs OR Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.
Roof	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
Entry doors	28	Fixed so as to overlap the frame or rebate of the frame, constructed of - (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4kg/m^2; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter acoustically rated seals.
Noise Category 0		
No additional acoustic treatment required – standard building assessment provisions apply.		

Trinity Consultants Australia

BRISBANE

A: Level 3, 43 Peel Street
South Brisbane, QLD 4101
T: +61 7 3255 3355
E: brisbane@trinityconsultants.com

GLADSTONE (Vision Environment)

A: Unit 3, 165 Auckland Street
PO Box 1267
Gladstone, QLD, 4680
T: +61 7 4972 7530
E: office@visionenvironment.com.au

SYDNEY

A: Level 6, 69 Reservoir Street
Surry Hills, NSW 2010
T: +61 2 8217 0706
E: sydney@trinityconsultants.com

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