MARSHALL DAY Acoustics

WALLAN EAST (PART 1) PSP

HIGH LEVEL NOISE IMPACT ASSESSMENT

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Project: **WALLAN EAST (PART 1) PRECINCT STRUCTURE PLAN**

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1.0 INTRODUCTION

The Victorian Planning Authority (VPA) are working on the development of the Wallan East (Part 1) Precinct Structure Plan (the subject PSP).

The purpose of this high-level noise impact assessment is to inform the land use and development response for the land adjacent the North East rail line and the Wallan Whittlesea Road, and other potential noise-sensitive interfaces.

A glossary of acoustic terminology is provided in Appendix A.

2.0 SITE DETAILS

2.1 Project description

The subject PSP is located near several other ongoing and future PSPs in the Shire of Mitchell. It is understood that the PSP has a close relationship with Wallan South PSP located adjacent the existing Wallan township approximately 2 km away which is being progressed concurrently.

It is envisaged that together the Wallan South PSP and the subject PSP will support and complement the existing Wallan township by capitalising on opportunities arising from the Wallan train station and other existing natural and physical assets.

The current preliminary place based option plans under consideration for the subject PSP are provided in Appendix B.

2.2 Location and surroundings

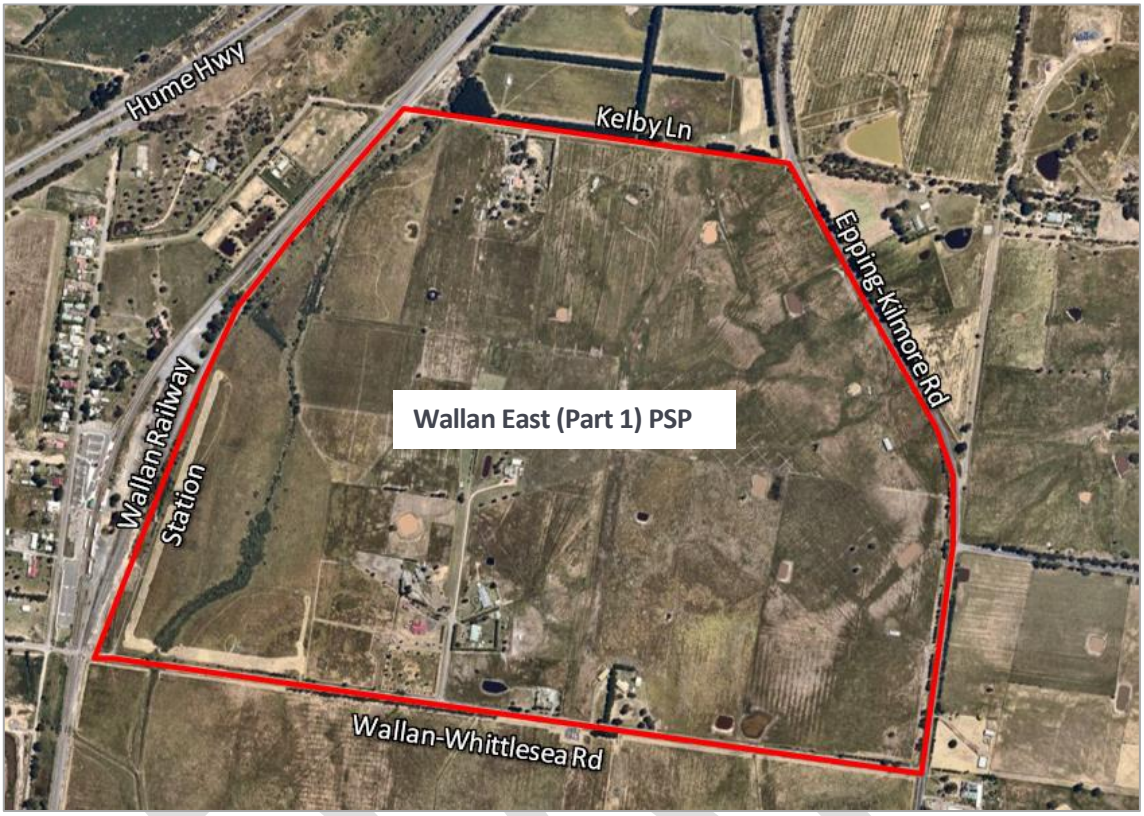
The subject PSP will cover a total of approximately 140 hectares bound by:

- Kelby Lane to the north;
- Epping-Kilmore Road to the east;
- Wallan-Whittlesea Road to the south; and
- The North East rail line and Wallan train station to the west.

An existing City Gate gas infrastructure is also located at Lot 1 TP683815, opposite Wallan-Whittlesea Road, approximately 630 m west of Epping-Kilmore Road.

An aerial photograph showing the extent of the subject PSP and surrounding environment is provided in Figure 1.

Figure 1: Aerial photograph of the subject PSP site and surrounds



Note: Image courtesy Nearmap©. Aerial photograph taken 11 December 2020

2.3 Potential noise sources

Proposed future sensitive (residential) land uses within subject PSP have the potential to be impacted by the following noise sources:

- Trains travelling along the North East rail line, immediately west of the site.

  An increase in freight traffic is envisaged, as a result of the development of the Inland Rail Project, with rolling stock accessing the Beveridge Intermodal Freight Terminal (BIFT) located approximately 2 km to the south of the PSP

- Traffic from the existing road networks including:
  - Hume Freeway which currently carries approximately 25,000 vehicles AADT[1], 24 % HV[2] at 110 km/h
  - Wallan-Whittlesea Road which currently carries approximately 4,700 AADT, 8-12 % HV at 80 km/h

    Designated on the proposed Principal Freight Network & potentially widened to four lanes.

    It is understood that a grade separation project (road over rail) is proposed to remove the current level crossing
  - Epping-Kilmore Road which currently carries approximately 3,200 AADT, 6-9% HV at 80 km/h
- Existing City Gate infrastructure, south of Wallan-Whittlesea Road

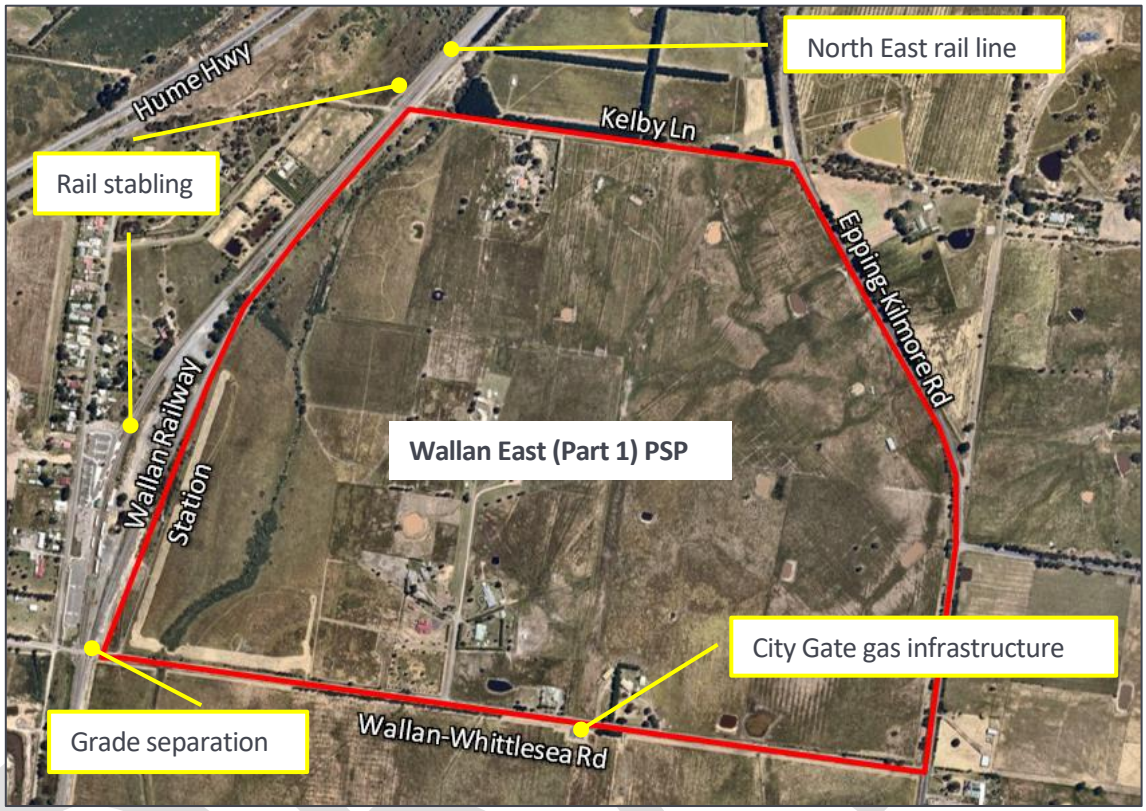
[1] Annual Average Daily Traffic (AADT)

[2] Heavy Vehicles (HV)

- Future stabling yard with the current preferred option to the north of William Street/Kelby Lane as part of the long-term plans for the site (2051). Although it is understood that an alternative is under consideration for stabling at the train station
- On-site commercial premises (i.e. any proposed commercial precincts within the site).

The noise sources identified above are shown in Figure 2.

Figure 2: Potential noise sources



2.4 Land use zoning

Land in and around the subject PSP is currently zoned as follows:

- Subject PSP: Farming Zone (FZ)
- Adjacent road network to the south and east: Road Zone Category 1 (RDZ1)
- North East rail line: Public Use Zone 4 (PUZ4)
- Wallan township, located opposite the railway line: Township Zone (TZ).

The relevant planning map is provided in Appendix C.

3.0 RELEVANT LEGISLATION AND GUIDELINES

A range of legislation, regulations and guidelines are used in Victoria to assess environmental noise.

The following sections provide an overview of the key documents used to conduct this high-level assessment.

Considering the separating distance between the potential sources of vibration and the proposed residential areas within the subject PSP, the assessment of vibration is not considered as a planning constraint. As such, potential vibration impacts have not been considered in this report.

3.1 Victorian Legislation

A summary of the relevant legislation used to assess potential noise impacts to sensitive uses within the subject PSP is provided in Table 1.

Refer to Appendix D for further details.

Table 1: Relevant Victorian noise Legislation

Document	Overview
Environment Protection Act 1970 (the Act)	The Act provides the overarching legislative framework for the protection of the environment in Victoria. It establishes obligations for the control of environmental noise and applies to all types of noise sources except rail operations. The legislation does not specify noise limit values but sets out legal requirements to comply with State environment protection policies and prescribed standards.
State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1)	SEPP N-1 defines mandatory noise limits for commercial, industrial or trade premises throughout the Melbourne Metropolitan region. The limits apply to the level of noise occurring at neighbouring sensitive receivers. The limits are based on the land use zoning and background noise level, where that level is particularly high or low. Additionally, SEPP N-1 provides the methodology for assessing environmental noise as described in Appendix D1.
VicRoads' *Traffic Noise Reduction Policy*	VicRoads has an internal policy which is used to determine entitlement to noise barriers in situations where VicRoads takes responsibility for noise mitigation. However, these situations only occur where arterial roads and freeways are built on new alignments, or where existing arterial roads or freeways are widened by two or more lanes and buildings previously protected from traffic noise are exposed by the removal of buildings required for widening. Refer to Appendix D3.1 for further detail.
Clause 58 of the *Victorian Planning Provisions* (VPP) and *Apartment Design Guidelines* (ADG)	The proposed development will be required to comply with the requirements of Clause 58.04-3, Standard (D16) of the VPP. The clause requires that noise impacts associated with the development are adequately addressed. This includes external and internal noise sources. The Guidelines recognise that Apartments located in urban environments near industrial areas, major roads and railway lines are subject to significant noise impacts requiring careful design responses. Refer to Appendix D4 for further detail.

