Hanson Tweed Sand Plant (HTSP) Expansion

Altona Road, Cudgen

Operational Noise Impact Assessment

Hanson Construction Materials Pty Ltd

Project No.: ATP190611

Project Name: Tweed Sand Plant

Document No.: ATP190611-R-NIA-08

October 2021

Document Control Record

Prepared by:	Aidan Daniels
Position:	Engineer – Acoustics
Signed:	
Date:	18 October 2021

Approved by:	Sasho Temelkoski RPEQ 13551
Position:	Managing Director
Signed:	
Date:	18 October 2021

REVISION STATUS

Revision No.	Description of Revision	Date	Approved
0	Issue 1	25 November 2020	S. Temelkoski
1	Issue 2	11 January 2021	S. Temelkoski
2	Issue 3	18 January 2021	S. Temelkoski
3	Issue 4	3 February 2021	S. Temelkoski
4	Issue 5	12 February 2021	S. Temelkoski
5	Issue 6	11 March 2021	S. Temelkoski
6	Issue 7	9 April 2021	S. Temelkoski
7	Issue 8	18 October 2021	S. Temelkoski

Recipients are responsible for eliminating all superseded documents in their possession.

atf ATP Engineering Trust
ABN: 95 634 079 845

Gold Coast
34 Lakefront Crescent
Varsity Lakes, QLD 4227
Ph: (07) 5593 0487

Brisbane
Studio 5, 33 Vulture Street
West End QLD 4101
Ph: 0499 015 150

Perth
Suite 59, 102 Railway Street
West Perth WA 6005
Ph: (08) 9265 1424

E-mail: admin@atpconsulting.com.au
Internet: www.atpconsulting.com.au

Executive Summary

ATP Consulting Engineers (ATP) was engaged to prepare an operational noise impact assessment (acoustic report) in support of the proposed expansion of the existing Hanson Tweed Sand Plant (HTSP) in Cudgen, owned and operated by Hanson Construction Materials Pty Ltd (Hanson).

Issue 8 of this report has been prepared in response to the Request for Advice letter from the New South Wales Environmental Protection Authority (EPA) dated 3 June 2021. Responses to the matters raised in the EPA Request for Advice letter are provided in Section 1.1 of this report. Furthermore, this issue of the report considers the latest road alignment for haulage access directly onto the Pacific Motorway (M1).

Issue 7 of this report was prepared in response to the Environmental Impact Statement (EIS) Additional Information Request from the New South Wales Department of Planning, Industry & Environment (DPIE) dated 1 April 2021, which calls for consideration of noise enhancing meteorological conditions in line with *Fact Sheet D* of the *NSW Noise Policy for Industry*. Responses to the matters raised in the DPIE Additional Information Request are provided in Section 1.2 of this report.

The HTSP currently operates under an existing Notice of Modification (MOD 1) to DA 152-6-2005 issued by the DPIE on 20 August 2018. The site also operates in accordance with Environment Protection Licence (No. 11453) issued by the EPA.

Hanson is proposing to expand and redevelop the existing HTSP and is applying to the DPIE for approval to enable the following:

- Access to a sand resource of approximately 30-35 million tonnes with an annual maximum extraction of 950,000 tonnes of sand;
- The operations to be 24 hours seven days a week;
- Initially the existing wash plant and stockpile area will be used with an expectation that as the extraction phases progress, the area would be relocated as per the operational requirements; and
- Hanson will retain ownership of the site following completion of sand extraction and any proposed subsequent use of the site will be decided via the appropriate consultative, application and regulation processes in place at that time.

This acoustic report is prepared as per the requirements of the *Environmental Planning and Assessment Act 1979, Noise Policy for Industry 2017* and *Tweed Local Environment Plan 2014.*

Noise monitoring was carried out at the nearest noise sensitive places using automated noise loggers to obtain information about the existing background noise levels during day, evening and night-time. The Rating Background Levels (RBL) were calculated based on the background noise levels when there were no dredging operations taking place at the HTSP.

As per the NSW EPA *Noise Policy for Industry*, the intrusiveness, amenity and maximum noise level criteria were determined based on the results of the background noise monitoring, the methodology for which is presented in Section 3 of this report.

It is proposed that the project trigger levels, as per Table 3.5 of this report, be adopted as the new Operational Noise Criteria for the HTSP. It is important to note that special consideration is given to private haulage roads under the NSW EPA *Noise Policy for Industry*. To this end, the use of the proposed private haulage road should be assessed separately, against project amenity noise level criteria, which are presented in Table 3.4 of this report.

The noise criteria do not apply if the Tweed Sand Plant has an agreement with any impacted landowner to exceed the noise criteria, and the Tweed Sand Plant has advised the DPIE in writing of the terms of this agreement.

Detailed noise propagation modelling was carried out to assess potential noise impacts from the future operation of the HTSP on the nearest noise sensitive land uses over the 30-year planning horizon.

In the 3D noise propagation model, all proposed activities at the site were considered, including dredging activities (dredge and booster), shoreline processing (water pump, wash plant and loader) and truck movements (haulage route, dispatch of loaded trucks from the plant). The results of the noise propagation modelling indicate that without noise control measures, there is a potential for noise impacts on the nearest noise sensitive receptors from the operation of the extended HTSP as per various planned phases of expansion.

The noise impacts on the nearest noise sensitive receptors are associated with the use of the dredge, the booster and the wash plant, mainly during night-time operations, and when the dredge is operated at location nearest to the sensitive receptors. To protect the noise amenity at the nearest noise sensitive places (mainly residential dwellings), it is recommended to attenuate noise from the dredge, the booster and the wash plant as required.

Recent noise attenuation works have been carried out on the dredge at the existing HTSP, including:

- Installation of a new exhaust silencer;
- Installation of an acoustic enclosure to the engine bay;
- Installation of acoustic louvres to the ventilation openings at the front and rear walls of the engine room;
- Acoustic lagging added to the external high-pressure line; and
- Acoustic upgrade to the engine room maintenance doors adjacent to the suction pipe.

The noise levels associated with the dredge, after the installation of the noise attenuation works, were assessed during the attended noise measurements carried out on 21 August 2020. The operational noise modelling was carried out considering the attenuated noise levels, assessed at the nearest noise sensitive receptors to the proposed expansions considering the proposed continuous operation, daytime, evening, and night-time.

The dredge as it operates now, is sufficiently attenuated to operate during daytime for all phases barring phase 9, as well as evening for phase 8 and 11, and night for phase 8. Should the existing dredge be further acoustically upgraded, it may expand its operations further.

However, under some scenarios (e.g. operating during evening or night time within close proximity to some receivers), the level of noise reduction required is not practicable with the current dredge. Therefore, it is recommended that the existing dredge be replaced with a dredge that has been acoustically treated so as to comply with the applicable noise limits, before dredging in these noise sensitive areas.

The maximum allowable dredge noise levels to achieve compliance with the noise criteria during daytime, evening and night-time for each project phase are presented in Table 5.1 of this report.

Based on the operational noise level requirements for the dredge presented in Table 5.1 of this report, ATP proposes the following five options for levels of noise attenuation in order to comply with the applicable noise criteria during different operating scenarios:

- Option 1 – Existing dredge – Existing dredge, which currently achieves a sound pressure level of 90dB(A), 97dB(C) or 97dB(Z) measured at a 3-metre setback, and 80dB(A), 87dB(C) or 87dB(Z) measured at a 10-metre setback.
- Option 2 – Existing dredge with acoustic upgrades – Existing dredge, with additional acoustic upgrades to achieve a sound pressure level of not more than 86dB(A), 93dB(C) or 93dB(Z) measured at a 3-metre setback, and no more than 76dB(A), 83dB(C) or 83dB(Z) measured at a 10-metre setback.
- Option 3 – Replacement dredge 1 – Replacement dredge which achieves a sound pressure level of not more than 78dB(A), 85dB(C) or 85dB(Z) measured at a 3-metre setback, and no more than 68dB(A), 75dB(C) or 75dB(Z) measured at a 10-metre setback.
- Option 4 – Replacement dredge 2 – Replacement dredge which achieves a sound pressure level of not more than 74dB(A), 81dB(C) or 81dB(Z) measured at a 3-metre setback, and no more than 64dB(A), 71dB(C) or 71dB(Z) measured at a 10-metre setback.
- Option 5 – Replacement dredge 3 – Replacement dredge which achieves a sound pressure level of not more than 70dB(A), 77dB(C) or 77dB(Z) measured at a 3-metre setback, and no more than 60dB(A), 67dB(C) or 67dB(Z) measured at a 10-metre setback.

Summary of the abovementioned options for levels of noise attenuation for the dredge, as they relate to the project phases and periods, is presented in Table 5.2 of this report.

Based on the information presented in Tables 5.1 and 5.2 of this report, it can be seen that for the existing dredge to be able to operate during the evening for phases 5, 6, 7 and 10, additional acoustic upgrades will be required to achieve a minimum 4dB noise attenuation (i.e. Option 2). After these upgrades, ATP does not expect that further significant improvement could be achieved with the existing dredge, and a replacement dredge would be required to operate under more stringent conditions.

For operations during daytime during project phase 9, a replacement dredge would be required which has a sound power level in line with Option 3 presented above, as a minimum. If the replacement dredge can operate in line with the performance of Options 4 or 5, expanded operations into evening and night-time of phase 9 are achievable.

ATP is aware of dredges that are available now that can operate at a sound power level of 92dB(A) (i.e. suitable for Option 4). Given that such a dredge would not be required until phase 9 (i.e. would not be required for at least 19 years), ATP anticipate that a quieter dredge would be available by this time, if it isn't on the market already.

The results of the operational noise modelling indicate that during night-time, when the booster is positioned within proximity to the nearest noise sensitive receptors, a minor exceedance of the noise criteria may occur.

ATP has carried out assessment of the existing noise attenuation works installed on the booster and have deemed them to be state of the art and sufficient for most operational scenarios. Because the booster is always located between the dredge and the processing plant, the noise impacts from the booster can be readily managed by appropriate positioning. Therefore, it is recommended that maximum distance is maintained between the booster and the nearest noise sensitive receptors during daytime, evening and night-time.

The results of the operational noise modelling indicate that during night-time operation the existing wash plant has the potential to cause minor exceedance of the noise criteria at the nearest noise sensitive receptors along Cudgen Road. To ensure the night-time operation of the wash plant does not impact the noise amenity at the nearest noise sensitive receptors it is recommended that a partial acoustic enclosure be installed around the wash plant motor, enclosing it on the south-east and south-west sides. The following design specifications are required for the acoustic enclosure:

- The enclosure is to be constructed using a material with minimum surface density of 15kg/m^2 (e.g. timber palings with minimum thickness of 22mm, fibre cement sheeting with minimum thickness of 12mm, or aerated concrete);
- The height of the enclosure is to be minimum 0.3m above the top of the wash plant motor, with returns along the south-east and south-west sides of the wash plant motor;
- The enclosure should be free of any gaps;
- If the walls of the enclosure are constructed of timber palings, planks should have minimum 35mm overlap; and
- The enclosure should be of durable construction.

To ensure ongoing compliance with the new Operational Noise Criteria (i.e. the project trigger levels, as per Table 3.5 of this report), annual attended compliance noise monitoring must be carried out at the nearest noise sensitive receivers (i.e. private residences or privately owned land).

Furthermore, attended compliance noise monitoring must be carried out at the nearest noise sensitive receivers following the commencement of dredging activities in new project phase areas (see Phasing Plan presented in Appendix A of this report).

Noise generated by the development is to be measured in accordance with the *NSW Noise Policy for Industry 2017*.

Provided the recommended noise control measures are fully implemented at detailed design and construction, there are no further acoustic constraints on the establishment of the proposed expanded operations of the Hanson Tweed Sand Plant in Cudgen.

Table of Contents

Tables

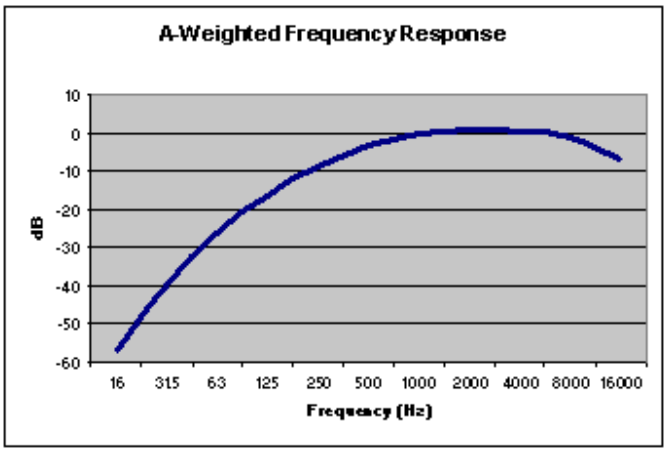
Figures

Appendices

Acoustics Glossary

A-weighting

The A-weighting filter suppresses low frequency sounds and some of the higher frequency sounds to which the human ear is less sensitive. It is a correction to sound pressure levels to mimic the response of the human ear at low sound pressure levels. The A-weighted sound pressure level correlates well with the perceived loudness at low sound levels. The A-weighted sound pressure level is used extensively for general purpose noise measurements.



Broadband sound

Sound distributed across the whole audible frequency range.

dB(A)

The A-weighted sound pressure level.

Fast time-weighting

The Fast ("F") time-weighting is defined in AS 1259.1-1990. Instruments with F time weighting use a time constant of 125 milliseconds in their exponential averaging circuit.

Hz (Hertz)

Hertz is the standard measure of the frequency of oscillations in a wave motion. The frequency is most often measured in cycles per second (cps) or Hertz (Hz). Frequency of 1 Hz is one cycle per second.

Impulsive noise and impulsiveness adjustment

Noise having a high peak of short duration or a sequence of such peaks. Impulsive noise is present if the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB. Impulsiveness adjustment (penalty) of up to 5dB should be applied to the component noise level.

$L_{Aeq,T}$

"Average-energy" sound level used in situations where sound varies over time. $L_{Aeq,T}$ is the A-weighted sound pressure level that has the same energy as the fluctuating sound over the time period T sec.

$L_{A01,T}$

Measure of the maximum sound level. $L_{A01,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 1% of the measurement time T.

$L_{A10,T}$

$L_{A10,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 10% of the measurement time T.

$L_{A90,T}$

Background sound level. $L_{A90,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 90% of the measurement time T.

Noise

Unwanted sound.

Octave bands and 1/3 octave bands	A range of frequencies whose upper frequency limit is twice that of its lower frequency limit. In acoustics, the audible spectrum (20Hz to 20kHz) is divided into 10 parts (octaves) with centre frequencies of 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz. For more detailed frequency analysis, octave bands are further divided into more discrete bands. For examples, 1/3 octaves bands are is where each octave band is divided into three parts. IEC 61260:1995, *Electroacoustics — Octave-band and fractional-octave band filters*
Rating background level (RBL)	The overall single-figure background level representing each assessment period (e.g. standard hours, non-standard hours). The RBL is the background noise level for each work period using the tenth percentile method of measured $L_{A90,15\text{-minute}}$.
Sound power	The sound energy radiated per unit time by a sound source in all directions, measured in Watts (W).
Sound Power Level, L_w (SWL)	The sound power level in decibels (dB) is 10 times the base 10 logarithm of the ratio of the sound power in W to the reference sound power of 1×10^{-12} W (hearing threshold).
Sound pressure	The difference between the pressure caused by a sound wave and the ambient pressure of the medium the sound wave is passing through. Measured in Pascals (Pa).
Sound Pressure Level, L_p (SPL)	The sound power level in decibels (dB) is 20 times the base 10 logarithm of the ratio of the sound pressure in Pa to the reference sound pressure of 2×10^{-5} Pa (hearing threshold).
Tonal noise, tonality and tonality adjustment	Tonal noise is characterised by one or more distinct frequency components (“tones”) that emerge audibly from the total sound. For example, distinct tones may be emitted by fans, saws, grinders and other equipment. Tonal noise is generally far more annoying than non-tonal noise. Presence of tonal sound (“tonality”) can be identified by analysing the sound levels in adjacent 1/3 octave bands. AS1055.1-1997 and the DEHP Noise Measurement Manual 2013 provides guidance on how tonality should be assessed. If tonal components are clearly audible and they can be detected by 1/3 octave analysis (1/3 octave band exceeds neighbouring bands by at least 5dB), tonality adjustment (penalty) of up to 5dB should be applied to the component noise level.
Weighted Sound Reduction Index (R_w)	A single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies.

1. Introduction

ATP Consulting Engineers (ATP) was engaged to prepare an operational noise impact assessment (acoustic report) in support of the proposed expansion of the existing Hanson Tweed Sand Plant (HTSP) in Cudgen, owned and operated by Hanson Construction Materials Pty Ltd (Hanson).

Issue 8 of this report has been prepared in response to the Request for Advice letter from the New South Wales Environmental Protection Authority (EPA) dated 3 June 2021. Responses to the matters raised in the EPA Request for Advice letter are provided in Section 1.1 of this report. Furthermore, this issue of the report considers the latest road alignment for haulage access directly onto the Pacific Motorway (M1).

Issue 7 of this report was prepared in response to the Environmental Impact Statement (EIS) Additional Information Request from the New South Wales Department of Planning, Industry & Environment (DPIE) dated 1 April 2021, which calls for consideration of noise enhancing meteorological conditions in line with *Fact Sheet D* of the *NSW Noise Policy for Industry*. Responses to the matters raised in the DPIE Additional Information Request are provided in Section 1.2 of this report.

