



Our Ref: Q184103:L002.01
Contact: Daniel Favier

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SARA Office Cairns
PO Box 2358
Cairns Qld 4870

Via email: cairnsSARA@dndmip.qld.gov.au

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

15 Scott Street
Paramatta Park
Cairns QLD 4870
Australia

Phone +61 7 4034 0500
Fax +61 7 4051 0133

www.cardno.com

YOUR REF: 1901-9440 SRA

RESPONSE TO STATE REFERRAL INFORMATION REQUEST FOR DEVELOPMENT APPLICATION SEEKING A DEVELOPMENT PERMIT FOR RECONFIGURING A LOT (1 LOT INTO 32 LOTS PLUS NEW ROAD, BALANCE LOT, DRAINAGE LOT AND PARK) OVER LAND ON THE CAPTAIN COOK HIGHWAY FORMALLY DESCRIBED AS LOT 2 ON SR431

We confirm that 'Cardno (Qld) Pty Ltd' have been engaged to act on behalf of 'Port Douglas Land Developments Pty Ltd' (the 'Land Owner' and 'Applicant').

Pursuant to Part 3 of the Development Assessment Rules, on behalf of the Applicant please find enclosed a copy of the Noise Impact Assessment which comprises the full response to the Information Request issued by the Department of State Development, Manufacturing, Infrastructure and Planning on the 15 February 2019.

Due to Flood Modelling, in the north around the proposed drainage reserve, a noise barrier consisting of an acoustic fence only (no mounding) is proposed along a short extent. The balance noise barrier will likely consist of a standard mound and fence design.

Should you wish to discuss the Development Application, or require further information please contact the undersigned.

Yours sincerely,

Daniel Favier
Senior Planner
for Cardno
Direct Line: 07 4034 0503
Email: daniel.favier@cardno.com.au

Enc: Noise Impact Assessment

cc: Douglas Shire Council
via email: enquiries@douglas.qld.gov.au
jenny.elphinstone@douglas.qld.gov.au

Noise Impact Assessment

Port Douglas Estate Stages 1A &
1B, Captain Cook Highway, Craiglie

I019_Q184013



Prepared for
Port Douglas Land Developments Pty Ltd

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Contact Information

Cardno QLD Pty Ltd
Trading as Cardno
ABN 57 051 074 992

L11 Green Square North Tower
515 St Pauls Terrace
Fortitude Valley QLD

Telephone: 07 3369 822
Facsimile: 07 3369 9722
International: +61 7 3369 9822

Julie.mcdonagh@cardno.com.au
www.cardno.com

Document Control

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Executive Summary

This noise impact assessment was conducted on behalf Port Douglas Land Developments, in support of proposed material change of use application for a multiple dwelling development located on property described as Lot 2 on SR431 Captain Cook Highway Craiglie.

This assessment was conducted in accordance with the Douglas Shire Council Planning Scheme and the Queensland State Development Assessment Provisions (SDAP)

In cases where predicted noise levels were found to exceed the applicable noise limits, recommendations have been provided to allow for compliance.

Cardno was engaged to conduct an acoustic investigation of potential road traffic noise impact from the adjacent Captain Cook Highway and a proposed new local road on the future residential allotments and recreational park space.

Assessment Findings

This assessment has indicated the following outcomes:

Based on this assessment, we understand that noise from the Captain Cook Highway is the dominant noise source, which will impact the proposed development. Therefore, road traffic noise modelling has been carried out to determine the level of transport noise predicted to impact dwellings on the site for a 10 year planning horizon.

Predictions indicate that external noise limits are likely to be achieved for most of the site with a small number of Lots affected by road traffic noise.

Noise prediction modelling indicates that a noise barrier ranging from 2.4 to 2.6 metres high is required along the western boundary of the site as shown in Figure 6-2, to reduce predicted external noise levels to comply with the Douglas Shire Council (DSC) Planning Scheme and State Development Assessment Provisions (SDAP) requirements at ground level on each Lot. Refer to Table 6-2 for predicted results at each Lot.

In order to satisfy the internal noise limit requirements of Queensland Development Code Mandatory Part 4.4 (QDC MP4.4), with respect to road traffic noise impact, the required minimum external building construction requirements for these dwellings are presented Table 7-1.

Noise modelling indicated that the predicted road traffic noise levels impacting the site are likely to comply for the majority of the recreational park area with or without noise barriers installed along the western boundary.

Based on the assessment, the proposed development is capable of achieving the required noise limits provided the recommendations in Section 7 are implemented.

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1 Introduction

This noise impact assessment was conducted on behalf of Port Douglas Land Developments, in support of proposed material change of use application for a multiple dwelling development located on property described as Lot 2 on SR431 Captain Cook Highway Craiglie.

This assessment was conducted in accordance with the Queensland State Development Assessment Provisions (SDAP) and *Queensland Development Code Mandatory Part MP4.4 (QDCMP4.4)*. In cases where predicted noise levels were found to exceed the applicable noise limits, recommendations have been provided to achieve compliance.

1.1 Site Description

The proposed site is located on Lot 2 on SR431. The site is bounded by the Captain Cook Highway to the west, existing residential dwellings to the north and farm land to the south. Wetlands and ocean reef exist to the east of the proposed site. Figure 1-1 below shows the location of the proposed development site in relation to the surrounding area.

Figure 1-1 Proposed Site Location



1.2 The Proposal

The proposal involves redevelopment of the site, formerly farm land, into 32 residential lots as part of Stage 1A and 1B of a multi-dwelling residential development known as Port Douglas Estate. Figure 1-2 below shows Stages 1A and 1B of the proposed development.

Figure 1-2 Overall Site Plan Stages 1A & 1B



The development parcel comprises of the following land uses:

- > 32 Residential Lots
- > A new internal road system
- > 7 Residential Lots adjacent with the Captain Cook Highway
- > 3833 m² of recreation parkland along the northern boundary of the site.

2 Existing Noise Environment

Continuous long term noise monitoring was carried out at two locations within the proposed site. The noise logging was carried out using two unmanned noise loggers configured to measure 15-minute statistical noise levels between the 28 February and 7 March 2019.

The unattended noise monitors were configured to measure noise levels as follows:

- 'A' weighting
- 'Fast' response
- 15 minute statistical interval
- Measurement descriptors $L_{A_{Max}}$, $L_{A_{eq}}$, L_{A1} , L_{A10} , L_{A90} ,

All monitoring was conducted in accordance with Australian Standard *AS1055.1-1997 Acoustics – Description and measurement of environmental noise, Part 1: General procedures* and the *Noise Measurement Manual* (EPA, 2000).

2.1 Equipment

The following equipment was used to measure the existing ambient noise levels.

- **Logger 1:** Rion NL-21 - 509345
- **Logger 2:** Rion NL-21 - 509343
- Rion NC-73 Sound Level Calibrator

Calibration of the measuring equipment was carried out before and after the measurement, and it was noted that the maximum variation was less than +/-0.2 dB(A) during the course of the monitoring period.

2.2 Noise Monitoring Locations

Refer to Table 2-1 and Figure 2-1 for the noise monitoring locations.

Table 2-1 Noise Monitoring Location

Logger ID	Location	Noise Logger Type & Serial Number
Logger 1	On the western boundary of site, approximately 9 metres east of the Captain Cook Highway.	Rion NL-21 - 509343
Logger 2	At the northern boundary of the site approximately 220 metres from the Captain Cook Highway.	Rion NL-21 - 509343

The noise monitoring locations are displayed in Figure 2-1.

Figure 2-1 Noise Monitoring Locations



Noise logger locations were located where access was available on site and based on the following rationale:

Table 2-2 Noise Monitoring Location Rationale

Logger ID	Location	Rationale for logger Location Selection
Logger 1	On the western boundary of the site, approximately 9 metres east of the Captain Cook Highway.. Refer to Figure 2-1 for location.	This logger was placed to allow verification of a road traffic noise model for the Captain Cook Highway impacting on the site.
Logger 2	At the northern boundary of the site approximately 220 metres from the Captain Cook Highway. Refer to Figure 2-1 for location.	This logger was placed to allow further verification of a road traffic noise model from the Captain Cook Highway impacting on the site.

2.3 Weather Conditions

Weather data during the monitoring period (28 February to 7 March 2019) was recorded from the Bureau of Meteorology Cairns Aero (station 031011), as follows:

- Rain: Mostly fine with some showers on 3 and 7 March.
- Temperature: 22-32°C
- Humidity: 68-88%
- Wind: 7-28 km/h, predominantly from the SE

Analysis indicated that removal of the rain affected data from the monitoring data did not significantly affect the measured results with the difference being less than 0.2 dB(A) at all locations. For this reason data was not removed from the analysis.

A spray tractor operated on site between 7am and 9am on the 7 March. Noise measurements have been excluded from the analysis for this period.

2.4 Measurement Parameters

As environmental noise varies with time, the use of statistical descriptors is necessary to understand and describe these variations. For environmental noise, the assessment period for day time is split into daytime (7am – 6pm), evening (6pm – 10pm) and night-time (10pm – 7am). A-weighted statistical levels are used to describe ambient noise levels. The common descriptors used to describe environmental noise are described as follows:

- L_{Amax} : the A-weighted maximum noise level measured during the measurement period.
- L_{A1} : the A-weighted noise level exceeded for 1% of the measurement period.
- L_{A10} : the noise A-weighted level exceeded for 10% of the measurement period, generally referred to as the average of the maximums.
- L_{A90} : the A-weighted noise level exceeded for 90% of the measurement period, generally referred to as the average minimum sound pressure level or background noise level (refer AS 1055.1 – 1997).
- L_{Aeq} : the equivalent continuous noise level over the measurement period, generally referred to as the energy averaged sound pressure level over the measurement period.

2.5 Measured Noise Levels

2.5.1 Background Noise Levels

The results of the unattended noise monitoring are presented below in Table 2-3 Table 2-4. Graphical representation of the measured ambient noise levels are presented in Appendix B.

Figure 2-2 and Figure 2-3 detail typical 24 hour noise levels averaged over the monitoring period.

