DESIGN ADVICE

MARSHALL DAY Acoustics

Project:	20201153	**Document No.:**	Da 001		
To:	Victorian Planning Authority	**Date:**	6 October 2021		
Attention:	Deanne Sheppard	**Cross Reference:**	Rp 001 01Draft 20201153		
Email:	Deanne.Sheppard@vpa.gov.au	**Project No.:**	20201153		
From:	Ima Fricker	**No. Pages:**	8	**Attachments:**	Yes
Subject:	Wallan East (Part 1) PSP – Noise assessment update				

INTRODUCTION

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

A high level noise impact assessment[1] for the subject site was prepared by Marshall Day Acoustics Pty Ltd (MDA) which investigated potential noise impacts to sensitive uses within the PSP associated with:

- The North East Railway Line (NERL) which runs adjacent the west site boundary. The assessment allowed for increased freight traffic associated with the Inland Rail Project and Beveridge Intermodal Freight Terminal (BIFT)
- Increased road traffic from Wallan-Whittlesea Road to the south, and Epping-Kilmore Road to the east. As the Hume Highway is located sufficiently far from site, the noise monitoring results indicated that noise barriers are not required to attenuate road traffic noise
- Potential commercial uses on site, including the existing City Gate infrastructure to the south of site. Applicable noise limits for the City Gate and potential use of an on-site stabling facility were also determined in accordance with the Victorian Environmental Protection Authority (EPA) Publication 1411 *Noise from Industry in Regional Victoria* (NIRV)[2].

On 16 September 2021 a meeting was held between MDA, VPA, Urbis and the Department of Transport (DoT) to discuss the outcomes of the Draft Report, and subsequent noise modelling included in the latest MDA Design Advice (DA)[3]

During the meeting there was general agreement from all parties that train horn noise is the loudest noise source associated with the NERL, and hence, the deciding criteria in terms of assessing operational train noise to sensitive uses within the PSP.

For reference, Table B of the Department of Transport *Passenger Rail Infrastructure Noise Policy* (PRINP) provides an investigation threshold of 85 dB L_{Amax} for a change in land use near an existing rail corridor applicable to the PSP. As per Section 6 of the PRINP:

> *The investigation thresholds are provided to guide transport bodies and planning authorities when assessing the impacts of rail noise on nearby communities and exposure of people to passenger rail noise. They are not a limit on allowable noise emissions.*

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1 MDA Report Rp 001 01Draft 20201153 *Wallan East (Part 1) PSP High Level Noise Impact Assessment*, dated 12 May 2021 (referred to as 'the Draft Report')

2 On 1 July 2021 NIRV was replaced by EPA Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*, dated May 2021

3 MDA Da 001 20201153 *Wall East (Part 1) PSP Horn noise modelling results*, dated 10 September 2021 (referred to as 'Da 001')

Certified System ISO 9001

If an assessment shows the investigation thresholds are not exceeded, noise impacts should be considered a secondary matter. This means no further action need be considered under this policy.

In the context of the Wallan East site, it is understood that the use of the proposed stabling yard is likely to result in a significant increase in the use of horns (i.e. up to an additional 80 horns sounded between 0400 and 0600 hrs). As such, the use of emergency horns at the stabling yard has also been considered, in addition to operational noise from the facility.

We provide below the latest assessment and noise modelling results for the site.

EXISTING NOISE LEVELS ACROSS PSP SITE

Section 7.1 of the Draft Report provides detailed noise monitoring results along the NERL, the results of which have been reproduced in Table 1.

Table 1: Maximum and average rail noise levels, dB

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

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

As part of the recent analysis, audio recordings of several horn soundings at the southwest noise monitoring location were analysed to determine the typical duration, range of noise levels and sound spectrum associated with horn use near the level crossing.

