HALYCON BLU

Western Drive, Banya

Road Traffic Noise Assessment

Stockland

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2023/1405

Date: 27 November 2023

Queensland Government

Date
17 October 2023

Report
227401.0209.R01V03

DOCUMENT CONTROL

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PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL
Approval no: DEV2023/1405
Date: 27 November 2023
Queensland Government

Reference	Date	Description	Prepared	Checked
227401.0209.R01V02	16/05/2023	For issue	Bassam Al-Haddad	Samuel Wong
227401.0209.R01V03	17/10/2023	Updated site layout and barrier location	Bassam Al-Haddad	Samuel Wong

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APPENDICES

1. INTRODUCTION

Trinity Consultants Australia was commissioned by Stockland to provide a traffic noise impact assessment for the proposed Halycon Blu being developed at Western Drive, Banya.

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 were 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 Halycon Blu in P15 of the development. Trinity has previously provided a traffic noise impact assessment concerning Halycon Blu, which has been documented in Trinity Report 227401.0209.R01V02. This report addresses the changes in development design and determines the predicted noise levels at the new lot and barrier locations.

This model is based on the model for P15 west and east for Stockland, it has been used and modified to assess the traffic road noise impact on the development.

Based on previous assessments, no noise impacts are expected from the CAMCOS rail at the site. However, road traffic noise from the north-south trunk collector, the east-west neighbourhood connector and the Bruce Highway are expected to have an impact on the acoustic amenity of the development.

The purpose of this report is as follows:

- Outline the relevant project noise criteria.
- Present the results of noise monitoring.
- Predict and assess the road traffic noise impact onto the development.
- Describe noise mitigation requirements, if any.

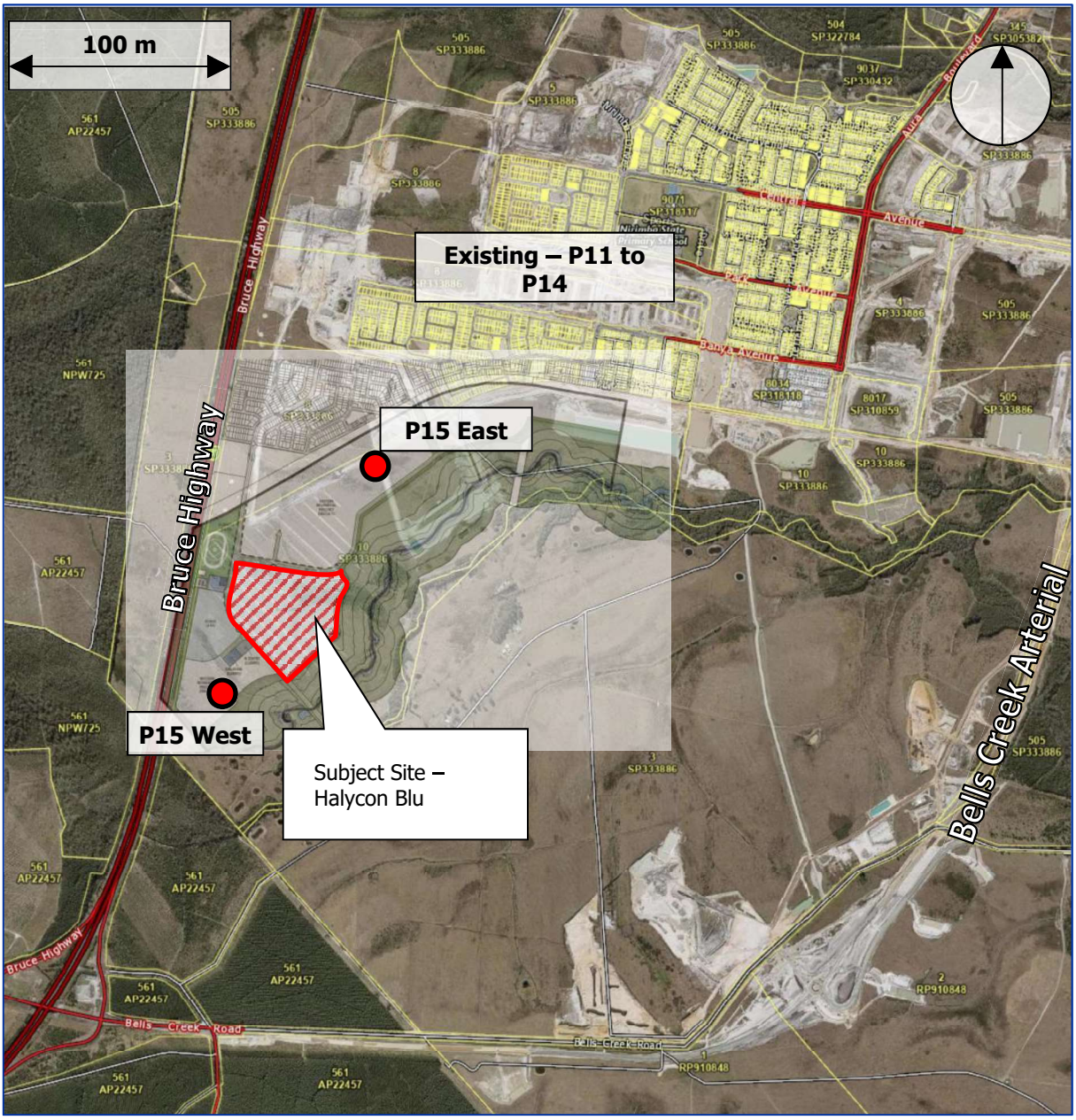
To aid in the understanding of the terms in this report a glossary is included in **Appendix A**.