Document	Overview
Victorian Passenger Rail Infrastructure Noise Policy dated April 2013 (VPRINP)	Section 5 of the VPRINP sets out the conditions under which transport bodies must apply the policy. The policy sets 'investigation thresholds' for the assessment of noise. These are noise levels, which if exceeded, indicate that noise mitigation should be considered. Refer to Appendix D10 for further detail.

3.2 Guidelines

A summary of the relevant guidelines applicable to the noise sources potentially impacting the subject PSP is provided in Table 2.

Table 2: Additional references and guidelines

Document	Overview
EPA Publication 1411 *Noise from Industry in Regional Victoria* (NIRV)	NIRV prescribes recommended maximum noise levels (recommended levels) for commercial, industrial and trade premises in regional Victoria. The NIRV document is a non-statutory guideline. Accordingly, the recommended levels are only legally binding when applied through statutory instruments, such as a planning permit or notice. The subject PSP is located outside of the Melbourne metropolitan SEPP N-1 area (red line) and Urban Growth Boundary area (blue line) shown in Appendix C2. As such, the noise limits should be derived in accordance with NIRV (see Appendix D2), with noise assessed using the methodology provided in SEPP N-1.
VicRoads' *Requirements for Developers – Noise Sensitive uses*	VicRoads has developed guidelines for noise mitigation at residential developments near major roads. Refer to Appendix D3.2 for further detail.
AS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* (AS 2107)	Provides recommendations for acceptable internal noise levels. Table 1 of AS 2107 presents the recommended internal noise levels for 'houses and apartments near major roads', which is considered to be applicable to the areas on the edge of the subject PSP. Refer to Appendix D7 for further detail.
Sleep disturbance criteria sourced from *NSW Road Noise Policy 2011* (Sleep disturbance criteria)	The provisions of this document are often referred to in Victoria for general guidance on potential sleep disturbance. Based on a review of research into sleep disturbance, the NSW policy nominates maximum external night-time noise levels at noise sensitive locations which are unlikely to disturb sleep. Refer to Appendix D5 for further detail.
EPA Publication 1254 *Noise Control Guidelines* (EPA Guidelines)	Provides an overview of noise policies and legislation in Victoria for a range of different noise sources and provides supplementary guidance for situations where there is no policy or legislation. Refer to Appendix D6 to D9 for further detail.

4.0 EXISTING NOISE ENVIRONMENT

Table 3 provides a summary of the key parameters measured relevant to each assessment.

Details of the unattended noise monitoring survey are presented in Appendix E.

Table 3: Summary of lowest background noise levels and key assessment parameters

Parameter	Day	Time	NW	SW	SE	NE
Industry noise						
Day background L_{A90}	Monday to Friday	0700 - 1600 hrs	45	47	44	42
	Saturday	0700 - 1300 hrs				
Evening background L_{A90}	Monday to Friday	1800 - 2200 hrs	49	48	42	43
	Saturday	1300 - 2200 hrs				
	Sunday and Pub. Hol.	0700 - 2200 hrs				
Night background L_{A90}	Monday to Sunday and Pub. Hol.	2200 - 2400 hrs	45	39	32	36
		0000 - 0700 hrs				
Road traffic noise						
Average Traffic noise $L_{A10(18h)}$	Monday to Friday	0600 - 2400 hrs	56	57	62	61
Road/Railway noise						
Average Day $L_{Aeq(16h)}$	Monday to Friday	0600 - 2200 hrs	64	60	60	59
Average Night $L_{Aeq(8h)}$	Monday to Friday	2200 - 0600 hrs	60	55	51	52

During the deployment and retrieval of the noise monitoring equipment, attended noise measurements were undertaken at each of the noise monitoring locations and near the City Gate infrastructure. Results of the attended measurements are summarised in Appendix F.

5.0 DERIVED NOISE LIMITS AND ACOUSTIC DESIGN TARGETS

5.1 Road noise

Road traffic noise in occupied spaces should be assessed against the internal design targets detailed in Table 4.

Table 4: Recommended internal noise targets, dB L_{Aeq}

Area	Recommended internal design target for road traffic noise	
	AS 2107 design range[A]	ADG Table D3 internal target
Living areas	35-45	40 (0600 – 2200 hrs)
Sleeping areas	35-40	35 (2200 - 0600 hrs)
Work areas	35-45	
Apartment common areas (eg, lobbies)	45-50	

Note A: Compliance with the lower level is preferred, but compliance with the maximum noise level is considered acceptable.

5.2 Rail noise

Rail noise in occupied spaces should be assessed against the internal design targets detailed in Table 5.

Table 5: Recommended internal design targets for rail noise, dB L_{Amax}

Area	Airborne rail noise		Structure-borne rail noise	
	Metro passenger trains	Diesel freight trains	Metro passenger trains	Diesel freight trains
Sleeping areas	50-55	55-60	40-45	45-50
Living areas	60	65-70	50	55-60
Retail areas	65	70-75	55	60-65

Note that where design targets in Table 5 are presented as a range, compliance with the lower level is preferred, but compliance with the higher level is still considered acceptable.

To quantify noise from longer term activity, which could potentially increase appreciably near the North East rail line due to the Inland Rail and BIFT projects, it is recommended that the L_{Aeq} 'day' and 'night' noise levels are also assessed against the internal targets provided in the ADG (see Appendix D4).

For reference, the internal noise targets are:

- Day 0600 - 2200 hrs (habitable rooms / living areas): 40 $L_{Aeq(16h)}$
- Night 2200 - 0600 hrs (sleeping areas / bedrooms): 35 $L_{Aeq(8h)}$

5.3 Sleep disturbance

The *NSW Road Noise Policy* (RNP) notes that from research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50–55dB L_{Amax} are unlikely to awaken people from sleep*
- *One or two noise events per night, with maximum internal noise levels of 65-70 dB L_{Amax}, are not likely to affect health and wellbeing significantly.*

We note that the internal design targets for airborne noise from freight presented in Table 5 (55 - 60 dB L_{Amax}) are significantly more stringent than the target of 65 - 70 dB L_{Amax} specified in the RNP as not likely to affect health and wellbeing significantly provided there are only one or two events per night at this level.

5.4 Noise from commercial premises

Noise from commercial premises that could impact residential areas within the subject PSP, including the City Gate gas infrastructure and proposed stabling yard are to be assessed against NIRV using the methodology provided in SEPP N-1.

The derivation of the NIRV recommended noise levels, which consider land zoning and background noise levels from Section 3.2 is provided in Appendix D2.2 and summarised below in Table 6.

It should be noted that background noise levels will inevitably change as the subject PSP is being developed. As such, the recommended noise levels (noise limits) could and are likely to change with time; however, the results are likely to provide a conservative estimate for indicate assessment purposes.

Table 6: NIRV recommended levels, dB L_{eff}

Period	Day	Time	Wallan-Whittlesea Rd near City Gate	Railway alignment near stabling yard
Day	Monday to Friday	0700 - 1600 hrs	52	53
	Saturday	0700 - 1300 hrs		
Evening	Monday to Friday	1800 - 2200 hrs	47	53
	Saturday	1300 - 2200 hrs		
	Sunday and Pub. Hol.	0700 - 2200 hrs		
Night	Monday to Sunday and Pub. Hol.	2200 - 2400 hrs	37	45
		0000 - 0700 hrs		

6.0 HIGH LEVEL ROAD TRAFFIC NOISE ASSESSMENT

The following sections provide a high-level assessment of road traffic noise against the VicRoads requirements discussed in Appendix D3 as well as the internal ADG targets of Appendix D4.

6.1 Existing road traffic noise

The measured noise levels relevant to the road traffic noise study are summarised in Table 7.

Table 7: Measured road traffic noise, dB

Location	Ambient noise L_{Aeq}		Average weekday traffic noise, $L_{10,18hr}$
	Day 0600-2200 hrs	Night 22:00-0600 hrs	
NE (Epping-Kilmore Rd)	59	52	61
SE (Wallan-Whittlesea Rd)	60	51	62

The results presented above generally indicate similar noise levels at both monitoring locations, with ambient noise levels measured during the night period typically 7 to 9 dB quieter relative to the day period.

6.2 Road traffic volumes

Road traffic noise assessments in Victoria typically require consideration of traffic volumes 10 years after finalisation of the development as nominated in the VicRoads *Requirements for Developers – Noise Sensitive Uses*. Given the preliminary nature of the subject PSP, this date cannot be accurately forecast.

To facilitate an indicative screening assessment of potential road traffic noise to the subject PSP, a theoretical design year of 2040 has been assumed, with forecast noise levels predicted based on latest available (2020) VicRoads traffic data[3]. The forecast traffic volumes conservatively assume additional traffic on each of the connective roads from the development of the PSP.

The forecast increase in road traffic is provided in Table 8.

Table 8: Existing 2020 and forecast 2040 daily traffic volumes (AADT) based on VicRoads data

Road	Existing 2020	Percentage Heavy Vehicles	Compound growth rate p/a	Forecast 2040
Hume Freeway (2-way)	29,000	21 %	2.3 %	44,814
Epping-Kilmore Road (2-way)	3,500	8 % to 12 %	0.3 %	5,441
Wallan-Whittlesea Road (2-way)	4,700	6 %	5 %	14,620

[3] https://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/ accessed 20 April 2021

6.3 Predicted traffic noise

It is worth noting that the VicRoads *Traffic Noise Reduction Policy* (see Appendix D3.1) only applies in cases where:

- Arterial roads are built on new alignments, or where;
- Existing arterial roads or freeways are widened by two or more lanes, and buildings previously protected from traffic noise are exposed by the removal of buildings required for widening.

While Wallan-Whittlesea Road will likely be duplicated allowing for two lanes of traffic in each direction, these works will not remove any existing major structures. As such, the TNRP is not strictly applicable in this situation, with VicRoads not responsible for any noise control works.

Similarly, while the VicRoads *Requirements for Developers – Noise Sensitive Uses* (see Appendix D3.2) places the onus for noise control on the developer, there is some ambiguity in terms of its application. This ambiguity relates to the fact that while the guideline specifically references noise sensitive developments adjacent Freeways under VicRoads control, there have been several occasions where these requirements have been included on planning permits for developments adjacent arterial roads (i.e., not Freeways).

To facilitate a high-level assessment of potential road traffic noise to the subject PSP, forecast traffic noise levels have been assessed against the 63 dB $L_{A10(18h)}$ traffic noise criteria.

Predicted noise levels to the site have been based on the measured noise levels provided in Table 7 and forecast traffic in Table 8.

Predicted worst case noise levels to residential areas within 30 to 40 m of Wallan-Whittlesea Road and Epping-Kilmore Road are presented in Table 9.

