Van Diemen Consulting

Vinegar Hill sand extraction pit and quarry environmental noise assessment

Report No. 5697_AC_R_R1

TARKARRI ENGINEERING PTY LTD
PO Box 506
Kings Meadows TAS 7249
August 2022

Tarkarri Engineering
Air Quality • Acoustics • Environment • Vibration

DOCUMENT CONTROL

VINEGAR HILL SAND EXTRACTION PIT AND QUARRY ENVIRONMENTAL NOISE ASSESSMENT

Report No.
5697_AC_R_R1
Prepared for
Van Diemen Consulting
32 Banticks Road
Mangalore
Tasmania 7030

Contact Dr Richard Barnes
☎
Mobile +61(0)438 588 695
Email rwbarnes73@gmail.com

Library Code
ACAQ
Prepared by
Tarkarri Engineering Pty Ltd
PO Box 506
Kings Meadows
Tasmania 7249

Contact Dr Alex McLeod
☎ +61 3 6343 2077
Mobile +61(0)439 357 297
Email alex.mcleod@tarkarri.com

Author	Alex McLeod Director / Principal Consultant	Date: 26 August 2022

Revision History

Revision No.	Date Issued	Reason/Comments
1	4 November 2022	Additional receiver

Distribution

Copy No._____	Revision No.	Location
1	1	Project/Client File
2	1	Client
3	1	Tarkarri Engineering Library

Keywords

dBA – *Decibels A-weighted.*

A-weighting – *Weighting of the audible frequencies reflective of the response of the human ear to noise.*

$L_{Aeq,T}$ – *Equivalent continuous A-weighted sound pressure level over a given time (T).*

Table of Contents

List of figures

List of tables

References

[1] Environment Protection Authority (2017) Quarry Code of Practice 3rd Edition, EPA Tasmania, Hobart, Tasmania.

[2] SoundPLAN Acoustic modelling software - Braunstein & Berndt GmbH.

[3] CONCAWE The oil companies' international study group for conservation of clean air and water – Europe (est. 1963) report 4/81.

Executive summary

Tarkarri Engineering conducted an environmental noise assessment of operations at the Vinegar Hill sand extraction pit and quarry located at Lady Barron Rd, Lady Barron.

Modelling of operational noise shows that predicted noise levels are below the relevant Quarry Code of Practice criterion level for noise and as such unreasonable noise impact is unlikely to occur.

1 Introduction

Tarkarri Engineering was commissioned by Van Diemen Consulting (VDC) to conduct and environmental noise assessment of operations at the Vinegar Hill sand extraction pit and quarry located at Lady Barron Rd, Lady Barron. This follows Requests for Further Information (RFIs) from the Flinders Council. Relevant sections of the RFIs are provided below for reference.

DA 2022 / 00029

- Due to the proximity of the neighbouring sensitive uses please provide an attenuation report prepared by a suitably qualified person to assess the impact of the proposed industry on the existing sensitive uses

DA 2022 / 00031

- Please provide a response to C9.5.1, prepared by a suitably qualified person, which demonstrates what specific measures will be put in place to ensure that no unreasonable loss of amenity occurs to the existing surrounding sensitive uses. The response should consider the cumulative effect of the proposed use including traffic, noise, dust and vibration.

This assessment address environmental noise only.

2 Site description

The Vinegar Hill sand pit and quarry is located on Lady Barron Rd to the north of the township of Lady Barron. Nosie sensitive residential properties bound the land to the south and south-west.

Figure 2-1 presents an aerial view of the sand pit and quarry land and surrounds while Figure 2-2 presents mine plan.

Figure 2-1: Aerial view of existing Vinegar Hill sand pit and quarry and surrounds.