The HTSP currently operates under an existing Notice of Modification (MOD 1) to DA 152-6-2005 issued by the DPIE on 20 August 2018. The site also operates in accordance with Environment Protection Licence (No. 11453) issued by the EPA.

Hanson is proposing to expand and redevelop the existing HTSP and is applying to the DPIE for approval to enable the following:

- Access to a sand resource of approximately 30-35 million tonnes with an annual maximum extraction of 950,000 tonnes of sand;
- The operations to be 24 hours seven days a week;
- Initially the existing wash plant and stockpile area will be used with an expectation that as the extraction phases progress, the area would be relocated as per the operational requirements; and
- Hanson will retain ownership of the site following completion of sand extraction and any proposed subsequent use of the site will be decided via the appropriate consultative, application and regulation processes in place at that time.

ATP Consulting has also prepared a Construction Noise Assessment (CNA) report (ref. ATP190611-R-CNA-05, dated 18 October 2021) for this project to address potential noise impacts from the construction activities associated with the expanded operations of the HTSP.

This acoustic report is prepared as per the requirements of the *Environmental Planning and Assessment Act 1979, Noise Policy for Industry* and *Tweed Local Environment Plan 2014.*

1.1 Response to EPA Request for Advice Letter

Issue 8 of this report has been prepared in response to the EPA Request for Advice letter dated 3 June 2021. Responses to the matters raised by the EPA are presented in Table 1.1.

Table 1.1 Response to EPA Request for Advice letter

EPA comment	ATP response
The NIA does not mention the existing daytime noise limit in EPL 11453. The NIA includes details of long term background noise monitoring that was undertaken to determine Project Noise Trigger Levels for the proposed expansion (which for the daytime are up to 2 dBA higher than the existing noise limit at the nearest receivers and up to 6 dBA higher at the receivers in close proximity to the Pacific Highway).	ATP acknowledges that EPL 11453 Condition L4.1 stipulates a Noise Limit of 40dB(A), as does Schedule 3 Condition 1 of the DPIE MOD1 approval. These existing daytime noise limits are included in Section 1.8 of this report. It is acknowledged that the background noise levels recorded as part of this assessment are higher than those previously measured and used as a basis for determining the existing noise limits. These previous measurements were taken over a decade ago, and the acoustic environment in the area has changed significantly. This assessment has featured a more detailed noise measurement survey which represents the current noise amenity more accurately and at a wider array of receivers.
EPA is concerned about the proposed night time operations and the potential for noise impact during this sensitive time. The area around the site is rural in nature, with numerous elevated residences and the village of Cudgen nearby.	ATP acknowledges the reservations of EPA in this regard, however the recommendations of this assessment have been prepared to ensure protection of the noise amenity at these most affected residences.
The noise monitoring graphs in Appendix E of the NIA appear to show some influence from extraneous noise that keeps the levels elevated, particularly during the night time. It is stated in the NIA that the background noise levels were influenced by insects (Section 2.3 and under Table 3.1).	The insect noise referenced in Section 2.3 of this report is reflective of the operational noise monitoring carried out on 21 August 2021, and is not associated with the determination of the noise criteria. This section of the report acknowledges that the noise levels recorded at ~250m-500m from the dredge/booster were influenced by noise from the environment. As discussed in Section 3.1.1 of this report, insect noise is a part of the existing ambient environment and is typical of rural uses. In these rural locations, for the majority of the year background noise during evening/night is dominated by insect noise. The approach utilised in this report is as per the directive of the Noise Policy for Industry, capping the evening noise levels at the daytime levels. As per Fact Sheet A of the Noise Policy for Industry: "*The background noise level is defined here as 'the underlying level of noise present in ambient noise, generally excluding the noise source under investigation, when extraneous noise is removed'. Sound levels contributing to background levels can include sound from nearby traffic (see Section A1.3), birds, insects, animals, machinery and similar sources, if these sounds are a normal feature of the location.*"
It is also stated in Table 2.1 that the site was operating during the noise monitoring, but that the days when dredging occurred were excluded from the background noise level calculation. Table 2.1 also states "Product loading was still carried out on these days but had negligible contribution to the measured background noise at Locations 1 and 2." It is not clear in the NIA how this was determined.	Further discussion has been included in Table 2.1 to provide clarity with regards to the product loading. The separation distance from the loading area to Locations 1 and 2 is significant (500m-600m), and based on numerous site visits and attended measurements during HTSP operations, ATP can confirm that the noise levels from loading are not audible or measurable at these locations.

EPA comment	ATP response
The NIA should include more detail and justification that the measured and calculated background noise levels are representative of all seasons and are not influenced by existing site noise, insect noise or other extraneous noise, in accordance with the Noise Policy for Industry (EPA, 2017).	See above.
The sound power level of the dredge between Option 1 (existing dredge) and Option 5 (dredge 3), as shown in Table 5.2, needs to reduce by 20 dBA in order to achieve the Project Noise Trigger Levels (PNTLs). EPA is not clear whether this level of noise attenuation is possible for a dredge.	The wording in Section 5.2.1 and in Table 5.2 has been amended to more clearly indicate that the existing dredge is not expected to be attenuated by 20dB. Rather that it would need to be replaced by a quieter dredge. To briefly summarise: Option 1 represents the existing dredge noise levels; Option 2 represents the expected maximum level of attenuation for the current dredge (4dB); and Options 3, 4 and 5 represent several options for replacement dredges that operate at a lower sound power level than the current dredge. This approach was chosen as it clearly expresses for which phase and time of day a replacement or upgraded dredge would be required. For example, noise modelling shows a replacement dredge is required for Phase 9 only. In addition, modelling also suggests a replacement will also be required to enable dredging at night during Phases 5-7 and 10-11. Furthermore, ATP is aware of dredges that are available now that are 16dB quieter than the existing dredge (i.e. suitable for Option 4 – Replacement dredge 2). Given that such a dredge would not be required until Phase 9 (i.e. would not be required for at least 19 years), ATP anticipate that a quieter dredge would be available by this time, if it isn't on the market already.
The predicted noise levels, in Section 4.3, during the evening and night are higher than daytime. It is not clear from the scenarios what is proposed to operate during the evening and night that is different to the daytime.	As discussed in Section 2.4.2 of this report, in accordance with the Noise Policy for Industry, the daytime, evening and night-time noise levels have had correction factors applied due to the low frequency component of the noise. During daytime, the noise levels are increased by 2dB, and during evening and night-time, the noise levels are increased by 5dB, hence the 3dB difference between daytime and evening/night-time noise levels.
The Noise Monitoring Report September 2020 (available on the Hanson website, Appendix 12 of the Annual Environmental Management Report 2019-2020) indicates a noise contribution from existing operations at the site of 43 dBA at the nearest residential receivers. The predicted noise level for Phase 5 at the same receivers (535C and 543 Cudgen Road) is 37 and 38 dBA. It is not clear how the operation changes to bring about a 5-6 dBA reduction in noise level from the existing operations to the next phase.	Comparison of the noise levels from the September 2020 Noise Monitoring Report to this report are not appropriate for a number of reasons, including: • For the noise modelling for Phase 5, the dredge is twice as far away from the dwellings than it was during the noise monitoring carried out on 21 August 2020 (Noise Monitoring Report September 2020). The doubling of distance accounts for 3dB decrease in the noise levels; and • The noise levels presented in Tables 4.4 through 4.18 feature the dredge noise levels mitigated (dredge muffled or replaced) to a level required in order to comply during daytime, evening and night-time at the most exposed dwellings for each phase of the HTSP expansion. This accounts for the remaining difference between the noise levels from the two reports.

EPA comment	ATP response
The NIA should: **- provide confirmation that the required 20 dBA noise attenuation for the dredge is practical and achievable.** **- clarify the proposed operations during different time periods to explain the increase in predicted noise level during the more sensitive evening and night period.** **- provide a detailed explanation for the 5-6 dBA reduction in noise level from the existing operation (Phase 4) to the proposed Phase 5.**	See above.

1.2 Response to DPIE Additional Information Request

Issue 7 of this report was prepared in response to the EIS Additional Information Request from DPIE dated 1 April 2021 for the Hanson Tweed Sand Plant Expansion SSD-10398. The Information Request calls for consideration of noise enhancing meteorological conditions in line with Fact Sheet D of the *NSW Noise Policy for Industry*, as follows:

> *"The Department notes that the Secretary's Environmental Assessment Requirements (SEARs) for the project require noise impacts to be assessed in accordance with the NSW Noise Policy for Industry (NPfI). Fact Sheet D of the NPfI sets out the necessary considerations for noise enhancing meteorological conditions when assessing a project's noise impacts. The methodology used in the Noise Impact Assessment for the EIS assesses noise impacts under a modelled worst-case scenario, however the assumed noise enhancing meteorological conditions have been established using Equation 3 of ISO 9613, which is inconsistent with the methodology set out in the NPfI.*
>
> *Please provide a revised Noise Impact Assessment that either provides justification as to why this alternative methodology has been adopted, or adopts the methodologies set out in the NPfI."*

ATP has prepared this report, as per the DPIE Additional Information Request, to provide justification as to why the methodology used in the noise impact assessment has been adopted and is appropriate.

Fact Sheet D of the *Noise Policy for Industry* stipulates that noise-enhancing weather conditions must be considered as part of the noise impact assessment, with specific reference made to the Pasquill-Gifford Stability Classification Scheme.

The Pasquill-Gifford (P-G) Stability Classification Scheme is used to describe atmospheric stability. Stability class under the P-G scheme is designated a letter from A-F, and sometimes G, which describes a range of atmospheric conditions ranging from highly unstable to extremely stable (Pasquill 1961).

During extremely stable conditions, cool air near the ground is trapped by a layer of warm air above which results in virtually no vertical air motion; this condition is known as a 'temperature inversion', and is favourable for noise propagation. The density of the air decreases with increased altitude, altering the speed of sound, which creates a refractive effect. As a result, sound waves that would

normally radiate out into the atmosphere are refracted back to the ground, leading to an increased noise level at the receiver (Kochanowski & Mackenzie 2008).

In relation to noise propagation modelling, the variables that relate to noise-enhancing weather conditions are as follows:

- Separation distance between noise source and receiver;
- Altitude, with respects to noise source, receiver, and the path between them;
- Relative humidity;
- Atmospheric pressure;
- Temperature;
- Wind speed;
- Wind direction; and
- Atmospheric stability, as a product of the above variables, and presence of temperature inversions.

Fact Sheet D of the *Noise Policy for Industry* stipulates that the Pasquill-Gifford Stability Classification Scheme must be utilised in the noise impact assessment, with no specific reference made to which noise prediction model is preferable. In Australia, the only noise prediction model that actively utilises the Pasquill-Gifford Stability Classification Scheme (i.e. makes specific reference to the stability classes) is the CONCAWE method from the 1960s. CONCAWE was established in 1963 by a conglomerate of oil companies carrying out research on environmental issues relevant to the oil industry (noise impacts from oil rigs at great distances).

It is widely accepted that at relatively short distances (less than 700m) the CONCAWE method overestimates the influence of wind on the calculated noise levels (Parry 2008). At greater distances, the CONCAWE method provides reliable noise modelling results, as the method was developed based on experimental validation at great distances – a product of the methods origins in the oil industry.

The nearest and most exposed noise sensitive receptors to the Hanson Tweed Sand Plant are within 80m to 300m from the proposed expansion. At this separation, the CONCAWE method is inappropriate and should not be utilised.

The methodology employed in this noise impact assessment is the ISO9613-2 noise prediction model, which has been widely accepted and utilised for industrial noise modelling throughout Australia and internationally since the late 1990s.

Specification and validation of specific P-G classes with respects to the ISO9613-2 model are largely irrelevant, as the standard already considers all components that make up the P-G stability classes, albeit without specifically referencing the classes themselves. This standard predicts noise under meteorological conditions favourable to the propagation of sound – a discussion of which is provided in Table 4.1 of this report, and is also presented below:

- All scenarios in the operational noise modelling were prepared to account for noise enhancing meteorological effects (equation 3 of ISO 9613), resulting in a worst-case scenario assessment.
- By utilising equation 3 in ISO 9613, the noise modelling automatically accounts for noise enhancing effects of downwind noise propagation and temperature inversion.
- The calculations give the average downwind sound pressure levels $L_{AT(DW)}$. The downwind propagation conditions are:
    - Wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from the source to receiver; and
    - Wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground.
- The calculations consider average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.
- Extract from ISO 9613 is as follows: "*use of equation 3 leads directly to an equivalent continuous A-weighted sound pressure level L_{AT} at the receiver for meteorological conditions which are favourable for propagation from the sound source to that receiver. This may be the appropriate condition for meeting a specific community noise limit, i.e. a level which is seldom exceeded.*"

As Kochanowski & Mackenzie (2008) stated; "*Papers note the improved accuracy of the ISO9613-2 method compared to other prediction models including CONCAWE*". Bass et al (1996) noted "*The accuracy of output from the ISO model is impressive. Agreement with sound pressure levels measured under conditions of an 8m/s positive vector wind speed has been measured to within 1.5 dBA on flat, rolling and complex terrain sites.*"

As the ISO9613-2 noise prediction model used in this noise impact assessment already considers highly conservative assumptions for all noise modelling parameters relevant to meteorological conditions favourable to the propagation of sound, it is considered appropriate, and accounts for all the factors discussed in *Fact Sheet D* of the *NSW Noise Policy for Industry.*

1.3 Study Objectives

Study objectives are as follows:

1.3.1 Review of Noise Criteria from Development Consent Conditions

- Identification and unattended noise measurements at the nearest noise sensitive receptors to the subject site (543 Cudgen Road, Cudgen; 139 Pacific Motorway, Chinderah; 271 Pacific Motorway, Chinderah; and 353 Cudgen Road, Cudgen) and the control noise monitoring location as proposed by SLR in the NMP dated May 2019.

- Determination of the Rating Background Levels (RBL) representative of the typical noise amenity at the residential area in Cudgen which may be affected by noise emissions from HTSP.
- Determination of the environmental noise criteria for the HTSP operations based on the measured RBLs.

1.3.2 Operational Noise Impact Assessment

- Attended noise measurements of all operational noise sources at the existing HTSP.
- Development of a 3D noise propagation model considering the noise sources associated with the HTSP, considering the operations as per the Phasing Plan over the 30-year planning horizon.
- Calculation of the HTSP noise levels at the nearest noise sensitive land uses and assessment against the environmental noise criteria.
- Recommendation of noise mitigation measures to ensure compliance with the noise criteria throughout various phases of the planned HTSP expansion and redevelopment.

1.4 Subject Site

The existing HTSP is located on the land described as Lot 22 on DP1082435, Lot 23 on DP1077509 and Lot 494 on DP720450.

Over the 30-year planning horizon it is proposed to expand the HTSP to also occupy adjacent allotments, specifically Lot 1 on DP1250570, Lot 2 on DP1192506, Lot 3 on DP1243752, Lot 50 on DP1056966 and Lot 51 on DP1166990.

The Phasing Plan for the proposed expansion is presented in Appendix A.

The location of the existing HTSP and the proposed 30-year planning horizon site extent is presented in Figure 1.1.

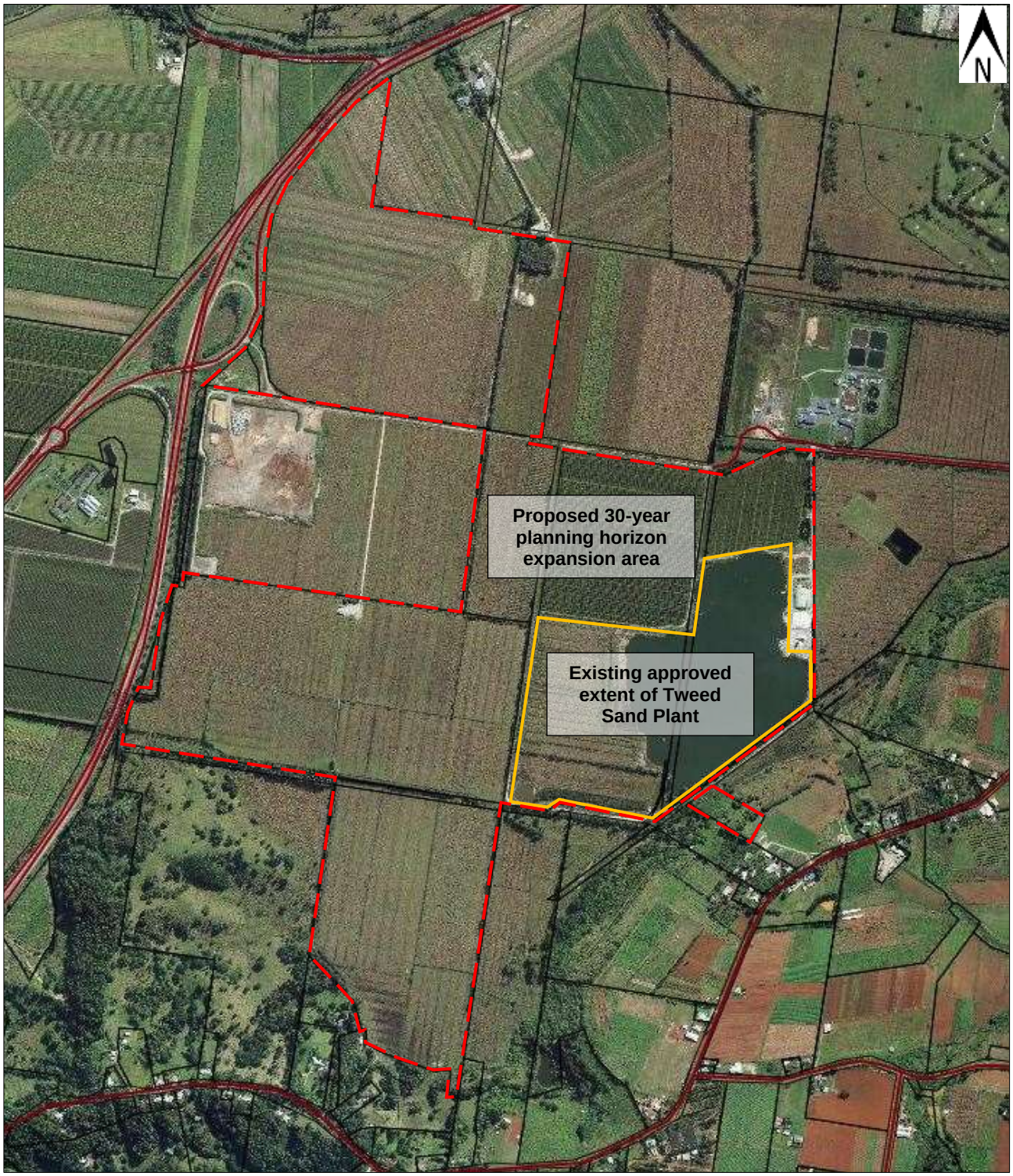


Figure 1.1 Site location

1.5 Tweed Sand Plant Operations

A brief summary of activities carried out at Tweed Sand Plant is as follows:

- Clearing of areas to be dredged (clearing of top soil to a depth of approximately 0.5m, and removal of cleared materials from site). Within each project phase, clearing will take place in stages, wherein over a 1–2 week period once a year, a 20–30m setback of land will be cleared to facilitate dredging operations;
    - As the clearing works are short term and periodic (i.e. only occurring once a year), and are carried out in order to enable the dredging activities to take place, they are considered construction activities (scheduled development work) specifically covered under the *Interim Construction Noise Guideline 2009*[1]. To this end, the clearing works are assessed as part of the Construction Noise Assessment (CNA) report (ref. ATP190611-R-CNA-04, dated 12 February 2021) for this project.
- Dredging of sand from the extraction area;
- Pumping of dredged material to wash plant at shoreline;
- Processing of sand using wash plant;
- Stockpiling of processed sand;
- Loading of sand onto product trucks; and
- Weighing and despatch of product trucks using weighbridge.

