STOCKLAND
LOCAL STRUCTURE PLAN
PRECINCT 15
(EAST WANNEROO DISTRICT STRUCTURE PLAN)

ROAD TRAFFIC AND FREIGHT RAIL (SPP 5.4)
ACOUSTIC ASSESSMENT

FEBRUARY 2023

OUR REFERENCE: 30648-1-22346

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SPP 5.4 ACOUSTIC ASSESSMENT

PRECINCT 15 LSP

Job No: 22346

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FOR

STOCKLAND

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CONTENTS

APPENDICIES

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Stockland Development Pty Ltd to undertake an acoustical assessment of noise received within the proposed Mariginiup LSP (Precinct 15) of the East Wanneroo District Structure Plan (DSP.

As part of the study, the following was carried out:

- Determine by noise modelling the noise levels that would be received within the LSP from trains travelling on the future passenger rail line.
- Assess the predicted noise levels received at residence for compliance with the requirements of the WAPC State Planning Policy 5.4 *"Road and Rail Noise"* (SPP 5.4).
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For information, the local structure plan is attached in Appendix A.

2. SUMMARY

Under the WAPC State Planning Policy 5.4, for this development, the appropriate "Noise Targets" to be achieved under SPP 5.4, external to a residence are:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}

The policy states that the "outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines". The Policy also states, under Section 6 – Policy Measures that "a reasonable degree of acoustic amenity for living areas on each residential lot". The policy recognises that "it may not be practicable to meet the outdoor noise targets".

The Policy states the following acceptable internal noise levels:

Internal

Living and Work Areas	$L_{Aeq(Day)}$ of 40 dB(A)
Bedrooms	$L_{Aeq(Night)}$ of 35 dB(A)

For this development, compliance with the requirements of SP 5.4, noise modelling and assessment are based on the day period for residence located adjacent to the passenger rail line.

This assessment is provided to provide overall guidance for the LSP, once detailed information is available at subdivision stage, such as final heights, Lot placements etc, more detailed acoustic advice can be provided.

The results of the acoustic assessment indicate that noise received at residences located adjacent to the passenger rail line would exceed the "Noise Targets" as outlined in SPP 5.4.

For lots which are to contain residential development the possible noise amelioration options that are normally considered are Setbacks or Buffer areas, Noise bunds and / or Barriers. and "Quiet House" design. Example of these in relation to this development are detailed below.

SETBACKS OR BUFFER AREAS

Using the above options, the distance for separation (buffer) of the rail line (at grade) and residential premises with no noise amelioration (wall or bund) would be as shown in Figure B2 in Appendix B.

As can be seen, the minimum setback (with no noise wall) would be 40 metres for there to be no other noise amelioration requirements, such as Quiet House Design.

The buffer would effectively isolate significant amounts of land, hence, not be practical for residential areas such as those proposed. However, if realignment of Public Open Space (POS) can be incorporated into the Lot design, then this maybe an affectual design.

NOISE BUNDS AND / OR BARRIERS

Noise control in the form of barriers, such as noise wall have been investigated as a way of ameliorating the noise levels for future development.

Details the noise contour plot for a 2.4 metre noise wall at the eastern boundary of the rail line is contain within Appendix B as Figure B3 and shown in summary below in Figure 5.1.

With the inclusion of a barrier, noise levels are attenuated sufficiently to enable residential development behind the wall with no further acoustic requirements.

It is noted that the setback on the western side for residential Lots is such that the boundary of the Lots meets the criteria Target Noise Level, hence there is no requirements for a wall on this side of the rail line.

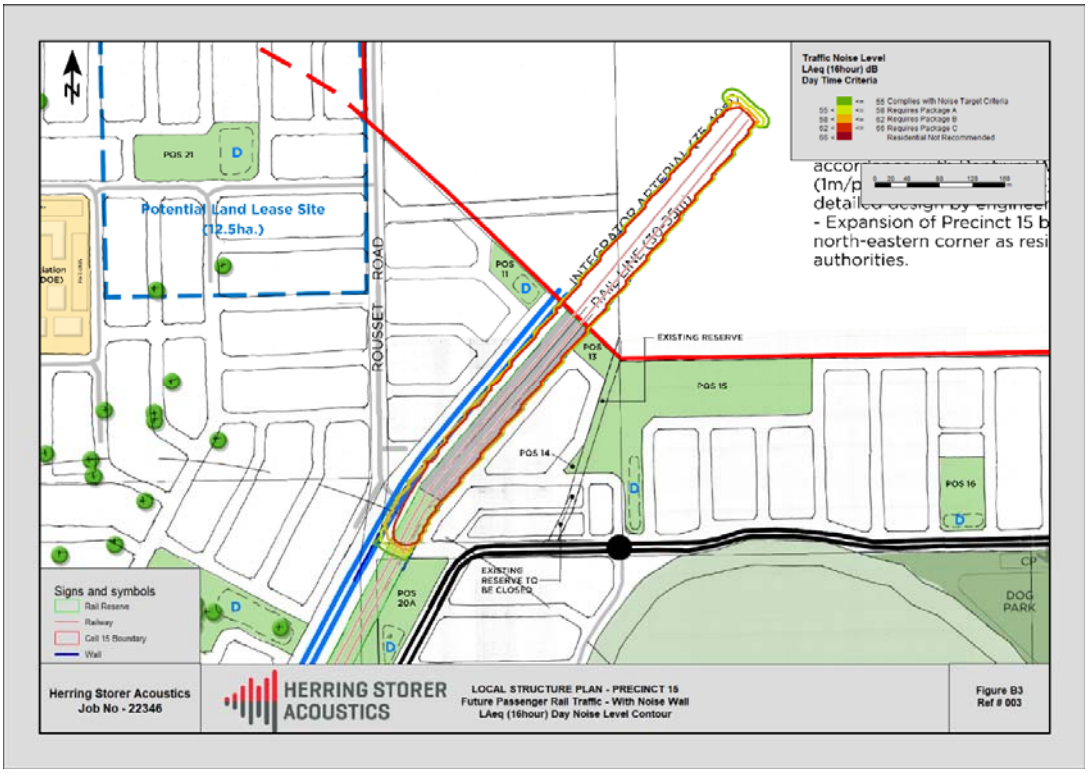


FIGURE 5.1 – PASASENGER RAIL NOISE CONTOUR – 2.4M NOISE WALL

QUIET HOUSE DESIGN

If considering residential development within areas above 55 dB(A) noise level, quiet house design as outlined in SPP 5.4 guidance would be required to further ameliorate noise levels to meet internal noise level criteria.

The package requirement depends on the external noise levels, however, for guidance Figure 5.4 details the quiet house design for the future noise levels associated with the rail line, without any noise control in the form of barriers, with a summary contained in Table 5.1 below.

TABLE 5.1 ROAD AND RAIL NOISE GUIDELINES SEPTEMBER 2019 (TABLE 2)
NOISE EXPOSURE FORECAST

Forecast Excess Noise Level, dB	Exposure Category	Policy requirements for noise-sensitive land-use and/or development
0 or less	**-**	No further measures
1 to 3	**A**	Noise-sensitive land-use and/or development is acceptable, subject to: Mitigation measures in accordance with an approved noise management plan; Or quiet house package as specified
-	***A+**	
4 to 7	**B**	
-	***B+**	
8 to 11	**C**	
-	***C+**	
12 to 15	**D**	Noise-sensitive land-use and /or development is not recommended. There is no default quiet house option due to excessive forecast noise: Professional design input is required in order to achieve compliance with relevant criteria. If noise-sensitive land-use and/or development is unavoidable, an approved noise management plan is required to demonstrate compliance with the noise target (see Table 1).
16+	**E**	

*Assists to mitigate short term noise events from freight rail.

Information on the deemed to satisfy constructions for the various “Quiet House Design” packages are contained in Appendix D.

Notes:

1 Given the location of the development and the projected market, we understand that 2 storey residences are unlikely, hence the Quiet House Design is for single storey residence only. If double storey residences are proposed, then it is recommended that specialist acoustic advice be sought by the proponent.

