Vipac Engineers & Scientists Ltd.
4/5 Leo Lewis Close, Toronto, NSW 2283, Australia
PO Box 306, Toronto, NSW 2283, Australia
t. +61 2 4950 5833 | **f.** +61 2 4950 4276 | **e.** huntervalley@vipac.com.au
w. www.vipac.com.au | A.B.N. 33 005 453 627 | A.C.N. 005 453 627

Vipac Engineers & Scientists

Planit Consulting Pty Ltd

Catherine Hill Bay
Waste Water Treatment Plant (WWTP)

Noise Impact Assessment

29N-13-0053-TRP-472252-0

31 March 2014

Report Title: Noise Impact Assessment Job Title: Catherine Hill Bay	
DOCUMENT NO: 29N-13-0053-TRP-472252-0 **PREPARED FOR:** **Planit Consulting Pty Ltd** Level 2, 11-13 Pearl Street, Kingscliff Central Kingscliff NSW 2487 P O Box 1623 Kingscliff NSW 2487 **CONTACT:** Adam Smith **Tel:** +61 2 6674 5001 **Fax:** +61 2 6674 5003	**REPORT CODE:** TRP **PREPARED BY:** Vipac Engineers & Scientists Ltd. 4/5 Leo Lewis Close, Toronto, NSW 2283, Australia **Tel:** +61 2 4950 5833 **Fax:** +61 2 4950 4276

PREPARED BY: Author:	Lynne Tan **Project Engineer**	Date: 31 March 2014
REVIEWED BY: Reviewer:	Darragh Kingston **Manager Hunter Valley/Newcastle** **Team Leader, Acoustics**	Date: 31 March 2014
AUTHORISED BY:	Darragh Kingston **Manager Hunter Valley/Newcastle** **Team Leader, Acoustics**	Date: 31 March 2014

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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Planit Consulting Pty Ltd on behalf of Solo Water Pty Ltd to carry out an acoustic assessment of a proposed Wastewater Treatment Plant (WWTP) at Montefiore Road, Catherine Hill Bay NSW.

The following standards and guidelines were used for this assessment:

- Environmental Protection Authority (EPA) Office of Environmental and Heritage (OEH) NSW *Industrial Noise Policy* (INP),
- Australian Standard AS 1055-1997- "*Acoustics Description and Measurement of Environmental Noise, Part 1- General Procedure*".

A noise impact assessment has been undertaken to determine the potential noise impact of the proposed wastewater treatment plant operations on noise sensitive receptors in the surrounding area.

The acoustic impact of the proposed wastewater treatment plant is predicted to be within the applicable noise criteria during day, evening and night time criteria for all development/operational stages of the WWTP.

It is therefore Vipac's professional opinion that the proposed wastewater treatment plant is acceptable from an acoustic point of view.

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Planit Consulting Pty Ltd on behalf of Solo Water Pty Ltd to carry out an acoustic assessment of a proposed Wastewater Treatment Plant (WWTP) at Montefiore Road, Catherine Hill Bay NSW.

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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 an 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 proposed water treatment plant is located at Lot 101 DP 1129872 Montefiore Street, Catherine Hill Bay, NSW. The site of the proposed WWTP is located at the corner of the intersection of Montefiore Street and existing road reserve (Old Pacific Highway).

There are a small number of existing receivers located approximately 800-metre radius from the proposed WWTP. There are only future residences (Stage 5 and 6 of the proposed residential development) located within a 500-metres radius of the proposed WWTP that may potentially be impacted by the WWTP operations. The site location of the proposed water treatment plant and surrounding noise sensitive receptors is illustrated in ***Figure 1***.

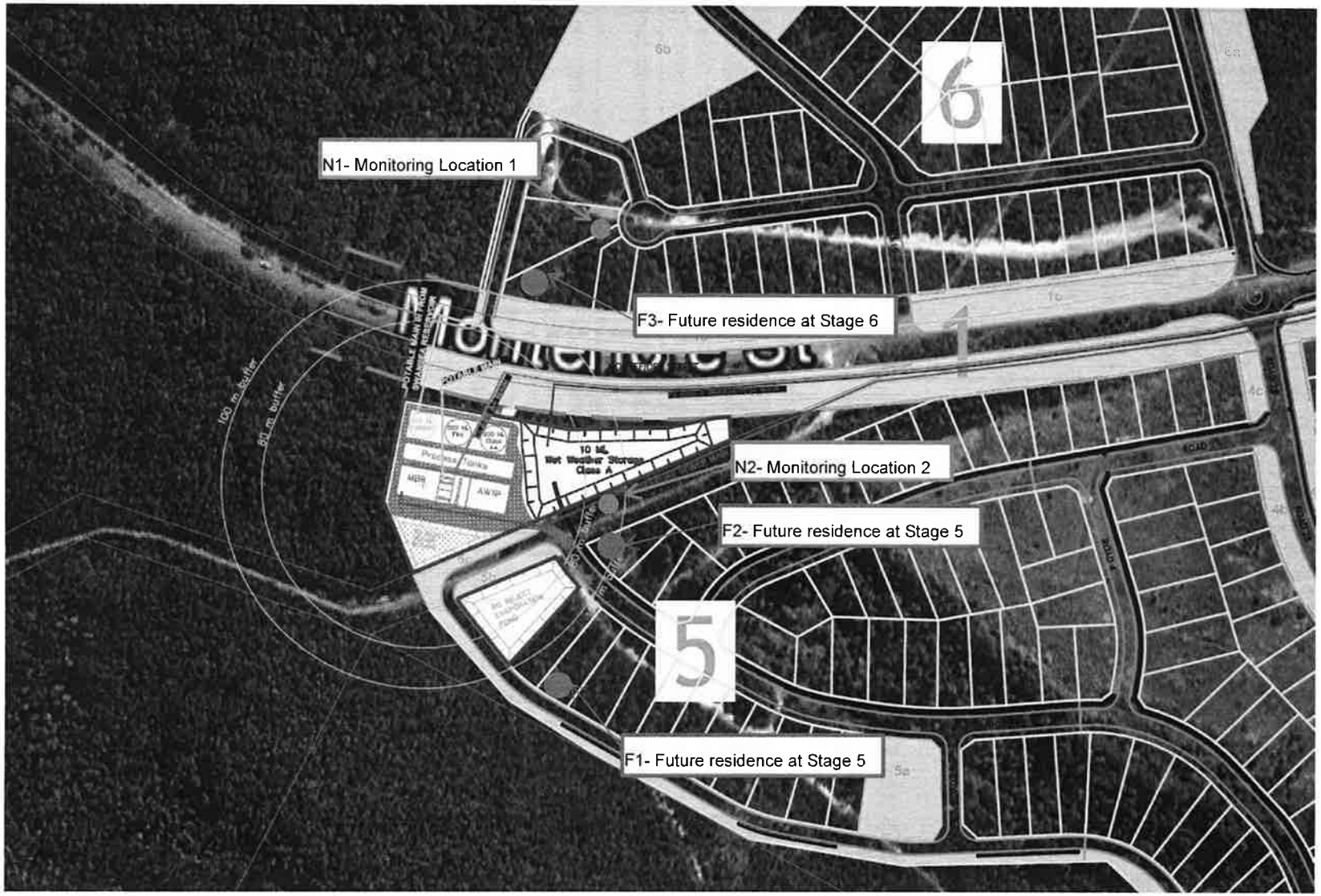


Figure 1: Locality Plan of Proposed WWTP and Noise Sensitive Receivers

31 Mar 2014

3.2 Noise Sensitive Receivers

A list of the nearest potentially affected noise sensitive receivers to the wastewater treatment plant (WWTP) is provided below in ***Table 2***. The distance is calculated from the boundary of proposed WWTP to the property boundary of noise sensitive receivers.