Over the 30-year planning horizon, it is proposed to expand operations to be carried out continuously, 24 hours a day, 7 days a week.

1.6 Zoning

Under the *Tweed Local Environment Plan 2014*, the subject site and most of the surrounding land is zoned RU1 Primary Production. There is a portion of land to the north which is zoned SP2 Infrastructure (Tweed Shire Sustainable Living Centre) and some land to the east, which is zoned R2 Low Density Residential, RE1 Recreation and R1 General Residential.

Zoning map from the *Tweed Local Environment Plan 2014* online mapping system is presented in Figure 1.2.

[1] The *Interim Construction Noise Guideline 2009* coverers a number of construction activities, including: "*scheduled development work that will enable scheduled activities to be carried out (section 47 of the Protection of the Environment Operations (POEO) Act 1997)*". Section 47 of the *POEO Act 1997* states that "*scheduled development work means work at any premises at which scheduled activities are not carried on that is designed to enable scheduled activities to be carried on at the premises*". As the dredging activities are considered a scheduled activity (extractive activity) under Schedule 1 of the *POEO Act 1997*, the clearing work is therefore considered to be scheduled development work that will enable the scheduled activities (extractive activities) to be carried out.

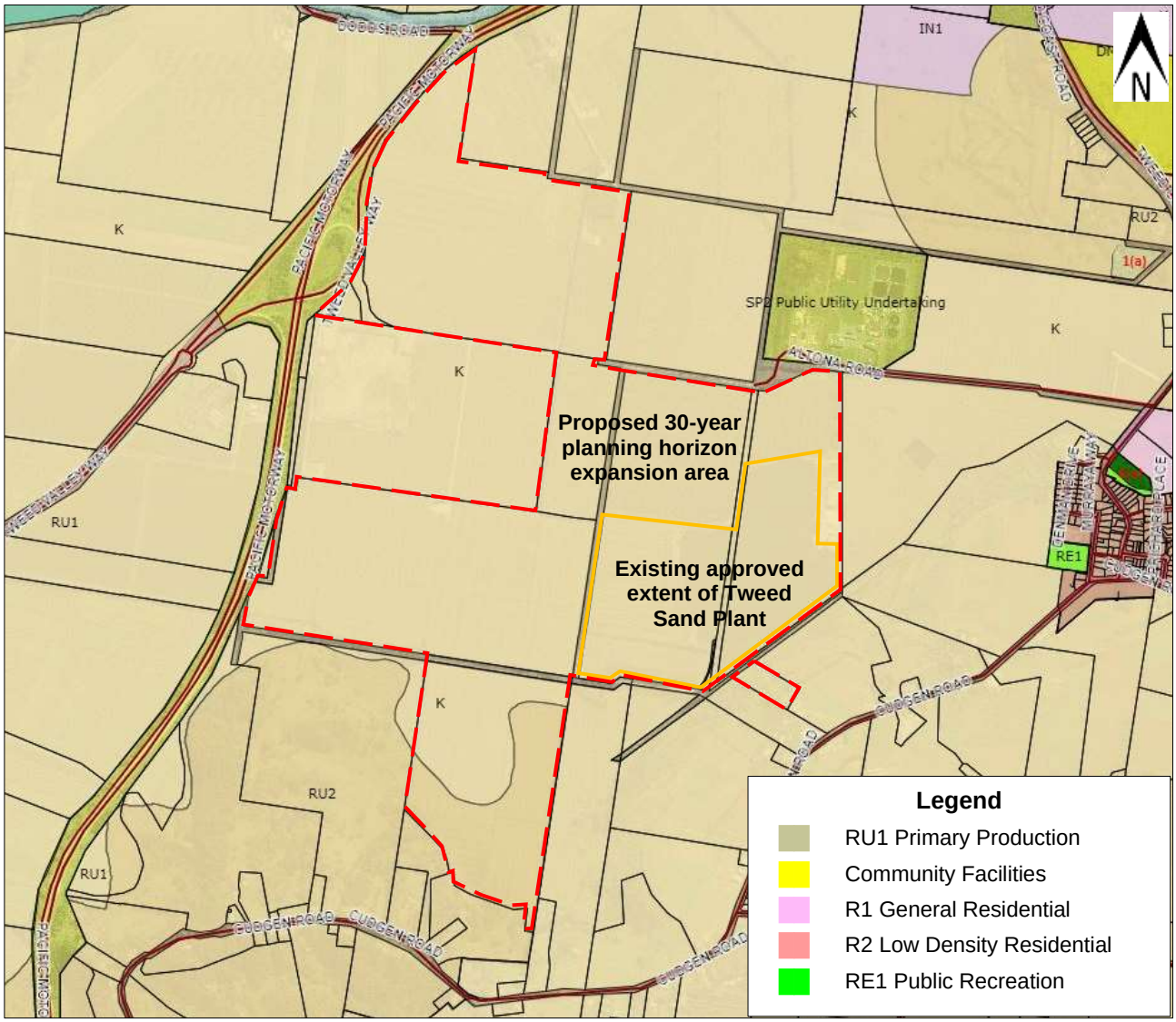


Figure 1.2 Zoning map – Tweed Shire Council

1.7 Nearest Noise Sensitive Places

In accordance with the *Noise Policy for Industry* (2017), a noise sensitive land use is defined as a land use that is sensitive to noise such as residential areas, churches, schools and recreation areas.

The nearest noise sensitive land uses to the HTSP are as follows:

- Residential dwellings to the south at Cudgen Road;
- Cudgen Public School to the east;
- Residential dwellings to the east; and
- Residential dwellings to the north.

All noise sensitive land uses are labelled in Appendix B.

1.8 Current MOD1 Approval – Operational Noise Criteria

The current MOD1 approval granted 20 August 2018[2] requires attended noise monitoring to determine whether the development is complying with the approval conditions.

Extract from Schedule 3 (*Specific Environmental Conditions*) of the MOD 1 approval dated 20 August 2018 is as follows:

NOISE

Operational Noise Criteria

1. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Noise criteria dB(A)

Receiver	***Day*** $L_{Aeq\ (15\ minute)}$
Any residence on privately owned land	40

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy.* Appendix 2 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

2. The Applicant must:

a) implement best practice management to minimise the construction, operational and road transportation noise of the development;

b) minimise the noise impacts of the development during meteorological conditions when the noise criteria in this consent do not apply (see Appendix 2);

c) carry out attended noise monitoring (at least every 3 months or as otherwise agreed by the Secretary) to determine whether the development is complying with the relevant conditions of this consent (see Appendix 2); and

d) regularly assess noise monitoring data and modify and/or stop operations on site to ensure compliance with the relevant conditions of this consent, to the satisfaction of the Secretary.

Note: Monitoring under this consent is not required at all residences and the use of representative monitoring locations can be used to demonstrate compliance with criteria, if agreed to by the Secretary.

[2] Notice of Modification, Section 75W of the Environmental Planning and Assessment Act 1979 – Development Consent DA 152-6-2005, dated 20 August 2018

Extract from Appendix 2 (*Noise Compliance Assessment*) of the MOD 1 approval dated 20 August 2018 is as follows:

Applicable Meteorological Conditions

1. The noise criteria in Table 2 are to apply under all meteorological conditions except the following:

   a) wind speeds greater than 3 m/s at 10 m above ground level; or

   b) temperature inversion conditions between 1.5°C and 3°C/100 m and wind speed greater than 2 m/s at 10 m above ground level; or

   c) temperature inversion conditions greater than 3°C/100 m.

Compliance Monitoring

2. A noise compliance assessment must be undertaken prior to the dispatch of more than 10 laden trucks from the site in any hour. The assessment must be conducted by a suitably qualified and experienced acoustical practitioner and must assess compliance with noise criteria presented above. A report must be provided to the Department and EPA prior to the dispatch of more than 10 laden trucks from the site in any hour.

3. Unless the Secretary agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:

   a) monitoring locations for the collection of representative noise data;

   b) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment;

   c) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration; and

   d) the use of an appropriate modifying factor for low frequency noise to be applied during compliance testing at any individual residence if low frequency noise is present (in accordance with the NSW Noise Policy for Industry (2017, or its latest version) Fact Sheet C) and before comparison with the specified noise levels in the consent.

2. Noise Measurements

2.1 Site-Specific Noise Measurements

Noise monitoring was carried out at the nearest noise sensitive places using automated noise loggers to obtain information about the existing background noise levels during day, evening and night-time. The Rating Background Levels (RBL) were calculated based on the background noise levels when there were no dredging operations taking place at the HTSP.

Additional noise monitoring was carried out close to the plant and equipment at the existing HTSP to determine the sound power levels for development of the 3D noise propagation model in SoundPLAN.

The noise measurement methodology is summarised in Table 2.1.

Table 2.1 Noise measurements

Relevant legislation, standards and guidelines	The noise measurements were carried out in accordance with: • Australian Standard AS 1055:2018 (*Acoustics – Description and measurement of environmental noise*). • NSW EPA, 2017, *Noise Policy for Industry.*
Measurement period	Unattended noise monitoring was carried out 24 hours a day from 16 to 30 September 2020. During the unattended noise monitoring, the existing HTSP has been operating during business hours. However, site records show that there were no dredging operations on the following workdays: 16, 18 to 20, 22, 23, 25 to 27, and 29 September 2020. Product loading was still carried out on these days, but due to the significant setback distance (500m-600m) these operations had negligible contribution to the measured background noise at Locations 1 and 2. It has been confirmed by ATP during numerous site visits that operational noise levels from loading are not audible or measurable at Locations 1 and 2. Further afield at Locations 3-5, due to the large separation distance (more than 1 kilometre), the product loading would not have had any contribution towards the measured background noise levels. As part of a previous compliance assessment for the HTSP, attended noise measurements were carried out between 9:15am and 11:00am on 12 September 2019, at a time when dredging operations were taking place. These measurements were carried out prior to acoustic upgrades being carried out for the dredge. The primary measurements of interest from 12 September 2019 include the measurements of noise associated with the booster barge, sand wash plant, front loader trucks, and water pump. Further attended noise measurements were carried out between 9:15am and 10:45am on 21 August 2020, at a time when dredging operations were taking place. These measurements were on the dredge barge and wash plant after a number of acoustic upgrades were implemented on the dredge barge.
Measurement location	The unattended noise monitoring was carried out at the following locations: • Location 1 – 543 Cudgen Road, Cudgen; • Location 2 – South-eastern shoreline of lake at subject site; • Location 3 – 139 Pacific Motorway, Chinderah; • Location 4 – 271 Pacific Motorway, Chinderah; and • Location 5 – 353 Cudgen Road, Cudgen. The attended noise measurements carried out on 12 September 2019 were carried out at various locations, including:

	• On the dredge and booster barges; • On lake surface near the dredge and booster barges; • Sand wash plant; and • Product loading area. The attended noise measurements carried out on 12 August 2020 were carried out at various locations, including: • Locations 1 and 2; • On the dredge barge and at various setback distances from it; and • At sand wash plant. The noise monitoring locations are presented in Figures 2.1 through 2.3, with photos showing the noise measurement locations are presented in Appendix C.
Measurement equipment	The following sound measurement equipment was used: <u>Unattended noise monitoring from 16 to 30 September 2020:</u> • Location 1 noise logger – ARL Ngara, serial no. 8781BC; • Location 2 noise logger – SVAN 977A, serial no. 81347; • Location 3 noise logger – ARL EL316, serial no. 16-707-017; • Location 4 noise logger – SVAN 977A, serial no. 92176; • Location 5 noise logger – ARL EL315, serial no. 15-203-537; and • Calibration – RION NC-74, serial no. 34615224. <u>Attended noise monitoring on 12 September 2019:</u> • Sound level meter – SVAN 977A, serial no. 69736; • Sound level meter – SVAN 977, serial no. 45740; and • Calibration – RION NC-74, serial no. 34615224. <u>Attended noise monitoring on 21 August 2020:</u> • Sound level meter – SVAN 977A, serial no. 92130; • Sound level meter – SVAN 977A, serial no. 92176; and • Calibration – RION NC-73, serial no. 11038082. The noise measurement instruments conform to Australian Standard AS IEC61672.1-2019. Calibration was performed during set up and download of the data from the instruments. The calibration drift was <0.1 dB(A).
Meteorological conditions	In accordance with Table A1 of the NSW EPA *Noise Policy for Industry*, the conditions for background noise monitoring are "*Average wind speed < 5 m/s (at microphone height), no rain, no extraneous noise*". Meteorological data for the nearest weather station, Coolangatta Airport, for the unattended and attended noise monitoring periods are both presented in Appendix D. The meteorological conditions during the unattended and attended noise monitoring periods have been fine with no rainfall recorded. However, the Coolangatta Airport weather station had intermittent technical issues occurring on 18 and 19 September 2020, resulting in some periods of missing meteorological data. Noise data gathered on these days were disregarded in determination of the background noise levels. Calculation of L_{A90} and ABL noise levels excludes data with wind speed greater than 5 m/s at the microphone height. The wind speed at Coolangatta Airport is recorded at 10 m above ground level. The wind speed at the microphone height (1.5 m above ground level) was calculated from the wind speed at 10 m above ground level, assuming a logarithmic wind profile and roughness length of z_0 = 0.1 m. $$v_{@1.5\mathrm{m}} = v_{@10\mathrm{m}} \frac{\ln\left(\frac{1.5}{z_0}\right)}{\ln\left(\frac{10}{z_0}\right)}$$

Analysis of data	The noise measurement data was analysed to determine the following noise descriptor: • **RBL:** Rating Background Level during daytime (7am to 6pm), evening (6pm to 10pm) and nighttime (10pm to 7am). The RBL was calculated from the $L_{A90,15min}$ noise levels using the procedure described in the *Noise Policy for Industry*. The RBL noise levels are used to determine the intrusiveness noise criteria as per Section 3.1 of this report.

The unattended noise monitoring locations are presented in Figure 2.1.