2. STUDY AREA DESCRIPTION

The proposed development is to be located at Western Avenue, Banya, QLD 4551. The site is irregularly shaped and includes approximately 600m of linear park frontage adjacent to Bells Creek, separated from the development by an esplanade road connection. Moreover, the site is proposed to be bounded by a trunk collector road running north south along the western boundary and a neighbourhood collector road running east west along the northern boundary.

The site location 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**):

- Existing Aura development (P11 to P14) to the north.
- Future residential development to the immediate north.

- Future residential development including a small neighbourhood retail centre to the west.
- 100m wide conservation area to Bells Creek South to the south and east.
- Bruce Highway further to the west (approximately 280 metres away).
- Cleared land and future precincts to the south, along with Bells Creek Arterial Road (under construction).

The proposed development is impacted upon by road traffic noise, and this is required to be considered in the project design.

3. PROPOSED DEVELOPMENT

The proposed development includes the following components:

- Residential dwellings – Between 420 and 500 dwellings in total.
- Clubhouses and associated facilities for future residents, including:
  - Gyms
  - Wellness Centre
  - Hobby / Arts facilities
  - Lawn Bowls Court
  - Pickle Ball Courts
  - Swimming pool

The proposed building plans are included in **Figure 3.1**.

Figure 3.1: Site Masterplan

Based on the proposed site layout and building shielding, noise from the driveway and carparking is not considered to be significant, and is therefore not addressed further in this report.

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'.
- 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; c. Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020.

Performance Outcomes	Acceptable Outcomes
	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 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013

Performance Outcomes	Acceptable Outcomes
	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 drainage purposes to comply with the Building Code of Australia);	No acceptable outcome is provided.

Performance Outcomes	Acceptable Outcomes
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 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013;	No acceptable outcome is provided.

Performance Outcomes	Acceptable Outcomes
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 2.2: Private open space for an accommodation activity (including lots created for a future accommodation activity)	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))
2.3: 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 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, 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 4.4**.

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. 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)

4.4 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.

4.5 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. The recommended design levels are as listed in **Table 4.5**.