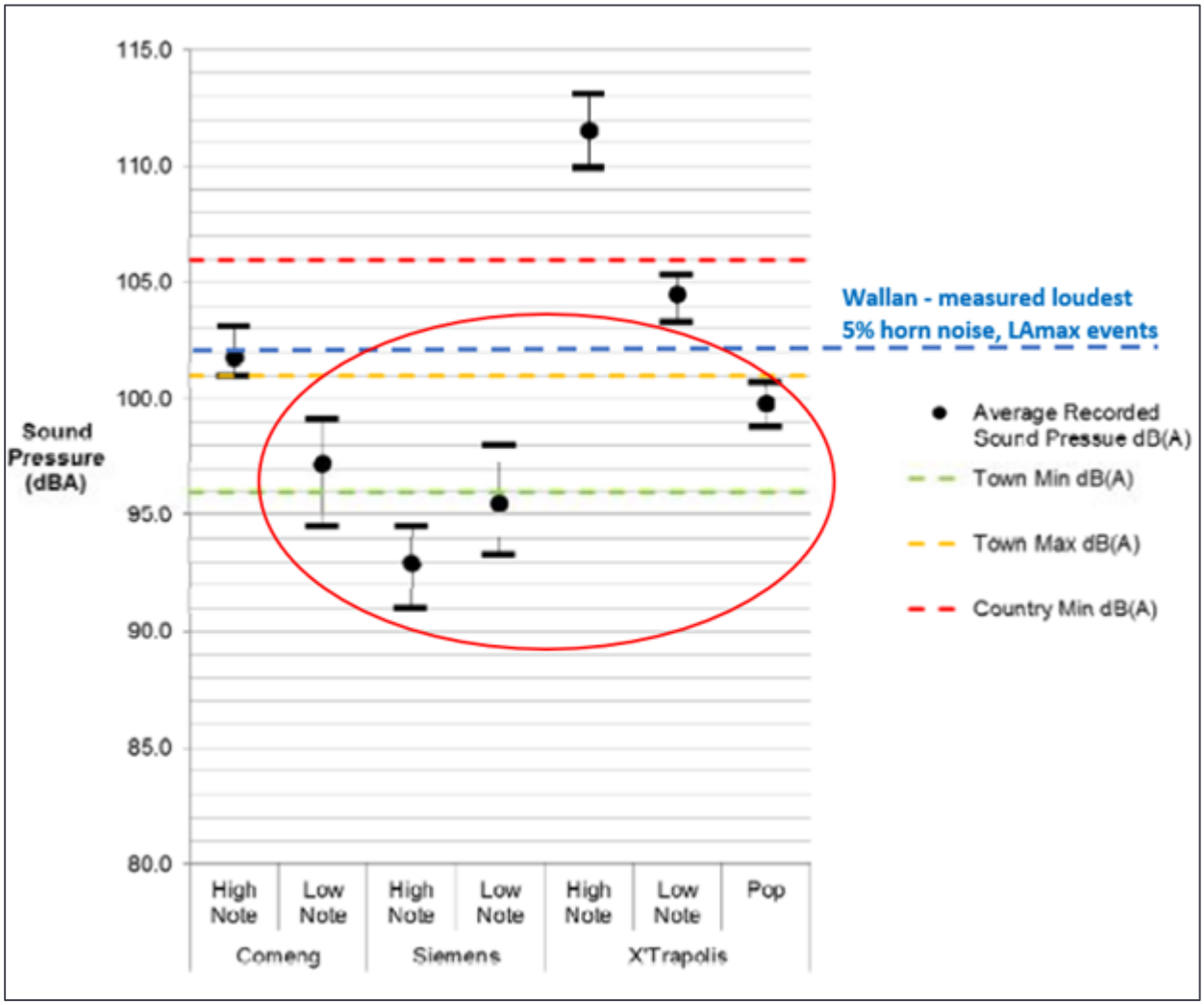
Noise from horns along the NERL was found to typically range between 81-95 dB L_{Amax} at 60 m with each use typically lasting only 3 seconds; however, in some rare circumstances this extended to a total of 6 seconds

For reference, noise from train pass-by movements (a mixture of noise from the locomotives exhaust and wheel-rail noise, without horn use) was typically 10 to 20 dB quieter relative to horn use (also as an L_{Amax}), with the movements typically lasting anywhere from 11 to 20 seconds for passenger trains and up to 60 seconds for freight trains.

It is understood that the line will eventually be electrified with Metro Trains Melbourne (MTM) also using the line. Figure 1 shows the measured Wallan results compared with reference MTM horn data[4] normalised to a distance of 30 m. The measurement results within the PSP site correlate well with the maximum range of the 'Town horn'. Assuming all future MTM rolling stock use the appropriate horn settings, this is unlikely to increase existing horn noise within the subject PSP.