2 We understand that the development is a Local Structure Plan stage, hence the information contained in Appendix D regarding areas requiring “Quiet House” design will need to be refined once the lots have been defined and final heights are established. Additionally, any modifications to the Structure Plan, would vary the noise mitigation requirements relating to barriers and “Quiet House” design outlined in Appendix C.

3 The summary of the Quiet House Design Packages attached in Appendix D, are “Deemed to Satisfy” constructions. Alternative constructions would be acceptable, provided they are supported by an acoustic report prepared by a suitably qualified acoustic consultant.

4 Quiet House Design requirements are likely to lessen for residential premises set back from the highway, as the façade residences will barrier those behind.

5 Additionally, these residences also require Notifications on Titles.

3. CRITERIA

3.1 ROAD AND RAIL TRAFFIC NOISE

The Western Australian Planning Commission (WAPC) released on 6th September 2019 State Planning Policy 5.4 *"Road and Rail Noise"*. The requirements of State Planning Policy 5.4 are outlined below.

POLICY APPLICATION (Section 4)

When and where it applies (Section 4.1)

SPP 5.4 applies to the preparation and assessment of planning instruments, including region and local planning schemes; planning strategies, structure plans; subdivision and development proposals in Western Australia, where there is proposed:

*a) noise-sensitive land-use within the policy's trigger distance of a transport corridor as specified in **Table 1**;*

*b) New or major upgrades of roads as specified in **Table 1** and maps **(Schedule 1,2 and 3);** or*

*c) New railways or major upgrades of railways as specified in maps (**Schedule 1, 2 and 3);** or any other works that increase capacity for rail vehicle storage or movement and will result in an increased level of noise.*

Policy trigger distances (Section 4.1.2)

***Table 1** identifies the State's transport corridors and the trigger distances to which the policy applies.*

*The designation of land within the trigger distances outlined in **Table 1** should not be interpreted to imply that land is affected by noise and/or that areas outside the trigger distances are un-affected by noise.*

*Where any part of the lot is within the specified trigger distance, an assessment against the policy is required to determine the likely level of transport noise and management/ mitigation required. An initial screening assessment (**guidelines: Table 2: noise exposure forecast**) will determine if the lot is affected and to what extent."*

TABLE 1: TRANSPORT CORRIDOR CLASSIFICATION AND TRIGGER DISTANCES

Transport corridor classification	*Trigger distance*	*Distance measured from*
Roads		
Strategic freight and major traffic routes *Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume*	*300 metres*	*Road carriageway edge*
Other significant freight/traffic routes *These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meet the criteria of either >=23,000 daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes)*	*200 metres*	*Road carriageway edge*
Passenger railways		
	100 metres	*Centreline of the closest track*
Freight railways		
	200 metres	*Centreline of the closest track*

Proponents are advised to consult with the decision making authority as site specific conditions (significant differences in ground levels, extreme noise levels) may influence the noise mitigation measures required, that may extend beyond the trigger distance.

POLICY MEASURES (Section 6)

The policy applies a performance-based approach to the management and mitigation of transport noise. The policy measures and resultant noise mitigation will be influenced by the function of the transport corridor and the type and intensity of the land-use proposed. Where there is risk of future land-use conflict in close proximity to strategic freight routes, a precautionary approach should be applied. Planning should also consider other broader planning policies. This is to ensure a balanced approach takes into consideration reasonable and practical considerations.

Noise Targets (Section 6.1)

***Table 2** sets out noise targets that are to be achieved by proposals under which the policy applies. Where exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.*

In the application of the noise targets the objective is to achieve:

- *indoor noise levels as specified in **Table 2** in noise sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and child care centres the design of outdoor areas should take into consideration the noise target.*

It is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.

TABLE 2: NOISE TARGETS

Proposals	***New/Upgrade***	***Noise Targets***		
		Outdoor		***Indoor***
		Day (L_{Aeq}(Day) dB) (6 am-10 pm)	***Night (L_{Aeq}(Night)dB) (10 pm-6 am)***	***(L_{Aeq} dB)***
Noise-sensitive land-use and/or development	*New noise sensitive land use and/or development within the trigger distance of an existing/proposed transport corridor*	*55*	*50*	*L_{Aeq} (Day) 40(Living and work areas)* *L_{Aeq} (Night) 35 (bedrooms)*
Roads	*New*	*55*	*50*	*N/A*
	Upgrade	*60*	*55*	*N/A*
Railways	*New*	*55*	*50*	*N/A*
	Upgrade	*60*	*55*	*N/A*

Notes:

- *The noise target is to be measured at one metre from the most exposed, habitable façade of the proposed building, which has the greatest exposure to the noise-source. A habitable room has the same meaning as defined in State Planning Policy 3.1 Residential Design Codes.*

- *For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.*

- *The 5dB difference in the criteria between new and upgrade infrastructure proposals acknowledges the challenges in achieving noise level reduction where existing infrastructure is surrounded by existing noise-sensitive development.*

- *Outdoor targets are to be met at all outdoor areas as far as is reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines. For example, it is likely unreasonable for a transport infrastructure provider to achieve the outdoor targets at more than 1 or 2 floors of an adjacent development with direct line of sight to the traffic.*

Noise Exposure Forecast (Section 6.2)

*When it is determined that SPP 5.4 applies to a planning proposal as outlined in Section 4, proponents and/or decision makers are required to undertake a preliminary assessment using **Table 2**: noise exposure forecast in the guidelines. This will provide an estimate of the potential noise impacts on noise-sensitive land-use and/ or development within the trigger distance of a specified transport corridor. The outcomes of the initial assessment will determine whether:*

- *no further measures is required;*

- *noise-sensitive land-use and/or development is acceptable subject to deemed-to- comply mitigation measures; or*

- *noise-sensitive land-use and/or development is not recommended. Any noise-sensitive land-use and/ or development is subject to mitigation measures outlined in a noise management plan."*

4. MODELLING

For the purpose of assessment for future noise levels, predictive noise modelling software (SoundPlan) was utilised.

4.1 CALIBRATION

Measurements of a current passenger rail system have been conducted for the purpose of relating noise emissions to the proposed passenger rail line.

Noise level measurements of individual train pass-by events were made at the Perth to Armadale line for current speeds and train configuration, i.e., 90km/hr, and 2 and 4 carriage A Series passenger trains.

Noise measurements were conducted with a Larson Davis 831 Sound Level Meter. The Sound Level Meter was calibrated prior to and after use with a Bruel and Kjaer 4230 Calibrator. All equipment used is currently NATA laboratory calibrated. Calibration certificates are available on request.

The resultant noise levels for a sample of the measurements are contained in Table 4.1.

TABLE 4.1: SUMMARY OF MEASURED NOISE LEVELS

Train Type	Size	Speed	Measurement Distance Metres	L_{Amax} (95th percentile)	L_{Aeq} Average
A-Series	2 Carriage Train (43m long)	90km per hour	18	***80.0***	***74.4***
A-Series	2 Carriage Train (43m long)	90km per hour	21	***79.0***	***72.1***
A-Series	4 Carriage Train (86m long)	90km per hour	18	***85.2***	***76.9***
A-Series	4 Carriage Train (86m long)	90km per hour	21	***82.8***	***74.5***

The above individual train pass noise level can be used to calculate the $L_{Aeq(16hour)}$ Day, and the $L_{Aeq(8hour)}$ Night noise levels. This is based on the quantity of trains for each period, referencing the passenger rail timetable. Hence, Table 4.2 contains the details used for the calculations.

TABLE 4.2 – RELATIONSHIP BETWEEN MEASURED NOISE LEVELS AND TRAIN VOLUMES

Description	Value
Train Qty per 24 hours	149*
Train Qty per 16 hours Day	129
Train Qty per 8 hours Night	20
Distance of receiver (metres)	15
$L_{Aeq(20second)}$ at receiver (Train pass by event)	77.0
Time train noise is present (Seconds)	20
Total time noise present (Minutes) Day	43
Total time noise present (Minutes) Night	7
Total time noise present (Minutes) 24 hours	50
$L_{Aeq(16hour)}$ Day period	**63.5**
$L_{Aeq(8hour)}$ Night period	**58.4**

*Based on the public timetable for this section of rail line.