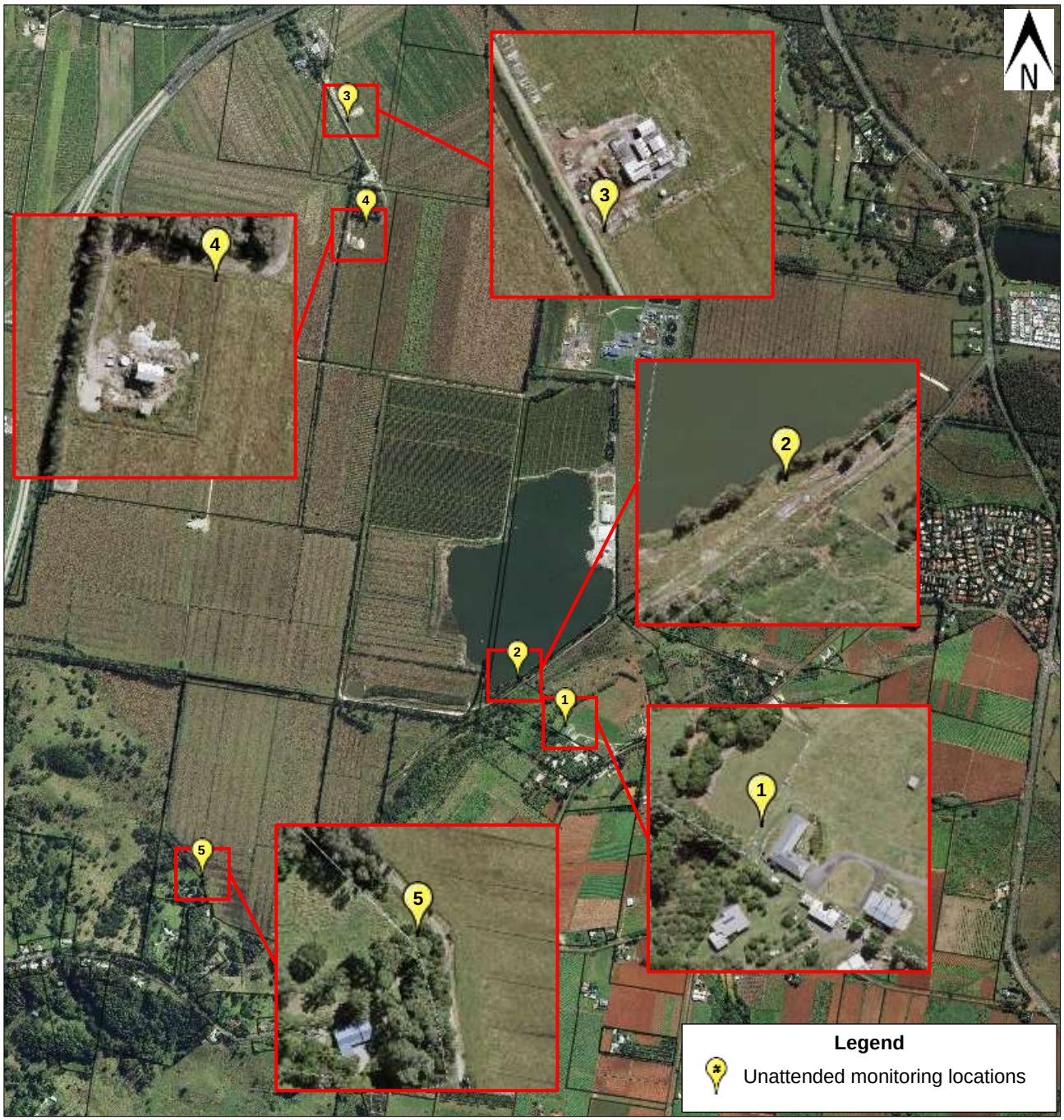


Figure 2.1 Unattended noise measurement locations

Figure 2.2 shows the attended and unattended noise measurement locations within closer proximity to the HTSP.

Figure 2.2 Attended noise measurement locations – 12 September 2019

Figure 2.3 shows the attended and unattended noise measurement locations within closer proximity to the HTSP.

Figure 2.3 Attended noise measurement locations – 29 August 2020

2.2 Unattended Background Noise Measurements

This section of the report presents the background noise levels measured during the unattended noise monitoring period from 16 to 30 September 2020.

2.2.1 Unattended Noise Measurement Results – Location 1

The results of the background noise monitoring at Location 1 are presented in Table 2.2 and Appendix E.

Table 2.2 Measured background noise levels – Location 1

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)
16 Sep 2020 (Wed)	—	40	42	—	38	39
17 Sep 2020 (Thu)	43*	43	41	39*	41	37
18 Sep 2020 (Fri)	39	49	38	36	41	34
19 Sep 2020 (Sat)	38	41	37	37	37	34
20 Sep 2020 (Sun)	39	46	40	38	40	37
21 Sep 2020 (Mon)	48*	49	45	46*	47	43
22 Sep 2020 (Tue)	47	45	41	46	44	39
23 Sep 2020 (Wed)	41	45	37	38	43	33
24 Sep 2020 (Thu)	41*	43	42	39*	42	39
25 Sep 2020 (Fri)	48	48	41	45	45	37
26 Sep 2020 (Sat)	39	36	30	37	33	25
27 Sep 2020 (Sun)	38	35	35	35	33	32
28 Sep 2020 (Mon)	42*	35	36	40*	33	32
29 Sep 2020 (Tue)	39	37	40	37	35	37
Arithmetic Average	39	41	39	—	—	—
Rating Background Level (RBL) with no dredging operations				**37**	**38**	**37**

Note:

Data excluded due to meteorological effects (wind speed) or extraneous noise

Data excluded due to missing meteorological data

* Data excluded due to dredging operations

2.2.2 Unattended Noise Measurement Results – Location 2

The results of the background noise monitoring at Location 2 are presented in Table 2.3 and Appendix E.

Table 2.3 Measured background noise levels – Location 2

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)
16 Sep 2020 (Wed)	—	45	44	—	42	41
17 Sep 2020 (Thu)	49*	45	43	39*	43	40
18 Sep 2020 (Fri)	39	49	40	36	42	37
19 Sep 2020 (Sat)	40	49	39	37	44	36
20 Sep 2020 (Sun)	39	47	40	38	43	37
21 Sep 2020 (Mon)	55*	53	49	48*	52	47
22 Sep 2020 (Tue)	51	48	39	48	44	36
23 Sep 2020 (Wed)	41	46	37	38	43	33
24 Sep 2020 (Thu)	44*	44	44	40*	42	41
25 Sep 2020 (Fri)	51	51	42	47	48	34
26 Sep 2020 (Sat)	38	37	30	35	32	24
27 Sep 2020 (Sun)	36	35	36	33	34	31
28 Sep 2020 (Mon)	44*	37	37	41*	35	34
29 Sep 2020 (Tue)	39	39	42	36	35	38
Arithmetic Average	39	43	40	—	—	—
Rating Background Level (RBL) with no dredging operations				**36**	**42**	**36**

Note:

Data excluded due to meteorological effects (wind speed) or extraneous noise

Data excluded due to missing meteorological data

* Data excluded due to dredging operations

2.2.3 Unattended Noise Measurement Results – Location 3

The results of the background noise monitoring at Location 3 are presented in Table 2.4 and Appendix E.

Table 2.4 Measured background noise levels – Location 3

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)
16 Sep 2020 (Wed)	—	51	45	—	47	40
17 Sep 2020 (Thu)	46*	50	44	42*	47	37
18 Sep 2020 (Fri)	43	45	46	39	40	40
19 Sep 2020 (Sat)	44	51	42	43	44	39
20 Sep 2020 (Sun)	44	56	49	42	46	40
21 Sep 2020 (Mon)	55*	54	50	53*	52	44
22 Sep 2020 (Tue)	55	54	51	53	52	44
23 Sep 2020 (Wed)	46	51	43	42	46	35
24 Sep 2020 (Thu)	45*	50	45	42*	48	40
25 Sep 2020 (Fri)	53	50	43	50	47	36
26 Sep 2020 (Sat)	45	46	35	41	41	29
27 Sep 2020 (Sun)	41	45	41	39	43	35
28 Sep 2020 (Mon)	46*	47	43	42*	43	37
29 Sep 2020 (Tue)	43	49	45	41	46	39
Arithmetic Average	44	50	44	—	—	—
Rating Background Level (RBL) with no dredging operations				**41**	**46**	**39**

Note:

Data excluded due to meteorological effects (wind speed) or extraneous noise

Data excluded due to missing meteorological data

* Data excluded due to dredging operations

2.2.4 Unattended Noise Measurement Results – Location 4

The results of the background noise monitoring at Location 4 are presented in Table 2.5 and Appendix E.

Table 2.5 Measured background noise levels – Location 4

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)
16 Sep 2020 (Wed)	—	48	43	—	45	40
17 Sep 2020 (Thu)	41*	48	43	38*	44	39
18 Sep 2020 (Fri)	41	47	44	36	44	38
19 Sep 2020 (Sat)	41	52	43	39	48	38
20 Sep 2020 (Sun)	40	51	46	37	46	41
21 Sep 2020 (Mon)	46*	52	46	44*	49	42
22 Sep 2020 (Tue)	47	49	42	46	47	38
23 Sep 2020 (Wed)	41	50	42	37	45	40
24 Sep 2020 (Thu)	41*	47	44	38*	45	40
25 Sep 2020 (Fri)	46	46	41	43	44	38
26 Sep 2020 (Sat)	41	42	35	38	39	31
27 Sep 2020 (Sun)	38	40	40	35	39	37
28 Sep 2020 (Mon)	45*	42	42	40*	40	38
29 Sep 2020 (Tue)	42	44	44	40	40	41
Arithmetic Average	41	47	42	—	—	—
Rating Background Level (RBL) with no dredging operations				**37**	**45**	**39**

Note:

Data excluded due to meteorological effects (wind speed) or extraneous noise

Data excluded due to missing meteorological data

* Data excluded due to dredging operations

2.2.5 Unattended Noise Measurement Results – Location 5

The results of the background noise monitoring at Location 5 are presented in Table 2.6 and Appendix E.

Table 2.6 Measured background noise levels – Location 5

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)	$L_{90,11hr}$ day (7am–6pm)	$L_{90,4hr}$ evening (6pm–10pm)	$L_{90,9hr}$ night (10pm–7am)
16 Sep 2020 (Wed)	—	48	43	—	46	40
17 Sep 2020 (Thu)	41*	48	40	38*	44	38
18 Sep 2020 (Fri)	38	48	43	35	44	41
19 Sep 2020 (Sat)	39	50	41	37	47	38
20 Sep 2020 (Sun)	39	51	43	37	49	39
21 Sep 2020 (Mon)	49*	52	47	46*	50	45
22 Sep 2020 (Tue)	48	48	42	46	46	38
23 Sep 2020 (Wed)	40	49	40	37	45	35
24 Sep 2020 (Thu)	38*	47	43	35*	45	39
25 Sep 2020 (Fri)	51	51	42	45	47	37
26 Sep 2020 (Sat)	36	40	28	33	34	24
27 Sep 2020 (Sun)	36	36	36	32	32	30
28 Sep 2020 (Mon)	39*	39	37	37*	38	35
29 Sep 2020 (Tue)	38	42	40	36	40	38
Arithmetic Average	38	45	40	—	—	—
Rating Background Level (RBL) with no dredging operations				**36**	**45**	**38**

Note:

Data excluded due to meteorological effects (wind speed) or extraneous noise

Data excluded due to missing meteorological data

* Data excluded due to dredging operations

2.3 Attended Operational Noise Measurements

This section of the report presents the operational noise levels with HTSP operating.

Summary of the attended noise measurements carried out on 12 September 2019 (Thursday) and on 21 August 2020 (Friday) are presented in Table 2.7.

Table 2.7 Attended noise measurements

Date	Location	Distance between noise source and measurement location, m	Noise level L_{Aeq} dB(A)	Noise level L_{Ceq} dB(C)
12 Sep 2019 (Thu)	Booster (front)	7	69	86
	Booster (side)	8	71	87
	Sand wash plant	5 (distance from engine)	71	73
	Front loader loading product truck	8	72	83
	Water pump at shore near sand wash plant	1.5	84	85
21 Aug 2020 (Fri)	Location 1* (543 Cudgen Road)	Distance from dredge: 485m Distance from booster: 355m	47 TSP component: 43	62 TSP component: 60
	Location 2* (South-eastern shore of lake)	Distance from dredge: 255m Distance from booster: 350m	54 TSP component: 52	71 TSP component: 66
	Dredge	Distance from front (west): 45m	60	74
		Distance from left side (north): 30m	61	81
		Distance from rear (east): 50m	60	77
		Distance from right side (south): 35m	69	78
	Sand wash plant	Distance from west: 45m	57	71
		Distance from south: 15m	66	73
		Distance from east: 38m	62	70

*Note: Measured noise level includes background noise, but HTSP noise level is not distinguishable from the background. The HTSP component noise level was calculated using SoundPLAN noise propagation model.

During attended noise measurements at 543 Cudgen Road, ATP observed that the dredge was just audible as a distant “hum”.

It is noted that the measured noise levels at Location 1 include significant background noise which was contributing more to the noise levels than the HTSP. Due to the large separation distance between Location 1 and the existing HTSP, and dominance of background noise, the HTSP noise level was undistinguishable from the background noise. Background noise present at Location 1 included birds, insects, wind rustling through vegetation and distant traffic noise.

The highest noise levels associated with the HTSP at Location 1 during the noise monitoring period, in the absence of background noise, are estimated to be 43 dB(A) $L_{Aeq,15min}$. This noise level has been calculated using a SoundPLAN noise propagation model, which was validated using the attended noise measurements close to the plant and equipment at the existing HTSP.

It is noted that the results of the SoundPLAN noise propagation model indicate noise level of 43 dB(A) $L_{Aeq,15min}$ at the adjacent residence at 535 Cudgen Road.

2.4 Corrections for Annoying Noise Characteristics

Extract from the *Noise Policy for Industry* is as follows:

> *Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration. This section outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels specified in Section 2, to account for the additional annoyance caused by these modifying factors.*
>
> *The modifying factor corrections should be applied having regard to:*
>
> - *the contribution noise level from the premises when assessed/measured at a receiver location, and*
> - *the nature of the noise source and its characteristics (as set out in this fact sheet).*
>
> *The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels.*

2.4.1 Tonal Noise

Tonal noise is characterised by one or more distinct frequency components (“tones”) that emerge audibly from the total sound. Tonal noise can be assessed with one-third octave band analysis of the noise measured at the receiver.

In accordance with the *Noise Policy for Industry*, the method of assessing tonality is the “objective method for assessing the audibility of tones in noise – simplified method” (ISO 1996.2:2007 – Annex D). Extract from ISO 1996.2:2007 – Annex D:

> *For a prominent, discrete tone to be identified as present, the time-average sound pressure level in the one-third-octave band of interest is required to exceed the time-average sound pressure levels of both adjacent one-third-octave bands by some constant level difference.*

The constant level difference may vary with frequency. Possible choices for the level differences are:

- *15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz),*
- *8 dB in middle-frequency bands (160 Hz to 400 Hz),*
- *5 dB in high-frequency bands (500 Hz to 10 000 Hz).*

Correction to the measured noise levels, by addition of a tonal noise correction factor (penalty) of +5 dB(A) to the measured noise levels, is applied when tonal noise is present at the noise sensitive receiver.

Figure 2.4 presents the sound pressure levels in one-third octave bands, at various distances from the dredge.

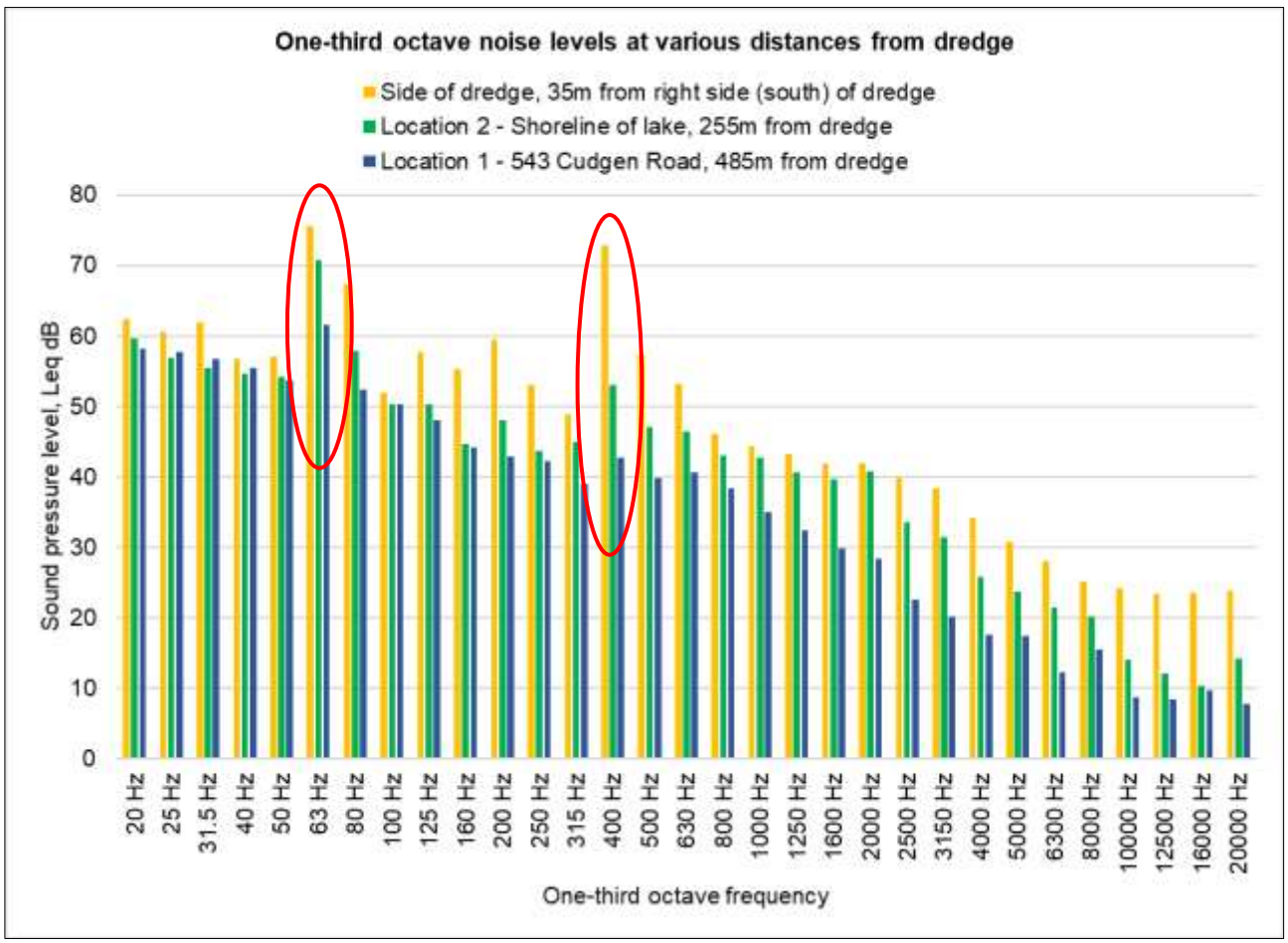


Figure 2.4 One-third octave noise levels at various distances from dredge

Review of Figure 2.4 shows the following:

- Pronounced noise in the 63 Hz band was recorded at the measurement locations. However, the 63 Hz noise level at the nearest noise sensitive receptor at 543 Cudgen Road did not exceed the criteria for tonality as specified above.

