



Parwan Adverse Amenity Impact Assessment

Victorian Planning Authority

Victorian Planning Authority

18 September 2023



GHD Pty Ltd | ABN 39 008 488 373

180 Lonsdale Street, Level 9

Melbourne, Victoria 3000, Australia

T +61 3 8687 8000 | F +61 3 8732 7046 | E melmail@ghd.com | ghd.com

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
	0	C.Fairlie Y.Lim V.Lenchine	M.Asimakis		M.Asimakis		06/09/2023
S4	1	C.Fairlie Y.Lim V.Lenchine	M.Asimakis		M.Asimakis		18/09/2023
[Status code]							
[Status code]							
[Status code]							

© GHD 2023

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Executive summary

GHD was engaged by the Victorian Planning Authority (VPA) to prepare an Adverse Amenity Impact Assessment (AAIA) for the Parwan Precinct Structure Plan (Parwan PSP) and the Parwan Employment Precinct (PEP).

Key focus areas of the AAIA assessment included the following:

- Identify industries within the Parwan PSP Precinct and within a 2 km catchment area which attract a separation distance and/or be a potential noise/vibration source which may affect the future development of the land.
- Utilise EPA Publication 1518 *Recommended separation Guideline distances for industrial residual air emissions* (March 2013) and Draft EPA Publication 1949 *Separation Distance Guideline* (December 2022) to determine the separation distance for each of the industries identified with odour or dust sources.
- Undertake approximately two weeks of unattended noise monitoring at four locations within the Parwan PSP Precinct.
- Undertake a review of potential impacts associated with the identified noise sources and recommend applicable criteria for them and assess the likely impact of re-zoning.
- Provide recommendations on which adverse amenity impacts can be mitigated through built form and planning controls for the Precinct, allowing for optimisation of the placing of sensitive land uses within the Precinct.
- Provide general recommendations to assist with the land use planning and development of the Precinct.

Key findings

Key findings of this report are summarised below:

- Various existing premises with the potential for odour, dust, noise and vibration were identified within and surrounding the Precinct.
- From the results of the separation distance assessment, three key constraints to the proposed Parwan PSP were identified; namely :
 - Maddingley Brown Coal Composting facility (odour)
 - Maddingley Brown Coal Coalmine (dust)
 - Bacchus Marsh Irrigation District (odour)
- The three separation distances identified extending to the Parwan PSP are in direct conflict with the recommended precinct planning principles as recommended in the Bacchus Marsh Urban Growth Framework and Municipal Planning Strategy with respect to protecting the Maddingley Waste Resource and Recovery Hub and Bacchus Marsh Irrigation District.
- The land uses proposed to form part of the PEP are not defined as sensitive uses therefore the separation distances affecting the PEP do not pose a constraint.
- In terms of other constraints identified to the Parwan PSP, a 20 m set back to mitigate air emissions from roads were also recommended for The Parwan-Exford Road which crosses the Precinct in east-west direction and the Geelong-Bacchus Marsh Road located at the western boundary of the Precinct.
- Key noise and vibration sources with potential to impact the sensitive uses within the Precinct were identified as:
 - Industrial and commercial premises within the Precinct and surrounding area (broiler farm, Bacchus Marsh Water Reclamation Plant (WRP) and Maddingley Brown Coal)
 - Traffic noise from the existing arterial and local road network and occasional noise from heavy vehicles servicing industrial facilities (Western freeway, Parwan-Exford Road, Geelong- Bacchus Marsh Road)
 - Rail corridor noise and vibration due to passenger and freight passbys (Melbourne-Ararat rail corridor)
 - Aircraft noise (Bacchus Marsh Airfield)

- The existing industrial sites within the Precinct such would have been required to comply with the Noise Protocol at the existing noise sensitive receivers and are not required to mitigate further if new sensitive land uses encroach on their site.
- Sensitive land uses adjacent to the rail corridor and arterial roads are subject to noise control requirements in Moorabool Planning Scheme. Noise influence area extends 80 m from the nearest track since the corridor is outside of Melbourne metropolitan area.
- Recommended indoor noise limits outlined in VPP Clause 58.04-3 as follows are recommended to be met for any proposed dwelling:
 - Not greater than 35 dB(A) for bedrooms, assessed as an LAeq,8h from 10 pm to 6 am
 - Not greater than 40 dB(A) for living areas, assessed LAeq,16h from 6 am to 10 pm
- Any proposed development within the Precinct should be designed and constructed such that the environmental noise emissions comply with the requirements of the Noise Protocol at the relevant surrounding noise sensitive receivers. This also includes new small commercial establishments such as petrol stations, auto facilities, workshops and the like.

Recommendations

The following recommendations are provided within this report:

- Undertake an odour risk assessment of the constraining industries, which may result in a variation of the separation distances (Stage 2 assessment).
- Careful strategic planning of land uses to:
 - Plan where different types of land uses can be located using a setback strategy (separation distances) noting the planning principles outlined in the UGF and Municipal Planning Strategy.
 - Manage and minimise noise impact from sensitive and non-sensitive land use interfaces including but not limited to consideration of in-principle noise mitigation strategies outlined in this report.
 - Locate complimentary commercial and other business uses within the specified buffer distances to industrial developments and adjacent to arterial roads (interface land uses). The commercial and business land uses would act as a physical buffer between industrial activities and more sensitive land uses.
- The implementation of design controls within the Moorabool Planning Scheme (the planning scheme) and where appropriate development approval process to:
 - Implement application requirements into the planning scheme for sensitive uses to appropriately facilitate sensitive uses within the separation distances and manage the risk of adverse amenity (i.e. an application requirement to undertake an odour/dust risk assessment).
 - Where appropriate place specific planning requirements as part of planning scheme amendments or planning permit conditions (i.e. control of air quality and noise emission) on proposed sensitive land use and developments in particular areas and implementing separation distance areas.
 - Require any proposed sensitive land uses to undertake external noise intrusion assessment to demonstrate that the development is designed and constructed to achieve recommended noise amenity targets outlined in VPP Clause 58.04-3 and sleep disturbance criteria as defined by World Health Organisation from external noise sources.
 - Require any noise sensitive land use located within 80 m of the rail track line, to undertake external noise intrusion assessment to demonstrate that the development is designed and constructed to achieve recommended noise amenity targets outlined in VPP Clause 58.04-3 and sleep disturbance criteria as defined by World Health Organisation from rail noise.
 - Require developments with potential to generate noise to undertake further acoustic assessment to demonstrate that the development is designed and constructed to comply with the Noise Protocol requirements at surrounding sensitive uses (including within the Precinct).

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained in section 1.5 and throughout the report.

Contents

Executive summary	i
1. Introduction	1
1.1 Context	1
1.2 Purpose of this report	1
1.3 Scope of limitations	2
1.4 Scope of works	2
1.5 Assumptions	3
2. Project description	4
2.1 Location and land use	4
2.2 Surrounding land use	6
2.3 Sensitive land use	6
2.4 Precinct descriptions	7
2.4.1 Parwan PSP Precinct	7
2.4.2 Parwan Employment Precinct	7
3. Existing planning and land use context	8
3.1 Planning policy framework	8
3.1.1 Clause 11 Settlement	8
3.1.2 Clause 13 Environmental Risks and Amenity	8
3.1.3 Clause 17 Economic Development	9
3.1.4 Clause 18 Transport	9
3.1.5 Clause 19 Infrastructure	9
3.2 Local planning policy framework	9
3.2.1 Municipal Planning Strategy	10
3.2.2 Local Planning Policies	10
3.2.3 Clause 53.10	10
3.2.4 Clause 44.08	11
3.3 Strategies and plans	11
3.3.1 Bacchus Marsh Urban Growth Framework & Amendment C81 (2018)	11
4. Identified industries and existing uses	14
4.1 Identified industry and existing land use operations	19
4.1.1 Inside Precinct	19
4.1.2 Outside Precinct	19
4.2 Transport and civil infrastructure related sources	22
4.3 Site visits	25
4.4 Complaint history	25
4.5 Legislation and guidelines	33
4.5.1 Environment Protection Act 2017	33
4.5.2 Environment Reference Standard	33
4.5.3 EPA Publication 1961	34
4.5.4 EPA Publication 1943	34
4.5.5 EPA Publication 1883	35
4.6 Separation distance guidelines	35
4.6.1 Clause 53.10 – Threshold distances	36

4.6.2	EPA separation distances (Publication 1518 and Draft Publication 1949)	37
4.6.3	Application to the Precinct	44
4.7	Transport	47
4.7.1	Vehicle emissions	47
4.7.2	Locomotive emissions	47
4.7.3	Application to the Precinct Vehicle Emissions	48 48
4.8	Future uses	50
4.9	Variation to separation distances	50
4.9.1	Risk Assessment	50
4.10	Air quality mitigation strategies	51
4.11	Summary	52
5.	Noise and vibration assessment	54
5.1	What is noise	54
5.2	Potential major noise sources	54
5.3	Noise monitoring programme	55
5.3.1	Noise monitoring locations	55
5.3.2	Instrumentation	57
5.3.3	Meteorological conditions	57
5.3.4	Noise monitoring results	57
5.4	Existing potential primary vibration sources	58
5.5	Legislation, guidelines and standards	58
5.5.1	Moorabool Planning Scheme	58
5.5.2	The Noise Protocol	64
5.5.3	Victoria Planning Provisions (VPP)– Clause 58.04-3	64
5.5.4	Indoor sound levels – AS/NZS 2107	64
5.5.5	Victorian Passenger Rail Infrastructure Noise Policy	65
5.5.6	Sleep disturbance	65
5.5.7	Aircraft noise – AS 2021:2015	66
5.5.8	National Airport Safeguarding Framework	67
5.6	Discussion of potential noise impacts from existing sources	67
5.6.1	Transport, industrial and commercial	67
5.6.2	Broiler farm	71
5.6.3	Music noise	71
5.6.4	Road traffic noise	71
5.6.5	Rail noise	74
5.6.6	Aircraft noise	74
5.7	Discussion of potential noise emissions	75
5.8	Discussion of potential vibration impacts	75
5.8.1	Rail movements	75
5.8.2	Vibration from coal mine	76
5.9	General noise and vibration mitigation strategies	76
5.9.1	Land use controls	76
5.9.2	Control in transmission	76
5.9.3	Receiver control	78
5.10	Summary	80
6.	Future land use planning considerations	83
6.1	Key findings and development constraints	83
6.1.1	Odour and dust	83

6.1.2	Noise and vibration	85
6.2	Mitigation measures	86
6.3	Recommended actions	88

Table index

Table 1	Identified industry and existing uses details	17
Table 2	Identified transport noise sources	24
Table 3	Summary of complaint history from 2016-2021	28
Table 4	Default separation distances for identified industries	38
Table 5	Interface land uses	52
Table 6	Major noise sources with potential for noise impacts to the Precinct	55
Table 7	Noise monitoring locations	55
Table 8	Noise monitoring instrumentation	57
Table 9	Noise protocol time periods	57
Table 10	Measured noise protocol background noise levels	58
Table 11	VPP Clause 58.04-3 Noise influence area and indoor design noise criteria	64
Table 12	Table 1 of AS/NZS 2107: 2016 Design sound levels for residential buildings	65
Table 13	PRINP investigation threshold for land use change near existing rail	65
Table 14	Summary of L_{max} Criteria for Sleep Disturbance	66
Table 15	AS2021 Building Acceptability based on Aircraft noise exposure	66
Table 16	Potential noise impacts from existing sources	68
Table 17	Attended noise measurement notes	68
Table 18	Summary of ground- borne trigger levels $L_{Amax,Slow}$ for rail projects	75
Table 19	Noise assessment summary	81

Figure index

Figure 1	Site overview	5
Figure 2	Urban Growth Framework Plan	13
Figure 3	Identified industries	16
Figure 4	Complaint history within the Parwan/Maddingley area	26
Figure 5	Locations of lodged complaints	27
Figure 6	EPA separation distances	46
Figure 7	Transport Air Quality Setback	49
Figure 8	Noise monitoring locations	56
Figure 9	Noise influence area – Table 8, 8B and Table D5 of the Moorabool Planning Scheme	63
Figure 10	Noise influence area	70
Figure 11	Western freeway and Geelong-Bacchus Marsh Road relative to the Precinct	73
Figure 12	Noise barrier features (NSW DoP, 2008)	77
Figure 13	Noise barrier topography and features (NSW DoP, 2008)	77
Figure 14	Sample of building layout strategies 1(NSW DoP, 2008)	78
Figure 15	Sample of building orientation layout strategies 2 (NSW DoP, 2008)	79

Appendices

Appendix A	Noise monitoring locations
Appendix B	Results of noise monitoring

1. Introduction

1.1 Context

The Parwan Precinct Structure Plan (Parwan PSP) and Parwan Employment Precinct (collectively referred to as 'the Precinct') form part of the Moorabool Shire. The Victorian Planning Authority (VPA) in partnership with Moorabool Shire Council (Council) is preparing a Precinct Structure Plan which will guide future development of Parwan PSP and Parwan Employment Precinct (PEP). The Precinct was identified as a strategic precinct in the Bacchus Marsh Urban Growth Framework which forms the guide for future growth within the Bacchus Marsh area. The Precinct provides potential for future development for individual dwellings, rural activities and will provide an area for a significant employment hub. This is expected to intensify land use and boost population growth.

GHD was engaged by the Victorian Planning Authority (VPA) to conduct an adverse amenity impact assessment (AAIA) (Stage 1) and buffer risk assessment (Stage 2) for the Precinct. This report relates to Stage 1 only.

GHD has prepared this report assessing potential sources of adverse amenity impacts including noise, dust, odour and air emissions against relevant regulations to assist VPA in their decision making regarding land use and built form requirements under the proposed structure plan. The assessment area included the Precinct itself and features within a 2 km radius of the Parwan PSP boundary. A number of existing industries currently exist within and surrounding the Precinct which may have the potential to constrain future planning by virtue of amenity impacts.

As part of the AAIA, GHD has undertaken a separation distance assessment with respect to air quality. The purpose of air quality separation distances is to provide sufficient separation between sensitive land uses (such as residences) and industries that have the potential to generate emissions of dust and/or odour so that on the occasion of an emission event, the off-site dis-amenity is minimised.

GHD understands that a buffer assessment was undertaken by Pacific Environment in 2017, to inform the Bacchus Marsh UGF. As part of the Bacchus Marsh UGF Plan three (3) industries were assessed for an EPA recommended separation distance (for odour) associated with their operations. The Bacchus Marsh Recycled Water Plant, Maddingley Waste and Recovery Hub and Broiler Farms were all assessed for odour impacts as part of the Pacific Environment Buffer Assessment Report issued in 2017. The findings and recommendations of this report conflict with the residential areas proposed for the Precinct.

GHD understands that two stage assessment therefore seeks to:

- Advise whether the EPA's recommended separation distances (for odour) can be reduced without adversely affecting the amenity for future sensitive land uses
- Review any other adverse amenity impacts associated with these industries

This report also includes a noise and vibration impact review of potential noise and vibration sources that may affect development within the Precinct. General advice on mitigation considerations prior to construction is also provided to aid in the development design to mitigate these impacts through the proposed built form.

The report draws upon Clause 53.10 of the Victorian Planning Provisions (VPP) 'Uses with Adverse Amenity Potential', the EPA Recommended separation Guideline distances for industrial residual air emissions Publication 1518 dated March 2013 and the EPA Draft Separation distance guideline (Consultation Draft to supersede Publication 1518), Publication 1949 dated December 2022, as part of this assessment.

1.2 Purpose of this report

The purpose of this report is to assess the potential for adverse amenity impact from noise, dust, odour and air emissions to new sensitive receptors that may be planned for within the Precinct. The assessment in this report has been conducted in accordance with the scope of works presented in Section 1.4 of this report.

The findings, conclusions and recommendations of this assessment should be read in conjunction with the limitations presented in Section 1.3 of this report.

1.3 Scope of limitations

This report has been prepared by GHD for Victorian Planning Authority and may only be used and relied on by Victorian Planning Authority for the purpose agreed between GHD and the Victorian Planning Authority as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Victorian Planning Authority arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in section 1.5 and throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Victorian Planning Authority and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based in part on an onsite inspection undertaken by GHD in February 2023, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.4 Scope of works

This assessment was prepared in accordance with the following scope of works:

General

1. An inception meeting was held with the VPA and Council to clarify and confirm objectives, reporting, program and discuss any outstanding issues or queries.
2. A site visit was undertaken to inspect the Precinct and identify potential industries within the Precinct and within a 2 km catchment area of the Parwan PSP (surrounding area) which may attract a separation distance and/or be a potential noise source which may have the potential to result in adverse amenity impact at the Precinct. The site visit was also supplemented by desktop searches including using NPI website and the EPA website.

Separation distances

1. Identify potential odour, dust, air and noise sources that may affect the future redevelopment of the land, combining the findings of the desktop investigation and site visit.
2. Hold meetings with relevant industries and stakeholders including the EPA.
3. Discuss the nature of odour, dust, air and noise associated with different types of industrial operations as well as transportation sources.
4. Assess and scribe the separation distance for each of the sources identified.

5. Provide conclusions as to any constraints that may impact the Precinct.
6. Identify the requirements for further assessment work at the Precinct with regards to air quality.

Noise and vibration

1. Undertake a review of the relevant noise and vibration guidelines and standards applicable to the Precinct and 2 km catchment.
2. Undertake approximately two weeks of unattended noise monitoring at four locations.
3. Undertake short-term attended noise measurements during deployment and withdrawal of the monitoring equipment, to characterise the noise environment and identify potential noise contributions from other noise sources.
4. Undertake a review of potential impacts associated with the identified noise sources and recommend applicable noise criteria for them.
 - a. Assess the likely impact of re-zoning on surrounding noise sensitive receivers (changes in zoning will likely impact the future noise requirements).
5. Provide general recommendations in relation to noise and vibration to assist with planning, use, design and development of the Precinct.

Mitigation

1. Assess which adverse amenity impacts can be mitigated through design and built form interventions.
2. Provide high level recommendations on how these can be translated into land use and built form planning controls for the Precinct.

Reporting

1. Present the findings of the Adverse Amenity Impact Assessment

1.5 Assumptions

The following assumptions have been used in this report:

- The ambient noise environment on the day of the site visit is representative of typical conditions in the area.
- The most site representative available meteorological data is from the EPA automatic weather station (AWS) located at Melton.
- Where throughputs or capacity of industries within the Precinct are unknown, GHD has taken a conservative approach.
- The surrounding industries site boundaries are based off publicly available information provided by the Victorian State Government Department of Environment, Land, Water and Planning (DELWP).
- Information on the operations and throughput of the identified industries are from publicly available information, site visits, planning permit data (where available) and not through direct contact with local industry or industry bodies except with the following businesses:
 - Greater Western Water (virtual meeting on 24 March 2023)
 - Maddingley Brown Coal (site visit and meeting on 7 March 2023)

2. Project description

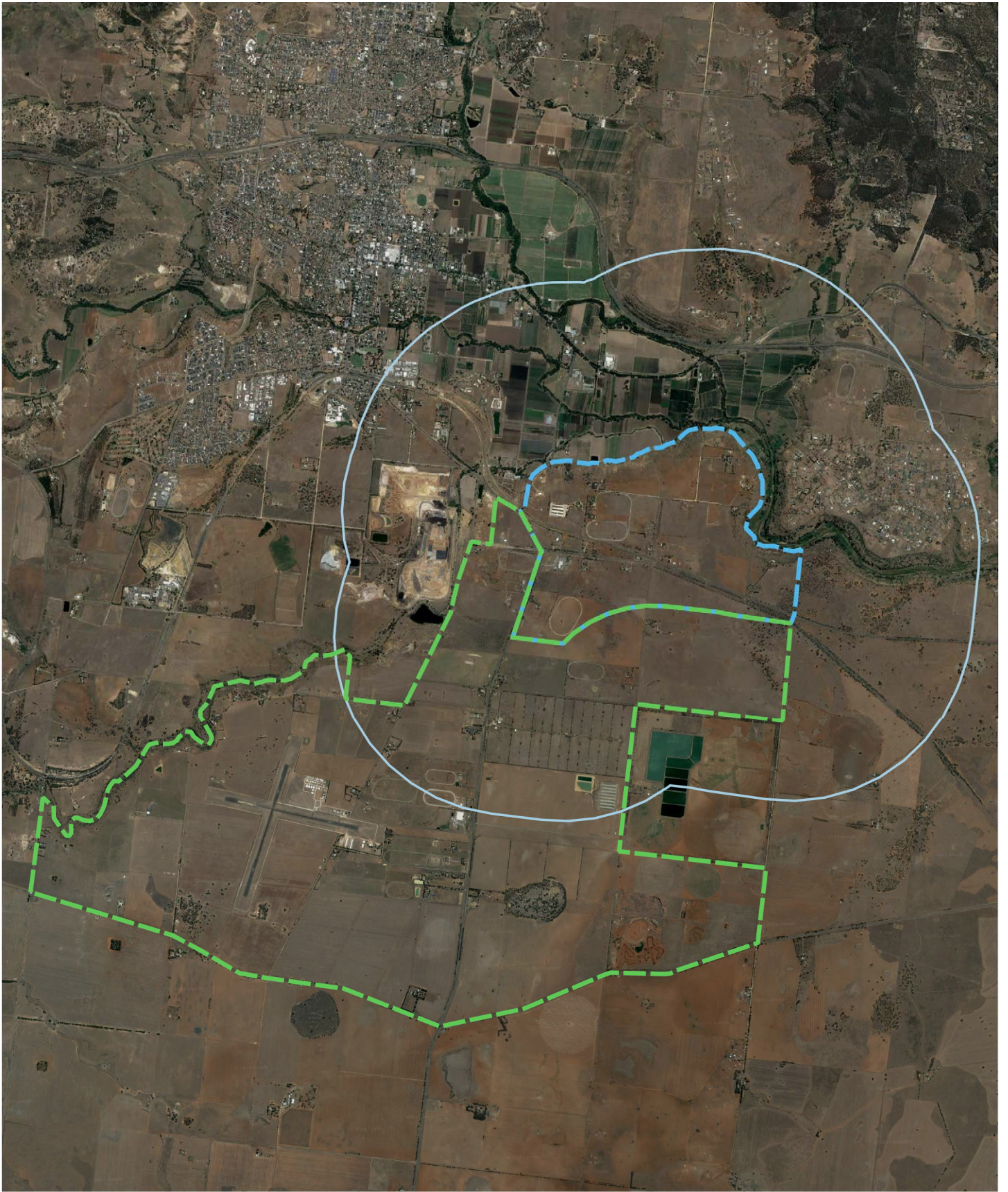
2.1 Location and land use

The Parwan PSP is located in the suburbs of Parwan, Maddingley and Rowsley which is found southeast of Bacchus Marsh within Moorabool Shire. It encompasses the land generally bordered by Werribee River and Parwan Creek in the north, Nortons Road in the east, Nerowie and Glenmore Roads in the south and Bacchus Marsh-Balliang Road in the west. The Bacchus Marsh Irrigation District forms the north border of The Precinct. The Melbourne-Ararat Railway Line runs directly through The Precinct, following an east-west path parallel to Parwan Exford Road.

The land within the Parwan PSP and PEP consists predominately of Farming Zone land where some residences are present. Within the PSP the railway line is zoned as Transport Zone 1. The land located to the north of the Parwan PSP consists mostly of Farming Zone land, where the north-east which the Werribee River separates the Parwan PSP from the Hopetoun Park residential area, is zoned as Public Use Zone 1. Found directly east of the Parwan PSP is Green Wedge Zone land, where directly west is Special Use Zone 1 land.

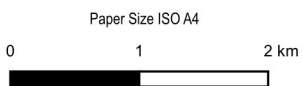
The PEP is located directly south of the PSP and is dominated by Farming Zone land. The PEP also encompasses relatively smaller areas of Special Use Zone 1, Industrial Zone 1, Comprehensive Development Zone 1 and Public Use Zone 1. Excluded from the PEP and thereby located directly east, is the Wastewater Treatment Plant located in a Public Use Zone 1 area. The remaining area to the east of the PEP is mostly Green Wedge Zone land. West and south of the PEP is predominately Farming Zone Land and the north west is a mixture of Special Use Zone 1 and Industrial Zone land.

The PSP and PEP site boundaries, and the 2 km buffer radius from the PSP is shown in Figure 1.

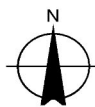


Legend

- - - PSP
- - - PEP
- 2km Radius



Map Projection: Transverse Mercator
 Horizontal Datum: GDA2020
 Grid: GDA2020 MGA Zone 55



Victorian Planning Authority
 Parwan Adverse Amenity Impact Assessment

Project No. 12598868
 Revision No. -
 Date. 22/03/2023

Parwan PSP and PEP

FIGURE 1.0

2.2 Surrounding land use

The PSP is surrounded by Maddingley to the west, Bacchus Marsh to the north and Hopetoun Park to the northeast. Maddingley consists of mostly general residential zones and special use zones 1 and 4 that being the Maddingley Brown Coal site. The locality has a scattering of industrial 1 and 2 zones and public use zones 2 and 5, mixed use zone and rural living zone with the remaining land of Maddingley as farming zone. Bacchus Marsh is mostly farming zone on the east and residential zones on the west. Hopetoun Park is a low-density residential zone at its south and farming zone land to its north. The southerly border of the Hopetoun Park is a public use zone, which borders the precinct.

The PEP is located mostly within Parwan and is surrounded by the locality to the north, east and south consisting mostly of Farming Zone and Green Wedge Zone land. The west boundary extends into Rowsley which is mainly Farming Zone land with few Special Use Zone 2 areas. Directly north-west is Maddingley as described above.

2.3 Sensitive land use

The definition of sensitive land use in the context of odour and dust emissions provided in Draft EPA Publication 1949 is defined by:

'Any land use that requires a focus on protecting human health and wellbeing, local amenity and aesthetic enjoyment. Examples of such sensitive land uses include, but are not limited to:

- *dwelling and private open space (including detached dwellings, multiple dwellings, flat/apartment buildings, row dwellings and semi-detached dwellings)*
- *accommodation (excluding caretaker's residence)*
- *child care centres*
- *education centres*
- *informal outdoor recreation that is adjacent to residential zones*
- *camping and caravan parks*
- *indoor recreation facility*
- *medical centres*
- *hospitals*
- *residential aged care facility and retirement villages*
- *outdoor recreation facility, open sports grounds, (regular public use, for example sporting fields) adjacent to residential zones.'*

Environment Protection Regulations 2021 defines a noise sensitive area as:

- a) *That part of the land within the boundary of a parcel of land that is:*
- *within 10 metres of the outside of the external walls of any of the following buildings*
 - *a dwelling (including a residential care facility but not including a caretaker's house)*
 - *a residential building*
 - *a noise sensitive residential use; or*
 - *within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings*
 - *a caretaker's house*
 - *a hospital*
 - *a hotel*
 - *a residential hotel*
 - *a motel*
 - *a specialist disability accommodation*

- a corrective institution
- a tourist establishment
- a retirement village
- a residential village; or
- within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours):
 - a child care centre
 - a kindergarten
 - a primary school
 - a secondary school; or
- b) subject to paragraph (c), in the case of a rural area only, that part of the land within the boundary of
 - a tourist establishment; or
 - a campground; or
 - a caravan park; or
- c) despite paragraph (b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue
 - a tourist establishment
 - a campground
 - a caravan park

Thus, the definition of sensitive receptor or sensitive land use is considered to be that identified by EPA for the purposes of this assessment.

Current sensitive land uses are sparsely located within the Precinct which include the residences within the Farming Zone (FZ). The Precinct is surrounded by other uses that include Special Use Zone 1 (SUZ1) to the west, PUZ1 - Public Use Zone-Service and Utility (PUZ1) to the east and south of the Precinct. Neither the Precinct nor adjacent areas are located within the major urban area.

2.4 Precinct descriptions

2.4.1 Parwan PSP Precinct

The Parwan PSP (previously referred to as Parwan Station PSP) is directly north of the Parwan Employment Precinct (PEP) boundary and south east of the Bacchus Marsh urban area, with an area of approximately 472 hectares. It comprises of a mix individual dwellings, as well as a range of rural activities.

2.4.2 Parwan Employment Precinct

The Parwan Employment Precinct (PEP) will be a regionally significant employment hub. PEP is as a strategic outcome area which covers an area of approximately 2,480 ha and holds significant economic and employment growth potential for Bacchus Marsh. PEP is located directly south of the Parwan PSP.

3. Existing planning and land use context

3.1 Planning policy framework

The Planning Policy Framework (PPF) includes a number of references to planning for the location of potentially conflicting land uses and their relationship to each other. The following clauses are relevant to this study.

3.1.1 Clause 11 Settlement

Clause 11 seeks to anticipate and respond to the needs of existing and future communities through appropriately zoned and serviced land for housing, employment, recreation and open space, commercial and community facilities and infrastructure.

Clause 11.01-1S identifies the need to focus investment and growth in places of state significance, and to capitalise on development opportunities around planned transport infrastructure. This Clause also highlights the opportunity for urban renewal and infill redevelopment to provide for the needs of a growing Victoria.

Clause 11.02-2S encourages the orderly development of urban areas through the preparation of relevant plans, including structure plans. These plans should support land use and development which considers the strategic and physical context of a location, and facilitate both the provision of new infrastructure and continued use of established infrastructure and services as required within a given area.

3.1.2 Clause 13 Environmental Risks and Amenity

Clause 13 considers environmental risks including reference to land use separation and protection of sensitive uses from adverse impacts caused by other land uses. Policies under this Clause which are of particular relevance to the assessment of adverse amenity impacts are underlined below.

Clause 13.05-1S Noise Guidelines seeks to ensure that development is not prejudiced and community amenity is not reduced by noise emissions, using a range of building designs, urban designs and land use separation techniques as appropriate to the land use functions and character of the area. The policy considers the following policy guidelines (considered relevant to this study).

- The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826.2, Environment Protection Authority, March 2021) (the Noise Protocol)

Clause 13.06-1S Air Emissions Guidelines relates to air quality management and aims to assist in the protection and improvement of air quality. This clause seeks to ensure, wherever possible, that there is suitable separation between land uses that reduce amenity and sensitive land uses. The policy considers the following policy guidelines (as considered relevant to this study).

