Annex K – Construction Noise Management Plan

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Vipac Engineers & Scientists

Tattersall Lander PTY LTD

Bobs Farm Sand Mine

Construction Noise Management Plan

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Report Title: Construction Noise Management Plan **Job Title: Bobs Farm Sand Mine**	
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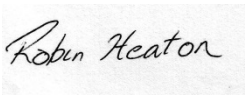
AUTHORISED BY:	 Robin Heaton **Project Engineer**	Date: 19 Jan 2016

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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Tattersall Lander Pty Ltd to conduct a Construction Noise Impact Assessment for the proposed Sand Mine located on Deposited Plans DP753204 (40.9ha) and DP1015671 (6.63ha) with associated land at DP1071458 (2.53ha), Bob's Farm NSW. The location of the proposed development site is illustrated in ***Figure 1***.

The potential Construction Phase noise impacts have been assessed in accordance with the Department of Environment & Climate Change (DECC) NSW "*Interim Construction Noise Guideline";* the EPA (OEH) NSW "*Industrial Noise Policy";* and AS 2436-2010 "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites".*

The predicted noise levels during a number of phases of the construction program (Eastern End Worst-Case & Western End Worst-Case) are predicted to potentially exceed the Noise Affected - Noise Management Levels for Standard Construction Hours at up to four of the twenty five noise sensitive receptors (R1, R13, R14 and R15), located in the vicinity of the site. However, the predicted noise levels during all of the different phases of the construction program are within the Highly Noise Affected – Noise Management Levels for Standard Construction Hours at all of the noise sensitive monitoring locations, located in the vicinity of the proposed development site.

In the unlikely event that construction works are proposed to be undertaken outside of Standard Construction Hours, the predicted noise levels associated with the different phases of the construction program would be raised above the Noise Affected – Noise Management Levels at the five of the twenty five noise sensitive receptors (R1, R13, R14, R15 and R16), located in the vicinity of the site.

The predicted construction noise levels would also be raised above the applicable sleep disturbance criteria at five of the noise sensitive receptors locations (R1, R12, R13, R14 and R15) across the two scenarios modelled, in the unlikely event that construction works were proposed to be undertaken during the night-time period.

These predictions are based on a conservative assumption that construction operations and activities are situated at the closest distances to noise sensitive receivers, which relates to the highest potential impact on the local community during the construction phase of the proposed development.

In order to limit the impact on the surrounding noise sensitive receivers Vipac makes the following recommendation to minimise noise emissions from the site during the construction phase:

- To reduce the predicted noise impact on residential receivers in particular R1, R12, R13, R14 and R15, removal of trees by chainsaw near these receivers should only be completed following consultation with the receivers to notify them of the planned works and to advise the receivers of the proposed schedule to complete the tree removal works, with regard to the use of chainsaws for tree felling.

- Additionally in order to minimise the potential construction phase noise impacts on the sensitive receptors located in the vicinity of the site, a site specific noise management plan adopting feasible and reasonable noise attenuation and management measures should be implemented as detailed in ***Section 10*** of this report, as best practise to minimise the potential construction phase noise impacts.

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Tattersall Lander Pty Ltd to conduct a Construction Noise Impact Assessment for the proposed Sand Mine located on Deposited Plans DP753204 (40.9ha) and DP1015671 (6.63ha) with associated land at DP1071458 (2.53ha), Bob's Farm NSW. The location of the proposed development site is illustrated in ***Figure 1***.

The steps for managing potential Noise Impacts from construction projects are outlined as follows:

- Identify the location of the proposed works.
- Identify the sensitive receiver locations with respect to the proposed works.
- Define noise management levels for the sensitive locations.
- Describe the nature of the works to be undertaken and their expected duration.
- Predict levels of noise from construction work at the identified sensitive receivers.
- Provide reasonable and feasible mitigation and management strategies where the noise management levels are exceeded.

The potential Construction Phase noise impacts have been assessed in accordance with the Department of Environment & Climate Change (DECC) NSW "*Interim Construction Noise Guideline";* the EPA (OEH) NSW "*Industrial Noise Policy";* and AS 2436-2010 "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites".*

2 GLOSSARY OF TERMS

A list of commonly used acoustical terms (and their definition) used in this report is provided below in ***Table 1***, as an aid to readers of the report.

Table 1: Definition of Acoustical Terms

Term	Definition
$L_{eq,1hr}$	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event, has the same amount of acoustic energy as the given event for the period of one hour.
$L_{A10,1\ hr}$	The noise level, which is equalled or exceeded for 10% of the measurement period of one hour.
$L_{A90,T}$	The noise level, which is equalled or exceeded for 90% of a given measurement period, T. $L_{A90,T}$ is used in Australia as the descriptor for background noise.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time, for a given time period. It can be considered as the average sound pressure level over the measurement period and is commonly used as a descriptor for ambient noise.
L_n	The Sound Pressure levels that is equalled or exceeded for n% of the interval time period. Commonly used noise intervals are L_1, L_{10}, L_{90} and L_{99}%
$L_{A10,18hrs}$	The L_{10} noise level for the time period extending from 6am to midnight.

3 PROJECT DESCRIPTION

3.1 SITE LOCATION

The Bobs Farm site deposit is situated on the northern end of the Stockton Bight Dunal system, approximately 200 km north of Sydney, near Bobs Farm, NSW. The surrounding area is predominately zoned as rural with minimal primary production.

The site is located in Bob's Farm approximately 27 km north-east of Newcastle and approximately 14 km south-west of Nelsons Bay. The site is bounded to the south by Nelson Bay Road and to the north by Marsh Road.

3.2 PROPOSED OPERATIONS

The Bobs Farm Sand Project comprises:

- The establishment of a quarry to extract and process sand at a rate of approximately 750,000 tonnes per annum, from a total sand resource of approximately 8-10 million tonnes. The estimated life of the extraction process is 13 years;
- The construction of extractive materials processing and transport infrastructure;
- The transportation of extractive materials off-site via roads; and
- The rehabilitation of the site.