Table 2: Noise Sensitive Receivers

ID	Property	Location
F1	Future residence at Stage 5	Approximately 120m to the South of the WWTP
F2	Future residence at Stage 5	Approximately 40m to the East of the WWTP
F3	Future residence at Stage 6	Approximately 60m to the North of the WWTP

3.3 Proposed Wastewater Treatment Plant

The proposed WWTP will provide sewerage and recycled water services to serve a subdivision approved by the NSW Planning Assessment Commission under Project Approval MP10_0204 on the 13th May 2011, which includes 550 residential lots, 1 retail lot, 9 reserves and 2 heritage lots.

4 EXISTING NOISE ENVIRONMENT

Vipac installed noise logging equipment at two locations to measure baseline environmental noise levels at a representative location in the vicinity of the proposed wastewater treatment plant. The location of the monitoring points are listed in ***Table 3*** and shown in ***Figure 1***.

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.

Table 3: Monitoring Locations

Loc.	Date	Location / Address	Instrument	Serial No.
N1	30/01/14 - 05/02/14	Opposite Proposed WWTP, approximately 60m to Montefiore Road	LD 870	1459
N2	30/01/14 - 05/02/14	Existing Old Reserve (Old Pacific Highway), Approximately 80m to Montefiore Road	LD 870	0181

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 site.

Table 4: Summary of current ambient noise levels (dBA)

Monitoring Location	Period	L_{Aeq}	L_{A90}	RBL[1]
N1	Day	66	49	45
	Evening	65	43	41
	Night	60	40	38
N2	Day	63	49	47
	Evening	58	50	49
	Night	62	52	49

[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 terms

5 CRITERIA

THE EPA (OEH) INP sets limits on the noise that may be generated by the WWTP during the operational stage. These limits are dependent upon the existing noise levels at the site and are designed to ensure changes to the existing noise environment are minimised and deal with the intrusiveness of the noise and the amenity of the environment. The most stringent of the limits is taken as the limiting criterion for the noise source.

The intrusiveness noise criterion requires that the $L_{Aeq,15minutes}$ for the noise source, measured at the most sensitive receiver under worst-case conditions, should not exceed the Rated Background Level (RBL) by more than 5dB, represented as follows:

- $L_{Aeq,15minutes} < RBL + 5dB$

Noise levels at nearby noise sensitive receptors (located in the surrounding area) associated with the operational phase of the WWTP should not exceed the Project Specific Noise Levels detailed in ***Table 5***.

Table 5: Project Specific Noise Levels at Noise Sensitive Receptors dB(A)

Location	Period	L_{Aeq}	RBL	Recommended Acceptable L_{Aeq} [1]	Intrusiveness Criteria Level	Project Specific Noise Level
F1 & F2	Day	63	47	55	52	52
	Evening	58	49	45	54	45
	Night	62	49	40	54	40
F3	Day	66	45	55	50	50
	Evening	65	41	45	46	45
	Night	60	38	40	43	40

6 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 Office of Environment and Heritage (OEH) for environmental noise modelling purposes. Vipac have undertaken numerous noise modelling and impact assessments previously for a range of projects, including mining and industrial projects using SoundPLAN®.

6.1 Geographical Data

Planit Consulting supplied topographical details of the area in 3-dimensional DXF format. ***Table 6*** below lists the drawings received and used in the noise model.

Table 6: Drawings used

Drawing Title	Description	Received Date
H10052_WWTP Site Layout_130710.dwg	Layout Plan of proposed WWTP	21/01/2014
11688-Treatment Site. dxf	Existing Ground elevations and future allotment layout plan of Bingara Gorge Subdivision	23/01/2014

[1] Recommended Acceptable L_{Aeq} noise level for residence in Suburban area from Table 2.1 in OEH Industrial Noise Policy. 31 Mar 2014

6.2 Noise Sources

A list of equipment that will be used in the proposed wastewater treatment plant was provided to Vipac by Planit Consulting. Vipac has identified a number of "noisy" sources, which will potentially impact on the noise sensitive receivers and is listed in ***Appendix B:***.

As equipment sound power levels are not available at this stage, Vipac has used typical pump sound power levels with varying power ratings, as shown in ***Table 7*** to logarithmically interpolate the sound power level of a pump based on the given power rating.

Table 7: Sound power levels for various power rating of centrifugal pump

Power Rating	Sound Power Levels (dBA)
1kW	73
3kW	78
10kW	82
30kW	87
100kW	91

For equipment such as air blowers and chemical exhaust fans, the sound power levels of these units were determined using the similar power rating of comparable centrifugal fans. The noise output for these units has been determined as producing a sound power level of 83dB(A).

The noise emission levels for plant and equipment incorporated into the noise prediction model are also listed in ***Appendix B:***.

Based on the drawing titled "Wastewater Treatment Plant Site Layout" dated 30/03/2013, most of the noise sources are located within the building and pump station with the exception of the chemical exhaust fan. It is understood that this fan will be a roof or wall mounted type fan. Taking into account the breakout noise from the vent of the building, it is anticipated that the building façade will provide an attenuation of at least 20dB.

6.3 Noise Modelling Scenario

Four acoustic modelling scenarios were run for the WWTP within the SoundPLAN program using CONCOWE algorithms under both neutral and worst case weather conditions for the day and evening/night periods. It should be noted that sound waves (i.e. noise) will propagate further through the atmosphere under certain weather conditions. The 'worst-case' weather conditions chosen were those highly conducive to the propagation of sound. As operations occur during 24 hours 7-days a week, this situation has been considered in the noise predictions.

Table 8 presents the weather parameters used in the CONCOWE calculations based on the annual data for the Bureau of Meteorology (BoM) Weather Station at Norah Head Light House

Table 8: Sound Plan Weather Parameters

Parameter	Day		Evening/Night	
	Neutral	Worst-Case	Neutral	Worst-Case
Pasquill Stability Category	B	D	D	F
Wind Speed (m/s)	0	3	0	3
Humidity (%)	71	71	77	77
Temperature (deg Celsius)	16	16	12	12
Met Category	3	5	4	6

7 WWTP OPERATIONA PHASE- PREDICTED NOISE LEVELS

Noise prediction modelling has been carried out to assess the potential impact associated with the proposed Wastewater Treatment Plant on the existing noise environment at the nearest noise sensitive receptors located in proximity to the site. The predicted noise levels representative of the operational phase of each stage for both neutral conditions and worst-case conditions during day, evening and night time are presented in ***Table 9***

Table 9: Proposed WWTP Operations - Predicted Noise Impact (dBA)

Location	Predicted Noise Levels dB(A)					
	Day time			Evening/Night time		
	Neutral	Worst	Criteria	Neutral	Worst	Criteria (evening, night)
F1	29	30	52	29	30	45, 40
F2	38	39	52	38	39	45, 40
F3	21	21	50	21	21	45, 40

Noise prediction modelling has been undertaken for the operational phase of propose WWTP taking into consideration two scenarios considering both the neutral and worst-case conditions during day time and night time. The difference between the predicted noise levels for each weather scenario is approximately 1dB.

The predicted noise impact from the proposed wastewater treatment plant on the noise sensitive receivers ranged between 21 to 39dB(A), falling below the applicable criteria during day, evening and night time.

Error! Reference source not found. provides the noise contour maps associated with the acoustic modelled scenarios.