- Recommended Separation distances for industrial residual air emissions (Publication 1518, Environment Protection Authority, March 2013)

Clause 13.07-1S Land Use Compatibility seeks to safeguard community amenity while facilitating appropriate commercial, industrial or other uses with potential off-site effects.

This can be achieved by ensuring the compatibility of a use or development as appropriate to the land use functions and character of the area by:

- Directing land uses to appropriate locations
- Using a range of building design, urban design, operational and land use separation measures

Clause 13.07-2S seeks to minimise the potential for human and property exposure to risk from incidents that may occur at major hazard facilities.

3.1.3 Clause 17 Economic Development

Clause 17 aims to provide for a strong and innovative economy by supporting economic growth and development. This is to be achieved by providing land, facilitating decision-making and resolving land use conflicts, so that each district may build on its strengths and economic potential.

Clause 17.03-1S seeks to ensure the adequate supply of land for industry in appropriate locations. This can be achieved by protecting existing industrial areas to, where possible, facilitate further industrial development; and to avoid locating non-industrial land uses in locations identified for future industrial use. The policy considers the following guidelines:

- *Recommended separation distances for industrial residual air emissions – EPA Publication Number 1518 March 2013.*

Clause 17.03-2S refers to the siting of industrial development. It encourages the sustainable development and operation of industry by protecting industrial activity in industrial zones from encroachment of commercial, residential and other sensitive uses that would adversely affect industry viability. This can be achieved by the provision of adequate separation and buffer areas between sensitive uses and offensive and dangerous industries to ensure existing or future residents are not affected by adverse environmental effects, nuisance or exposure to hazards.

3.1.4 Clause 18 Transport

Clause 18 seeks to achieve an integrated and sustainable transport system which facilitates economic prosperity, contributes to environmental sustainability, and is accessible and safe.

Clause 18.01-2S is relevant given the proposed Parwan railway station located within the Precinct. It seeks to locate and design new transport routes and adjoining land uses to minimise disruption of residential communities and their amenity, and to enhance the service, safety and amenity desirable for that transport route.

3.1.5 Clause 19 Infrastructure

Clause 19 considers the efficient and adequate provision of infrastructure to support the growth and redevelopment of settlements.

Clause 19.03-5S seeks to reduce waste and maximise resource recovery so as to reduce reliance on landfills and minimise environmental, community amenity and public health impacts. In relation to planning for urban renewal Precincts, the policy encourages future waste and resource recovery infrastructure needs to be identified and planned for, to safely and sustainably manage all waste and maximise opportunities for resource recovery.

Buffers should be implemented to protect any existing or planned waste and resource recovery infrastructure from encroachment from incompatible land uses, and waste and resource recovery facilities should be sited, designed and operated to minimise impacts on surrounding communities.

3.2 Local planning policy framework

Relevant provisions of the Municipal Planning Strategy (MPS) and Local Planning Policy Framework (LPPF) to this study are summarised below.

3.2.1 Municipal Planning Strategy

The Municipal Planning Strategy (MPS) sets out the strategic vision for planning at the local level and holds considerable weight in strategic decision making. The MPS underwent a major revision through Amendment C100. This Amendment implemented the findings of the Bacchus Marsh Urban Growth Framework and the Moorabool Industrial Areas Strategy in the Planning Scheme. The MPS outlines that Council seeks to accommodate residential growth at Parwan Station and provide employment and agricultural land uses within the Parwan Employment Precinct. The MPS recognises and aims to protect existing and future industrial and agribusiness land uses from the encroachment of sensitive land uses (particularly Maddingley Waste and Resource Recovery Hub, Darley/Coimadai sand quarries, South Maddingley industrial precinct south of Kerrs Road, Parwan Employment Precinct, Bacchus Marsh Aerodrome and Bacchus Marsh Recycled Water Plant) (Clause 02.03-7). The MPS also outlines that there are a number of strategically important land uses surrounding Bacchus Marsh, including the Darley Sand Quarries, Maddingley Brown Coal operations (coal mining, landfill and composting), agribusiness, the airport and the Bacchus Marsh Recycled Water Plant. Such uses are inherently incompatible with residential development due to their off-site impact. Council seeks to manage off-site impacts and avoid conflict with residential and other sensitive uses, environmental quality objectives and agricultural values. Further Council seeks to protect the highly productive Bacchus Marsh Irrigation District from urban expansion.

3.2.2 Local Planning Policies

Clause 13 of the Moorabool Planning Scheme contains two local planning policies that are relevant to land in the study area:

- Clause 13.05 (Noise) To assist the management of noise effects on sensitive land uses. With strategy to ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions. Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area. Relevant policies identified the noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017.
- Clause 13.06 (Air Quality) To assist the protection and improvement of air quality. With strategy to ensure, wherever possible, that there is suitable separation between land uses that pose a human health risk or reduce amenity due to air pollutants, and sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital). Relevant policies identified include EPA Publication 1518 and the ERS.
- Clause 13.07 (amenity, human health and safety) To protect community amenity, human health and safety while facilitating appropriate commercial, industrial, infrastructure or other uses with potential adverse off-site impacts. With strategy to ensure that use or development of land is compatible with adjoining and nearby land uses. Avoid locating incompatible uses in areas that may be impacted by adverse off-site impacts from commercial, industrial and other uses. Avoid or otherwise minimise adverse off-site impacts from commercial, industrial and other uses through land use separation, siting, building design and operational measures. Protect commercial, industrial and other employment generating uses from encroachment by use or development that would compromise the ability of those uses to function safely and effectively. Relevant policy identified include EPA Publication 1518.

3.2.3 Clause 53.10

Clause 53.10 sets out distances that apply to land uses with potential off-site impacts.

These distances are based on the potential adverse impacts of each land use or activity. They represent a threshold distance within which further detailed assessment is needed. This is to determine whether the proposed use or activity is appropriate.

3.2.4 Clause 44.08

The Buffer Area Overlay (BAO) clause 44.08, can be used to prevent incompatible use and development. It can apply to areas affected by the potential off-site impacts of industry, warehouse, infrastructure, or other uses.

The BAO supports the objectives in clause 13.07-1S. The BAO also complements clause 53.10 by ensuring that land use and development around existing industry is appropriate.

Proponents must meet criteria and provide supporting information to apply the BAO. Issues of land use conflict and compatibility may still exist in areas not covered by the BAO.

Planning Practice Note 92 explains the criteria and information required to apply the BAO.

3.3 Strategies and plans

3.3.1 Bacchus Marsh Urban Growth Framework & Amendment C81 (2018)

The Bacchus Marsh Urban Growth Framework, 2018 (UGF) was prepared by the Victorian Planning Authority, with the support of Moorabool Shire Council. The UGF provides a high level, long-term framework for urban growth in Bacchus Marsh, in response to strong population growth, particularly for residential and employment land (VPA, 2018, 7). The UGF recognises the importance of the Maddingley WRR Hub at the state level, both for coal extraction for industry and the role of the landfill as a waste and resource recovery hub (VP, 2018, 38). It also recognises that the Maddingley WRR Hub and other industrial uses around Bacchus Marsh that require buffers are a constraint on urban development. In relation to industrial use, the UGF recognises that the land south of Kerrs Road is generally unconstrained by sensitive land uses (VPA, 2014, 37).

Key elements of the UGF in relation to the study area are:

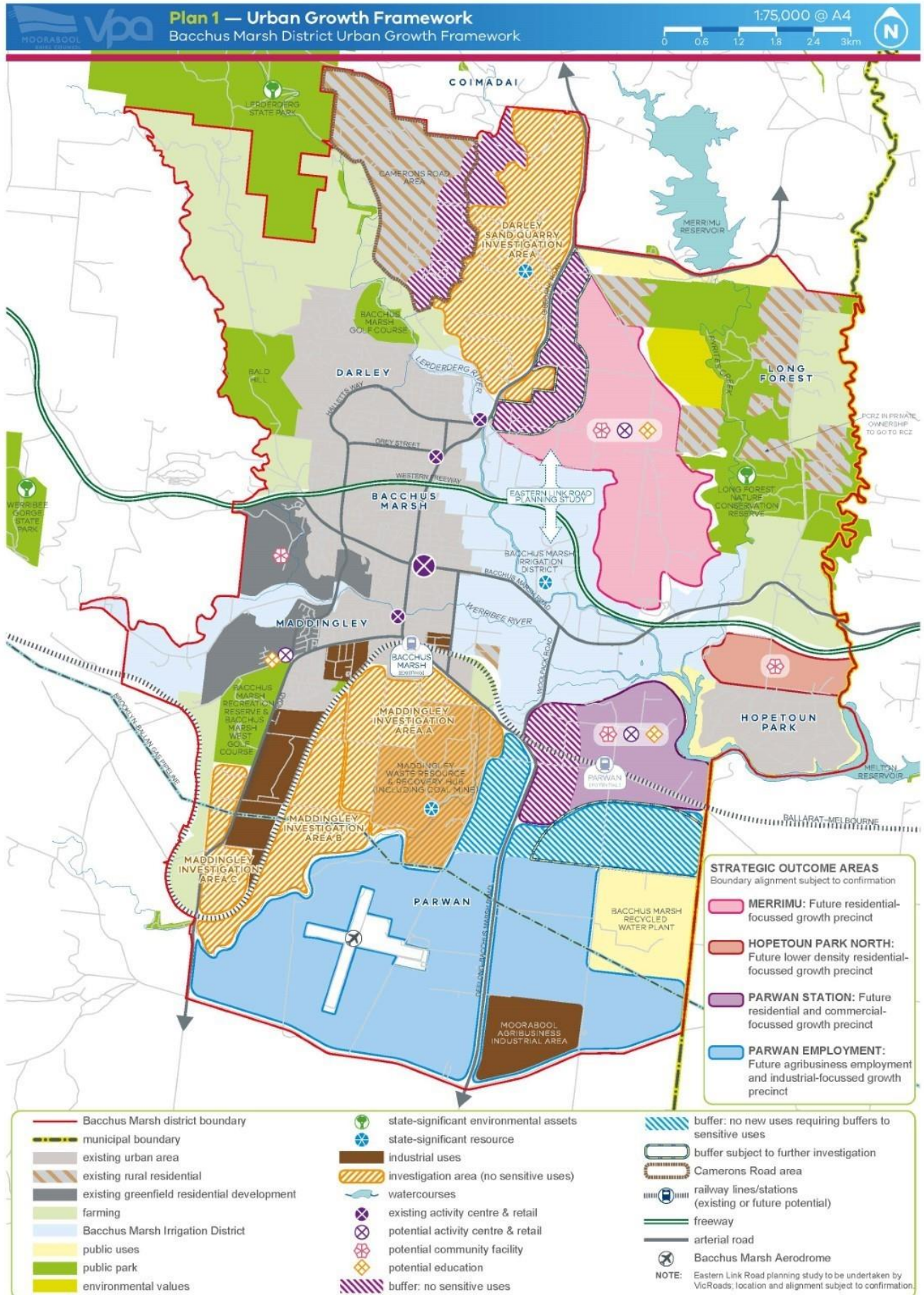
- A future residential and commercial precinct at Parwan Station
- The Parwan agribusiness and employment Precinct

These directions are shown in the UGF Framework Plan Figure 2.

The UGF recommended the following precinct planning principles with respect to the Precinct were made in relation to amenity and buffers:

- Avoid new sensitive land uses from establishing within relevant buffers to the Maddingley Waste Resource and Recovery Hub.
- Ensure that sequencing of Parwan PSP precinct protects the existing use rights of the broiler farm at 51 Browns Lane, by identifying an amenity buffer where no sensitive uses will be permitted until such time as the broiler farm use ceases.
- Ensure that land zoned for sensitive uses is located beyond the buffer distance to Bacchus Marsh Recycled Water Plant as determined in Western Water's odour dispersion modelling project; or work with Western Water to deliver treatment plant upgrades to facilitate a reduced buffer distance. Any reduced buffer distance must be at least 1.4 km and will be subject to the proponents committing to a substantial financial contribution towards treatment plant upgrades.
- Consider interfaces with environmental assets such as Werribee River, Parwan Gorge and BMID, to protect and enhance biodiversity values and agricultural land uses, and to achieve attractive development for local residents.
- Prepare a land use amenity plan to provide appropriate buffers to sensitive uses and avoid incompatible land uses.

Council implemented the findings of the UGF through Moorabool Planning Scheme Amendment C81. The presence of buffer distances around existing industrial land uses was a key planning issue at the Panel Hearing. Submissions to the Amendment were made from MBC, the Metropolitan and Grampians Central West Waste, Resource Recovery Groups, the Environment Protection Authority (EPA), the Department of Jobs, Skills, Industry and Regions (DSIR) and the Department of Energy, Environment and Climate Action (DEECA). At the panel, it was found that a 2,000 metre composting buffer around the existing composting site should apply to land on the east side of the Maddingley WRR Hub and that this should remain unchanged for future composting. It was also found that this buffer should be amalgamated with the 1,000 metre coal mining buffer (Amendment C81 Panel Report, 2018, 28), although other submitters contested the extent of the buffer.



10 | **BACCHUS MARSH URBAN GROWTH FRAMEWORK** FINAL REPORT – AUGUST 2018
© Victorian Planning Authority, 2018. The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility, or liability whatsoever for any errors, faults, defects or omission in the information.

Figure 2 Urban Growth Framework Plan

4. Identified industries and existing uses

A site inspection of the Precinct and surrounding area was conducted by GHD on 1 February 2023. This was supplemented by research using aerial photography from Google Earth and Google Street View and research of the National Pollutant Inventory database and the EPA website for licenced facilities.

GHD also conducted the following searches:

- National Pollutant Inventory (NPI) database – Hospitals, tertiary education, and electricity generation NPI categories have not been considered in line with Publication 1518. There are a total of three industries that report emissions to the NPI database within the Precinct and surrounding 2km catchment area. They are listed below with their reported emissions for 2020/2021:
 - Western Region Water Corporation
 - Ammonia: 7600 kg
 - Maddingley Brown Coal
 - Acetone: 280 kg
 - Acetonitrile: 36 kg
 - Acrylonitrile (2-propenenitrile): 240 kg
 - Ammonia (total): 3800 kg
 - Antimony & compounds: 1.2 kg
 - Arsenic & compounds: 0.26 kg
 - Benzene: 130 kg
 - Beryllium & compounds: 0.088 kg
 - Cadmium & compounds: 0.26 kg
 - Carbon disulfide: 7.9 kg
 - Carbon monoxide: 18000 kg
 - Chlorine & compounds: 11000 kg
 - Chloroethane (ethyl chloride): 180 kg
 - Chloroform (trichloromethane): 6.6 kg
 - Chlorophenols (di, tri, tetra): 0.0093 kg
 - Chromium (III) compounds: 0.77 kg
 - Chromium (VI) compounds: 0.33 kg
 - Copper & compounds: 0.99 kg
 - Cumene (1-methylethylbenzene): 37 kg
 - Cyclohexane: 62 kg
 - 1,2-Dichloroethane: 8.3 kg
 - Dichloromethane: 390 kg
 - Ethanol: 7.5 kg
 - Ethyl acetate: 120 kg
 - Ethylbenzene: 370 kg
 - Fluoride compounds: 0
 - Formaldehyde (methyl aldehyde): 0.25 kg
 - n-Hexane: 190 kg
 - Hydrochloric acid: 37 kg
 - Hydrogen sulfide: 770 kg
 - Lead & compounds: 1.2 kg
 - Mercury & compounds: 0.054 kg

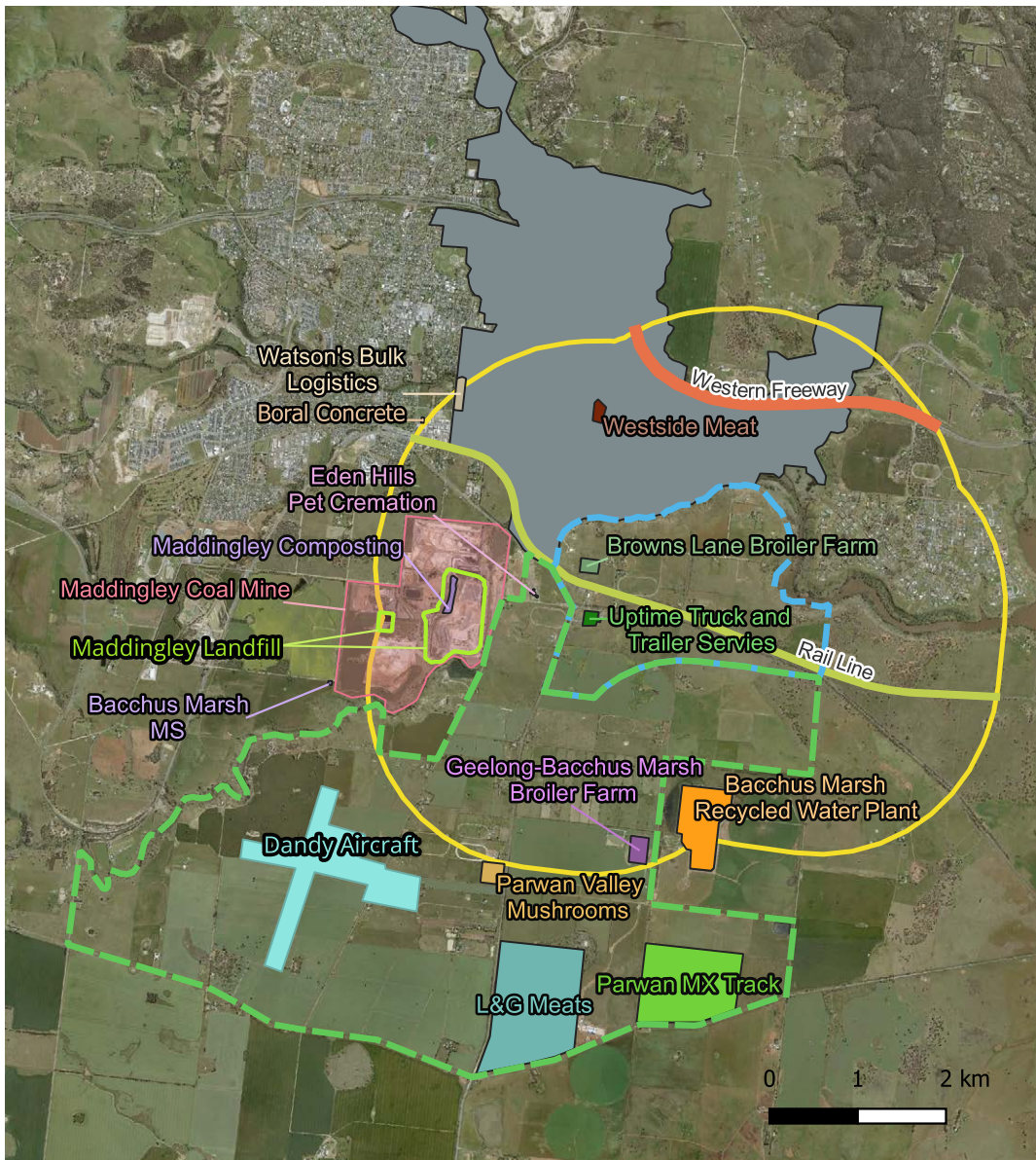
- Methyl ethyl ketone: 360 kg
- Methyl isobutyl ketone: 130 kg
- Nickel & compounds: 3.1 kg
- Oxides of Nitrogen: 15000 kg
- Particulate Matter 10.0 um: 6300 kg
- Particulate Matter 2.5 um: 6000 kg
- Phenol: 7.0 kg
- Polychlorinated dioxins and furans (TEQ): 0.000019 kg
- Polycyclic aromatic hydrocarbons (B[a]P_{eq}): 0.0046 kg
- Styrene (ethenylbenzene): 30 kg
- Sulfur dioxide: 3200 kg
- Tetrachloroethylene: 240 kg
- Toluene (methylbenzene): 1900 kg
- Total Volatile Organic Compounds: 32000 kg
- 1,1,2-Trichloroethane: 15 kg
- Trichloroethylene: 79 kg
- Vinyl Chloride Monomer: 65 kg
- Xylenes (individual or mixed isomers): 690 kg
- Zinc and compounds: 12 kg
- APA VTS Australia (Operations) Pty Ltd
 - Natural Gas Transmission meter station total volatile organic compounds: 800 kg
- EPA Licenced facilities – The following industries currently have an active EPA Licence and can be found within the Precinct and surrounding 2 km catchment area. These industries may have to potential to emit odour, dust or noise:
 - L&G Meats Pty Ltd (now expired as has recently moved locations)
 - Dandy Aircraft Pty Ltd
 - Stankovic Land Trust
 - Western Region Water Corporation
 - City West Water Corporation
 - Maddingley Brown Coal Pty Ltd

From GHD’s site visit, the following identified industries listed in Table 1 were identified to have the potential to emit odour, dust, noise or vibration, within a 2 km radius of the PSP Precinct. A 2 km radius was chosen as only two categories in Publication 1518 require a buffer distance of greater than 2 km, namely “paper and paper pulp manufacture by other methods” which requires a separation distance of 5km and a large dairy stock feedlot that requires a separation distance of 5 km. As no industries which fall under these categories are located in this area, a 2 km radius will identify all relevant industries.

For each identified industry, Table 1 shows the company, type of operation, street address, potential sources, primary concern (dust, odour, noise and/or vibration), and location of the industry with respect to the Precinct. Refer to Figure 3 for locations of the industries that have been identified. These industries will then be assessed to determine whether they require buffer distances for air in Section 4.6, or noise mitigation in Section 5.

Auto facilities, service stations, general factories and warehouses have not been included, as they do not attract an odour/dust buffer under the EPA separation distance guidelines, hence likely to be a low risk to air quality and not considered further in the air quality assessment.

It should be noted that depending on the type of activities and distance to the subject site, these could result in potential low to medium noise impact on the subject site. Any noise impact from surrounding industries is addressed through the noise control provisions of Moorabool Planning Scheme and Victorian Planning Provisions (VPP), which is discussed in Section 5.5.



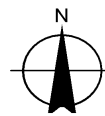
2km Radius



Zoomed into Precinct

Legend

- ▬ PEP
- ▬ PSP
- ▬ 2 km from PSP



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55



Victorian Planning Authority
Parwan AAIA

Project No. 12598868
Revision No. -
Date. 05/09/2023

Parwan Precinct Identified Industries

Paper Size ISO A4

FIGURE 3.0

Table 1 Identified industry and existing uses details

Company	Address	Operations	Operating hours	Potential sources of amenity impact	Primary concern
Browns Lane Broiler Farm	51 Browns Lane, Maddingley 3340	Broiler Farm	24 hours	Broiler operations	Odour
Uptime Truck and Trailer Services	4300 Geelong-Bacchus Marsh Road, Parwan 3340	Truck repairs	Unknown	Repair and servicing of large trucks and trailers	Dust, Noise
Maddingley Brown Coal Pty Ltd	11 Tilley's Road, Maddingley 3340	Coalmine, landfill, materials recycling and composting facility	Typical operations between 6.30 am to 4:30 pm	Brown coal mining Landfilling and materials recycling composting	Odour, dust, noise
Geelong-Bacchus Marsh Broiler Farm	4050 Geelong-Bacchus Marsh Road, Parwan 3340	Broiler Farm	24 hours	Broiler operations	Odour
Bacchus Marsh Recycled Water Plant	144 Miles Road, Parwan 3340	Waste Water Treatment Plant	24 hours	Waste water treatment	Odour
Eden Hills Pet Cremation	42 School Lane, Maddingley 3340	Animal cremation	Typical operations between 7:00 am to 7:00 pm	Cremation activities	Odour
L&G Meats	3922 Geelong-Bacchus Marsh Road, Parwan 3340 (previously at 6 Woolpack Road, Bacchus Marsh 3340)	Meat processor	Typical operations between 6:00 am to 5:00 pm	Meat Processing	Odour
Boral Concrete	3 Park Street, Maddingley 3340	Concrete supplier	Typical operations between 6:30 am to 4:00 pm	Concrete Batching	Dust, noise
Watson's Bulk Logistics	18 Fiske Street, Maddingley 3340	Transport, container packer and grain storage	Unknown	Grain transport, handling and storage	Noise, odour, dust
Parwan Valley Mushrooms	12 Aerodrome Road, Parwan 3340	Mushroom farm	Unknown	Mushroom Farm	Odour
Dandy Aircraft Pty Ltd	Cummings Road, Parwan 3340	Aerodrome operations	Unknown	Aircraft	Noise
Bacchus Marsh MS APA VTS AUSTRALIA PTY LTD	71 Rowsley Station Road, Maddingley 3340	Gas pump and supply	24 hours	Natural Gas supply	Noise

Company	Address	Operations	Operating hours	Potential sources of amenity impact	Primary concern
Bacchus Marsh Irrigation District	Werribee River flood plain	Agricultural district specialising in horticulture and market gardening	Unknown	Agricultural activities	Odour
Parwan MX Track	395-429 Parwan South Road, Parwan 3340	BMX track	Typical operations between 9:00 am to 4:30 pm	Motorbikes	Noise
Westside meats	6 Woolpack Road	Meat processor	Typical operations between 7:00 am to 9:00 pm	Meat Processing	Odour

4.1 Identified industry and existing land use operations

A brief company overview and description of the manufacturing process for the above identified industries is provided below.

The following descriptions are based on GHD's understanding of the process at each industry from a typical industry of the type identified, planning permits, an examination of the facilities' website where available, a roadside site inspection and not through direct contact with local industry or industry bodies except with the following businesses:

- Greater Western Water
- Maddingley Brown Coal

4.1.1 Inside Precinct

Browns Lane Broiler Farm

The Broiler Farm located at Browns Lane is EPA licenced. It has four sheds with a stock of approximately 164,800 birds. From information provided to GHD from the VPA, it is our understanding that this farm is no longer operational.

Uptime Truck and Trailer Services

Uptime Truck and Trailer Services Pty Ltd specialise in American Drivetrain and Kenworth Trucks and Hendrickson and BPW & York Trailers. They provide servicing, replacement and repairs.

4.1.2 Outside Precinct

Maddingley Brown Coal Pty Ltd

Maddingley Brown Coal (MBC) is a designated waste and resource-recovery hub of State Importance as defined in the State Wide Resource Recovery Infrastructure Plan (SWRRIP) that combines a range land uses within one precinct.

These uses include mining, landfill, soil conditioning (composting and soil recycling) and potential acid sulphate soils (PASS) disposal.

The site, which forms part of a broader, 1,200-hectare landholding owned by the Calleja Group, is regulated by a number of existing statutory approvals including:

- Planning Permit (PA 2011338-3) dated 5 February 2014 (last amended 1 September 2021) allows: Use and development of land for a landfill and production of soil and soil products (including composting) and works associated with these uses; Use and development of the land for the purpose of materials recycling (metals and construction and demolition waste) and Construction of a treatment plant for leachate management.
- Mining Licence (4701) together with an approved Work Plan dated 21 November 1994, allows continued mining operations of an area of 220.2 ha for 20 years (until 28 September 2033).
- EPA Licence (OL000045288) issued 6 October 1978 (last amended 28 November 2022) allows a landfill that includes the following waste streams: solid inert waste, tyres shredded into pieces <250 mm, paper pulp, waste acid sulphate soils, metal recycling shredder residue (floc) and prescribed industrial waste (category C contaminated soil) to be deposited to land. The licence also allows for organic composting.

Landfill

Stage One of the MBC landfill – which utilised the previous coal mine's 13.5 million cubic metre void, is almost exhausted. Stage Two EPA-approved landfill cells have recently commenced operation, extending the life of the landfill until at least 2043. The landfill receives more than 600,000 tonnes of inert (C&D and C&I) waste each year. The landfill would be classified as a Type 3 landfill (solid inert waste) in accordance with Draft EPA Publication 1550 Landfill Buffer Guideline.

Mining

The brown coal seam extracted by MBC under licence MIN4701 from Earth Resources Regulation Victoria is of high quality. Its applications are entirely non-thermal (i.e., not for electricity generation), including the development of non-chemical fertiliser products and cleaner fuels for industrial manufacturing. The mining activities that take place on the MBC site are entirely consistent with the purpose of the SUZ1. The mine extracts in excess of 65,000 tonnes of coal per annum and is sold to external parties for use as an organic fertiliser and soil conditioner, as well as for use in coal densification technologies. The remaining coal is used in MBC Soils soil conditioning and blending operations. The site does not undertake blasting.

Composting

MBC currently conducts waste reprocessing in the form of open windrow composting, to be used in conjunction with the brown coal and overburden to form topsoil, with the facility permitted to produce up to 50,000 tonnes of compost annually. The site also produces fertilisers and a range of soil products using the compost, brown coal and other materials obtained diverted from the waste streams entering the site. The existing composting area is operated under the EPA Licence. The MBC Composting Area is licenced by EPA to receive; municipal green waste, solid animal wastes, foundry sands, bio-solids, paper pulp, and hard green waste. The volume of material that can be accepted for composting at the MBC Composting Area is not restricted within the EPA Licence, however, composting activities are limited to the area marked as 'Compost Processing Area' on Schedule 1B of the Licence. The greenwaste stored in Area 1B is limited to material which is predominantly woody (including timber from construction and demolition waste, hardwood, and reclaimed timber from the materials recycling use undertaken on the land) and must not include lawn clippings or food waste and must not include green waste collected by Councils in their green waste wheelie bin collections.

Materials Recycling

Materials recycling is also undertaken on site within two waste transfer stations. These two facilities accept metals and construction and demolition waste only.

Geelong-Bacchus Marsh Broiler Farm

The Broiler Farm on Geelong-Bacchus Marsh Road consists of eight sheds. It is assumed it houses around 400,000 birds (50,000 per shed). It is an EPA licenced facility.

Bacchus Marsh Recycled Water Plant

The Recycled Water Plant in Bacchus Marsh is EPA Licenced, duty held by Western Water Region Water Corporation and City West Water Corporation. The facility provides treatment of sewerage and provides recycled water to agricultural regions of Melbourne's west.