Sand will be extracted from the site by two main mining methods:

- Dry mining utilising excavator and haul trucks to remove dry sand products from the pit areas above the water table for processing prior to export, and
- Wet mining utilising a dredge and pump line system to pump wet raw sand materials for processing prior to export.

A graphical display of the Deposited Plan is presented below in ***Figure 1*** also showing the outline of the mine boundary.

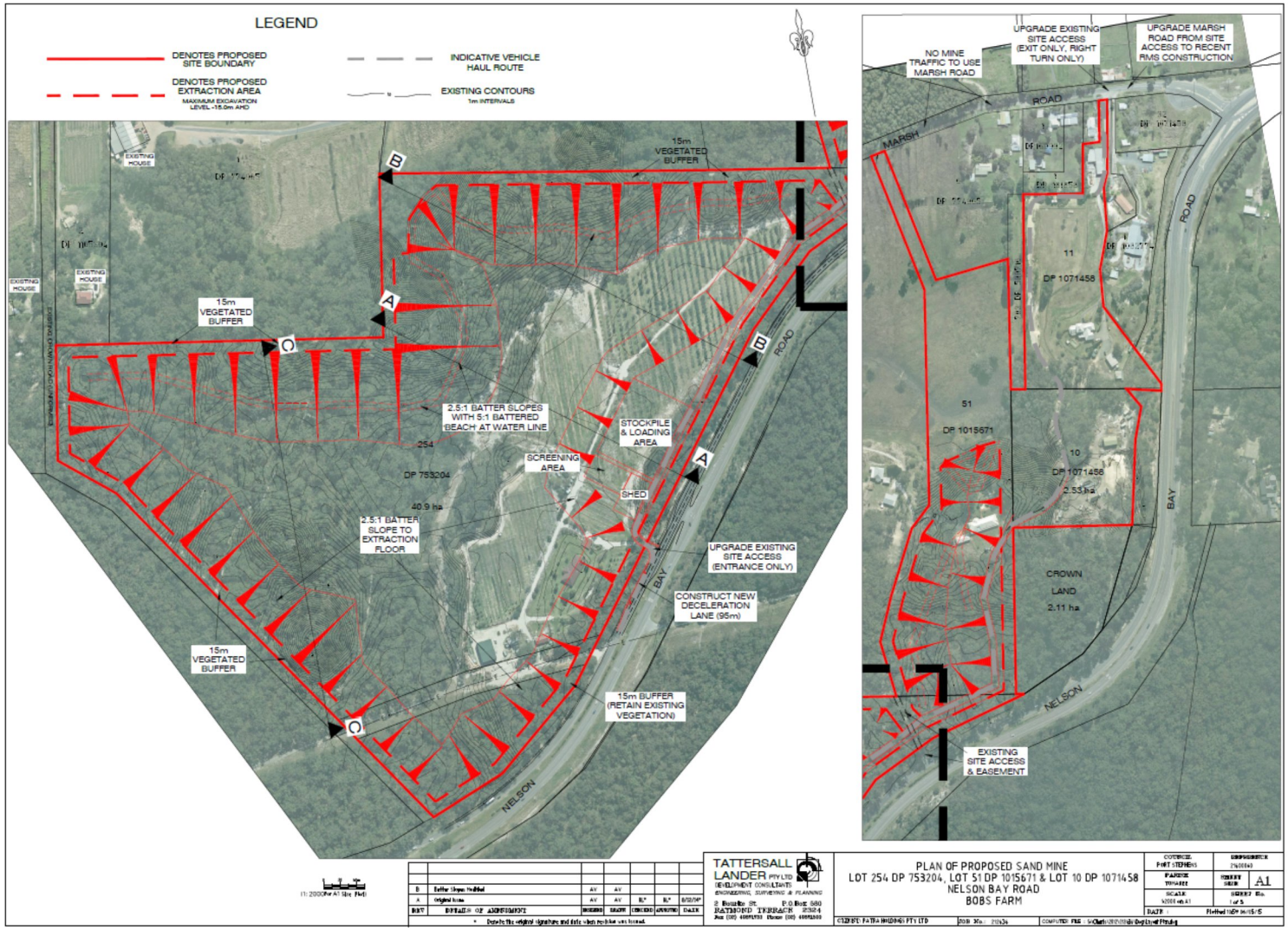

Figure 1: Site Location – Deposited Plans

3.3 CONSTRUCTION METHODOLOGY

The typical construction work activities to be undertaken in preparing the site to operate as a Sand Mine will be:

- Clearing and mulching of tress,
- Removal of layer of topsoil overlaying the sand material for extraction,
- Construction of Noise bunds and barriers surrounding the pit/haul road.

3.4 OPERATIONAL HOURS

During construction of the proposed Sand Mine the proposed operating hours will be 10 hours per day from 07:00 to 17:00.

3.5 EQUIPMENT

The proposed construction equipment that will be utilized during the stripping of vegetation and topsoil to prepare the site to operate as a Sand Mine is outlined below:

Clearing of Vegetation / Trees

- Chain saw
- Grab Arm Excavator
- Trucks for Removal of waste

Top Soil Removal & Bund Construction

- D7 Dozer
- Excavator
- Trucks for Removal of waste

3.6 NOISE SENSITIVE RECEIVERS

The closest dwellings to the site are located approximately 10m to west of the Haul Road at the exit end of the haul road at Marsh Road, approximately 45m to the north-west of the site boundary at the eastern end of the proposed extraction area and 53m to the west of the site boundary at the western end of the extraction area of the proposed Sand Mine. The sensitive receptors considered in this assessment are presented in ***Table 2*** below and illustrated in ***Figure 3 and Figure 4.***