[4] MTM Engineering Technical Report – Rolling Stock L2-ROS-REP-012 *Train Horn Noise Level Assessment*, dated September 2016 (provided by VPA on September 2016 to quantify any changes with MTM usage)

Figure 1: Measured Wallan horn noise compared with reference MTM data (normalised to 30 m)



HORN NOISE ASSESSMENT

A calibrated noise model was prepared based on the measured horn noise levels to determine typical noise levels across proposed residential areas identified in the latest Place Based Plan (PBP), provided by the VPA on 28 September 2021.

The PRINP sets 'investigation thresholds' for the assessment of noise. These are noise levels, which if exceeded, indicate that noise mitigation should be considered. For change in land use near an existing rail corridor, the specified investigation threshold is 85 dB L_{Amax}.

Table 2 shows the predicted noise from horn use at these noise sensitive areas for the following scenarios:

- Horn use across the entire updated alignment (Note: the through line now runs up to 35 m east of the existing track near Wallan-Whittlesea Road, south of the site)

  See noise contour plot provided in Attachment A, Map 1; and

- Horn use along the stabling area (located west of the updated NERL through line)

  See noise contour plot provided in Attachment A, Map 2.

Table 2: Predicted train horn noise levels across the PSP site, dB L_{Amax}

PBP sensitive receptor location	Distance from the rail corridor	Horn use across entire updated alignment	Horn use through stabling area
North residential	125 m	87	61
Medium density residential	125 m	87	70
High density residential (north)	260 m	80	78
High density residential (south)	180 m	83	83

The noise modelling results show that the PRINP 85 dB L_{Amax} investigation threshold is met across most of the PSP site. The only region where horn noise is predicted to be above the investigation threshold is the approximate 10,000 m² parcel of medium density residential land extending approximately 500 m south of Kelby Road at the northern site boundary. However, given the marginal excess of 2 dB, any potential sleep disturbance impacts to residential dwellings located in this area can be adequately controlled by minor building treatment upgrades to bedrooms/sleeping areas located within this area.

NOISE CONTROL CONSIDERATIONS

Given the horn is typically located 4 to 4.6 m above the top of rail (TOR) for most trains, any effective noise barrier or bund would need to be at least 5 m high to cut the line of sight to single storey dwellings. For multi-storey dwellings, the required barrier height would need to increase accordingly.

It is also worth noting that for this type of mitigation measure to be effective, it would need to be located as close as possible to either the source or the receiver. However, during the next phase of works, noise predictions would be presented with a range of noise mitigation options to demonstrate the effectiveness of noise barriers, or lack thereof.

In Victoria, it is common practice to assess noise from transient events such as horn use against sleep disturbance criteria sourced from the *NSW Road Noise Policy 2011*. The NSW policy notes that, from the research on sleep disturbance to date, it can be concluded that:

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

Considering the predicted noise levels presented in the above section, it is envisaged that any potential sleep disturbance impacts associated with horn use along the line can be controlled throughout proposed residential areas identified in the latest PBP by relatively minor upgrades to the glazing/ventilation paths.

Preliminary calculations indicate that a standard bedroom with a 2.1 x 2.4 m window facing the railway line could reduce horn noise levels below 56 dB L_{Amax} by using relatively standard glazing configurations (i.e. with 12.76 mm laminated glass or 6/12/6.38 thermal IGU glazing).

Table 3: Predicted internal horn noise from proposed NERL through line, dB L_{Amax}