The RWP consists of the following processes:

- Inlet works
- Aerated lagoon
- Three primary facultative ponds operating in parallel
- Three secondary ponds in series
- Winter storage basin

The current capacity of the plant is 20,000 equivalent population (EP) and the flow to the plant is 3 MLD.

Eden Hills Pet Cremation

InvoCare's branch Eden Hills Pet Cremation conducts private cremation services at the facility in Parwan.

L&G Meats

L&G Meats is a new facility is in the process of being built on Geelong-Bacchus Road. The new facility will provide multiple protein recovery plants and associated equipment to convert animal by-products into useable materials.

Westside Meats

Westside Meats is an abattoir facility located on 6 Woolpack Road an abattoir facility operated by L & G Failli. The facility operated as the buying and distribution arm of the business and provides cattle and sheep produce. This site does not hold any EPA licencing or report to the NPI.

Boral Concrete (Alsafe Pre-mix Concrete)

Boral Concrete Maddingley supply ready mix concrete to industrial, commercial and residential building projects. A typical concrete batching plant contains silos, storage bins, a conveyor system with a fabric filter connected to hopper, concrete truck parking area and raw feed stockpiles. Typical operations for a concrete batching plant will not vary substantially, with cement delivered by road tanker and pneumatically transferred to silos. Sand and aggregate are transferred by truck from the on-site stockpiles in a damp condition to in-ground bins. Transfer from the bins is metered onto a bin conveyor and transferred to the loading tower via a covered conveyor and then into an agitator. Cement and water are mixed with the aggregate in the agitator and batches are checked before loading into delivery trucks through a rubber loading sock.

Watson's Bulk Logistics

Watson's Bulk Logistics is a family-owned agribusiness specialising in transport, container packing and grain storage. Based in Bacchus Marsh, the facility transports grain via a fleet of 13 b/doubles and two single trailer units. They move loads between 28-48 tonnes, moving 3500 tonnes per week. They also have tippers and container packers on site for direct pick ups to be exported for the Tasmanian grain market.

Parwan Valley Mushrooms

Parwan Valley Mushrooms is situated in the Parwan employment precinct. The facility grow and sell premium and exotic mushroom varieties, processing 50 metric tonnes of mushrooms each week. From information provided to GHD from the VPA it appears that this facility has now ceased operating.

Dandy Aircraft Pty Ltd

A small Aerodrome operated in Bacchus Marsh, flying aircrafts like those owned by Dandy Aircraft Pty Ltd. The facility is currently EPA licensed.

Parwan MX Track

Parwan MX Track is a BMX track facility located directly south of the precinct.

Bacchus Marsh Meter Station

This facility provides a Natural Gas Supply to Bacchus Marsh.

Bacchus Marsh Irrigation District

The Bacchus Marsh Irrigation District is located in Bacchus Marsh on a flood plain of the Werribee River. It is currently a busy agricultural district specialising in horticulture and market gardening. The BMID is a state-significant irrigation and agricultural district administered by Southern Rural Water. The BMID supports most of Bacchus Marsh's agricultural production, thanks to its fertile alluvial soils and location in the Bacchus Marsh Valley. Produce from the BMID is transported across the state, interstate and internationally. It is located along the Avenue of Honour. Council has begun the BMID Planning Study which was identified as an action within the Bacchus Marsh Urban Growth Framework, 2018. The objectives of the BMID Planning Study are to;

- Review the current and ongoing use of land within the BMID
- Provide direction on the future of the BMID
- Recommend planning policy and controls for both the protection of, and development in, the BMID

4.2 Transport and civil infrastructure related sources

Major transport sources of noise and vibration may impact on future sensitive developments from the following transport associated (mobile) activities and air traffic within and surrounding the Precinct, as shown in Table 2.

A brief overview and description of the major identified noise and vibration sources is provided below.

The following descriptions are based on GHD's understanding of the process at each source from a typical source of the type identified, planning permits, an examination of the facilities' website where available, and a site visit.

Western freeway

Western freeway is a roadway connecting Melbourne city with Adelaide and other major and local roads. Most of the road to the north of the Precinct contains two east bound and two west bound lanes. The road has average annual daily traffic (AADT) of 37,000 vehicles with average percentage of heavy vehicles 12-13%. This is expected to be the major noise contributor at the northern boundary of the precinct due to the large volume of daily traffic.

Old Western Highway

The Old Western Highway is separated by greater buffer from the Precinct and lays to the north east of the Western Freeway. Traffic volumes are substantially less for this road. Noise contribution from this road is expected to be substantially less than from the Western Freeway (total AADT 9000 with 16% of heavy vehicles).

Parwan- Exford Road

The Parwan- Exford Road crosses the Precinct in east-west direction. This is a local road with insignificant AADT of 594 vehicles and 6% of heavy vehicles. These volumes are likely to increase in future if the area will attain more residents and businesses.

Parwan- South Road

The Parwan- South Road crosses the Precinct in south -north direction. This road also carries insignificant amount of daily traffic, AADT estimates are not available from VIC Department of Transport.

Geelong- Bacchus Marsh Road

The Geelong- Bacchus Marsh Road is located at the western boundary of the Parwan PSP and runs north-south through the middle of the PEP. This is an arterial road with AADT 6500 vehicles and 8-9% of heavy vehicles. In spite of classification of this road as arterial, traffic volumes are likely to increase if development proceeds within the Parwan PSP and PEP.

Melbourne-Ararat Railway Line

The Melbourne-Ararat Railway Line is a railway line which forms part of the V-Line regional rail service. The line travels east-west along Parwan Exford Road and runs through the Parwan PSP. The line is single-tracked in the western half of the Parwan PSP and double-tracked in the eastern half of the PSP. The number of trains passing the site of Parwan Station include 185 passenger trains to and from Melbourne on weekdays and up to 17 trains on Weekends. In total there are 430 train passings each week¹. From 2024, the number of weekend services will increase with the introduction of a 40 minute frequency in lieu of the current average of 60 minutes, however at the time of preparation of this report the increase in services is unknown.

The maximum line speed through this section is 160 km/h, however, there is a crossing loop at Parwan which would mean that some trains would be slowing and coming to a stop after entering the loop and then waiting for an opposing train. This would require further analysis to establish what line speeds are being achieved (bearing in mind that trains heading to Melbourne face a climb up to Parwan, which would see them running below 160 km/h).

All passenger trains from the mid-2020s will be worked by VLocity railcars consisting of either three or six cars. There are some locomotive hauled passenger trains going past this site at present, but it is intended to phase these trains out in the mid-2020s and replace them with VLocity railcars.

¹ Information provided from Department of Transport and Planning

There are no scheduled freight services on this corridor at present. However, around twice a week in each direction (on average), a 40 wagon grain train runs via this route. These ad hoc grain movements will cease in around 2024/25 when alterations to the trackwork at Sunshine will permanently redirect these trains to the route running via Geelong.

Bacchus Marsh Aerodrome

The aerodrome is located at significant separation distance to the southwest of the Parwan Precinct. Current an proposed operations² of the field do not trigger need for planning assessment and forecast of ANEF contours in accordance with Australian standard AS2021.

Bacchus Marsh Recycled Water Plant

The plant is located to the south of the Parwan Precinct. Noise monitoring program was performed to identify noise from the plant and other southern noise sources. From GHD's site visits it was not considered as a high risk noise contributor to noise at future sensitive land uses.

² Aerodrome Masterplan

Table 2 Identified transport noise sources

Source	Location	Operations	Operating hours	Potential sources of amenity impact	Primary concern	Location
Western Freeway	To the north of the precinct	Freeway	Constant	Vehicle noise	Noise	Outside Precinct
Melbourne-Ararat Railway Line	Centre of the Parwan PSP, along Parwan-Exford Road	Railway	Constant	Passing freight and passenger trains	Noise, vibration	Within Precinct
Old Western Highway	To the north of the precinct	Highway	Constant	Vehicle noise	Noise	Outside Precinct
Parwan- Exford Road	East-west through the Parwan PSP	Road	Constant	Vehicle noise	Noise	Within Precinct
Parwan- South Road	Centre of the Precinct	Road	Constant	Vehicle noise	Noise	Within Precinct
Geelong- Bacchus Marsh Road	Western boundary of the Parwan PSP and runs north-south through the PEP	Road	Constant	Vehicle noise	Noise	Boundary of Precinct
Bacchus Marsh Aerodrome	South west of the Parwan PSP	Local airport	N/A	Aircraft noise	Noise	Outside Precinct

4.3 Site visits

At the site visit conducted on the 1 February 2023, the following observations regarding odour, dust and noise were made:

- Odour was observed nearby the Geelong-Bacchus Marsh Road Broiler Farm (up to approximately 300 m from the edge of the sheds along Parwan South Road).
- The ambient noise environment within the Precinct area at the time was observed to be predominantly influenced by traffic, which included a mix of domestic vehicles and vehicles servicing industrial facilities.
- In addition to the typical urban ambient noise environment, noise was observed to be prominent from the following sources:
 - Western Freeway
 - Ballarat-Melbourne Railway Line

Ambient noise monitoring programme was performed from 15 to 29 March 2023. Four noise loggers were deployed at different parts of the precinct. Attended measurements were taken during deployment of the equipment (refer to section 5). During deployment and withdrawal of the monitoring equipment it was noted that:

- Noise at the northern monitoring location was influenced by the western freeway however natural background
- Noise at the central monitoring location was controlled by rail pass-buys, crossing bells and road traffic noise from Parwan-Exford Road
- Noise at the western monitoring location was dominated by natural background, there was slight audibility of machine noise from the broiler farm direction, however it may not be associated with the broiler farm operation
- Noise at the southern monitoring location was dominated by natural background with sporadic contributions from train horns and crossing bells, airplane flyover noise was audible periodically

GHD also visited the Maddingley Brown Coal site on 7 March 2023. A full tour of the site's operations was provided including viewing the coal mine, landfilling and composting operations. GHD did not observe any significant odour or dust during the visit. Some residual dust was observed at the coal mine location from unsealed roads due to heavy vehicle movements, a water cart was watering roads during the visit to minimise dust. Minor odour was observed driving past the active tip face of the landfill but was only localised to the tipping area and was not observed beyond that. Similarly, with the greenwaste operations only a slight greenwaste/timber odour was observed driving past the raw input material which was predominately woody/ timber material. No odour was observed from windrows onsite. It is also noted that the operations of landfilling and in particular the composting is undertaken a level well below the surrounding area essentially occurring in the pit of a mine which would assist in containing odours.

4.4 Complaint history

EPA has provided complaint records for odour and dust within the area captured by the Parwan Structure Plan and Parwan Employment Precinct for the period between 2016 to 2021. A summary of this data can be found in Table 3. The approximate location from where the complaint was made has been plotted in Figure 5 corresponding to each receptor number in Table 3. The number of each complaints made per alleged source type is shown in Figure 4.

The most known number of complaints was attributed to Maddingley Brown Coal Pty Ltd followed by Boratto Farms Pty Ltd with most complaints lodged at receptors within the Maddingley residential area. Majority of complaints were odour related with the most common being described as fertiliser/manure or chemical type smells. From GHD's site visit, it is noted that this type of odour character is more likely to be from a market garden farm than the Maddingley Brown Coal site and the residents making the complaint may have wrongly identified the alleged source.

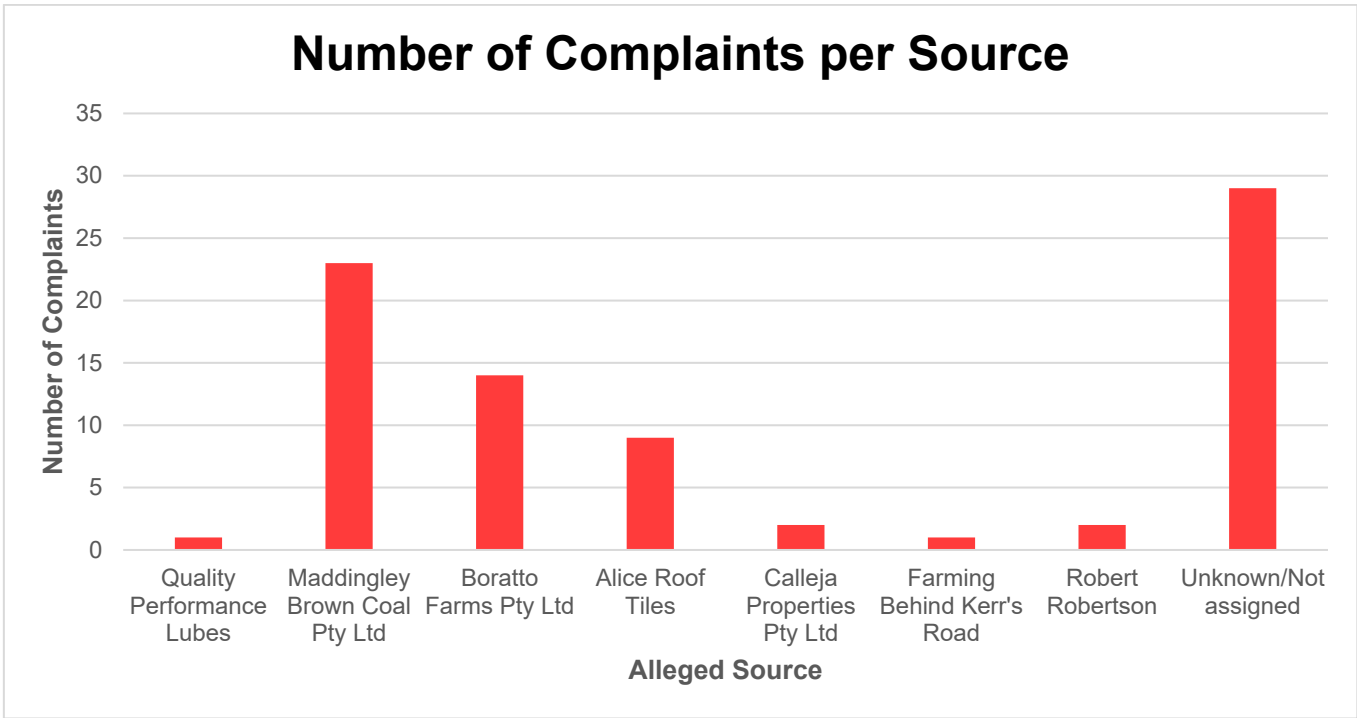
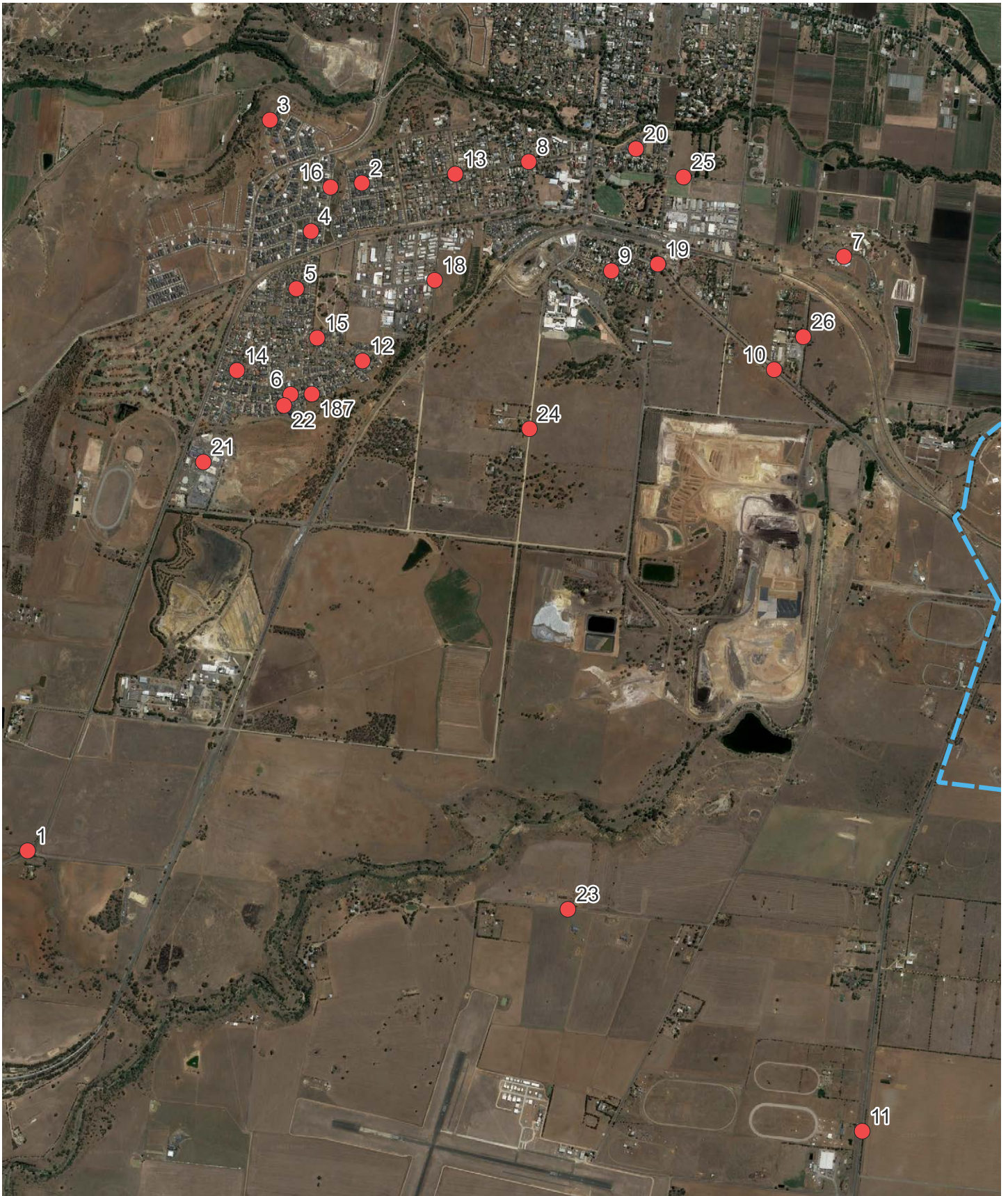
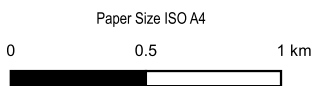


Figure 4 Complaint history within the Parwan/Maddingley area

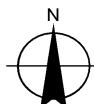


Legend

-  PSP
-  Complaints



Map Projection: Transverse Mercator
 Horizontal Datum: GDA2020
 Grid: GDA2020 MGA Zone 55



Victorian Planning Authority
 Parwan Adverse Amenity Impact Assessment

Project No. 12598868
 Revision No. -
 Date. 17/05/2023

Complaint Locations

FIGURE 5.0

Table 3 Summary of complaint history from 2016-2021

Receptor Number	Location	Category	Date	Alleged Source	Description
1	Bacchus Marsh-Balliang Road, Maddingley 3340	Odour	2/03/2020	Unknown	Glue paint on the brush
		Odour	27/10/2020	Not assigned	Clag glue and a glue stick/chemical
		Odour	20/01/2021	Unknown	Glue, paint
2	Bulbin Road, Maddingley 3340	Odour	9/03/2018	Unknown	Fertiliser and stinky socks
3	Calderwood Road, Maddingley 3340	Dust	27/02/2018	Unknown	Trucking soil out
4	Casper Place, Maddingley 3340	Odour	13/11/2017	Maddingley Brown Coal landfill	Fertiliser smell
		Odour	7/03/2018	Unknown	Chemical odour
		Odour	9/03/2018	Unknown	Fertilizer/chemical
		Odour	12/03/2018	Unknown	Please see attachments.
		Odour	12/03/2018	Unknown	Toxic smell
5	Dewar Crescent, Maddingley 3340	Odour	2/07/2018	Unknown	Gas/chemical
		Odour	18/01/2017	Quality Performance Lubes	Chemical smell or toxic glue smell.
6	Eighth Mews, Maddingley 3340	Odour	9/03/2018	Maddingley Brown Coal Pty Ltd	Poo
7	Finn Court, Maddingley 3340	Odour	18/05/2020	Unknown	Refer to incident 8100039850
		Odour	17/06/2020	Boratto Farms Pty Ltd	Chicken Manure And Mushroom Compost
		Odour	18/06/2020	Boratto Farms Pty Ltd	Chicken Manure
		Odour	25/06/2020	Boratto Farms Pty Ltd	Manure
		Odour	25/06/2020	Boratto Farms Pty Ltd	Chicken Manure
		Odour	27/06/2020	Boratto Farms Pty Ltd	Chicken Poo
		Odour	27/06/2020	Boratto Farms Pty Ltd	Ammonia And Dust
		Odour	29/06/2020	Boratto Farms Pty Ltd	Chook Manure
		Odour	7/07/2020	Boratto Farms Pty Ltd	Chicken Manure
		Odour	7/07/2020	Boratto Farms Pty Ltd	Chicken Manure

Receptor Number	Location	Category	Date	Alleged Source	Description
		Odour	8/07/2020	Boratto Farms Pty Ltd	Manure Or Fertilizer
		Odour	9/07/2020	Boratto Farms Pty Ltd	Market Garden-composting
		Odour	10/07/2020	Boratto Farms Pty Ltd	Mushroom compost and Manure
		Odour	17/07/2020	Unknown	Chicken Manure
		Odour	22/03/2021	Boratto Farms Pty Ltd	Rotting Manure
		Odour	7/04/2022	Boratto Farms Pty Ltd	Mushroom composting and dumping
8	Franklin Street, Maddingley 3340	Odour	9/03/2018	Unknown	Something died 10 days ago
		Odour	13/03/2018	Maddingley Brown Coal Pty Ltd	Coal mine
9	Gaynor Street, Maddingley 3340	Dust	8/03/2020	-	Dust and debris on roads
10	Geelong-Bacchus Marsh Road, Maddingley 3340	Dust	10/01/2018	Alice Roof Tiles (Barro Group)	Concrete dust everyday and solar panels clogged up
		Odour	30/04/2019	Calleja Properties Pty Ltd	Dust from trucks going in and out
		Dust	6/05/2019	Calleja Properties Pty Ltd	-
11	Geelong-Bacchus Marsh Road, Parwan 3340	Dust	21/11/2020	Unknown	Dust Coming From The Mowing Of The Crops On Property In Front Of Them. Chicken Farm Across The Road.
12	Hegarty Place, Maddingley 3340	Odour	9/03/2018	Unknown	Dead carcasses - like rotting meat
13	Inglis Street, Maddingley 3340	Dust	18/11/2020	Unknown Alleged Source	Dust Is Coming From Earth Moving Equipment On Next Door.
14	Leahy Street, Maddingley 3340	Odour	9/03/2018	Unknown	Wet dog/cow/ dirty
			27/02/2020	Not assigned	

Receptor Number	Location	Category	Date	Alleged Source	Description
15	McLennan Avenue, Maddingley 3340	Odour	9/03/2018	Maddingley Brown Coal Pty Ltd	Fertilizer manure
		Odour	16/03/2018	Maddingley Brown Coal Pty Ltd	Fertilizer/cattle
16	Mimulus Road, Maddingley 3340	Odour	9/03/2018	Unknown	Fertilizer or sewage
17	Ninth Mews, Maddingley 3340	Odour	13/03/2018	Maddingley Brown Coal Pty Ltd	Farmers fertilizer
18	Osborne Street, Maddingley 3340	Odour	9/03/2018	Farming Behind Kerr's Road	Toxic gas Blood and Bone Chemical Based.
		Odour	25/05/2018	Not assigned	Alice Roof Tiles
		Dust	3/09/2020	Maddingley Brown Coal Pty Ltd	Redish Colour - Cars Are Covered In Dust
19	Parwan Road, Maddingley 3340	Odour	4/01/2023	Maddingley Brown Coal Pty Ltd	Leachate
		Odour	30/06/2017	Unknown Alleged Source	Nitrate
		Odour	23/04/2022	Robert Robertson	Blood and bone
		Dust	5/08/2020	Unknown Alleged Source	Fine Dust Coming From Works Done By Western Water sub contractors, Upgrading Sewage Pipes.
20	Rivergum Place, Maddingley 3340	Odour	27/01/2023	Maddingley Brown Coal Pty Ltd	Odourous smoke haze chemical, acrid smell
		Dust	24/01/2018	Alice Roof Tiles (Barro Group)	Concrete dust everyday and solar panels clogged up
21	Rutherford Court, Maddingley 3340	Dust	2/02/2018	Alice Roof Tiles (Barro Group)	Concrete dust everyday and solar panels clogged up
		Dust	13/03/2018	Maddingley Brown Coal Pty Ltd	Dust/glue/paint
		Dust	3/04/2018	Alice Roof Tiles (Barro Group)	Caller is being impacted by concrete particles, paint particles,

Receptor Number	Location	Category	Date	Alleged Source	Description
		Dust	11/04/2018	Alice Roof Tiles (Barro Group)	Caller is being impacted by concrete particles, paint particles,
		Dust	8/01/2019	Alice Roof Tiles (Barro Group)	Caller is being impacted by concrete particles, paint particles,
		Odour	24/06/2020	Alice Roof Tiles (Barro Group)	Glue And Paint Fumes
		Odour	16/03/2018	Unknown Alleged Source	Manure or fertilizer
22	Sixth Mews, Parwan 3340	Odour	12/03/2018	Maddingley Brown Coal Pty Ltd	Fertilizer
23	Smiths Road, Parwan 3340	Odour	17/03/2018	Maddingley Brown Coal Pty Ltd	Fertiliser smell, blood and bone, a dynamic lifter.
		Odour	8/04/2019	Maddingley Brown Coal Pty Ltd	Rotting sewerage, more 'rounded' rather than 'sharp'
		Odour	29/04/2019	Unknown Alleged Source	Rotting ham, or really ripe cheese
		Odour	11/07/2020	Maddingley Brown Coal Pty Ltd	Rich Chemical
		Dust	27/12/2020	Not assigned	Significant dust is being blown into the air
		Odour	23/02/2018	Maddingley Brown Coal Pty Ltd	Offal and manure
24	South Maddingley Road, Maddingley 3340	Odour	9/03/2018	Maddingley Brown Coal Pty Ltd	Poo and sewage
		Odour	10/03/2018	Unknown Alleged Source	Manure or fertilizer
		Odour	16/03/2018	Not assigned	Manure
		Dust	5/02/2019	Maddingley Brown Coal Pty Ltd	Black dust, Very fine
		Odour	22/02/2019	Alice Roof Tiles (Barro Group)	Rubbery enamel paint
		Odour	6/06/2019	Alice Roof Tiles (Barro Group)	Melted plastic ploymer

Receptor Number	Location	Category	Date	Alleged Source	Description
		Dust	12/06/2020	Not assigned	Trucks constantly going up and down dirt road to and from the Calleja Tip
		Odour	16/04/2021	Maddingley Brown Coal Pty Ltd	Sewage/septic
		Odour	27/01/2023	Maddingley Brown Coal Pty Ltd	Heavy smell of coal happened after a fire at the mine.
		Dust	6/01/2023	Maddingley Brown Coal Pty Ltd	Dirt dust
		Odour	6/09/2022	Maddingley Brown Coal Pty Ltd	Methane smell
		Dust	20/10/2021	Maddingley Brown Coal Pty Ltd	Bunding under construction. A lot of dust is being generated on-site
25	Taverner Street, Maddingley 3340	Odour	7/04/2022	Robert Robertson	PUTRID sewerage!!!!
26	Vallence Road, Maddingley 3340	Odour	16/07/2020	Maddingley Brown Coal Pty Ltd	Chemical Solvent

4.5 Legislation and guidelines

4.5.1 Environment Protection Act 2017

EPA Victoria implemented a new legal framework which came into force on 1 July 2021, with the intention for this framework to drive environmental improvements in industrial operations. The cornerstone of the Environment Protection 2017 (Act) is the general environmental duty (GED). The GED requires all Victorian businesses and individuals to prevent and minimise harm to the environment and human health as far as reasonably practicable. Any new or existing plant or development will be required to meet the GED. The expectation is that individuals will manage their activities to avoid the risk of environmental damage. There is also a requirement to quickly and appropriately respond if pollution does occur.

For businesses already managing their environmental risks, the GED generally means little to no change to how they operate. Most businesses already follow good management practices. This will make complying with the GED easier. EPA Victoria has committed to working with industry to help them understand how to fulfil their obligations, by providing guidance, advice and other support. Complying with the GED is about taking reasonable proactive steps and employing good environmental work practices. Compliance with the GED can be through following responsibilities under occupational health and safety (OHS) laws, meeting industry standards, adopting industry better management practices, and following other relevant legislation related to the environment. In effect, the GED makes it clear that it is the individual businesses' responsibility to reduce risk to the environment and to protect it.

4.5.2 Environment Reference Standard

The EP Act's environment protection framework includes the Environment Reference Standard (ERS). This identifies environmental values, air indicators and objectives that set the benchmark for the quality of the air environment needed to protect environmental values. The environmental values identified include:

- Life, health and wellbeing of humans
- Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity
- Local amenity and aesthetic enjoyment
- Visibility
- The useful life and aesthetic appearance of buildings, structures, property and materials
- Climate systems that are consistent with human development, the life, health and well-being of humans, and the protection of ecosystems and biodiversity

The ERS is a reference standard, not a 'compliance standard' for businesses i.e. it relates to ambient air and not any individual facility. The ERS replaces SEPP (AQM) and generally adopts the objectives in the National Environment Protection Measure (Ambient Air Quality) (NEPM AAQ) with some modifications.

The following air quality indicators, and respective objectives, relevant to this assessment are outlined below:

- Particles as PM₁₀ (maximum concentration)
 - 50 µg/m³ for an averaging period of one day
 - 20 µg/m³ for an averaging period of one year
- Particles as PM_{2.5} (maximum concentration)
 - 25 µg/m³ for an averaging period of one day
 - 8 µg/m³ for an averaging period of one year
- Odour
 - An air environment that is free from offensive odours from commercial, industrial, trade and domestic activities

4.5.3 EPA Publication 1961

EPA Publication 1961 Guideline for Assessing and Minimising Air Pollution provides businesses and risk assessors with a framework for evaluating and minimising air pollution in accordance with the requirements of the GED.

This guideline forms part of Victoria's environmental protection framework that establishes the state of knowledge to protect the environmental values of the ambient air environment. The guideline describes the General Environmental Duty (GED) which requires anyone engaging in any activity that may give rise to risks of harm to human health or the environment from pollution or waste to minimise those risks, so far as reasonably practicable.