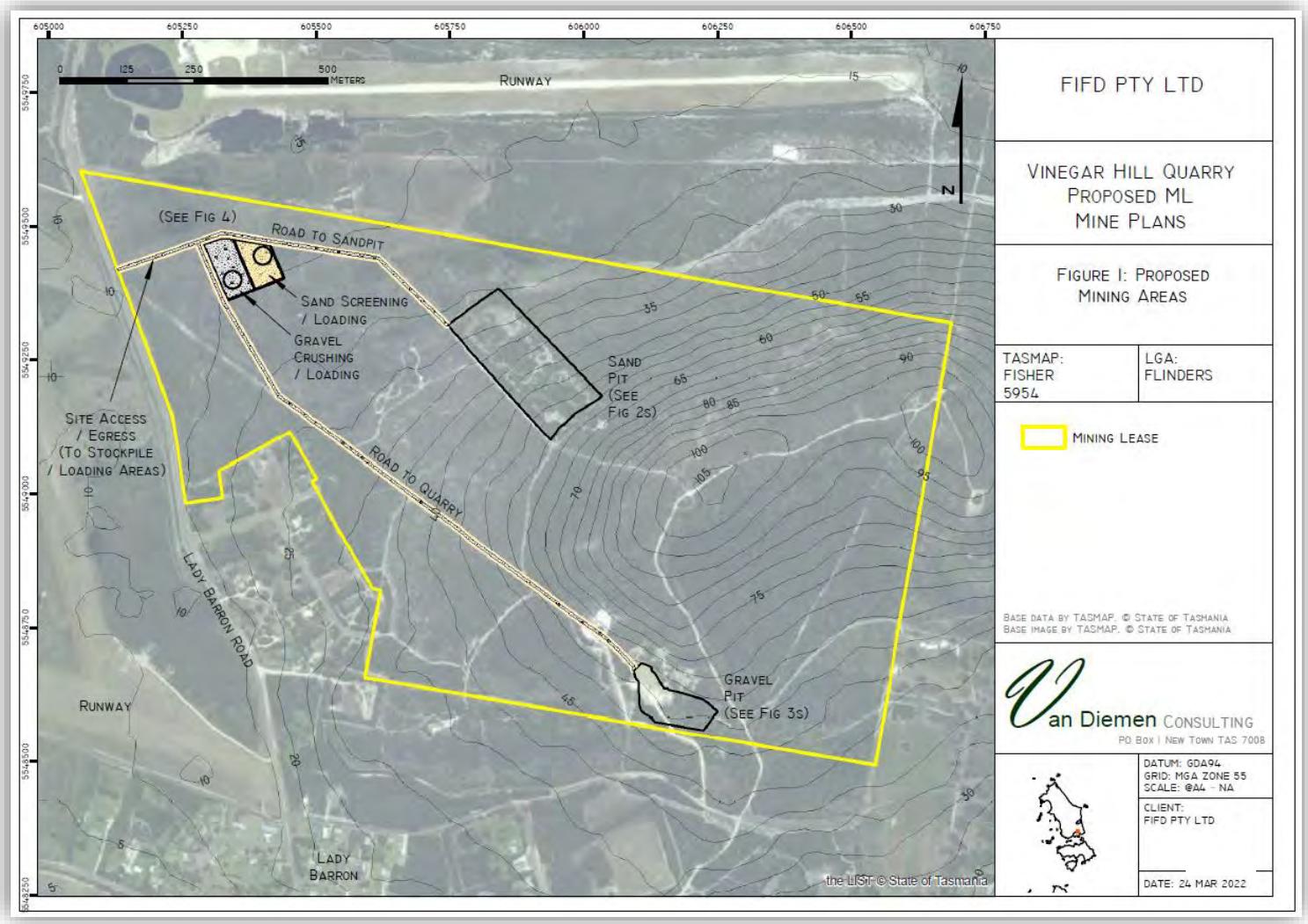

Figure 2-2: Mine Plan (provided by VDC).