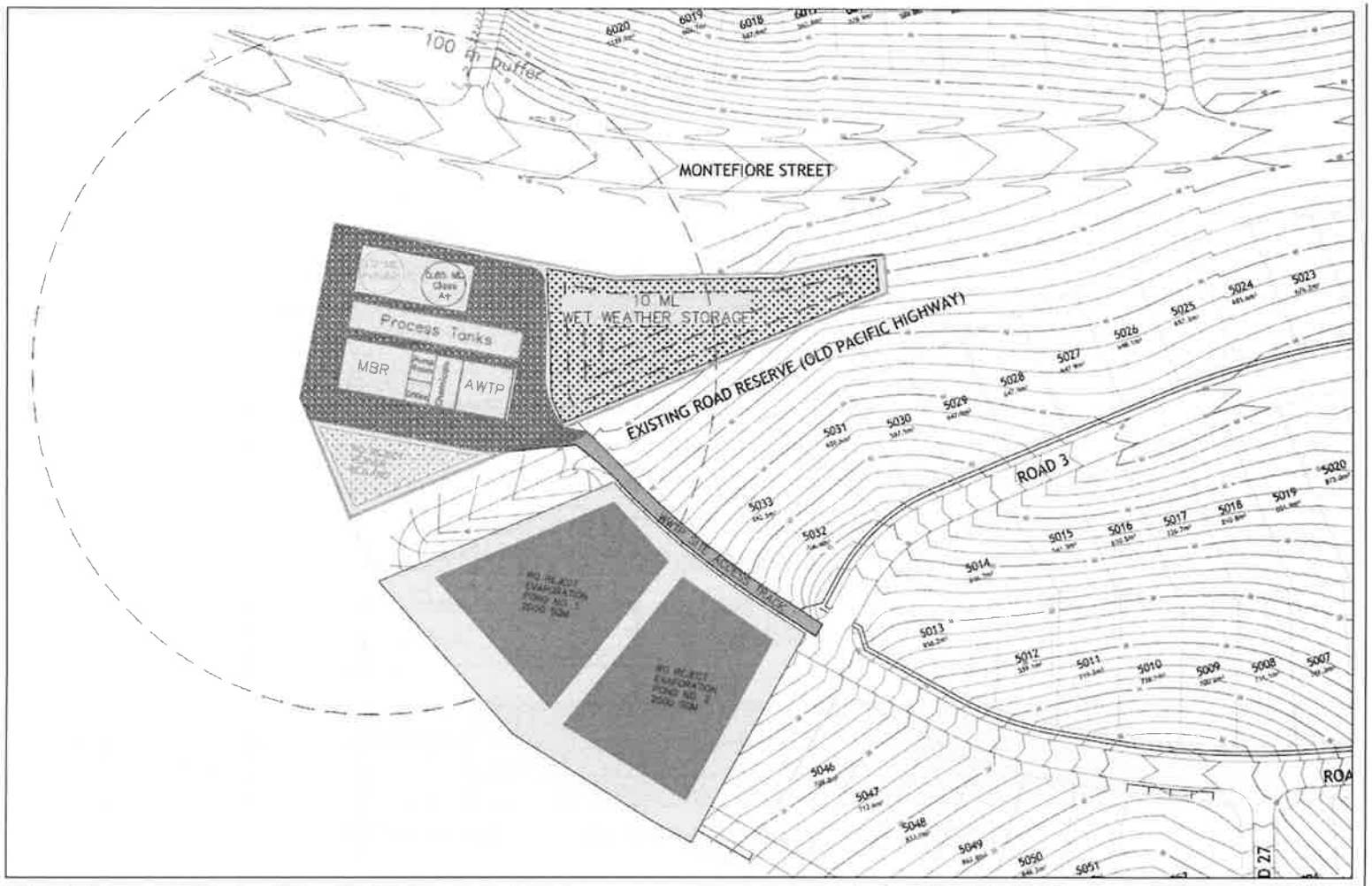
8 CONCLUSION

A noise impact assessment has been undertaken to determine the potential noise impact of the proposed wastewater treatment plant operations on noise sensitive receptors in the surrounding area.

The acoustic impact of the proposed wastewater treatment plant is predicted to be within the applicable noise criteria during day, evening and night time criteria for all development/operational stages of the WWTP.

It is therefore Vipac's professional opinion that the proposed wastewater treatment plant is acceptable from an acoustic point of view.

Appendix A: SITE LAYOUT PLAN



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Appendix B: LIST OF PLANT AND EQUIPMENT

MBR						
Tag No	Equipment Description	No of unit	Type of Drive	KW	Phase	Estimate Sound Power Level /unit (dBA)
P- 2001	Influent Discharge Pump	1	Variable Speed	1.1	1	73
P-3001	Influent Discharge Pump	1	Variable Speed	1.1	1	73
MV-2001	Influent Discharge Valve	1	Fixed	1	1	73
P-2002	Anerobic Feed Pump	1	Variable Speed	1.88	1	75
P-3002	Anerobic Feed Pump	1	Variable Speed	1.88	1	75
MX-2001	Anoxic Mixer Pump	1	Fixed	1.1	1	73
MX-3001	Anoxic Mixer Pump	1	Fixed	1.1	1	73
P-2003	Anoxic Feed Pump	1	Variable Speed	1.1	1	73
P-3003	Anoxic Feed Pump	1	Variable Speed	1.1	1	73
P-2004	MBR Feed Pump	1	Fixed	1.1	1	73
P-3004	MBR Feed Pump	1	Fixed	1.1	1	73
P-2005	MBR De-Sludge Pump	1	Fixed	1.1	1	73
P-3005	MBR De-Sludge Pump	1	Fixed	1.1	1	73
P-2006	Permeate Pump	1	Variable Speed	1.5	3	75
P-2006A	Permeate Transfer Pump	1	Fixed	2	3	76
DP-2007	Alum Dosing Pump	1	Fixed	0.2	1	67
DP-2008	Caustic Dosing Pump	1	Fixed	0.2	1	67
DP-2009	Hypo Dosing Pump CIP	1	Fixed	0.2	1	67
DP-2010	Acetic Acid Dosing Pump	1	Fixed	0.2	1	67
PSU-1	Floor Sump Pump	1	Fixed	1.1	1	73
BU-2001	Blower Unit	1	Variable Speed	15	3	83
BU-2002	Blower Unit	1	Variable Speed	15	3	83
Chemical Exhaust	Chemical Exhaust Fan	1	Fixed	2	3	83

MBR						
Tag No	Equipment Description	No of unit	Type of Drive	KW	Phase	Estimate Sound Power Level /unit (dBA)
Evap Cooler MBR	Evap Cooler	1	Fixed	3	3	77
PSU-2	CR-Sewerage Pump	1	Fixed	1.1	1	73
RCP-2010	Recycled Water Pump Set	1	Variable Speed	60	3	89

Advanced Water Treatment Plant						
Tag No	Equipment Description	No of Unit	Type of Drive	KW	Phase	Sound Power Level/unit dBA
AWTP-CTP	Chlorine Contact Pump	1	Fixed	5	3	79
DP-CT005	Hypo Chlorine Contact Tank	1	Variable Speed	1	1	73
DP-RWT006	Hypo Recycled Water tank	1	Variable Speed	1	1	73
DP-RWT007	Caustic Recycled Water Tank	1	Variable Speed	1	1	73
Evap Cooler	AWTP Evap Cooler	1	Fixed	3	1	77