Table 2: Noise Sensitive Receptors

Reference	Description	Distance from Site Boundary	UTM Coordinates	
			Easting	Northing
R1	724 Marsh Road	45m	407080	6373782
R2	776 Marsh Road	10m	407432	6374056
R3	772 Marsh Road	10m	407410	6374157
R4	764 Marsh Road	8m	407377	6374169
R5	762 Marsh Road	30m	407313	6374153
R6	760 Marsh Road	95m	407306	6374183
R7	756 Marsh Road	65m	407270	6374128
R8	710 & 712 Marsh Road	500m	406822	6374040
R9	698 Marsh Road	160m	406807	6373689
R10	666 Marsh road	330m	406409	6373926
R11	650 Marsh Road	365m	406345	6373915
R12	686 Marsh road	240m	406209	6373694
R13	644 Marsh Road	53m	406123	6373508
R14	640 Marsh Road	103m	406016	6373514
R15	630 Marsh Road	154m	405912	6373456
R16	3551 Nelson Bay Road	485m	405906	6373182
R17	3515 Nelson Bay Road	235m	405758	6372941
R18	723 Marsh Road	650m	406868	6374185
R19	731 Marsh Road	500m	407003	6374232
R20	761 Marsh Road	150m	407322	6374277
R21	767 Marsh Road	100m	407385	6374280
R22	781 Marsh Road	80m	407503	6374223
R23	3780 Nelson Bay Road	215m	407631	6374081
R24	3724 Nelson Bay Road	180m	407629	6373758
R25	3790 Nelson Bay Road	300m	407547	6373678

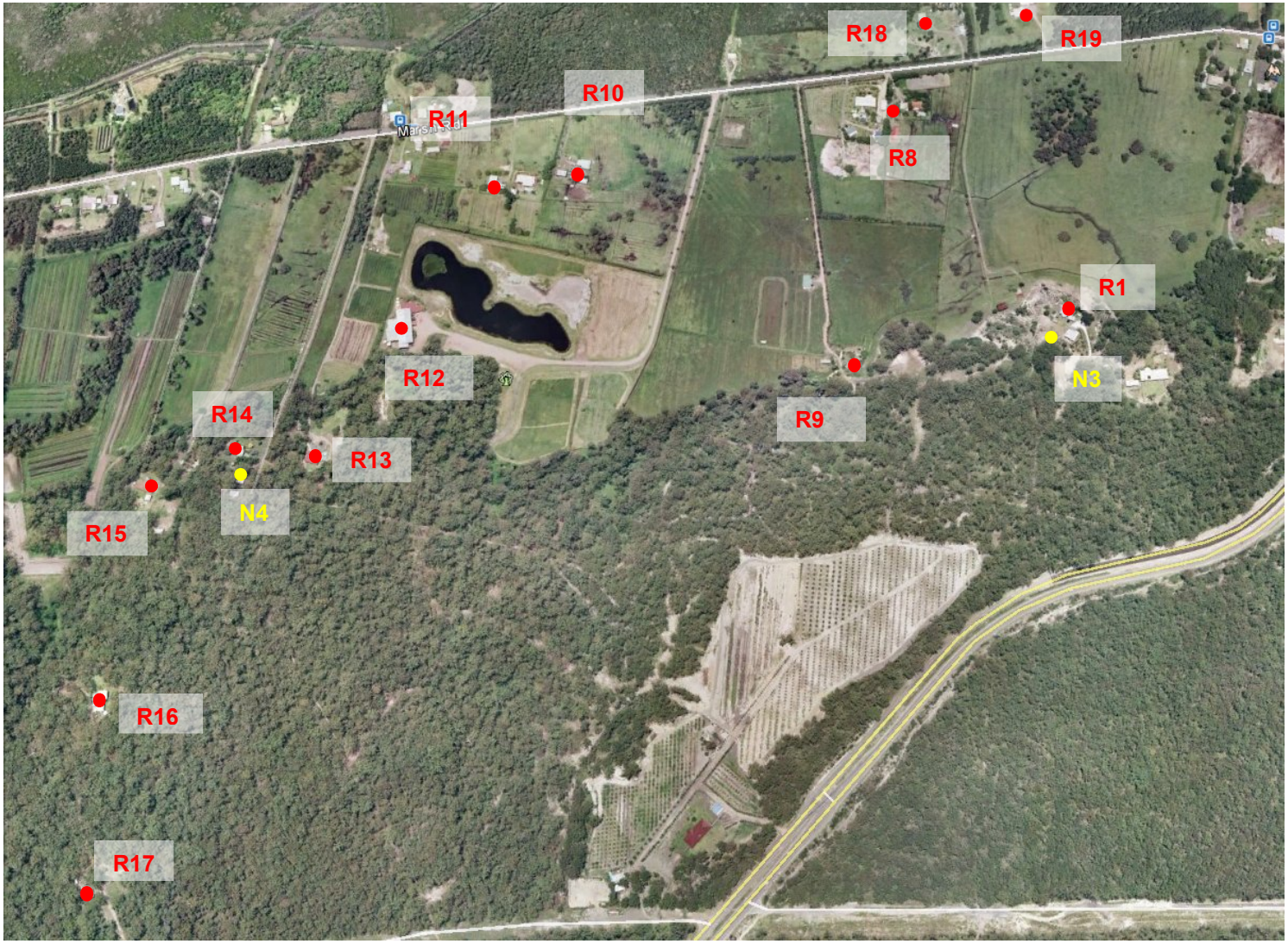

Figure 2: Noise Sensitive Receivers (R1 & R8 - R19) and Noise Monitoring Locations (N3 – N4)