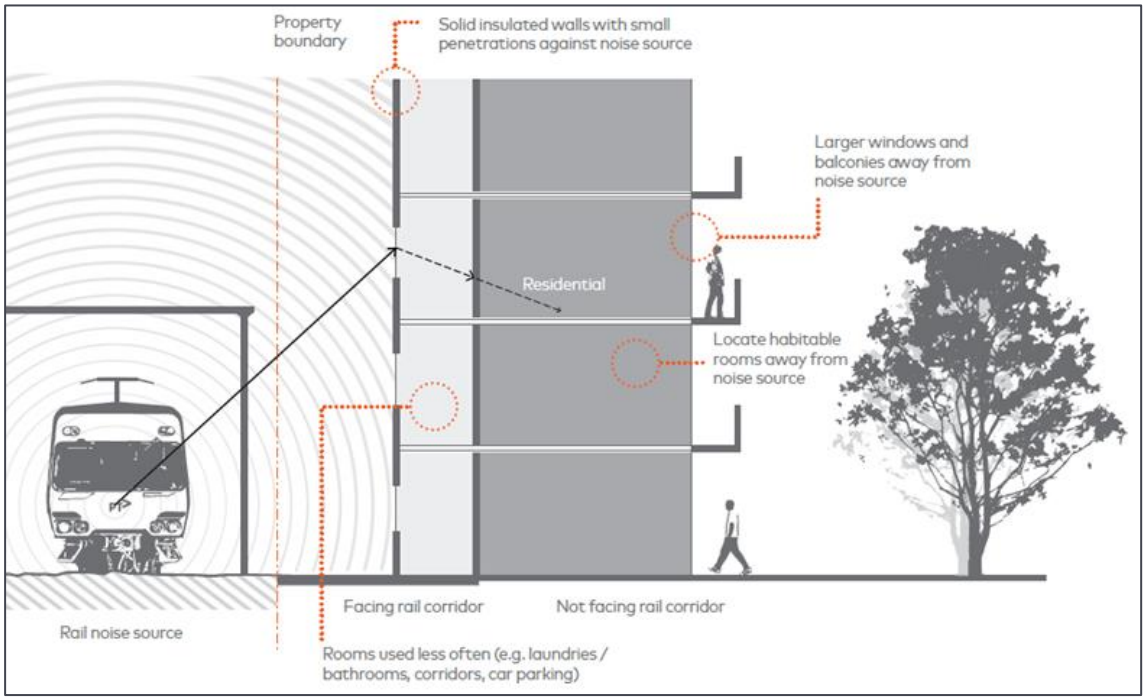
PBP sensitive receptor location	Distance from the rail corridor	External horn noise	Internal noise	Indicative window treatment
North residential	125 m	87	55	12.76 mm lam or 6/12/6.38 IGU
Medium density residential	125 m	87	55	12.76 mm lam or 6/12/6.38 IGU
High density residential (north)	260 m	80	53	Standard 4 mm per Safety
High density residential (south)	180 m	83	53	6 mm lam or 6/12/6 IGU

Note: The above preliminary results allow for a furnished bedroom with hard floor (i.e. polished boards) and a total glazed area facing the railway line of approximately 5 m². Where larger windows are proposed higher performance glazing may be necessary

It is envisaged that a design and development overlay (DDO) could be used to ensure that sensitive uses exposed to residual horn noise above the PRINP 85 dB L_{Amax} investigation threshold are adequately considered throughout the design process. This could be achieved by using building facade treatments similar to those presented above and/or a combination of the following:

- Where possible, as shown in Figure 2, design residential buildings so that bedrooms and living areas are located away from the rail corridor by:
  - Locating non-sensitive areas such as bathrooms, laundries, corridors and stairwells on the rail corridor side
  - In mixed use developments, locating intervening commercial and non-sensitive uses / buildings immediately adjacent the railway line
  - In multi-level developments, locating a car park adjacent to the rail corridor to provide a useful buffer
- Maximise solid building mass adjacent to the rail corridor;
- Configure building layouts to reduce the impact of noise. For example, by extending walled areas or maximising the built form to act as a noise barrier;
- Consider the type of materials used adjacent the rail corridor as lightweight construction can have poor acoustic performance compared to masonry;
- Minimise the use of windows adjacent to the rail corridor
- Where sleeping areas face the railway corridor, consider the use of semi-enclosed winter gardens or acoustic double glazing.

Figure 2: Good design advice for sensitive areas near rail



Source: *VicTrack Rail Development Interface Guidelines*

STABLING YARD NOISE ASSESSMENT

The noise modelling results presented in the preceding section indicate that the operation of train horns associated with the use of the stabling yard is unlikely to adversely affect noise sensitive uses within throughout proposed residential areas identified in the latest PBP design.

It is understood that as the proposed stabling yard will be considered as agent of change to surrounding noise sensitive land uses (inclusive of both existing residential areas to the west and the approved PSP design to the east). As such, a detailed noise assessment will need to be undertaken to demonstrate compliance with the mandatory operational noise limits provided in EPA 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).

Using the Urban area method as detailed in the Noise Protocol, noise limits are determined for the day, evening, and night periods, with different adjustments applicable based on high background noise, distance from the noise generating zone, and for extractive type industries.

The limits are separately defined for the day, evening, and night periods. The time periods are defined in Regulation 116 of the *Environment Protection Regulations 2021* and summarised in Table 4.