Appendix C: NOISE CONTOUR MAPS

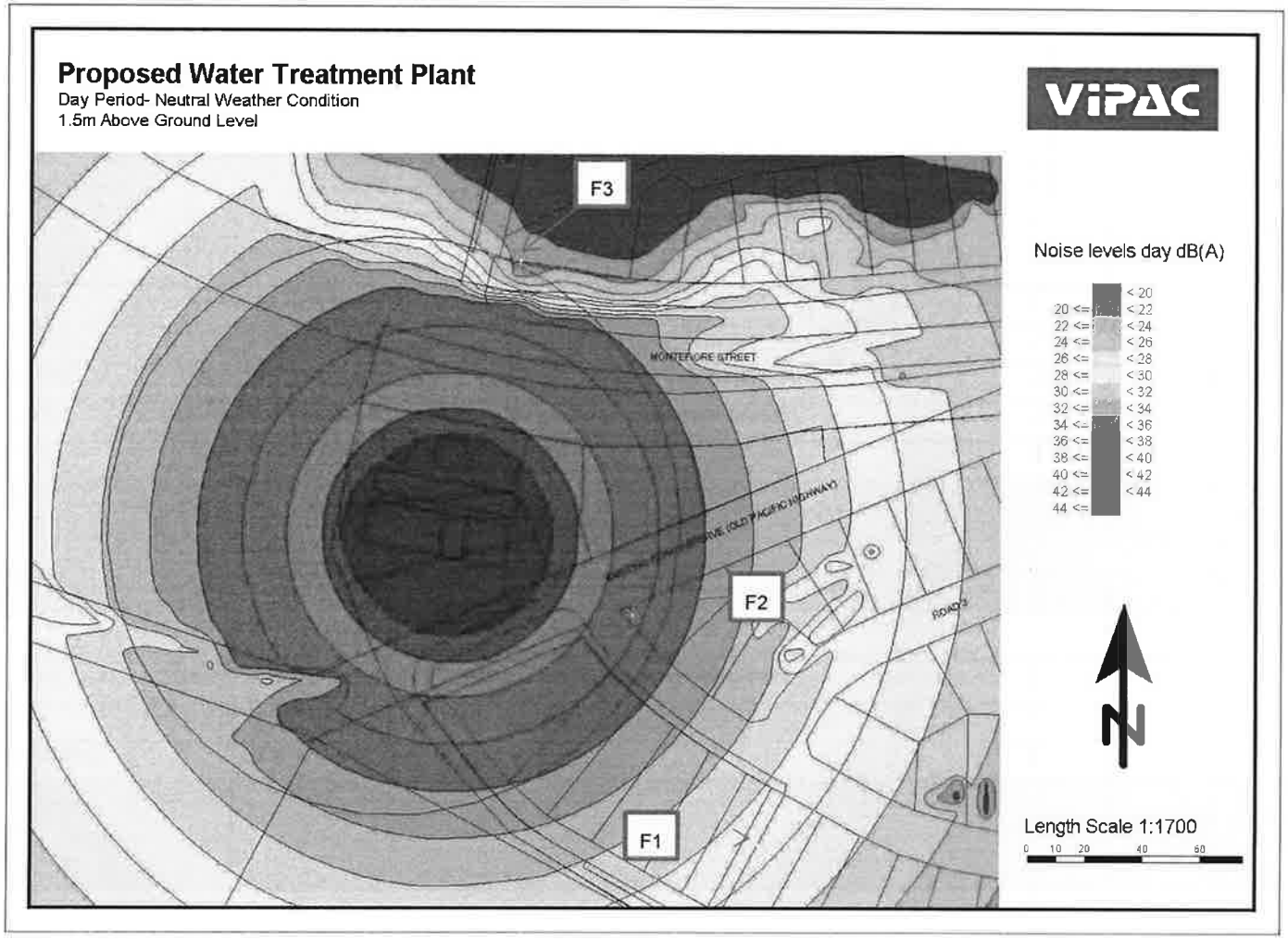

Figure 2: Proposed WWTP – Day Period, Neutral Weather Conditions
31 Mar 2014

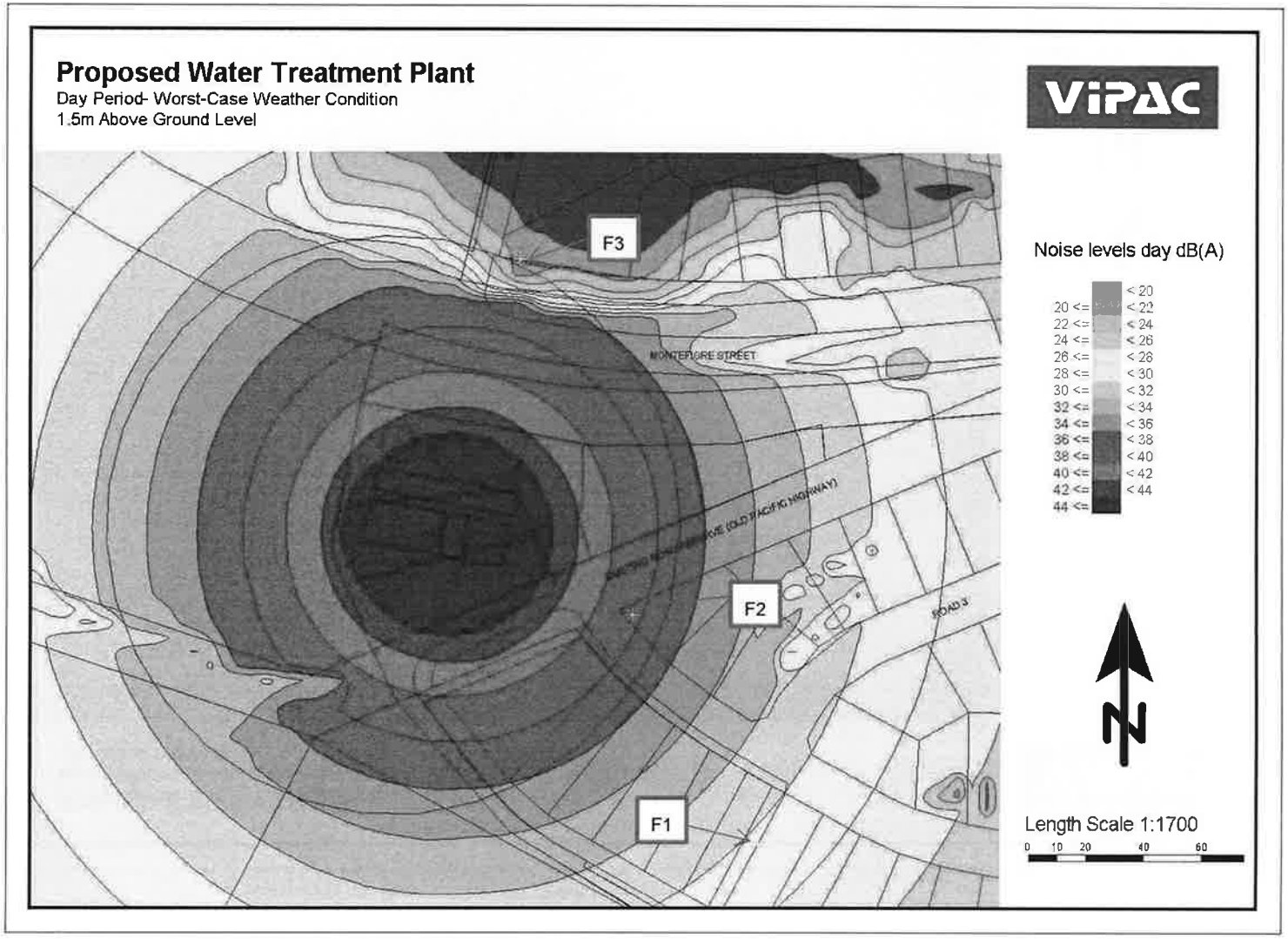

Figure 3: Proposed WWTP – Day Period, Worst Care Weather Conditions
31 Mar 2014

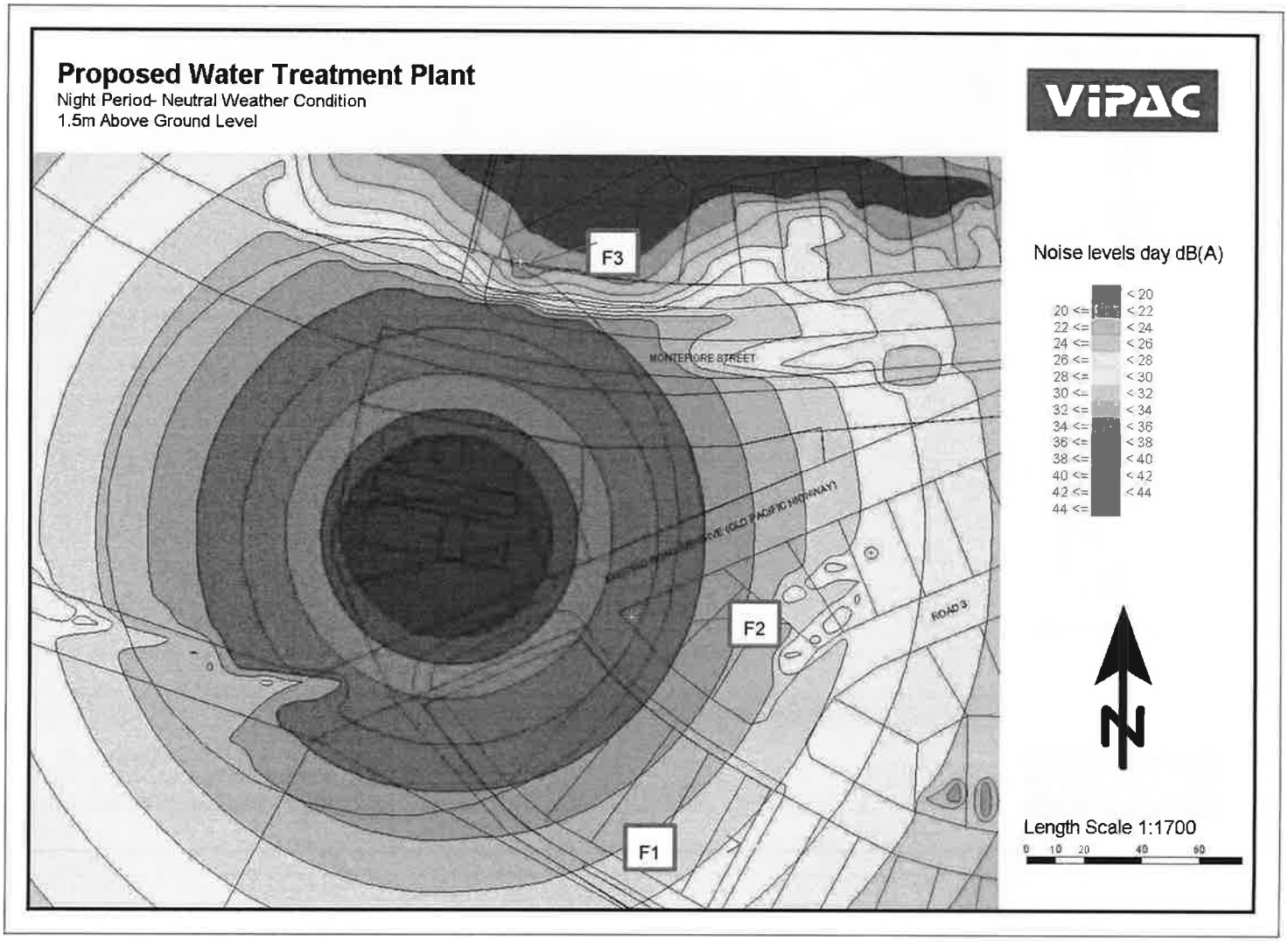

Figure 4: Proposed WWTP – Night Period, Neutral Weather Conditions

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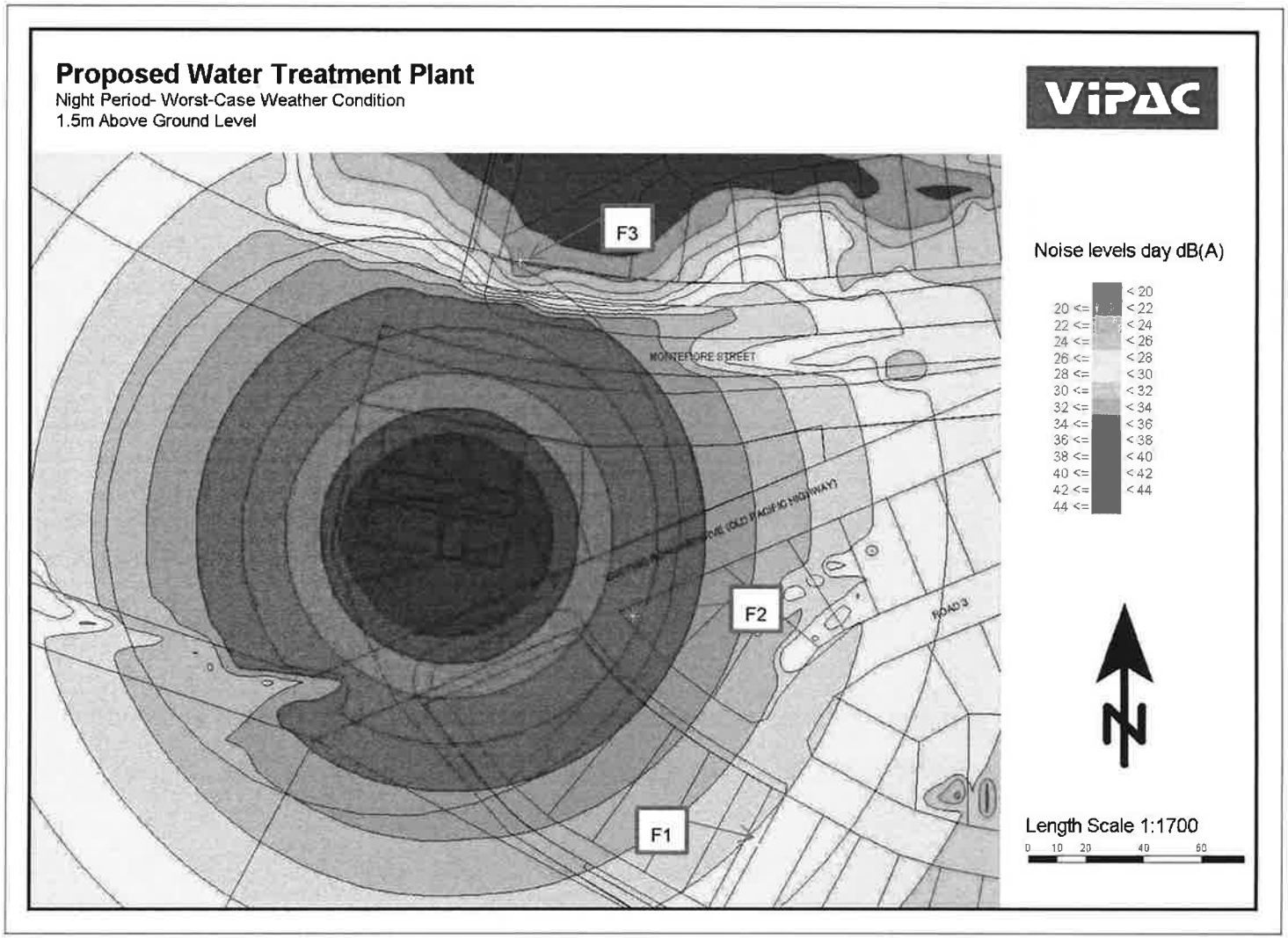

Figure 5: Proposed WWTP – Night Period, Worst Care Weather Conditions

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Vipac Engineers & Scientists Ltd.
4/5 Leo Lewis Close, Toronto, NSW 2283, Australia
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t. +61 2 4950 5833 | f. +61 2 4950 4276 | e. huntervalley@vipac.com.au
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CELEBRATING ENGINEERING EXCELLENCE