3 Assessment criterion

Criteria for the assessment of environmental noise emissions from quarry operations are given in the Quarry Code of Practice (QCP)[1] as follows:-

> ***7.2.2.2 Level of noise***
>
> Noise from quarrying and associated activities, including equipment maintenance, when measured at any neighbouring sensitive use must not exceed the greater of:
>
> - the A-weighted 10 minute L90, excluding noise from the quarry, plus 5 dB(A), or
> - the following levels:
>   - 45 dB(A) from 0700 to 1900 hours (daytime)
>   - 40 dB(A) from 1900 to 2200 hours (evening), and
>   - 35 dB(A) from 2200 to 0700 hours the following day (night time)
>
> when measured as a 10 minute L_{eq}.
>
> Regulatory authorities may require compliance with alternative noise limits derived from a site-specific noise assessment.

All operations would occur in the day period and given this and the above the following noise emission criterion is nominated for this assessment:

- Day: 45 dBA ($L_{Aeq,10min}$)

4 Environmental noise model

SoundPLAN[2] software was used for carrying out detailed noise modelling of the two extractive industries. This program allows the use of the CONCAWE[3] calculation method for modelling atmospheric attenuation/amplification of noise. Parameters influencing sound propagation and attenuation include:

- Source type (point, line, plane).
- Relative source and receiver height.
- Topography and barriers.
- Industrial buildings as sources and/or barriers.
- Ground and air absorption.
- Distance attenuation.
- Atmospheric conditions (Pasquill stability, temperature, humidity and vector wind speed).
- Reflecting surfaces.
- Source directivity.

As all propagation and attenuation parameters are frequency dependent, all input source data has been based on 1/3-octave band sound power spectra.

Geo-referenced topographic data was based 5 m and 10 m interval contour data obtained from LISTdata.

Layout data and equipment locations were provided by VDC.

All source and geodata is referenced to the Map Grid of Australia (MGA).

4.1 Model input data

Input sound power (SWL) spectra were developed from Tarkarri Engineering library data. Table 5-1 and 5-2 present overall SWLs, equipment details and 1/1-octave band SWL spectra. Four model scenarios were considered as follows and the SWL data in the tables in laid out in accordance with theses scenarios:

- **Sand Pit extraction**: excavator and FEL operating in pit, truck carting martial to the materials handling pad (MHP).
- **Sand Pit MHP**: FEL and screen operating at the MHP, trucks transporting martial off-site.

  NB: screen located on the northern side of a 3 m earth bund to provide attenuation.
- **Gravel Pit extraction**: excavator and FEL operating in pit, truck carting martial to the materials handling pad (MHP).
- **Gravel Pit MHP**: FEL and crusher operating at the MHP, trucks transporting martial off-site.

  NB: crusher located on the northern side of a 4 m earth bund to provide attenuation.

These four scenarios would occur as separate operations (i.e. not concurrently) and are therefore not modelled together.

Overall sound power levels (dBA)		
Source	SWL	Comment
Sand Pit extraction		
Excavator	101	Scaled SWL for operating half of 10-minute period
Front End Loader (FEL)	98	Scaled SWL for operating half of 10-minute period
Truck (pit to MHP)	88	Scaled for low speed and time of operation over traverse length (20 km/h speed)
Sand Pit MHP (screen and load)		
FEL	101	
Transport trucks	90	X3 trucks in 10-minute period and scaled for low speed and time of operation over traverse length (20 km/h speed)
Screen	107	
Gravel Pit extraction		
Excavator	101	Scaled SWL for operating half of 10-minute period
FEL	98	Scaled SWL for operating half of 10-minute period
Truck (pit to MHP)	92	Scaled for low speed and time of operation over traverse length (20 km/h speed)
Gravel Pit MHP (crush and load)		
FEL	101	
Transport trucks	89	X3 trucks in 10-minute period and scaled for low speed and time of operation over traverse length (20 km/h speed)
Crusher	116	

Table 4-1: Overall sound power levels and data source information.