Based on the above monitoring results, for this project, the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ has been taken to be those listed in Table 4.2. It was assumed that these differences would apply in the future and to the proposed rail line.

We note that with the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ being greater than 5 dB(A), achieving compliance with the day period criteria will also achieve compliance with the night period criteria. Thus, only noise contour plots for the day period have been shown.

4.2 METHODOLOGY

Using the measured levels of the train as a basis for calibration, predictive noise modelling using Soundplan has been carried out.

The input data for the model included:

- Topographical data obtained from SMEC / Downer.
- Current passenger rail volumes as per information contained on https://www.transperth.wa.gov.au/timetables. (Assumed to be similar to the future traffic volume).
- A +2.5 dB adjustment to allow for façade reflection.
- Calibrated noise levels for the $L_{Aeq(day)}$ and $L_{Aeq(night)}$ as per the monitored noise levels, summarised in Table 4.2. Note calibration is against the current traffic flow.

The scenario considered for the assessment is the future train volumes for the passenger rail line with details as follows:

- Future trains – 240 per day ($L_{Aeq16hour}$) i.e. 15 per hour at 90km/hr consisting of 6 carriage B-Series trains.

For the future passenger rail line, it is understood that the rail is underground for the southern section of the LSP, exiting in the northern section of the LSP after the station. At this stage of the assessment, the scenario considers noise levels for the rail line at grade exiting the station. It is likely the line would be in a cutting; however, this would provide a conservative noise assessment.

Predictive noise levels for the rail line have been calculated using Nord2000 railway algorithms.

5. DISCUSSION / RECOMMENDATION

Under the WAPC State Planning Policy 5.4, for this development, the "Noise Target" as listed in Table 1 are the appropriate noise levels for to be achieved for this development. Under SPP 5.4, the "Noise Target" criteria which are applicable external to a residence are:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}

The policy states that the outdoor criteria apply to the ground floor level only, however, it also states that noise mitigation measures should be implemented with a view to achieving the “Noise Target” levels in least one outdoor living area. The Policy states the following acceptable internal noise levels:

Internal

Living and Work Areas	$L_{Aeq(Day)}$ of 40 dB(A)
Bedrooms	$L_{Aeq(Night)}$ of 35 dB(A)

For this development, compliance with the requirements of SP 5.4, noise modelling and assessment are based on the day period for residence located adjacent to the passenger rail line.

The results of the acoustic assessment indicate that noise received at residences located adjacent to the passenger rail line would exceed the "Noise Targets" as outlined in SPP 5.4.

For lots which are to contain residential development the possible noise amelioration options that are normally considered are Setbacks or Buffer areas, Noise bunds and / or Barriers. and "Quiet House" design. Example of these in relation to this development are detailed below.

SETBACKS OR BUFFER AREAS

Using the above options, the distance for separation (buffer) of the rail line (at grade) and residential premises with no noise amelioration (wall or bund) would be as shown in Figure B2 in Appendix B.

As can be seen, the minimum setback (with no noise wall) would be 40 metres for there to be no other noise amelioration such as Quiet House Design.

The buffer would effectively isolate significant amounts of land, hence, not be practical for residential areas such as those proposed. However, if realignment of Public Open Space (POS) can be incorporated into the Lot design, then this maybe an affectual design.

NOISE BUNDS AND / OR BARRIERS

Noise control in the form of barriers, such as noise wall have been investigated as a way of ameliorating the noise levels for future development.

Details the noise contour plot for a 2.4 metre noise wall at the eastern boundary of the rail line is contain within Appendix B as Figure B3 and shown in summary below in Figure 5.1.

With the inclusion of a barrier, noise levels are attenuated sufficiently to enable residential development behind the wall with no further acoustic requirements.

It is noted that the setback on the western side for residential Lots is such that the boundary of the Lots meets the criteria Target Noise Level, hence there is no requirements for a wall on this side of the rail line.

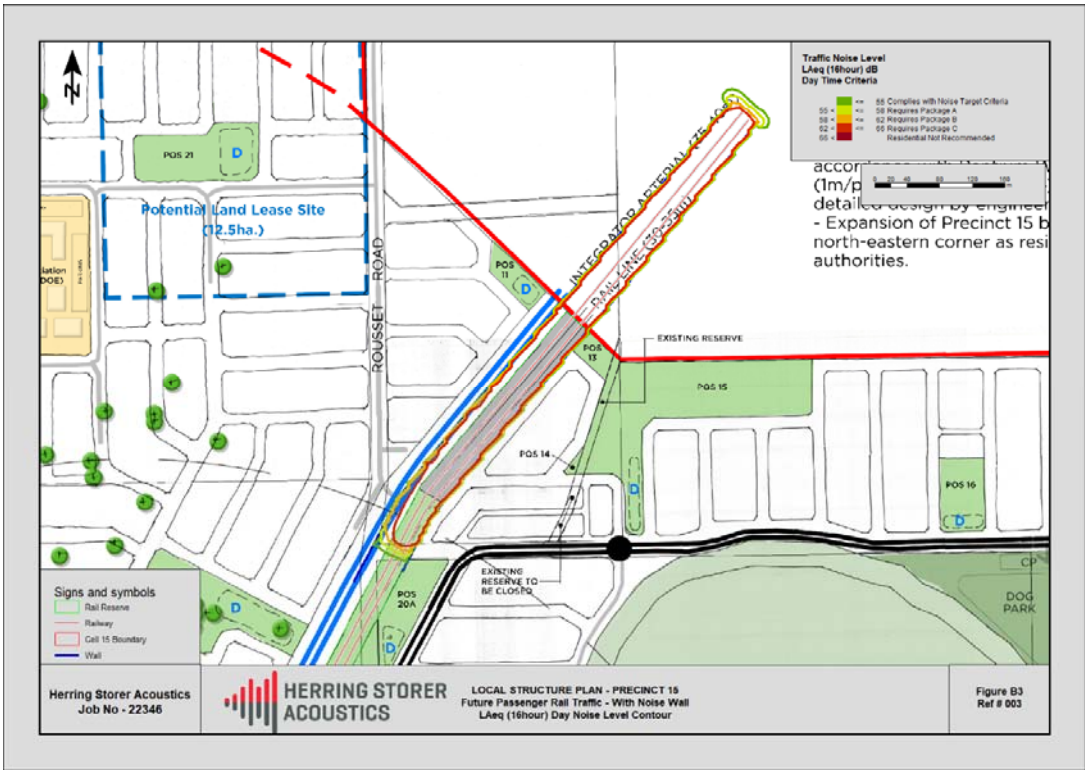


FIGURE 5.1 – PASASENGER RAIL NOISE CONTOUR – 2.4M NOISE WALL

QUIET HOUSE DESIGN

If considering residential development within areas above 55 dB(A) as per the previous two scenarios, quiet house design as outlined in SPP 5.4 guidance would be required to further ameliorate noise levels to meet internal noise level criteria.

The package requirement depends on the external noise levels, however, for guidance Figure 5.4 details the quiet house design for the future noise levels associated with the rail line, without any noise control in the form of barriers, with a summary contained in Table 6.1 below.

TABLE 6.1 ROAD AND RAIL NOISE GUIDELINES SEPTEMBER 2019 (TABLE 2) : NOISE EXPOSURE FORECAST

Forecast Excess Noise Level, dB	Exposure Category	Policy requirements for noise-sensitive land-use and/or development
0 or less	**-**	No further measures
1 to 3	**A**	Noise-sensitive land-use and/or development is acceptable, subject to: Mitigation measures in accordance with an approved noise management plan; Or quiet house package as specified
-	***A+**	
4 to 7	**B**	
-	***B+**	
8 to 11	**C**	
-	***C+**	
12 to 15	**D**	Noise-sensitive land-use and /or development is not recommended. There is no default quiet house option due to excessive forecast noise: Professional design input is required in order to achieve compliance with relevant criteria. If noise-sensitive land-use and/or development is unavoidable, an approved noise management plan is required to demonstrate compliance with the noise target (see Table 1).
16+	**E**	

*Assists to mitigate short term noise events from freight rail.