Vipac Engineers & Scientists

Planit Consulting Pty Ltd

Catherine Hill Bay
Waste Water Treatment Plant (WWTP)

Construction Noise Management Plan

29N-13-0053-TRP-472254-0

31 March 2014

Report Title: Construction Noise Management Plan Job Title: Catherine Hill Bay	
DOCUMENT NO: 29N-13-0053-TRP-472254-0 **PREPARED FOR:** **Planit Consulting Pty Ltd** Level 2, 11-13 Pearl Street, Kingscliff Central Kingscliff NSW 2487 P O Box 1623 Kingscliff NSW 2487 **CONTACT:** Adam Smith **Tel:** +61 2 6674 5001 **Fax:** +61 2 6674 5003	**REPORT CODE:** TRP **PREPARED BY:** Vipac Engineers & Scientists Ltd. 4/5 Leo Lewis Close, Toronto, NSW 2283, Australia **Tel:** +61 2 4950 5833 **Fax:** +61 2 4950 4276

PREPARED BY: Author:	 Lynne Tan **Project Engineer**	Date: 31 March 2014
REVIEWED BY: Reviewer:	 Darragh Kingston **Manager Hunter Valley/Newcastle** **Team Leader, Acoustics**	Date: 31 March 2014
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The following standards and guidelines were used for this assessment:

- Office of Environment and Heritage (OEH) NSW "*Interim Construction Noise Guideline*";
- EPA (OEH) NSW "*Industrial Noise Policy*";
- AS 2436-2010 "*Guide to Noise Construction, Maintenance and Demolition Sites*";

A construction noise impact assessment has been undertaken to determine the potential noise impact of the construction of the proposed wastewater treatment plant on noise sensitive receptors in the surrounding area.

The acoustic impact of the proposed wastewater treatment plant construction is predicted to be within all the applicable noise criteria during standard and outside construction working hour.

It is therefore Vipac's professional opinion that the proposed wastewater treatment plant is acceptable from an acoustic point of view.

Section 8 of this report outlines the construction management plan that should be adopted for the construction phase of the project.

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1 INTRODUCTION

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This Construction Noise Management Plan is prepared in accordance with the:

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- EPA (OEH) NSW "*Industrial Noise Policy*";
- AS 2436-2010 "*Guide to Noise Construction, Maintenance and Demolition Sites*";

The steps for managing noise impacts from construction are as follows:

- Identify the location of the proposed works.
- Identify the sensitive receiver locations with respect to 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 and vibration from construction work at the identified sensitive receivers.
- Provide reasonable and feasible mitigation and management strategies where the noise management levels are exceeded.

2 GLOSSARY OF TERMS

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$L_{A10,18hrs}$	The L_{10} noise level for the time period extending from 6am to midnight.

3 PROJECT DESCRIPTION

3.1 Site Location

The proposed water treatment plant will be located at Lot 101 DP 1129872 Montefiore Street, Catherine Hill Bay, NSW. The site of the proposed WWTP is located at the corner of the intersection of Montefiore Street and existing road reserve (Old Pacific Highway).

There are a small number of existing receivers located approximately 800-metre radius from the proposed WWTP that may potentially be impacted by the construction activities of proposed WWTP. The site location of the proposed WWTP and surrounding noise sensitive receptors is illustrated in ***Figure 1***.

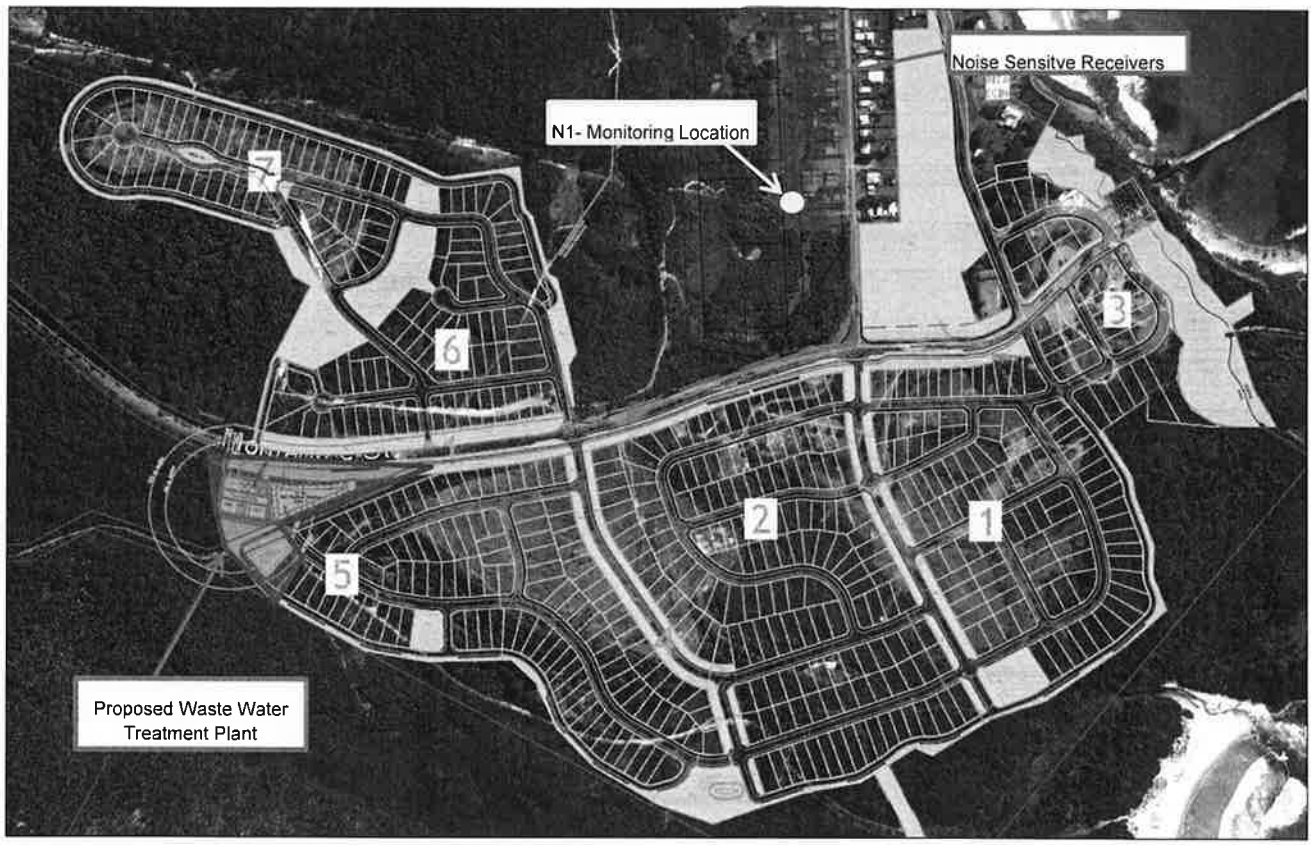

Figure 1: Locality Plan of proposed WWTP and Noise Sensitive Receivers

3.2 Noise Sensitive Receivers

A list of the nearest potentially affected noise sensitive receivers to the proposed wastewater treatment plant (WWTP) that may be impacted during the construction phase of the WWTP is provided below in ***Table 2***.