Table 4: Noise Protocol time periods

Period	Day of week	Start time	End time
Day	Monday-Saturday	0700 hrs	1800 hrs
Evening	Monday-Saturday	1800 hrs	2200 hrs
	Sunday, Public holidays	0700 hrs	2200 hrs
Night	Monday-Sunday	2200 hrs	0700 hrs

Noise limits applicable at sensitive receivers closest the stabling yard are provided in Table 4.

Table 5: Urban method noise limits, dB

Period	Zoning Level, L_{eff}	Background noise level, L_{A90}	Noise Limit, L_{eff}
Day	55	47	55
Evening	49	48	51
Night	44	39	44

To provide an indicative assessment of operational noise from the stabling yard, it is assumed, based on advice by DoT and VPA, that a set of six car Electric Multiple Unit (EMU) is located on each of the two tracks closest the high density residential area at the southern end of the PBP. The assumed sound power level for each EMU idling car (as controlled by the air conditioning systems) is presented in Table 6.

Table 6: Assumed sound power data for major noise sources at Stabling Yard

	Octave band centre frequency, Hz							
Plant Item	**63**	**125**	**250**	**500**	**1 k**	**2 k**	**4 k**	**A**
EMU idling per car	78	81	83	79	76	72	66	81

Table 7 provides an indicative assessment of noise from the proposed stabling yard, for which the results are provided graphically as Attachment A, Map 3.

Table 7: Predicted stabling noise to sensitive uses across the PSP site, dB L_{eff}

PBP sensitive receptor location	Distance from the rail corridor	Predicted stabling noise
North residential	125 m	15
Medium density residential	125 m	21
High density residential (north)	260 m	30
High density residential (south)	180 m	32

Based on the indicative noise modelling results provided above, noise from the proposed stabling yard can be controlled to achieve compliance with the Noise Protocol at sensitive uses within the PSP.

For reference, the predicted operational noise from the idling EMU cars was also below the Environmental Reference Standard (ERS) objectives of 40 dB $L_{Aeq(8h)}$ and 50 dB $L_{Aeq(16h)}$ for Category 3 type uses (i.e. lower rise building form including lower density residential development).

Considering, the limited information currently available with regard to the proposed operations at the stabling yard it is recommended that a more detailed assessment is undertaken when further information is available.

SUMMARY

Where noise sensitive uses (i.e. residential dwellings) are located beyond 160 m of the rail reserve, the predicted maximum noise levels (L_{Amax}) from horn use along the railway line are predicted to comply with the Department of Transport *Passenger Rail Infrastructure Noise Policy* (PRINP) investigation threshold of 85 dB L_{Amax} for 'a change in land use near existing or planned passenger rail corridors'.

In accordance with the PRINP, noise impacts for these locations where the investigation threshold is achieved *should be considered a secondary matter. This means no further action need be considered under this policy*.

For proposed residential areas identified in the latest PBP design within 160 m of the rail reserve some level of noise attenuation would be required. This could include a combination of either of the following:

1. Building facade treatments (i.e. upgrades to the glazing and any ventilation paths/openings).

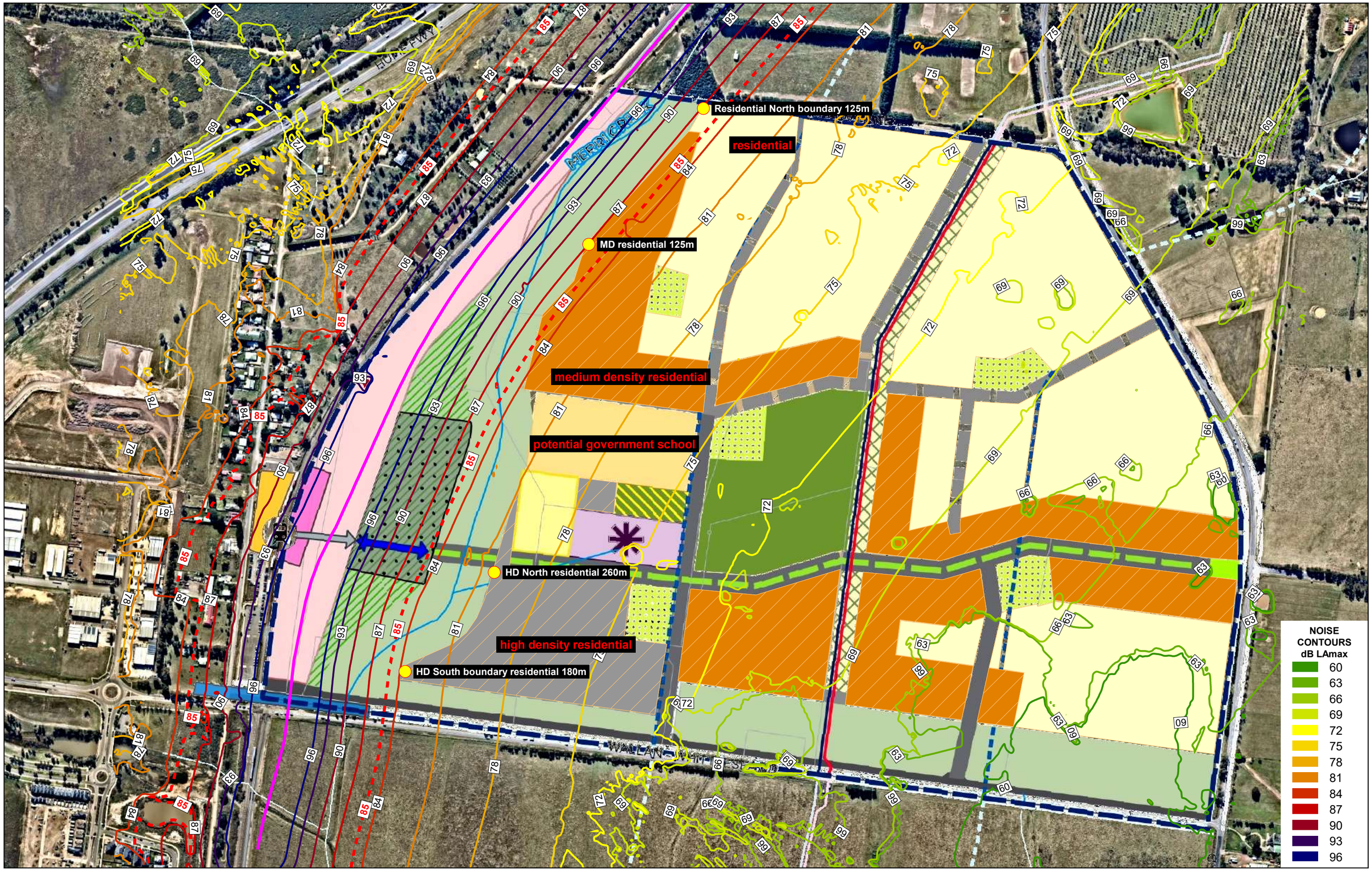
   Preliminary calculations indicate that internal noise amenity targets can be achieved without relying on the use of high performance acoustic double glazing systems.

2. A combination earth berm/noise wall with total height greater than 5 to 6 m

   However, it is worth noting that this option would only be effective without gaps and to protect single storey dwellings only.

3. Use of the existing built form (i.e. the first row of dwellings will provide significant shielding to those located behind).

Indicative predictions of operational noise from the proposed stabling yard show that compliance with the Noise Protocol noise limits can be achieved at proposed residential areas identified in the latest PBP design. However, considering the unknowns associated with the use of the proposed stabling yard, it is recommended that a more detailed assessment is undertaken as more information comes available.