Information on the deemed to satisfy constructions for the various “Quiet House Design” packages are contained in Appendix D.

Notes:

1 Given the location of the development and the projected market, we understand that 2 storey residences are unlikely, hence the Quiet House Design is for single storey residence only. If double storey residences are proposed, then it is recommended that specialist acoustic advice be sought by the proponent.

2 We understand that the development is a Local Structure Plan stage, hence the information contained in Appendix D regarding areas requiring “Quiet House” design will need to be refined once the lots have been defined and final heights are established. Additionally, any modifications to the Structure Plan, would vary the noise mitigation requirements relating to barriers and “Quiet House” design outlined in Appendix C.

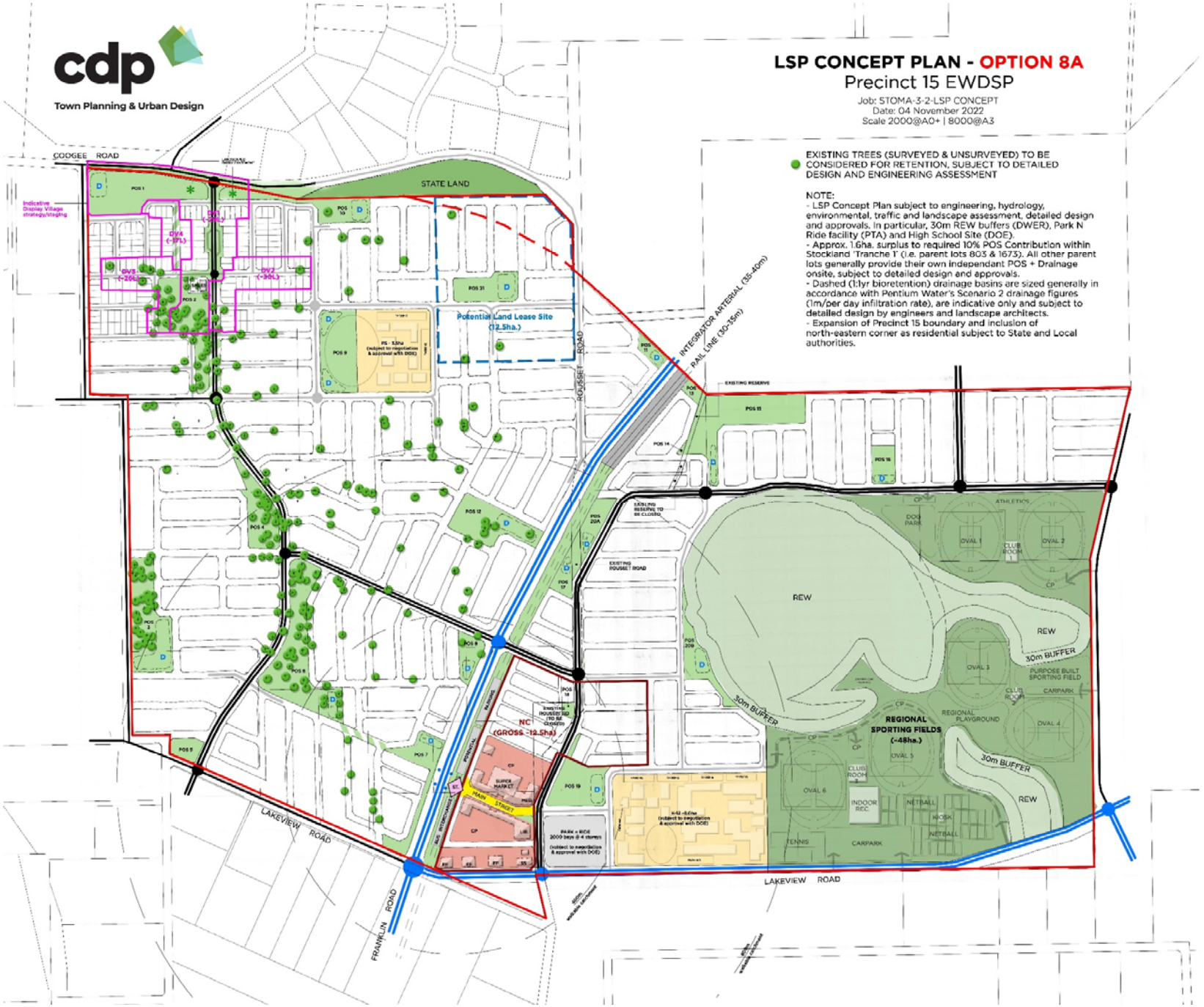
3 The summary of the Quiet House Design Packages attached in Appendix D, are “Deemed to Satisfy” constructions. Alternative constructions would be acceptable, provided they are supported by an acoustic report prepared by a suitably qualified acoustic consultant.

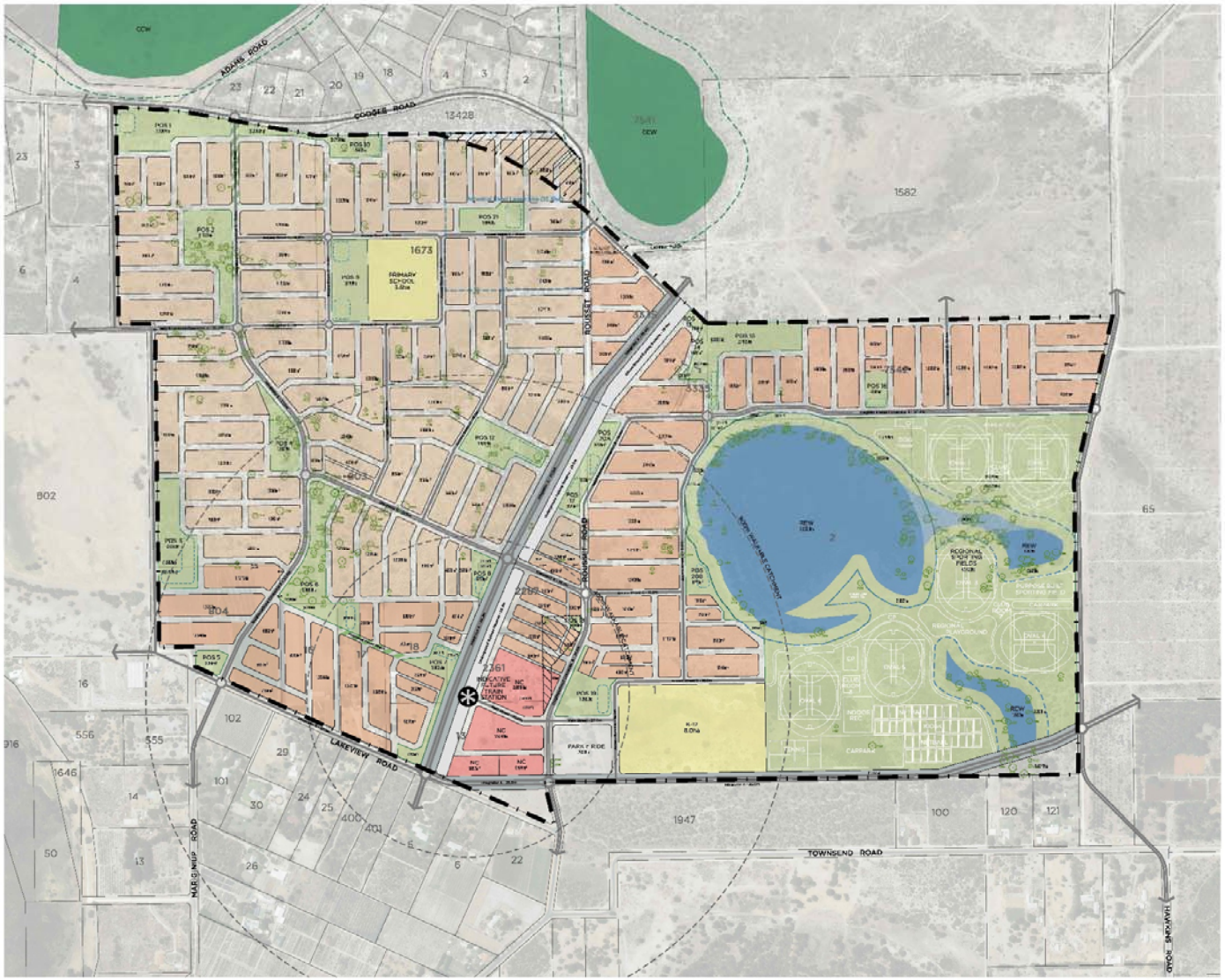
4 Quiet House Design requirements are likely to lessen for residential premises set back from the railway line, as the façade residences will barrier those behind.