Table 9: Predicted noise levels at ground floor level (Forecast 2040), dB $L_{A10(18h)}$

	40 m west of Epping-Kilmore Rd	**30 m north of Wallan-Whittlesea Rd**
Highest average weekday measured level	61	62
Facade correction	+2.5	+2.5
Estimated increase due to higher traffic volume	+2.4	+4.9
Predicted noise level (Forecast 2040)	**64**	**69**
VicRoads criteria	**63**	**63**
Excess	**+1**	**+6**

From Table 9, it can be seen that the predicted road traffic noise 40 m west of Epping-Kilmore Road marginally exceeds the 63 dB $L_{A10(18h)}$ preliminary noise target.

For the preliminary assessment location at Wallan-Whittlesea Road, road traffic noise levels were predicted up to 6 dB above the 63 dB $L_{A10(18h)}$ preliminary noise target.

For reference, the predicted external day and night L_{Aeq} noise levels have also been predicted based on the forecast traffic growth as provided in Table 8 to allow for an indicative comparison with the ADG noise targets.

Table 10: Predicted external noise levels, dB L_{Aeq}

Description	Daytime ambient noise $L_{Aeq(16h)}$	Night ambient noise $L_{Aeq(8h)}$
NE (Epping-Kilmore Rd)		
Existing (2020) traffic noise	59	52
Forecast (2040) traffic noise	61	54
SE (Wallan-Whittlesea Rd)		
Existing (2021) traffic noise	60	51
Forecast (2040) traffic noise	65	56
Internal ADG noise targets	**40 (Living rooms)**	**35 (Bedrooms/ sleeping areas)**

From Table 10 the 2040 road traffic noise levels are predicted to increase by 2 dB and 5 dB along Epping-Kilmore Road and Wallan-Whittlesea Road, respectively.

To achieve the ADG internal noise targets within future dwellings:

- Road traffic noise levels on Epping-Kilmore Road would need to be reduced by a minimum of 19 dB. This magnitude of reduction can be easily achieved with standard building construction.
- Road traffic noise levels on Wallan-Whittlesea Road would need to be reduced by a minimum of 25 dB. This magnitude of reduction can be easily achieved with minimal facade upgrades.

Given the above road traffic noise from Epping-Kilmore Road and Wallan-Whittlesea Road are not considered to be a significant noise constraint for the development of residential areas within the subject PSP.

7.0 HIGH-LEVEL RAILWAY NOISE ASSESSMENT

The following sections provide an high-level assessment of railway noise against the *Victorian Passenger Rail Infrastructure Noise Policy* (VPRINP).

7.1 Existing railway noise

Noise monitoring results from the loggers installed next to the North East rail line alignment were analysed and compared with the investigation thresholds provided in the VPRINP.

As discussed in Appendix D10, the VPRINP requires the maximum railway noise be based on the 95th percentile of the maximum noise for all measured events. To identify train pass-by movements, a screening threshold was applied based on the measured L_{Amax} noise level and difference between the short-term $L_{Aeq(20sec)}$ and $L_{Aeq(10min)}$. To distinguish between freight and passenger trains, the results were further screened based on the time it takes for the train to pass the monitoring location. Based on this analysis it was estimated that, over the one-week monitoring period, a total of approximately 210 passenger trains and 70 freight trains went past the subject PSP site.

The noise monitoring results for both monitoring locations assessable to the investigation thresholds provided in the VPRINP are summarised in Table 11.

Table 11: Maximum and average rail noise levels, dB

Location	Daytime ambient noise level $L_{Aeq(16h)}$	Night-time ambient noise level $L_{Aeq(8h)}$	95th percentile maximum of all train events, L_{Amax}
NW: 22 to 40 m from railway	64	60	94
SW: 60 to 90 m from railway	60	55	95[A]
VPRINP investigation thresholds	**65**	**60**	**85**

Note A: The maximum train noise levels were dominated by horn use.

From Table 11 it is evident that the measured maximum noise levels were 8 to 9 dB above the VPRINP investigation threshold.

With reference to the average 16-hour (day) and 8-hour (night) screening criteria used to assess longer term events, the measured noise levels were below the investigation thresholds. It is worth noting that these noise levels were possibly affected by noise from the Hume Highway given the relatively short duration of most train movements.

Reference safety data from the Australian Rail Track Corporation (ARTC) for freight train horns specifies that a 'low' horn must achieve a minimum noise level of 85 dB L_{Amax} at 100 m. It is noted that horns have directional characteristics such that the noise levels directly in front of the horn are higher than the noise levels off-axis (i.e., at 90 ° to the side).

7.2 Forecast train movements

As noted in Section 7.1, the measured L_{Aeq} railway noise levels were below the VPRINP investigation thresholds.

To assess future L_{Aeq} railway noise levels in detail, as typically required for the purpose of a planning permit application, would normally require the preparation of a three dimensional computer noise model which includes detailed information regarding the existing and proposed train types, site operations, and track features (i.e., noise emission data, operating speeds, and notch settings, consist length, turnout details/track radii, etc.).

Given the high-level nature of this assessment and lack of available detailed information regarding proposed usage, this assessment has been undertaken based on:

- The measured noise levels provided in Table 11
- Forecast train volumes associated with the Inland Rail Project as provided in SLR Consulting Australia Pty Ltd Report 0-0021-110-EMN-00-ME-0001 (SLR Report) *Inland Rail – Tottenham to Albury*, prepared for ARTC.

To assist with the consideration of railway noise, it was necessary to estimate the existing train pass-by frequency at the site. A review of the V-Line timetable for the North East rail line[4] provides the typical weekday activity as shown in Table 5 which correlates well with the measurement data and analysis described in Section 7.1.

Table 12: Average weekday train activity

Period	Up		Down		Total
	Passenger	Freight	Passenger	Freight	
Day 0600 - 2200 hrs	22	4	21	3	50
Night 2200 - 0600 hrs	3	1	2	2	7
Total	25	5	23	5	57

As part of the SLR Report, existing and forecast train volumes were provided to facilitate the assessment of noise from the Inland Rail Project (see Appendix G). An indicative assessment has been undertaken based on the Inland Rail data at Tallarook and identified train movements at Wallan train station. The forecast train movements are provided in Table 13.

[4] https://corporate.vline.com.au/Network-Access/Network-service-plan accessed 3 May 2021

It is worth noting that, while the provided data references two daily freight movements to the 'Inland Rail Intermodal' facility, it is not clear whether additional freight servicing the Beveridge Intermodal Freight Facility (BIFT) has been considered. To allow for potential cumulative effects from the BIFT, a nominal additional eight (8) freight trains per day has been included for the 2040 Design Year.

Table 13: Existing and forecast railway traffic at Wallan Station due to Inland Rail and BIFT

Classification	Existing - No Project		2025 - Project comm.		2040 - Design Year	
	Day	Night	Day	Night	Day	Night
Passenger	43	5	43	5	43	5
Inland Rail freight	5	3	10	5	12	6
BIFT freight (nominal estimate)			2	2	4	4
Increase from existing			9	6	11	7

7.3 Predicted train noise

As noted in Section 7.1, the measured ambient noise levels near the North East rail line were potentially affected by road traffic noise from the Hume Highway. However, to facilitate a high-level assessment of L_{Aeq} noise from the upgraded rail line, the measured ambient noise levels were assumed to be dominated by noise from the North East rail line with the predicted railway noise levels provided in Table 14. This approach is considered conservative.

Table 14: Predicted train noise

Location	Daytime ambient noise level $L_{Aeq(16h)}$	Night-time ambient noise level $L_{Aeq(8h)}$	95th percentile maximum of all train events, L_{Amax}
NW: 22 to 40 m from railway			
Existing – No Project	64	60	94
2025 – Project commencement	69	65	94
2040 – Design year	70	66	94
SW: 60 to 90 m from railway			
Existing – No Project	60	55	95 [A]
2025 – Project commencement	65	60	95 [A]
2040 – Design year	66	61	95 [A]
VPRINP investigation thresholds	**65**	**60**	**85**
Maximum excess, dB	**+5**	**+6**	**+10**
Minimum off-set distance, m	**80**	**120**	**240**

Note A: The maximum train noise levels were affected by horn use.

Table 14 show that the forecast L_{Aeq} noise levels are 5 to 6 dB above the ambient day and night-time investigation thresholds, respectively. To comply with the VPRINP night-time ambient noise target, residential dwellings within the PSP site would need to be constructed more than 120 m from the railway alignment.

Similarly, based on the maximum noise levels measured near Wallan train station which were dominated by train horn noise, residential dwellings would need to be constructed more than 240 m from the alignment.

Based on the above results, train noise along the North East rail line is considered to be a significant noise constraint for the development of residential areas within the subject PSP.

7.4 Indicative noise control treatments

Appendix H shows the two design options currently under consideration for the subject PSP and the relative areas where the VPRINP investigation thresholds would be exceeded.

It is worth noting that a suitably designed noise barrier along the railway alignment could achieve a reduction in the order of 10 dB thereby meeting the VPRINP external investigation thresholds. Where this can be achieved, no further consideration of railway noise would be necessary.

Further, significant levels of shielding to most of the site can also be achieved by maximising the use of the built form. For example, this could be achieved by using an intermediary commercial zone, or multi-level apartment building/s with either a blank wall or significant facade treatments to any west facing apartments (i.e., depending on the proximity to the railway alignment these rooms may require winter gardens / high performance acoustic rated double glazing to meet the internal design targets provided in Section 5.2).

7.5 Design use considerations

In considering the options and applying the policy principles for changes in land use near an existing rail corridor, the VPRINP requires planning authorities and transport bodies to have regard to the considerations listed in Table A of Attachment 4.

For reference, these considerations have been reproduced as Table 15.

Table 15:Considerations in assessing options for managing rail noise for change in land use near existing or planned passenger rail corridors (reference VPRINP Attachment 4, Table A)

Principles	Considerations for applying the policy principles
Integrated early consideration	- Is the existing or currently proposed land use sensitive to rail noise? - Can non-sensitive uses be located along the existing or planned rail corridor? - Can developments be located or situated to protect sensitive receptors from noise from the existing or planned rail corridor? - Will a design and development overlay be needed to mitigate exposure of sensitive receivers to significant levels of rail noise?

Principles	Considerations for applying the policy principles
Balancing objectives	- How effective is it to avoid/minimise conflicting land use and rail activity (and hence rail noise impacts) through a land use planning approach compared to mitigating rail noise with project design approaches and engineering options? - How effective is the land use planning approach compared to future rail project design approaches (if a future rail investment is expected) and development design options? - Have social and environmental impacts of each option been considered in addition to economic impacts? - What are the benefits and costs of each option? - Have options that reduce internal noise of buildings, particularly bedrooms, been considered? - How do the benefits and costs of avoiding, minimising or mitigating the rail noise compare to that of doing nothing (i.e. no land use change, no treatment)? - What are the opportunity costs of the proposed land use? - Given the benefits and costs of the land use planning approach and that of project design approaches and engineering options, how do the benefit-to cost ratios for each option compare? - What are the costs in terms of project budget? - Are the costs of avoiding, minimising or mitigating the rail noise proportionate to the overall public value of the change in land use? - Are the costs of noise treatment shared equitably? - Is there an existing passenger rail corridor? Was the rail corridor reserved or was there a public acquisition overlay in place before landowners or developers purchased in this location? If so, transport bodies and planning authorities may decide management of rail noise at this location is the responsibility of the landowner or developer and a planning control such as a design and development overlay may be considered. - Will landowners or developers in this location benefit from the land use change and if so should they share responsibility for avoiding, minimising or mitigating the rail noise? - Is the highest preference given to the options that are expected to provide the greatest overall public value?