Table 2-3 Measured Ambient Noise Levels – Logger 1

Measurement Type	Measurement Descriptor	Time Period		Measured Noise Level, dB(A)
Traffic Noise	$L_{A10,18\text{ hour}}$	06:00-00:00		62
Background Noise	$L_{A90, 15\text{ minute}}$	Day	07:00 – 18:00	46
		Evening	18:00 – 22:00	46
		Night	07:00 – 18:00	42

Measurement Type	Measurement Descriptor	Time Period		Measured Noise Level, dB(A)
	LA90,8 hour	10:00-06:00		42
	LA90,18 hour	06:00-00:00		46
Rating Background Level (RBL)	-	Day	07:00 – 18:00	42
		Evening	18:00 – 22:00	43
		Night	07:00 – 18:00	40

Figure 2-2 24 Hour Averaged Noise Monitoring Results – Logger 1

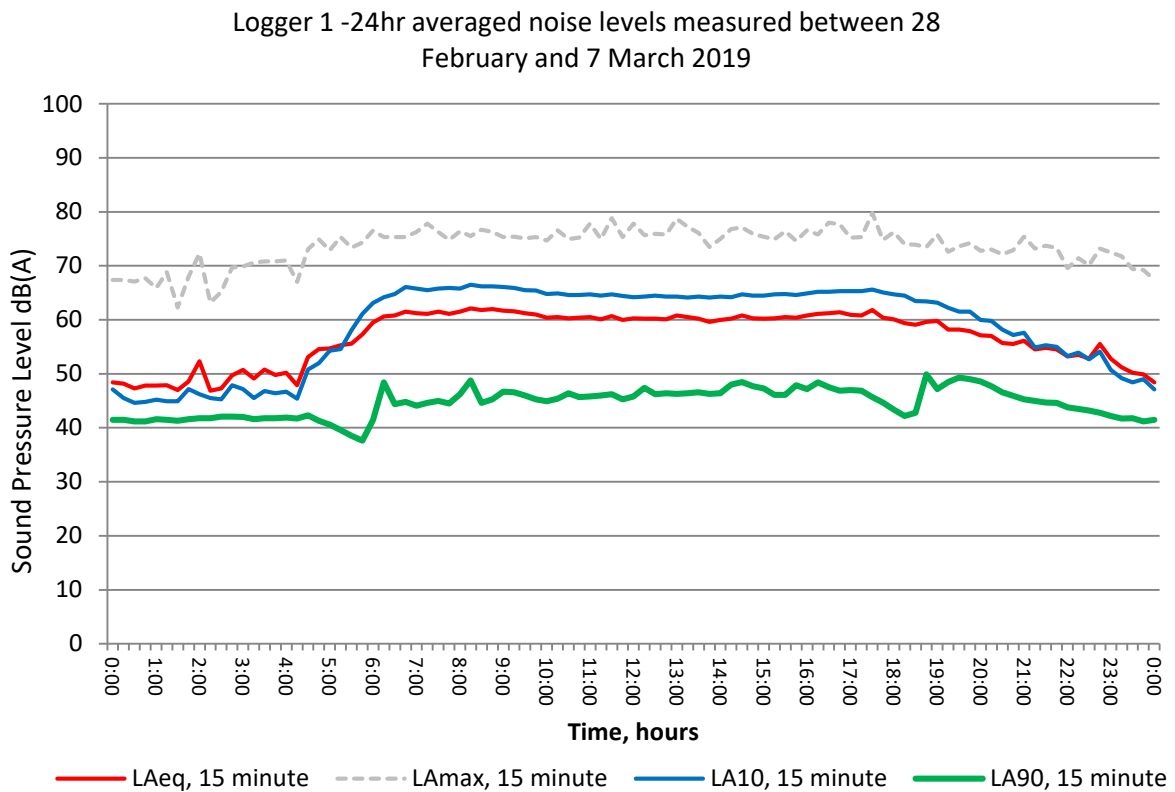
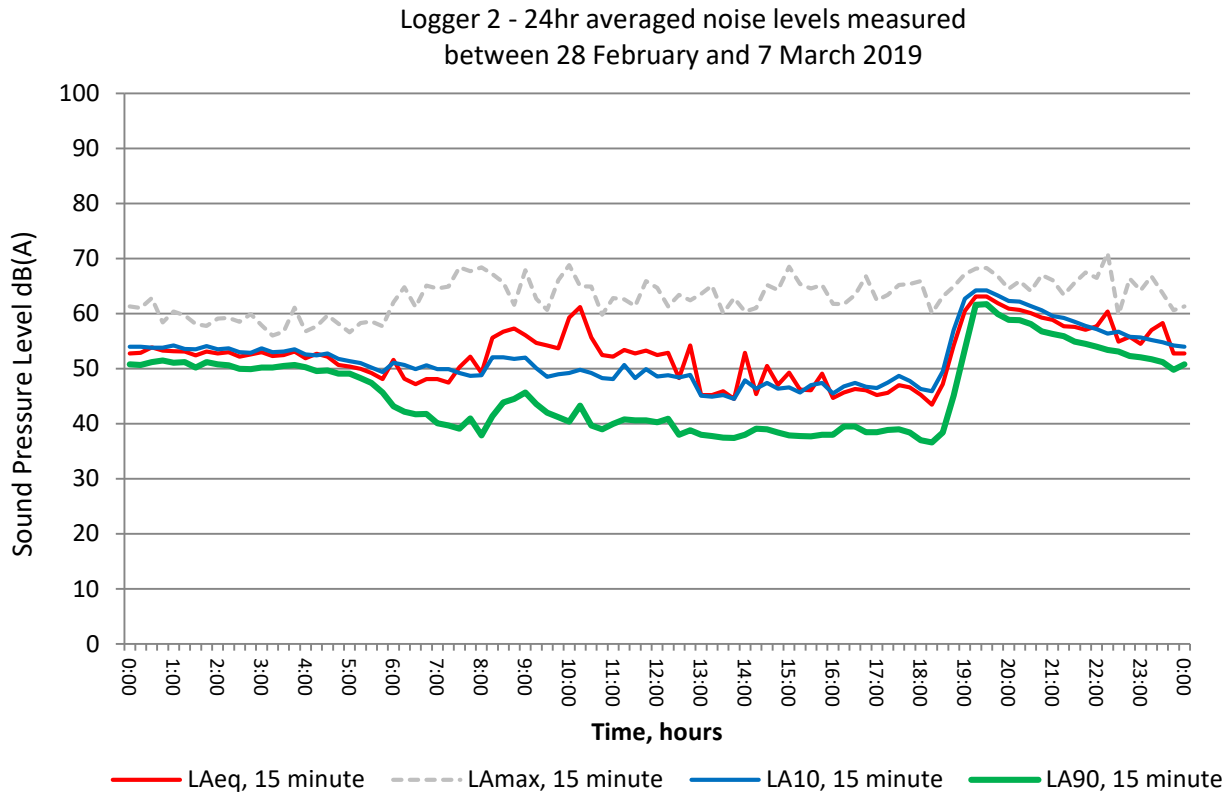


Table 2-4 Measured Ambient Noise Levels – Logger 2

Measurement Type	Measurement Descriptor	Time Period		Measured Noise Level, dB(A)
Traffic Noise	LA10,18 hour	06:00-00:00		51
Background Noise	LA90, 15 minute	Day	07:00 – 18:00	39
		Evening	18:00 – 22:00	54
		Night	07:00 – 18:00	49
	LA90,8 hour	10:00-06:00		50
	LA90,18 hour	06:00-00:00		44
Rating Background Level (RBL)	-	Day	07:00 – 18:00	36

Measurement Type	Measurement Descriptor	Time Period		Measured Noise Level, dB(A)
		Evening	18:00 – 22:00	42
		Night	07:00 – 18:00	43

Figure 2-3 24 Hour Averaged Noise Monitoring Results – Logger 2



3 Statutory Assessment Criteria

Based on our understanding of the development, the following statutory standards and policies apply to this assessment:

3.1 Douglas Shire Council Planning Scheme

A review of the Douglas Shire Council Planning Scheme indicates the subject site is located within a Transport Noise Corridor Overlay Maps (TCN-01 & TCN-/012). Based on this, traffic noise impact from the Captain Cook Highway impacting on the proposed residential development has been assessed in accordance with State Development Assessment Provisions, State Code 1: Development in a State controlled road environment, Performance outcomes 23 and 24 – Noise (accommodation activities).

3.2 State Development Assessment Provisions (SDAP)

As shown in Figure 3-1, the proposed development is located within a state controlled road noise corridor. Therefore, Module 1.1 – Managing Noise and Vibration Impacts from Transport Corridors State Code, of the ‘State Development Assessment Provisions, November 2018 (SDAP)’ is applicable to assess the road noise impact onto the proposed development. Performance Outcomes PO23 & PO24 of Table 1.2.2 under the State Code 1 – Development in a State Controlled Road Environment, include the relevant road noise criteria and acceptable outcomes for the development as presented below in Table 3-1.