1/1-octave band sound power level spectra (dBA)										
Source	Frequency (Hz)									Total
	31.5	63	125	250	500	1k	2k	4k	8k	
Sand Pit extraction										
Excavator	67	75	88	89	96	95	95	89	81	**101**
Front End Loader (FEL)	52	67	86	94	87	90	90	86	79	**98**
Truck (pit to MHP)	52	63	73	73	79	81	85	79	70	**88**
Sand Pit MHP (screen and load)										
FEL	55	70	89	97	90	93	93	89	82	**101**
Transport trucks	53	65	74	75	81	83	86	81	72	**90**
Screen	52	73	82	91	98	101	102	101	95	**107**
Gravel Pit extraction										
Excavator	69	77	90	91	98	97	97	91	83	**101**
FEL	52	67	86	94	87	90	90	86	79	**98**
Truck (pit to MHP)	55	67	76	77	83	85	88	83	74	**92**
Gravel Pit MHP (crush and load)										
FEL	55	70	89	97	90	93	93	89	82	**101**
Transport trucks	52	64	73	74	80	82	85	80	71	**89**
Crusher	64	84	99	106	113	110	107	103	94	**116**

Table 4-2: 1/1-octave band sound power level spectra.

8 environmental noise model receiver locations were selected for the prediction of sound pressure levels from the four model scenarios. These were selected to represent the closest residential premises in any direction (R8 was modelled as the closest location in the Village Zone under the planning scheme to extractive activities) Table 4-3 present location information for each receiver.

Model receiver positions		
Position number	Location	Coordinates (MGA, Zone 55 G)
R1	7 Vinegar Hill Dr	605486 5549037
R2	13 Moonbird St	605595 5548784
R3	3 Gunter St	605539 5548440
R4	18 Gunter St	605659 5548348
R5	21 Barr St	605924 5548208
R6	53 Franklin Pde	606484 5548284
R7	57a Franklin Pde	606621 5548718
R8	11 Henwood St	605866 5548409

Table 4-3: Model receiver positions.

4.2 Atmospheric conditions

Using the CONCAWE[3] algorithm, SoundPLAN[2] models atmospheric attenuation via Pasquill stability indices. These indices are influenced primarily by vector wind speed and solar radiation levels. Combinations of these conditions are used to determine appropriate frequency

dependent attenuation parameters. In this study two main propagation conditions have been analysed as follows:

- **Worst-case propagation (wcw)**: This condition considers all receiver points to be downwind of the plant with a Pasquill stability class F and a vector wind speed of 2 m/s, noise contours will then represent the highest predicted sound pressure levels at any location around the plant. These conditions commonly occur on cold clear nights when atmospheric inversions develop.
- **Neutral propagation (neu)**: Situations where the atmospheric conditions are neutral generally occur with a Pasquill stability class D and no wind. These conditions can typically occur in the hour before sunset and the hour after sunrise. Neutral conditions can also occur during calm, cloudy conditions.

4.3 Model views

Figures 4-1 and 4-2 present a model plan views with the location of the sources listed in Tables 5-1 and 5-2 and receiver locations marked. Figure 5-2 presents a wire-frame model view from the south.

NB: The sources that form all four model scenarios are presented in the figures.