Best-fit solutions	- What are the local constraints on avoiding and/or minimising exposure to rail noise?
	  o Topography of surrounding land
	  o Shielding provided by other buildings
	  o Presence of waterways and bridges
	  o Amount of land required for mitigation
	- Are there cultural heritage requirements such as sites of Aboriginal significance including burial and ceremonial sites that might impact potential land use, project design elements or engineering treatment options?
	- Are there environmental protection issues such as presence of endangered local fauna and flora that might limit land use, project design elements or engineering treatment options?
	- What impact will these local constraints have on land use or future engineering options to avoid, minimise or mitigate rail noise?

8.0 HIGH-LEVEL COMMERCIAL NOISE ASSESSMENT

Noise emissions from commercial premises in the vicinity and within the subject PSP may affect dwellings within the site boundary.

8.1 Noise from City Gate to future residential areas

During the attended site surveys on the 26 March and 3 April 2021 noise from the City gate infrastructure could not be heard opposite Wallan-Whittlesea Road. Based on near-field measurements detailed in Appendix F, the worst case noise levels to the planned residential area were predicted at 26 dB L_{eff}, at least 11 dB below the lowest NIRV recommended noise level detailed in Section 5.4.

Noise from the existing City Gate gas infrastructure is not considered to be a noise constraint for the development of residential areas within the subject PSP.

8.2 Future Commercial Use

At this stage of planning there is insufficient detail available to determine the likely degree of compliance with NIRV of future commercial uses within the subject site. However, with appropriate planning, boundaries between commercial and residential uses can be successfully designed and managed. As part of the planning permit applications, compliance with NIRV should be demonstrated with consideration given to the following:

- Location and siting of less-noisy commercial uses on the commercial/residential boundary where possible
- Incorporation of appropriate screening or buffers between commercial and residential uses
- Incorporation of required noise attenuation measures for commercial tenants which may include localised or site boundary screening, attenuators, upgraded sound insulation of buildings and/or managerial controls such as limiting certain activities to specific times of day
- Location and siting of residential uses and dwelling layouts to maximise available acoustic screening and noise-reduction (e.g., locating sensitive areas such as bedrooms further away from the commercial interface, where possible)

The above measures may not be required in all instances; however, the design of commercial and residential interfaces will need to be carefully managed as the subject PSP design progresses.

In relation to the planned intensification of the railway line, it is recommended that future noise emissions from the proposed stabling yard are assessed in detail as more information comes available.

9.0 SUMMARY

The Victorian Planning Authority are developing the Wallan East (Part 1) Precinct Structure Plan (subject PSP) in northern Victoria.

MDA has been commissioned by the VPA to conduct a high-level noise assessment for the subject PSP, reviewing potential noise impacts on sensitive areas within the site from:

- Road traffic on Wallan-Whittlesea Road and Epping-Kilmore Road
- Existing and intensified railway operations along the North East rail line
- Existing commercial premises, including the City Gate gas infrastructure

This high-level assessment has been based on:

- Existing noise conditions determined from measurement surveys at the site
- Criteria and design targets determined in accordance with the relevant Victorian EPA legislation, guidelines, and accepted industry best practice; and
- Indicative calculations conducted based on provided third-party data (e.g. forecast road and rail usage)

Indicative noise mitigation options have been provided to control noise from road and rail traffic at the site with the assumed operating conditions outlined in Section 6.2 and Section 7.2.

With the included sensitive interface and parkland buffers, standard building construction treatments will be sufficient to control road traffic noise levels within the subject PSP.

To control rail noise, indicative treatments have been provided in relation to noise barriers and built-form treatments to achieve the internal amenity design targets. The indicative facade treatments must be reviewed when more detailed information is available relating to the planned rail intensification and future design options / dwelling constructions.

Noise from the existing City Gate gas infrastructure was predicted to comfortably comply with the lowest derived NIRV recommended noise levels without consideration for noise mitigation measures.

This high-level assessment concluded that rail noise along the North East rail line is a significant constraint for the development of residential areas within the subject PSP.

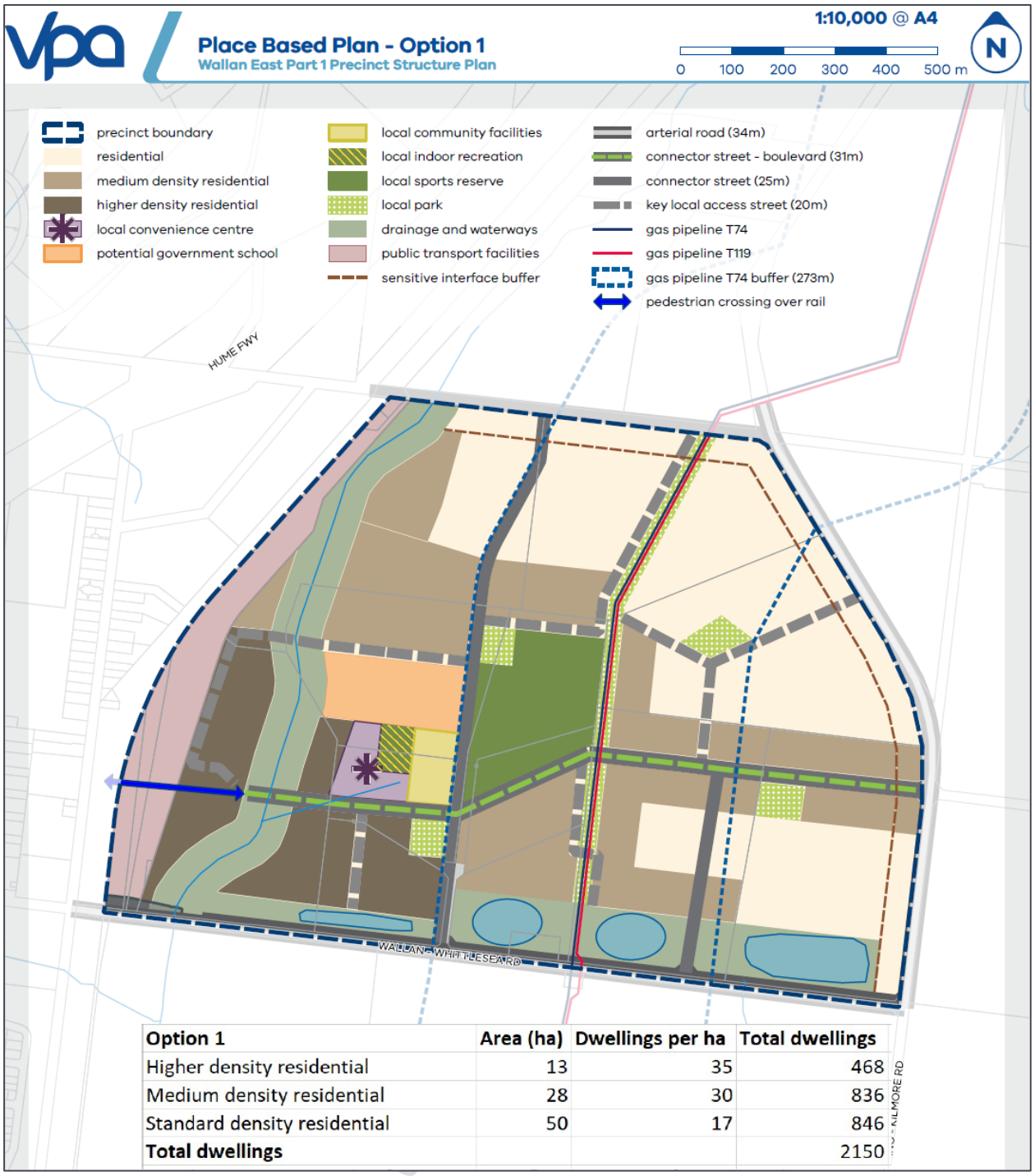
APPENDIX A GLOSSARY OF TERMINOLOGY

The following acoustic terminology has been used throughout this report.

dB	Decibel The unit of sound level.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{A90}	The A-weighted noise level equalled or exceeded for 90 % of the measurement period. This is commonly referred to as the background noise level.
L_{A10}	The A-weighted noise level equalled or exceeded for 10 % of the measurement period. This is commonly referred to as the average maximum noise level.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
L_{eff}	The effective noise level of commercial or industrial noise determined in accordance with *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1* (SEPP N-1). This is the L_{Aeq} noise level over a half-hour period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency and impulsiveness.

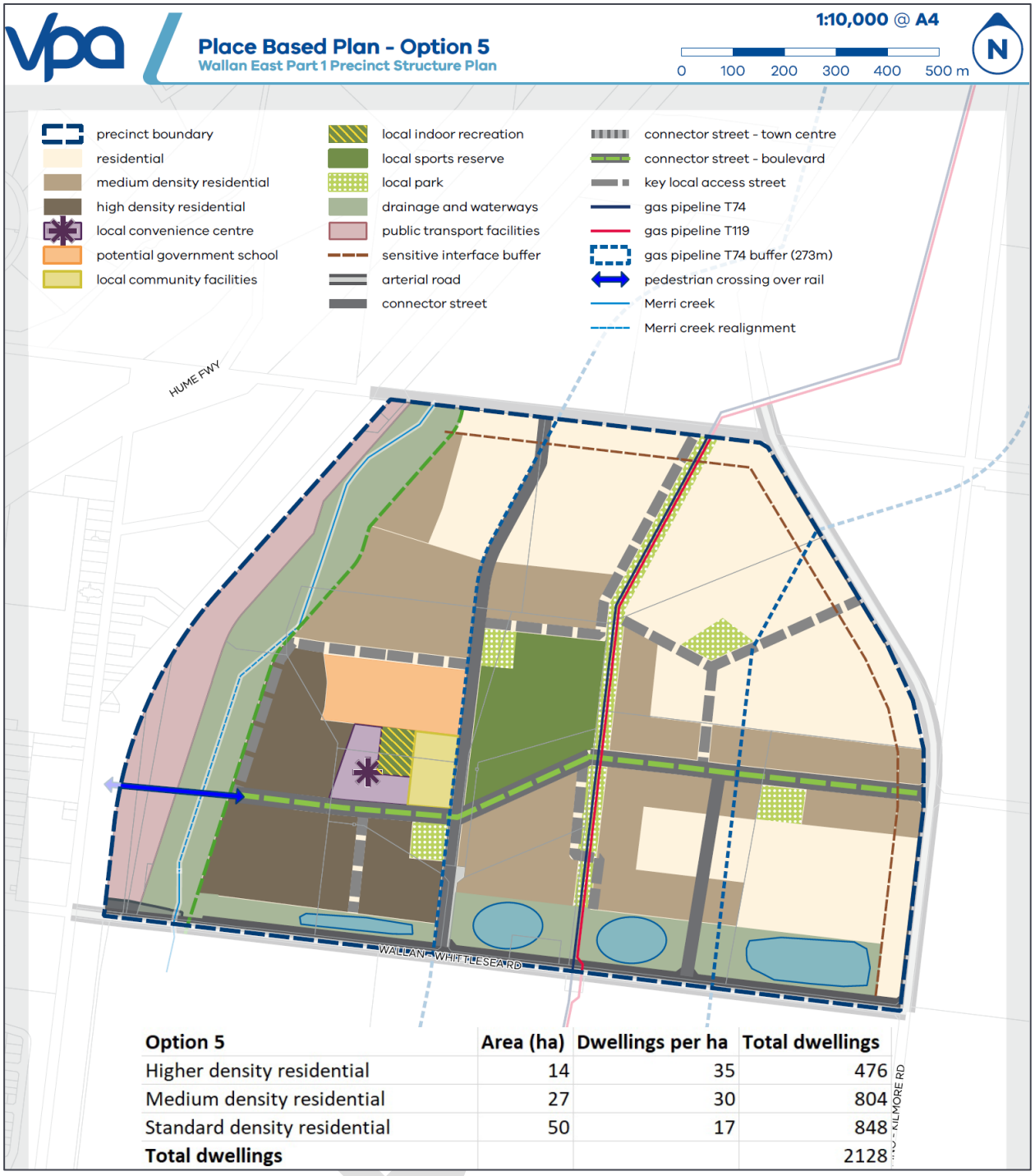
APPENDIX B VPA DRAFT PLACE BASED PLANS

B1 Option 1



Option 1	Area (ha)	Dwellings per ha	Total dwellings
Higher density residential	13	35	468
Medium density residential	28	30	836
Standard density residential	50	17	846
Total dwellings			2150