- Tonality at 400 Hz is present in the noise measurements at 35 m from the dredge and to a lesser extent at Location 2 on the shoreline of the lake. However, no tonality at 400 Hz was detected at 543 Cudgen Road.

Figure 2.5 presents the sound pressure levels in one-third octave bands, at various distances from the booster. It should be noted that the noise levels at 7m from the booster, as presented in Figure 2.5, were measured as part of previous noise monitoring in August to September 2019. There have been no modifications to the booster since 2019, so the close-up measurements of the booster were not repeated.

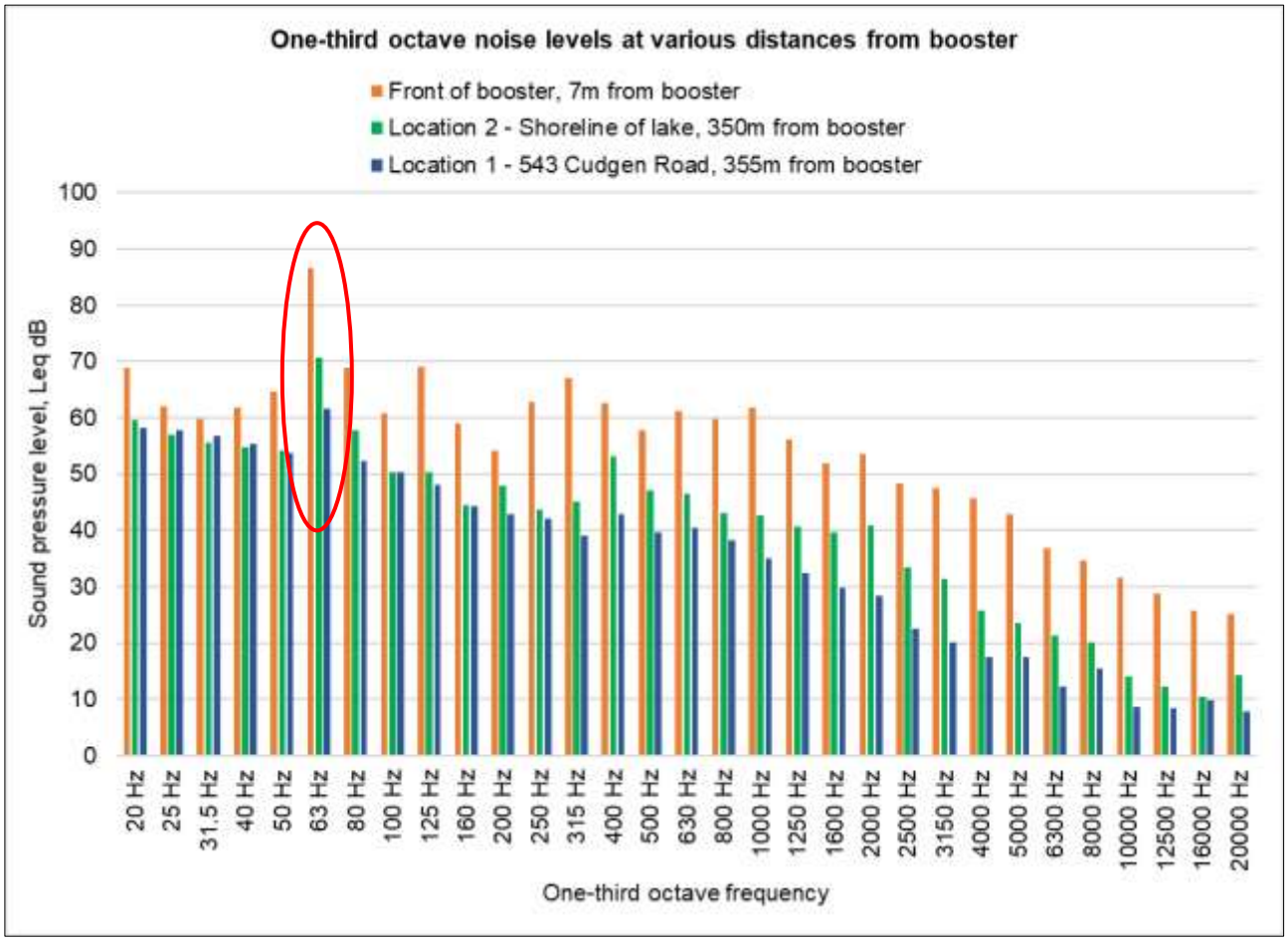


Figure 2.5 One-third octave noise levels at various distances from booster

Review of Figure 2.5 shows the following:

- Tonality at 63 Hz was recorded at 7 m from the booster. However, there was no tonality at the shoreline or 543 Cudgen Road.

No tonality associated with the HTSP was detected in the one-third octave noise measurements at 543 Cudgen Road, according to the objective method of assessing tonality.

2.4.2 Low Frequency Noise

In accordance with the *Noise Policy for Industry*, low frequency noise is present at the receiver when the C-weighted noise level ($L_{Ceq,T}$) is at least 15 dB greater than the A-weighted noise level ($L_{Aeq,T}$) and:

- Where any of the one-third octave band noise levels in Table 2.8 are exceeded by up to and including 5 dB, a 2 dB(A) positive adjustment to the measured A-weighted levels applies for the evening/night period; and
- Where any of the one-third octave band noise levels in Table 2.8 are exceeded by more than 5 dB, a 5 dB(A) positive adjustment to the measured A-weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.

Table 2.8 One-third octave low-frequency noise thresholds

Low frequency noise threshold	One-third octave $L_{Zeq,15min}$ threshold level, dB(Z)												
	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Source: Moorhouse A, Waddington D and Adams M 2011, Procedure for the assessment of low frequency noise complaints, Department for Environment Food and Rural Affairs (Contract No. NANR45, Revision 1) December 2011

Review of the measured noise levels in Table 2.7 shows that the C-weighted noise level at 543 Cudgen Road was 15 dB greater than the A-weighted level. The one-third octave dB(Z) noise levels measured at 543 Cudgen Road, including background noise, are presented in Table 2.9.

Table 2.9 One-third octave low-frequency noise levels at Location 1

Frequency (Hz)	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
Measured noise level, dB(Z)	—	—	—	58	58	57	55	54	62	52	50	48	44
Exceedance of low frequency threshold	—	—	—	0	0	0	1	4	12	4	2	2	0

— No noise data available

The low frequency threshold is exceeded at the nearest noise sensitive receiver at 543 Cudgen Road during day time by more than 5 dB, so a 5 dB(A) positive applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period. It is likely that the low frequency threshold would also be exceeded at the adjacent residence at 535 Cudgen Road.

3. Noise Criteria

3.1 Noise Policy for Industry

The NSW EPA *Noise Policy for Industry* identifies three criteria for assessing the impact of noise from a premise:

- Intrusiveness noise levels: – noise limits set relative to existing background levels;
- Amenity noise levels: – absolute noise limits set according to surrounding land uses; and
- Maximum noise levels: – maximum noise levels and number of events during night-time.

The project noise trigger level is the lower value of the project intrusiveness noise level and project amenity noise level.

3.1.1 Intrusiveness Noise Levels

Noise from the premises may generally be considered acceptable if the equivalent continuous A-weighted level of noise from the premises (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the RBL measured in the absence of the all noise from premises by more than 5 dB.

Based on the results of the background noise measurements, it has been determined that different RBLs are applicable to different areas, depending on the level of development and proximity to major roads. The proposed intrusiveness noise levels are presented in Table 3.1.

Table 3.1 Intrusiveness noise criteria

Location	Period	RBL	Intrusiveness noise level $L_{Aeq,adj,15min}$, dB(A)	
Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road) *(zoned as RU1 and R2)*	Day	37	RBL + 5dB(A)	**42** (37 + 5)
	Evening	38		**42** (37 + 5) *
	Night	37		**42** (37 + 5)
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road) *(zoned as RU1)*	Day	36		**41** (36 + 5)
	Evening	45		**41** (36 + 5) *
	Night	38		**41** (36 + 5) *
Noise sensitive places to the north at significant setback from Pacific Motorway (primarily applicable to dwelling at 271 Pacific Motorway) *(zoned as RU1)*	Day	37		**42** (37 + 5)
	Evening	45		**42** (37 + 5) *
	Night	39		**42** (37 + 5) *
Noise sensitive places to the north and west within proximity to Pacific Motorway *(zoned as RU1)*	Day	41		**46** (41 + 5)
	Evening	46		**46** (41 + 5) *
	Night	39		**44** (39 + 5)

** The noise levels measured at a number of locations featured higher RBLs during evening than daytime. Similarly, in some locations the RBLs for night-time were higher than daytime and/or evening. This is likely due to seasonal insect noise and is typical of rural areas. As per the procedure from Section 2.3 of the NSW Noise Policy for Industry, the intrusiveness noise limits for evening were set to be no greater than the limits for day time, and the noise limits for night time were set to be no greater than the limits for day time or evening.*

3.1.2 Amenity Noise Levels

The *Noise Policy for Industry* defines two planning noise levels:

- *Recommended amenity noise level:* – the objective for total industrial noise at a receiver location.
- *Project amenity noise level:* – the objective for noise from a single industrial development at a receiver location. To ensure that industrial noise levels (existing plus new) remain within the *recommended amenity noise levels* for an area, a *project amenity noise level* applies for each new source of industrial noise as follows:

  Project amenity noise level for industrial developments = *Recommended amenity noise level* minus 5dB(A)

The *recommended amenity noise level* is set according to the surrounding land uses (receiver category) and the existing background noise levels. The receiver categories and typical existing background noise levels are presented in Table 3.2.

Table 3.2 Residential receiver categories

Receiver category	Typical planning zoning – standard instrument	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40dB(A) Evening RBL <35dB(A) Night RBL <30dB(A)	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime RBL<45dB(A) Evening RBL<40dB(A) Night RBL <35dB(A)	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime RBL> 45dB(A) Evening RBL> 40dB(A) Night RBL >35dB(A)	**Urban** – an area with an acoustical environment that: • is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • has through-traffic with characteristically heavy and continuous traffic flows during peak periods. • is near commercial districts or industrial districts. • has any combination of the above.

Note: *This table is reproduced from Table 2.3 of the Noise Policy for Industry*

Land zoning map from the *Tweed Local Environmental Plan 2014* indicates that the subject site and nearest dwellings to the south along Cudgen Road are zoned "RU1 Primary Production". This corresponds to the "rural residential" in accordance with Table 3.2.

The Cudgen Public School and residential area to the east are zoned "R2 Low Density Residential". This corresponds to the "suburban residential" in accordance with Table 3.2.

Considering the above, the *recommended amenity noise levels* to be used in this assessment are presented in Table 3.3.

Table 3.3 Recommended amenity noise levels

Location	Period	Receiver category based on zoning and existing RBLs	Recommended amenity noise level $L_{Aeq,adj,15min}$, dB(A)
Residences to south, south-west and north (located within RU1 zone)	Day	Rural	50
	Evening		45
	Night		40
Residences to east (located within R2 zone)	Day	Suburban	55
	Evening		45
	Night		40
School classroom	Noisiest 1-hour period when in use	All	35 (internal) 40 (external)[3]
Active recreation area (e.g. school playground)	When in use	All	55

Then, considering the minus 5dB(A) adjustment to obtain the *project amenity noise level*:

> *Project amenity noise level* for industrial developments = *Recommended amenity noise level minus 5dB(A).*

The resulting *project amenity noise levels* are presented in Table 3.4.

Table 3.4 Project amenity noise levels

Location	Period	Recommended amenity noise level $L_{Aeq,adj,15min}$, dB(A)	Project amenity noise level $L_{Aeq,adj,15min}$, dB(A)
Residences to south, south-west and north (located within RU1 zone)	Day	50	**48** (50 – 5 + 3)
	Evening	45	**43** (45 – 5 + 3)
	Night	40	**38** (40 – 5 + 3)
Residences to east (located within R2 zone)	Day	55	**53** (55 – 5 + 3)
	Evening	45	**43** (45 – 5 + 3)
	Night	40	**38** (40 – 5 + 3)
School classroom	Noisiest 1-hour period when in use	40	**38** (40 – 5 + 3)
Active recreation area (e.g. school playground)	When in use	55	**53** (55 – 5 + 3)

Note: *Project amenity noise level (ANL) is suburban ANL (Table 2.1 of The Noise Policy for Industry) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level)*

[3] Noise Policy for Industry specifies an internal noise criterion of 35 dB(A). External noise level is derived from the internal noise level, considering 5 dB(A) noise attenuation by building envelope with windows fully open.

3.1.3 Project Trigger Level

The project noise trigger levels (lower value of the project intrusiveness noise level and project amenity noise level) are presented in Table 3.5.

Table 3.5 Project trigger level

Location	Period	Project trigger level $L_{Aeq,adj,15min}$, dB(A)
Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road) *(zoned as RU1 and R2)*	Day	**42**
	Evening	**42**
	Night	**38**
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road) *(zoned as RU1)*	Day	**41**
	Evening	**41**
	Night	**38**
Noise sensitive places to the north at significant setback from Pacific Motorway *(zoned as RU1)*	Day	**42**
	Evening	**42**
	Night	**38**
Noise sensitive places to the north and west within proximity to Pacific Motorway *(zoned as RU1)*	Day	**46**
	Evening	**46**
	Night	**38**
School classroom	Noisiest 1-hour period when in use	**38**
Active recreation area (e.g. school playground)	When in use	**53**

It is proposed that the project trigger levels as per Table 3.5 be adopted as the new Operational Noise Criteria for the HTSP.

It is important to note that special consideration is given to private haulage roads under the NSW EPA *Noise Policy for Industry*, as follows:

> *"Where a private haul road is proposed to convey materials from one premises to another and is proposed for the express purpose of removing traffic from a public road, the private haul road should be assessed against the project amenity noise levels only."*

To this end, the use of the proposed private haulage road will be assessed separately, against project amenity noise level criteria.

The remaining operations will be assessed against the project trigger level criteria.

3.1.4 Maximum Noise Level Events During Night-time

There is considerable published research into sleep disturbance caused by short duration or intermittent noise events. For example, sleep disturbance is addressed in the *Night Noise Guidelines for Europe* (World Health Organization, 2009). The *Night Noise Guidelines for Europe* states that the likelihood of awakening is related to the maximum instantaneous noise levels (L_{Amax}), ambient noise

levels and number of events during night-time. As a rule, in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45dB(A) L_{max} more than 10-15 times per night. The corresponding external noise level, assuming partially closed windows, is 52dB(A) L_{max}, measured in the free field.

In accordance with the *Noise Policy for Industry*, detailed maximum noise level event assessment is required when the night-time (10pm to 7am) noise levels from the premises exceed the following:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is greater; and/or
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is greater.

Considering the night-time RBL of 35dB(A), the resulting noise limits are presented in Table 3.6.

Table 3.6 Maximum noise level criteria

	Period	Noise limit, $L_{Aeq,15min}$, dB(A)	Noise limit, L_{AFmax}, dB(A)
Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road) *(zoned as RU1 and R2)*	Night	Criteria 1: 40dB(A) Criteria 2: 42dB(A) (37 + 5) Criteria 2 is applicable	Criteria 1: 52dB(A) Criteria 2: 52dB(A) (37 + 15) Criteria 1 and 2 are the same
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road) *(zoned as RU1)*		Criteria 1: 40dB(A) Criteria 2: 41dB(A) (36 + 5) Criteria 1 is applicable	Criteria 1: 52dB(A) Criteria 2: 51dB(A) (36 + 15) Criteria 1 is applicable
Noise sensitive places to the north at significant setback from Pacific Motorway (primarily applicable to dwelling at 271 Pacific Motorway) *(zoned as RU1)*		Criteria 1: 40dB(A) Criteria 2: 42dB(A) (37 + 5) Criteria 2 is applicable	Criteria 1: 52dB(A) Criteria 2: 52dB(A) (37 + 15) Criteria 1 and 2 are the same
Noise sensitive places to the north and west within proximity to Pacific Motorway *(zoned as RU1)*		Criteria 1: 40dB(A) Criteria 2: 44dB(A) (39 + 5) Criteria 2 is applicable	Criteria 1: 52dB(A) Criteria 2: 54dB(A) (39 + 15) Criteria 2 is applicable

The $L_{Aeq,15min}$ maximum noise level criteria for night-time presented in Table 3.6 is more lenient than the $L_{Aeq,15min}$ project trigger level criteria for night-time presented in Table 3.5. To this end, assessment of the $L_{Aeq,15min}$ noise levels for night-time with respects to the maximum noise level criteria is unnecessary. The maximum noise level assessment for night-time will only consider the L_{AFmax} criteria.