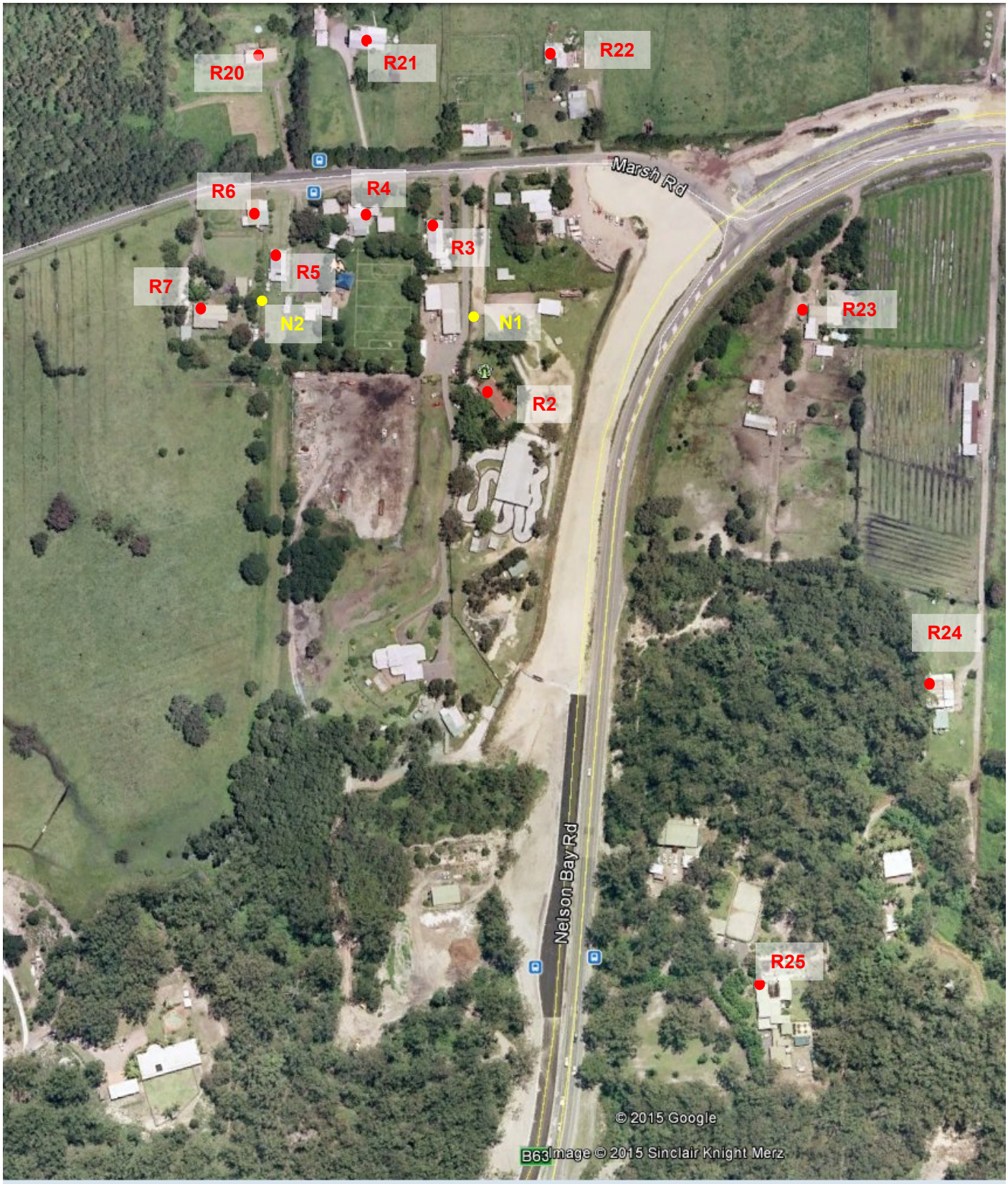

Figure 3: Noise Sensitive Receivers R2-R7 & R20-R25 & Noise Monitoring Locations N1 & N2

4 EXISTING NOISE ENVIRONMENT

4.1 UNATTENDED NOISE MEASUREMENTS

Vipac installed noise logging equipment at four locations to measure baseline environmental noise levels at representative noise sensitive receptor locations in the vicinity of the proposed Sand Mine site. The location of the monitoring points are listed in ***Table 3*** and shown in ***Figure 2*** and ***Figure 3***.

The primary aim of the noise logging survey was to determine the existing environmental noise levels of the potentially affected area and to enable an assessment of the potential noise impacts on the receiving environment. Logger Location 1 (N1) represents receivers along Nelson Bay Road. Logger Location 2 (N2) represents receivers in the vicinity of Marsh Road Public School and Public Hall. Logger 3 (N3) represents receivers R1 & R11 and Logger Location 4 (N4) represents the receivers R14- R19 to the west of the proposed Sand Mine site.

Table 3: Monitoring Locations

Loc.	Noise Survey Dates	Location / Address	Instrument	Serial No.
N1	02nd- 06th Sept 2014	776 Marsh Road	Larson Davis 824	A2597
N2	12th-25th Aug 2014	762 Marsh Road	Larson Davis 870	1466
N3	12th-25th Aug 2014	724 Marsh Road	Larson Davis 870	1461
N4	12th-18th Aug 2014	640 Marsh Road	Larson Davis 870	1459

The instruments were programmed to accumulate noise data continuously over sampling periods of 15-minutes for the entire monitoring period. Internal software then calculates and stores the Ln percentile noise levels for each sampling period, which can later be retrieved for detailed analysis.

The instruments were calibrated using a Rion NC-73 calibrator immediately before and after monitoring and showed a maximum error of 0.5 dB.

Table 4 presents a summary of the current ambient noise levels at the monitoring locations.

Table 4: Summary of current ambient noise levels (dB (A))

Loc.	Period	L_{Aeq}	L_{A90}	RBL[1]
N1	Day	70	52	52
	Evening	60	49	48
	Night	68	51	49
N2	Day	61	43	43
	Evening	69	43	41
	Night	48	41	47
N3	Day	47	40	40
	Evening	46	40	39
	Night	45	38	36
N4	Day	47	40	40
	Evening	40	37	36
	Night	41	39	38

[1] RBL is the median of the overall assessment background noise level calculated using OEH Industrial Noise Policy methodology as defined in the glossary of acoustic term

5 CONSTRUCTION NOISE GUIDELINES

5.1 DECC "INTERIM CONSTRUCTION NOISE GUIDELINE"

The NSW Interim Construction Noise Guidelines were developed by the Department of Environment & Climate Change and contains detailed procedures for the assessment and management of construction noise impacts.

The Guideline presents two ways of assessing construction noise impacts – the quantitative method, which is generally suited to longer-term construction projects, and the qualitative method, which is generally suited to short-term works (usually not more than 3 weeks) such as infrastructure maintenance.

The construction activities will extend for more than 3 weeks and therefore, a quantitative method has been used for this assessment.