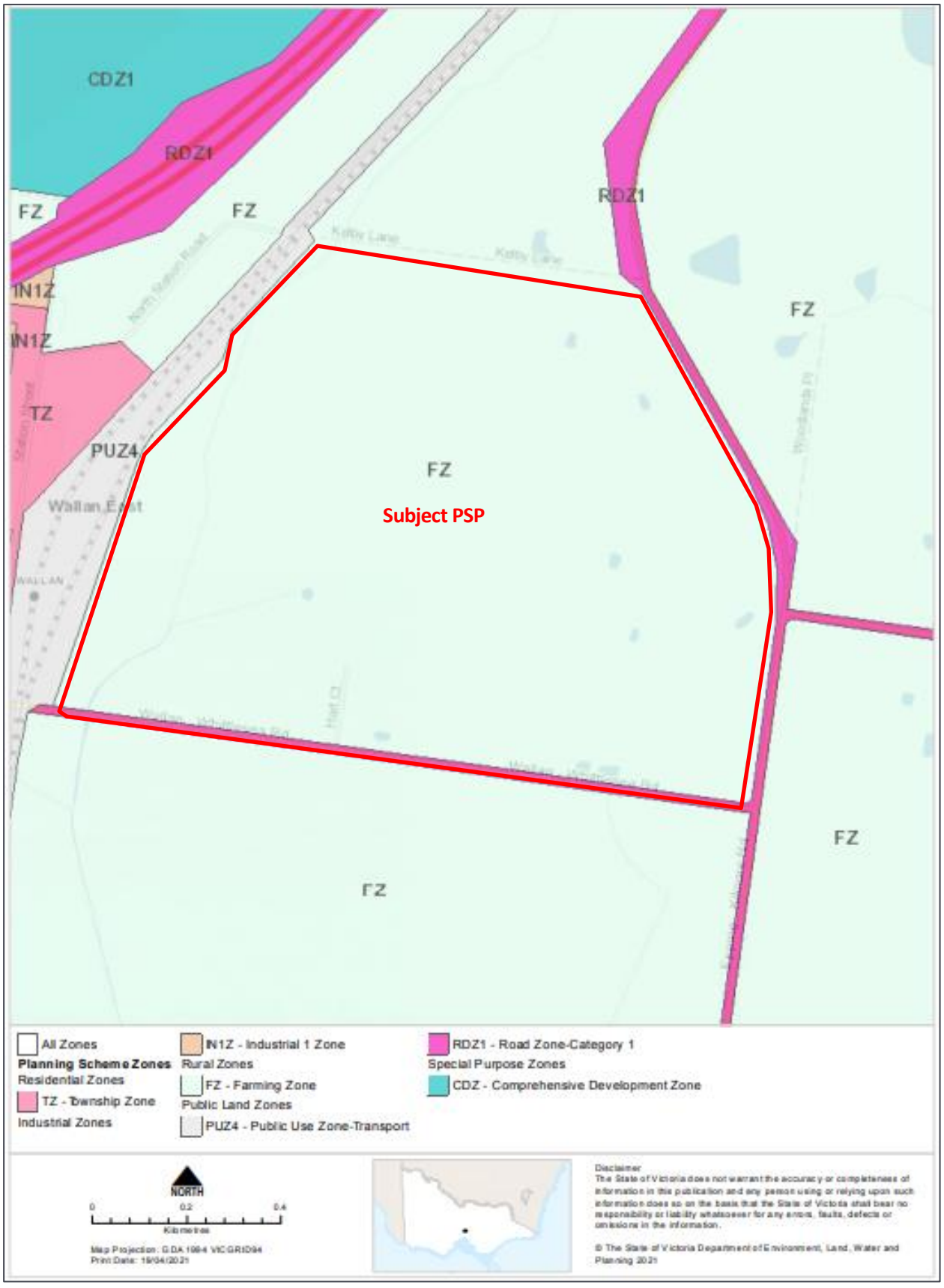
B2 Option 5



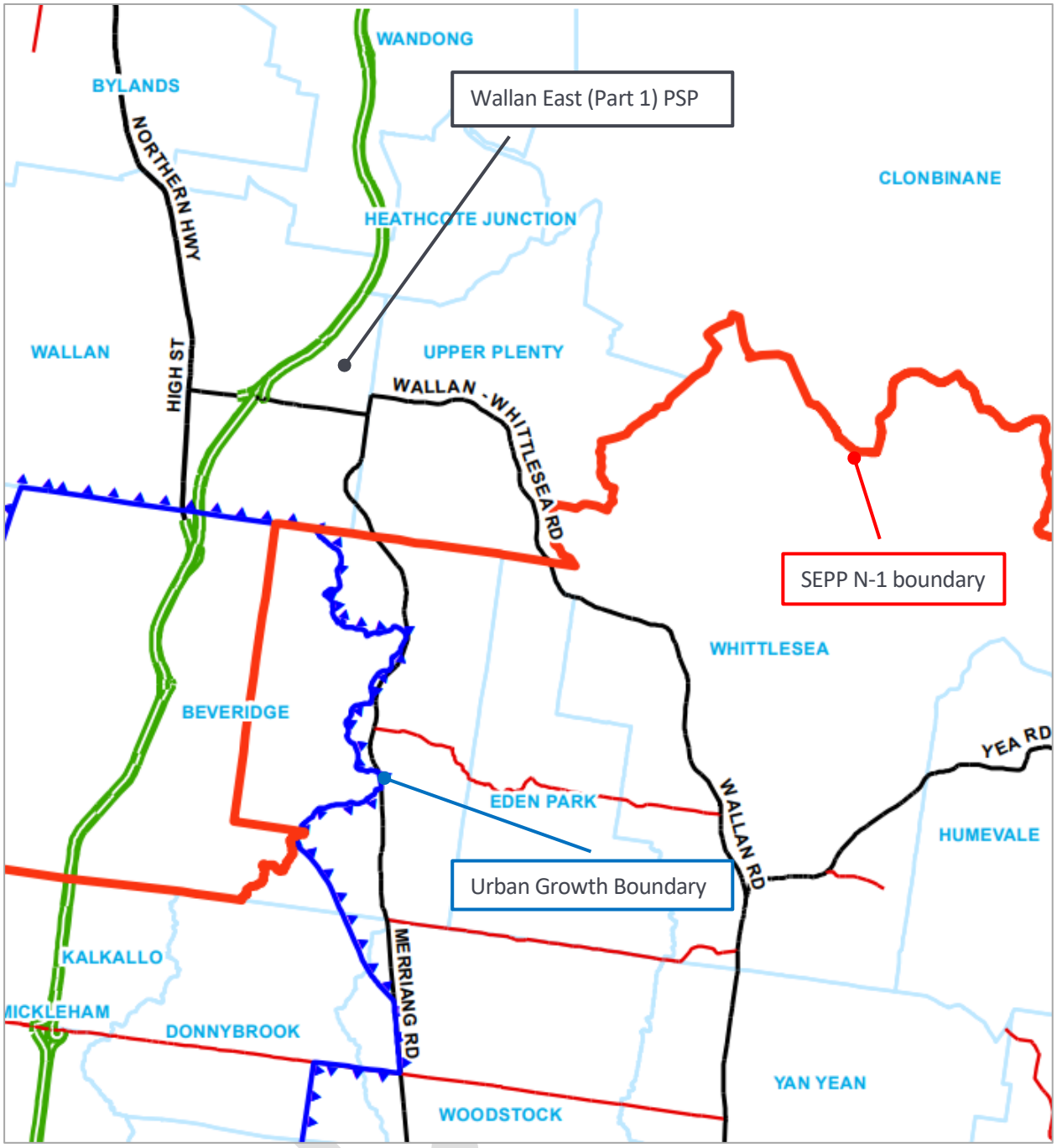
Option 5	Area (ha)	Dwellings per ha	Total dwellings
Higher density residential	14	35	476
Medium density residential	27	30	804
Standard density residential	50	17	848
Total dwellings			2128

APPENDIX C PLANNING MAPS

C1 Existing land use zoning



C2 SEPP N-1 boundary and Urban Growth Boundary



APPENDIX D LEGISLATION AND GUIDELINES

D1 SEPP N-1

D1.1 Application

State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1) sets noise limits that apply to commercial, industrial and trade premises within the Melbourne metropolitan region. Compliance with SEPP N-1 is mandatory under section 46 of the Environment Protection Act 1970.

SEPP N-1 defines a 'commercial, industrial and trade premises' as:

> *any premises except:*
>
> *(a) residential premises as defined in section 48A of the* [Environment Protection] *Act;*
>
> *(b) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road;*
>
> *(c) a tram, light rail or railway line not being a siding, marshalling yard or maintenance depot of any tram, light rail or railway line; and*
>
> *(d) [land situated at Luna Park, St Kilda].*
>
> *Section 48A of the Act defines residential premises as:*
>
> *any building or part of a building used as or for the purposes of a private residence or residential flat.*

D1.2 Assessment methodology

SEPP N-1 is a policy and technical document. The Policy prescribes the methodology and measurement procedure used to determine applicable noise limits and assessment of compliance.

The Policy requires that proposed commercial premises be designed to comply with SEPP N-1 noise limits. Clause 16 of the Policy states:

> *Where it is planned to develop new commercial, industrial or trade premises, the premises shall be designed so that the noise emissions do not exceed the noise limits*

Further, the occupier of commercial, industrial or trade premises has an ongoing obligation to meet the SEPP N-1 noise limits. Clause 15 of the Policy states:

> *where noise emissions from existing commercial, industrial or trade premises exceed the requirements set out in the Policy, steps shall be taken by the occupier to reduce the level of these noise emissions to, or below, the relevant Policy noise limits.*

SEPP N-1 defines a 'noise sensitive area' as an area of land within 10m outside the external walls of:

> *a dwelling or residential building*
>
> *a dormitory, ward or bedroom of a caretaker's house, hospital, hotel, institutional home, motel, reformative institution, tourist establishment or work release hostel.*

The assessment of noise from the subject site under SEPP N-1 is based on the calculation of a noise limit at a receiver position, taking into account a zoning noise level derived from the land zoning types in the surrounding area and the background noise level.