5 Additionally, these residences also require Notifications on Titles.

APPENDIX A

PRECINCT 15 LOCAL STRUCTURE PLAN
AND
DEAST WANNEROO DISTRICT STRUCTURE PLAN


cdp
Town Planning & Urban Design
LSP CONCEPT PLAN - OPTION 8A
Precinct 15 EWDSP
Job: STOMA-3-2-LSP CONCEPT
Date: 04 November 2022
Scale 2000@A0+ | 8000@A3
EXISTING TREES (SURVEYED & UNSURVEYED) TO BE CONSIDERED FOR RETENTION, SUBJECT TO DETAILED DESIGN AND ENGINEERING ASSESSMENT
NOTE:
- LSP Concept Plan subject to engineering, hydrology, environmental, traffic and landscape assessment, detailed design and approvals. In particular, 30m REW buffers (DWER), Park N Ride facility (PTA) and High School Site (DOE).
- Approx. 1.6ha. surplus to required 10% POS Contribution within Stockland 'Tranche 1' (i.e. parent lots 803 & 1673). All other parent lots generally provide their own independant POS + Drainage onsite, subject to detailed design and approvals.
- Dashed (1:1yr bioretention) drainage basins are sized generally in accordance with Pentium Water's Scenario 2 drainage figures (1m/per day infiltration rate), are indicative only and subject to detailed design by engineers and landscape architects.
- Expansion of Precinct 15 boundary and inclusion of north-eastern corner as residential subject to State and Local authorities.
COOGEE ROAD
STATE LAND
Potential Land Lease Site (12.5ha.)
INTEGRATOR ARTERIAL (35-40m)
RAIL LINE (30-35m)
ROUSSET ROAD
REW
30m BUFFER
REGIONAL SPORTING FIELDS (~48ha.)
OVAL 1
OVAL 2
OVAL 3
OVAL 4
OVAL 5
OVAL 6
CLUB ROOM
CARPARK
NC (GROSS ~12.5ha)
LAKEVIEW ROAD
FRANKLIN ROAD



LEGEND

- PRECINCT 15 BOUNDARY
- ADDITIONAL AREA TO BE ADDED TO PRECINCT 15
- CONSERVATION CATEGORY WETLAND (CCW)
- RESOURCE ENHANCEMENT WETLAND (REW)
- CCW BUFFER (50m)
- REW BUFFER (30m)
- EXISTING SIGNIFICANT TREE SURVEY (MNG REF: 105191de-003a-SEPT 2022)
- PUBLIC OPEN SPACE
- SCHOOL
- NEIGHBOURHOOD CENTRE
- PARK & RIDE
- FUTURE TRAIN STATION
- TRANCHE 1 NDA - 69.895ha
- TRANCHE 2 NDA - 47.631ha

MARIGINIUP ASSUMPTIONS & NOTES

- Expansion of Precinct 15 boundary to include north-eastern corner of Tranche 1 as residential, subject to State and Local authority approvals.
- LSP Concept Plan subject to engineering, hydrology, environmental, traffic and landscape assessment, detailed design and approvals.
- Existing trees (surveyed & unsurveyed) to be considered for retention, subject to arborist report, detailed design and engineering assessment.
- 30m REW buffers subject to environmental assessment and DWER approval.
- Size and location of Park N Ride facility subject to PTA approval.
- Size and location of High School Site subject to DOE approval.
- Proposed relocation of Groundwater Holding Facility, as shown on the EWDSP.
- The overall Precinct 15 provides an approx. 1.5ha. surplus to the required 10% POS Contribution, with approx. 2.1ha surplus within Stockland 'Tranche 1' (i.e. parent lots 803 & 1673) and a 0.6ha deficit within the balance parent lots.
- Dashed areas within POS indicate approx. area of 1-1yr bioretention basins, sized generally in accordance with Pentium Water's Scenario 2 drainage figures (1m/per day infiltration rate): are indicative only and subject to hydrologist, engineer and landscape architect detailed design and respective approvals.
- Coogee Road extension realignment, along northern edge of State Land, subject to approval.
- Existing Rousset Road located within 50m CCW subject to further environmental assessment and approvals. Potential reduction in residential/NDA, adjacent to CCW, subject to outcome.
- Concept Plan subject to BAL Contour Plan and Bushfire Management Plan (BMP). Concept Plan provides 18m minimum peripheral roads to mitigate against expected bushfire setbacks.
- Provision of one (1) Primary School and one (1) Kindergarten – Year 12 subject to final yield and negotiation with DOE. Larger schools could result as required.
- Concept Plan subject to various road and reserve closures: and consequent acquisition arrangements.
- Levels of Rousset Road to be cut down (north of Transport Corridor) subject to neighbouring landowner consent and relevant approvals.
- Regional Sporting Field (RSF) facilities in-line with EWDSP Community Infrastructure Report. RSF layout indicative only and subject to DSR approval.
- *Layout and configuration of Neighbourhood Centre subject to Retail Analysis and detailed design.*
- 'Green Street' and 'Entry Road' intended to be embellished to create high quality landscape amenity, subject to detailed design.
- Inclusion of Railway corridor subject to outcome of PTA assessment, expected early-mid 2023.
- Inclusion of 12.5ha. Land Lease Site (where indicated) subject to further assessment by Stockland.
- Kink to eastern-most portion of Lakeview Road, to avoid the Wastewater Treatment Plant, creates an awkward portion of land identified as 'Rural/Tourism on the EWDSP, whilst compromising potentially environmentally sensitive land/trees. Opportunity to straighten Lakeview Road at the risk of staggering integrators onto Whiteman-Yanchep Highway.