Figure 3-1 SDAP Transport Noise Corridor (Road) Overlay

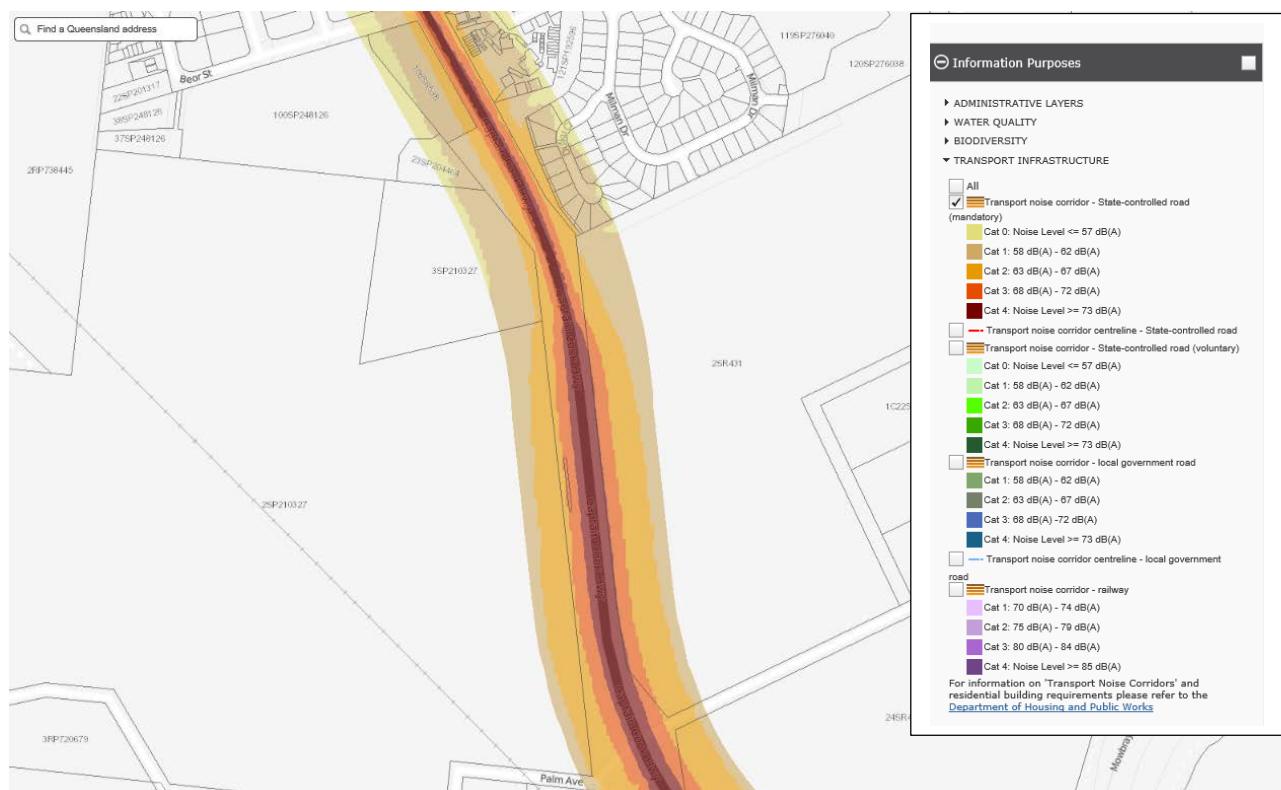


Table 3-1 SDAP Road Noise Criteria

Performance Outcome	Acceptable Outcomes
Accommodation activities	
<p>PO23</p> <p>Development involving an accommodation activity that is a residential building achieves acceptable noise levels for residents and visitors by mitigating adverse impacts on the development from noise generated by a state-controlled road or a type 1 multi-modal corridor</p>	<p>A023.1</p> <p>A noise barrier or earth mound is provided which is designed, sited and constructed:</p> <ol style="list-style-type: none"> 1. to meet the following external noise criteria at all facades of the building envelope: <ol style="list-style-type: none"> a) ≤ 60 dB(A) L_{A10} (18 hour) façade corrected (measured L_{A90} (8 hour) free field between 10 pm and 6 am ≤ 40 dB(A)). b) ≤ 63 dB(A) L_{A10} façade corrected (measured L_{A90} (8 hour) free field between 10 pm and 6 am > 40 dB(A)). 2. in accordance with 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. <p>Note: To demonstrate compliance with the acceptable outcome, it is recommended that a RPEQ certified noise assessment report is provided, prepared in accordance with the SDAP Supporting Information: Environmental emissions in a state-controlled road environment, Department of Transport and Main Roads, 2017.</p> <p>If the building envelope is unknown, the deemed-to-comply setback distances for buildings stipulated by the local planning instrument or relevant building regulations should be used.</p> <p>In some instances, the design of noise barriers and mounds to achieve the noise criteria above the ground floor may not be reasonable or practicable. In these instances, any relaxation of the criteria is at the discretion of the Department of Transport and Main Roads.</p> <p>OR all of the following acceptable outcomes apply:</p> <p>A023.2</p> <p>Buildings which include a habitable room are setback the maximum distance possible from a state controlled road or type 1 multi-modal corridor.</p> <p>AND</p> <p>A023.3</p> <p>Buildings are designed and oriented so that habitable rooms are located furthest from a state controlled road or type 1 multi-modal corridor.</p> <p>AND</p> <p>A023.4</p> <p>Buildings (other than a relevant residential building or relocated building) are designed and constructed using materials which ensure that habitable rooms meet the following internal noise criteria:</p>

Performance Outcome	Acceptable Outcomes
	<p>a) ≤ 35 dB(A) L_{Aeq} (1 hour) (maximum hour over 24 hours).</p> <p>Note: Noise levels from state-controlled roads or type 1 multi-modal corridors are to be measured in accordance with <i>AS1055.1-1997 Acoustics – Description and measurement of environmental noise</i>.</p> <p>To demonstrate compliance with the acceptable outcome, it is recommended that a RPEQ certified noise assessment report is provided, prepared in accordance with the SDAP Supporting Information: Environmental emissions in a state controlled road environment, Department of Transport and Main Roads 2017.</p> <p>Habitable rooms of residential buildings located within a transport noise corridor must comply with the Queensland Development Code MP4.4 Buildings in a transport noise corridor, Queensland Government, 2010. Transport noise corridors are mapped on the State Planning Policy Interactive Mapping System</p>
<p>PO24 Development involving an accommodation activity or land for a future accommodation activity minimises noise intrusion from a state controlled road or type 1 multi-modal corridor in outdoor spaces for passive recreation.</p>	<p>AO24.1 A noise barrier or earth mound is provided which is designed, sited and constructed:</p> <ol style="list-style-type: none"> 1. to meet the following external noise criteria in outdoor spaces for passive recreation: <ol style="list-style-type: none"> a) ≤ 57 dB(A) L_{A10} (18 hour) free field (measured L_{A90} (18 hour) free field between 6am and midnight ≤ 45 dB(A)). b) ≤ 60 dB(A) L_{A10} free field (measured L_{A90} (18 hour) free field between 6am and midnight > 45 dB(A)). 2. in accordance with 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.: <p>Note: To demonstrate compliance with the acceptable outcome, it is recommended that a RPEQ certified noise assessment report is provided, prepared in accordance with the SDAP Supporting Information: Environmental emissions in a state controlled road environment, Department of Transport and Main Roads 2017.</p> <p>OR</p> <p>AO24.2 Each dwelling has access to an outdoor space for passive recreation which is shielded from a state-controlled road or type 1 multi-modal corridor by a building, solid gap-free fence, or other solid gap-free structure.</p> <p>AND</p> <p>AO24.3 Each dwelling with a balcony directly exposed to noise from a state-controlled road or type 1 multi-modal corridor has a continuous solid gap-free balustrade (other than gaps required for drainage purposes to comply with the Building Code of Australia).</p>

3.3 QLD Development Code Mandatory Part4.4 (QDC MP4.4)

QDC MP4.4 provides a required construction category based on the predicted external façade rail noise level and the types of construction required to achieve this category.

The required categories are defined as follows:

Table 3-2 Required QDC Construction Categories

Predicted External Road Traffic Noise Level, dB(A)	Required Category Construction
≤ 57 dB(A)	0
58 – 62 dB(A)	1
63 – 67 dB(A)	2
68 – 72 dB(A)	3
≥ 73 dB(A)	4

3.4 Australian Standards

The following Australian Standards have been referenced in this assessment.

- Australian Standard AS1055: "Acoustics – Description and measurement of environmental noise"
- Australian Standard AS/NZS 2107:2000 "Recommended design sound levels and reverberation times for building interiors.
- Australian Standard AS 2702 – 1984, Methods for the Measurement of Road Traffic Noise

4 Design Benchmarks

4.1 Road Traffic Noise Impacting on Residential Accommodation within the Site

On the basis of the above criteria outlined in Section 3, the following quantitative noise criteria applies to the project:

Noise Source	External / Internal	Location	Parameter	Noise Criteria
Road Traffic Noise	External	Most Exposed Dwelling Facade	L _{A10, 18hr}	63 dB(A)
		External Open Space	L _{A10, 18hr}	60 dB(A)
	Internal	Design to QDC MP4.4 Requirements depending on external noise level		
	External	Outdoor spaces for passive recreation	L _{A10, 18hr}	60 dB(A)

4.1.1 Residential Receivers – Minimum Building Envelope Noise Reduction

Residential dwellings associated with the development are affected by a state controlled road, and as such the entire site has been assessed against the state development assessment provisions.

Residential dwellings associated with the proposed development will need to comply with Queensland Development Code Mandatory Part 4.4 - Buildings in a Transport Noise Corridor (QDC MP 4.4). QDC MP 4.4 specifies acoustic treatments based upon a noise category are provided in Table 7-1 of this report.

Noise categories are defined by the measured (or predicted) L_{A10, 18hr} at 1 metre from the facade of a dwelling, and are displayed below in Table 4-1.

Table 4-1 QDC MP4.4 Noise Categories

Noise Category	Level of transport noise*(L _{A10,18hr}) for State controlled roads and designated local government roads
Category 4	≥ 73 dB(A)
Category 3	68 – 72 dB(A)
Category 2	63 – 67 dB(A)
Category 1	58 – 62 dB(A)
Category 0	≤ 57 dB(A)

5 Noise Assessment Methodology

5.1 Road Traffic Noise Impacting on the Site

Computer modelling has been undertaken for the development site using SoundPLAN 8 computer modelling software in order to assess predicted noise impact onto the development from road traffic on the Captain Cook Highway. The road traffic data has been used to generate a computer model for the years 2019 and 2029 which has then been assessed in accordance with the relevant criteria.

The modelling is based on the following input data:

- Existing 3D topography of the site, surrounds and nearby road provided by Cardno.
- Existing and proposed road traffic volumes referenced from the TMR Traffic Census.
- Dense Grade Asphalt (DGA) pavement surface on the Captain Cook Highway.

5.1.1 Modelled Scenarios

The following scenarios were modelled using SoundPLAN 8 computer modelling software:

1. Existing (2019) verification road traffic noise levels incident of the development.
2. Predicted road traffic noise levels incident on the dwelling facades for the design year 2029 based on traffic volumes referenced from the TMR Traffic Census with an applied growth rate of 3% per annum. This model includes +2.5 dB(A) façade correction, and -1.7dB(A) CoRTN correction for Australian conditions.
3. Predicted road traffic noise levels incident on the passive recreation areas for the design year 2029 based on traffic volumes referenced from the TMR Traffic Census with an applied growth rate of 3% per annum. This model includes no façade correction, and -0.7dB(A) CoRTN correction for Australian conditions.