Once a noise limit is established, the noise level (L_{Aeq}) due to the commercial premises is measured or predicted. If necessary, the L_{Aeq} noise level is adjusted for noise character and duration to give the effective noise level (L_{eff}). If the L_{eff} level exceeds the noise limit, then remedial action is required.

D2 Noise from Industry in Regional Victoria

D2.1 EPA Publication 1411

As the subject PSP site is located outside the SEPP N-1 area and the Urban Growth Boundary, noise from commercial activities (including the existing City Gate gas infrastructure and future uses in the area) are subject to EPA Publication 1411 Guideline *Noise from Industry in Regional Victoria* (NIRV).

The procedures for setting recommended levels are defined by considering the land zoning in the area and the noise environment of the receiver location. The recommended levels are defined separately for day, evening and night periods. To assess the noise of an activity against the recommended levels, the measurement and analysis procedures specified in SEPP N-1 are used. These procedures include adjustments which are to be applied to noise that is characterised by audible tones, impulses or intermittency.

Zone levels are determined according to the land zoning of the area in which the noise source and receivers are located. These zone levels are then adjusted, where appropriate, for a range of factors including high background noise and distance to the commercial zone.

Recommended noise levels are defined separately for the day, evening and night periods as defined in Table 16.

Table 16: NIRV time periods

Period	Day of week	Time
Day	Monday to Friday	0700 - 1600 hrs
	Saturday	0700 - 1300 hrs
Evening	Monday to Friday	1800 - 2200 hrs
	Saturday	1300 - 2200 hrs
	Sunday and Public Holidays	0700 - 2200 hrs
Night	Monday to Sunday and Public Holidays	2200 - 2400 hrs
		0000 - 0700 hrs

EPA Publication 1826 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol) is intended to replace NIRV as of 1 July 2021. The recommended levels and assessment procedures of NIRV are consistent with the Noise Protocol. Assessing compliance with the NIRV recommended levels therefore also provides an equivalent assessment of compliance with the forthcoming Noise Protocol.

D2.2 Derivation of recommended noise levels

Recommended noise levels for residential zones within the subject PSP are based on the land zoning of the area in which the noise source and receivers are located, as well as the distance between the edge of the noise source's zone and the receiver.

The closest sensitive areas to the City Gate and future stabling yard are currently classified Farming Zone (FZ) type usage. If the land were to be rezoned to residential type usage as part of the PSP, the resultant noise limits would not change.

As this area is located within a 'background-relevant area' as defined in NIRV (i.e., within 300 m of an undivided main road), unattended noise monitoring was conducted to inform the NIRV recommended levels. A 01dB CUBE environmental noise logger (Serial No.: 10518) was deployed in the paddock north of the City Gate to continuously measure background noise between 26 March and 3 April 2021. During the equipment deployment and retrieval, it was evident that this was location was dominated by road traffic noise from the nearby Wallan-Whittlesea Road and to a lesser extent by the Hume Highway. Noise from the City Gate could not be heard above background.

The measured background noise levels presented in Table 3 of Section 4.0 were used to determine the recommended noise levels provided in Table 17 and Table 18.

Table 17: NIRV Recommended noise level near City Gate, dB L_{eff}

Period	Recommended level
Day	52
Evening	47
Night	37

Table 18: NIRV Recommended noise level near future stabling yard, dB L_{eff}

Period	Recommended level
Day	53
Evening	53
Night	45

D3 Road Traffic Noise

D3.1 VicRoads Traffic Noise Reduction Policy

VicRoads has an internal policy which is used to determine entitlement to noise barriers in situations where VicRoads takes responsibility for noise mitigation. Since October 1997, this policy has been known as the *Traffic Noise Reduction Policy* (TNRP).

The TNRP provides the following noise level objectives as a means of limiting the effect of traffic noise on nearby residents when new or improved freeways and arterial roads are opened to traffic:

> *Where arterial roads and freeways are built on new alignments, or where existing arterial roads or freeways are widened by two or more lanes and buildings previously protected from traffic noise are exposed by removal of buildings required for widening, the traffic noise level will be limited to the objectives set out below or the level that would have prevailed if the road improvements had not occurred, whichever is the greater.*
>
> - *Category A: - For residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature, the noise level objective will be 63 dB(A), $L_{10(18h)}$ measured between 6 am and midnight,*
> - *Category B: - For schools, kindergartens, libraries, and other noise-sensitive community buildings the noise level objective will be 63 dB(A), $L_{10(12h)}$ measured between 6 am and 6 pm,*
> - *Where the noise level adjacent to Category A or B buildings prior to road improvements is less than 50 dB(A), L10(18h), consideration will be given to limiting the noise level increase to 12 dB(A).*

Where noise from the new freeway or arterial road exceeds the above levels, the TNRP requires suitable noise barriers to be installed.

It is noted that this requirement does not address internal amenity; consequently, first floor habitable rooms of dwellings which are not shielded by traffic noise barriers can be exposed to high levels of road traffic noise. As such, we would normally recommend façade treatments (i.e. glazing upgrades) to be considered for affected habitable rooms closest the freeway.

D3.2 VicRoads Requirements for Developers – Noise Sensitive Uses

VicRoads is a referral authority, and so has the right to seek to impose requirements on residential developers seeking planning approvals for land adjacent to VicRoads-controlled roads.

Where new noise sensitive developments are planned close to existing major traffic routes, the developer must take responsibility for noise mitigation in accordance with the VicRoads *Requirements of Developers – Noise Sensitive Uses* document.

These guidelines complement the requirements outlined in VicRoads' TNRP and additionally recommend developers undertake some combination of the following:

- Erect traffic noise barriers of sufficient height and suitable construction in order to reduce external noise levels to 63 dB $L_{A10(18h)}$ or less at the ground floor level of exposed dwellings
- Provide sound insulation treatment to residential dwellings sufficient to achieve compliance with the recommended internal noise levels specified in AS 2107-2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* (AS 2107).

If compliance with the external 63 dB $L_{A10(18h)}$ noise limit is achieved, VicRoads will generally not require compliance with AS 2107 internal criteria.

D4 Clause 58 of the Victorian Planning Provisions (VPP)

The *Better Apartment Design Standards* (BADS) which were released by the Department of Environment, Land, Water & Planning (DELWP) in December 2016 have become the *Apartment Design Guidelines for Victoria* (ADG). The guidelines implement the requirements of the *Victorian Planning Provisions* (VPP) Clause 58.

Clause 58 of the VPP applies to apartment developments of five or more storeys and introduces new requirements for apartment developments including noise impacts.

The new apartment provisions contain Objectives, Standards and Decision Guidelines. Planning advisory note 66 (April 2017) defines these terms as follows:

> *Objectives describe the desired outcome to be achieved in the completed development*
>
> *A Standard contains the requirements to meet the objective. A standard should normally be met. However, if the responsible authority is satisfied that an alternative design solution meets the objective, the alternative design solution may be considered.*
>
> *Decisions guidelines set out the matters that the responsible authority must consider before deciding if an application meets the objectives. When an alternative design solution is proposed, the effect of the design solution on the achievement of other objectives should be considered.*

Clause 58.04-3 relates specifically to noise and contains the following.

> *Noise impacts objectives*
>
> *To contain noise sources in the development that may affect existing dwellings*
>
> *To protect residents from external and internal noise sources*
>
> *Standard (D16)*
>
> *Noise sources, such as mechanical plant should not be located near bedrooms of immediately adjacent existing dwellings.*
>
> *The layout of new dwellings and buildings should minimise noise transmission within the site.*
>
> *Noise sensitive rooms (such as living areas and bedrooms) should be located to avoid noise impacts from mechanical plants, lifts, building services, non-residential uses, car parking, communal areas and other dwellings.*
>
> *New dwellings should be designed and constructed to include acoustic attenuation measures to reduce noise levels from off-site noise sources. Buildings within a noise influence area specified in Table D3 should be designed and constructed to achieve the following noise levels:*
>
> - *Not greater than 35 dB(A) for bedrooms, assessed as an $L_{Aeq,8h}$ from 10pm to 6am.*
> - *Not greater than 40 dB(A) for living areas, assessed $L_{Aeq,16h}$ from 6am to 10pm.*
>
> *Buildings, or part of a building screened from a noise source by an existing solid structure, or the natural topography of the land, do not need to meet the specified noise level requirements.*
>
> *Noise levels should be assessed in unfurnished rooms with a finished floor and the windows closed.*

Table D3 and B6 of ADG is reproduced in Table 19

Table 19: ADG Table D3 and B6 Noise influence area

Noise source	Noise influence area
Zone interface Industry	300 metres from the Industrial 1, 2 and 3 zone boundary
Roads Freeways, tollways, and other roads carrying 40,000 Annual Average Daily Traffic Volume	300 metres from the nearest trafficable lane
Railways Railway servicing passengers in Victoria	80 metres from the centre of the nearest track
Railway servicing freight outside Metropolitan Victoria	80 metres from the centre of the nearest track
Railway servicing freight outside Metropolitan Melbourne	135 metres from the centre of the nearest track

D5 Sleep Disturbance

The *NSW Road Noise Policy 2011* produced by the NSW EPA, provides guidance on potential for sleep disturbance. While the Policy applies strictly only in NSW, the provisions of the document are often referred to in Victoria for general guidance on potential sleep disturbance.

The NSW policy notes that from the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50–55 dB L_{Amax} are unlikely to awaken people from sleep*
- *One or two noise events per night, with maximum internal noise levels of 65–70 dB L_{Amax}, are not likely to affect health and wellbeing significantly.*

It is noted that the maximum internal noise levels are prescribed for instances where windows to an internal area would be open. It is accepted that internal noise levels in conventional dwellings with the windows open are generally 10 dB lower than external noise levels.

Based on these NSW EPA findings, a noise level of 60-65 dB L_{Amax} outside an open bedroom window would be unlikely to cause awakening reactions.

D6 Apartment/domestic air-conditioning plant noise criteria

Noise from fixed domestic plant associated with residential properties must comply with the requirements of the *Environment Protection (Residential Noise) Regulations 2008* (Statutory Rule No.121/2008) which sets out provisions for control of noise from domestic appliances including motorized equipment, electric power equipment, domestic air-conditioning plant, swimming pool pumps and musical equipment, whether amplified or not.

The regulation does not prescribe noise limits for the equipment, but it does prescribe allowable hours of operation for the purposes of determining whether noise is 'unreasonable' at residential premises under Section 48A(5) of the *Environment Protection Act 1970*.

The *Environment and Protection (Residential Noise) regulation 2008* is the only legislation regarding residential noise in the State of Victoria.

Group 3 of the schedule of prescribed items covers domestic air-conditioners and domestic heating equipment, and prohibits hours of operation as follows:

- Monday to Friday: before 0700hrs and after 2200hrs
- Weekends and Public Holidays: before 0900hrs and after 2200hrs

Notwithstanding the above requirements, it is not always practical to turn off air-conditioning units during the night-time hours. If noise was inaudible inside any residence, then Section 48A (5) of the Environment Protection Act would effectively be achieved. This is consistent with Section 1 of EPA Publication 1254 *Noise Control Guidelines* which provides recommended noise limits for fixed domestic plant.