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SCALE 1:5500

0 25 50 100 150 200 250 300 350 m

ORIENTATION

LEGEND

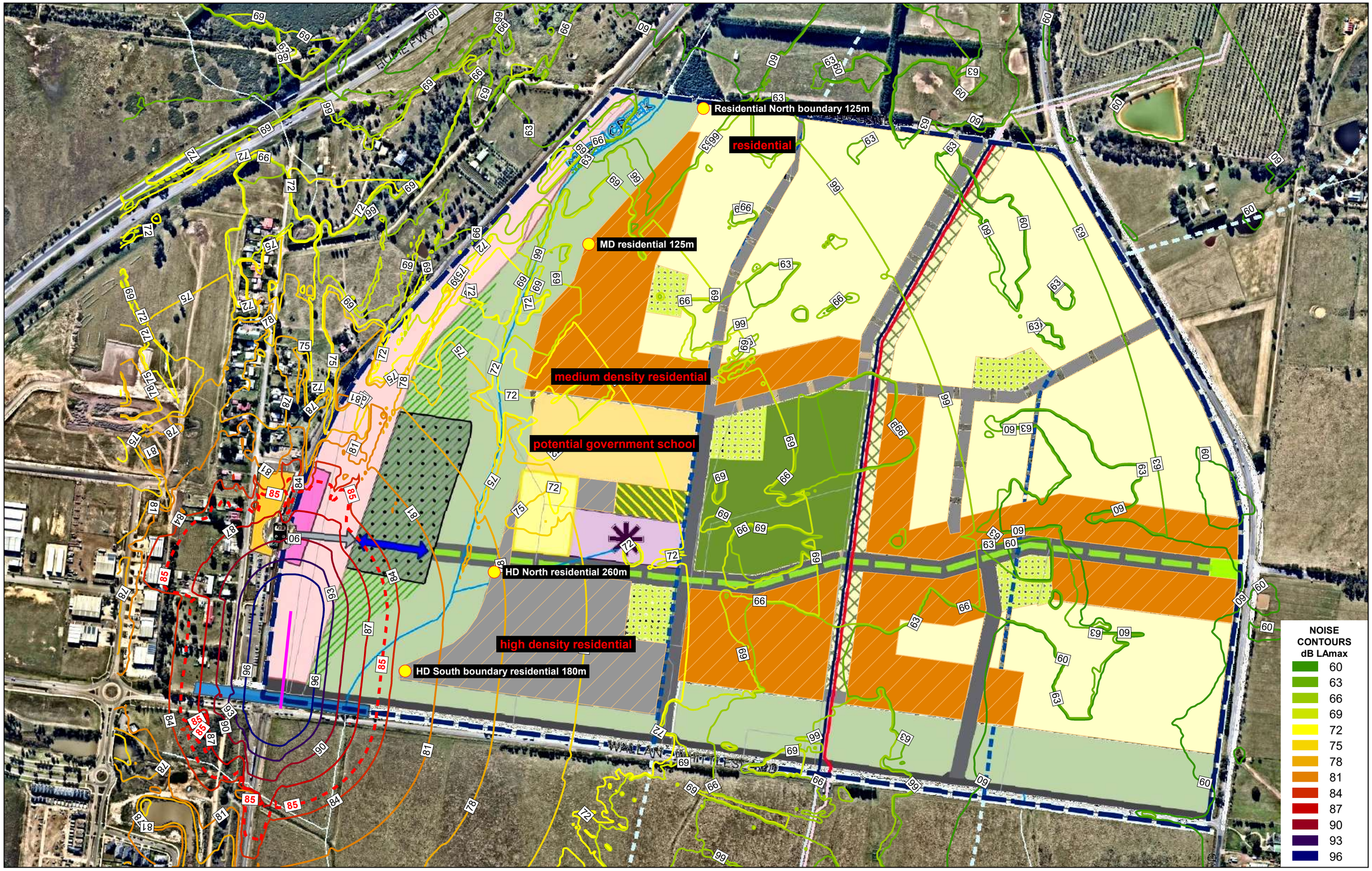
- PBP reference residential area
- Train Horn 4.4 m TOR
- 85 dB LAmax PRINP
- HD residential
- MD residential
- Residential

PROJECT	Wallan East (Part 1) PSP
CLIENT	VPA
DESCRIPTION	Horn noise along updated NERL line adjacent PSP

Date:	5/10/2021
Project No.:	20201153
Run No.:	2000
Prediction Method:	ISO 9613-2:1996
Prepared By:	I Fricker
Prediction Height:	1.5 m