As such, emitters of pollution to air have a responsibility to put in proportionate controls to eliminate or minimise risks to human health or the environment. Being proportionate and preventative requires duty holders to:

- Understand their risks
- Actively seek out ways to eliminate or minimise these risks, so far as reasonably practicable
- Ensure any risks remaining after the implementation of all controls are within acceptable limits

The purpose of the guideline is to provide a framework to assess and control risks associated with air pollution.

The guideline outlines a risk management approach that involves a repeating cycle of four steps, namely:

Identifying hazards

This involves identifying, and if necessary, quantifying emission sources. This also involves characterising the receiving environment including local topography, meteorology, background air quality and nearby sensitive land uses.

Assessing risks

A three-tiered approach to the assessment of risks from air pollution is outlined, namely:

- Level 1 assessment: qualitative or semiquantitative assessment, used to assess risks from activities that either have intrinsically low risks, or have common, well-understood risks that can be controlled without extensive assessment.
- Level 2 assessment: involve the use of dispersion modelling or monitoring with predicted concentrations benchmarked against air quality assessment criteria (APAC).
- Level 3 assessment: detailed risk assessment, used when a simple comparison of a pollutants concentration to an APAC cannot adequately assess risks.

Implementing controls

Emitters should demonstrate how existing or proposed risk controls minimise risks so far as reasonably practicable.

Checking controls

To evaluate performance, emitters should have clearly documented environmental performance objectives that can be monitored and reported on.

Publication 1961 however does not address odour or nuisance dust. These are dealt with via Publications 1943 and Publication 1883.

4.5.4 EPA Publication 1943

Section 13.7 of EPA Publication 1961 describes a nuisance dust risk assessment and directs the user to the *EPA Publication 1943 Guidance for Assessing Nuisance Dust*. Nuisance dust is different to the air pollutants of particulate matter such as PM₁₀ which are assessed under the health criteria within EPA Publication 1961. Nuisance dust generally comprises larger dust particles which create visible impacts when emitted.

The purpose of Publication 1943 is to:

- “Provide methods for assessing the impacts of nuisance dust on human health and wellbeing, including site specific risk assessment methods” (EPA 2022)
- “Provide guidance on what to include in any report relating to the assessment of nuisance dust in Victoria” (EPA 2022)

The agent of change has the responsibility to assess the risk of nuisance dust, with the following responsibilities:

- Consider their obligations under the GED including the implications of the proposal on human health and amenity
- Avoid land use conflict
- Ensure potential impacts on nearby land uses are appropriately mitigated and managed

EPA Publication 1943 uses four-steps to assess the risk of nuisance dust impacts from an emission source, as follows:

- Step 1: Dust source hazard potential
- Step 2: Exposure pathway effectiveness
- Step 3: Receiving environment sensitivity
- Step 4: Overall risk of dust impacts (combining steps 1 to 3)

The publication allocates a quantitative value to the outcome of each assessment step, to obtain an overall level of risk encompassing each aspect. The allocations are selected for several components contributing to the risk factor in each step, using the examples given by EPA.

4.5.5 EPA Publication 1883

Publication 1883 provides information on how to assess the risk posed by odour emission sources and to understand the receiving environment where effects might occur. This guidance is focused on the assessment of odour under the provisions of the EP Act, including the GED, which requires all Victorians to take precautionary and reasonable actions to avoid hazards causing harm. The guideline is primarily intended for government, the planning sector, practitioners and specialists, who need to understand offensive odours that are associated with a development proposal, investigation or study where an odour assessment is required. Risk assessment is related to whether the risk of harm can be easily understood through the assessment framework. The publication provides a framework for three levels of risk assessment, according to the odour impact potential of an industry or site. Publication 1883 is to be utilised once an assessment of the separation distance has been undertaken to assess for any potential constraints. The three levels of assessment include:

- Level 1 – Gateway assessment of emissions duration, wind direction and cumulative odour sources
- Level 2 – Source-Pathway-Receptor assessment
- Level 3 – Detailed risk assessment that could include:
 - Comparisons with similar operations or case studies
 - Risk assessment using field odour surveillance data
 - Complaint assessment
 - Community odour surveys/questionnaires and odour diaries

4.6 Separation distance guidelines

Two classes of buffer/separation distance guidelines are relevant in the context of planning in Victoria, namely threshold distances and buffer (or separation) distances.

4.6.1 Clause 53.10 – Threshold distances

Victorian Planning Schemes seek to ensure that planning resolves and does not create land use conflicts. This is typically achieved by providing separation distances between potentially conflicting land use zones that may result in incompatible uses.

Clause 53.10 of the VPPs seeks to define those types of industries and warehouses which if not appropriately designed and located may cause offence or unacceptable risk to the neighbourhood.

The clause sets out the threshold distance that is the minimum distance from any part of the land of the proposed use of or buildings and works for specified uses that have adverse amenity potential.

The table to the Clause 53.10 includes three columns that refer to the type of production or use or storage (purpose) which may result in adverse amenity potential and includes the threshold distance in metres and notes:

- **Note 1** is where the threshold distance is variable, dependent on the process to be used and the materials to be processed or stored.
- **Note 2** is where an assessment of risk to the safety of people located off the land may be required.

Clause 53.10 does not itself trigger the need to obtain a permit, however Clause 66.02 – 7 (use and development referrals) requires that an application is referred to the EPA as the determining referral authority if the proposal is to use land for an industry or warehouse for a purpose listed in the table to Clause 53.10 with no threshold distance specified or if the threshold distance is not to be met.

Over the years there have been a number of VCAT, Planning Panel and Advisory Committee reports and recommendations in relation to the use and operation of the threshold distances (separation distances) included in under clause 53.10 – Uses with adverse amenity potential.

The following Planning Panel commentary provides a snapshot as to the recent application of the threshold distances listed under Clause 53.10 and the separation distances included in the EPA Guidelines 1518 – *Recommended Separation Distances for Industrial Residual Air Emissions*.

Melbourne Planning Scheme Amendment C221 – West Melbourne Waterfront (26 January 2017)

The purpose of the Panel Hearing was to consider submissions in response to a rezoning application to facilitate a mixed use development of approximately 2.8 hectares comprising substantial residential, retail, commercial and open space land uses. The subject land is proximate to both the Footscray Major Activity Centre and the Melbourne's Central Business District.

The Panel considered odour and dust impacts from surrounding industry and considered whether the site could achieve adequate separation distances. The following commentary in relation to the application of Clause 53.10 and EPA 1518 Guidelines are as follows:

- *The Panel reiterates that it is satisfied that the most relevant consideration in the establishment of appropriate separation distances between existing industries and proposed new sensitive land uses are the EPAV 1518 Guidelines.*
- *The Panel agrees with the views of the Advisory Committee, which notes that Clause 52.10 (now 53.10) does not act as a 'reverse buffer' (the concept of 'reverse buffer' is where an impact generating use is protected from encroachment by sensitive uses, rather than the sensitive use being protected from encroachment by a use with adverse impacts). It does not provide a statutory buffer for the location of residential uses that is a suitable distance from existing industries. Industries are not therefore completely protected from encroachment of residential uses.*

In considering the evidence, the Panel made the following conclusion:

- *The Panel considers that the EPAV 1518 Guideline is the relevant guideline to inform separation distances between existing commercial/industrial uses and proposed sensitive uses. Informed by these Guidelines and the testing of the evidence, the Panel is satisfied that, subject to further assessment and detailed site planning, the introduction of sensitive uses on [sic] subject site can be accommodated in a manner that will afford adequate separation distances from existing commercial and industrial operations in the Dynon Precinct*

Summary

The use of the *EPA Guideline - Recommended Separation Distances for industrial residual air emissions 1518 (March 2013)* is the preferred approach to determining suitable separation distances between existing industrial and proposed new sensitive uses. GHD notes that Publication 1518 is to be superseded by Publication 1949 Separation Distance Guideline (currently in Draft form at the time of writing this assessment).

4.6.2 EPA separation distances (Publication 1518 and Draft Publication 1949)

In the case of an existing industrial use, the EPA recommends buffer distances should be considered when preparing a planning scheme, planning scheme amendment or planning permit application. A buffer distance is a planning instrument used to provide separation of sensitive land uses (i.e. residential, schools, hospitals) from existing premises with the potential for off-site emissions (odour or dust) that can cause dis-amenity in the event of unintended emissions. The use of separation distances can:

- Prevent land use conflict
- Help protect the health and amenity of sensitive land uses
- Minimise risks and mitigate odour and dust impacts from certain industries and activities
- Help protect industrial and commercial land uses and activities
- Provide local government, industry, developers and the community with some certainty about future land use

Recent advice from EPA regarding Draft Publication 1949 noted that the separation distances are not a substitution for pollution controls. The industry should still be minimising risks of odour and dust so far as reasonably practical based on the current state of knowledge in that sector, (i.e., meeting the GED for that sector). Therefore, the separation distance is not a substitution for pollution controls and complying with the GED.

The purpose of the EPA separation distance guideline is to provide recommended minimum separation distances between odour or dust emitting industrial land uses and sensitive land uses. The guideline is to support land use and development decisions that:

- Protect the community from human health and amenity risks associated with unintended offsite odour and dust impacts generated by industry
- Protect industry from inappropriate land use and development nearby that may constrain operations

In the case of the Precinct, the EPA recommended separation distance guideline (Publication 1949 and Publication 1518) will apply to existing industries in and surrounding the Precinct. GHD met with the EPA on 23 February 2023 to discuss GHD's methodology. In that meeting GHD confirmed with EPA that they would prefer that both EPA Publications 1518 and Draft 1949 are considered in the assessment.

GHD notes that one major change between the two publications is that EPA Publication 1518 seeks to protect for upset conditions while the latest Publication 1949 seek to protect for routine operations.

Note that noise, vibration, ambient and hazardous air pollutants and light spill are not considered in the separation guideline.

4.6.2.1 EPA separation distances from surrounding industries and uses

The industrial premises and uses identified in Section 4 which attract separation distances under EPA publications 1949 and 1518 are listed in Table 4. A description is given below of the evaluation of each industrial premise.

Table 4 Default separation distances for identified industries

Company	Industry type and activity/ definition	EPA 1518 Guideline separation distance (m)	Draft EPA 1949 Guideline separation distance (m)	Impact Precinct (Y/N)
<p>Browns Lane Broiler Farm</p>	<p>ODOUR Poultry: Egg, meat and bird production, including quails, ducks, turkeys, geese and chickens</p>	<p>See further Guidelines: Victorian Code for Broiler Farms, Department of Primary Industries, 2009 $D = 27 \times N^{0.54}$ where D = Separation Distance (metres) N = farm capacity /1000 0.54 is an exponential factor that is applied to N. Separation distance for 164,800 birds= 425 m</p>	<p>See further guidelines: S Factor calculation in Appendix A of Planning and environment guideline for establishing meat chicken farms (Guide 1 – Assessment guide) (2021)</p> <p>Separation distance = (Number of birds/1,000)^{0.63} x S1 x S2 x S3 x S4 x S5 (optional)</p> <p>Where:</p> <ul style="list-style-type: none"> – S1 = Sensitive land-use factor for estimating the relative odour impact on different receptor types (50 for non-rural zone) – S2 = Surface roughness factor for estimating the potential changes to odour dispersion due to changes in the roughness of the land surface (1.0 for limited ground cover/short grass) – S3 = Terrain weighting factor for estimating the potential changes to odour dispersion in situations where terrain may influence weather conditions (1.0 for flat) – S4 = Locality/climate factor for estimating the potential changes in shed odour emission rates due to local climate (1.0 for all other situations) – S5 = Optional wind frequency factor for estimating the relative odour impact due to wind direction frequency, for wind speeds less than 3 m/s (0.83 winds from the west, west-southwest and west-northwest) <p>Separation distance = $(164800/1000)^{0.63} \times (50) \times (1.00) \times (1.00) \times (1.00) \times (0.83)$ = 1034.5 m</p>	<p>Y However the site is understood to have ceased operations.</p>
<p>Uptime Truck and Trailer Services</p>	<p>N/A</p>			<p>N</p>

Company	Industry type and activity/ definition	EPA 1518 Guideline separation distance (m)	Draft EPA 1949 Guideline separation distance (m)	Impact Precinct (Y/N)
Maddingley Brown Coal – Coal Mine	DUST Open cut coal mine: Harvesting, crushing, screening, stockpiling and conveying of coal	1000 m	2000 m However from GHD meeting with EPA on 23 February 2023 the EPA indicated that the appropriate distance for the MBC site remains at 1,000 m with the larger 2,000m distance intended for Coal Mines in the Latrobe Valley. EPA expects this change to be made for the revised final version of Publication 1949.	Y
Maddingley Brown Coal - Composting Facility	ODOUR Composting facility: Receiving, storing temporarily and transferring putrescible solid and green waste.	See further guidelines: Separation distances for large composting facilities, EPA Publication 1495, 2012 Draft guidelines for separation distances for composting facilities, EPA Publication 1445, 2012 >2000 m	See further guidelines: See Designing, constructing and operating composting facilities (EPA publication 1588) and Appendix C for new and emerging composting technologies and feedstocks. The composting facility allows inputs for up to 50,000 tonnes per annum (Planning Permit PA2011338-3). Type 1 (1949 Appendix C Table 6) as low risk waste: 2,200 m	Y
Maddingley Brown Coal - Landfill	ODOUR Landfill	Best Practice Environmental Management -- Siting, Design, Operation and Rehabilitation of Landfills, EPA Publication 788.1, 2010 Type 3 landfill 200 m	See Landfill buffer guideline (EPA publication 1950) Type 3 (solid inert waste) landfill: 500 m	N
Maddingley Brown Coal – Materials recycling	DUST Materials recovery and recycling facility	Case by case	250 m	N

Company	Industry type and activity/ definition	EPA 1518 Guideline separation distance (m)	Draft EPA 1949 Guideline separation distance (m)	Impact Precinct (Y/N)
Geelong-Bacchus Marsh Broiler Farm Stankovic Land Trust	ODOUR Poultry: Egg, meat and bird production, including quails, ducks, turkeys, geese and chickens	See further Guidelines: Victorian Code for Broiler Farms, Department of Primary Industries, 2009 $D = 27 \times N^{0.54}$ where D = Separation Distance (metres) N = farm capacity /1000 0.54 is an exponential factor that is applied to N Sep distance for 400,000 birds= 686 m	See further guidelines: S Factor calculation in Appendix A of Planning and environment guideline for establishing meat chicken farms (Guide 1 – Assessment guide) (2021) Separation distance = (Number of birds/1,000) ^{0.63} x S1 x S2 x S3 x S4 x S5 (optional) Where: – S1 = Sensitive land-use factor for estimating the relative odour impact on different receptor types (50 for non-rural zone) – S2 = Surface roughness factor for estimating the potential changes to odour dispersion due to changes in the roughness of the land surface (1.0 for limited ground cover/short grass) – S3 = Terrain weighting factor for estimating the potential changes to odour dispersion in situations where terrain may influence weather conditions (1.0 for flat) – S4 = Locality/climate factor for estimating the potential changes in shed odour emission rates due to local climate (1.0 for all other situations) – S5 = Optional wind frequency factor for estimating the relative odour impact due to wind direction frequency, for wind speeds less than 3 m/s (0.66 winds from the south) Sep distance = $(400000/1000)^{0.63} \times (50) \times (1.0) \times (1.0) \times (1.0) \times (0.66)$ = 1438.17 m	N
Bacchus Marsh Recycled Water Plant Western Region Water Corporation / City West Water Corporation	ODOUR Wastewater treatment plant: Premises on or from which sewage (including sullage) effluent, is treated, discharged or deposited	Sewerage Treatment Plant: Premises on or from which sewage (including sullage) effluent, is treated, discharged or deposited Exceeding a design or actual flow rate of 5,000 litres per day Type of installation: facultative ponds Buffer = $10n^{1/2}$ With n = 20,000 EP (current) Separation distance = 1,414 m	Exceeding a design or actual flow rate of 5,000 litres per day: see further guidelines (Appendix B) Type of installation: facultative ponds Buffer = $10n^{1/2}$ With n = 20,000 EP (current) Separation distance = 1,414 m	N

Company	Industry type and activity/ definition	EPA 1518 Guideline separation distance (m)	Draft EPA 1949 Guideline separation distance (m)	Impact Precinct (Y/N)
Eden Hills Pet Cremation	ODOUR Incineration: Disposal of human and animal remains by cremation	N/A	150 m	N
L&G Meats	ODOUR Rendering and casings works: Abattoirs, knackereries or poultry processing works involving rendering	>200 t/yr 1000 m	>200 t/yr: 1000 m	N
Westside Meat	ODOUR Rendering and casings works: Abattoirs, knackereries or poultry processing works involving rendering	>200 t/yr 1000 m	>200 t/yr: 1000 m	N
Boral Concrete	DUST Concrete plant: production of concrete	>5000 t/yr: 100 m	>5000 t/yr: 100 m	N
Watson's Bulk Logistics	ODOUR Grain and stock feed mill and handling facility: Receiving, storing, fumigating, bagging, transporting and loading grain or stock feed	>20,000 t/yr: 250 m	>20,000 t/yr: 500 m	N
Parwan Valley Mushrooms	ODOUR Mushroom farm: Using blended solids or compost to produce mushrooms	Case by case – no further specifications	Case by case	N/A However the site is understood to have ceased operations
Bacchus Marsh Irrigation District	ODOUR Soil blending, conditioning and mixing applied to farms or market gardens: Using pasteurised compost, biosolids or animal manures and litter	N/A	500 m	Y

Browns Lane Broiler Farm (separation distance 1,035 m, impacts on Parwan PSP)

The Broiler Farm on Brown's Lane is best described by Draft EPA Publication 1949 and 1518 as poultry production for meat. The recommended distance was calculated using the separation distance formula and S-factor method as detailed in Planning and Environment Guideline for establishing meat chicken farms (Guide 1 – Assessment guide 2021) referenced by Publication 1949 equating to 1,035 m. Publication 1518 recommends using Victorian Code for Broiler Farms which gives a separation distance of 425 m. As this method has since been superseded by the newer 2021 guideline, the largest *separation* distance is chosen. The potential amenity impact relates to odour and does impact the Precinct.

However, the site is understood to have ceased operations therefore no longer affecting the Precinct.

Uptime Truck and Trailer Services (no separation distance, no impact on Parwan PSP)

Draft EPA Publication 1949 and 1518 do not include an industry class that represents truck and trailer servicing. Therefore, no separation distance has been applied.

Maddingley Brown Coal – Coal Mine (separation distance 1,000 m, impacts on Parwan PSP)

Draft EPA Publication 1949 specifies a 2,000 m buffer for open cut coal mines, however since this is a small coal mine (65,000 tpa) the EPA has advised⁴ that the 1000 m buffer distance as per the EPA Publication 1518 would apply to the MBC site and the larger distance would be applicable to large coal mines such as that in the Latrobe Valley. GHD understands that the category will be revised for the final version of Draft EPA Publication 1949. The coal mine is to act within the conditions of the mining licence MIN4701 delegated by the Department of State Development, Business and Innovation. This licence is currently renewed until 2033 and details the size of the mine, confirming the smaller scale of this mine. The potential amenity impact relates to dust. The separation distance has been scribed from the envelope of the extraction area outlined in Mining Licence 4701.

Maddingley Brown Coal - Composting (2,200 m separation distance, impacts on Parwan PSP)

The MBC Composting Facility is considered a Type 1 composting facility classified as lowest risk wastes by Table 6, Appendix C of Draft EPA Publication 1949. The facility is permitted to produce up to 50,000 tonnes of compost annually. The recommended separation distance as described by Draft EPA Publication 1949 is 2,200 m. The separation distance has been scribed from the envelope of the composting area outlined in EPA licence OL000045288.

Maddingley Brown Coal - Landfill (separation distance 500 m, no impact on Parwan PSP)

The MBC Landfill is described best by the Landfill Buffer Guideline 1950 as a Type 3 Landfill accepting solid inert waste such as construction waste and fill material. All waste types are detailed in the Maddingley Brown Coal EPA Operating Licence, OL000045288, issued in 1978. This EPA Licence allows a tipping face of up to 1,200 m² with the site receiving more than 500,000 tonnes of inert (construction and demolition and commercial and industrial) waste each year. Based on this information, the recommended separation distance is 500 m. The potential amenity impact relates to dust and odour. The separation distance has been scribed from the envelope of the landfill cells (closed and future inclusive of WA70655) outlined in EPA licence OL000045288.

Maddingley Brown Coal – Materials Recycling (separation distance 250 m, no impact on Parwan PSP)

Materials recycling is also undertaken on site within two waste transfer stations. These two facilities accept metals and construction and demolition waste only. The applicable category is Materials recovery and recycling facility which has a recommended separation distance of 250 m in Draft EPA Publication 1949. EPA Publication 1518 did not prescribe a distance (case by case). Given the unknown nature of the exact source envelopes and the fact that both distances would sit well within the existing larger separation distances for the site (landfill, coalmine and composing) they have not been plotted.

⁴ Meeting with Chris Bydder EPA on 23 February 2023

Geelong-Bacchus Marsh Broiler Farm (separation distance 1,438 m, no impact on Parwan PSP)

The Broiler Farm on Geelong-Bacchus Marsh Road is best described by both EPA Publications 1949 and 1518 as poultry production for meat. The recommended distance was calculated using the separation distance formula and S-factor method as detailed in Planning and Environment Guideline for establishing meat chicken farms (Guide 1 – Assessment guide 2021) referenced by Publication 1949 equating to 1,438 m. Publication 1518 recommends using Victorian Code for Broiler Farms which gives a separation distance of 686 m. As this method has since been superseded by the newer 2021 guideline, the largest separation distance is chosen. The potential amenity impact relates to odour and does not impact the Precinct.

Bacchus Marsh Recycled Water Plant (WRP) (separation distance 1,414 m, no impact on Parwan PSP)

EPA Publications 1949 and 1518 best describes the Bacchus Marsh Recycled Water Plant as a wastewater treatment plant or sewerage treatment plant respectively. The current design of the WWTP is for equivalent population (EP) of 20,000 as a facultative pond plant. A separation distance of 1,414 m is calculated for the plant. The potential amenity impact relates to odour and does not impact the Precinct.

In 2018, Western Water employed CH2M Beca to produce an Odour Modelling and Buffer Zone Assessment. CH2M Beca undertook odour sampling at the plant to derive site specific odour emission rates for use in odour dispersion modelling using CALPUFF and AERMOD. This was conducted for both normal and upset conditions as the EPA 1518 Guideline's odour impact criteria indicated the need for a separation distance intended to protect land uses from unintended emissions which would be a result of upset conditions. An odour impact criterion was chosen to be 4 OU concentration at 99.9th percentile for 3-minute averaging time, to minimise the offensive odours occurring beyond the proposed boundary. At the time of the assessment, the plant facilitated an equivalent population of 20,000 population and consisted of the following processes:

- Inlet works
- Aerated lagoon
- Three primary facultative ponds operating in parallel
- Three secondary ponds in series
- Winter storage basin

Odour sampling and H₂S logging was conducted at each of these components to establish odour emission rates. CALPUFF and AERMOD utilised the collated data for odour dispersion modelling.

The 1518 EPA Guideline indicates a recommended default buffer of 1,414 m based on 20,000 EP. Following odour dispersion modelling, the 4 OU impact contour from both models AERMOD and CALPUFF were fully contained within the 1,414 m separation distance. Under upset conditions which included algal blooms or power outages, odour emissions increased by approximately 28%. The odour modelling of upset conditions predicted that the 4OU contours from AERMOD were contained within the 1414 m separation distance while the contours from CALPUFF extended an additional 1,000 m beyond the 1414 m separation distance to the northeast. It was concluded under normal conditions the WWTP buffer distance would be 1,414 m, and under upset conditions the buffer distance would be a combination of 1,414 m as well as the 4OU contour from CALPUFF extending further northeast. However, GHD notes that the updated Draft EPA Publication 1949 require separation distances for routine operations and not upset events as per Publication 1518, so the separation distance presented for under normal operating conditions is considered to be the appropriate distance to apply for the WRP. This separation distance does not impact the Parwan PSP.

The report also noted the WWTP at this size would be predicted to provide capacity through to 2021 but would need to be upgraded in the future to facilitate an essential doubling of the equivalent population to 40,000. The separation distance corresponding to this would be 2,000 m, but from a meeting held with Greater Western Water on 24 March 2023 it was indicated that any upgrade of the plant in the future would include an upgrade to the plants technology which would include upgrading to a mechanical plant which would have a much smaller separation distance. EPA Publication 1518 and 1949 recommend a separation distance of 342 m for a mechanical plant with an EP of 40,000. This separation distance does not extend to the Parwan PSP.

Eden Hills Pet Cremation (separation distance 150 m, no impact on Parwan PSP)

Eden Hills Pet Cremation is best described by Draft EPA Publication 1949 as an incineration facility. The EPA Publication recommends a separation distance of 150 m. EPA Publication 1518 does not categorise this facility. The potential amenity impact relates to odour and the facility does not impact the Precinct.

L&G Meats (separation distance 1,000 m, no impact on Parwan PSP)

EPA Publications 1949 and 1518 specify a 1,000 m separation distance for rendering and casing works/abattoirs that have a throughput of more than 200 tonnes per year. As this site has not yet begun production, GHD has assumed based on a visual inspection of the current built site and planning reports that the facility will produce more than 200 tonnes per year. The potential amenity impact relates to odour.

Westside Meats (separation distance 1,000 m, no impact on Parwan PSP)

Similar to L&G Meats, Westside Meats has a 1,000 m separation distance for rendering and casing works/abattoirs that have a throughput of more than 200 tonnes per year. The potential amenity impact relates to odour.

Boral Concrete (separation distance 100 m, no impact on Parwan PSP)

Boral Concrete is best described by EPA Publications 1949 and 1518 as a concrete plant which requires a separation distance of 100 m given a throughput of >5,000 tonnes per year. GHD does not know the throughput of Boral Concrete and has therefore conservatively applied the 100 m separation distance to the site based on a visual inspection. The potential amenity impact relates to dust.

Watson's Bulk Logistics (separation distance 500 m, no impact on Parwan PSP)

Draft EPA Publication 1949 specifies a 500 m separation distance for production grain and stock feed mills and handling for a throughput of >20,000 tonnes per year. GHD has assumed based on a visual inspection of the site and review of the facility's website, that the facility has a throughput of more than 20,000 tonnes per year. EPA Publication 1518 recommends a separation distance of 250 m for this categorisation. Taking a conservative approach a separation distance of 500 m has been applied. The potential amenity impact relates to odour.

Parwan Valley Mushrooms (separation distance case by case, no impact on Parwan PSP)

Parwan Valley Mushrooms is best described as a Mushroom Farm by both Draft EPA Publication 1949 and 1518 and recommend a case by case approach with regards to a separation distance.

However, the site is understood to have ceased operations therefore not affecting the Precinct.

Bacchus Marsh Irrigation District (separation distance 500 m, impact on Parwan PSP)

Draft EPA Publication 1949 best describes the Bacchus Marsh Irrigation District as a soil blending, conditioning and mixing applied to farms or market gardens. Previously, EPA Publication 1518 did not specify a category for market gardens. According to the Draft EPA Publication 1949, a separation distance of 500 m is recommended, therefore market gardens as part of the Bacchus Marsh Irrigation District do impact the Precinct.

4.6.3 Application to the Precinct

The buffer distances should be scribed from the envelope of potential sources within the premises as per the EPA separation guidelines (Method 1 – Urban method), however, given the uncertainty regarding the individual sources within some of the identified facilities, the property boundary has been used to define the envelope of the sources (this is a conservative approach). For other sites where appropriate level of information was available such as EPA Licences the separation distance was scribed from the envelope of sources. The separation distances should be drawn from the activity boundary relevant to that separation distance. For example, the 1,000 m recommended separation distance for a coal mine should be drawn from the extraction boundary of the mining licence and the 500 m separation distance for a landfill from the landfill cell boundary (closed, active or future) or leachate pond.

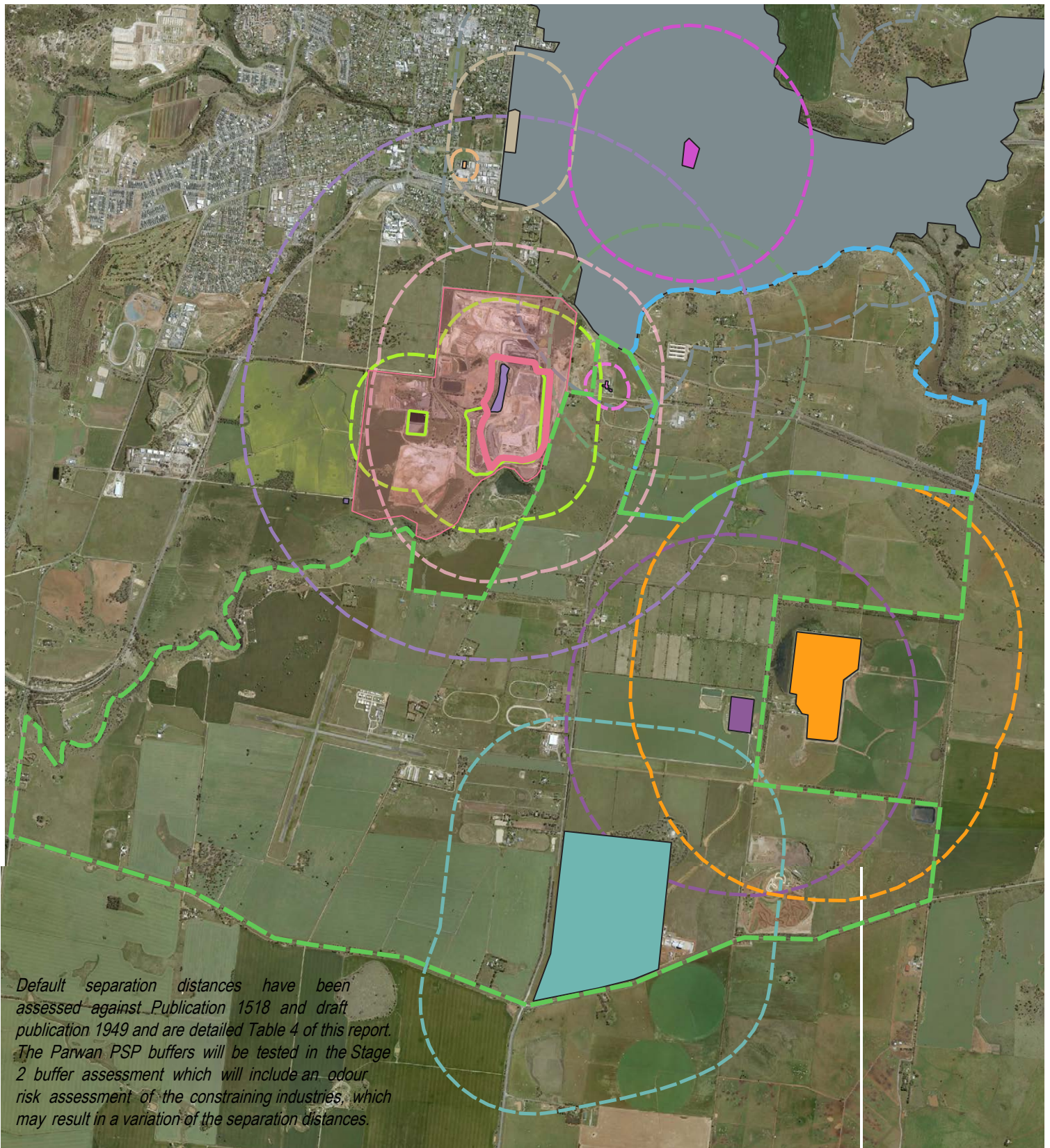
The separation distances for Browns Lane broiler farm and Parwan Valley mushrooms have not been plotted given operations at each facility have ceased. In total, ten industries with a separation distance were identified.