5.1.2 Noise Model Inputs & Assumptions

The following modelling assumptions were applied to the modelling:

Table 5-1 Noise Model Input Assumption

Modelling Element	Input/Assumption
Ground Elevation Geometry	Provided by Cardno
Road Alignment	Provided by Cardno
Existing & Predicted (2029) Traffic Flow Data,	Referenced from the most current TMR Qld Traffic Census (2017). Refer to Table 5-2 and Table 5-3.
Ground Absorption	Assumed 100% soft ground absorption surfaces between road and receivers
Facade Reflection	+2.5 dB(A) – applied to L_{A10} façade prediction models to allow for façade reflection
Correction to CoRTN for Façade Corrected Australian Conditions	-1.7 dB(A) CoRTN correction for Australian conditions for predicted façade levels and -0.7 dB(A) correction for passive recreation area levels (free field) (with reference to TMR RTNM CoP2008)
Receiver Height	Assumed to be 1.8 & 4.6 metres above ground for ground and first floors respectively as required by the TMR RTNM CoP2008.

5.1.3 Modelling Traffic Volume Assumptions

The following traffic data was adopted for the assessment:

Table 5-2 Existing 2019 Road Traffic Flow Information

Road	Traffic Speed	Traffic flow: AADT (2019)	% Heavy Vehicles
Captain Cook Highway	70 & 100 km/h	6,847	9.15

Table 5-3 Future 2029 Road Traffic Flow Information

Road	Traffic Speed	Traffic flow: AADT (2029)	% Heavy Vehicles
Captain Cook Highway	70 & 100 km/h	8,650	9.15

5.1.4 Noise Model Verification – Road Traffic Noise

An existing scenario model was set up using SoundPLAN 8 and spot receiver calculations were run for logger locations 1 and 2. A correction factor of -0.7 dB(A) was applied to the modelled results in accordance with the CoRTN correction for Australian Conditions for free field measurements. The modelled results were then compared to the measured results to determine whether the model was verified. The model verification results are as follows:

Table 5-4 Road Traffic Modelling Verification Results

Logger Location	Modelled Existing L _{A10,18hr} , dB(A)	Measured Existing L _{A10,18hr} , dB(A)	Difference, dB(A)
Logger 1	62	62.1	-0.1
Logger 2	49.5	51.4	-1.9

Comparison of the modelled and measured values agreed closely at Logger location 1. The model was found to be under predicting at Logger location 2 but this was likely due to high levels of insect and bird noise at this location which occurred in the afternoon and evening at the same time every day. The model was found to be within the required tolerance for road traffic noise model verification of +/- 2 dB(A) for all locations. Therefore the model was considered verified and no further correction factors were added.

6 Noise Impact Assessment

Road traffic noise prediction was conducted using SoundPLAN 8 noise modelling software. SoundPLAN software applies the algorithm from the *Calculation of Road Traffic Noise*, UK Department of Transport, Welsh Office 1988 (CoRTN). CoRTN methodology is commonly used for road traffic noise assessment throughout Australia.

At the time of this assessment the proposed dwelling heights were yet to be determined. Therefore, for the purpose of this report road traffic noise impact was assessed at both ground and first floor levels for all proposed lots within Stage 1A & 1B.

Figure 6-1 Two Storey Modelled Receiver Locations



6.2 Predicted Results – Road Traffic Noise External Noise Levels

The following table shows the predicted 2029 noise levels and required QDC MP4.4 construction category at noise sensitive receivers within the proposed Port Douglas development Stages 1A & 1B:

Table 6-1 Predicted $L_{A10,18hr}$ 2029 Road Traffic Noise Levels and Required QDC MP4.4 Category (No Mitigation)

Lot Receiver	Floor	2029 Predicted Façade Noise Levels $L_{A10,18hr}$, dB(A) (Façade Corrected)	Predicted Exceedance of 63 dB(A) SDAP Criteria, dB(A)	2029 Predicted Recreational Area Noise Levels $L_{A10,18hr}$, dB(A) (Free Field)	Predicted Exceedance of 60 dB(A) SDAP Criteria, dB(A)
Lot 1	GF	48	-	47	-
	1st	51	-	49	-
Lot 2	GF	47	-	45	-
	1st	51	-	49	-
Lot 3	GF	46	-	45	-
	1st	50	-	49	-

Lot Receiver	Floor	2029 Predicted Façade Noise Levels L _{A10,18hr} , dB(A) (Façade Corrected)	Predicted Exceedance of 63 dB(A) SDAP Criteria, dB(A)	2029 Predicted Recreational Area Noise Levels L _{A10,18hr} , dB(A) (Free Field)	Predicted Exceedance of 60 dB(A) SDAP Criteria, dB(A)
Lot 4	GF	48	-	47	-
	1st	51	-	50	-
Lot 5	GF	49	-	48	-
	1st	52	-	51	-
Lot 6	GF	49	-	47	-
	1st	52	-	50	-
Lot 7	GF	50	-	48	-
	1st	53	-	51	-
Lot 8	GF	51	-	49	-
	1st	54	-	52	-
Lot 9	GF	55	-	54	-
	1st	57	-	56	-
Lot 10	GF	55	-	53	-
	1st	57	-	55	-
Lot 11	GF	52	-	51	-
	1st	55	-	53	-
Lot 12	GF	50	-	48	-
	1st	53	-	51	-
Lot 13	GF	49	-	47	-
	1st	52	-	50	-
Lot 14	GF	49	-	47	-
	1st	51	-	50	-
Lot 15	GF	47	-	46	-
	1st	51	-	49	-
Lot 16	GF	52	-	51	-
	1st	54	-	53	-
Lot 17	GF	54	-	52	-
	1st	55	-	54	-
Lot 18	GF	55	-	53	-
	1st	57	-	55	-
Lot 19	GF	57	-	55	-
	1st	59	-	57	-
Lot 20	GF	65	2	63	3
	1st	66	3	64	4
Lot 21	GF	65	2	64	4
	1st	66	3	65	5
Lot 22	GF	66	3	64	4
	1st	67	4	65	5
Lot 23	GF	66	3	64	4
	1st	67	4	66	6
Lot 24	GF	66	3	65	5

Lot Receiver	Floor	2029 Predicted Façade Noise Levels $L_{A10,18hr}$, dB(A) (Façade Corrected)	Predicted Exceedance of 63 dB(A) SDAP Criteria, dB(A)	2029 Predicted Recreational Area Noise Levels $L_{A10,18hr}$, dB(A) (Free Field)	Predicted Exceedance of 60 dB(A) SDAP Criteria, dB(A)
	1st	68	5	66	6
Lot 25	GF	67	4	65	5
	1st	68	5	67	7
Lot 26	GF	67	4	65	5
	1st	68	5	67	7
Lot 27	GF	57	-	56	-
	1st	59	-	58	-
Lot 28	GF	54	-	53	-
	1st	56	-	55	-
Lot 29	GF	52	-	50	-
	1st	54	-	52	-
Lot 30	GF	51	-	49	-
	1st	53	-	51	-
Lot 31	GF	50	-	49	-
	1st	52	-	51	-
Lot 32	GF	46	-	45	-
	1st	50	-	48	-

6.3 Modelled Noise Barrier

A road traffic noise barrier located as shown in Figure 6-2 has been included in the modelling in order to reduce the external noise levels at ground floor lots to comply with the SDAP PO24 criteria for passive recreational spaces.

Provision of a barrier to control noise levels to comply with PO24 on first floor external living spaces (such as verandas or balconies) would require a barrier of 7 metres high. This is likely to be impractical, therefore first floor formal external living spaces are recommended to be located on the opposite façade to the highway for Lots 20 to 26.

A noise barrier ranging between 2.4 and 2.6 metres high as shown below in Figure 6-2 is required to control the road traffic noise levels in the passive external recreation areas for the most affected Lots to comply with the SDAP PO24 criteria.

Figure 6-2 Modelled Noise Barrier Location



6.4 Predicted Results – Road Traffic Noise Internal Noise Levels

The following table compares the predicted noise levels and required QDC MP4.4 construction categories with and without the recommended noise barrier.

Table 6-2 Comparison of Predicted $L_{A10, 18hr}$ 2029 Road Traffic Noise Levels and Required QDC MP4.4 Category with and without the Recommended Noise Barrier

Lot Receiver	Floor	2029 Predicted External Recreation Space Noise Level with no Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted External Recreation Space Noise Level with Recommended Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted Façade Noise Levels with no Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required	2029 Predicted with recommended metre Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required
Lot 1	GF	47	47	48	0	48	0
	1st	49	49	50	0	50	0
Lot 2	GF	45	45	47	0	47	0
	1st	49	49	50	0	50	0
Lot 3	GF	45	45	46	0	46	0
	1st	49	49	50	0	50	0
Lot 4	GF	47	46	48	0	48	0
	1st	50	50	51	0	51	0
Lot 5	GF	48	48	49	0	49	0

Lot Receiver	Floor	2029 Predicted External Recreation Space Noise Level with no Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted External Recreation Space Noise Level with Recommended Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted Façade Noise Levels with no Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required	2029 Predicted with recommended metre Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required
	1st	51	50	52	0	52	0
Lot 6	GF	47	47	48	0	48	0
	1st	50	50	52	0	51	0
Lot 7	GF	48	48	50	0	49	0
	1st	51	51	53	0	52	0
Lot 8	GF	49	49	51	0	50	0
	1st	52	52	54	0	53	0
Lot 9	GF	54	52	55	0	54	0
	1st	56	55	57	1	56	0
Lot 10	GF	53	53	54	0	54	0
	1st	55	55	56	0	56	0
Lot 11	GF	51	51	52	0	52	0
	1st	53	53	54	0	54	0
Lot 12	GF	48	48	49	0	49	0
	1st	51	51	52	0	52	0
Lot 13	GF	47	47	48	0	48	0
	1st	50	50	51	0	51	0
Lot 14	GF	47	47	48	0	48	0
	1st	50	50	51	0	51	0
Lot 15	GF	46	46	47	0	47	0
	1st	49	49	50	0	50	0
Lot 16	GF	51	51	52	0	52	0
	1st	53	53	54	0	54	0
Lot 17	GF	52	52	53	0	53	0
	1st	54	54	55	0	55	0
Lot 18	GF	53	53	55	0	55	0
	1st	55	55	56	0	56	0
Lot 19	GF	55	55	57	1	57	1
	1st	57	57	58	1	58	1
Lot 20	GF	63	60	64	2	63	1
	1st	64	64	66	2	66	2
Lot 21	GF	64	59	65	2	63	1
	1st	65	64	66	2	66	2
Lot 22	GF	64	59	65	2	62	1
	1st	65	65	67	2	67	2
Lot 23	GF	64	59	66	2	62	1
	1st	66	65	67	2	67	2
Lot 24	GF	65	59	66	2	61	1