CONCEPT CELL STRUCTURE PLAN

Precinct 15

A Stockland Project

DRAFT

NORTH

Scale: 1:10 000 @ A3

0 100 200 300m

PLAN: STOMA-1-010 REVISION: G

DATE: 19/12/2022 DRAWN: JP

PROJECTION: MGA 50 PLANNER: BK

DATUM: AHD CHECK: IH

cdp
Town Planning & Urban Design

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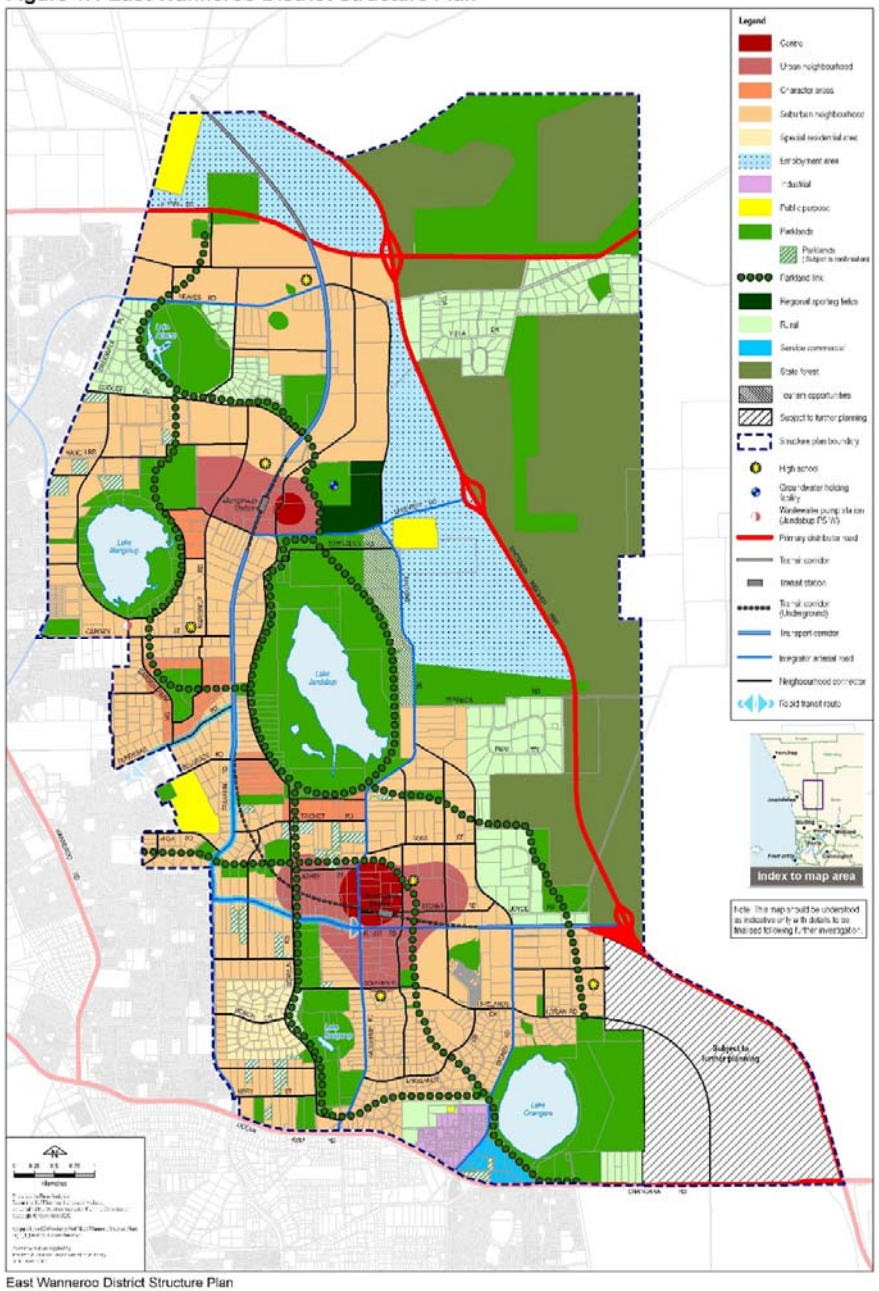
Figure 1.1 East Wanneroo District Structure Plan



East Wanneroo District Structure Plan

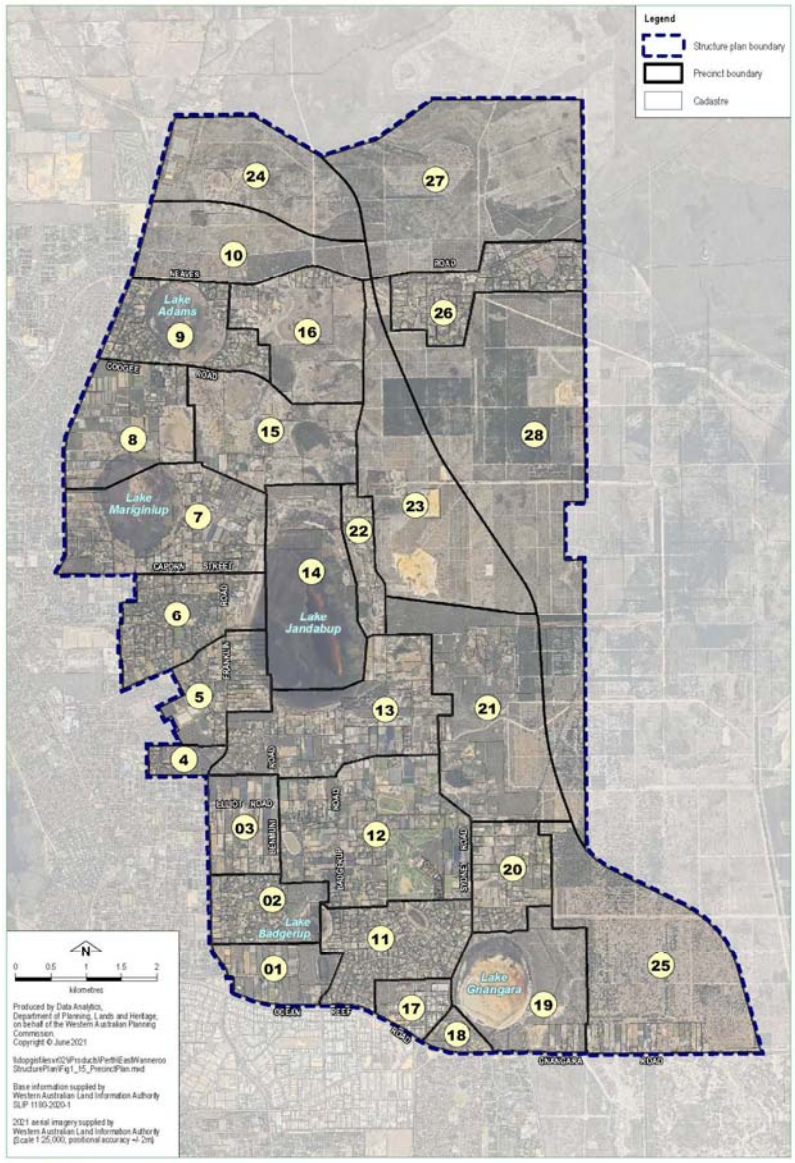
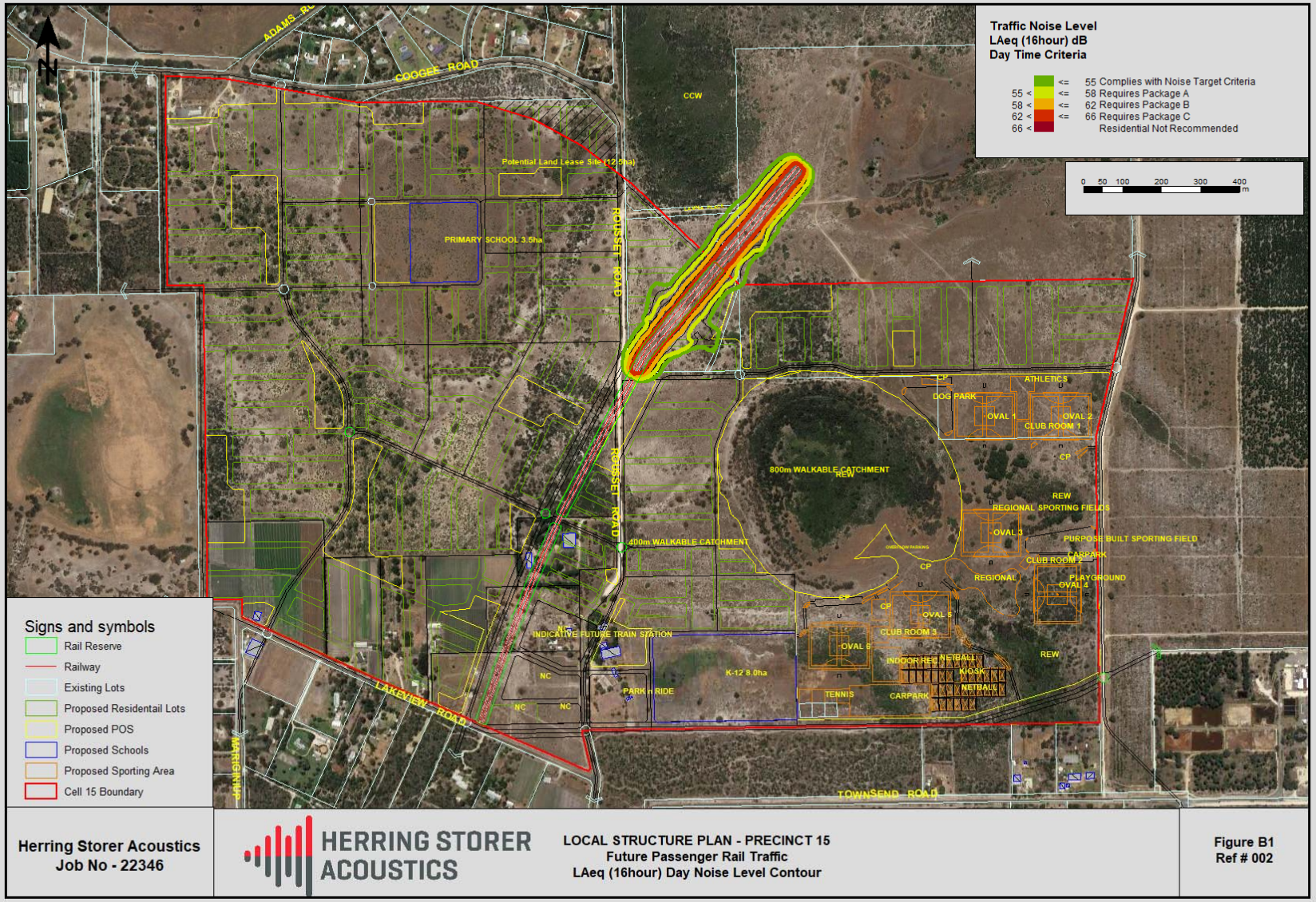