Table 4.5: Recommended Internal Noise Levels from AS 2107:2106

Type of Occupancy / Activity	Design Sound Level ($L_{Aeq,t}$) Range
Leisure centre and gaming	40 to 50
Indoor sports – with coaching	< 45

Type of Occupancy / Activity	Design Sound Level ($L_{Aeq,t}$) Range
Art/craft studios	40 to 45
Manual arts workshops	< 45
Dwelling near major road – Living areas	35 to 45
Dwelling near major road – Sleeping areas	35 to 40
Dwelling near major road – Work areas	35 to 45
Dwelling near minor road – Living areas	30 to 40
Dwelling near minor road – Sleeping areas	30 to 35
Dwelling near minor road – Work areas	35 to 40

4.6 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 & Northbound 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 & Northbound Road (Council controlled roads):

- Road traffic noise from both State and Council controlled roads – follow the process advised by Council in **Section 4.4**.

It is noted the Bruce Highway is not of a sufficient level to trigger QDC MP4.4 (due to distance), therefore, internal design levels are to be specified in accordance with AS/NZS 2107.

5. ROAD TRAFFIC NOISE ASSESSMENT

5.1 Overview

For the purposes of this project, the noise assessment will consider contribution from both the state controlled roads and council controlled roads.

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

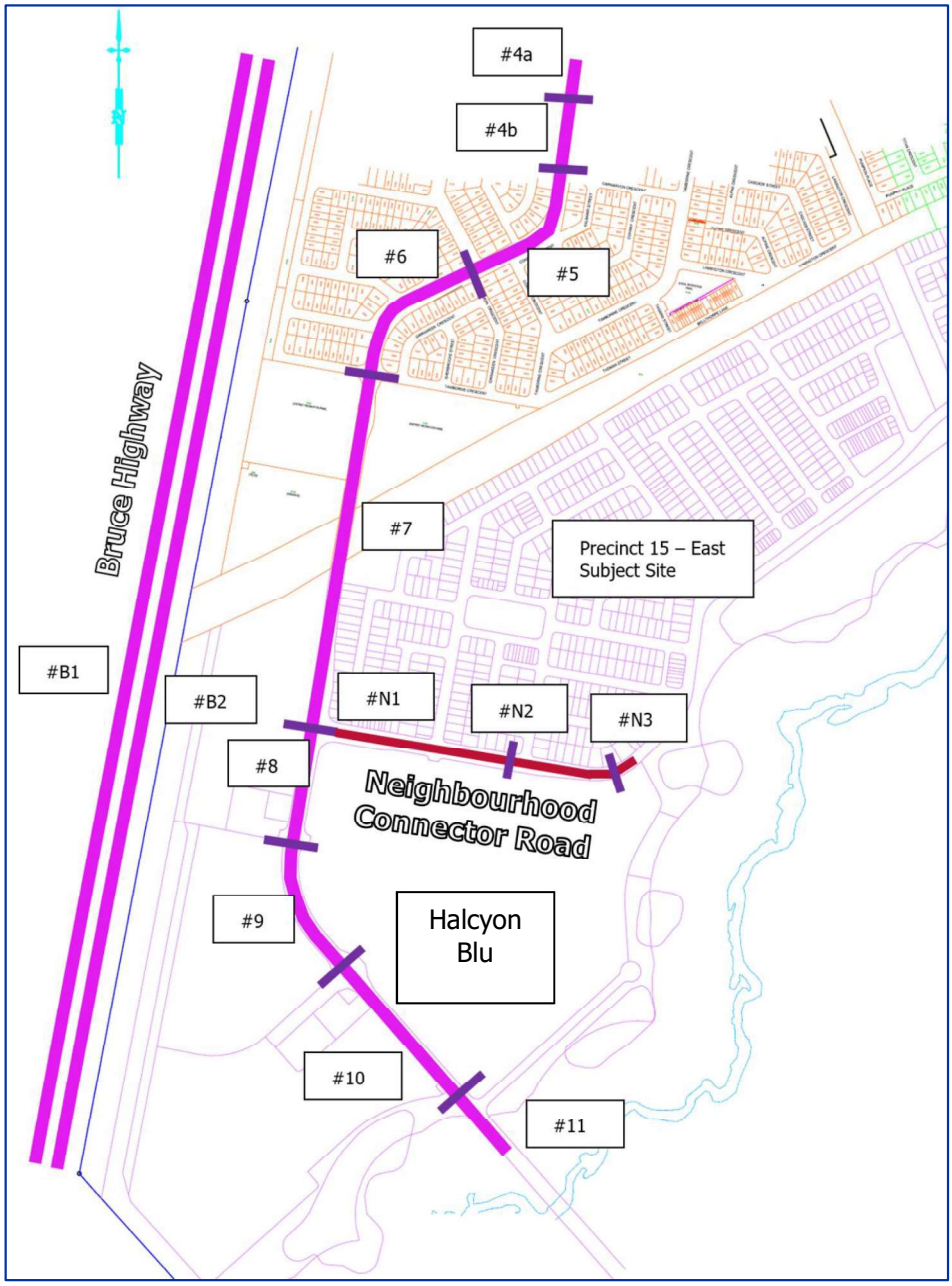
Segment	Road / Section	Direction	Predicted Year 2037 Traffic Volumes		Heavy Vehicles (HV%)	Speed (km/h)
			AADT	18 hours (6am to midnight)		
4a	Internal (Trunk Connector) Road – Section 4a	Both	13352	12284	3	60
4b	Internal (Trunk Connector) Road – Section 4b	Both	9929	9134	3	60
5	Internal (Trunk Connector) 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