Lot Receiver	Floor	2029 Predicted External Recreation Space Noise Level with no Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted External Recreation Space Noise Level with Recommended Barrier $L_{A10,18hr}$, dB(A)	2029 Predicted Façade Noise Levels with no Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required	2029 Predicted with recommended metre Barrier $L_{A10,18hr}$, dB(A)	QDC4.4 Category Required
	1st	66	65	68	3	67	2
Lot 25	GF	65	58	66	2	61	1
	1st	67	65	68	3	67	2
Lot 26	GF	65	58	66	2	61	1
	1st	67	64	68	3	67	2
Lot 27	GF	56	54	57	1	56	0
	1st	58	56	59	1	58	1
Lot 28	GF	53	52	54	0	53	0
	1st	55	54	56	0	55	0
Lot 29	GF	50	50	52	0	51	0
	1st	52	52	54	0	53	0
Lot 30	GF	49	49	51	0	50	0
	1st	51	51	53	0	52	0
Lot 31	GF	49	49	50	0	50	0
	1st	51	50	52	0	52	0
Lot 32	GF	45	45	46	0	46	0
	1st	48	48	49	0	49	0

6.4.2 Road Traffic Noise Impact on the Recreation (Park)

Refer to Figure 8-9 for a noise contour map showing the expected impact on the proposed Recreation Park in 2029. The predicted noise contour map indicates that compliance will be achieved for the majority of the park area with the recommended noise barrier installed.

7 Recommendations

Based on the outcomes of the assessment the following mitigation measures are recommended:

7.1 Building Construction Requirements

In order to satisfy the requirements of QDC MP4.4 with respect to road traffic noise impact, the required minimum external building construction requirements for residential dwellings located within the proposed development are presented below in Table 7-1.

Table 7-1 QDC MP4.4 Schedule of Building Construction Requirements

Noise Category	Minimum transport noise reduction (dB(A)) required for habitable rooms	Component of Buildings external envelope	Minimum Rw required for each component
Category 3	35	Glazing	38 (where total area of glazing for a habitable room is greater than 1.8m ²)
			35 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External Walls	47
		Roof	41
		Floors	45
		Entry Door	33
Category 2	30	Glazing	35 (where total area of glazing for a habitable room is greater than 1.8m ²)
			32 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External Walls	41
		Roof	38
		Floors	45
		Entry Door	33
Category 1	25	Glazing	27 (where total area of glazing for a habitable room is greater than 1.8m ²)
			24 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)

Noise Category	Minimum transport noise reduction (dB(A)) required for habitable rooms	Component of Buildings external envelope	Minimum Rw required for each component
		Roof	35
		Floors	35
		Entry Door	28
Category 0		No additional acoustic treatment required – standard building assessment provisions apply.	

7.2 QDC Deemed to Comply Construction Constructions

QDC MP4.4 provides acceptable Constructions for a range of building elements as follows:

Based on the recommended noise categories nominated in Table 6-2, QDC MP 4.4 nominates glazing treatments as presented in Table 7-2.

Table 7-2 QDC MP4.4 Recommend Glazing Constructions

Noise Category	Rw Requirement	QDC Acceptable Glazing	Acoustic Seals?
3	38 (where total area of glazing for a habitable room is greater than 1.8m ²)	14.38mm Laminate	Yes
	35 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	10.38mm Laminate	Yes
2	35 (where total area of glazing for a habitable room is greater than 1.8m ²)	10.38mm Laminate	Yes
	32 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	6.38mm Laminate	Yes
1	27 (where total area of glazing for a habitable room is greater than 1.8m ²)	4mm Float	Yes
	24 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	4mm Float	No
0	N/A	N/A	N/A

7.2.2 External Walls

Based on the recommended noise categories presented in Table 6-2, QDC nominates acceptable wall treatment as presented in Table 7-3.

Table 7-3 QDC MP 4.4 Acceptable Wall Construction

Noise Category	Rw Requirement	QDC Acceptable Wall Construction
3	47	Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and

Noise Category	Rw Requirement	QDC Acceptable Wall Construction
		<p>(ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 20kg/m³ in the cavity.</p> <p>OR</p> <p>Two leaves of clay brick masonry at least 110mm thick with:</p> <p>(i) cavity not less than 50mm between leaves; and</p> <p>(ii) at least 13mm thick cement render on each face</p> <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <p>(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</p> <p>(ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and</p> <p>(iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs.</p> <p>OR</p> <p>Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.</p>
2	41	<p>Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves</p> <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <p>(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</p> <p>(ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and</p> <p>(iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs</p> <p>OR</p> <p>Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face</p> <p>OR</p> <p>Concrete brickwork at least 110mm thick</p> <p>OR</p> <p>In-situ concrete at least 100mm thick</p> <p>OR</p> <p>Precast concrete at least 100mm thick and without joints.</p>
1	35	<p>Single leaf of clay brick masonry at least 110mm thick with:</p> <p>(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</p> <p>(ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs</p> <p>OR</p> <p>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.</p>

Noise Category	Rw Requirement	QDC Acceptable Wall Construction
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.3 Roof/Ceiling

Based on the recommended noise categories presented in Table 6-2, QDC nominates acceptable roof/ceilings treatments as presented in Table 7-4.

Table 7-4 QDC MP 4.4 Acceptable Roof/Ceiling Construction

Noise Category	Rw Requirement	QDC Acceptable Roof/Ceiling Construction
3	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.
2	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 .
1	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.4 External Doors

Based on the recommended noise categories presented in Table 6-2, QDC nominates acceptable external door treatments as presented in Table 7-5.

Table 7-5 QDC MP 4.4 Acceptable External Door Construction

Noise Category	Rw Requirement	QDC Acceptable External Door Construction
2-3	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.
1	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	Rw Requirement	QDC Acceptable External Door Construction
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.5 Exposed Floors

Based on the applicable noise categories presented in Table 6-2, QDC nominates acceptable exposed floor treatments as presented in Table 7-6.

Table 7-6 QDC MP 4.4 Acceptable Exposed Floor Construction

Noise Category	Rw Requirement	QDC Acceptable Exposed Floor Construction
2-3	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.
1	N/A	N/A
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

8 Conclusion

This road traffic noise impact assessment, has been conducted on behalf Port Douglas Land Developments, in support of proposed material change of use application for a multiple dwelling development located on property described as Lot 2 on SR431 Captain Cook Highway Craiglie. The assessment has been carried out in accordance with the Douglas Shire Council (DSC) Planning Scheme & the Old State Development Assessment Provisions (SDAP).

The assessment indicates that noise from the Captain Cook Highway is the dominant noise source, which will impact the proposed development. Therefore, road traffic noise modelling was carried out to determine the level of transport noise predicted to impact dwellings on the site for a 10 year planning horizon.

Predictions indicate that external noise limits are likely to be achieved for most of the site with a small number of Lots affected by road traffic noise greater than the limits prescribed in the SDAP.

Noise prediction modelling indicates that a noise barrier ranging from 2.4 to 2.6 metres high is required along the western boundary of the site as shown in Figure 6-2, to reduce predicted external noise levels to comply with the Douglas Shire Council (DSC) Planning Scheme and State Development Assessment Provisions (SDAP) requirements at ground level on each Lot. Refer to Table 6-2 for predicted results at each Lot.

In order to satisfy the internal noise limit requirements of Queensland Development Code Mandatory Part 4.4 (QDC MP4.4), with respect to road traffic noise impact, the required minimum external building construction requirements for these dwellings are presented Table 7-1.

Noise modelling indicated that the predicted road traffic noise levels impacting the site are likely to comply for the majority of the recreational park area with or without noise barriers installed along the western boundary.

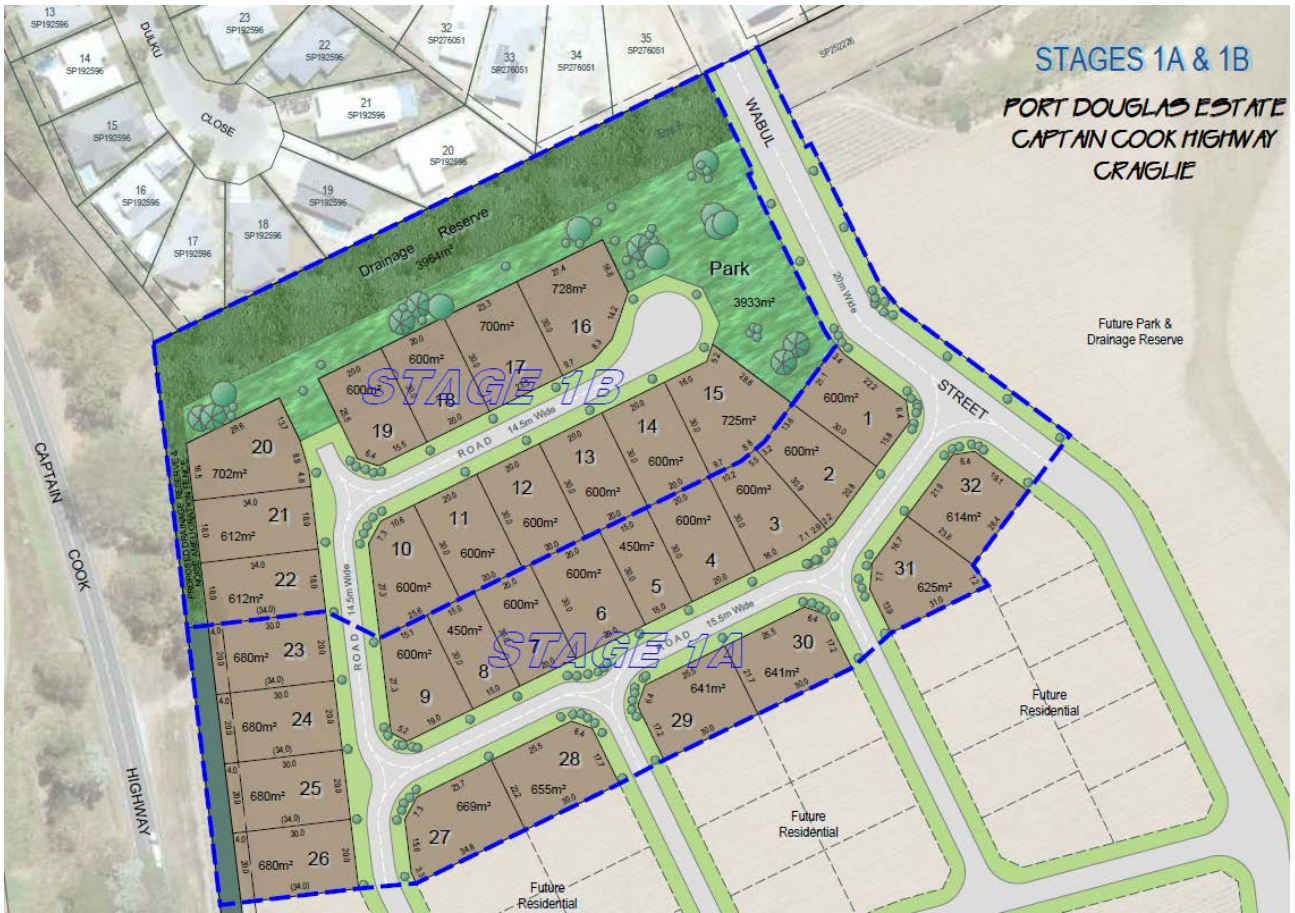
Based on the assessment, the proposed development is capable of achieving the required noise limits provided the recommendations in Section 7 are implemented.