The noise criteria do not apply if the Tweed Sand Plant has an agreement with any impacted landowner to exceed the noise criteria, and the Tweed Sand Plant has advised the NSW Department of Planning, Industry and Environment in writing of the terms of this agreement.

4. Operational Noise Impact Assessment

4.1 Modelling Methodology

A 3D model of the site and surroundings was developed using SoundPLAN noise propagation software considering the operations at the HTSP as per the planned expansion over a 30 year period and the location of the extraction sites, processing site and dispatch roads associated with the expanded HTSP relative to the nearest noise sensitive places.

The calculations were carried out as per the procedures specified in the International Standard ISO9613 (*Acoustics – Attenuation of sound during propagation outdoors*).

The calculation method for a single frequency is as follows:

$$L_S = [\ L_W + K_0\ ] - [\ A_{dI} + A_{div} + A_{gr} + A_{bar} + A_{atm} + d_{Lrefl} + d_{Lw}\ ]$$

Where:

L_S	Sound pressure for a single frequency
L_W	Sound power of source
K_0	Correction for propagation in limited spatial angle
A_{DI}	Mean directivity correction
A_{div}	Mean attenuation due to geometrical spreading
A_{gr}	Mean attenuation due to ground effect
A_{bar}	Mean attenuation due to screening
A_{atm}	Mean attenuation due to air absorption
d_{Lrefl}	Level increase due to reflections
d_{Lw}	Correction due to source operation time

The noise propagation losses are calculated as a combination of distance attenuation (geometrical spreading), screening, ground attenuation and other factors.

The assumptions and data used in development of the operational noise propagation model are presented in Table 4.1.

Table 4.1 Data and assumptions – Operational noise model

Development layout and modelling of site expansion over 30-year planning horizon	Seven (7) different modelling scenarios were considered in the operational noise modelling, to account for the future phasing plan over the 30-year planning horizon as the HTSP expands its operations onto the adjacent allotments. These seven modelling scenarios are based on the Concept Development / Phasing Plan for the HTSP Expansion, prepared by Zone Planning Group (job / drawing no: Z19163-119-120), which is presented in Appendix A. The seven scenarios consider Phase 5 (year 1-3) through to Phase 11 (year 27-30), and account for the operations of the dredge, booster, wash plant and haulage route as they change during the expansion. For each of the seven modelling scenarios, two variations have been considered, with the location of the dredge and booster being shifted to be as close as possible to the nearest noise sensitive receivers to assess the worst-case scenarios. The modelling scenarios are as follows:

	• **Phase 5 – Year 1-3 (expansion of dredge area to the north-west, onto northern section of Lot 22 on DP1082435 and onto the area of Lot 2 on DP1192506 not occupied by future wash plant facilities):**
	  ○ Scenario 1A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 1B – Dredging on southern side of the expanded dredge area
	• **Phase 6 – Year 4-8 (expansion of dredge area to the south-west, onto centre portion of Lot 1 on DP1250570, over Lot 3 on RP1243752 onto southern section of Lot 1 on DP1250570, and over location of existing wash plant facilities):**
	  ○ Scenario 2A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 2B – Dredging on southern side of the expanded dredge area
	• **Phase 7 – Year 9-13 (relocation of wash plant facilities to northern portion of Lot 2 on DP1192506. and expansion of dredge area to the west, towards western portion of Lot 1 on DP1250570):**
	  ○ Scenario 3A – Dredging on eastern side of the expanded dredge area
	  ○ Scenario 3B – Dredging on western side of the expanded dredge area
	• **Phase 8 – Year 14-18 (expansion of dredge area to the west, to the far western portion of Lot 1 on DP1250570):**
	  ○ Scenario 4A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 4B – Dredging on southern side of the expanded dredge area
	• **Phase 9 – Year 19-22 (expansion of dredge area to the south, onto southern portion of Lot 1 on DP1250570):**
	  ○ Scenario 5A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 5B – Dredging on southern side of the expanded dredge area
	• **Phase 10 – Year 23-26 (relocation of dredge to eastern portion of Lot 51 on DP1166990):**
	  ○ Scenario 6A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 6B – Dredging on southern side of the expanded dredge area
	• **Phase 11 – Year 27-30 (expansion of dredge area to the west, onto western portion of Lot 51 on DP1166990):**
	  ○ Scenario 7A – Dredging on northern side of the expanded dredge area
	  ○ Scenario 7B – Dredging on southern side of the expanded dredge area
	• **Proposed Haulage Route Assessment**
	  ○ Scenario 8A – Phases 5 to 6 (Year 1-8)
	  ○ Scenario 8B – Phases 7 to 11 (Year 9-30)

Proposed haulage route	• A new haulage route is proposed to enable the Hanson Tweed Sand Plant to directly access to the Pacific Motorway (M1). The proposed haulage road has been modelled as per the Traffic Impact Assessment report prepared by Burchills Engineering Solutions (BE190043-RP-TIA-06), dated 9 February 2021. • The haulage road is expected to carry 267 heavy vehicle movements (two-way) per day (AADT) (rolling quarterly average) for the ultimate design (Year 2042). The maximum daily two-way traffic is expected to be no more than 559 heavy vehicles per day. • The AM and PM peak hourly vehicle movements, as per the Traffic Impact Assessment, are expected to be at most 64 vehicle movements per hour (32 in and 32 out) in the year 2042. • To obtain conservative results, the peak hourly heavy vehicle movements for the Year 2042 (64 vehicle movements – 32 in and 32 out) were modelled as occurring during every hour of daytime, evening and night time (total of 1,536 heavy vehicle movements per day).
Terrain	• Ground surface levels were obtained from ELVIS 5 metre grid elevation data. • Ground surface absorption factor of 0 was applied to all paved surfaces and water body surfaces, whilst a factor of 1 was applied for all grassed areas.

Calculation receivers	• Receivers were attached to the façades of the nearest noise sensitive buildings at a height of 1.5m above each floor level. • SoundPLAN adds +2.5dB(A) to the calculated noise levels when the receivers are attached to the buildings, thus the noise levels are facade adjusted. • 50m grid spacing was used for calculation of the noise contour maps
Noise sources and operating times	• Refer to Table 4.2.
Noise control measures	• The recommended noise control measures are discussed in Section 5 of this report.

Noise enhancing meteorological effects	• All scenarios in the operational noise modelling were prepared to account for noise enhancing meteorological effects (equation 3 of ISO 9613), resulting in a worst-case scenario assessment.
	• By utilising equation 3 in ISO 9613, the noise modelling automatically accounts for noise enhancing effects of downwind noise propagation and temperature inversion.
	• The calculations give the average downwind sound pressure levels $L_{AT(DW)}$. The downwind propagation conditions are:
	  ○ Wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from the source to receiver; and
	  ○ Wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground.
	• The calculations consider average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.
	• Extract from ISO 9613 is as follows: "*use of equation 3 leads directly to an equivalent continuous A-weighted sound pressure level L_{AT} at the receiver for meteorological conditions which are favourable for propagation from the sound source to that receiver. This may be the appropriate condition for meeting a specific community noise limit, i.e. a level which is seldom exceeded.*"

Distance attenuation	• 3D model of the subject site and surroundings was developed using cadastral data in SoundPLAN. The source-receiver distances and geometrical spreading are automatically calculated in SoundPLAN to a high level of accuracy in accordance with the ISO 9613 procedure. • Separation distances and distance attenuation values are presented in Appendix F.
Barrier attenuation / screening	• Some of the neighbouring properties are shielded by intervening buildings and topographical features which act as noise barriers. The barrier attenuation has been calculated in SoundPLAN to a high level of accuracy in accordance with the ISO9613 procedure. • Barrier attenuation / screening values are presented in Appendix F.
Ground attenuation	• Sound reflecting surfaces such as pavement or water are modelled with ground absorption coefficient of 0 (no absorption). Grassed and vegetated areas are modelled with ground absorption coefficient of 1 (100% absorption) in accordance with ISO9613. • Ground attenuation values are presented in Appendix F.

4.2 Noise Sources

4.2.1 L_{eq} Noise Level Assessment

The sound power levels, tonality/impulsiveness adjustment factors, and the operational scenarios for all noise sources considered in the SoundPLAN model are presented in Table 4.2.

Table 4.2 Noise sources – L_{eq} noise level assessments

Operational noise source	Location	Sound power level dB(A) (re 10^{-12}W)	Operational scenario	Tonality/ impulsiveness
Project trigger noise level assessments (Scenarios 1 to 7)				
Loader	Loading area	Sound power of 97.7 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	Continuous operation	+2 dB (day) +5 dB (evening /night) (low frequency noise)
Shoreline water pump	Shoreline processing area	Sound power of 95.6 dB(A) – Derived from site-specific noise measurements on 21 Aug 2020	Continuous operation	+2 dB (day) +5 dB (evening /night) (low frequency noise)
Dredge	Extremities of extraction area, as per Figures 4.1 to 4.7.	Sound power of 107.8 dB(A) – Derived from site-specific noise measurements on 21 Aug 2020	Continuous operation	+2 dB (day) +5 dB (evening /night) (low frequency noise)
Booster	Halfway between dredge and shoreline processing area	Sound power of 95.4 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	Continuous operation	+2 dB (day) +5 dB (evening /night) (low frequency noise)
Wash plant	Shoreline processing area	Sound power of 98.1 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	Continuous operation	+2 dB (day) +5 dB (evening /night) (low frequency noise)
Project amenity noise level assessment (Scenario 8)				
Truck movements	Haul roads and loading area	Sound power of 51.0 dB(A) per metre for moving point source – Derived from site-specific noise measurements on 12 Sep 2019	64 trucks per hour (32 in and 32 out)	+2 dB (day) +5 dB (evening /night) (low frequency noise)

4.2.2 Maximum Noise Level Assessment (Night-time Only)

For the night-time period, the activities at the proposed development which will produce short duration, intermittent noise events were considered. To provide conservative assessment, all noise sources considered in the L_{eq} assessment were considered in the L_{Amax} assessment.

The sound power levels for calculation of the noise levels in terms of L_{Amax} for the night-time assessment (10pm to 7am) are presented in Table 4.3.

Table 4.3 Noise sources – Maximum noise level assessment (night time only)

Operational noise source	Location	Sound power level dB(A) (re 10^{-12}W) for calculation of L_{Amax}	Tonality/ impulsiveness
Loader	Loading area	Sound power of 102.7 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	+5 dB (low frequency noise)

Operational noise source	Location	Sound power level dB(A) (re 10^{-12}W) for calculation of L_{Amax}	Tonality/ impulsiveness
Shoreline water pump	Shoreline processing area	Sound power of 98.6 dB(A) – Derived from site-specific noise measurements on 21 Aug 2020	+5 dB (low frequency noise)
Dredge	Extremities of extraction area, as per Figures 4.1 to 4.7.	Sound power of 110.8 dB(A) – Derived from site-specific noise measurements on 21 Aug 2020	+5 dB (low frequency noise)
Booster	Halfway between dredge and shoreline processing area	Sound power of 98.4 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	+5 dB (low frequency noise)
Wash plant	Shoreline processing area	Sound power of 101.1 dB(A) – Derived from site-specific noise measurements on 12 Sep 2019	+5 dB (low frequency noise)

Extract from the SoundPLAN operational noise model for Scenario 1 is presented in Figure 4.1.

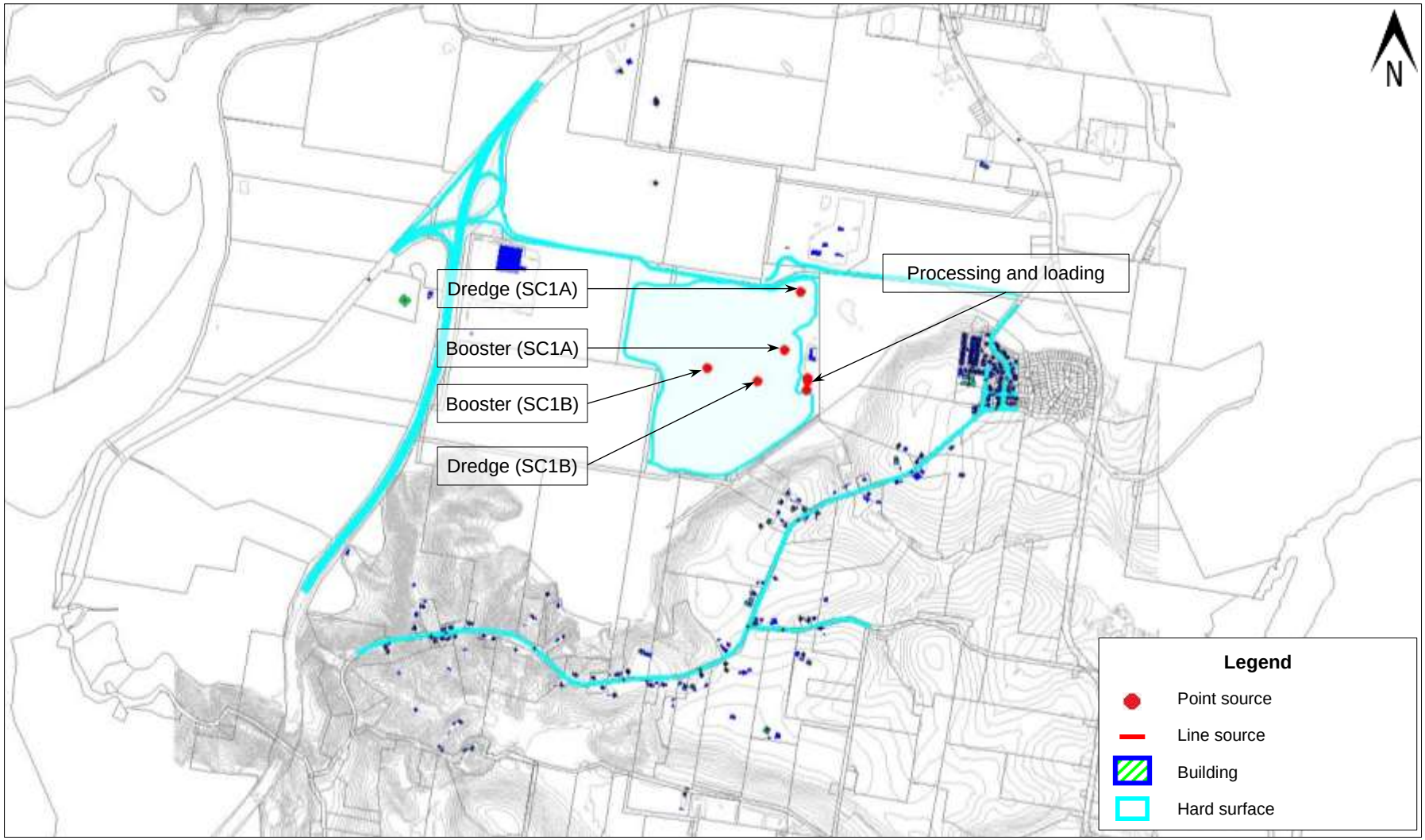


Figure 4.1 SoundPLAN operational noise model excerpt – Scenario 1 (year 1-3)

Extract from the SoundPLAN operational noise model for Scenario 2 is presented in Figure 4.2.

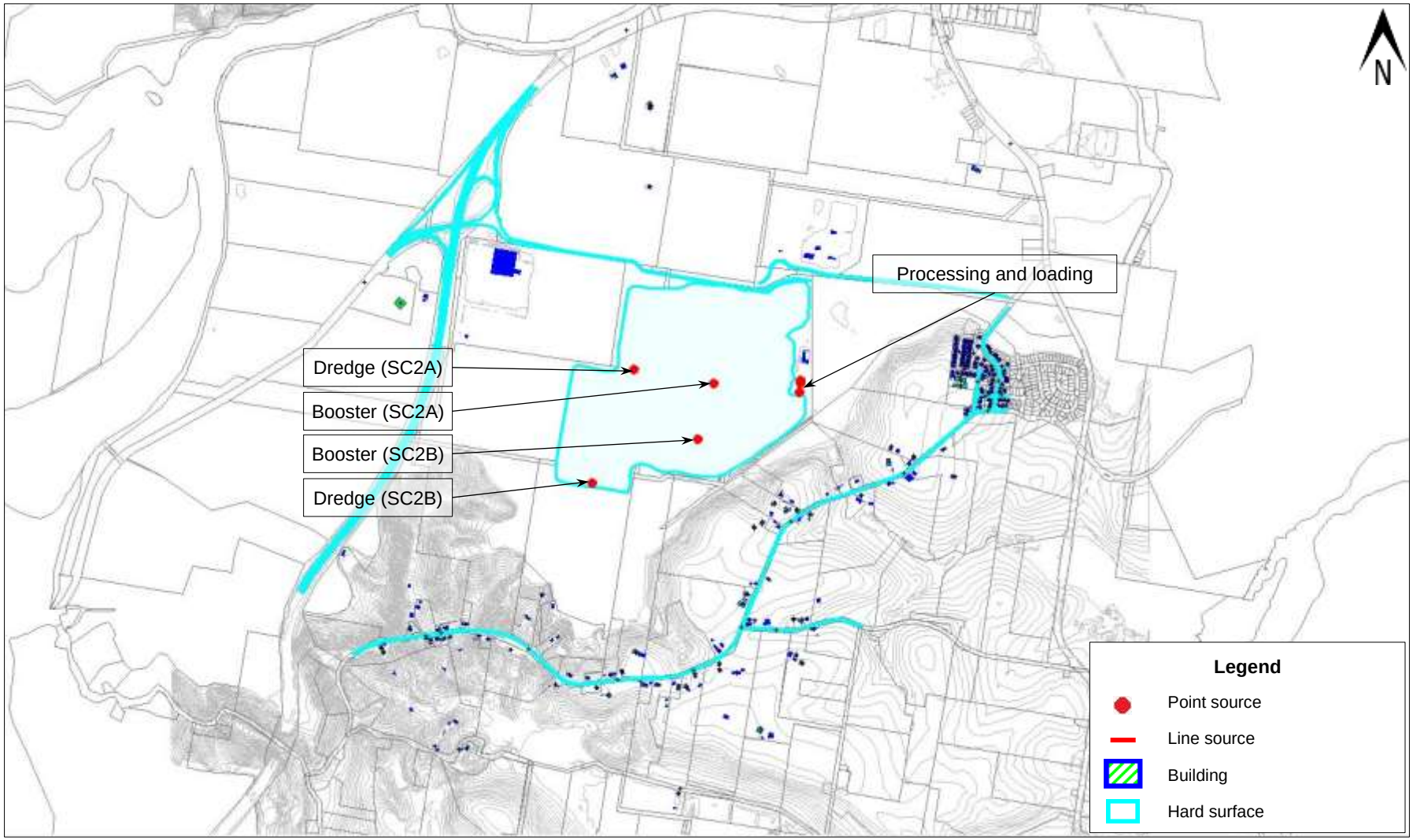


Figure 4.2 SoundPLAN operational noise model excerpt – Scenario 2 (year 4-8)

Extract from the SoundPLAN operational noise model for Scenario 3 is presented in Figure 4.3.