5.1.1 RESIDENCES AND OTHER SENSITIVE LAND USES

Table 5 and ***Table 4*** set out the management levels for noise at residences and sensitive land uses, respectively. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

Table 5: Noise at residence using Quantitative Assessment

Recommended Hours	Time of Day	Management level $L_{Aeq(15min)}$ [1]
Recommended standard hours	Monday to Friday - 7 am to 6pm Saturday - 8am to 1 pm No Work on Sundays or Public holidays	Noise affected RBL[2] + 10dB
		Highly noise affected[3] 75dB
Outside recommended standard hours		Noise affected RBL[2] + 5dB

Table 6: Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management Level, $L_{Aeq(15min)}$ Applies when properties are being used
School Classroom	Internal Noise Levels 40dB
Active Recreation Areas	55dB

Where internal noise management levels are specified, the external noise level may be 10dB(A) greater for buildings with no adequate ventilation or 20dB(A) for buildings with fixed external windows and mechanical ventilation

When assessing construction noise, it should be noted that several types of plant and equipment can be particularly annoying to nearby residents. In those instances a +5dB penalty is applied to the predicted noise level. Examples of the type of machines and operations that typically fit this category are listed below:

- Use of 'beeper' style reversing or movement alarms, particularly at night-time,
- Use of power saws, such as used for cutting timber, masonry, road pavement or steel work,
- Grinding metal, concrete or masonry,
- Rock drilling,
- Vibratory rolling,

1 Noise levels apply at the boundary that is most exposed to construction noise and at a height of 1.5 m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise-affected residence.

2 RBL is the Rating Background Level as defined in the EPA (OEH) Industrial Noise Policy.

3 $L_{Aeq\ 15\text{-}minute} \geq 75$ dB is highly likely to generate strong community reactions and should be avoided.

- Bitumen milling or profiling,
- Jack hammering, rock hammering or rock breaking', and
- Impact piling.

5.1.2 ASSESSING IMPACTS

The process of predicting noise is summarised in ***Figure 5***.

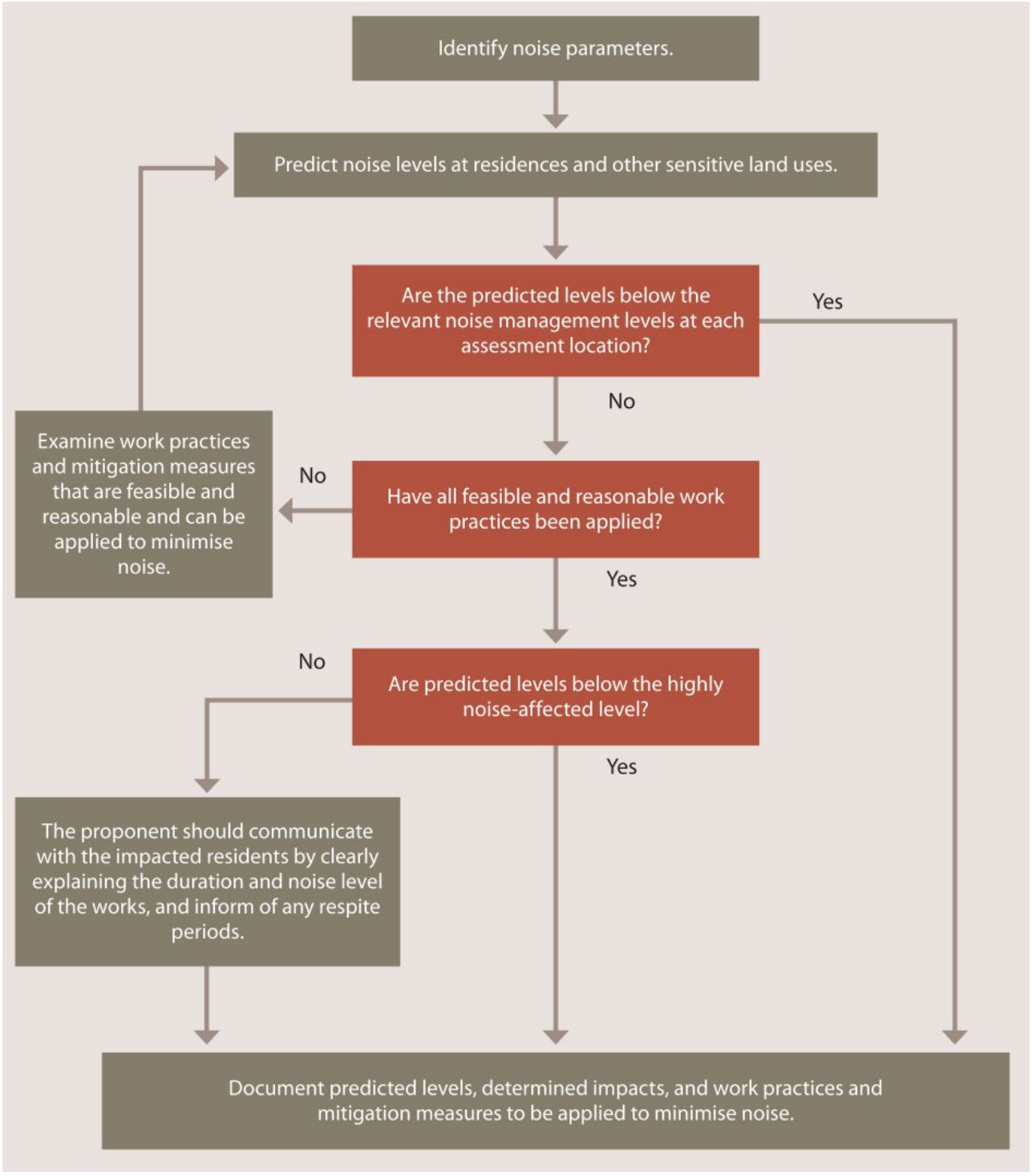

Figure 5: Prediction and Assessment of Impacts - Quantitative Method

5.2 SLEEP DISTURBANCE ASSESSMENT APPROACH

The NSW Interim Construction Noise Guideline recommends that when construction works extend for more than two consecutive nights, the analysis should cover maximum noise levels, and the extent that they exceed the Rating Background Level (RBL). Guidance indicating the potential for sleep disturbance is set out in the NSW Environmental Criteria for Road and Traffic Noise (EPA 1999), and is summarised as follows:

"OEH reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, OEH recognised that current sleep disturbance criterion of an $L_{A1,\ (1\ minute)}$ not exceeding the L_{A90}, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, OEH will continue to use it as a guide to identify the likelihood of sleep disturbance.