Port Douglas Estate
Stages 1A & 1B, Captain
Cook Highway, Craiglie

APPENDIX A
PROPOSED SITE
PLAN



Figure 8-1 Proposed Site Plan – Stages 1A & 1B



Port Douglas Estate
Stages 1A & 1B, Captain
Cook Highway, Craiglie

APPENDIX B
EXISTING SITE
NOISE LEVELS



Figure 8-2 Site Ambient Noise Levels Logger 1

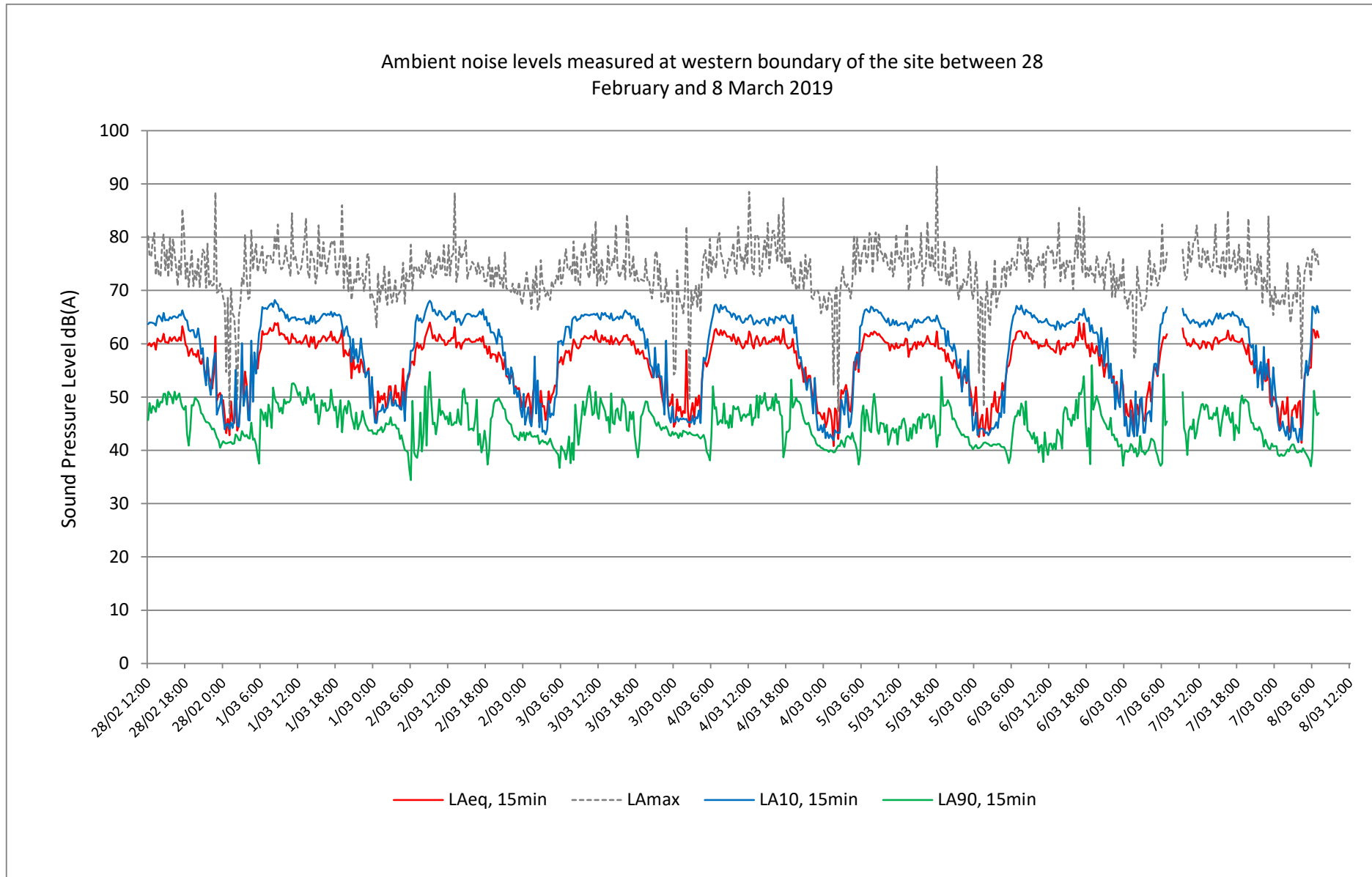
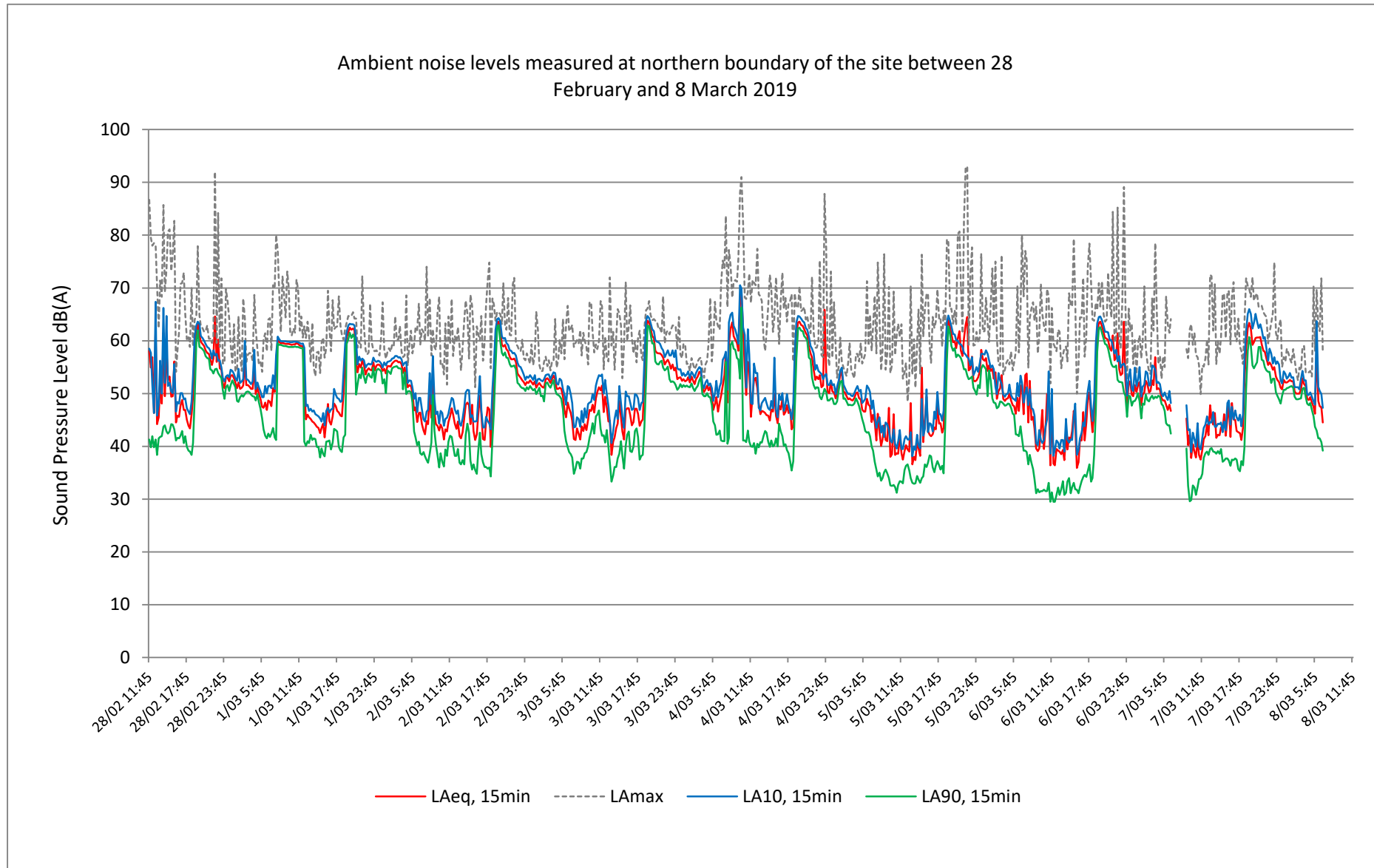


Figure 8-3 Site Ambient Noise Levels Logger 2



Port Douglas Estate
Stages 1A & 1B, Captain
Cook Highway, Craiglie

APPENDIX C
NOISE CONTOUR
MAPS



Figure 8-4 Predicted Road Traffic Noise Impact (LA10,18hr) – Existing Year (2019)



Figure 8-5 Predicted Road Traffic Noise Impact Ground Floor (LA10,18hr) – Design Year (2029) & Required QDC MP 4.4 Noise Categories – No Barrier



Figure 8-6 Predicted Road Traffic Noise Impact First Floor (LA10,18hr) – Design Year (2029) & Required QDC MP 4.4 Noise Categories - No Barrier