Similarly, the 18-hour traffic volumes for the Northern Neighbourhood Connector (refer to **Figure 5.1**) can be found in **Table 5.3**.

Table 5.3: Northern Neighbourhood Connector Road Year 2037 Traffic Data

Segment	Direction	Predicted Year 2037 Traffic Volumes		Heavy Vehicles (HV %)	Speed (km/h)
		AADT	18 Hours (6am to Midnight)		
N1	Both	6461	5944	3	60
N2	Both	5267	4846	3	60
N3	Both	3784	3481	3	60

Figure 5.1: Road Segments



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 Egis Group on 13/10/2023. The noise bund / earth berm adjacent to the Bruce Highway was included for the purposes of this assessment.
- Receiver heights for the proposed lots were 1.935m above bulk earthworks level for ground floors. This includes 435mm on top of bulk earthworks to represent the finished floor level, plus 1.5m about FFL to consider the receptor height.
- 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 and Assessment

5.5.1 Overview

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

- Noise from all roads (2037) – No boundary barriers
- Noise from all roads (2037) – With boundary barriers (2.0 m – 2.5 m barrier, refer to **Appendix B.1**).

Results are presented and assessed in the following sections.

5.5.2 Noise from All Roads (2037) – No Noise Barriers

Predicted noise level contours for this scenario are shown in **Appendix B.2**. As can be seen, the first row of housing along the northern and southwestern boundaries of the site are predicted to exceed the Council 63 dBA façade limit. Furthermore, the noise contours shown in **Appendix B.4** demonstrate compliance with the 60 dBA TMR outdoor limit (equivalent to 63 dBA façade limit).

5.5.3 Noise from All Roads (2037) – With Noise Barriers

Predicted noise level contours for this scenario are shown in **Appendix B.3**. The noise contours show an improvement to the number of houses above 63 dBA (and therefore, requiring acoustic-rated construction). Houses where the noise levels exceed 63 dBA are located along the northern boundary of the site.

5.6 Construction Material Requirements

For buildings where noise levels are above the 63 dBA limit, construction materials need to be selected according to:

- AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors
- AS 3671 Acoustics – Road traffic noise intrusion – Building siting and construction

AS 2107 specifies recommended internal design sound levels, while AS 3671 provides the methodology for calculating acoustic ratings for construction materials (based on the predicted traffic noise levels and AS 2107 internal design levels).