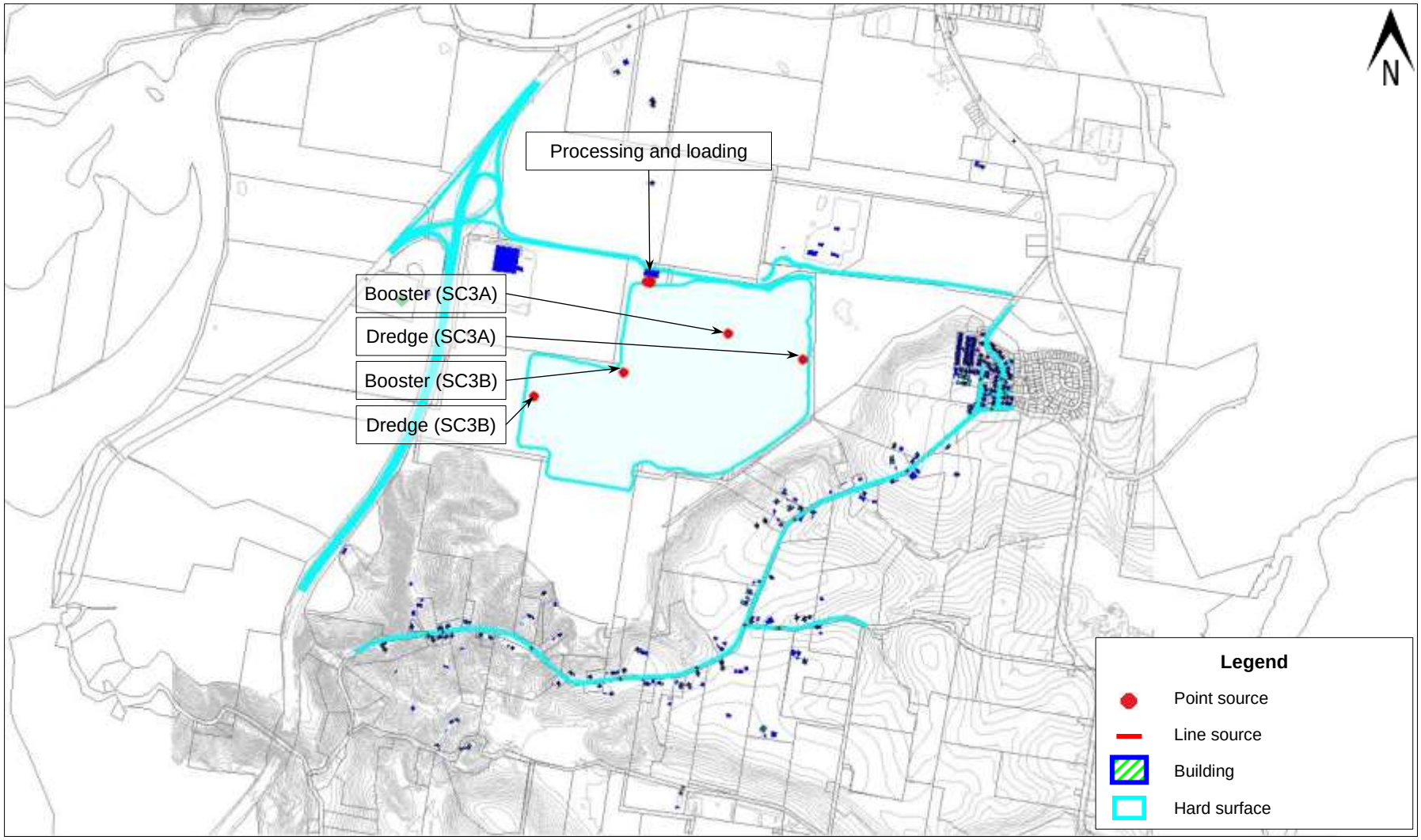


Figure 4.3 SoundPLAN operational noise model excerpt – Scenario 3 (year 9-13)

Extract from the SoundPLAN operational noise model for Scenario 4 is presented in Figure 4.4.

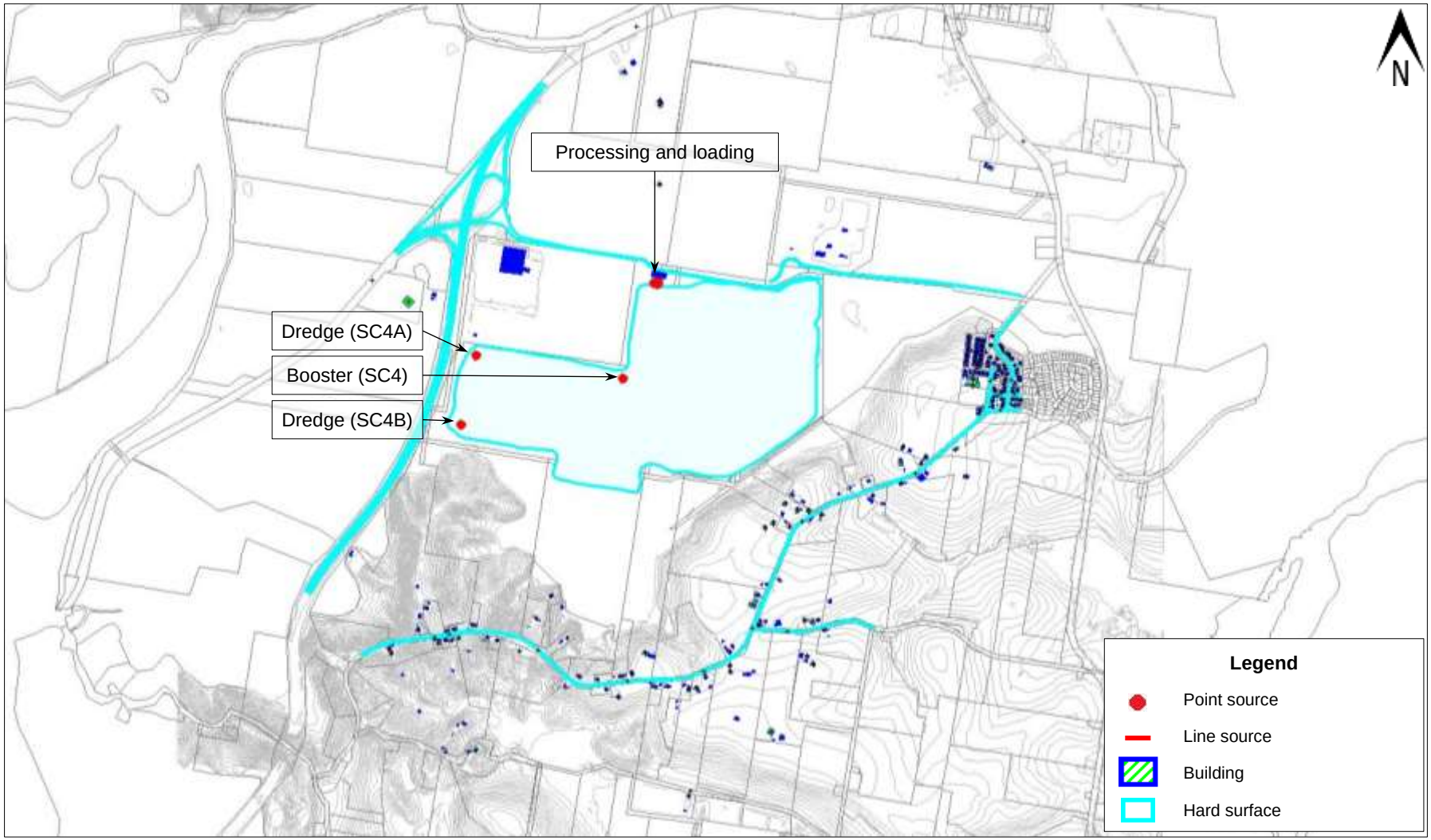


Figure 4.4 SoundPLAN operational noise model excerpt – Scenario 4 (year 14-18)

Extract from the SoundPLAN operational noise model for Scenario 5 is presented in Figure 4.5.

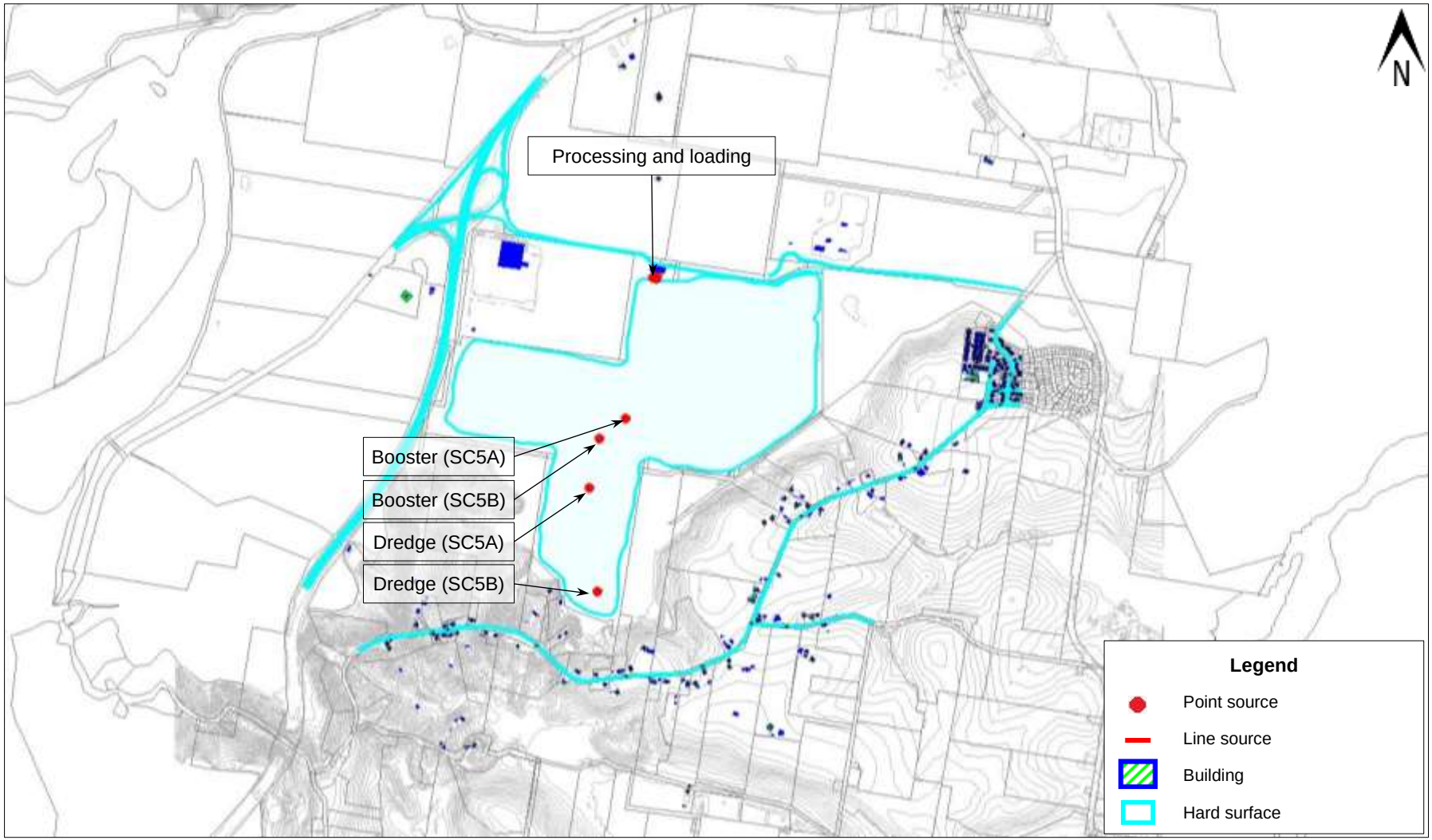


Figure 4.5 SoundPLAN operational noise model excerpt – Scenario 5 (year 19-22)

Extract from the SoundPLAN operational noise model for Scenario 6 is presented in Figure 4.6.

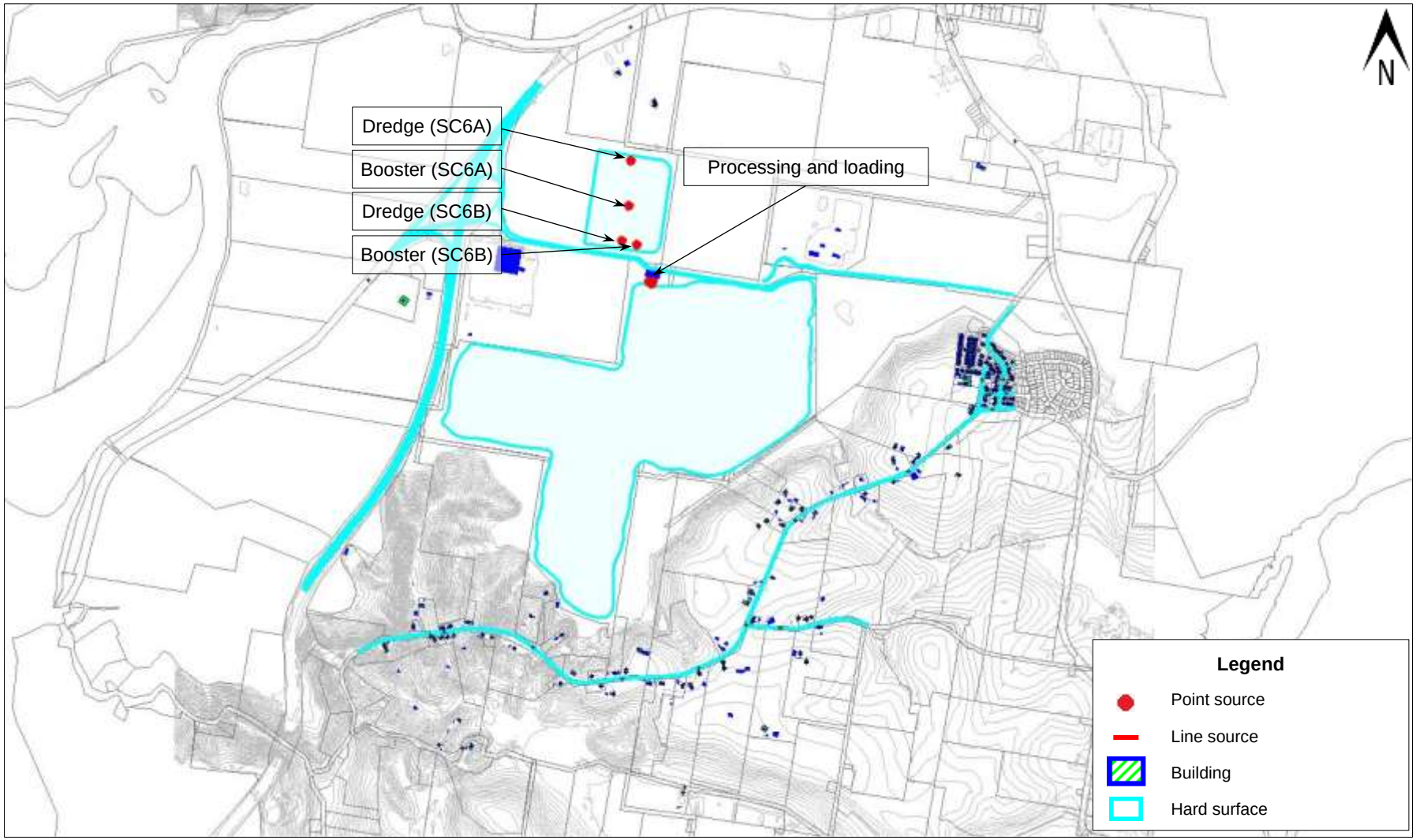


Figure 4.6 SoundPLAN operational noise model excerpt – Scenario 6 (year 23-26)

Extract from the SoundPLAN operational noise model for Scenario 7 is presented in Figure 4.7.