This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1,\ (1\ minute)}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:

- *How often high noise events will occur*
- *Time of day (normally between 10pm and 7am)*
- *Whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The $L_{A1,\ (1\ minute)}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. DECCW will accept analysis based on either $L_{A1,\ (1\ minute)}$ or $L_{A(Max)}$.

It should be noted that the OEH refers to the Office of Environment and Heritage, and DECCW refers to the Department of Environment, Climate Change and Water.

6 CRITERIA

6.1 CONSTRUCTION NOISE GOAL

A summary of the Noise Management Level (NML) criterion at the noise sensitive receptors is provided in ***Table 7***.

Table 7: Construction Noise Management Levels

Receiver type	Period	NML	Highly affected Noise Level
N1 R2-R3, R22-R25	Day - (RBL+10)	62	75
	Day (RBL +5) (or outside standard hours)	57	
	Evening - (RBL+5) (or outside standard hours)	53	
	Night (RBL+5) (or outside standard hours)	54	
N2 R5, R7-R8, R10-R11, R18-R21	Day - (RBL+10)	53	75
	Day (RBL +5) (or outside standard hours)	48	
	Evening - (RBL+5) (or outside standard hours)	46	
	Night (RBL+5) (or outside standard hours)	52	
N3 R1 & R9	Day - (RBL+10)	50	75
	Day (RBL +5) (or outside standard hours)	45	
	Evening - (RBL+5) (or outside standard hours)	44	
	Night (RBL+5) (or outside standard hours)	41	
N4 R13- -R17	Day - (RBL+10)	50	75
	Day (RBL +5) (or outside standard hours)	45	
	Evening - (RBL+5) (or outside standard hours)	41	
	Night (RBL+5) (or outside standard hours)	43	

7 CONSTRUCTION NOISE ASSESSMENT

7.1 CONSTRUCTION NOISE MODELLING

Noise modelling has been undertaken using the SoundPLAN® computational noise modelling software package. The use of the SoundPLAN® software and referenced modelling methodology is accepted for use in the state of NSW by the EPA (OEH) for environmental noise modelling purposes. Vipac have undertaken numerous noise modelling and impact assessments previously for a range of projects, including infrastructure development and industrial projects using SoundPLAN®.

7.2 GEOGRAPHICAL DATA

Tattersall Lander supplied topographical details of the area to Vipac and ***Table 8*** below lists the drawings received and used in the noise prediction model.

Table 8: Drawings used

Drawing Title	Description	Date
Existing Surface Survey dxf	Current Terrain Layout	11/08/2014
3m Design Surface dxf	3m pit proposed design	11/08/2014
Sand Mine Plan (Rev B)	Proposed Mine Layout	06/05/2015

7.3 PLANT AND EQUIPMENT

The proposed construction plant and equipment and the corresponding acoustic power produced by each item is listed in ***Table 9***. The total predicted sound power levels for each of the construction phases is also presented in ***Table 9***. The typical sound levels of the plant and equipment were extracted from *"Australian Standard AS 2436-2010, Appendix A"; "British Standard BS 5228-1:2009- Code of practice for noise and vibration control on construction and open sites- Part 1: Noise*" and "*Vipac database".*

Table 9: Construction Activities and Sound Powel Levels

Plant & Equipment	Quantity	Sound Power Level (L_W) dB(A)	Predicted Sound Pressure Levels (dB(A)) at various distances per equipment (metres)					
			50	100	200	300	400	500
D7 Dozer	1	109	67	61	55	51	49	47
22 Tonne Tracked Excavator	1	106	64	58	52	48	46	44
Chain Saw	2	109	67	61	55	51	49	47
Haul Truck onsite	1	118	76	70	64	60	58	56

7.4 PREDICTED CONSTRUCTION NOISE LEVELS

As outlined above, the predicted noise levels have been calculated using the SoundPLAN computational noise prediction modelling software package.

Noise levels are expressed as external $L_{Aeq,\ 15\ minutes}$ at the nearest boundary of the receiver properties. The predicted levels are presented in ***Table 10*** for each of the construction stages.

Table 10: Predicted Noise Levels (dB(A))

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level	
				Eastern End of Pit	Western End of Pit
R1 Residential	Standard Hours	Highly Noise Affected	75	62	31
		Noise Affected (RBL+10dB)	50	**62**	31
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	**62**	31
		Noise Affected Evening (RBL+5dB)	44	**62**	31
		Noise Affected Night (RBL+5dB)	41	**62**	31
R2 Residential	Standard Hours	Highly Noise Affected	75	35	24
		Noise Affected (RBL+10dB)	62	35	24
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	35	24
		Noise Affected Evening (RBL+5dB)	53	35	24
		Noise Affected Night (RBL+5dB)	54	35	24
R3 Residential	Standard Hours	Highly Noise Affected	75	34	23
		Noise Affected (RBL+10dB)	62	34	23
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	34	23
		Noise Affected Evening (RBL+5dB)	53	34	23
		Noise Affected Night (RBL+5dB)	54	34	23
R4 School	When in use	Highly Noise Affected	75	37	25
		Noise Affected (RBL+10dB)	53	37	25
R5 Residential	Standard Hours	Highly Noise Affected	75	38	25
		Noise Affected (RBL+10dB)	53	38	25
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	38	25
		Noise Affected Evening (RBL+5dB)	46	38	25
		Noise Affected Night (RBL+5dB)	52	38	25
R6 Public Hall	When in use	Highly Noise Affected	75	34	18
		Noise Affected (RBL+10dB)	53	34	18
R7 Residential	Standard Hours	Highly Noise Affected	75	39	26
		Noise Affected (RBL+10dB)	53	39	26
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	39	26
		Noise Affected Evening (RBL+5dB)	46	39	26
		Noise Affected Night (RBL+5dB)	52	39	26
R8 Residential	Standard Hours	Highly Noise Affected	75	35	20
		Noise Affected (RBL+10dB)	53	35	20