Based on **Figure B.3**, the rear (northern facades) of some houses along the northern boundary are predicted to experience noise levels above 63 dBA.

The modelling is based on ground contours provided by Egis Group on 13 October 2023. It is recommended that the modelling be updated should there be any changes to finished design levels, including pad levels and retaining walls.

6. BARRIER CONSTRUCTION

The proposed noise barrier/s may be constructed in accordance with a number of alternative designs including via 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 recommended barrier placement and heights can be found in **Appendix B.1**.

7. RECOMMENDATIONS AND CONCLUSION

A road traffic noise assessment has been conducted for the proposed Halycon Blu development at Western Drive, Banya. The results and recommendations of the assessment are as follows:

- The relevant noise criteria for the project are listed in **Section 4**. For the purposes of this project, the assessment will consider all state and council roads, which requires a AS3671 assessment when the lots are exposed to noise levels of 63 dBA or higher.
- The following scenarios have been considered for this project:
  - Noise from all roads (2037) – No boundary barrier.
  - Noise from all roads (2037) – With boundary barrier.
- When no barrier is present, the first row of lots along the northern and southwestern boundaries of the site are above the Council 63 dBA limit and require acoustic rated construction. When a 2.0-2.5 m high barrier is present (as per **Appendix B.1**), there is an improvement in noise levels, with facades along first row housing along the northern boundary of the site requiring acoustic-rated construction.
- It is noted that building layouts have not been finalized, which are required for AS3671 assessments. Houses where noise levels exceed 63 dBA will require further acoustic review to determine construction materials in accordance with AS 3671 and AS 2107.
- Barrier placement and heights are shown in **Appendix B.1**. 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.
- It is recommended that the modelling be updated should there be any changes to finished design levels, including pad levels and retaining walls.

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 NOISE CONTOUR MAPS

Scale 1:2528

0 12.5 25 50 75 100 m

Barrier Locations

Figure

B.1

Project Number: 227401.0008
Date: 17/10/2023
Drawn By: BAH
Prepared For: Stocklands Development

Signs and symbols

- Barrier (2.5m)
- Barrier (2m)