4.6.3.1 Parwan PSP

The impact of each of the identified separation distances can be seen in Figure 6. The figure shows that the 2,200 m odour separation distance from composting facility at MBC to have the largest impact to the Parwan PSP. The 1,000 m dust separation distance from the Coal mine at MBC also marginally encompasses some of the far western side of the Precinct. The Bacchus Marsh Irrigation District attracting a 500 m odour separation distance is the other main constraining industry that encompasses a large portion of the north of the Precinct. No other industry separation distances are identified to pose a constraint to the Parwan PSP. The 2,200 m composting separation distance extends 460 m into the PSP while the Bacchus Marsh Irrigation District 500 m separation distance extends 370 m into the PSP. Default separation distances have been assessed against Publication 1518 and draft publication 1949 and are detailed Table 4 of this report. These buffers will be tested in the Stage 2 buffer assessment, which will include an odour risk assessment of the constraining industries, and which may result in a variation of the separation distances.

4.6.3.2 Parwan Employment Precinct (PEP)

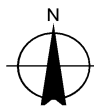
A number of separation distances are shown in Figure 6 to encompass areas within the Parwan employment Precinct particularly to the east. This includes the Maddingley Brown Coal coalmine, landfill and composting operations, the Bacchus Marsh RWP, the Geelong-Bacchus March broiler farm, Eden hills pet crematorium and L&G meats facility. The land uses encompassed by the distances proposed to form part of the PEP are not defined as sensitive use therefore the separation distances outlined do not pose a constraint to the PEP. In fact, the type of uses proposed are in line with what EPA consider to be 'interface uses'. Interface land uses are that can be located within separation distances between industrial land uses and sensitive land uses. Interface land uses neither generate significant odour emissions, nor warrant protection from them. Further details on interface land uses are provided in section 4.9.



Default separation distances have been assessed against Publication 1518 and draft publication 1949 and are detailed Table 4 of this report. The Parwan PSP buffers will be tested in the Stage 2 buffer assessment which will include an odour risk assessment of the constraining industries, which may result in a variation of the separation distances.

Legend

- | | | | |
|--|--|---------------------------------|--|
| PEP | Geelong-Bacchus Marsh Broiler Farm (1,438 m) | Maddingley Composting (2,200 m) | Watson's Bulk Logistics (500m) |
| PSP | Eden Hills Pet Cremation (150 m) | Maddingley Coal Mine (1,000 m) | Bacchus Marsh Irrigation District (500m) |
| Boral Concrete (100 m) | L&G Meats (1,000m) | Maddingley Landfill (500 m) | Westside Meats (1000m) |
| Bacchus Marsh Recycled Water Plant (1,414 m) | | | |



Victorian Planning Authority
Parwan AAIA

Project No. 12598868
Revision No. -
Date. 05/09/2023

EPA separation distances

FIGURE 6.0

4.7 Transport

4.7.1 Vehicle emissions

The EPA has identified motor vehicles as being a major source of urban air pollution. In Melbourne in 2006, motor vehicle emissions contributed the following levels of pollutants to the overall air quality⁵:

- 72 per cent of all carbon monoxide (CO) emissions
- 70 per cent of all nitrogen oxides (NO_x) emissions
- 28 per cent of all volatile organic compounds (VOC) emissions
- 31 per cent of all emissions of PM_{2.5}
- 27 per cent of all emissions of PM₁₀
- 6 per cent of all sulphur dioxide (SO₂) emissions

The EPA conducted a four year review⁶ of air quality near major roads in Melbourne (including the Westgate Freeway) and Geelong in 2006. That study concluded:

- Particles measured as PM₁₀ and PM_{2.5} generally remained below intervention (criteria) levels
- In general, particle levels were similar to or slightly above background levels
- Carbon monoxide, nitrogen dioxide and sulphur dioxide were below intervention (criteria) levels
- Carbon monoxide, nitrogen dioxide and sulphur dioxide were similar to background site monitored
- Benzene levels were at intervention (criteria) levels
- Benzene levels were above background levels
- Within a short distance from the road, the air quality objectives are generally met, for example, the level of PM₁₀ declined by 50% within 20 m of the roadside
- Improved fuel standard and vehicle design is expected to improve air quality near roads despite increased vehicle usage

Further, there is currently a parliamentary inquiry into the Health Impacts of Air Pollution in Victoria, with one of the focus areas being vehicle emissions. The report prepared as part of the inquiry notes that heavy vehicles, diesel vehicles and idling of vehicles have the largest impact on air quality. Various recommendations are outlined in the inquiry related to diesel vehicle emissions standards, guidelines to assist with the location of facilities (such as childcare centres) and methods to reduce vehicle idling.

In the absence of local policy, the policy outlined by the Brisbane City Council can be utilised as a guide. The Brisbane City Council planning scheme includes a transport air quality corridor planning scheme policy that provides guidance on best-practice built form and landscape design elements to

1. Minimise the impacts of air pollution from vehicle traffic on the health and wellbeing of users of a child care centre, multiple dwelling, residential care facility or retirement facility
2. Maximise wind movement around buildings and the dispersion of traffic air pollutants
3. Minimise the impacts of air pollution from a tunnel ventilation stack on the health and wellbeing of occupants of sensitive uses

4.7.2 Locomotive emissions

Emissions to air during the operations phase of a rail line involves the combustion of diesel by trains and generation of dust. Exhaust emissions from these engines will produce a range of products of combustion, of which carbon monoxide, nitrogen dioxide, particulate matter (PM₁₀ and PM_{2.5}), benzene and polycyclic aromatic hydrocarbons (PAHs) are the significant pollutants of potential concern in relation to odour.

⁵ EPA Victoria (2006) Publication 1025: *Environmental Report - Review of air quality near major roads*. Retrieved from: <https://www.epa.vic.gov.au/-/media/epa/files/publications/1025.pdf>

The generation of air emissions from passing of trains through the Precinct will be dependent on:

- Type and capacity of trains operated
- Number of trains operating
- Train speed

Currently there are no suitable set back guidelines from locomotives within Victoria. A separate air quality study to predict the ground level concentrations of individual air pollutants would be required.

4.7.3 Application to the Precinct

Vehicle Emissions

Although none of the categories strictly apply to the Precinct, the first category can be used as a general principal to minimise impacts of air pollution from vehicle traffic. It is widely recognised that traffic pollutants reduce as distance from the road kerb increases. Thus, setting back sensitive development as far as practicable from Parwan-Exford Road and Geelong- Bacchus Marsh Road will provide the best outcome for the health and well-being of occupants. Brisbane City Council recommend separation distances for the different traffic route types which are based on best available air quality roadside monitoring data and air quality modelling predictions.

The Brisbane City Council policy outlines the following acceptable outcome which can be applied to Parwan-Exford Road and Geelong- Bacchus Marsh Road:

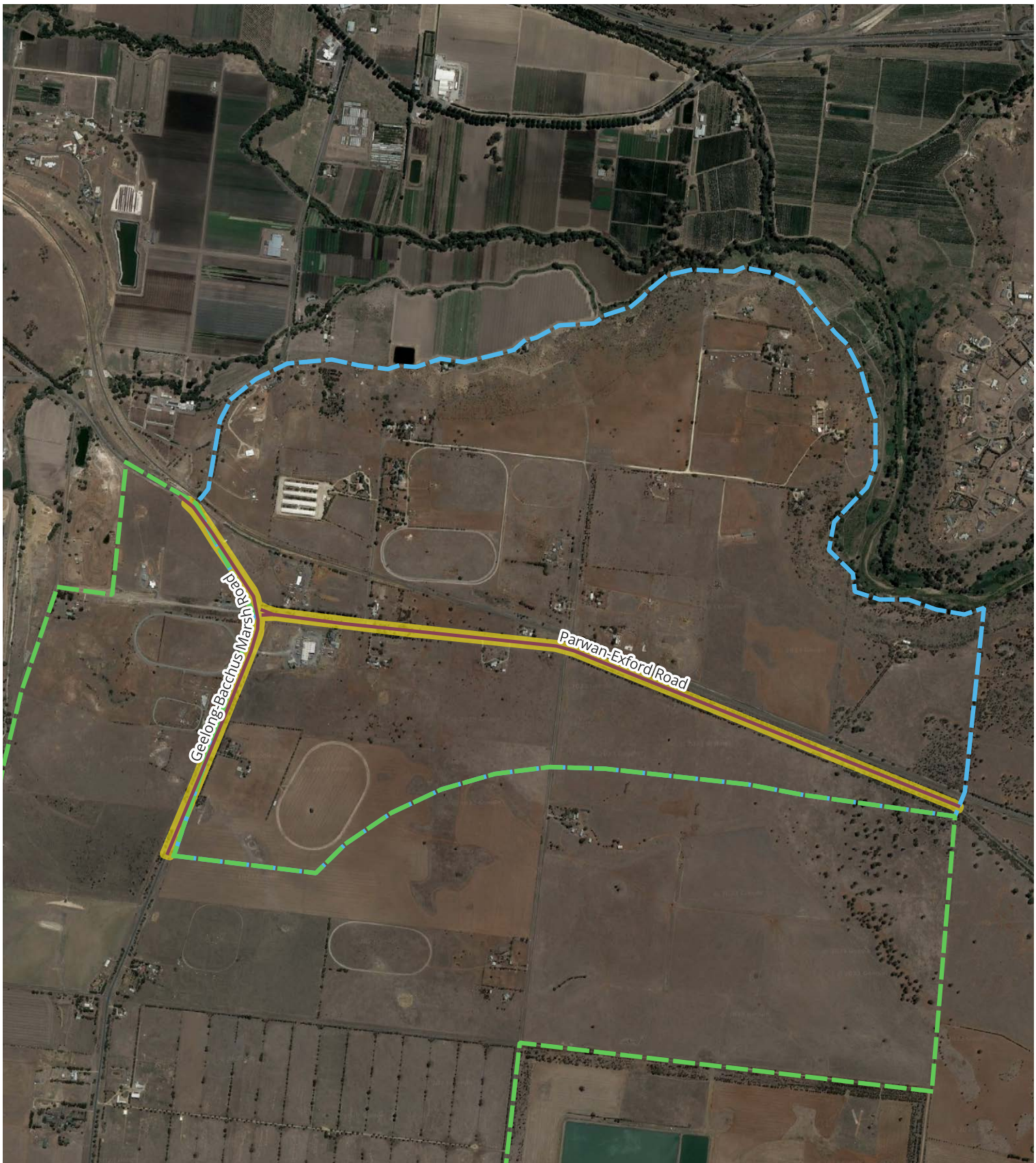
- Development for a multiple dwelling, residential care facility, rooming accommodation where accommodating six people or more, or retirement facility.
- A set back distance separating the sensitive use from the kerb in accordance with recommended separation distances for the different traffic route types. A minimum of 30 m is recommended for a motorway, 20 m for a high-volume traffic route and 10 m for an intermediate volume traffic route.

The Parwan-Exford Road crosses the Precinct in east-west direction. This is a local road with insignificant AADT of 594 vehicles and 6% of heavy vehicles. These volumes are likely increase in future if the area will attain more residents and businesses. If Parwan-Exford Road is considered to be a high-volume traffic route then a 20 m set back from the kerb to sensitive uses would be sufficient.

The Geelong-Bacchus Marsh Road is located at the western boundary of the Parwan PSP. This is an arterial road with AADT 6500 vehicles and 8-9% of heavy vehicles These volumes may increase in future if the area will attain more residents and businesses. If Geelong-Bacchus Marsh Road is considered to be a high-volume traffic route then a 20 m set back from the kerb to sensitive uses would be sufficient.

A 20 m set back for both roads have been displayed in Figure 7.

Where the development cannot meet the recommended separation distance from the kerb, the policy includes an alternative to install ducted mechanical ventilation with the supply of clean outdoor air. Where the ventilation outdoor air intakes cannot be sufficiently separated from the kerb, a third alternative for achieving clean air for building occupants is provided. This involves installing particle filtration in combination with ducted mechanical ventilation.



Legend

- PEP
- - - PSP
- Roads
- Transport air quality 20 m set back

Paper Size ISO A4

0 0.5 1 km

Map Projection: Transverse Mercator
 Horizontal Datum: GDA2020
 Grid: GDA2020 MGA Zone 55



Victorian Planning Authority
 Parwan AAIA

Project No. 12598868
 Revision No. -
 Date. 17/05/2023

Transport Air Quality set back

FIGURE 7.0

4.8 Future uses

Checking the Engage Victoria website and EPA website, at the time of preparing this report, there were no new uses proposed for the area that were seeking EPA approvals.

GHD notes that any future changes to the sites, which may impact the buffers will be subjected to further assessment through relevant departments or agencies: guidance and practice notes, strategies or documents.

4.9 Variation to separation distances

Sections 5.2 and 6.2 of Draft EPA Publication 1949 outlines the requirements to vary a separation distance. This section details Stage 3 of the decision-making process for both odour and dust separation distances. When an alternative separation distance is being considered, a risk assessment is prepared to determine the variability of the separation distance.

Draft EPA Publication 1949 identifies the following factors that can impact the acceptability of a recommended separation distance for odour and dust:

- Cumulative impacts
- Interface land uses
- The scale and configuration of the operation
- The environment surrounding the odour emitter
- Size of the source
- Type of dust emission
- Meteorology
- Terrain and interface land use
- The sensitivity of the receptor (existing and/or proposed)
- Historical context
- Management practices and engineering controls employed by the relevant industry

If these factors influence the acceptability of a recommended separation distance, EPA recommends a risk assessment be prepared to demonstrate that either the recommended separation distance is acceptable or the recommended separation distance can be varied.

4.9.1 Risk Assessment

A risk assessment identifies and evaluates the impacts and risks associated with an activity that may cause harm to human health or the environment. The purpose of a risk assessment for odour or dust is to show a clear understanding of the potential impacts of the activity source (whether it be odour or dust) on sensitive land uses. The findings of a risk assessment will assist in determining if a variation to a recommended separation distance is possible and appropriate.

EPA recommends that the risk assessment be to the satisfaction of the decision maker and should follow the guidelines set out in EPA publications relevant to the activity source:

- For an odour risk assessment, refer to Guidance for assessing odour (EPA publication 1883)
- For a dust risk assessment, refer to Guidance for assessing nuisance dust (EPA publication 1943)

EPA also recommends that a risk assessment uses a variety of assessment tools noted in relevant EPA publications to identify key elements that may affect the risks of odour or dust emissions from the source. A combination of tools can assist in providing a practical and compelling risk assessment.

Further detail on environmental and site-specific factors for odour and dust are outlined below.

4.9.1.1 Odour

To seek a variation of a recommended odour separation distance, Draft EPA Publication 1949 outlines that the proponent should:

- Provide a risk assessment that details the factors and risks associated with the odour source
- Based on the findings of the risk assessment, propose an alternative separation distance
- Based on the factors outlined in this section, demonstrate the proposed separation distance poses a low risk of odour impact

The three key assessment factors that EPA recommends are taken into consideration when considering an application to vary a recommended separation distance for odour are:

- Environmental and site-specific factors
- Management practices
- Engineered controls

An odour risk assessment in accordance with EPA Publication 1883 Guidance for Assessing Odour may include:

- Level 2 Assessment:
 - Source-Pathway-Receptor assessment
- Level 3 Assessment:
 - Comparison with similar operations
 - Field odour surveillance
 - Complaint data analysis
 - Dispersion modelling

4.9.1.2 Dust

To seek a variation of a recommended for a dust separation distance, Draft EPA Publication 1949 outlines that the proponent should:

- Provide a risk assessment based on the source, pathway, receptor model, considering cumulative impacts where relevant
- Based on the findings of the risk assessment, propose an alternative separation distance
- Demonstrate that the proposed separation distance poses a low risk of dust impact

Evidence that the proposed separation distance poses a low risk of harm from dust may include an assessment of the size of the dust source, the type of dust emission, the frequency, intensity and duration of the dust emission and the level of dust control implemented.

A nuisance dust risk assessment in accordance with EPA Publication 1943 Guidance for Assessing Nuisance Dust may include:

- Source-Pathway-Receptor assessment
- Comparison with similar operations
- Dust monitoring
- Dust modelling and Dust Assessment

4.10 Air quality mitigation strategies

To reduce disamenity (odour and dust impacts) to the proposed sensitive uses in the Precinct, the following potential mitigation measures are outlined for consideration where appropriate (i.e. in the event sensitive uses are located within a separation distance during the transition phase of an industry). Note that these are general in nature and a detailed assessment should be undertaken as required to quantify the nature of the impact and adequacy of any proposed mitigation measures.

Interface Land Uses

Interface land uses are those that can be located within separation distances between industrial land uses and sensitive land uses. Interface land uses neither generate significant odour emissions, nor warrant protection from them.

Table 3 from Draft EPA Publication 1949 reproduced here as Table 5 provides examples of activities and their suitability as interface land uses. This is not intended to be an exhaustive list of all activities. Other activities not listed should be assessed in accordance with the principles contained in this document.

Table 5 *Interface land uses*

Suitability	Land use
To be encouraged	Agriculture, car parks, emergency services facilities, natural systems, service stations, garden supplies, plant nursery, veterinary centre.
To be considered (subject to assessment)	Industry with no adverse amenity potential/risk of harm to human health and the environment, utilities (except for sewage works) offices, research centres, retail premises, informal outdoor recreation.
To be prevented	Land uses sensitive to odour and dust - including dwellings, hospitals, aged care facilities, education centres, childcare centres, places of worship, corrective institutions

Control of air quality emissions through built form

- The principal option is to limit the exposure of air emissions to residential openable windows/balconies. This can be dealt with in the design and orientation of buildings through urban design measures:
- Mechanical ventilation for rooms facing the potential source
- Locate air intakes away from the potential source i.e. on the lee wind side of the building
- Use of a filtration unit on heating, ventilating and air conditioning (HVAC) systems
- Non-openable windows facing the potential source

Control at source

Odour/dust emissions at source in an industrial premises can be reduced by odour/dust treatment/control. This can be requested for new industries as part of best practice or required by EPA. For those industries identified to cause a constraint, it is the EPA's responsibility to enforce compliance with Environmental Reference Standard (ERS) and the General Environmental Duty (GED) so that these sites do not cause off-site adverse impacts or odour/ dust complaints under normal operations. EPA is also responsible for validating and investigating any odour/dust complaints that they receive.

It is also recognised that where there are industrial air emissions from a premises, even with good pollution control technology and practice, there may still be unintended emissions which must be anticipated and allowed for. Recent advice from EPA regarding Draft Publication 1949 noted that the separation distances are not a substitution for pollution controls. The industry should still be minimising risks of odour and dust so far as reasonably practical based on the current state of knowledge in that sector, (i.e., meeting the GED for that sector). Therefore, the separation distance is not a substitution for pollution controls and complying with the GED. Under the VPPs, industrial land uses have use rights which enable the industry to operate, provided they comply with relevant regulations.

4.11 Summary

From the results of the separation distance assessment, three key constraints to the proposed Parwan PSP were identified; namely:

- Maddingley Brown Coal Composting 2,200 m separation distance (odour)
- Maddingley Brown Coal mine 1,000 m separation distance (dust)
- Bacchus Marsh Irrigation District 500 m separation distance (odour)

No constraints to the proposed land uses within the PEP were identified as the separation distances do not apply to non-sensitive uses.

Based on the factors identified by Draft EPA Publication 1949 that can impact the acceptability of a recommended separation distance for odour and dust (section 4.9), the VPA may wish to further investigate the three constraining sites in the form of a risk assessment in accordance with Draft EPA Publication 1949. The risk assessment would demonstrate that either the recommended separation distance is acceptable, or the recommended separation distance can be varied for the industries identified to pose a conflict with the proposed uses within the Parwan PSP. Given both conflicting sites relate to odour, any risk assessment should be undertaken in line with EPA Publication *1883 Guidance for assessing odour*.

GHD notes that the purpose of the risk assessment would be not to redraw a line in the sand outside of which there are “no risks”, but to assist in determining the level of risk of harm to human health and the environment and inform on the degree of risk in areas within the separation distance and what uses may be suitable.

5. Noise and vibration assessment

5.1 What is noise

Noise is generally defined as unwanted sound, which may be hazardous to health, interfere with speech, normal activities and could potentially be disturbing, irritating or annoying. Noise can be generated from various sources, such as industrial/commercial premises, musical instruments, and transport operations.

Noise sources may have certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. These characteristics may evoke penalties in accordance with Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826.2, Environment Protection Authority, March 2021) (the Noise Protocol). There is evidence to suggest that noise with these characteristics can cause greater annoyance than noise without these characteristics at the same noise level.

5.2 Potential major noise sources

As discussed in section 4.3, the ambient noise environment was observed during the site visits undertaken on 15 February and 29 March 2023. Dominant noise sources vary across the Precinct. It may be local traffic and intermittent heavy vehicles servicing industrial facilities, rail noise in the area adjacent to the rail corridor or natural background. The following activities and industries were observed to contribute to noise levels during the site visits:

- Melbourne- Ararat rail corridor (frequent noise from passing trains)
- Noise from broiler farm
- Noise from water treatment plant
- Western freeway (constant hum from traffic or varying sound levels in the northern part of the Precinct)
- Parwan- Exford Road (intermittent traffic noise)
- Geelong- Bacchus Marsh Road (intermittent traffic noise)
- Aircraft flyovers (rare aircraft noise)

Noise from broiler farm was not identifiable during day time visits, that may indicate that the broiler farm was not operational and activities on the site ceased. There is also substantial buffer to the existing sensitive receivers to the east of the farm boundary, therefore noise impact from industrial activities was not audible. There are other industries in the north western part of the Precinct that would influence acoustic environment, but noise from them was not audible during the site visits to the monitoring locations. The MBC site to the west of the Precinct is separated by approximately 1.5 km buffer to the area where future noise sensitive developments may occur. Noise from the MBC site was not audible during site visits. The location of the major noise sources likely impacting the Parwan PSP are shown in Figure 3.

The Parwan PSP does not have boundaries adjacent to high density industrial areas and all industrial activities within the precinct are localised in the western part of the Precinct. Residential area in Hopetown park is situated to the east of the Precinct across Werribee river. The proposed residential uses are separated by buffer of approximately 100 m or greater.

Risk of noise impact on sensitive land uses within the Parwan Precinct is expected to be from low to medium depending on proximity to noise sources. Medium risk areas are adjacent to boundaries of the broiler farm and the rail corridor. The medium impact risk can be interpreted as follows:

- Minor reduction in amenity would be either almost certain or likely
- Moderate reduction in amenity would be either possible or unlikely
- Major reduction in amenity would be rare

Reduction in amenity could be interpreted as exceedance above recommended noise amenity levels for sensitive land uses.

Risk of noise impact for the PEP is considered to be small due to substantial separation distances to major noise sources in the area assuming that new developments within the Precinct will not contain businesses with noise equipment or requiring deliveries of good by heavy trucks.

Small commercial establishments such as auto facilities, service stations and the like depending on the type of activities and distance to the sensitive land uses, could potentially result in medium noise impact on the subject site.

These facilities generally operate during normal commercial hours (some exceptions may apply due to deliveries, service stations and the like), and hence their likely noise impact is expected to be during day and evening hours with minor impact during night time hours.

The low impact risk may be interpreted as follows:

- Negligible reduction in amenity would be either almost certain or likely
- Minor reduction in amenity would be either possible or unlikely
- Moderate reduction in amenity would be very unlikely

Table 6 Major noise sources with potential for noise impacts to the Precinct

Industry/ activity	Noise sources
Broiler farm	Onsite activities, equipment, vehicles movements
Maddingley Brown Coal	Equipment, heavy vehicles movements
Bacchus Marsh Recycled Water Plant	Equipment noise
Western Freeway	Passing vehicles on arterial roads
Melbourne-Ararat Railway Line	Train pass-buys
Old Western Highway	Passing vehicles on arterial roads
Parwan- Exford Road	Passing vehicles
Parwan- South Road	Passing vehicles
Geelong- Bacchus Marsh Road	Passing vehicles
Bacchus Marsh Aerodrome	Airplanes flyovers

5.3 Noise monitoring programme

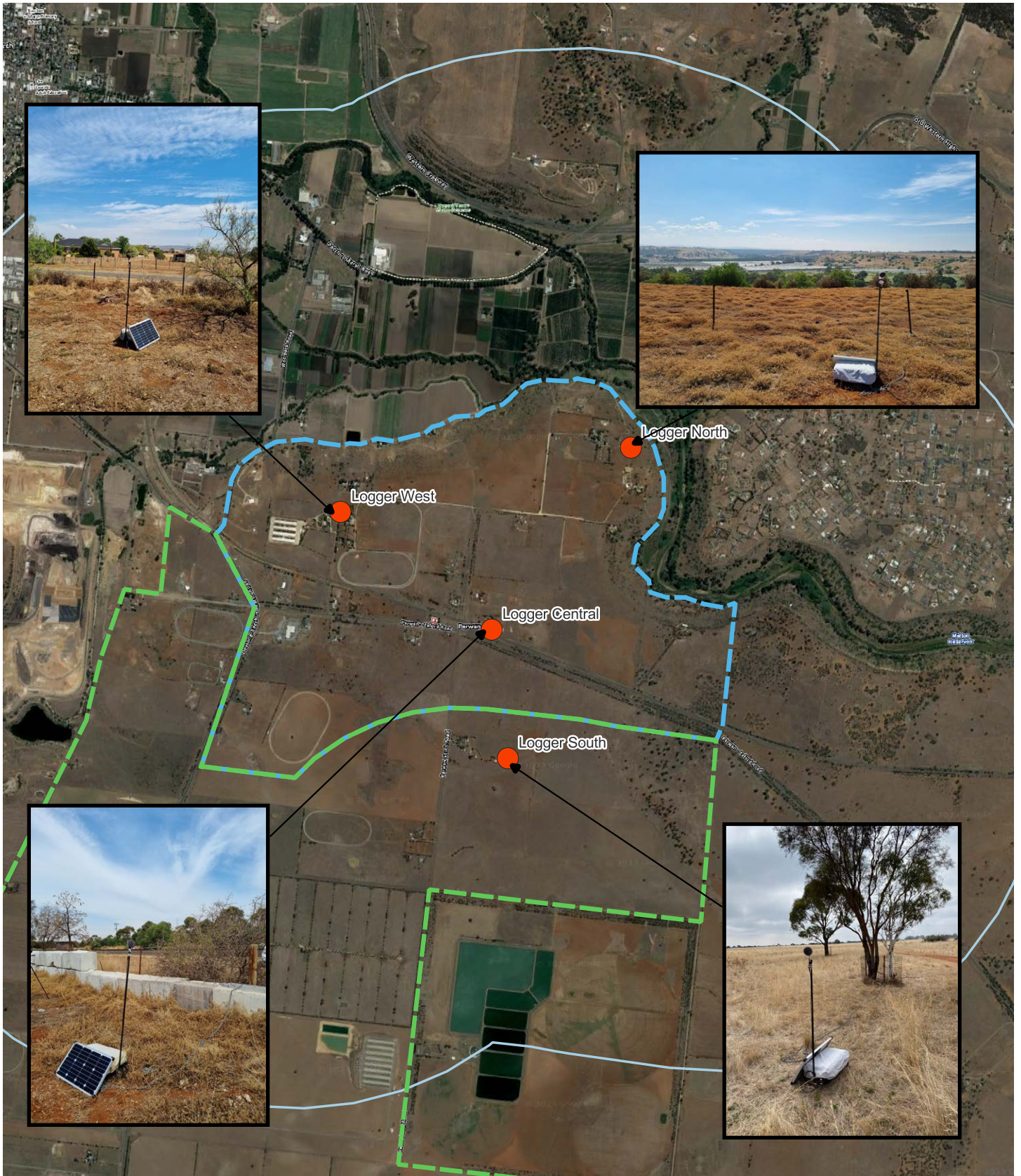
Noise monitoring programme was performed to characterise existing noise impact at the northern, western, southern boundaries of the Parwan PSP and in area adjacent to the rail corridor. Unattended noise measurements were taken for period of two weeks from 15 March to 29 March 2023 in line with requirements in EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol).

5.3.1 Noise monitoring locations

Noise monitoring locations were chosen closer to the boundary of the Precinct and assumed dominant noise sources. They are summarised in Table 7 and locations are shown in Figure 8. Pictures showing deployed instruments can be found in Figure 8.