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level	
				Eastern End of Pit	Western End of Pit
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	35	20
		Noise Affected Evening (RBL+5dB)	46	35	20
		Noise Affected Night (RBL+5dB)	52	35	20
R9 Residential	Standard Hours	Highly Noise Affected	75	31	24
		Noise Affected (RBL+10dB)	50	31	24
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	31	24
		Noise Affected Evening (RBL+5dB)	44	31	24
		Noise Affected Night (RBL+5dB)	41	31	24
R10 Residential	Standard Hours	Highly Noise Affected	75	33	21
		Noise Affected (RBL+10dB)	53	33	21
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	33	21
		Noise Affected Evening (RBL+5dB)	46	33	21
		Noise Affected Night (RBL+5dB)	52	33	21
R11 Residential	Standard Hours	Highly Noise Affected	75	33	21
		Noise Affected (RBL+10dB)	53	33	21
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	33	21
		Noise Affected Evening (RBL+5dB)	46	33	21
		Noise Affected Night (RBL+5dB)	52	33	21
R12 Aquarium	When in use	Highly Noise Affected	75	34	47
		Noise Affected (RBL+10dB)	50	34	47
R13 Residential	Standard Hours	Highly Noise Affected	75	35	61
		Noise Affected (RBL+10dB)	50	35	**61**
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	35	**61**
		Noise Affected Evening (RBL+5dB)	41	35	**61**
		Noise Affected Night (RBL+5dB)	43	35	**61**
R14 Residential	Standard Hours	Highly Noise Affected	75	34	56
		Noise Affected (RBL+10dB)	50	34	**56**
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	34	**56**
		Noise Affected Evening (RBL+5dB)	41	34	**56**
		Noise Affected Night (RBL+5dB)	43	34	**56**
R15 Residential	Standard Hours	Highly Noise Affected	75	33	51
		Noise Affected (RBL+10dB)	50	33	**51**

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level	
				Eastern End of Pit	Western End of Pit
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	33	**51**
		Noise Affected Evening (RBL+5dB)	41	33	**51**
		Noise Affected Night (RBL+5dB)	43	33	**51**
R16 Residential	Standard Hours	Highly Noise Affected	75	34	43
		Noise Affected (RBL+10dB)	50	34	43
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	34	43
		Noise Affected Evening (RBL+5dB)	41	34	**43**
		Noise Affected Night (RBL+5dB)	43	34	43
R17 Residential	Standard Hours	Highly Noise Affected	75	25	25
		Noise Affected (RBL+10dB)	50	25	25
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	45	25	25
		Noise Affected Evening (RBL+5dB)	41	25	25
		Noise Affected Night (RBL+5dB)	43	25	25
R18 Residential	Standard Hours	Highly Noise Affected	75	37	20
		Noise Affected (RBL+10dB)	53	37	20
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	37	20
		Noise Affected Evening (RBL+5dB)	46	37	20
		Noise Affected Night (RBL+5dB)	52	37	20
R19 Residential	Standard Hours	Highly Noise Affected	75	38	20
		Noise Affected (RBL+10dB)	53	38	20
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	38	20
		Noise Affected Evening (RBL+5dB)	46	38	20
		Noise Affected Night (RBL+5dB)	52	38	20
R20 Residential	Standard Hours	Highly Noise Affected	75	26	24
		Noise Affected (RBL+10dB)	53	26	24
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	48	26	24
		Noise Affected Evening (RBL+5dB)	46	26	24
		Noise Affected Night (RBL+5dB)	52	26	24
R21 Residential	Standard Hours	Highly Noise Affected	75	35	23
		Noise Affected (RBL+10dB)	53	35	23
	Outside Standard	Noise Affected Day (RBL+5dB)	48	35	23

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level	
				Eastern End of Pit	Western End of Pit
	Hours	Noise Affected Evening (RBL+5dB)	46	35	23
		Noise Affected Night (RBL+5dB)	52	35	23
R22 Residential	Standard Hours	Highly Noise Affected	75	30	14
		Noise Affected (RBL+10dB)	62	30	14
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	30	14
		Noise Affected Evening (RBL+5dB)	53	30	14
		Noise Affected Night (RBL+5dB)	54	30	14
R23 Residential	Standard Hours	Highly Noise Affected	75	36	23
		Noise Affected (RBL+10dB)	62	36	23
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	36	23
		Noise Affected Evening (RBL+5dB)	53	36	23
		Noise Affected Night (RBL+5dB)	54	36	23
R24 Residential	Standard Hours	Highly Noise Affected	75	32	27
		Noise Affected (RBL+10dB)	62	32	27
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	32	27
		Noise Affected Evening (RBL+5dB)	53	32	27
		Noise Affected Night (RBL+5dB)	54	32	27
R25 Residential	Standard Hours	Highly Noise Affected	75	38	27
		Noise Affected (RBL+10dB)	62	38	27
	Outside Standard Hours	Noise Affected Day (RBL+5dB)	57	38	27
		Noise Affected Evening (RBL+5dB)	53	38	27
		Noise Affected Night (RBL+5dB)	54	38	27

7.5 SLEEP DISTURBANCE

For construction activities, the L_1 sound pressure level of a known L_{eq} (ambient noise level) is typically 10dB higher than the L_{eq} level, (L_1 refers to the 1 percentile noise level, i.e. the noise level that is exceeded for 1% over a given measurement period and L_{eq} refers to the equivalent (or average) noise level over a given measurement period). It is on this basis (i.e. the relationship of an L_1 noise level being approximately 10dB greater than the L_{eq} noise level for a given noise source) that the L_1 noise emission level of the proposed construction equipment has been estimated, as outlined in ***Table 11***. Vipac have assessed sleep disturbance by using the criteria of RBL+15dB. It should also be noted that the assessment has been completed for all activities.