Table 2: Noise Sensitive Receivers

ID	Address	Usage
R001	21 Clarke Street	Residential
R002	Catho Pub	Commercial
R003	22 Clarke Street	Residential
R004	20 Clarke Street	Residential
R005	18 Clarke Street	Residential
R006	16 Clarke Street	Residential
R007	14 Clarke Street	Residential
R008	12 Clarke Street	Residential
R009	10 Clarke Street	Residential
R010	8 Clarke Street	Residential
R011	6 Clarke Street	Residential
R012	12 Lindsley Street	Residential

3.3 Construction Methodology

The typical construction work activities to be undertaken will comprise of the following works:

- Excavation
- Pilling
- Construction

The following is the typical construction equipment that will be used during the construction activities of each stage:

- Excavation - Excavator and trucks for removals
- Pilling - Mobile crane, hydraulic jack and delivery trucks.
- Construction - Mobile crane, material hoist, concrete mixer and concrete pump, delivery trucks and general construction tools such as drill, nail gun, electric saw, etc.

4 CONSTRUCTION NOISE GUIDELINES

4.1 NSW OEH "Interim Construction Noise Guideline"

The NSW Interim Construction Noise Guideline was developed by the NSW - OEH and contains detailed procedures for the assessment and management of construction noise impacts.

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

It is expected that the length of the construction works will be more than 3 weeks and therefore, a quantitative method has been used for this assessment.

4.1.1 Residences and Other Sensitive Land Uses

Table 3 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 3: Noise at residence using Quantitative Assessment

Recommended Hours	Time of Day	Management level [1] $L_{Aeq(15min)}$
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 4: Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management Level, $L_{Aeq(15min)}$ Applies when properties are being used
Offices, retail outlets	External Noise Levels 70dB

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, rail lines, masonry, road pavement or steel work
- Grinding metal, concrete or masonry
- Rock drilling
- Line drilling
- Vibratory rolling
- Rail tamping and regulating
- Bitumen milling or profiling
- Jack hammering, rock hammering it rock breaking'
- Impact piling

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 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.

4.1.2 Assessing Impacts

The process of predicting noise is summarised in ***Figure 2.***

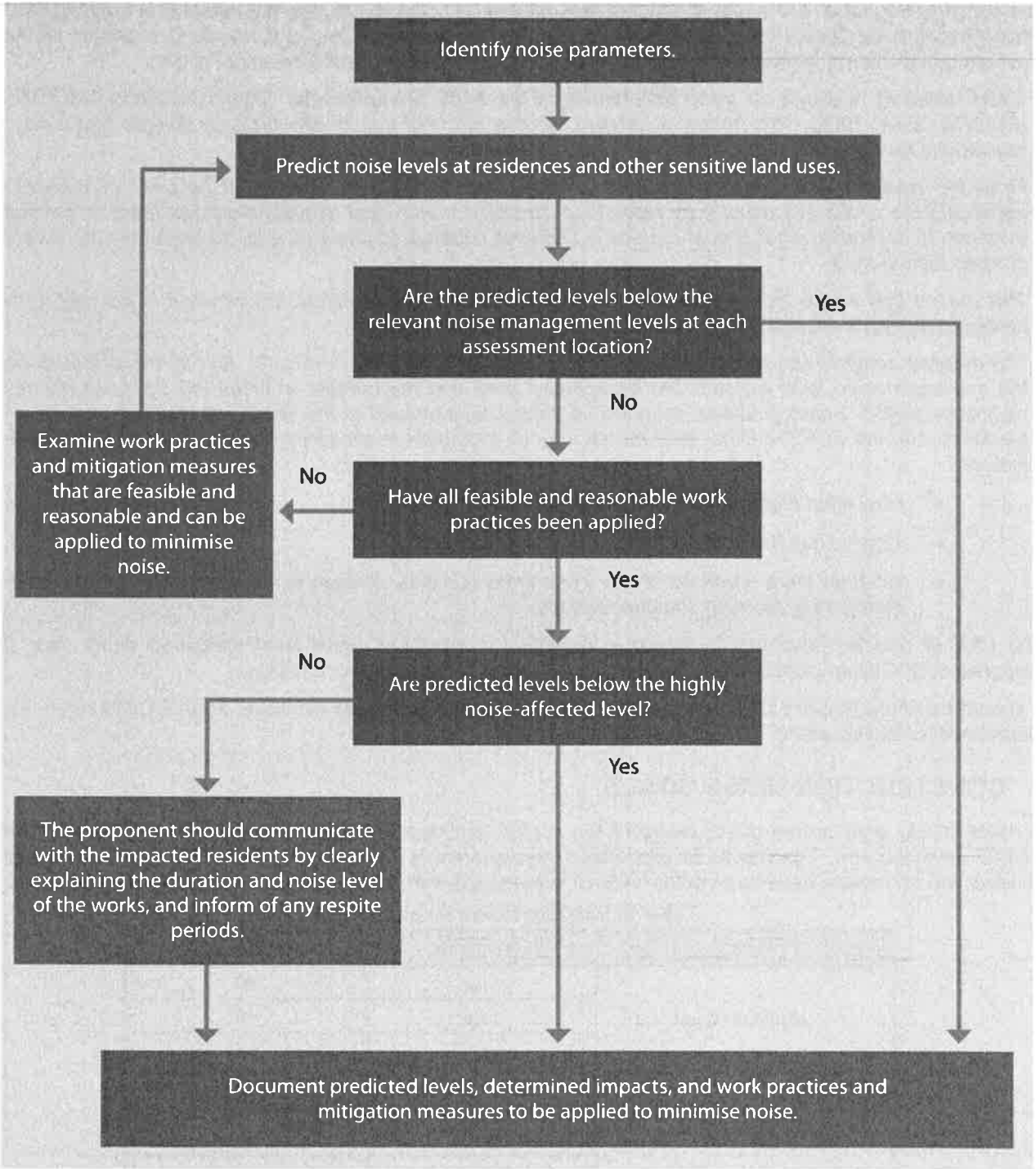

Figure 2: Prediction and Assessment of impacts - Quantitative Method

4.2 Sleep Disturbance Assessment Approach

The NSW Construction Noise Guideline also 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 LA1, (1 minute) not exceeding the LA90, (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 LA1, (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 LA1, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. DECCW will accept analysis based on either LA1, (1 minute) or LA(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.

5 CONSTRUCTION NOISE GOALS

A noise survey was carried out to measure the current ambient noise levels in the vicinity of the proposed WWTP development. The results of unattended measurements are shown in ***Table 5.*** The noise limits for construction on the site have been determined in accordance with the interim construction noise guideline.

Table 5: Existing Noise levels, dB(A)

Period	Descriptor	L1
Day (7am- 6pm)	L_{Aeq}	60
	L_{A90}	49
	RBL[1]	44
Evening (6pm-10pm)	L_{Aeq}	50
	L_{A90}	43
	RBL[1]	41
Night (10pm-7am)	L_{Aeq}	44
	L_{A90}	38
	RBL[1]	36

[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 terms.

Table 6 provides a summary of the noise management levels (NML) criterion at the sensitive receivers. Where internal noise levels were specified, 10dB was added to approximate an external noise level.

Table 6: Construction Noise Management Levels

Receiver type	Period	NML	Highly affected Noise Level
Residential	Day - (RBL+10)	54	75
	Evening - (RBL+5) (or outside standard hours)	46	
	Night (RBL+5) (or outside standard hours)	41	

In the absence of the proposed construction hours, Vipac has assessed the construction noise impact during standard construction hours and also outside standard permissible construction hours.