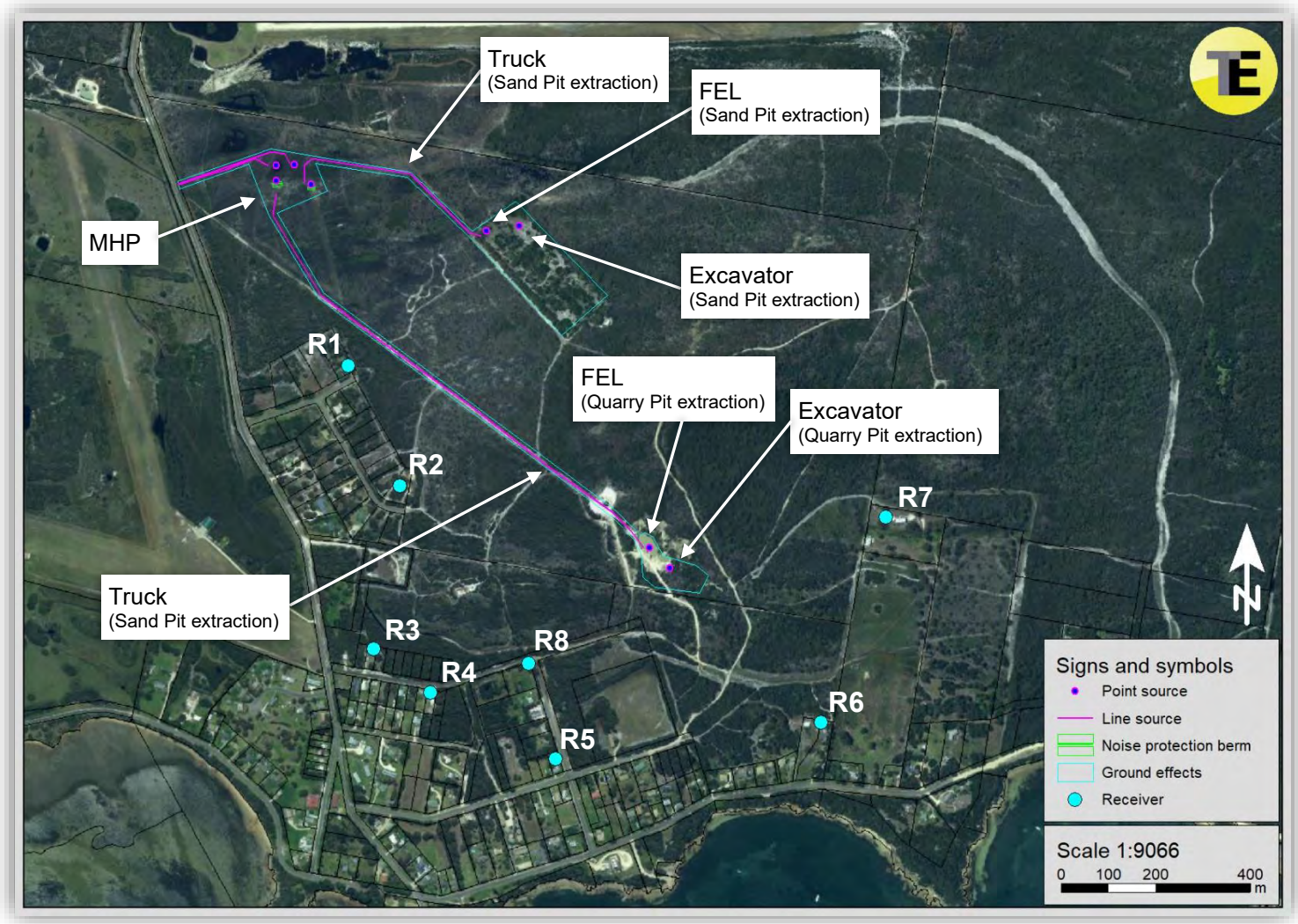

Figure 4-1: Model plan view.