These Noise Control Guidelines are used by local authorities and municipal councils to assess noise issues and recommend the following:

Day and evening operation

Where noise from any fixed domestic plant occurs beyond the residential property boundary, the broadband intrusive noise resulting from its use shall not exceed the background noise level by more than 5dB when measured at the property boundary.

Night operation

The noise from fixed domestic plant must not be audible within a habitable room of any other residence (regardless of whether any door or window giving access to the room is open) during prohibited hours.

D7 AS 2107 - Internal noise levels

Recommended internal noise levels for spaces of varying usage, applicable to semi-continuous sources such as road traffic, are provided in AS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* (AS 2107).

Table 20 shows the recommended internal design sound levels stated in AS 2107 for *'houses and apartments in inner city areas or entertainment districts or near major roads',* considered applicable to the proposed development.

Table 20: AS 2107 recommended internal noise levels, dB L_{Aeq}

Area	Recommended design sound level range
Living areas	35-45
Sleeping areas	35-40
Work areas	35-45

Area	Recommended design sound level range
Apartment common areas (eg, lobbies)	45-50

While compliance with the lower level is preferred, compliance with the maximum noise level is generally considered acceptable.

AS 2107 does not specify the measurement procedure to determine whether compliance has been achieved but does state the following:

> *In situations where traffic (or other) noise levels may vary widely over a 24-hour period, measurements to assess compliance with this Standard should be taken at the relevant time according to the area of occupancy or activity in the building.*

Given the above, it could be argued that compliance measurements for bedrooms should be made during the period between 2200-0700 hrs (commonly referred to as the night period), although this does not allow for those occupants who may be shift workers or such like that may have a requirement to sleep during the day. For living and dining rooms, the compliance measurement could be made during the period between 0700-2200 hrs (commonly referred to as the day/evening period).

Further, AS 2107 does not specify the noise measurement duration. It is recommended that compliance generally be assessed based on the typical worst-case 15-minute L_{Aeq} noise level throughout the relevant period (e.g., night-time for bedrooms).

The requirements of Clause 58 of the VPP are mostly consistent with the requirements of AS 2107 and further nominate the time period during which compliance measurements should be made.

D8 Industrial Waste Collection

EPA Publication 1254 *Noise Control Guidelines* provides the following recommendations for industrial waste collections:

- Refuse bins should be located at sites that provide minimal annoyance to residential premises
- Compaction should be carried out while the vehicle is moving
- Bottles should not be broken up at the collection site
- Routes which service predominantly residential areas should be altered regularly to reduce early morning disturbances
- Noisy verbal communication between operators should be avoided where possible.

EPA Publication 1254 recommends that collections should be restricted to the following times:

One collection per week

6:30am-8pm Monday to Saturday

9am-8pm Sunday and Public Holidays

Two or more collections per week

7am-8pm Monday to Saturday

9am-8pm Sunday and Public Holidays.

D9 Deliveries

EPA Publication 1254 *Noise Control Guidelines* states the following concerning store deliveries:

Where a residential area will be impacted by noise from deliveries, the deliveries should be inaudible in a habitable room of any residential premises (regardless of whether any door or window giving access to the room is open) outside the hours contained in the schedule

Schedule: Deliveries to shops, supermarkets & service stations

7am-10pm Monday to Saturday

9am-10pm Sunday and Public Holidays.

D10 Rail noise

The *Victorian Passenger Rail Infrastructure Noise Policy* (VPRINP) was released in April 2013 and states that transport bodies and planning authorities must refer to the policy when the following is proposed:

- New passenger rail infrastructure,
- Redevelopment of existing passenger rail infrastructure; or
- A planning scheme amendment for land near an existing or planned rail corridor.

With regard to new freight railway lines, the policy states that: "…transport bodies and planning authorities… need not have regard to this policy when exercising powers or performing functions in relation to… new freight rail… infrastructure projects."

The above extract shows that the Policy does not apply to freight. However, the policy notes that:

> *When assessing whether the investigation thresholds are exceeded, transport bodies and planning authorities should consider noise from current rail activity and forecast future trends in rail activity. Noise from both passenger rail and freight rail activity should be considered where the corridor is or is likely to also be used for freight rail operations.*

As such, for the purpose of this preliminary assessment, noise from existing passenger and freight train movements have been considered in conjunction with additional growth on the network due to the Inland Rail Project.

The policy sets 'investigation thresholds' for the assessment of noise. These are noise levels, which if exceeded, indicate that noise mitigation should be considered. It states that:

> *In considering **changing land use near an existing passenger rail corridor**, transport bodies and planning authorities should consider the receivers set out in Table B in Attachment 2. Transport bodies and planning authorities should consider whether the noise level produced at these receivers will exceed the investigation thresholds for the periods specified in Table B in Attachment 2.* [reproduced below as Table 21]
>
> *If an assessment shows the investigation thresholds are not exceeded, noise impacts should be considered a secondary matter. This means no further action need be considered under this policy.*

The investigation thresholds are defined in terms of:

- $L_{Aeq,16h}$ – equivalent continuous daytime (0600 - 2200hrs) noise level
- $L_{Aeq,8h}$ – equivalent continuous night-time (2200 - 0600hrs) noise level
- L_{Amax} – maximum noise level.

Table 21: Investigation thresholds for change in land use near an existing rail corridor

Time	Type of receiver	Investigation threshold(s)	
Day (0600 - 2200hrs) External	Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks. Noise sensitive community buildings including schools, kindergartens, libraries.	65 L_{Aeq}	85 dB L_{Amax}
Night (2200 - 0600hrs) External	Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks.	60 L_{Aeq}	85 dB L_{Amax}

It is worth noting that the VPRINP investigation thresholds are generally consistent with that used in other States, such as the NSW *Rail Infrastructure Noise Guideline* (RING) for redevelopment of an existing 'heavy rail' line.

The investigation thresholds are not design criteria. Should the investigation thresholds be exceeded, then the following internal design targets are recommended by MDA based on sleep disturbance as per Section D6:

- Bedrooms: 50-55 dB L_{Amax}
- Other living areas: 60 dB L_{Amax}
- Shops/offices: 65 dB L_{Amax}

The VPRINP requires the maximum railway noise be based on the 95th percentile of the maximum for all measured events. Where practical, maximum noise levels of trains and vehicles should meet internal sleep disturbance criteria with windows of apartments closed. The assessment should consider the airborne and structure-borne components.

These limits are based on a precedent set in the Victorian Civil and Administrative Tribunal (VCAT) regarding acceptable internal noise levels for residences adjacent to tramway lines (Reference No. P2470/2003). In this case, a decision to grant a permit was made on the basis that the noise level of trains was not to exceed 55 dB L_{Amax} in bedrooms and 60 dB L_{Amax} in living areas. These levels were based on the commonly-used criteria for sleep disturbance taken from the *NSW Road Noise Policy*.

Since 2003, there have been two VCAT decisions which have recommended an internal noise limit of 50 dB L_{Amax} in bedrooms. However, there is no compelling case for the lower criterion as the decisions were not based on objective evidence presented to the Tribunal and are, in MDA's opinion, unnecessarily restrictive; 55 dB L_{Amax} is very close to the threshold of onset for noise-related sleep disturbance, and there is almost no significant difference (<1 %) in reported levels of sleep disturbance between 55 dB L_{Amax} and 50 dB L_{Amax}.

APPENDIX E BACKGROUND NOISE MONITORING

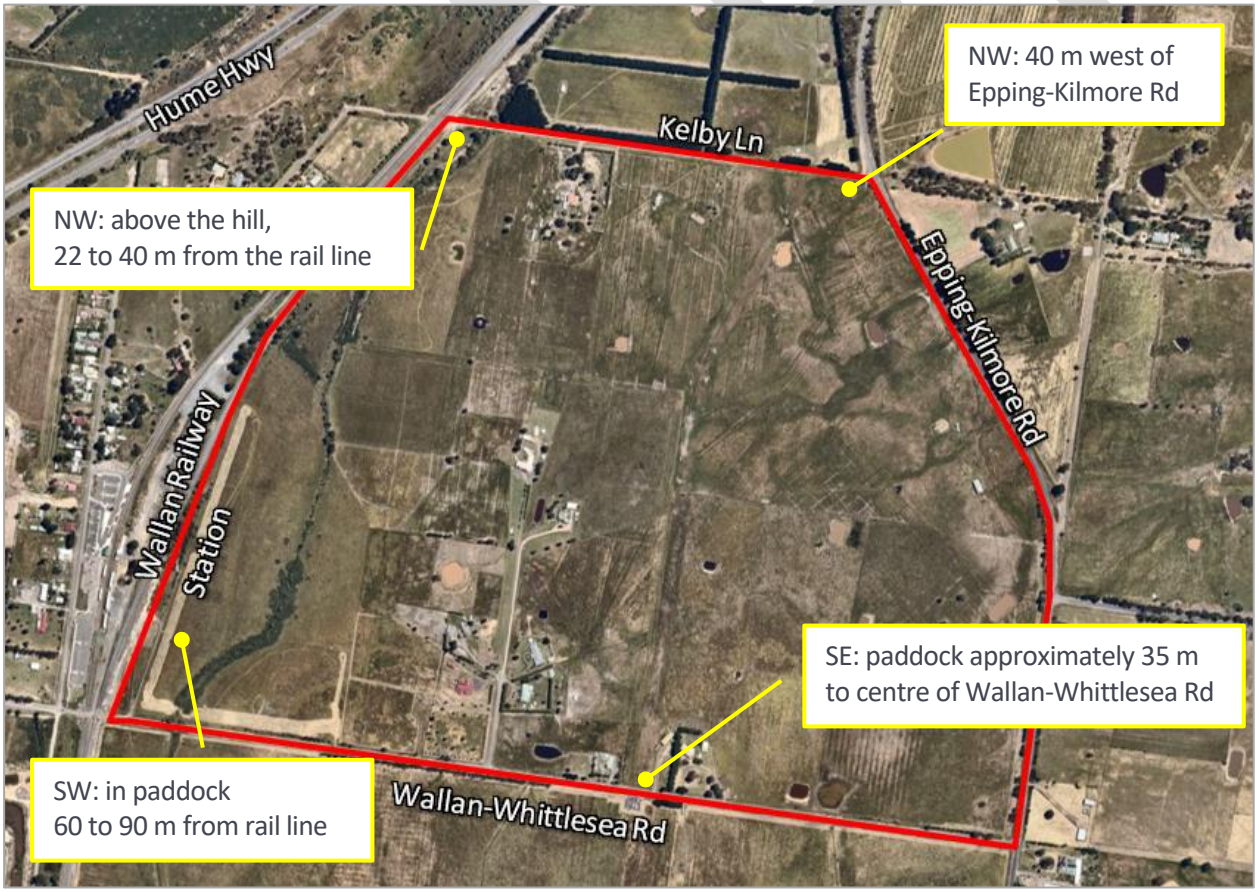
Unattended noise monitoring locations are presented in Table 22 and Figure 3.