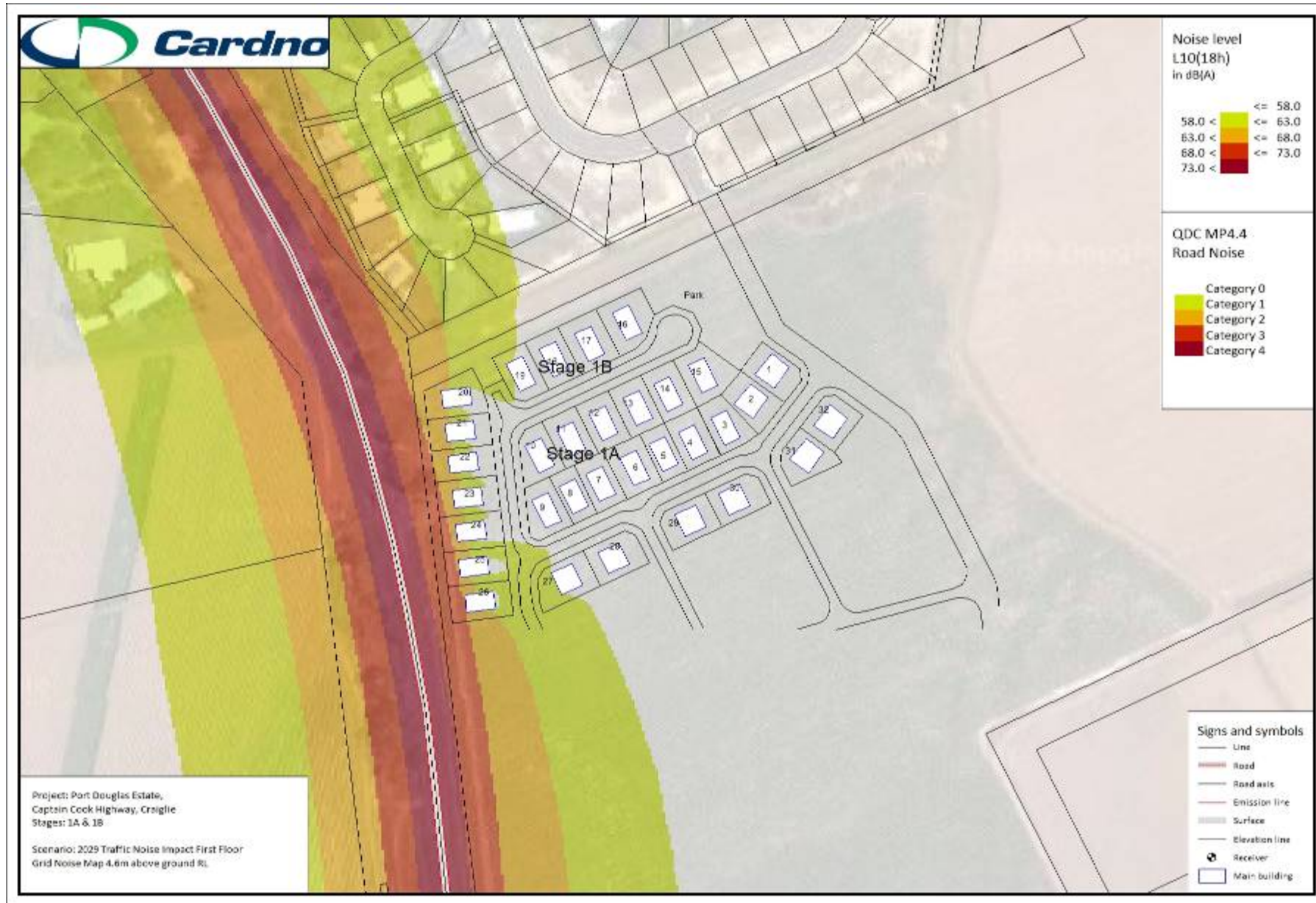


Figure 8-7 Predicted Road Traffic Noise Impact Ground Floor with Recommended Barrier (LA10,18hr) – Design Year (2029) & Required QDC MP 4.4 Noise Categories

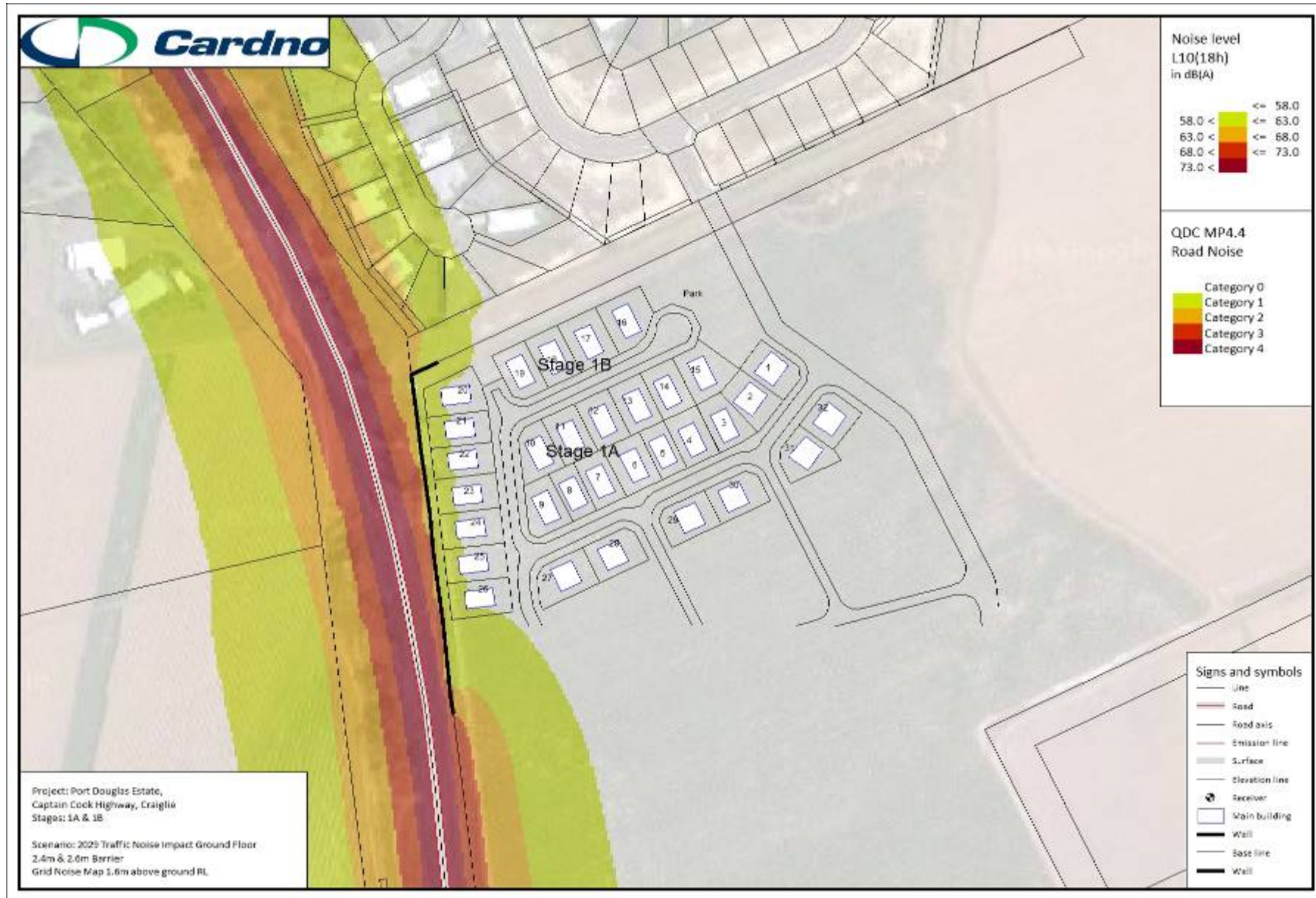


Figure 8-8 Predicted Road Traffic Noise Impact First Floor with Recommended Barrier (LA10,18hr) – Design Year (2029) & Required QDC MP 4.4 Noise Categories