6 CONSTRUCTION NOISE ASSESSMENT

6.1 Plant and Equipment

Table 7 details the proposed plant and equipment and the corresponding acoustic power produced by each item. The total predicted sound power levels for each of the construction phases is also presented. 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 7: Construction activities and Sound Powel Levels

Plant & Equipment	Quantity	Sound Power Level (LWA) dB	Predicted Sound Pressure Levels (dBA) at various distances per equipment (metres)						
			50	100	200	300	400	500	600
Tracked excavator (103kW)	1	103	61	55	49	45	43	41	39
Drop Hammer Pilling (2 tonne)	1	109	67	61	55	51	49	47	45
Mobile Crane (70 tonne)	1	98	56	50	44	40	38	36	34
Trucks	1	102	60	54	48	44	42	40	38
Mobile Concrete Line Pump	1	103	61	55	49	45	43	41	39
Hand-held Electric Drill	1	94	52	46	40	36	34	32	30
Hand-held Electric Grinder	1	103	61	55	49	45	43	41	39
Hoist	1	93	51	45	39	35	33	31	29
Circular Saw	1	113	71	65	59	55	53	51	49
Jackhammer	1	113	71	65	59	55	53	51	49

6.2 Predicted Construction Noise Levels

The predicted noise levels have been calculated using the SoundPLAN computational noise prediction modelling software package. The use of the SoundPLAN software and referenced modelling methodology is accepted for use in the state of NSW by the Office of Environment and Heritage (OEH) for environmental noise modelling purposes. Vipac have undertaken numerous noise modelling and impact assessments previously for a range of projects, including mining and industrial projects using SoundPLAN.

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 8*** for each of the construction stages.

Table 8: Predicted Noise Levels

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level (L_{Aeq})		
				Excavation	Pilling	Construction
R001	Standard Hours	Highly Noise Affected	75	26	38	37
		Noise Affected (RBL+10dB)	54	26	38	37
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	26	38	37
		Noise Affected Evening (RBL+10dB)	46	26	38	37
		Noise Affected Night (RBL+10dB)	41	26	38	37
R002	when in use	Highly Noise Affected	75	26	38	37
		Noise Affected	70	26	38	37
R003	Standard Hours	Highly Noise Affected	75	25	37	36
		Noise Affected (RBL+10dB)	54	25	37	36
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	36
		Noise Affected Evening (RBL+10dB)	46	25	37	36
		Noise Affected Night (RBL+10dB)	41	25	37	36
R004	Standard Hours	Highly Noise Affected	75	25	37	36
		Noise Affected (RBL+10dB)	54	25	37	36
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	36
		Noise Affected Evening (RBL+10dB)	46	25	37	36
		Noise Affected Night (RBL+10dB)	41	25	37	36
R005	Standard Hours	Highly Noise Affected	75	25	37	36
		Noise Affected (RBL+10dB)	54	25	37	36
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	36
		Noise Affected Evening (RBL+10dB)	46	25	37	36
		Noise Affected Night (RBL+10dB)	41	25	37	36
R006	Standard Hours	Highly Noise Affected	75	25	37	36
		Noise Affected (RBL+10dB)	54	25	37	36
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	36
		Noise Affected Evening (RBL+10dB)	46	25	37	36
		Noise Affected Night (RBL+10dB)	41	25	37	36
R007	Standard Hours	Highly Noise Affected	75	25	37	36
		Noise Affected (RBL+10dB)	54	25	37	36
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	36
		Noise Affected Evening (RBL+10dB)	46	25	37	36
		Noise Affected Night (RBL+10dB)	41	25	37	36

Receiver ID	Period	Criteria	Noise Management Level	Predicted Noise Level (L_{Aeq})		
				Excavation	Pilling	Construction
R008	Standard Hours	Highly Noise Affected	75	25	37	35
		Noise Affected (RBL+10dB)	54	25	37	35
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	37	35
		Noise Affected Evening (RBL+10dB)	46	25	37	35
		Noise Affected Night (RBL+10dB)	41	25	37	35
R009	Standard Hours	Highly Noise Affected	75	25	36	35
		Noise Affected (RBL+10dB)	54	25	36	35
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	25	36	35
		Noise Affected Evening (RBL+10dB)	46	25	36	35
		Noise Affected Night (RBL+10dB)	41	25	36	35
R010	Standard Hours	Highly Noise Affected	75	24	36	35
		Noise Affected (RBL+10dB)	54	24	36	35
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	24	36	35
		Noise Affected Evening (RBL+10dB)	46	24	36	35
		Noise Affected Night (RBL+10dB)	41	24	36	35
R011	Standard Hours	Highly Noise Affected	75	24	36	35
		Noise Affected (RBL+10dB)	54	24	36	35
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	24	36	35
		Noise Affected Evening (RBL+10dB)	46	24	36	35
		Noise Affected Night (RBL+10dB)	41	24	36	35
R012	Standard Hours	Highly Noise Affected	75	23	37	35
		Noise Affected (RBL+10dB)	54	23	37	35
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	23	37	35
		Noise Affected Evening (RBL+10dB)	46	23	37	35
		Noise Affected Night (RBL+10dB)	41	23	37	35
R013	Standard Hours	Highly Noise Affected	75	23	37	35
		Noise Affected (RBL+10dB)	54	29	41	40
	Outside Standard Hours	Noise Affected Day (RBL+10dB)	49	29	41	40
		Noise Affected Evening (RBL+10dB)	46	29	41	40
		Noise Affected Night (RBL+10dB)	41	29	41	40

6.3 Sleep Disturbance

For construction activities, the L_1 sound pressure level of a known L_{eq} is typically 10dB higher than the L_{eq} level. This has been used to estimate L_1 data of the proposed construction equipment. Vipac has assessed sleep disturbance by using the RBL+15dB. It should also be noted that the assessment has been completed for all activities.

Table 9: Sleep disturbance assessment

Receiver ID	Predicted Noise Level (L_{A1}) dB			Sleep Disturbance RBL +15dB
	Excavation	Construction	Pilling	
R001	48	36	47	51
R003	47	35	46	
R004	47	35	46	
R005	47	35	46	
R006	47	35	46	
R007	47	35	46	
R008	47	35	45	
R009	46	35	45	
R010	46	34	45	
R011	46	34	45	
R012	47	33	45	
R013	51	39	50	

7 CONCLUSION & DISCUSSION

A construction noise impact assessment has been undertaken to determine the potential noise impact of the construction of the proposed wastewater treatment plant on noise sensitive receptors in the surrounding area.

The acoustic impact of the proposed wastewater treatment plant construction is predicted to be within all the applicable noise criteria during standard and outside construction working hour.

It is therefore Vipac's professional opinion that the proposed wastewater treatment plant is acceptable from an acoustic point of view.

Section 8 of this report outlines the construction management plan that should be adopted for the construction phase of the project.

8 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: requirements of Transport for NSW's Construction Noise Strategy, and 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 – refer to community liaison / complaints handling plan below.
Hours of Work / Respite Periods		Standard Hours for Construction: 07:00 – 18:00 Monday – Friday 08:00 -13:00 Saturday
		No more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven-day period, unless otherwise approved by the applicable Local Authority.
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 be restricted to the daytime period only.
		Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling.

Construction Noise Management Plan		
Component		**Details**
		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 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 resurfacing / paving works consideration should be given to taking pavers off site for cutting where practical.
Consultation	**General**	A Community Involvement Plan should be implemented to engage with government agencies, relevant councils, landowners, community members and other stakeholders to provide a single consultation framework.
	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. Thereafter a newsletter should be distributed to the local community by letter on a 2 weekly basis.
	Project info-line and Construction response line	A 24-hour construction response line should be provided as a contact point for any complaints regarding the construction work. A project info line should also be provided as a dedicated contact point for any project enquires. A Transport Project representative must respond to complaints within 2 hours.
Complaints management		Upon receiving any complaint regarding construction activities, the nominated member of staff must investigate the source of the complaint. The aim will be to initiate an immediate investigation no later than two hours after the complaint has been made. 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. Where three or more substantiated complaints of a similar nature are received (from at least two complainants), the work element must be reviewed in order to consider whether the work methods can be changed or if additional mitigation methods can be employed in order to prevent or reduce the likelihood of further complaints being made.