Table 22: Noise monitoring locations

Location	Latitude /Longitude	Serial No.:	Approx. distance to major noise source		
			Railway Line[A]	Arterial Road[B]	Hume Fwy
NW	37.410553°/145.011725°	10656	22 to 40 m	N/A	280 m
SW	37.418752°/145.005993°	10657	60 to 90 m	70 m	780 m
SE	37.420112°/145.015447°	10518	920 m	30 m	1.4 km
NE	37.411169°/145.019439°	10515	580 m	20 m	800 m

Note A: distance is from closest to furthest railway tracks
Note B: distance from closest arterial road i.e., Epping-Kilmore Road and Wallan-Whittlesea Road

Figure 3: Noise monitoring locations



Photographs of the noise monitoring equipment installed on site are provided in Figure 4 through Figure 7.

The unattended noise monitoring campaign ran from Friday 26 March through to Saturday 3 April 2021, during which weather conditions were predominantly calm and dry. Noise levels were continuously measured in general accordance with Appendix C of VicRoads Road Design Note RDN 06-01 *Interpretation and Application of VicRoads Traffic Noise Reduction Policy 2005*.

The microphones of all four noise loggers were located such that they were in clear view of the source under assessment. The noise monitoring equipment used consisted of four (4) 01dB CUBE environmental noise loggers which were acoustically calibrated before and after the monitoring period using a Rion NC-73 acoustic calibrator with minimal drift.

Details regarding the instrument serial numbers are provided in Table 23.

All noise monitoring and calibration equipment contains current National Australian Testing Authority (NATA) calibration certificates which can be made available on request.

Table 23: Equipment details

Location	Instrument	Serial No
NW	01dB CUBE Environmental Noise Logger	10515
SW	01dB CUBE Environmental Noise Logger	10656
SE	01dB CUBE Environmental Noise Logger	10657
NE	01dB CUBE Environmental Noise Logger	10518
Various	Rion NA-27 Type 1 sound level meter	10163
Various	Rion NC-73 acoustic calibrator	22-564

Figure 4: Photograph looking south towards NW noise logger 22 m from closest railway line

Figure 5: Photograph looking west towards SW noise logger near Wallan train station

Figure 6: Photograph looking south towards SE noise logger near Wallan-Whittlesea Road

Note: The noise monitoring location was deemed unaffected by noise from the City Gate based on the attended noise measurements

Figure 7: Photograph looking south towards NE noise logger near Epping-Kilmore Rd

APPENDIX F ATTENDED NOISE MEASUREMENT RESULTS

Attended noise measurements were taken near the City Gate infrastructure, and at reference locations near the main roads and railway alignments.

Attended noise measurement results are provided in Table 24. Weather conditions during both surveys were calm and dry, with a temperature of around 23 °C.

Table 24: Attended noise measurement results

Time Period / Location	Measured Noise Levels	Noise environment
Industry Noise		
Friday 26 March 2021 16:00 hrs (15 min) 7m south of City Gate	49 dB L_{A90} 53 dB L_{Aeq} 57 dB L_{A10} 61 dB L_{Amax}	Measurement taken during lulls in traffic; however, results still affected by nearby road traffic on Wallan-Whittlesea Rd Noise levels from City Gate were estimated to 49 dB L_{Aeq} The noise character was typically broadband in nature with dominant frequencies from 800 Hz to 1.6 kHz
Saturday 3 April 13:50 hrs (15 min) 7m south of City Gate	46 dB L_{A90} 49 dB L_{Aeq} 50 dB L_{A10} 52 dB L_{Amax}	Minimal road traffic Noise from City Gate at 49 dB L_{Aeq} at 7 m
Train movements		
Friday 26 March 2021 14:15 hrs (39 sec) SW noise logger ~60 m from closest racks	58 dB, L_{A90} 72 dB, L_{Aeq} 76 dB, L_{A10} 88 dB, L_{Amax}	Southbound freight train at ~60 m Noise levels up to 88 dB L_{Amax} during pass-by Noise from level crossing alarm ~55 dB
Friday 26 March 2021 14:38 hrs (47 sec) SW noise logger ~60 m from closest racks	52 dB, L_{A90} 54 dB, L_{Aeq} 56 dB, L_{A10} 59 dB, L_{Amax}	Northbound passenger train 59 dB L_{Amax} during pass-by, noticeably quieter relative to freight train Noise from level crossing alarm
Friday 26 March 2021 14:46 hrs (2 min) SW noise logger ~60 m from closest racks	55 dB L_{A90} 66 dB L_{Aeq} 67 dB L_{A10} 88 dB L_{Amax}	Slow moving south bound passenger train Noise from level crossing alarm typically 55 dB prior to train pass-by Maximum noise levels of 88 dB L_{Amax} due to train horn

Time Period / Location	Measured Noise Levels	Noise environment
Traffic measurements		
Friday 26 March 2021 11:49 hrs (15 min) NE noise logger ~40 m from Epping-Kilmore Rd	53 dB L_{A90} 63 dB L_{Aeq} 64 dB L_{A10} 76 dB L_{Amax}	Intermittent traffic from light vehicles on Epping-Kilmore Rd typically between 58 and 63 dB L_{Amax} Background noise levels generally dominated by Hume Hwy traffic, with continuous insect noise at 53 dB
Friday 26 March 2021 12:16 hrs (10 min) NW noise logger ~22 m from closest tracks and 280 m from Hume Fwy	56 dB L_{A90} 62 dB L_{Aeq} 64 dB L_{A10} 84 dB L_{Amax}	Slight to moderate northwest breeze (from Hume Hwy) Continuous noise from Hume Hwy ~53 to 55 dB L_{Aeq} Short-term noise from trucks up to 62 dB L_{Amax} Noise from northbound diesel passenger train up to 84 dB L_{Amax} During lull in traffic, noise levels drop to ~53 to 55 dB
Friday 26 March 2021 14:36 hrs (2.5 min) SW noise logger ~60 m from closest racks	52 dB L_{A90} 55 dB L_{Aeq} 57 dB L_{A10} 69 dB L_{Amax}	Trucks on Wallan-Whittlesea Rd ~58 dB L_{Aeq} Background noise environment generally dominated by traffic noise from the Hume Hwy ~52 dB L_{A90} Intermittent traffic on Wallan-Whittlesea Rd just audible above background
Friday 26 March 2021 14:40 hrs (5 min) SW noise logger ~60 m from closest racks	51 dB L_{A90} 54 dB L_{Aeq} 56 dB L_{A10} 75 dB L_{Amax}	Noise levels generally consistent with above
Friday 26 March 2021 14:40 hrs (5 min) SE noise logger ~35 m from Wallan-Whittlesea Rd	53 dB L_{A90} 65 dB L_{Aeq} 69 dB L_{A10} 77 dB L_{Amax}	Location shielded from City Gate – inaudible Continuous free flowing traffic on Wallan-Whittlesea Rd dominated background noise environment ~67 to 73 dB Plane flyover ~57 dB

APPENDIX G FORECAST INLAND RAIL TRAFFIC

Existing and forecast rail traffic associated with the Inland Rail Project as detailed in SLR Consulting Australia Pty Ltd Report 0-0021-110-EMN-00-ME-0001 *Inland Rail – Tottenham to Albury.*

Table 9 Train volumes – Existing

Project Section	Train service	Train movements		
		Daytime	Night-time	Total 24-hour
Existing – No Project				
Hume Highway Tallarook	Intermodal	3	3	6
	Steel	1	1	2
	General freight	1	1	2
	Grain	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	10	2	12
	V/line – DMU	21	3	24
	Total	**45**	**13**	**58**
Hume Highway Seymour	Intermodal	3	3	6
	Steel	1	1	2
	General freight	1	1	2
	Grain	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	9	1	10
	Total	**23**	**9**	**32**
Green Street Murray Valley Highway	Intermodal	3	3	6
	Steel	1	1	2
	General freight	1	1	2
	Grain	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	Total	**14**	**8**	**22**

Table 10 Train volumes – Year 2025 with Inland Rail

Project Section	Train service	Train movements		
		Daytime	Night-time	Total 24-hour
2025 – Project Commencement				
Hume Highway Tallarook	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	4	2	6
	Central NSW Grain	0	1	1
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	10	2	12
	V/line – DMU	21	3	24
	Total	**49**	**12**	**61**
	Increase from existing	**4**	**-1**	**3**
Hume Highway Seymour	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	4	2	6
	Central NSW Grain	0	1	1
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	9	1	10
	Total	**27**	**8**	**35**
	Increase from existing	**4**	**-1**	**3**
Green Street Murray Valley Highway	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	4	2	6
	Central NSW Grain	0	1	1
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	Total	**18**	**7**	**25**
	Increase from existing	**4**	**-1**	**3**

Table 11 Train volumes – Year 2040 with Inland Rail

Project Section	Train service	Train movements		
		Daytime	Night-time	Total 24-hour
2040 – Design Year				
Hume Highway Tallarook	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	5	2	7
	Central NSW Grain	0	2	2
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	10	2	12
	V/line – DMU	21	3	24
	Stopping Trains			
	Inland Rail Intermodal	1	0	1
	Total	**51**	**13**	**64**
	Increase from existing	**6**	**0**	**6**
Hume Highway Seymour	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	5	2	7
	Central NSW Grain	0	2	2
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	V/Line – Loco Hauled	9	1	10
	Stopping Trains			
	Inland Rail Intermodal	1	0	1
	Total	**29**	**9**	**38**
	Increase from existing	**6**	**0**	**6**
Green Street Murray Valley Highway	**Express Trains**			
	Inland Rail Intermodal	2	0	2
	Inland Rail Express	3	1	4
	Inland Rail Superfreighter	5	2	7
	Central NSW Grain	0	2	2
	Griffith Export Containers	1	1	2
	Passenger – Melbourne to Albury	6	0	6
	XPT – Melbourne to Sydney	2	2	4
	Stopping Trains			
	Inland Rail Intermodal	1	0	1
	Total	**20**	**8**	**28**
	Increase from existing	**6**	**0**	**6**

APPENDIX H PSP NOISE CONSTRAINTS

H1 Place based plan – Option 1

Depending on Stabling yard location & design some level of consideration will be required to meet nominal night-time noise limits of ~38 dB to 45 dB

50 m sensitive interface buffer sufficient to meet ADG/D16 design targets for Epping-Kilmore road traffic noise

Residential areas within 60-240 m of the alignment will need to be designed to achieve the internal design targets

Min. 55 m offset distance from Wallan-Whittlesea Rd sufficient to satisfy internal noise targets for amenity

Residential area located sufficient distance from City Gate to comply with NIRV recommended levels

H2 Place based plan – Option 5

Depending on Stabling yard location & design some level of consideration will be required to meet nominal night-time noise limits of ~38 dB to 45 dB

50 m sensitive interface buffer sufficient to meet ADG/D16 design targets for Epping-Kilmore road traffic noise

Residential areas within 130-240 m of the alignment will need to be designed to achieve the internal design targets

Min. 55 m offset distance from Wallan-Whittlesea Rd sufficient to satisfy internal noise targets for amenity

Residential area located sufficient distance from City Gate to comply with NIRV recommended levels

- precinct boundary
- residential
- medium density residential
- high density residential
- local convenience centre
- potential government school
- local community facilities
- local indoor recreation
- local sports reserve
- local park
- drainage and waterways
- public transport facilities
- sensitive interface buffer
- arterial road
- connector street
- connector street - town centre
- connector street - boulevard
- key local access street
- gas pipeline T74
- gas pipeline T119
- gas pipeline T74 buffer (273m)
- pedestrian crossing over rail
- Merri creek
- Merri creek realignment