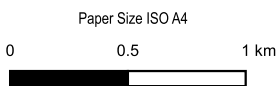
Table 7 Noise monitoring locations

Receiver	Address	Assumed dominant noise sources
Logger West	60 Browns Lane	Broiler farm
Logger Central	10 Whelans Rd	Rail corridor and road traffic
Logger North	170 Whelans Rd	Western freeway
Logger South	65 Parwan South Rd	Water treatment plant

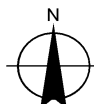


Legend

● Noise Loggers ▬ PEP ▬ PSP



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55



Victorian Planning Authority
Parwan AAIA

Noise monitoring location

Project No. 12598868
Revision No. -
Date. 17/05/2023

FIGURE 8.0

5.3.2 Instrumentation

Table 8 presents the equipment utilised for the unattended noise monitoring program. The loggers were equipped with standard 90 mm wind shields.

Table 8 *Noise monitoring instrumentation*

Equipment type	Location	Manufacturer	Model	Serial Number
Noise logger	R1 60 Browns Lane	SVANTEK	SVAN 977	36826
Noise logger	R2 10 Whelans Rd	SVANTEK	SVAN 977	36825
Noise logger	R3 65 Rarwan South Rd	SVANTEK	SVAN 977	69215
Noise logger	R4 170 Whelans Rd	SVANTEK	SVAN 977	97447
Acoustic calibrator	All	Brüel & Kjær	4231	3025447

The sound level meters were field checked and calibrated both before and after noise measurements with no discrepancies equal to or greater than 1 dB noted as required under Section 5.6 of Australian Standard AS 1055:2018 *Acoustics – Description and Measurement of Environmental Noise* (Standards Australia, 2018). All instruments were in National Association of Testing Authorities (NATA) calibration at the time of use and calibration certificates can be provided upon request.

5.3.3 Meteorological conditions

Adverse meteorological conditions such as high winds and rainfall can contaminate noise monitoring results. For noise monitoring, EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol) requires measurements to be carried out in dry conditions with wind conditions satisfying the Beaufort Wind Scale integers of 0, 1, 2 or 3.

As per Appendix C of Australian Standard AS 1055:2018, this corresponds to wind speeds of up to 5 m/s at the microphone.

Rainfall and wind speeds during the period of noise measurements were checked based on the nearest Bureau of Meteorology (BoM) automatic weather station (AWS) (ID: 86282) situated at Melbourne airport.

Where the wind speed at the microphone height was determined to be greater than 5 m/s at the microphone height or whenever rainfall occurred, the noise data was considered to be contaminated due to adverse weather.

5.3.4 Noise monitoring results

Noise levels at each unattended monitoring location have been analysed for all day, evening and night time periods as defined in the Environment Protection Regulations 2021 (EP Regulations) and the Noise Protocol.

The applicable day, evening, and night time periods as defined in the EP Regulations and Noise Protocol are outlined in Table 9.

Table 9 *Noise protocol time periods*

Time period	Time
Day	Monday to Saturday (except public holidays) from 7 am to 6 pm
Evening	Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm
Night	Any day of the week, 10 pm to 7 am the following day

Table 10 presents the overall established background noise levels for each monitoring location, analysed in accordance with the procedures outlined in Section 4 of EPA Victoria Publication 1826.4 Noise Protocol. Additional information and daily noise monitoring results are presented in Appendix A and Appendix B.

Table 10 Measured noise protocol background noise levels

Monitoring location	Background level, L _{A90} dB(A)			Ambient noise level, L _{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
R1 60 Browns Lane	36	37	29	48	49	42
R2 10 Whelans Rd	36	33	26	64	66	58
R3 65 Parwan South Rd	29	30	24	43	46	39
R4 170 Whelans Rd	37	34	26	45	43	40

Noise at all locations is affected by natural background. Noise from the Western freeway is clearly audible at location R4. Since location R2 is adjacent to the rail corridor, noise from train pass-bys and rail crossing contributes to measured levels as well as traffic noise from Parwan-Exford Road. Rail noise is also audible at times at location R2, but it is more controlled by local natural background and agricultural activities.

5.4 Existing potential primary vibration sources

Potential vibration sources within and adjacent to the Parwan PSP may result from the following features:

- Melbourne- Ararat rail corridor
- Pass-buys of heavy vehicles on the roads

It should be noted that vibration impact may be noticeable in close proximity to a rail corridor or major roads. It is not expected to be significant at larger separation distances. GHD also notes that the MBC does not undertake blasting.

5.5 Legislation, guidelines and standards

The Precinct is located within the Moorabool Shire for which the provisions of the Moorabool Planning Scheme are applicable. The following outlines the applicable requirements of the Moorabool Planning Scheme in relation to noise and vibration.

5.5.1 Moorabool Planning Scheme

This section provides review of noise related requirements in Moorabool Planning Scheme.

Clause 13.05-1S Noise management

Objective: To assist the control of noise effects on sensitive land uses.

Strategy: Ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions. Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area.

Policy Guidelines

Consider as relevant:

- The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017

Policy Documents

Consider as relevant:

- Environment Protection Regulations under the Environment Protection Act 2017
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826, Environment Protection Authority, May 2021)
- Environment Reference Standard (Gazette No. S 245, 26 May 2021) Passenger Rail Infrastructure Noise Policy (Victorian Government, 2013) VicTrack Rail Development Interface Guidelines (VicTrack, 2019)

Clause 18.04-1S Road system

Strategies

Ensure that land use and development do not prejudice levels of service, safety and amenity of the Western Freeway and minimises any adverse effects of noise from traffic.

Clause 18.02-7S Airports and airfields

Strategies

Minimise the detrimental effects of aircraft noise when planning for areas around airports and airfields.

Limit the intensification of noise-sensitive land uses, and avoid zoning or overlay changes that allow noise-sensitive land use and development, where ultimate capacity or long-range noise modelling indicates an area is within a 20 Australian Noise Exposure Forecast (ANEF) contour or higher.

Avoid zoning or overlay changes that allow noise-sensitive land uses outside the Urban Growth Boundary, and encourage measures to reduce the impact of aircraft noise in planning for areas within the Urban Growth Boundary, where ultimate capacity or long-range noise modelling indicates an area is within 'number above' contours (N Contours) representing:

- 20 or more daily events greater than 70 dB(A)
- 50 or more daily events of greater than 65 dB(A)
- 100 or more daily events greater than 60 dB(A)
- Six events or more between the hours of 11 pm to 6 am greater than 60 dB(A)

Ensure land use and development at airports and airfields contributes to the aviation needs of the state and the efficient and functional operation of the airport or airfield.

Clause 19.02-6S Open space

Strategies

Ensure that land use and development adjoining regional open space networks, national parks and conservation reserves complements the open space in terms of visual and noise impacts, preservation of vegetation and treatment of waste water to reduce turbidity and pollution.

Clause 19.03-5S Waste resource recovery

Strategies

Site, design, manage and rehabilitate waste disposal facilities to prevent or minimise contamination of groundwater and surface waters, litter, odour, dust and noise.

Clause 32.04-12 Mixed use zone

32.04-12 Application requirements

Strategies

Use for industry and warehouse

Unless the circumstances do not require, an application to use land for an industry or warehouse must be accompanied by the following information.

The likely effects, if any, on the neighbourhood, including noise levels, traffic, air-borne emissions, emissions to land and water, light spill, glare, solar access and hours of operation (including the hours of delivery and dispatch of materials and goods).

32.04-14 Decision guidelines

Use for industry, service station and warehouse:

For non-residential uses, the proposed hours of operation, noise and any other likely off-site amenity impacts.

32.05-12 Application requirements

Use for industry, service station and warehouse:

Unless the circumstances do not require, an application to use land for an industry or warehouse must be accompanied by the following information:

The likely effects, if any, on the neighbourhood, including noise levels, traffic, air-borne emissions, emissions to land and water, light spill, glare, solar access and hours of operation (including the hours of delivery and despatch of materials and goods).

32.08-11 Application requirements

If the land is in a Special Building Overlay, Land Subject to Inundation Overlay or is land liable to inundation the maximum building height specified in the zone or schedule to the zone is the vertical distance from the minimum floor level determined by the relevant drainage authority or floodplain management authority to the roof or parapet at any point.

An application must be accompanied by the following information, as appropriate:

The likely effects, if any, on adjoining land, including noise levels, traffic, the hours of delivery and despatch of good and materials, hours of operation and light spill, solar access and glare.

Clause 33.01 Industrial 1 Zone

33.01-1 Table of uses

For industry (other than material recycling and transfer station): Must not adversely affect the amenity of the neighbourhood, including through the:

Emission of noise, artificial light, vibration, odour, fumes, smoke, vapour, steam, soot, ash, dust, waste water, waste products, grit or oil.

For service station: The land must be at least 30 metres from land (not a road) which is in an Activity Centre Zone, Capital City Zone, Commercial 1 Zone, Docklands Zone, residential zone or Rural Living Zone, land used for a hospital, an education centre or a corrective institution or land in a Public Acquisition Overlay to be acquired for a hospital, an education centre or a corrective institution.

Must not adversely affect the amenity of the neighbourhood, including through the:

Emission of noise, artificial light, vibration, odour, fumes, smoke, vapour, steam, soot, ash, dust, waste water, waste products, grit or oil.

33.01-2 Application requirements:

An application to use land for an industry or warehouse must be accompanied by the following information, as appropriate:

- The likely effects, if any, on the neighbourhood, including noise levels, air-borne emissions, emissions to land or water, traffic (including hours of delivery and despatch), light spill or glare.

Clause 34.01 Commercial 1 Zone

34.01-2 Use of land

A use must not detrimentally affect the amenity of the neighbourhood, including through the:

Emission of noise, artificial light, vibration, smell, fumes, smoke, vapour, steam, soot, ash, dust, waste water, waste products, grit or oil.

34.01-6 Application requirements

An application to use land must be accompanied by the following information, as appropriate:

The likely effects, if any, on adjoining land, including noise levels, traffic, the hours of delivery and despatch of goods and materials, hours of operation and light spill, solar access and glare.

Clause 35.03 Rural Living Zone

35.03-5 Decision guidelines

General issues:

The potential for accommodation to be adversely affected by vehicular traffic, noise, blasting, dust and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied for or granted under the *Mineral Resources (Sustainable Development) Act 1990*.

Environmental issues:

The impact on the natural physical features and resources of the area and in particular any impact caused by the proposal on soil and water quality and by the emission of noise, dust and odours.

Accommodation issues:

Whether the dwelling will be adversely affected by agricultural activities on adjacent and nearby land due to dust, noise, odour, use of chemicals and farm machinery, traffic and hours of operation.

The potential for accommodation to be adversely affected by vehicular traffic, noise, blasting, dust and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied for or granted under the *Mineral Resources (Sustainable Development) Act 1990*.

Design and siting issue:

The need to locate and design buildings used for accommodation to avoid or reduce the impact from vehicular traffic, noise, blasting, dust and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied for or granted under the *Mineral Resources (Sustainable Development) Act 1990*.

Clause 35.07 Farming Zone

35-07-06 Decision guidelines

Accommodation issues:

Whether the dwelling will be adversely affected by agricultural activities on adjacent and nearby land due to dust, noise, odour, use of chemicals and farm machinery, traffic and hours of operation.

The potential for accommodation to be adversely affected by noise and shadow flicker impacts if it is located within one kilometre from the nearest title boundary of land subject to:

- A permit for a wind energy facility; or
- An application for a permit for a wind energy facility; or
- An incorporated document approving a wind energy facility; or
- A proposed wind energy facility for which an action has been taken under section 8(1), 8(2), 8(3) or 8(4) of the *Environment Effects Act 1978*.

The potential for accommodation to be adversely affected by vehicular traffic, noise, blasting, dust and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied for or granted under the Mineral Resources (*Sustainable Development*) Act 1990.

Design and siting issues:

The need to locate and design buildings used for accommodation to avoid or reduce noise and shadow flicker impacts from the operation of a wind energy facility if it is located within one kilometre from the nearest title boundary of land subject to:

- A permit for a wind energy facility; or
- An application for a permit for a wind energy facility; or
- An incorporated document approving a wind energy facility; or
- A proposed wind energy facility for which an action has been taken under section 8(1), 8(2), 8(3) or 8(4) of the Environment Effects Act 1978

The need to locate and design buildings used for accommodation to avoid or reduce the impact from vehicular traffic, noise, blasting, dust and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied for or granted under the *Mineral Resources (Sustainable Development) Act 1990*.

There are general noise provisions in Schedules of Moorabool Planning Scheme. They are consistent with requirements above and are not included in this review. Schedule 6 to Clause 43.04 is quoted here since it contains noise limits for traffic noise (Clause 4.0, Schedule 6):

Design response

- Noise attenuation measures, particularly within 50 metres of the Western Highway property boundary
- The requirement that no new allotment is to be created such that there is insufficient space below the 63 dB(A) or greater at one metre from the most exposed façade of any residential dwelling

The provision above imply reference to the VicRoads Traffic Noise Reduction Policy 2005, which specifies 63 dB(A) criterion (LA10, 18 hrs) for new and upgraded arterial roads.

Also schedule to Clause 45.01 contains reference to aircraft noise (45-02-2):

Construction of buildings

Any new building must be constructed so as to comply with any noise attenuation measures required by Section 3 of Australian Standard AS 2021-2015, Acoustics - Aircraft Noise Intrusion – Building Siting and Construction, issued by Standards Australia Limited.

It should be noted that the clause above cannot be directly applicable to the Precinct since the Bacchus Marsh airfield does not have ANEF contours developed under AS 2021- 2015.

There are also specific indoor limits in section 52.20- Victoria's Big Housing Build.

Clause 52.20-7.7 Noise impacts (Victoria's Big Housing Build program)

Noise sources, such as mechanical plants 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 8 should be designed and constructed to achieve the following noise levels:

- Not greater than 35dB(A) for bedrooms, assessed as an LAeq,8h from 10 pm to 6 am
- Not greater than 40dB(A) for living areas, assessed LAeq,16h from 6 am to 10 pm

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 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 Melbourne	80 metres from the centre of the nearest track
Railway servicing freight in Metropolitan Melbourne	135 metres from the centre of the nearest track

Note: The noise influence area should be measured from the closest part of the building to the noise source.

Figure 9 Noise influence area – Table 8, 8B and Table D5 of the Moorabool Planning Scheme

It is unlikely that area around the Precinct will be developed into a wind farm, but the planning scheme also contains reference to New Zealand standard NZS6808:2010 for assessment method and applicable criteria.

Clause 52.32-2 Use and development of land

Design response

A written report(s), including:

- The noise impacts of the proposal prepared in accordance with the New Zealand Standard NZS6808:2010, Acoustics - Wind Farm Noise, including an assessment of whether a high amenity noise limit is applicable, as assessed under Section 5.3 of the Standard.

Specific clause in the planning schedule gives reference to the EPA Publication 1826 for controlling music noise. It also has additional provision for outdoor music level.

Clause 53.06-6 Requirements to be met

A live music entertainment venue must be designed, constructed and managed to minimise noise emissions from the premises and provide acoustic attenuation measures that would protect a noise sensitive residential use within 50 metres of the venue.

A noise sensitive residential use must be designed and constructed to include acoustic attenuation measures that will reduce noise levels from any:

- Indoor live music entertainment venue to below the noise limits specified in the Environment Protection Regulations under the *Environment Protection Act 2017* and the incorporated Noise Protocol (Publication 1826, Environment Protection Authority, November 2020)
- Outdoor live music entertainment venue to below 45dB(A), assessed as an Leq over 15 minutes

This review of the Moorabool Planning Scheme does not cover every clause in the planning schedule, it is intended to show that the council planning requirements as relevant to noise are related to many noise sources and generally do not specify specific requirements that are different from relevant state documents and standards. Exception is music noise where the schedule contains additional outdoor noise limit for music noise (which corresponds to limit for Docklands area and “Agent of change” section of the Noise Protocol).

5.5.2 The Noise Protocol

Noise associated with commercial, industrial and entertainment premises is managed under the EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol).

The Noise Protocol provisions have been incorporated into the Environment Protection Regulations 2021 (EP Regulations 2021). The Noise Protocol provides a procedure for the purpose of determining noise limits for new and existing commercial, industrial and trade premises and entertainment venues as defined by the EP Regulations 2021. It sets the methodology for assessing the effective noise level to determine unreasonable noise under the provisions of EP Regulations 2021.

The Noise Protocol sets the maximum effective noise level allowed in a noise-sensitive area from commercial/industrial premises depending on the time of day, land use zoning and existing background noise levels. It should be noted that meeting limits in the Noise Protocol does not eliminate need for consideration of general environmental duty in the Environment Protection Act 2018. Potential environmental noise emissions from individual developments in the Precinct should be assessed in accordance with the requirements of the Noise Protocol during development approval stages and where relevant planning conditions incorporated to require individual developments to demonstrate compliance with the Noise Protocol noise limits at the surrounding noise sensitive areas.

5.5.3 Victoria Planning Provisions (VPP)– Clause 58.04-3

Relevant clauses of the planning scheme specifies indoor noise levels that should be met for residential dwellings within industrial areas or in a road or rail noise influence area.

In 2017, DELWP released a practice note for *Assessing External Noise Impacts for Apartments – Planning Practice Note 83* (August 2017) (PPN 83) to provide guidance about the operation of the VPP Clause 58.04-3. Potentially this document may be applicable in case apartment or similar developments will be planned in the Precinct due to presence of the railway corridor.

Table 11 VPP Clause 58.04-3 Noise influence area and indoor design noise criteria

Noise source	Noise influence area	Indoor noise criteria
Zone interface		Not greater than 35 dB(A) for bedrooms, assessed as a $L_{Aeq,8hr}$ from 10 pm to 6 am.
Industry	300 metres from the industrial 1, 2 and 3 zone boundary	
Roads		Not greater than 40 dB(A) for living areas, assessed $L_{Aeq,16hr}$ from 6 am to 10 pm.
Freeways, tollways and other roads carrying 40,000 Annual Average Daily Traffic (AADT) 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 Melbourne	80 metres from the centre of the nearest track	
Railway servicing freight in Metropolitan Melbourne	135 metres from the centre of the nearest track	

Note that the *noise influence area* should be measured from the closest part of the building to the noise source.

5.5.4 Indoor sound levels – AS/NZS 2107

It is recommended the indoor sound levels of any building comply with the Australian Standard AS/NZS 2107:2016 “*Acoustics – Recommended design sound levels and reverberation times for building interiors*” (AS/NZS 2107:2016). It should be considered as a supplementary requirement to acoustic specification in the VPP Clause 58.04-3.

Table 1 of AS/NZS 2107: 2016 outlines recommended internal design sound levels and reverberation times for residential buildings, as reproduced in Table 12. It should be noted that these recommendations are not applicable to rail or aircraft noise.

Table 12 Table 1 of AS/NZS 2107: 2016 Design sound levels for residential buildings

Type of occupancy/activity	Design sound level (L _{Aeq,t}) range
Houses and apartments in suburban areas or near minor roads	
Apartment common areas (e.g. foyer, lift lobby)	45 to 50
Living areas	30 to 40
Sleeping areas (night time)	30 to 35
Work areas	35 to 40

5.5.5 Victorian Passenger Rail Infrastructure Noise Policy

The Victoria *Passenger Rail Infrastructure Noise Policy* (PRINP 2013) provides guidance to the transport bodies and planning authorities in their consideration of the impact of rail noise from improved, new passenger rail infrastructure and from changes to land use near existing or planned rail corridors. The guidelines provide a set of investigation threshold to guide relevant authorities when assessing rail noise if further mitigation is required.

If an assessment shows the investigation threshold is not exceeded, noise impacts can be considered a secondary matter and no further actions are needed under the PRINP 2013.

The investigation threshold for the change in land use near an existing rail corridor is presented in Table 13. The noise levels shown in Table 13 are external noise levels. They should be considered if sensitive developments are planned in area adjacent to the rail corridor. It should be reminded that levels referenced for rail noise in section 5.5.3 are internal design levels applicable to apartment developments.

Table 13 PRINP investigation threshold for land use change near existing rail

Time	Type of receiver	Investigation threshold(s)
Day (6 am – 10 pm)	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.	L _{Aeq} 65 dB or L _{Amax} 85 dB
Night (10 pm – 6 am)	Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks	L _{Aeq} 60 dB or L _{Amax} 85 dB

5.5.6 Sleep disturbance

Impact of noise on sleep quality is greatly studied from long term effects perspective and sleep disturbance due to intermittent events is better correlated with maximum noise levels. Long term effects are typically addressed via design of average noise levels (such as L_{Aeq,8hr}), whereas sleep disturbance is better correlated to the maximum noise levels per event (i.e. L_{Amax}). Sleep disturbance can occur via changes in sleep state and awakening is more related to subjective assessments of sleep quality [NSW Road Noise Policy 2011 (NSW RNP)].

The World Health Organisation (WHO) *Guidelines for Community Noise* recommend a maximum internal noise level of L_{Amax} 45 dB(A) for sleeping areas and can be considered as equivalent to 60 dB(A) external noise level on a 15 dB outside and inside conversion for partially open windows. It is noted that a level of L_{Amax} 45 dB(A) is based on the noise level at which effects of noise induced awakenings are observed.

Studies by the EnHealth Council documented report titled *The health effects of environmental noise – other than hearing loss* dated May 2004 and also referenced in NSW RNP states that for short term events for good sleep over eight hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately L_{Amax} 45 dB(A) more than 10 or 15 times per night.

The NSW RNP also provides a summary of research in relation to noise induced sleep disturbance to date including the WHO and enHealth concluding the following:

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

A summary of the discussed sleep disturbance criteria is presented in Table 14. The NSW RNP approach has been previously accepted by Victorian Civil and Administrative Tribunal (VCAT) in relation to sleep disturbance. It should be noted sleep disturbance effects are usually taken into account in setting noise limits in regulatory and planning documents and is not considered separately.

Table 14 Summary of L_{max} Criteria for Sleep Disturbance

Source	Recommended internal L_{Amax}	Equivalent recommended external level ⁽¹⁾	Comment
WHO	45 dB(A)	60 dB(A)	Level at which the effects of noise induced sleep disturbance are observed.
enHealth Council	45 dB(A)	60 dB(A)	Recommended maximum noise level not exceed more than 10 – 15 times per night for a good sleep over eight hours.
NSW RNP	50 – 55 dB(A)	65 – 70 dB(A)	Level below unlikely to awaken people from sleep
	65 – 70 dB(A)	80 – 85 dB(A)	Level that not likely to affect health and wellbeing significantly if only occur one or two events per night.

¹Equivalent external level based on a typical outdoor to indoor conversion of 15 dB for partially open windows. This is adopted by WHO guidelines.

5.5.7 Aircraft noise – AS 2021:2015

Aircraft noise impact is assessed against the requirements of the Australian Standard AS 2021 – *Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*.

In accordance with the AS 2021, the acceptability of the location of building is dependent on the applicable ANEF (Australian Noise Exposure Forecast) from aircraft noise to the site as outlined in Table 15.

Table 15 AS2021 Building Acceptability based on Aircraft noise exposure

Building type	Site ANEF		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	< 20 ANEF	20 – 25 ANEF	>25 ANEF
Hotel, motel, hostel	< 25 ANEF	25 – 30 ANEF	>30 ANEF
School, university	< 20 ANEF	20 – 25 ANEF	>25 ANEF
Hospital, nursing home	< 20 ANEF	20 – 25 ANEF	>25 ANEF
Public building	< 20 ANEF	20 – 30 ANEF	>30 ANEF
Commercial building	< 25 ANEF	25 – 35 ANEF	>35 ANEF
Light industrial	< 30 ANEF	30 – 40 ANEF	>40 ANEF
Other industrial	Acceptable in all ANEF Zones		

Acceptable sites

For a building site that is classified as 'acceptable', there is usually no need for the building design and construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will be unnoticeable in areas with ANEF 20 contour or lower.

Conditionally acceptable sites

For a building site that is classified as 'conditionally acceptable', the maximum aircraft noise levels for the relevant aircraft within the proposed development should achieve the recommended AS 2021 indoor design aircraft noise levels.

Unacceptable sites

For a building site that is classified as 'unacceptable', construction of the proposed building should not normally be considered. Where in the community interest redevelopment is to occur in such areas where the relevant planning authority determines that a development may be necessary within existing built-up areas designated as unacceptable, then constructions should consider attenuation measures to achieve the recommended AS 2021 indoor design aircraft noise levels.

The Moorabool Planning Scheme references this document as relevant to airports that may have noticeable impact on the council area. Bacchus Marsh Aerodrome is not included in the list of airports that have specific planning provisions to address potential noise issues.

5.5.8 National Airport Safeguarding Framework

The *National Airports Safeguarding Framework* (NASF) developed by the Department of Infrastructure, Regional Development and Cities provides guidance on planning requirements for development that affects aviation operations. This includes building activities around the airport that might impact airport operations.

Guideline A of the NASF provides advice on the use of a supplementary suite of noise metrics, including the Australian Noise Exposure Forecast (ANEF) system and frequency-based noise metrics (N-contours), to inform strategic planning and provide communities with comprehensive and understandable information about aircraft noise.

The Bacchus Marsh Aerodrome does not have air traffic sufficient enough to trigger development of ANEF contours. Although aircraft noise may be audible in the Parwan PSP, it is not expected to have adverse impact on the amenity of sensitive land uses or pose any restrictions on current or future operation of the Bacchus Marsh Aerodrome with respect to aircraft noise. If number of flights, types of aircraft or hours of operations will change in future it may require assessment of aircraft noise impact to make sure that sensitive developments are within ANEF 20 contours, which is consistent with future residential use of central and eastern areas of the Parwan PSP.

5.6 Discussion of potential noise impacts from existing sources

5.6.1 Transport, industrial and commercial

Industrial and commercial noise sources, which could have potential noise impacts on the amenity of noise sensitive uses within the Parwan PSP are mainly located outside of the Parwan PSP except the western part where the broiler farm is located. There are transport noise sources within the Parwan PSP and at the Parwan PSP boundary. Results of the long monitoring program shows that impact from transport noise sources is perceivable in some areas but is not significant except the area adjacent to the rail corridor and Parwan-Exford road. Buffer separating the Parwan PSP from the Western Freeway is substantial enough to eliminate influence of the arterial road on ambient noise in northern and more distant parts of the Parwan PSP, however it is audible at the northern boundary of the precinct. Total noise characterised by acoustic descriptor LA10,18 hours at the northern monitoring location (170 Whelans Rd) was 44 dB(A) which is significantly below VicRoads strictest criteria of 63 dB(A) for new or upgraded roads (Traffic Noise Reduction Policy, VicRoads, 2005). Area adjacent to the rail corridor and Parwan-Exford Rd is relatively noisy with greatest detected levels of ambient noise levels due to combined impact from the road and rail (refer to section 5.3.4). Major existing noise sources have been grouped into those within the Parwan PSP and those adjacent to the Precinct, as outlined in Table 16.

Table 16 Potential noise impacts from existing sources

Group	Sources	Description	Part of the Precinct impacted
To the northern boundary of the Precinct	Western freeway	Distant traffic noise mixed with natural background and local activities	Northern part of the Precinct
To the southern boundary of the precinct	Water recycling plant, Bacchus Marsh Airfield	Natural background Distant rail and road traffic noise Aircraft flyovers	Southern part of the Precinct
To the western boundary of the Precinct	Maddingley Brown Coal Different businesses Geelong- Bacchus Marsh Rd	Equipment noise Traffic noise	Western part of the Precinct
Within the central part of the Precinct	Melbourne- Ararat rail corridor Parwan Exford Road	Passenger and freight trains bass-buys Crossing bells and train horns Traffic noise	Central part of the Precinct
Within the western part of the Precinct	Broiler farm	Mechanical equipment, loading and delivery activities (if farm is operational).	Western part of the Precinct
To the northern boundary of the Precinct	BMID	Potential gas guns that are used to scare away birds and bats ⁷	Northern part of the Precinct

Attended noise measurements

Attended noise measurements were made for selected sources during the site visit on 15/03/2023. The results are summarised in Table 17 below.

Table 17 Attended noise measurement notes

Location	Sources	Time	Average dB(A)	Peaks observed dB (A) and notes
60 Browns Lane	Natural background, broiler farm	13:28	41	51- Bird chirp 38- Distant truck pass-by
10 Whelans Rd	Rail corridor Parwan-Exford Rd	14:32	47	51- Bird chirp 52- Car pass-by 43- Train crossing noise 92- Train horn 68- Train pass-by
170 Whelans Rd	Natural background, rail noise, distant road traffic	12:30	45	42- Bird chirp 51- Large truck on freeway
65 Parwan South Rd	Natural background, rail noise, distant road traffic, fly overs	11:15	39	46- Bird chirp 40- Fly over 34- Rail crossing bells 40- Train horn

⁷ Note this was not identified in noise data obtained from background monitoring campaign

Planning requirements for the area and Clause 58.04-3

Most of the Precinct is currently zoned as Farming zone (FZ). Provisions of the Clause 35.07 of the Moorabool Planning Scheme are applicable to developments in this zone. These clauses do not contain specific recommendations as relevant to noise. Specific noise provisions may be applicable to future noise sensitive developments if rezoning is implemented for the Parwan PSP.

Sensitive land uses adjacent to the rail corridor and arterial roads are subject to noise control requirements in Moorabool Planning Scheme and other regulatory documents as described in section 5.5. Noise influence area extends 80 m from the nearest track since the corridor is outside of Melbourne metropolitan area (see Figure 10).

Accordingly, proposed noise sensitive development close to the rail corridor should be required to undertake a detailed noise intrusion assessment by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority, to demonstrate that the proposed design meets the following internal noise limits from external noise sources:

- Recommended indoor noise limits outlined in VPP Clause 58.04-3 as follows:
 - a. Not greater than 35 dB(A) for bedrooms, assessed as an LAeq,8h from 10 pm to 6 am
 - b. Not greater than 40 dB(A) for living areas, assessed LAeq,16h from 6 am to 10 pm

Due to the quiet rural nature of the area within and surrounding the Parwan PSP, it is recommended that the above indoor noise limits are met, regardless of whether the proposed dwelling is located within a noise influence area or not. This includes consideration of small industrial and commercial establishments such as auto facilities and the like.