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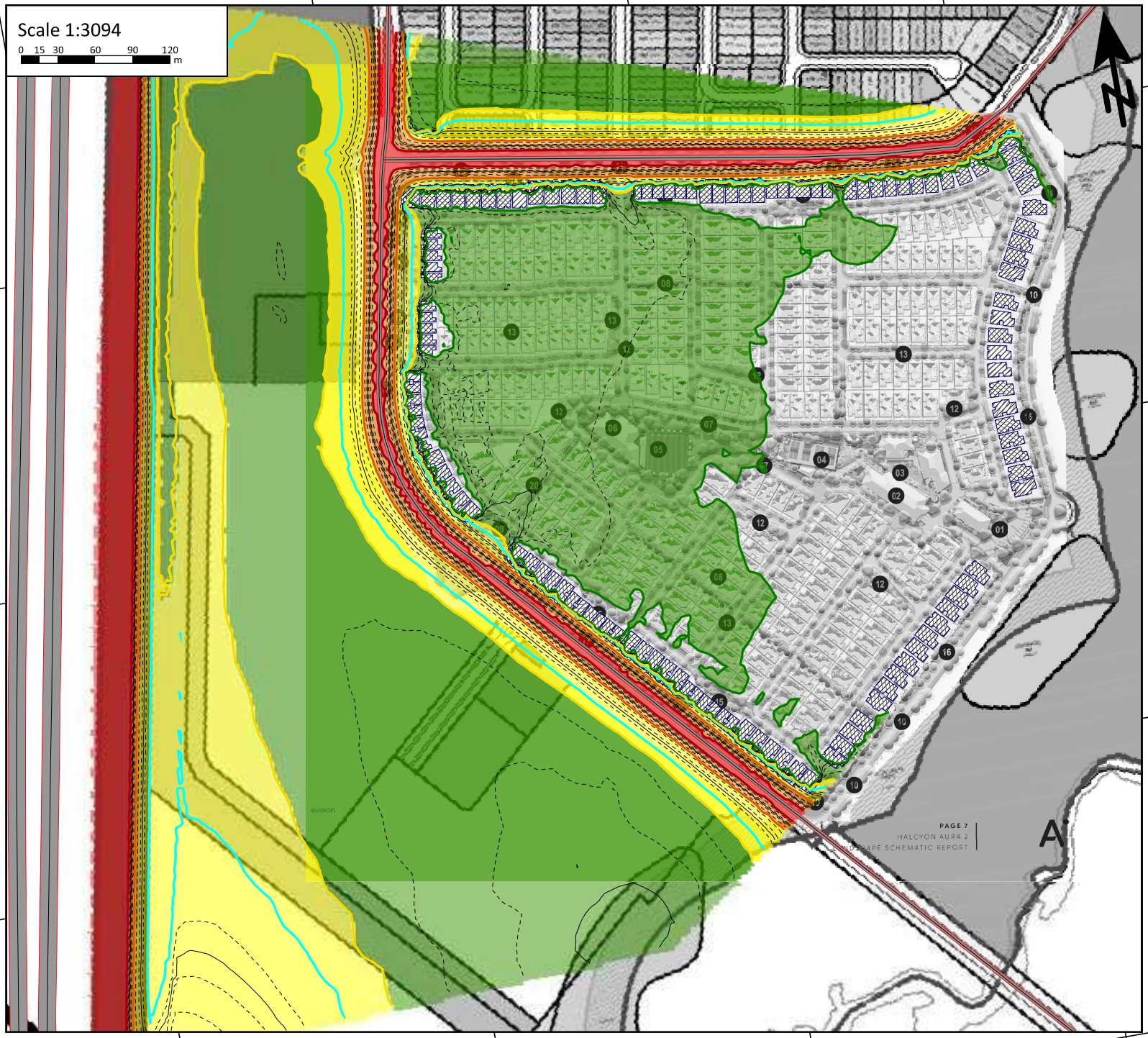

Halcyon Blu (P15)
All Roads (2037 Traffic Counts)
Ground Floor (GF) - No Barriers
Calculation Height - 1.935m

Figure

B.2

Project Number: 227401.0008
Date: 17/10/2023
Drawn By: BAH
Prepared For: Stocklands Development

Levels L10 (18 hr)
(Facade Corrected) dB(A)
- 58 - 62
- 63 - 67
- 68 - 72
- = 73

Signs and symbols
- Road
- Council Limit (63 dBA L10 (18 Hour))
- Building

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Halcyon Blu (P15)
All Roads (2037 Traffic Counts)
Ground Floor (GF) - With All Barriers
Calculation Height - 1.935m

Figure

B.3

Project Number: 227401.0008
Date: 18/10/2023
Drawn By: BAH
Prepared For: Stocklands Development

Levels L10 (18 hr)
(Facade Corrected) dB(A)

- 58 - 62
- 63 - 67
- 68 - 72
- = 73

Signs and symbols

- Road
- Council Limit (63 dBA L10 (18 Hour))
- Building
- Barrier (2.5m)
- Barrier (2m)