Figure 1.15: Precinct Plan

APPENDIX B

FIGURES B1, B2 and B3
$L_{Aeq(16hr)}$ DAY
NOISE CONTOURS FOR PASSENGER RAIL

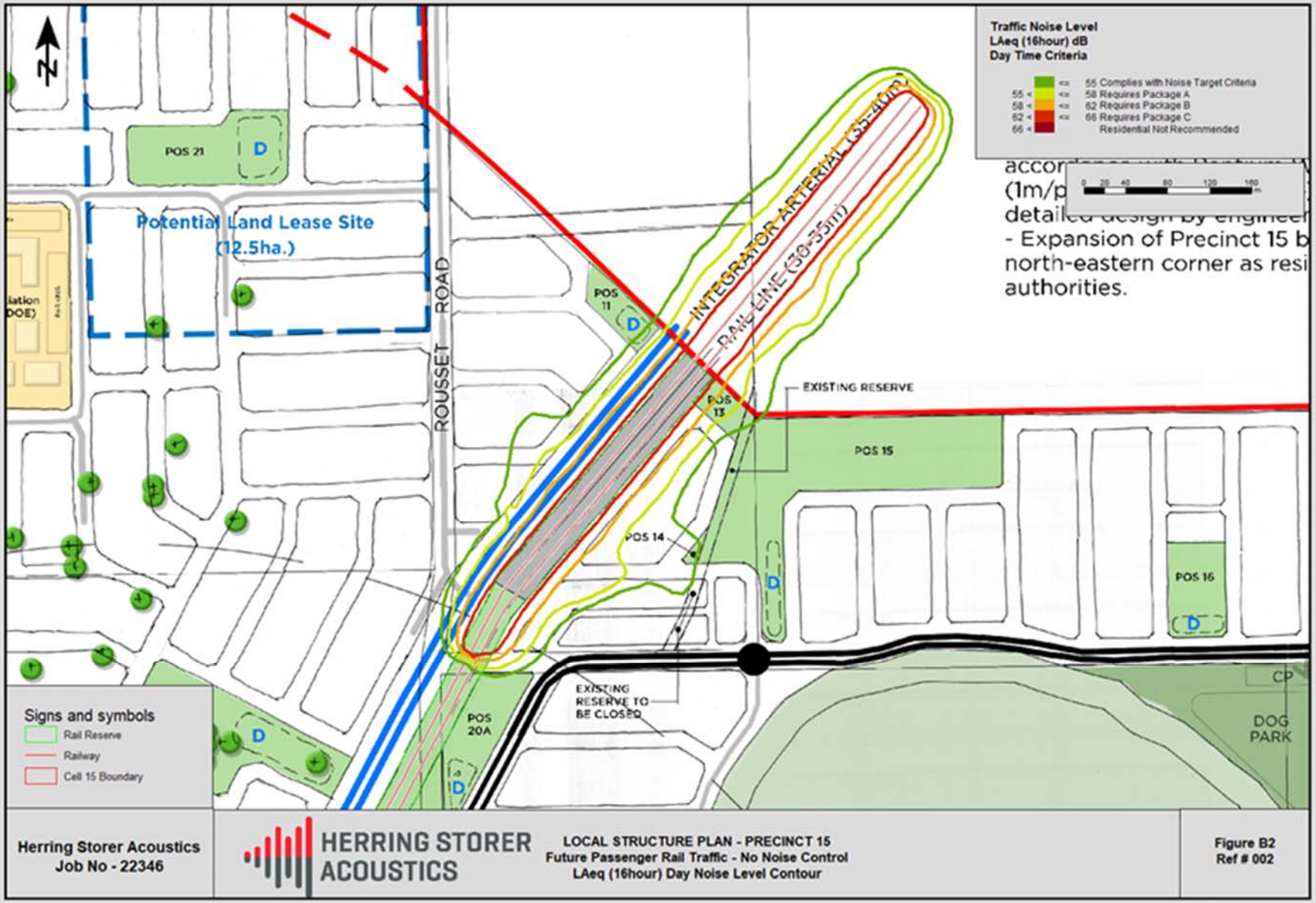


Herring Storer Acoustics
Job No - 22346

HERRING STORER ACOUSTICS

LOCAL STRUCTURE PLAN - PRECINCT 15
Future Passenger Rail Traffic
LAeq (16hour) Day Noise Level Contour

Figure B1
Ref # 002


Traffic Noise Level
LAeq (16hour) dB
Day Time Criteria
55 Complies with Noise Target Criteria
58 Requires Package A
62 Requires Package B
66 Requires Package C
Residential Not Recommended
POS 21
Potential Land Lease Site
(12.5ha.)
ROUSSET ROAD
POS 11
INTEGRATOR ARTERIAL (32-40m)
RAILLINE (36-55m)
EXISTING RESERVE
POS 13
POS 15
POS 14
POS 16
EXISTING RESERVE TO BE CLOSED
POS 20A
DOG PARK
- Expansion of Precinct 15 b
north-eastern corner as resi
authorities.
Signs and symbols
Rail Reserve
Railway
Cell 15 Boundary
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Job No - 22346
HERRING STORER ACOUSTICS
LOCAL STRUCTURE PLAN - PRECINCT 15
Future Passenger Rail Traffic - No Noise Control
LAeq (16hour) Day Noise Level Contour
Figure B2
Ref # 002

APPENDIX C

"QUIET HOUSE" DESIGN INFORMATION

Road Traffic and Passenger Rail
Quiet House Requirements
(*Based on Table 3 of State Planning Policy 5.4 2019*)

Exposure Category	Orientation to corridor	Acoustic rating and example constructions					Mechanical ventilation/air conditioning considerations
		Walls	**External doors**	**Windows**	**Roofs and ceilings of highest floors**	**Outdoor Living areas**	
A **Quiet House A**	**Facing**	**Bedroom and Indoor Living and work areas to Rw + Ctr 45dB** **Stud Frame Walls** ➢ One row of 92mm studs at 60mm centres with: ➢ Resilient steel channels fixed to the outside of the studs; and ➢ 9.5mm hardboard or 9mm fibre cement weatherboards or one layer of 19mm board cladding fixed to the outside of the channels; and ➢ 75mm glass wool (11kg/m3) or 75mm polyester (14kg/m3) insulation, positioned between the studs; and ➢ -Two layers of 16mm fire-protective grade plasterboard fixed to the inside face of the studs. **Brick Walls** ➢ Single leaf of 150mm brick masonry with 13mm cement render on each face: **OR** ➢ Double brick: two leaves of 90 mm clay brick masonry with a 20mm cavity between leaves.	**Bedrooms**: ➢ Fully glazed hinged door with certified **R_w+C_{tr} 28dB** rated door and frame including seals and 6mm glass **Indoor Living and work areas:** ➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR** ➢ Glazed sliding door with 10 mm glass and weather seals	**Bedrooms**: ➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**R_w+C_{tr} 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead**: OR** ➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**R_w+C_{tr} 31dB**). **Indoor Living and work areas** ➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**R_w+C_{tr} 25dB): OR** ➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB : OR** ➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**R_w+C_{tr} 31 dB**).	**To R_w+C_{tr} 35dB** ➢ Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard ceiling	➢ At least one outdoor living area located on the opposite side of the building from the transport corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces ➢ Evaporative systems require attenuated ceiling air vents to allow closed windows ➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements ➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable
	Side On		As per "Facing" above, except R_w+C_{tr} values may be 3dB less, e.g. glazed sliding door with 10 mm glass and weather seals for bedrooms	As above, except R_w+C_{tr} values may be 3dB less, or max % area increased by 20%			
	Opposite		No specific requirements	No specific requirements			