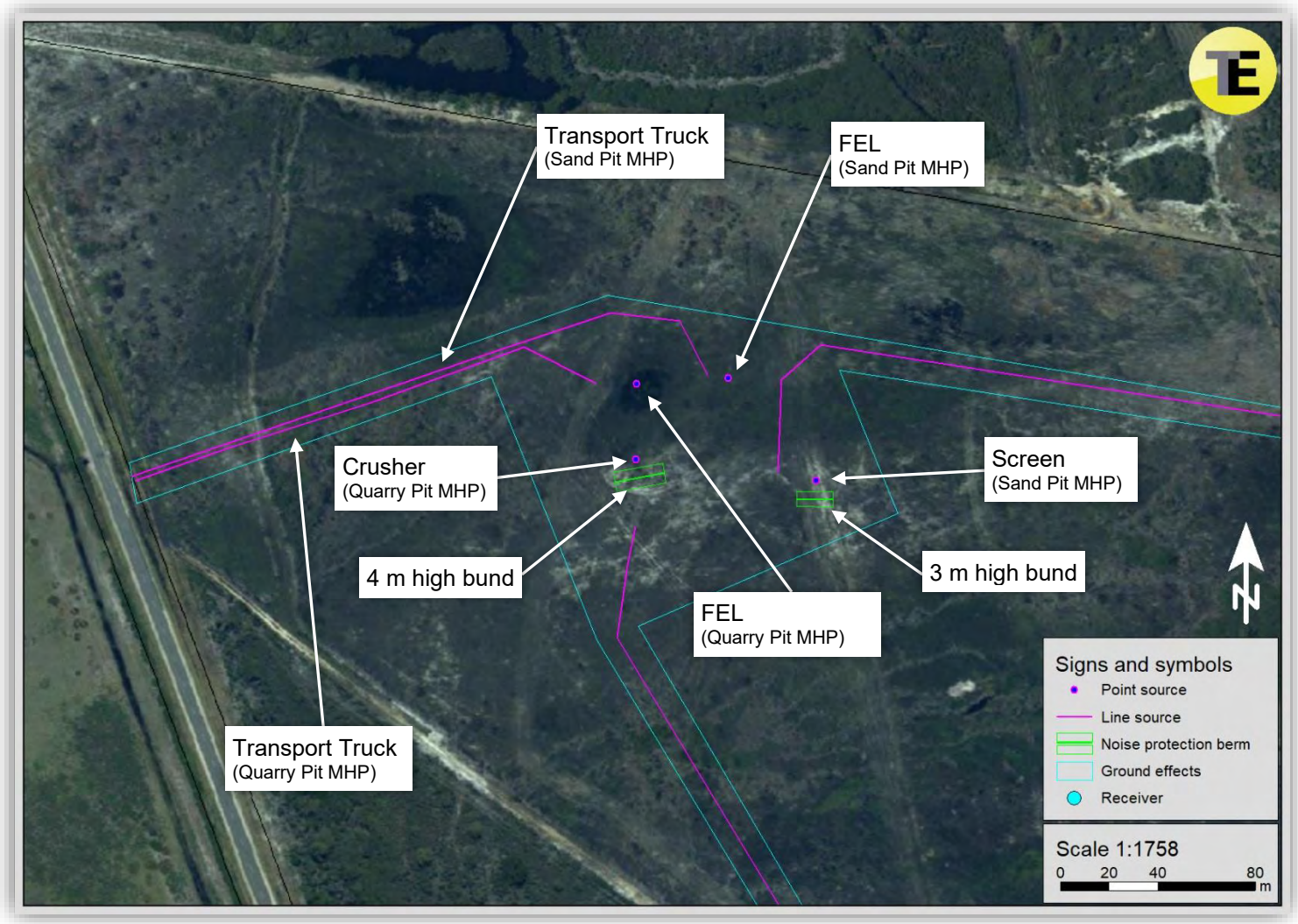

Figure 4-2: Model plan view, MHP.