Table 8: Sleep Disturbance Assessment

Name	Predicted Noise Level (L_{A1}) dB		Sleep Disturbance RBL +15dB
	Eastern End Worst-Case	Western End Worst-Case	
R1	**72**	41	51
R2	45	34	64
R3	44	33	64
R4	47	35	62
R5	48	35	62
R6	44	28	62
R7	49	36	62
R8	45	30	62
R9	41	34	51
R10	43	31	62
R11	43	31	62
R12	44	**57**	53
R13	45	**71**	53
R14	44	**66**	53
R15	43	**61**	53
R16	44	53	53
R17	35	35	53
R18	47	30	62
R19	48	30	62
R20	36	34	62
R21	45	33	62
R22	40	34	64
R23	46	35	64
R24	42	37	64
R25	48	37	64

8 CONCLUSION & DISCUSSION

A construction noise impact assessment has been undertaken to determine the potential noise impact associated with the construction of the proposed Sand Mine in Bobs Farm, on noise sensitive receptors in the surrounding area.

The predicted noise levels during a number of phases of the construction program (Eastern End Worst-Case & Western End Worst-Case) are predicted to potentially exceed the Noise Affected - Noise Management Levels for Standard Construction Hours at up to four of the twenty five noise sensitive receptors (R1, R13, R14 and R15), located in the vicinity of the site. However, the predicted noise levels during all of the different phases of the construction program are within the Highly Noise Affected – Noise Management Levels for Standard Construction Hours at all of the noise sensitive monitoring locations, located in the vicinity of the proposed development site.

In the unlikely event that construction works are proposed to be undertaken outside of Standard Construction Hours, the predicted noise levels associated with the different phases of the construction program would be raised above the Noise Affected – Noise Management Levels at the five of the twenty five noise sensitive receptors (R1, R13, R14, R15 and R16), located in the vicinity of the site.

The predicted construction noise levels would also be raised above the applicable sleep disturbance criteria at five of the noise sensitive receptors locations (R1, R12, R13, R14 and R15) across the two scenarios modelled, in the unlikely event that construction works were proposed to be undertaken during the night-time period.

These predictions are based on a conservative assumption that construction operations and activities are situated at the closest distances to noise sensitive receivers, which relates to the highest potential impact on the local community during the construction phase of the proposed development.

In order to limit the impact on the surrounding noise sensitive receivers Vipac makes the following recommendation to minimise noise emissions from the site during the construction phase:

- To reduce the predicted noise impact on residential receivers in particular R1, R12, R13, R14 and R15, removal of trees by chainsaw near these receivers should only be completed following consultation with the receivers to notify them of the planned works and to advise the receivers of the proposed schedule to complete the tree removal works, with regard to the use of chainsaws for tree felling.

- Additionally in order to minimise the potential construction phase noise impacts on the sensitive receptors located in the vicinity of the site, a site specific noise management plan adopting feasible and reasonable noise attenuation and management measures should be implemented as detailed in ***Section 10*** of this report, as best practise to minimise the potential construction phase noise impacts.

9 CONSTRUCTION NOISE MANAGEMENT PLAN

Construction Noise Management Plan		
Component		**Details**
General/Site Management Issues		All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: should instruct all persons at the site with regard to all relevant project specific and standard noise and vibration mitigation measures detailed herein including permissible hours of work; any limitations on high noise generating activities; location of nearest sensitive receivers; construction employee parking areas; designated loading/unloading areas and procedures; site opening/closing times (including deliveries); and environmental incident procedures.
		A dedicated person will form a point of contact for the dissemination of general information regarding site operations. Contact persons will also be defined to receive comment or complaints from the community.
Hours of Work/Respite Periods		Typical Standard Hours for Construction 07:00 – 18:00 Monday – Friday and 08:00 -13:00 on Saturday
Source Controls	**General/Work Practices**	Avoid unnecessary revving of engines and turn off plant that is not being used / required.
		Use only non-tonal reverse alarms (broadband alternatives are needed). Where possible organise the site so that delivery trucks and haulage trucks only drive forward to avoid the use of reversing alarms.
		Organise and schedule the equipment operations to limit the noisiest machines operating simultaneously.
		Site set up / movement of plant / delivery of materials / waste removal to site should generally be restricted to the daytime period.
		Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling.
		Ensure there is no unnecessary shouting or loud stereos/radios on-site. There must be no dropping of materials from heights, throwing of metal items, or slamming of doors.
		Equipment must be inspected on a regular basis and maintained as necessary, to ensure it is in good working order. This must include inspections of the condition and performance of mufflers.
	Substitution	Use less noise-intensive equipment where reasonable and feasible.

Construction Noise Management Plan		
Component		**Details**
		Construction equipment with the most effective mufflers, enclosures and low-noise tool bits and blades must be procured and utilised for the project.
		Where possible mains power should be utilised for temporary traffic signals / work area lighting. Where this is not feasible silenced generator sets are to be used instead.
	Use and Siting of Equipment/ Activities	Where practical fixed plant should be positioned as far away as possible from sensitive receivers.
		During paving works or any concrete cutting works consideration should be given to taking materials off site for cutting where practical.
Consultation	**Notification**	A letter should be distributed to local residents in advance of the works to notify them of the nature and estimated timescales for completion of the proposed works.
	Project info-line and Construction response line	A 24-hour contact point should be provided for any complaints regarding the construction work. A Project representative must respond to all complaints as soon as possible.
Complaints management		Upon receiving any complaint regarding construction activities, the nominated contact must investigate the source of the complaint. The aim will be for a Project representative to initiate a complaint investigation and to respond to all complaints as soon as possible. Where practicable a visit should be made to the complainant to verify the nature of the complaint and if justified appropriate action should be taken to cease or amend the activity causing the complaint. A Complaint Management Plan will be developed and implemented by the contractor engaged for the Construction Works. The Complaint Management Plan will at a minimum include provisions for the recommendations outlined above.