APPENDIX
A

MAP NO.
001



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SCALE 1:5500

0 25 50 100 150 200 250 300 350 m

ORIENTATION

LEGEND

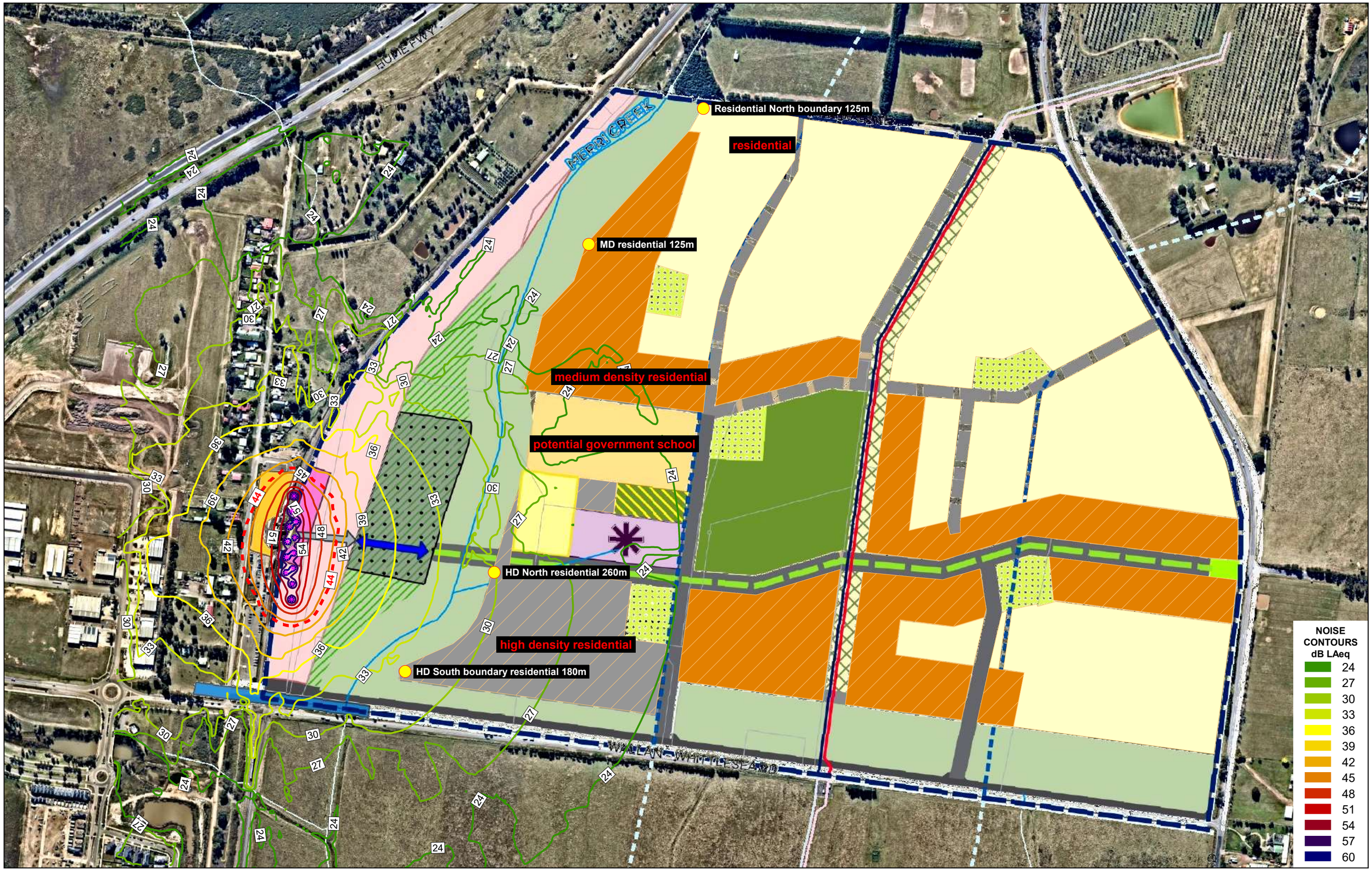
- PBP reference residential area
- Train Horn 4.4 m TOR
- 85 dB LAmax PRINP
- HD residential
- MD residential
- Residential

PROJECT	Wallan East (Part 1) PSP
CLIENT	VPA
DESCRIPTION	Horn use in Stabling Yard approximately 10-50m west of main NERL through line

Date:	5/10/2021
Project No.:	20201153
Run No.:	2001
Prediction Method:	ISO 9613-2:1996
Prepared By:	I Fricker
Prediction Height:	1.5 m

APPENDIX
A

MAP NO.
002



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SCALE 1:5500

0 25 50 100 150 200 250 300 350 m

ORIENTATION

N

LEGEND

- PBP reference residential area
- Train Horn 4.4 m TOR
- 44 dB Leff 1826 Night
- HD residential
- MD residential
- Residential

PROJECT	Wallan East (Part 1) PSP
CLIENT	VPA
DESCRIPTION	Idling EMU (2x6 car sets) at stabling area north of station

Date:	6/10/2021
Project No.:	20201153
Run No.:	2002
Prediction Method:	ISO 9613-2:1996
Prepared By:	I Fricker
Prediction Height:	1.5 m

APPENDIX
A

MAP NO.
003