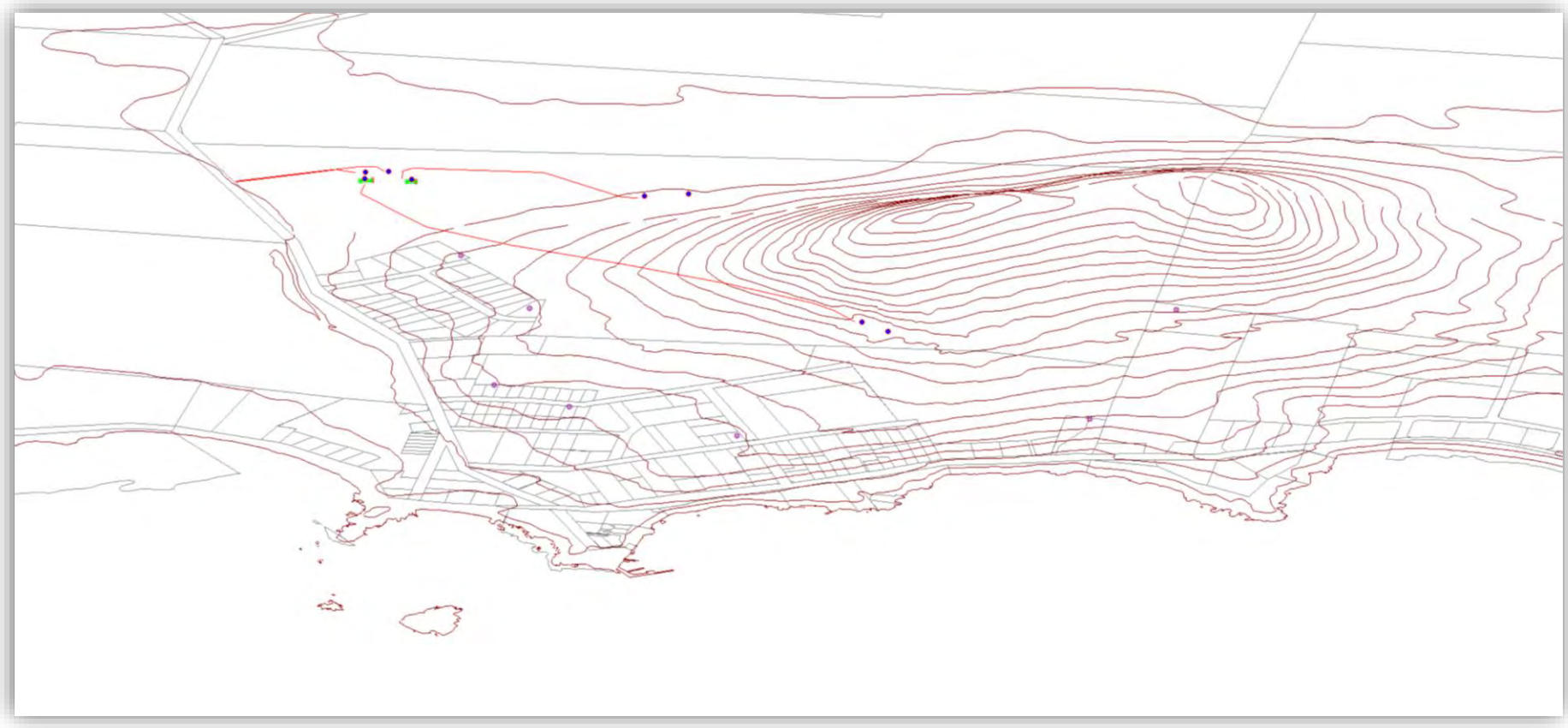

Figure 4-3: Model wire-frame view from the south.

5 Modelling results and discussion

Table 5-1 presents predicted sound pressure levels at receiver locations for the 4 modelling scenarios. Predicted levels for neutral and worst-case weather conditions are provided.

Predicted received sound pressure levels (dBA)								
Receiver	Sand Pit extraction		Sand Pit MHP		Gravel Pit extraction		Gravel Pit MHP	
	neu	wcw	neu	wcw	neu	wcw	neu	wcw
R1	33	37	33	37	37	38	37	41
R2	28	33	26	31	31	36	30	35
R3	18	23	20	26	28	33	23	29
R4	11	16	19	24	30	35	22	28
R5	5	10	16	22	32	37	20	26
R6	-	5	2	7	32	37	6	12
R7	2	7	2	7	23	28	6	11
R8	8	13	18	24	36	40	23	28

Table 5-1: Predicted received sound pressure levels.

From the above:

- The noise levels predicted are below the criterion level of 45 dBA. This demonstrates that unreasonable noise impact from sand pit and quarry operations is unlikely to occur.