The requirements of the internal noise levels are also enforced by Clause 55.07-07 of the planning scheme (Apartment Developments). Since ambient noise in the Precinct is generally low, it is important that amenity of residents inside dwellings is also preserved. Detailed acoustic assessment may be accompanied by a design response that addresses the recommendations of the acoustic assessment for sensitive developments close to the rail corridor, western boundary of the precinct and industrial cluster in the western part of the Parwan PSP.



Legend

- PEP
- - - PSP
- - - Rail line
- Noise influence area - 80 m from rail way

<p>Paper Size ISO A4</p> <p>0 0.3 0.6 km</p> <p>Map Projection: Transverse Mercator Horizontal Datum: GDA2020 Grid: GDA2020 MGA Zone 55</p>			<p>Victorian Planning Authority Parwan AAIA</p> <p>Noise influence area</p>	<p>Project No. 12598868 Revision No. - Date. 17/05/2023</p>
<p>FIGURE 10.0</p>				

5.6.2 Broiler farm

The broiler farm had the potential to be the greatest industrial noise source in the Precinct. Onsite activities could generate likely noise impact at adjacent sensitive sources. In spite of the fact that Bacchus Marsh Urban Growth Framework 2018 does not identify western part of the Parwan PSP for sensitive developments, industrial activities may impact on existing and future sensitive land uses in the central and eastern parts of the Parwan PSP. Noise measurements performed at the boundary of the broiler farm (section 5.3) show that ambient day time levels are order of 48 dB(A) and evening time levels are around 49 dB(A) in average. Noise for movements of trucks or broiler operations was not audible at the eastern receivers during site visits. The VPA has indicated that his farm is no longer operating. The noise monitoring data supports this conclusion. If operations resume in future, noise at the nearest sensitive receivers should meet requirements in the Noise Protocol. Based on the current zoning (FZ) and results of the noise monitoring programme background noise for receivers along the Brown lane is classified as “low”, which will result in stricter applicable noise criteria.

The noise emission from existing onsite facilities are expected to have been designed and controlled to meet the relevant Noise Protocol noise limits at the nearest noise sensitive receivers. Any notable increase in future operations may results in greater noise emissions from the site. Hence, it is expected that further noise investigations should be undertaken if significant changes in the broiler farm operations are planned to ensure that the upgraded capacity achieves the relevant Noise Protocol noise limits at the existing and approved future noise sensitive developments. Future new noise sensitive land uses as part of the Parwan PSP are generally recommended to be avoided in close proximity of the broiler station stations where possible. It is recognised that there are few existing sensitive receivers to the east of the broiler farm. However, any noise sensitive land use encroaching on the broiler farm should undertake a detailed noise intrusion assessment by a qualified acoustic engineer to demonstrate that the external noise amenity of proposed design achieves applicable noise limits with consideration to the farm as well as any other industrial or commercial noise sources within the area.

5.6.3 Music noise

Currently there are no entertainment noise sources within the Precinct or in close proximity to the boundaries. In view that western part of the Parwan PSP may include different types of businesses and commercial developments, it may be potential source of noise. Future planning approvals for pubs, entertainment venues should include requirements for acoustic assessment. Noise limits are specified in Part II Entertainment Venues and events of the Noise Protocol. There are also specific planning provisions in Moorabool Planning Scheme (Clause 53.06-6), which are applicable to residential noise impact if residence is located within 50 m from an entertainment venue.

5.6.4 Road traffic noise

The main traffic noise sources likely to affect future sensitive uses within the Precinct are Western Freeway to the north of the Precinct and Geelong-Bacchus Marsh Road on the western boundary of the Precinct.

Western freeway

According to VicRoads Open Traffic Volume Data⁸, the portion of road, which is closer to the northern part of the Parwan PSP receives an Annual Average Daily Traffic (AADT) volume of 20,000 vehicles in west bound direction with 12% of heavy vehicles and 17,000 vehicles in east bound direction with 13% of heavy vehicles. A total two way traffic volume of up to 37,000 AADT is expected along the nearest portion of the freeway in close proximity to the Parwan PSP's northern boundary. This does not exceed the threshold of 40,000 AADT for consideration of traffic noise in accordance with the requirements of the VPP. Intersection of the freeway with Old Western Highway also carries vehicles with AADT 5500 vehicles in western direction and 4500 in eastern direction. In any case, part of the Parwan PSP is not within the noise influence area of 300 m from the nearest trafficable lane, separation distance from the freeway is significantly greater (exceeding 800 m see Figure 11). Results of noise monitoring show that the freeway noise is still audible in the quiet rural area, however measured traffic noise descriptor $L_{A90,18hrs}$ of 44 dB(A) is significantly below outdoor limit of 63 dB(A) implemented by VicRoads. New noise sensitive uses in the northern part of the Parwan PSP will not require detailed acoustic assessment, but acoustical rationales may be taken into account to preserve dominantly rural character of the area.

⁸ <https://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/datasets/vicroadsmaps::traffic-volume/explore?location=-37.686524%2C144.479388%2C16.66>

Geelong- Bacchus Marsh Road

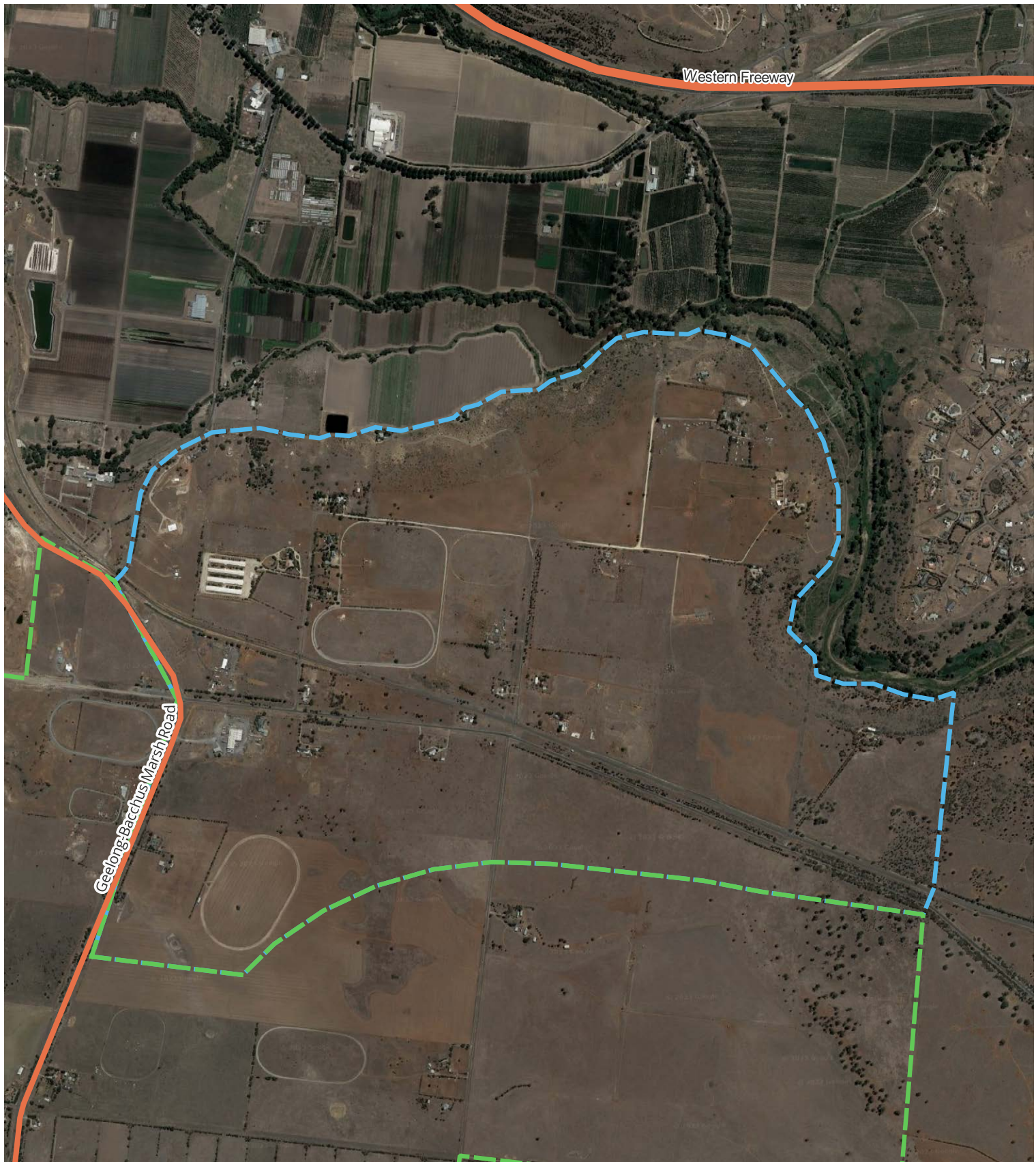
This road is classified as an arterial road. In accordance with VicRoads Open Traffic Volume Data⁹, the portion of road, which lays at the western boundary of the Parwan PSP receives an Annual Average Daily Traffic (AADT) volume of 5,400 vehicles in both direction with 12% of heavy vehicles. Formally it does not trigger requirements under VPP Clause 58.04-3 since AADT is below 40,000 vehicles.

However if council or planning authorities decide to give consideration to traffic noise, noise criteria that are applicable to noise sensitive land use within the established Noise Influence Area should be required to undertake a detailed noise intrusion assessment by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority, to demonstrate that the proposed design meets the following internal noise limits from external noise sources:

- Recommended indoor noise limits outlined in VPP Clause 58.04-3 (PPN 83) as follows:
 - a. Not greater than 35 dB(A) for bedrooms, assessed as an LAeq,8h from 10 pm to 6 am
 - b. Not greater than 40 dB(A) for living areas, assessed LAeq,16h from 6 am to 10 pm
- Sleep disturbance criteria in the bedrooms or sleeping areas in accordance with World Health Organisation (WHO) recommendations as follow:
 - c. Maximum internal noise levels (L_{Amax}) not exceeding 45 dB(A)

It is reminded that formally special measures to control road traffic noise in the Parwan PSP are not required and would be expected in case of significant growth of traffic volumes in future (above 40,000 AADT).

⁹ <https://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/datasets/vicroadsmaps::traffic-volume/explore?location=-37.686524%2C144.479388%2C16.66>



Legend

- - - PEP
- - - PSP
- Western Freeway and Geelong-Bacchus Marsh Road

<p>Paper Size ISO A4</p> <p>0 0.3 0.6 km</p> <p>Map Projection: Transverse Mercator Horizontal Datum: GDA2020 Grid: GDA2020 MGA Zone 55</p>			<p>Victorian Planning Authority Parwan AAIA</p> <p>Location of freeway and road relative to the Precinct</p>	<p>Project No. 12598868 Revision No. - Date. 17/05/2023</p>
FIGURE 11.0				

5.6.5 Rail noise

The Melbourne-Ararat railway line crosses the Precinct in western-eastern direction. Based on a review of publicly available data, GHD understands that this railway line services both passenger and freight trains only. GHD understands, based on a review of the train line timetable, that the line services at most five trains per hour one-way during peak periods.

Noise data was acquired at the Central monitoring locations during the monitoring programme. The logger was positioned approximately 20 m from the rail line. This location was characterised by greatest ambient noise levels with average day time L_{Aeq} of 64 dB(A) and evening time L_{Aeq} of 66 dB(A). Noise at this location was controlled by the train pass-buys, crossing bells and noise from Parwan-Exford road. Maximum levels of rail pass-buys exceeded 90 dB(A) at the monitoring location. It may trigger need for mitigation under requirements in Victorian Passenger Rail Infrastructure Noise Policy (section 5.5.5) in case sensitive land uses are allowed in close proximity to the rail corridor.

In accordance with the requirements of the VPP stipulated in Clauses 55.07-07 and 58.04-3 of the Moorabool Planning Scheme, any noise sensitive use closer than 80 m of the centre of the nearest track (since the Precinct is located outside Melbourne metropolitan area), should be designed and constructed to achieve the following indoor noise limits:

- Not greater than 35 dB(A) for bedrooms, assessed as an $L_{Aeq,8h}$ from 10 pm to 6 am
- Not greater than 40 dB(A) for living areas, assessed $L_{Aeq,16h}$ from 6 am to 10 pm

In addition to above, consideration of World Health Organisation (WHO) sleep disturbance criteria is also recommended as follow:

- Maximum internal noise levels (L_{Amax}) not exceeding 45 dB(A)

The noise influence area associated with the rail line running across the Parwan PSP is shown in Figure 10.

5.6.6 Aircraft noise

The Parwan PSP is located approximately 3 km to the north east of the Bacchus Marsh Aerodrome.

Moorabool Planning Scheme Clause 45.02 Airport Environs Overlay

The Parwan PSP is located outside of the Airport Environs Overlay and therefore no restrictions in the use and development is required in relation to potential aircraft noise exposure.

AS 2021 Site Acceptability

In accordance with the AS 2021, the acceptability of the location of building is dependent on the applicable ANEF contour.

Sporadic flyovers were audible during installation of monitoring equipment at the southern boundary of the Parwan PSP. However attended measurements do not show that aircraft noise was intrusive and noise from flyovers were below 50 dB(A).

The ANEFs for Bacchus Marsh airfield have not been produced since scale of the airfield operations is not sufficient to trigger requirements for performing ANEF assessment. If operations of the airfield will expand in future, then it should be ensured that the Parwan PSP is located outside of the ANEF 20 contour for Bacchus Marsh airport and therefore buildings developed within the Parwan PSP are considered acceptable for noise sensitive uses such as residential, accommodation, educational and health uses in accordance with the AS 2021.

5.7 Discussion of potential noise emissions

Since western part of the Parwan PSP is not intended for sensitive developments, it implies that new business/commercial dwellings may be built in the area. They have the potential to emit noise which may impact existing and future sensitive uses within the Precinct.

Clause 13.05-1S Noise management of the Moorabool Planning Scheme, gives reference to the following policy documents:

- The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826, Environment Protection Authority, May 2021) (the Noise Protocol)

Any proposed development within the Precinct should be designed and constructed such that the environmental noise emissions comply with the requirements of the Noise Protocol at the relevant surrounding noise sensitive receivers. This also includes new small commercial establishments such as petrol stations, auto facilities, workshops and the like.

Where relevant, the planning authority should ensure that appropriate planning conditions are imposed to require prospective developments to demonstrate compliance with the Noise Protocol at surrounding noise sensitive areas. This involves requiring an acoustic assessment by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority, to demonstrate that the proposed development comply with the requirements of the Noise Protocol.

5.8 Discussion of potential vibration impacts

5.8.1 Rail movements

Train pass-bys may induce ground borne vibration if sensitive receivers are located close to a rail corridor. Associated vibration may cause intermittent vibration nuisance to occupants of the surrounding sensitive receivers. Vibration levels at sensitive receivers would depend on various factors such as source type, distance to receivers and ground soil properties. It should be noted that Victoria's Passenger Rail Infrastructure Noise Policy 2013 does not contain ground borne vibration and noise criteria.

NSW Rail Infrastructure Noise Guideline 2013 suggest criteria for ground- borne noise (measured inside buildings), they are summarised in the table below.

Table 18 Summary of ground- borne trigger levels $L_{Amax,Slow}$ for rail projects

Sensitive use	Time of day	Internal noise limit
Residential	Day (7 am- 10 pm)	40 dB(A)
	Night (10 pm- 7 am)	35 dB(A)
School, educational institutions, places of worship	When in use	40 – 45 dB(A)

The Guideline references NSW DEC Assessing Vibration: A Technical Guideline (2006) for vibration limits that may be applicable to rail projects.

Currently the Parwan PSP does not have sensitive receivers located in close proximity to the rail corridor servicing passenger and freight trains. Rail vibration impact depends on many factors such types of the trains and track, track conditions, speed and frequency of movements. Existing nearest receiver within the precinct is situated at approximately 80 m separation distance from the rail, which is typically sufficient to eliminate adverse vibration effects.

Based available information, the following daily train pass-by events are typical of a weekday under current conditions:

- About 185 passenger train services

It is difficult to recommend buffer for sensitive developments due to dependence of the impact on multiple factors. Vibration assessment is recommended in case sensitive developments are planned adjacent to the rail corridor.

5.8.2 Vibration from coal mine

Maddingley coal mine is located to the west of the Precinct boundary. Separation distance to the mine is significant and sufficient to prevent vibration impact from onsite equipment and operations. Vibration from blasting operations may propagate at high levels over long distances. At the moment the site does not perform blast works. If character of onsite works will change and blasting operations will be permitted, condition of the blast works permit should require blasting noise and vibration assessment to demonstrate compliance with relevant limits. Typically these conditions include vibration limits in accordance with VIC Earth Resources Guidelines *Ground vibration and airblast limits for mines and quarries*.

5.9 General noise and vibration mitigation strategies

This section provides general guidance on potential mitigation strategies that could be implemented to control noise within prospective noise sensitive developments within the Parwan PSP and could be considered for control of external noise sources such as industrial noise, traffic and aircraft applicable to the proposed development.

Relevant in-principal noise mitigation strategies include:

- *Land use controls* (separating the location of noise-producing activities from sensitive areas)
- *Control in transmission* (reduce noise level at the receiver but not necessarily the environment surrounding the source, e.g. noise barrier, etc.)
- *Receiver control* (localised acoustic treatment at sensitive receptor)

5.9.1 Land use controls

There are several strategies involved in using the land use control measures, as follows:

- *Setback strategy* (e.g. open space design adjacent to noisy industries, busy roads and/or railway corridors to provide noise reduction through setback distances to residential uses).
- *Setback distances* between the noise source and the noise sensitive receptor may assist reducing the noise exposure level at the proposed Precinct development. A setback strategy would also be effective in mitigating ground-borne vibration impacts from nearby vibration sources.
- *Building locations and height controls*, could be adopted to provide noise shielding from noise sources to residential uses and the overall Precinct.
- *Expansion of cycle and pedestrian facilities* to discourage the use of motor vehicles and encourage the use of bicycles, scooters or walking, which would result in less noise emission within the area.
- *Impose acoustic control planning conditions on new developments* such as planning permit conditions for specific acoustic treatments to noise sensitive developments.

5.9.2 Control in transmission

The noise reduction strategy used to control in noise transmission generally involves the installation of noise barriers. Noise barriers may include an existing feature, such as:

- An elevated road or a natural slope (e.g. earth mound)
- A purpose designed feature such as a solid boundary fence
- A purpose designed feature of the building, such as a partially enclosed carport
- A purpose designed building which acts as a barrier block

Figure 12 and Figure 13 illustrate different noise barrier configurations, sourced from the NSW Department of Planning “*Development near Rail Corridors and Busy Roads – Interim Guideline*” (NSW DoP, 2008).

The barrier should be installed in a manner such that it covers the noise sources from direct line-of-sight to the sensitive receptors. In general, the barrier should provide sufficient screening to avoid direct line-of-sight between the shielded noise sources and the protected sensitive receptors.

Noise barriers would not be effective in reducing noise impacts if the line of sight from the noise source to the residence is not reduced. Hence, it may not be practical to install a noise barrier for elevated sensitive receptors.

Figure 3.18a: Noise barrier using an earth mound

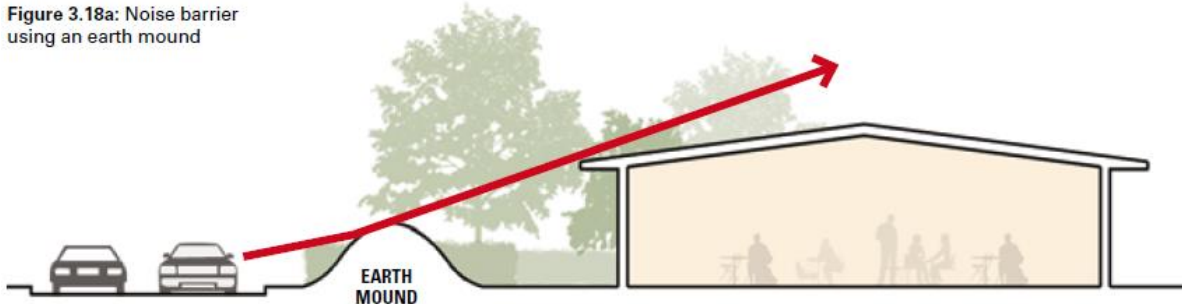


Figure 3.18b: Noise barrier using an earth fence/wall

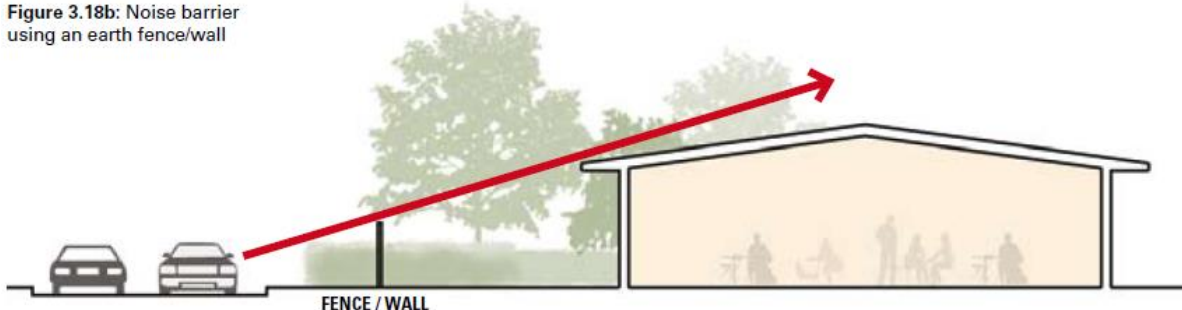


Figure 3.19: Noise barrier using a fence/wall

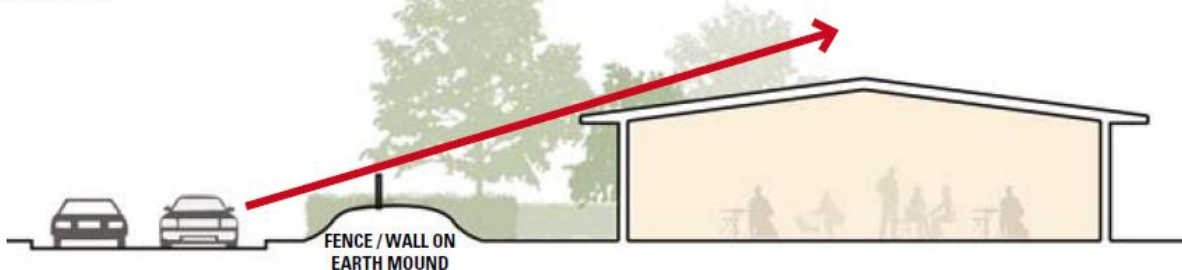


Figure 12 Noise barrier features (NSW DoP, 2008)

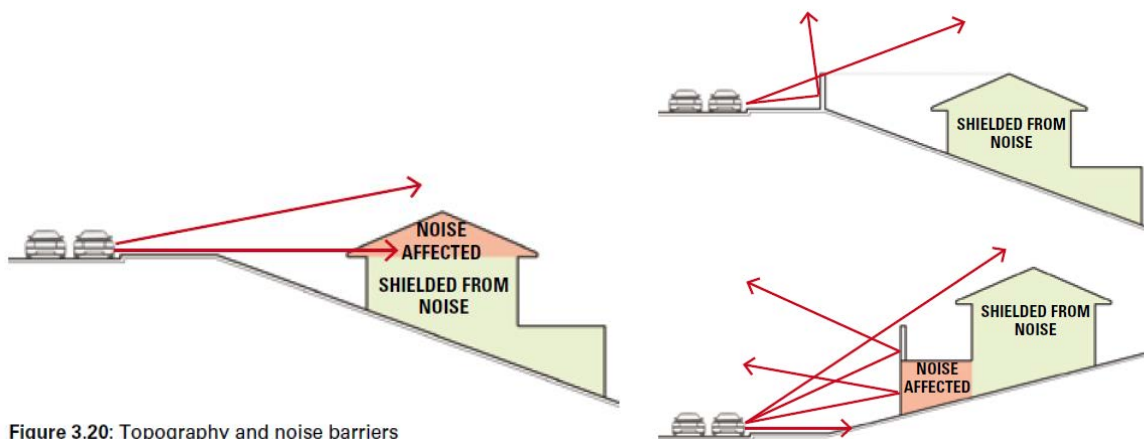


Figure 3.20: Topography and noise barriers

Figure 13 Noise barrier topography and features (NSW DoP, 2008)

5.9.3 Receiver control

There are several strategies that could be used to control noise at the receiver including:

- Building orientation
- Balustrade/balcony design/configuration
- Building façade acoustic treatment

Building orientation

The building orientation layout involves configuring the development’s floor plan to have sleeping areas/habitable areas facing away from the noise sources. Figure 14 and Figure 15 illustrate samples of building orientation layout strategies to minimise local noise intrusion, which is sourced from NSW Department of Planning “*Development near rail corridors and busy roads – Interim guideline*” (NSW DoP, 2008).

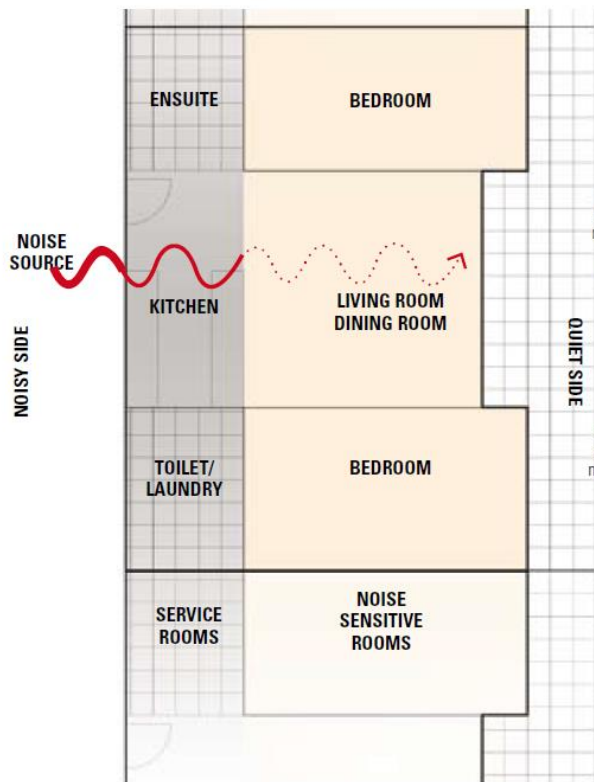


Figure 3.5: Single Dwellings – locating noise sensitive rooms away from road noise

involves increasing the separation between the road/rail noise sources and the noise sensitive area. As an indication, doubling the distance from the noise source to the receiver will normally reduce the noise levels by between 3dBA and 6dBA.