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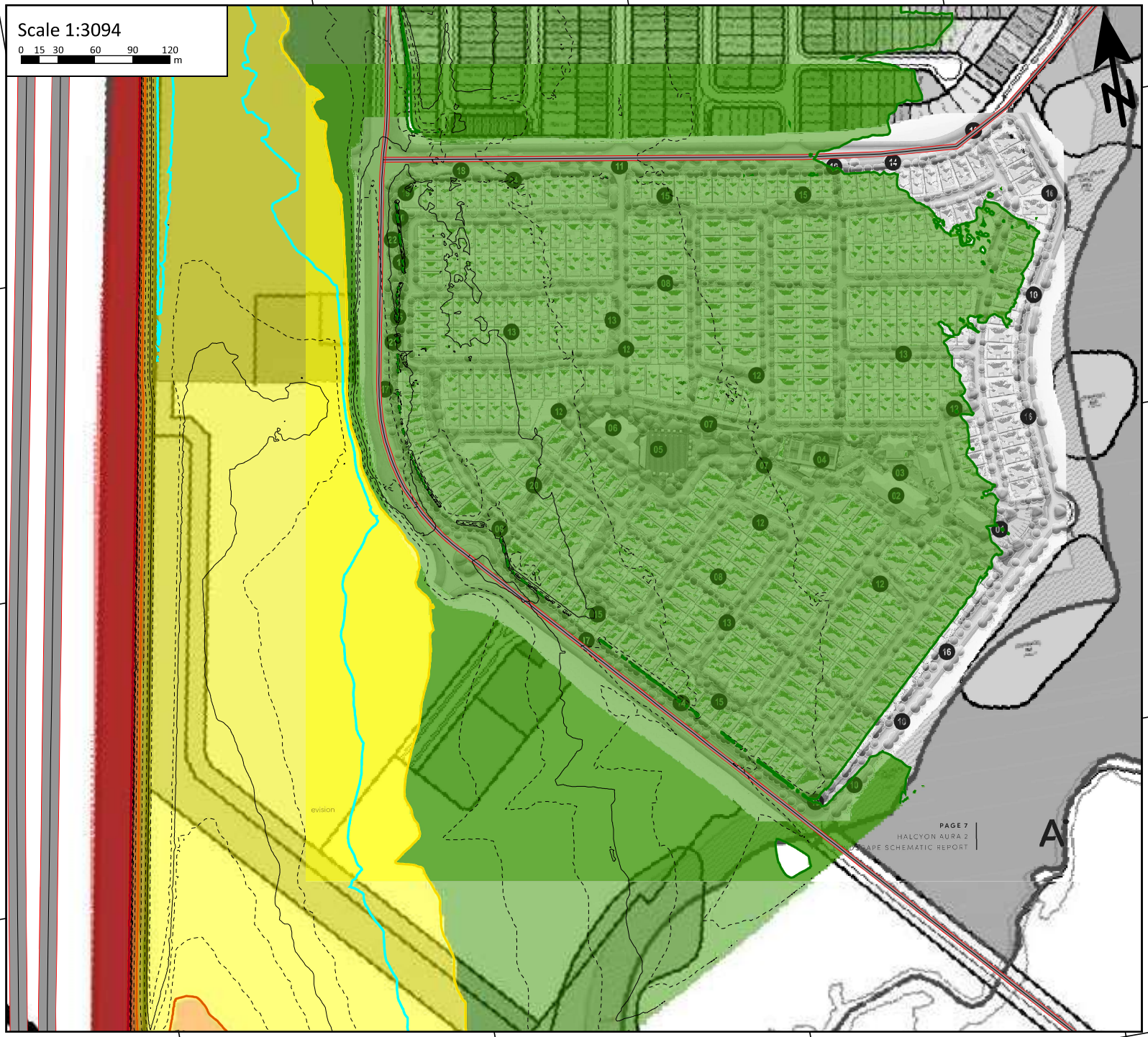

Halcyon Blu (P15)
Bruce Highway Only (2037 Traffic Counts)
Ground Floor (GF) - With All Barriers
Calculation Height - 1.8m

Figure

B.4

Project Number: 227401.0008
Date: 18/10/2023
Drawn By: BAH
Prepared For: Stocklands Development

Levels L10 (18 hr)
(Facade Corrected) dB(A)
- 58 - 62
- 63 - 67
- 68 - 72
- = 73

Signs and symbols
- Road
- TMR Outdoor Limit (63 dBA L10 (18 Hour))

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