Road Traffic and Passenger Rail
Quiet House Requirements
(*Based on Table 3 of State Planning Policy 5.4 2019*)

Exposure Category	Orientation to corridor	Acoustic rating and example constructions					Mechanical ventilation/air conditioning considerations
		Walls	**External doors**	**Windows**	**Roofs and ceilings of highest floors**	**Outdoor Living areas**	
B **Quiet House B**	**Facing**	**Bedroom and indoor living and work areas to R_w+C_{tr} 50dB** **Single leaf of 90 mm clay brick masonry with:** ➢ A row of 70 mm x 35 mm timber studs or 64 mm steel studs at 600 mm centres; ➢ A cavity of 25 mm between leaves; ➢ 50 mm glass wool or polyester cavity insulation (R2.0+) insulation between studs; and ➢ One layer of 10mm plasterboard fixed to the inside face ➢ Single leaf of 220mm brick masonry with 13mm cement render on each face ➢ 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face **Double brick: two leaves of 90mm clay brick masonry with:** ➢ A 50mm cavity between leaves ➢ 50mm glass wool or polyester cavity insulation (R2.0+) ➢ Resilient ties where required to connect leaves **Double brick: two leaves of 110mm clay brick masonry with** ➢ 50mm cavity between leaves and R2.0+ cavity insulation	**Bedrooms** ➢ Fully glazed hinged door with certified **R_w+C_{tr} 31dB** rated door and frame including seals and 10mm glass **Indoor Living and work areas** ➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR** ➢ Glazed sliding door with 10 mm glass and weather seals	**Bedrooms**: ➢ Total external door and window system area up to 40% of room floor areas: Fixed sash, awning or casement with minimum 6mm single or 6mm-12mm-6mm double insulted glazing (**Rw+Ctr 31dB**). ➢ Up to 60% floor area: as per above but must be minimum10mm single or 6mm-12mm-10mm double insulated glazing (**Rw+Ctr 34dB**) **Indoor Living and work areas** ➢ Up to 40% floor area; Sliding or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (R_w+C_{tr} 28dB). Sealed awning or casement windows may use 6mm glazing instead. **: OR** ➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**R_w+C_{tr} 31dB**). **: OR** ➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**R_w+C_{tr} 34dB).**	**To R_w+C_{tr} 35dB** ➢ Concrete or terracotta tile sarking and at least 10mm plasterboard ceiling, R3.0+ insulation **OR** ➢ Metal sheet roof, sarking and at least 10mm plasterboard ceiling, R3.0+ insulation	➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces ➢ Evaporative systems require attenuated ceiling air vents to allow closed windows ➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements ➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable
	Side-On		**Bedrooms**: ➢ Fully glazed hinged door with certified **R_w+C_{tr} 28dB** rated door and frame including seals and 6mm glass **Indoor Living and work areas:** ➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR** ➢ Glazed sliding door with 10 mm glass and weather seals	**Bedrooms**: ➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**R_w+C_{tr} 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead. **: OR** ➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**R_w+C_{tr} 31dB**). **Indoor Living and work areas** ➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**R_w+C_{tr} 25dB**). **: OR** ➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB**) **: OR** ➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**R_w+C_{tr} 31 dB**).			
	Opposite		As above, except R_w+C_{tr} values may be 3dB less, or max % area increased by 20%	As above, except R_w+C_{tr} values may be 3dB less, or max % area increased by 20%			

Road Traffic and Passenger Rail
Quiet House Requirements

(*Based on Table 3 of State Planning Policy 5.4 2019*)								
Exposure Category	**Orientation to corridor**	**Acoustic rating and example constructions**						
		Walls	**External doors**	**Windows**	**Roofs and ceilings of highest floors**	**Outdoor Living areas**	**Mechanical ventilation/air conditioning considerations**
C **Quiet House C**	**Facing**	**Bedroom and indoor living and work areas to R_w+C_{tr} 50dB** **Single leaf of 90 mm clay brick masonry with:** ➢ A row of 70 mm x 35 mm timber studs or 64 mm steel studs at 600 mm centres; ➢ A cavity of 25 mm between leaves; ➢ 50 mm glass wool or polyester cavity insulation (R2.0+) insulation between studs; and ➢ One layer of 10mm plasterboard fixed to the inside face ➢ Single leaf of 220mm brick masonry with 13mm cement render on each face ➢ 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face **Double brick: two leaves of 90mm clay brick masonry with:** ➢ A 50mm cavity between leaves ➢ 50mm glass wool or polyester cavity insulation (R2.0+) ➢ Resilient ties where required to connect leaves **Double brick: two leaves of 110mm clay brick masonry with** ➢ 50mm cavity between leaves and R2.0+ cavity insulation	**Bedrooms** ➢ External doors to bedrooms facing the corridor are not recommended. **Indoor Living and work areas** ➢ Fully glazed hinged door with certified **Rw+Ctr 31dB** rated door and frame including seals and 10mm glass**: OR** 40mm solid core timber frame and door (without glass or with glass inserts not less than 6mm), side hinged with certified **Rw 32dB** acoustically rated door and frame system including seals	**Bedrooms**: ➢ Total external door and window system area up to 20% of room floor area: Fixed sash, awning or casement with minimum 6mm single or 6mm-12mm-6mm double insulted glazing (**R_w+C_{tr} 31dB): OR** ➢ Up to 40% floor area; as per above but must be minimum 10mm single or 6mm-12mm-10mm double insulted glazing (**R_w+C_{tr} 34dB**). **Indoor Living and work areas** ➢ Up to 40% floor area: Sliding or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulated glazing (**R_w+C_{tr} 31dB**). Sealed awning or casement windows may use 6mm glazing instead**: OR** ➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr 34dB)**	**To R_w+C_{tr} 40dB** ➢ To al bedrooms, 2 layers of 10mm plasterboard, or one layer 13mm high density sealed plasterboard (minimum surface density of 12.5 kg/m2), affixed using steel furring channels beneath ceiling rafters/supports**: and** ➢ R3.0+ insulation batts laid in cavity **: and** ➢ Concrete or terracotta tile roof with sarking, or metal sheet roof with foil backed R2.0+ fibre insulation between steel sheeting and roof battens	➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of Rw 40dB into sensitive spaces. ➢ Evaporative systems require attenuated ceiling air cents to allow closed windows. ➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements ➢ Openings such as eaves, vents and air inlets must be acoustically treated, close or relocated to building sides facing away from the corridor where practicable.
	Side-on		**Bedrooms** ➢ Fully glazed hinged door with certified **R_w+C_{tr} 31dB** rated door and frame including seals and 10mm glass **Indoor Living and work areas** ➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR** ➢ Glazed sliding door with 10 mm glass and weather seals				
	Opposite		**Bedrooms**: ➢ Fully glazed hinged door with certified **R_w+C_{tr} 28dB** rated door and frame including seals and 6mm glass **Indoor Living and work areas:** ➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR** ➢ Glazed sliding door with 10 mm glass and weather seals	**Bedrooms**: ➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**R_w+C_{tr} 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead**: OR** ➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**R_w+C_{tr} 31dB**). **Indoor Living and work areas** ➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**R_w+C_{tr} 25dB): OR** ➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB : OR** ➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**R_w+C_{tr} 31 dB**).			