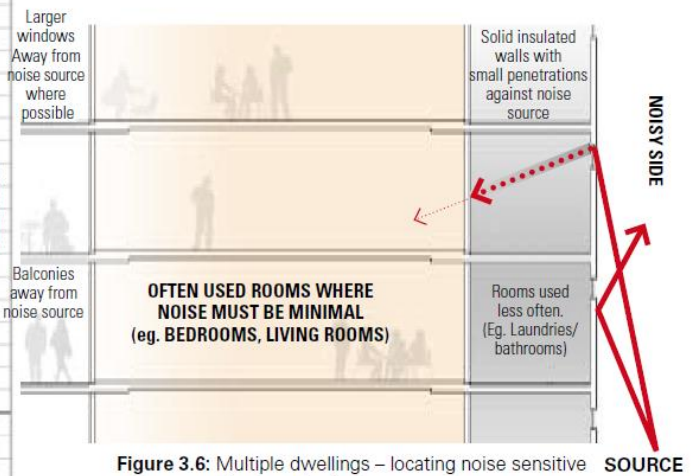


Figure 3.6: Multiple dwellings – locating noise sensitive rooms away from road noise

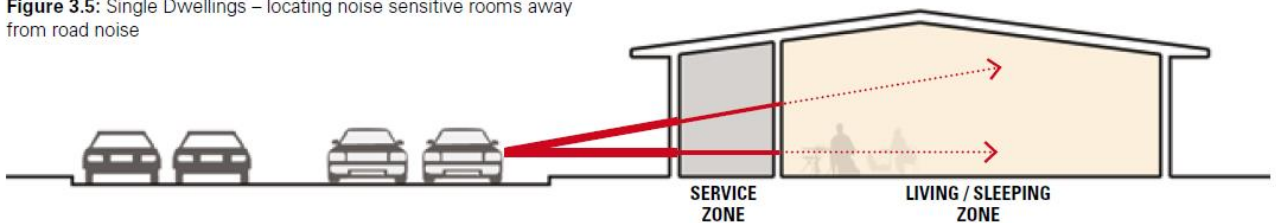


Figure 14 Sample of building layout strategies 1(NSW DoP, 2008)

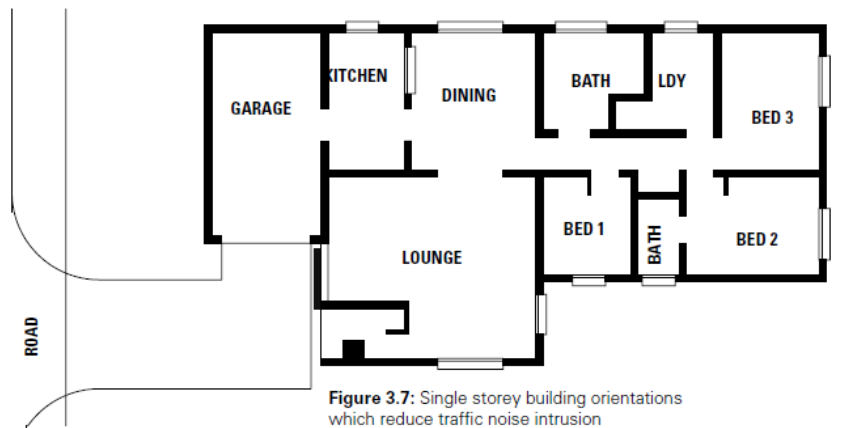


Figure 3.7: Single storey building orientations which reduce traffic noise intrusion

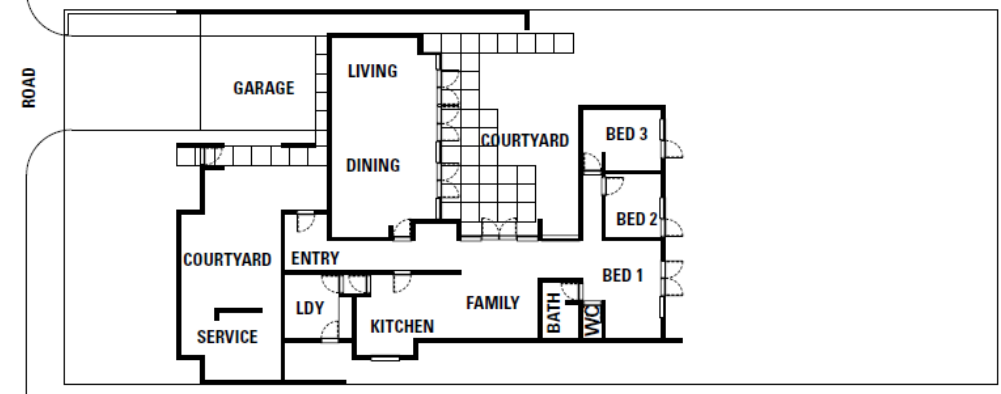


Figure 3.8: Double storey building orientation which reduces traffic noise intrusion

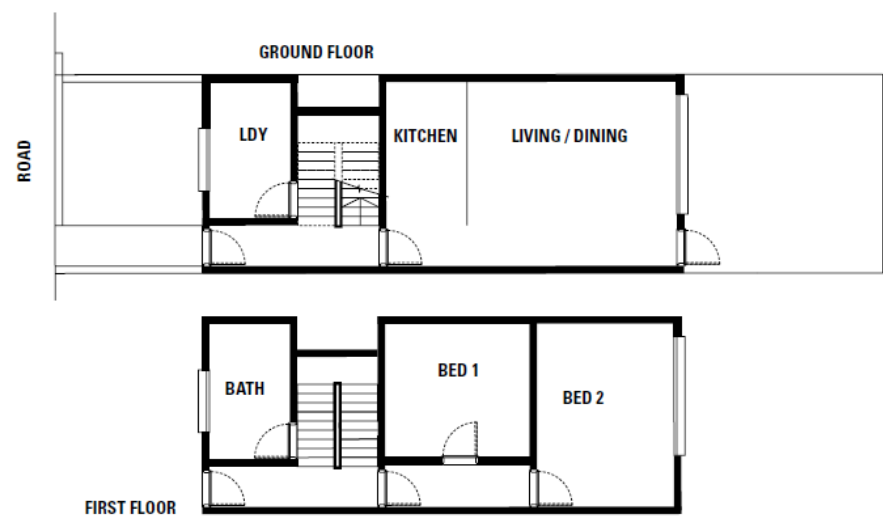


Figure 15 Sample of building orientation layout strategies 2 (NSW DoP, 2008)

Building façade acoustic treatment

External noise intrusion due to different sources such as traffic, rail, aircraft, music or industrial noise is typically transmitted into the building via lightweight façade elements such as glass, doors, lightweight cladding, roofs, as well as any air grille openings. Subject to more detailed noise assessment of external noise intrusion, these lightweight façade elements may need to be acoustically treated to preserve indoor amenity of the building occupants, such as:

- Minimise lightweight external wall construction facing the dominating noise sources
- Thicken glazing construction for the window façade
- Minimise window size and maximise masonry on the external wall construction
- Minimise the use of openable window construction
- Configure any discharge/intake duct grill layout (above ceiling level) facing away from the noise sources

The purpose of treating the building envelope is to reduce the internal noise. In principle, noise inside a building can be reduced if the building envelope provides a high sound reduction. Heavy, dense materials such as masonry or brick walls are better for low frequency sound reduction. However, lightweight solutions can also be effective in reducing noise. These include double-stud, staggered-stud or resilient-stud systems that have external layers of cement sheet or similar and internal layers of plasterboard with acoustic insulation in the cavity.

Noise from external noise sources may enter a room through the roof, external walls, windows and external doors. Windows and doors are often the weakest points in sound insulation. Such measures as thicker glass, laminated glass or double glazing and acoustically sealed windows (permanent or openable) provide better noise reduction. Louvre windows are less effective in noise reduction when compared to solid single and double glazed acoustically sealed windows. Depending on the noise reduction required, window size and effectiveness of acoustic seals, louvre windows can be considered as a construction component.

The internal noise design objectives in some cases can only be achieved when the windows remain closed. In such cases, to maintain internal design objectives at all times would require ventilation to rooms by means other than through openable windows. Alternative ventilation may include "borrowed" natural ventilation from other rooms with less exposure to external noise sources or a mechanically ventilated system or mechanical ventilation with external air intake can be suggested to supplement noise mitigation measures.

5.10 Summary

A summary of the noise assessment and recommendations for proposed uses to be located within the Precinct are presented in Table 19.

Table 19 Noise assessment summary

Item	Assessment Item	Report Section	Summary	Recommendation for proposed uses to be located within the Precinct
1	Moorabool Planning Scheme			
1.1	Clause 13.05-1S Noise Abatement	6.6	Noise emissions from external plants associated with proposed developments within the Precinct (prospective industrial, commercial, residential, etc.) should comply with the requirements of the Noise Protocol	Appropriate planning permit conditions are imposed to require prospective developments to demonstrate compliance with the Noise Protocol at surrounding noise sensitive areas. Consideration of an acoustic assessment required by planning authority as part of the development approval process.
1.2	Clause 18.02-7S Airport and airfields	6.5.6	Bacchus Marsh Aerodrome does not perform operations at the scale requiring assessment of ANEF contours for aviation noise. It is assumed that the Precinct is located within an area with ANEF 20 or less than where sensitive uses are considered acceptable.	Although aircraft noise may be audible at the Parwan PSP, it is not expected to have adverse impact on the amenity of sensitive land uses. If operations at the Bacchus Marsh Aerodrome will be expanded in future, ANEF contours should be produced to ensure that sensitive developments in the Precinct do not fall into area with ANEF exceeding 20.
1.3	Clause 35.07 Farming zone	6.5	Most of the Precinct is classified as Farming Zone.	Consideration of an acoustic assessment required by planning authority as part of the development approval process. Acoustic assessment should be undertaken if the potential for accommodation to be adversely affected by vehicular traffic, noise and vibration from an existing or proposed extractive industry operation if it is located within 500 metres from the nearest title boundary of land on which a work authority has been applied.
1.4	Clause 52.20-7.7 Noise impacts, Clause 55.07, Clause 58.04-3	6.5.5	May be applicable to housing funded by Victoria's Big Housing Build program and future apartment developments if farming zone is changed to residential or other relevant zones	The clause contains internal noise requirements. They should be met for noise from mechanical plants or buildings located within 80 m from the rail corridor. Proposed noise sensitive development within the Parwan PSP to be required to undertake a detailed noise intrusion assessment to demonstrate that the proposed design meets the internal noise limits.
1.5	Clause 53.06-6 Live Music Entertainment Venues	6.5.2	If live entertainment venues will be built in the Precinct, acoustic requirements in this clause are	Any noise sensitive residential development within the Parwan PSP should be designed and constructed to mitigate music noise levels from any entertainment venues to the noise limits specified in the Noise Protocol.
2	The Noise Protocol	6.5.1 6.5.3	Applicable to industrial, commercial and entertainment premises	Refer to Items 1.1 and 1.5 above.
3	AS/NZS 2107 Indoor Sound Levels	6.4.4	Recommended as supplementary design internal noise level for residential dwellings in addition to provisions of Clauses 52.20-7.7, 55.07 and 58.04-3 58.04-3.	

Item	Assessment Item	Report Section	Summary	Recommendation for proposed uses to be located within the Precinct
4	Passenger Rail Infrastructure Noise Policy	6.4.5	Specifies acceptable external rail noise levels including rezoning of land adjacent to the rail corridor.	Recommended as supplementary external noise level for residential dwellings in addition to provisions of Clauses 52.20-7.7, 55.07 and 58.04-3 58.04-3 (within 80 m from the rail).
4	Sleep disturbance	6.4.6	External sources such as traffic, rail pass- bys and industrial noise can high levels of generate short term noise events that could result in sleep disturbance at night.	Satisfaction of the sleep disturbance criteria in the bedrooms or sleeping areas of the noise sensitive development as defined by the limits recommended by the World Health Organisation.
5	AS 2021 Aircraft noise	6.4.7	The Precinct is supposed to be located outside of the ANEF 20 contour for Bacchus Marsh air field. Buildings developed within the Precinct are supposed to be acceptable for noise sensitive uses such as residential, accommodation, educational and health uses in accordance with the AS 2021.	<i>If air traffic operation will be expanded at Bacchus Marsh Aerodrome, the aerodrome operator should produce ANEF contours to verify that sensitive land uses in the Precinct PSP do not lay in the areas with ANEF exceeding 20.</i>
6	National airport safeguarding network	6.5.6	Refer to Item 1.2 above	Refer to Item 1.2 in above.
7	Vibration impact	6.7	Vibration from train movements potentially impact a part of the Parwan PSP adjacent to the rail corridor.	Vibration assessment is recommended in the event sensitive developments are planned adjacent to the rail corridor.

6. Future land use planning considerations

6.1 Key findings and development constraints

The key findings from each of the assessments are detailed below.

6.1.1 Odour and dust

EPA complaint history indicates that odour has been the predominant adverse amenity impact to air quality surrounding the Precinct. The most known number of complaints was attributed to Maddingley Brown Coal Pty Ltd followed by Boratto Farms Pty Ltd with most complaints lodged at receptors within the Maddingley residential area. Majority of complaints were odour related with the most common being described as fertiliser/manure or chemical type smells. From GHD's site visit, it is noted that this type of odour character is more likely to be from a market garden farm than the Maddingley Brown Coal site and the residents making the complaint may have wrongly identified the alleged source.

Ten industries within the assessment area (2 km radius from the Parwan PSP Precinct boundary) were identified as requiring a separation distance based on the EPA separation distance guidelines.

The application of separation distances from the EPA guidelines showed that the Parwan PSP Precinct is affected by separation distances. The industry with the largest constraint on the Parwan PSP Precinct is the Maddingley Brown Coal Composting facility with a 2,200 m separation distance followed by the Maddingley Brown Coal Coalmine with a 1,000 m separation distance and the Bacchus Marsh Irrigation District with a 500 m separation distance. The Maddingley Brown Coal Coalmine separation distance partially encompasses part of the western side of the PSP Precinct. The Maddingley Brown Coal composting facility 2,200 m separation distance extends 460 m into the PSP while the Bacchus Marsh Irrigation District 500 m separation distance extends 370 m into the proposed residential land to the south.

The identified three separation distances affecting the Parwan PSP are in direct conflict with the recommended precinct planning principles as recommended in the UGF namely;

- *Avoid new sensitive land uses from establishing within relevant buffers to the Maddingley Waste Resource and Recovery Hub*

In terms of the other key recommended precinct planning principles as recommended in the UGF the following can be concluded:

- *Ensure that sequencing of Parwan PSP precinct protects the existing use rights of the broiler farm at 51 Browns Lane, by identifying an amenity buffer where no sensitive uses will be permitted until such time as the broiler farm use ceases*
 - The broiler farm at 51 Browns Road has already ceased operations thereby no longer requiring a separation distance
 - It is noted that whilst operation of broiler farm appears to have ceased, it does not appear that a new use has commenced on the land. Another broiler farm may relocate in this location and that further assessment of separation distance may be required when/if this occurs.

- *Ensure that land zoned for sensitive uses is located beyond the buffer distance to Bacchus Marsh Recycled Water Plant as determined in Western Water’s odour dispersion modelling project; or work with Western Water to deliver treatment plant upgrades to facilitate a reduced buffer distance. Any reduced buffer distance must be at least 1.4 km and will be subject to the proponents committing to a substantial financial contribution towards treatment plant upgrades*
 - The proposed sensitive uses within the Parwan PSP are located beyond the existing 1.4 km WRP separation distance. The odour modelling provided to GHD supports this distance for existing routine operations which is what the Draft EPA Publication 1949 requires a distance for. Future upgrades to the plant will result in a lesser separation distance than current distance which will reduce the odour risk to the Parwan PSP in the longer term.
 - It is also noted that this separation distance is represented by the Parwan PSP boundary.
- *Consider interfaces with environmental assets such as Werribee River, Parwan Gorge and BMID, to protect and enhance biodiversity values and agricultural land uses, and to achieve attractive development for local residents*
 - A 500 m odour separation distance is recommended by Draft EPA Publication 1949 for the market gardens located within the BMID

The identified separation distances are also in conflict with the Municipal Planning Strategy; namely

- To protect existing and future industrial and agribusiness land uses from the encroachment of sensitive land uses particularly Maddingley Waste and Resource Recovery Hub and the BMID.

In terms of other constraints identified to the Parwan PSP, a 20 m set back to mitigate air emissions from roads were also recommended for The Parwan-Exford Road which crosses the Parwan PSP in east-west direction and the Geelong-Bacchus Marsh Road located at the western boundary of the Parwan PSP.

Draft EPA Publication 1949 outlines that a separation distance may be varied if a risk assessment is undertaken to determine the variability of the separation distance. The following factors are identified as impacting the acceptability of a recommended separation distance for odour and dust:

- Cumulative impacts
- Interface land uses
- The scale and configuration of the operation
- The environment surrounding the odour emitter
- Size of the source
- Type of dust emission
- Meteorology
- Terrain and interface land use
- The sensitivity of the receptor (existing and/or proposed)
- Historical context
- Management practices and engineering controls employed by the relevant industry

Some of these factors may influence the acceptability of the recommended separation distances identified to pose a constraint, in such cases EPA recommends a risk assessment be prepared to demonstrate that either the recommended separation distance is acceptable, or the recommended separation distance can be varied. Given both conflicting sites relate to odour, any risk assessment should be undertaken in line with EPA Publication 1883 *Guidance for assessing odour*. An odour risk assessment in accordance with EPA Publication 1883 *Guidance for Assessing Odour* may include:

- Level 2 Assessment:
 - Source-Pathway-Receptor assessment
- Level 3 Assessment:
 - Comparison with similar operations
 - Field odour surveillance
 - Complaint data analysis
 - Dispersion modelling

A number of separation distances were also identified to encompass areas within the Parwan employment Precinct (PEP) particularly to the east. This includes the Maddingley Brown Coal coalmine, landfill and composting operations, the Bacchus Marsh RWP, the Geelong-Bacchus March broiler farm, Eden hills pet crematorium and L&G meats facility. The land uses encompassed by the distances proposed to form part of the PEP are not defined as sensitive use therefore the separation distances outlined do not pose a constraint to the PEP. In fact, the type of uses proposed are in line with what EPA consider to be 'interface uses'. Interface land uses are those that can be located within separation distances between industrial land uses and sensitive land uses. Interface land uses neither generate significant odour emissions, nor warrant protection from them.

6.1.2 Noise and vibration

During a site visit to the Precinct, the ambient noise environment was observed. Dominant noise sources were noted to vary across the Precinct. It may be local traffic and intermittent heavy vehicles servicing industrial facilities, rail noise in the area adjacent to the rail corridor or natural background. The following activities and industries were observed to have the potential to impact the Parwan PSP:

- Melbourne-Ararat rail corridor (frequent noise from passing trains)
- Noise from broiler farm
- Noise from Bacchus Marsh WRP
- Noise from Maddingley Brown Coal
- Western freeway (constant hum from traffic or varying sound levels in the northern part of the Precinct)
- Parwan-Exford Road (intermittent traffic noise)
- Geelong- Bacchus Marsh Road (intermittent traffic noise)
- Aircraft flyovers (rare aircraft noise)

Noise monitoring programme was performed to characterise existing noise impact at the northern, western, southern boundaries of the Parwan PSP Precinct and in area adjacent to the rail corridor. Unattended noise measurements were taken for period of two weeks from 15 March to 29 March 2023 in line with requirements in EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol).

Noise at all locations was seen to be affected by natural background. Noise from the Western freeway was clearly audible at location R4. Since location R2 is adjacent to the rail corridor, noise from train pass-bys and rail crossing contributes to measured levels as well as traffic noise from Parwan-Exford Road. Rail noise was also audible at times at location R2, but it was more controlled by local natural background and agricultural activities.

Sensitive land uses adjacent to the rail corridor and arterial roads are subject to noise control requirements in Moorabool Planning Scheme and other regulatory documents as described in section 5.5. Noise influence area extends 80 m from the nearest track since the corridor is outside of Melbourne metropolitan area. Accordingly, proposed noise sensitive development close to the rail corridor should be required to undertake a detailed noise intrusion assessment by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority, to demonstrate that the proposed design meets the following internal noise limits from external noise sources:

- Recommended indoor noise limits outlined in VPP Clause 58.04-3 as follows:
 - a. Not greater than 35 dB(A) for bedrooms, assessed as an LAeq,8h from 10 pm to 6 am
 - b. Not greater than 40 dB(A) for living areas, assessed LAeq,16h from 6 am to 10 pm

Due to the quiet rural nature of the area within and surrounding the Parwan PSP Precinct, it is recommended that the above indoor noise limits are met, regardless of whether the proposed dwelling is located within a noise influence area or not. This includes consideration of small industrial and commercial establishments such as auto facilities and the like.

Any proposed development within the Precinct should be designed and constructed such that the environmental noise emissions comply with the requirements of the Noise Protocol at the relevant surrounding noise sensitive receivers. This also includes new small commercial establishments such as petrol stations, auto facilities, workshops and the like.

Where relevant, the planning authority should ensure that appropriate planning conditions are imposed to require prospective developments to demonstrate compliance with the Noise Protocol at surrounding noise sensitive areas. This involves requiring an acoustic assessment by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority, to demonstrate that the proposed development comply with the requirements of the Noise Protocol.

6.2 Mitigation measures

It is assumed that the development of the site will occur incrementally over time, and therefore it is important that the management of the transition from existing to proposed uses minimises short term impacts of non-compatible uses.

Land use controls

Separating odour and/ or dust producing activities from sensitive areas using a setback strategy (e.g. open space design adjacent to odour and/or dust sources to provide a reduction through setback distances to sensitive uses) is commonly adopted and recommended as part of this study locating sensitive uses outside the identified separation distance areas of existing industries.

The identified separation distances, as a minimum, indicate where the establishment of sensitive uses should be avoided to reduce potential adverse amenity issues.

Based on separation distances, this report has highlighted a number of locations where existing industries may have a detrimental impact on the amenity of proposed new sensitive uses and pose a conflict to the proposed uses within the Parwan PSP.

It is considered that the location of sensitive uses within prescribed separation distances of existing industries could raise the following two problems:

1. A risk to future sensitive uses being subjected to unacceptable odour, noise and dust during operations (amenity impacts).
2. The encroachment of sensitive uses on the separation distance areas of existing industries may result in unachievable or unreasonable requirements on the industries to mitigate the impacts at the source (reverse amenity impacts).

In order to manage the conflicts between existing and proposed land uses, there must be a balance between selecting measures that sufficiently mitigate amenity impacts, and avoiding over regulation and therefore impacting on the ability to achieve other objectives such as urban growth and environmental sustainability.

Use of interface land uses located within separation distances between industrial land uses and sensitive land uses is another measure that can be utilised. Interface land uses neither generate significant odour emissions, nor warrant protection from them. Table 3 from Draft EPA Publication 1949 provides examples of activities and their suitability as interface land uses. Other activities not listed should be assessed in accordance with the principles contained in this document.

Staged development

Undertake a staged development approach to the extent possible as the area is predominantly in private ownership – so that sensitive uses are not developed within separation distance areas until the industry adequately reduces the off-site impacts or provides information pertaining to transitioning out of the area. Planning policy may be introduced to support this approach and put the onus on ensuring appropriate separation rests with the encroaching sensitive land use.

Implementation of application requirements for sensitive uses

Given that the VPA is seeking to introduce sensitive uses inside the separation distances of the two constraining industries, application requirements would be recommended to be implemented into the planning scheme to appropriately facilitate sensitive uses within the separation distances and manage the risk of adverse amenity. Such application requirements could be implemented within proposed zoning controls (or schedule within). The requirement would apply to any application to develop land for a sensitive use which includes:

- Sensitive uses
 - Accommodation
 - Residential premises
 - Child care centre
 - Pre-schools
 - Primary schools
 - Education centres
 - Hospitals
 - Place of assembly
 - Aged care facility

The following requirement is recommended for further consideration:

- Application requirement:

While the industries continue to operate, an application to use or develop land for a sensitive use which includes accommodation, residential premises, child care centres, pre-schools, primary schools, education centres, hospitals, place of assembly and aged care facility within the separation distances as shown in must be accompanied by the following information:

 - *A odour/dust risk assessment in accordance with Draft EPA Publication 1949 – Recommended separation distances for industrial residual air emissions, December 2022 or as Amended, prepared by a suitably experienced and qualified person to the satisfaction of the responsible authority, in consultation with the Environment Protection Authority.*

Before deciding on an application, the responsible authority must consider, as appropriate:

- *The impacts of uses with adverse amenity potential on a proposed use or development for a sensitive use where the land to which the application applies is within the separation distance for the identified industries.*

Referral Requirement:

Applications for a sensitive use that fall within a separation distance must be referred to the Environmental Protection Authority (EPA) for comment.

Control through built form

Some possible air and noise mitigation strategies that are available include (see sections 4.10 and 5.9 for further detail):

- Control in transmission i.e. noise barriers
- Control at receiver i.e. building orientation, building façade acoustic treatment, mechanical ventilation for rooms facing the potential source

Control at source

Odour, dust and noise emissions at source in an industrial premises can be reduced by treatment/control. This can be requested for new industries as part of best practice or required by EPA. For those industries identified to cause a constraint, it is the EPA's responsibility to enforce compliance with Environmental Reference Standard (ERS) and the General Environmental Duty (GED) so that these sites do not cause off-site adverse impacts or complaints under normal operations. EPA is also responsible for validating and investigating any complaints that they receive.

6.3 Recommended actions

There are a number of different types of planning controls that could be implemented to assist in mitigating the potential for adverse amenity impacts.

Based on the above investigations, the following recommendations should be considered:



- Undertake an odour risk assessment of the constraining industries, which may result in a variation of the separation distances (Stage 2 of the assessment). GHD notes that the purpose of the risk assessment would be not to redraw a line in the sand outside of which there are “no risks”, but to assist in determining the level of risk of harm to human health and the environment and inform on the degree of risk in areas within the separation distance and what uses may be suitable.
- Careful strategic planning of land uses to:
 - Plan where different types of land uses can be located using a setback strategy (separation distances) noting the planning principles outlined in the UGF and Municipal Planning Strategy.
 - Manage and minimise noise impact from sensitive and non-sensitive land use interfaces including but not limited to consideration of in-principle noise mitigation strategies outlined in this report.
 - Locate complimentary commercial and other business uses within the specified buffer distances to industrial developments and adjacent to arterial roads (interface land uses). The commercial and business land uses would act as a physical buffer between industrial activities and more sensitive land uses.
- The implementation of design controls within the Moorabool Planning Scheme (the planning scheme) and where appropriate development approval process to:
 - Implement application requirements into the planning scheme to appropriately facilitate sensitive uses within the separation distances and manage the risk of adverse amenity(i.e. an application requirement to undertake an odour/dust risk assessment).
 - Where appropriate place specific planning requirements as part of planning scheme amendments or planning permit conditions (i.e. control of air quality and noise emission) on proposed sensitive land use and developments in particular areas and implementing separation distance areas.
 - Require any proposed sensitive land uses to undertake external noise intrusion assessment to demonstrate that the development is designed and constructed to achieve recommended noise amenity targets outlined in VPP Clause 58.04-3 and sleep disturbance criteria as defined by World Health Organisation from external noise sources.
 - Require any noise sensitive land use located within 80 m of the rail track line, to undertake external noise intrusion assessment to demonstrate that the development is designed and constructed to achieve recommended noise amenity targets outlined in VPP Clause 58.04-3 and sleep disturbance criteria as defined by World Health Organisation from rail noise.
 - Require developments with potential to generate noise to undertake further acoustic assessment to demonstrate that the development is designed and constructed to comply with the Noise Protocol requirements at surrounding sensitive uses (including within the Precinct).

Appendices

Appendix A

Noise monitoring locations

Monitoring location	Position
60 Browns Lane	
10 Whelans Road	

Monitoring location	Position
65 Parwan South Road	
170 Whelans Rd	

Appendix B

Results of noise monitoring

60 Browns Lane

Date	Background level, L _{A90} dB(A)			Ambient noise level, L _{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wednesday-15-Mar-23 **	33.8	35.4	32.2	56.4	50.2	43.4
Thursday-16-Mar-23**	44.0	38.5	31.0	50.5	42.9	44.2
Friday-17-Mar-23	33.6	41.0	34.3	46.7	48.1	41.8
Saturday-18-Mar-23	*	38.9	29.3	*	48.9	45.5
Sunday-19-Mar-23 **	36.0	40.6	24.2	45.9	47.3	41.2
Monday-20-Mar-23	*	35.5	23.6	*	45.7	42.5
Tuesday-21-Mar-23	34.8	40.9	30.8	49.3	47.0	45.1
Wednesday-22-Mar-23	35.8	34.2	29.9	47.2	47.3	42.0
Thursday-23-Mar-23	34.4	38.9	31.9	47.3	63.5	44.1
Friday-24-Mar-23 **	37.4	34.6	22.1	47.5	42.6	39.4
Saturday-25-Mar-23 **	40.1	35.9	22.9	47.3	44.9	39.8
Sunday-26-Mar-23	34.2	33.4	25.9	45.7	55.4	35.5
Monday-27-Mar-23 **	35.8	38.1	33.3	44.8	45.2	40.8

* No valid data is acquired during period

** Some hourly periods were affected by adverse environmental conditions, fields shown in red

10 Whelans Rd

Date	Background level, L _{A90} dB(A)			Ambient noise level, L _{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wednesday-15-Mar-23 **	39.3	32.0	29.3	72.2	65.1	59.0
Thursday-16-Mar-23**	41.5	35.1	31.3	63.5	69.2	60.7
Friday-17-Mar-23	31.9	32.1	30.6	63.9	69.6	57.5
Saturday-18-Mar-23	*	33.9	27.1	*	63.5	53.1
Sunday-19-Mar-23 **	30.9	38.0	22.9	61.5	59.7	49.1
Monday-20-Mar-23	*	29.4	20.3	*	69.2	61.9
Tuesday-21-Mar-23	34.2	32.8	25.7	64.6	65.0	59.3
Wednesday-22-Mar-23	34.0	31.8	30.1	65.2	66.1	60.5
Thursday-23-Mar-23	35.7	33.4	29.3	63.4	66.5	58.8
Friday-24-Mar-23 **	35.9	31.7	19.0	63.4	67.0	54.8
Saturday-25-Mar-23 **	33.1	28.3	17.8	61.1	62.2	58.6
Sunday-26-Mar-23	32.3	29.2	20.4	62.8	61.5	50.8
Monday-27-Mar-23 **	36.3	35.9	25.3	64.1	68.6	61.6

* No valid data is acquired during period

** Some hourly periods were affected by adverse environmental conditions, fields shown in red

65 Parwan South Rd

Date	Background level, L _{A90} dB(A)			Ambient noise level, L _{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wednesday-15-Mar-23 **	26.8	29.3	26.9	40.4	40.8	39.8
Thursday-16-Mar-23**	38.4	32.4	30.2	45.8	43.4	43.2
Friday-17-Mar-23	26.9	31.6	26.8	39.7	50.8	41.6
Saturday-18-Mar-23	*	28.5	27.1	*	44.9	41.3
Sunday-19-Mar-23 **	25.8	33.5	19.2	39.0	41.0	33.3
Monday-20-Mar-23	*	28.9	18.5	*	44.4	41.3
Tuesday-21-Mar-23	30.9	34.3	23.7	44.0	46.6	43.0
Wednesday-22-Mar-23	23.9	31.6	32.8	43.3	44.8	43.4
Thursday-23-Mar-23	25.9	32.6	28.8	44.8	63.8	43.1
Friday-24-Mar-23 **	31.1	27.1	17.7	39.7	39.4	34.6
Saturday-25-Mar-23 **	29.5	27.4	17.6	42.2	37.2	32.8
Sunday-26-Mar-23	27.7	28.2	18.3	40.8	44.2	34.0
Monday-27-Mar-23 **	28.0	32.5	26.8	48.8	43.5	37.9

* No valid data is acquired during period

** Some hourly periods were affected by adverse environmental conditions, fields shown in red

170 Whelans Rd

Date	Background level, L _{A90} dB(A)			Ambient noise level, L _{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wednesday-15-Mar-23 **	35.3	33.6	31.8	40.8	42.9	44.6
Thursday-16-Mar-23**	44.6	39.0	25.1	47.9	42.8	41.7
Friday-17-Mar-23	35.9	36.6	37.1	44.0	43.2	45.7
Saturday-18-Mar-23	*	27.9	22.3	*	39.5	32.9
Sunday-19-Mar-23 **	31.3	33.8	20.1	39.7	39.6	32.8
Monday-20-Mar-23	*	32.4	25.6	*	39.3	45.5
Tuesday-21-Mar-23	42.4	41.4	27.6	51.6	47.3	46.7
Wednesday-22-Mar-23	33.5	30.2	26.1	46.4	40.2	39.5
Thursday-23-Mar-23	34.3	32.2	23.1	43.7	45.8	35.7
Friday-24-Mar-23 **	31.9	35.3	27.8	43.0	39.7	39.2
Saturday-25-Mar-23 **	33.2	33.7	24.8	43.5	37.1	37.7
Sunday-26-Mar-23	35.1	33.5	21.5	45.2	41.1	39.4
Monday-27-Mar-23 **	44.3	40.8	23.3	48.3	49.8	41.9

* No valid data is acquired during period

** Some hourly periods were affected by adverse environmental conditions, fields shown in red



ghd.com

→ **The Power of Commitment**