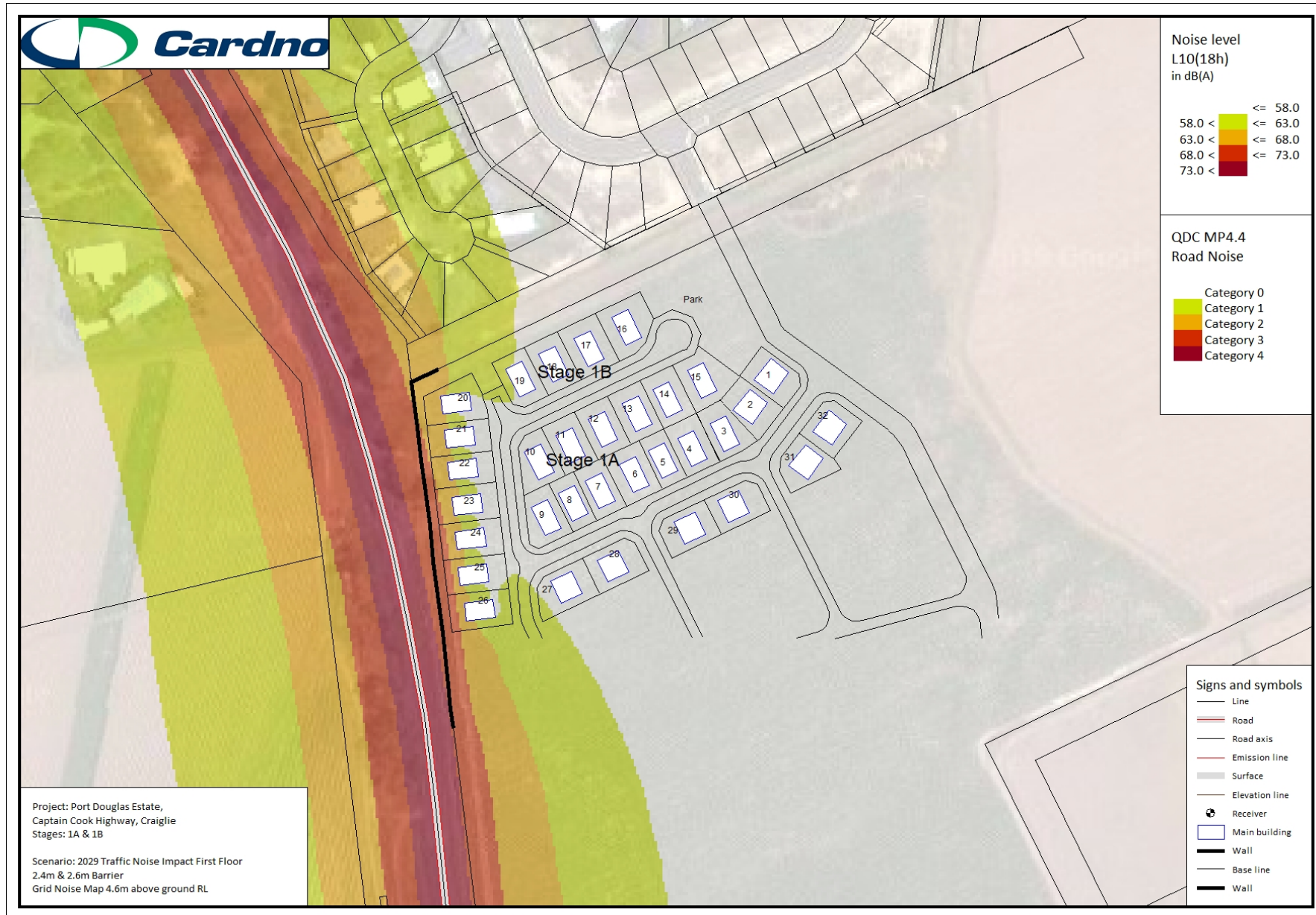


Figure 8-9 Predicted Road Traffic Noise Impact Ground Floor - External Recreation Spaces with No Barrier

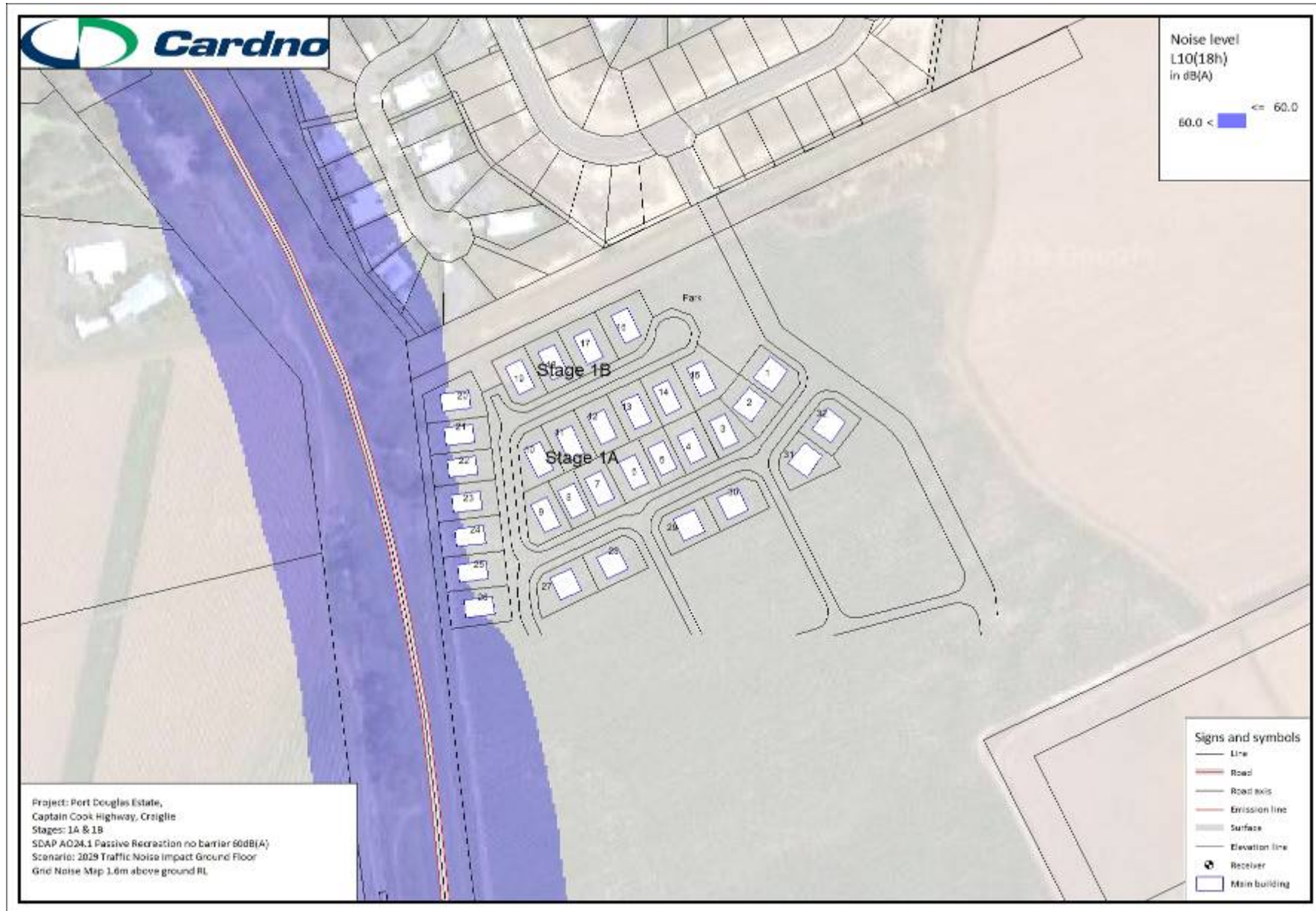
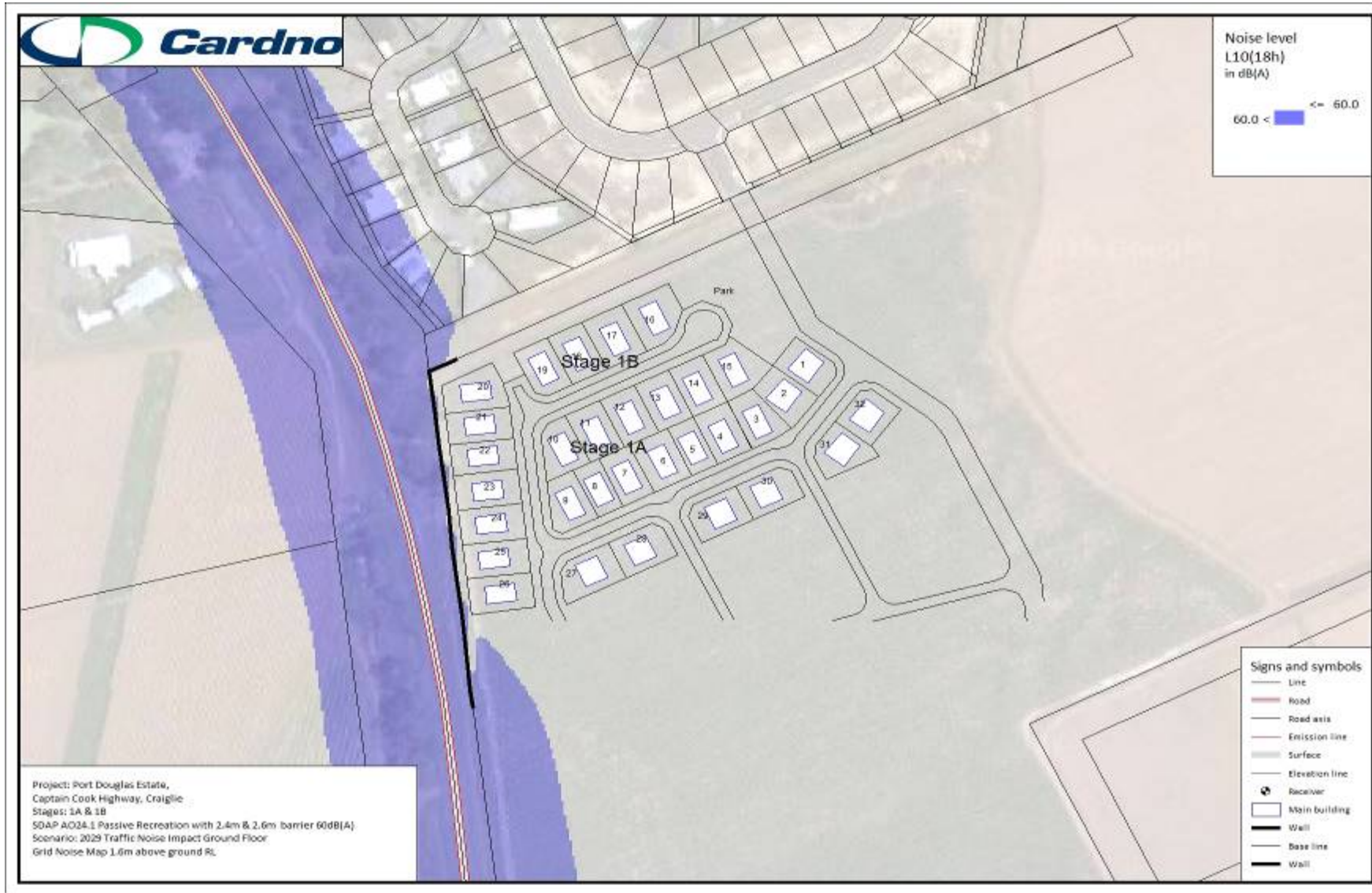


Figure 8-10 Predicted Road Traffic Noise Impact Ground Floor - External Recreation Spaces with Recommended Barrier



Port Douglas Estate
Stages 1A & 1B, Captain
Cook Highway, Craiglie

APPENDIX D
WEATHER DATA
DURING THE
MONITORING
PERIOD



Table 8-1 Weather Data Observations from Cairns Aero (Bureau of Meteorology 2019)

Date	Min Temp	Max Temp	Rain mm	Time of Rain	Daytime Wind Speed Range, km/h	Direction
28/02/2019	22.9	31	3.2	14:16	20	SE
1/03/2019	22.8	30.7	6.4	11:00	19	SE
2/03/2019	23	29.9	.8	13:34	22	S
3/03/2019	22.7	29.9	11.4	13:00	15	SSE
4/03/2019	23	30.4	0	-	17	SE
5/03/2019	22.6	31.9	0.2	14:41	15	SE
6/03/2019	23.2	31.1	0	-	7	N
7/03/2019	23.1	31.9	7.8	0:50	11	SE