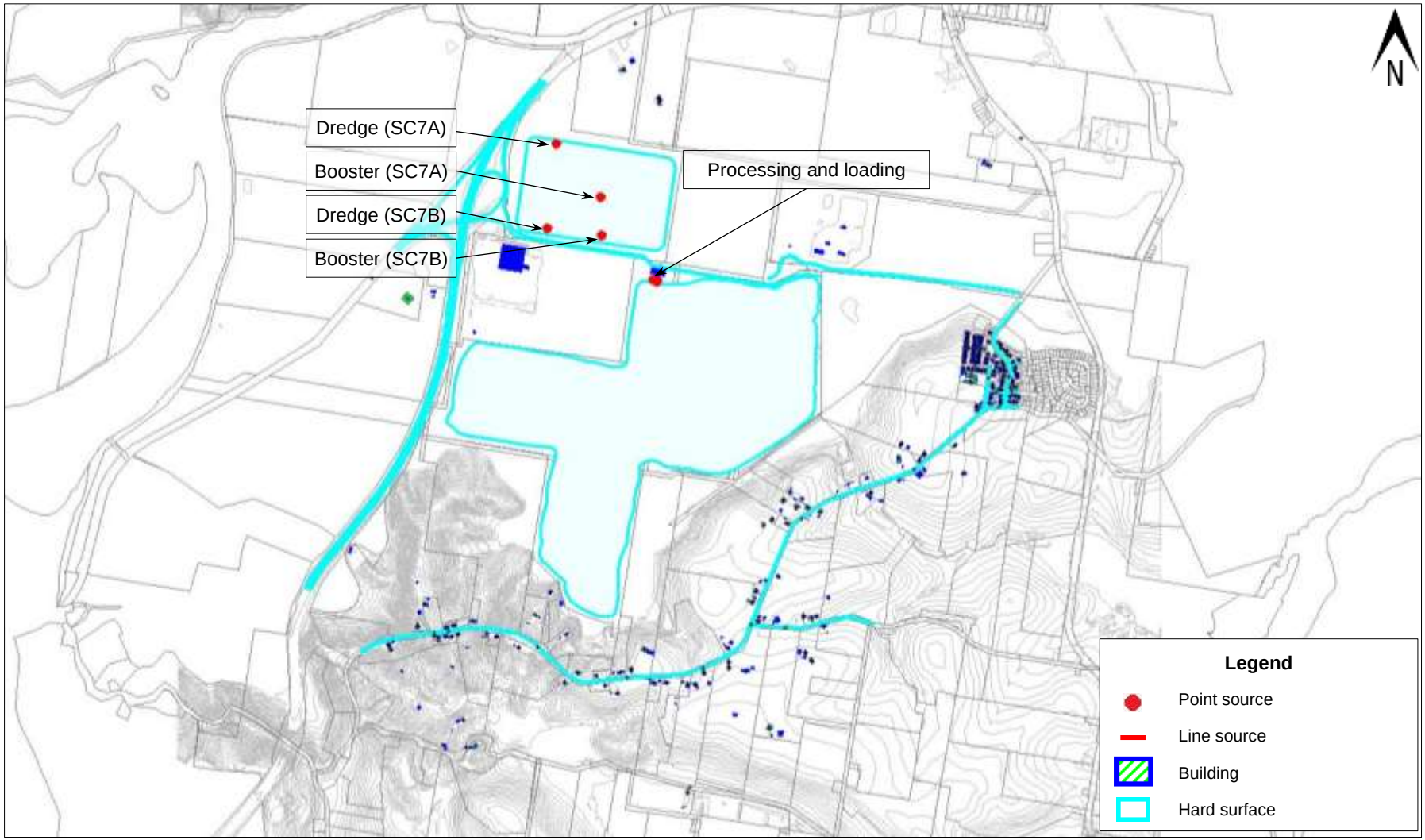


Figure 4.7 SoundPLAN operational noise model excerpt – Scenario 7 (year 27-30)

Extract from the SoundPLAN operational noise model for Scenario 8 is presented in Figure 4.8.

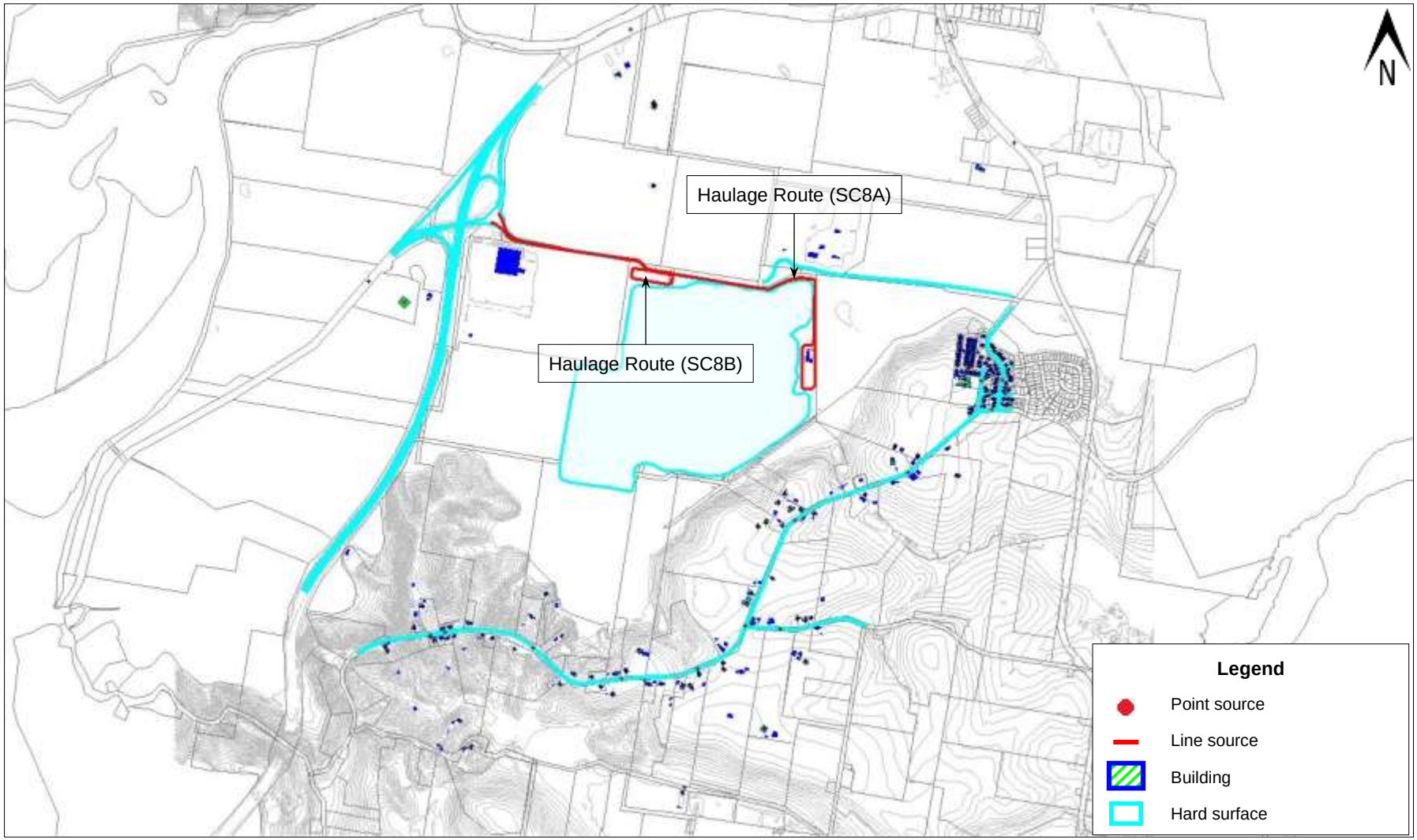


Figure 4.8 SoundPLAN operational noise model excerpt – Scenario 8 (proposed haulage road)

4.3 Operational Noise Modelling Results

4.3.1 Scenario 1 (Year 1-3)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 5 (year 1-3), assessed against the project trigger levels, are presented in Table 4.4.

Table 4.4 Operational noise levels – L_{eq} assessment – Scenario 1 (year 1-3)

Receiver name	Calculated noise levels $L_{eq,adj,15min}$, dB(A)			Complies with project trigger levels?
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	22	25	25	Yes
3 Clarke Street	23	26	26	Yes
6 Clarke Street	22	25	25	Yes
1 Collier Street	28	31	31	Yes
2 Collier Street	26	29	29	Yes
4 Collier Street	26	29	29	Yes
6 Collier Street	25	28	28	Yes
8 Collier Street	25	28	28	Yes
10 Collier Street	25	28	28	Yes
16 Collier Street	24	27	27	Yes
17 Collier Street	17	20	20	Yes
18 Collier Street	24	27	27	Yes
20 Collier Street	22	25	25	Yes
22 Collier Street	23	26	26	Yes
24 Collier Street	20	23	23	Yes
1 Crescent Street	23	26	26	Yes
3 Crescent Street	22	25	25	Yes
4 Crescent Street	23	26	26	Yes
5 Crescent Street	22	25	25	Yes
7 Crescent Street	23	26	26	Yes
8 Crescent Street	23	26	26	Yes
9 Crescent Street	24	27	27	Yes
10 Crescent Street	20	23	23	Yes
11 Crescent Street	22	25	25	Yes
12 Crescent Street	20	23	23	Yes
13 Crescent Street	23	26	26	Yes
14 Crescent Street	22	25	25	Yes
16 Crescent Street	20	23	23	Yes
17 Crescent Street	17	20	20	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	23	26	26	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
20 Crescent Street	17	20	20	Yes
20A Crescent Street	16	19	19	Yes
21 Crescent Street	21	24	24	Yes
22-24 Crescent Street	18	21	21	Yes
23 Crescent Street	17	20	20	Yes
26 Crescent Street	17	20	20	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	17	20	20	Yes
30 Crescent Street	16	19	19	Yes
32 Crescent Street	18	21	21	Yes
34 Crescent Street	17	20	20	Yes
36 Crescent Street	18	21	21	Yes
38 Crescent Street	16	19	19	Yes
1-5 Cudgen Road	25	28	28	Yes
7 Cudgen Road	23	26	26	Yes
11 Cudgen Road	17	20	20	Yes
463 Cudgen Road	25	28	28	Yes
480 Cudgen Road	22	25	25	Yes
480A Cudgen Road	24	27	27	Yes
482 Cudgen Road	26	29	29	Yes
501 Cudgen Road	25	28	28	Yes
529A Cudgen Road	31	34	34	Yes
529B Cudgen Road	34	37	37	Yes
531 Cudgen Road	29	32	32	Yes
535A Cudgen Road	30	33	33	Yes
535B Cudgen Road	30	33	33	Yes
535C Cudgen Road	34	37	37	Yes
542 Cudgen Road	30	33	33	Yes
543 Cudgen Road	35	38	38	Yes
576 Cudgen Road	30	33	33	Yes
592 Cudgen Road	29	32	32	Yes
604 Cudgen Road	25	28	28	Yes
607 Cudgen Road	35	38	38	Yes
609 Cudgen Road	29	32	32	Yes
611A Cudgen Road	29	32	32	Yes
611B Cudgen Road	34	37	37	Yes
626 Cudgen Road	27	30	30	Yes
647 Cudgen Road	27	30	30	Yes
5 Denman Drive	17	20	20	Yes
7 Denman Drive	17	20	20	Yes
9 Denman Drive	21	24	24	Yes
11 Denman Drive	24	27	27	Yes
13 Denman Drive	25	28	28	Yes
14 Denman Drive	31	34	34	Yes
15 Denman Drive	25	28	28	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
16 Denman Drive	31	34	34	Yes
17 Denman Drive	21	24	24	Yes
18 Denman Drive	30	33	33	Yes
19 Denman Drive	23	26	26	Yes
20 Denman Drive	29	32	32	Yes
21 Denman Drive	25	28	28	Yes
22 Denman Drive	29	32	32	Yes
23 Denman Drive	27	30	30	Yes
24 Denman Drive	29	32	32	Yes
25 Denman Drive	26	29	29	Yes
26 Denman Drive	29	32	32	Yes
27 Denman Drive	26	29	29	Yes
28 Denman Drive	28	31	31	Yes
30 Denman Drive	28	31	31	Yes
32 Denman Drive	28	31	31	Yes
34 Denman Drive	27	30	30	Yes
36 Denman Drive	25	28	28	Yes
38 Denman Drive	25	28	28	Yes
40 Denman Drive	26	29	29	Yes
42 Denman Drive	26	29	29	Yes
3 Murraya Way	15	18	18	Yes
6 Murraya Way	15	18	18	Yes
8 Murraya Way	16	19	19	Yes
9 Murraya Way	18	21	21	Yes
10 Murraya Way	20	23	23	Yes
12 Murraya Way	21	24	24	Yes
14 Murraya Way	18	21	21	Yes
15 Murraya Way	19	22	22	Yes
16 Murraya Way	21	24	24	Yes
17 Murraya Way	24	27	27	Yes
142 Plantation Road	23	26	26	Yes
154A Plantation Road	22	25	25	Yes
154B Plantation Road	22	25	25	Yes
2 The Village Lane	26	29	29	Yes
146 Tweed Coast Road	22	25	25	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	15	18	18	Yes
278B Cudgen Road	15	18	18	Yes
293 Cudgen Road	22	25	25	Yes
297 Cudgen Road	21	24	24	Yes
298A Cudgen Road	19	22	22	Yes
298B Cudgen Road	19	22	22	Yes
301 Cudgen Road	23	26	26	Yes
302 Cudgen Road	20	23	23	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
306 Cudgen Road	18	21	21	Yes
307 Cudgen Road	22	25	25	Yes
310 Cudgen Road	20	23	23	Yes
312 Cudgen Road	21	24	24	Yes
317 Cudgen Road	22	25	25	Yes
320 Cudgen Road	23	26	26	Yes
346 Cudgen Road	18	21	21	Yes
351 Cudgen Road	24	27	27	Yes
353 Cudgen Road	25	28	28	Yes
355 Cudgen Road	24	27	27	Yes
372 Cudgen Road	19	22	22	Yes
379 Cudgen Road	23	26	26	Yes
389 Cudgen Road	23	26	26	Yes
394 Cudgen Road	22	25	25	Yes
396 Cudgen Road	19	22	22	Yes
401 Cudgen Road	21	24	24	Yes
413A Cudgen Road	22	25	25	Yes
413B Cudgen Road	21	24	24	Yes
416 Cudgen Road	20	23	23	Yes
422 Cudgen Road	20	23	23	Yes
438 Cudgen Road	21	24	24	Yes
440A Cudgen Road	21	24	24	Yes
440B Cudgen Road	21	24	24	Yes
458A Cudgen Road	22	25	25	Yes
458B Cudgen Road	21	24	24	Yes
459 Cudgen Road	23	26	26	Yes
396 Melaleuca Road	14	17	17	Yes
37 Mccollums Road	16	19	19	Yes
41 Mccollums Road	15	18	18	Yes
54 Mccollums Road	16	19	19	Yes
52 Reardons Road	19	22	22	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	29	32	32	Yes
145 Plantation Road	24	27	27	Yes
155A Plantation Road	22	25	25	Yes
155B Plantation Road	22	25	25	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	20	23	23	Yes
139B Pacific Motorway	24	27	27	Yes
141 Pacific Motorway	22	25	25	Yes
9394 Tweed Valley Way	19	22	22	Yes
School class room	38	38	38	
11A Collier Street	28	31	31	Yes
11B Collier Street	27	30	30	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 5 (year 1-3), assessed against the maximum noise level criteria, are presented in Table 4.5.

Table 4.5 Operational noise levels – L_{max} assessment – Scenario 1 (year 1-3)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	24	17	28	16	20	Yes
3 Clarke Street	25	18	25	16	20	Yes
6 Clarke Street	24	17	26	15	19	Yes
1 Collier Street	32	25	29	20	28	Yes
2 Collier Street	30	24	27	17	26	Yes
4 Collier Street	29	24	27	17	24	Yes
6 Collier Street	28	23	27	17	24	Yes
8 Collier Street	28	23	27	16	24	Yes
10 Collier Street	28	23	27	17	23	Yes
16 Collier Street	27	20	27	18	21	Yes
17 Collier Street	19	6	20	18	9	Yes
18 Collier Street	26	22	26	19	21	Yes
20 Collier Street	24	16	25	16	18	Yes
22 Collier Street	25	16	25	18	19	Yes
24 Collier Street	23	14	23	16	16	Yes
1 Crescent Street	26	19	25	15	22	Yes
3 Crescent Street	21	23	26	16	16	Yes
4 Crescent Street	25	15	28	16	19	Yes
5 Crescent Street	22	23	26	16	18	Yes
7 Crescent Street	25	20	25	16	20	Yes
8 Crescent Street	25	17	26	17	19	Yes
9 Crescent Street	27	20	27	17	23	Yes
10 Crescent Street	22	18	25	16	16	Yes
11 Crescent Street	25	17	25	14	19	Yes
12 Crescent Street	22	13	23	15	14	Yes
13 Crescent Street	26	20	26	17	21	Yes
14 Crescent Street	25	18	25	15	20	Yes
16 Crescent Street	22	11	24	15	15	Yes
17 Crescent Street	20	9	21	11	11	Yes
18 Crescent Street	20	12	23	14	13	Yes
19 Crescent Street	24	13	26	17	17	Yes
20 Crescent Street	18	9	21	14	9	Yes
20A Crescent Street	16	4	20	16	6	Yes
21 Crescent Street	20	16	26	13	12	Yes
22-24 Crescent Street	21	13	22	18	12	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
23 Crescent Street	17	6	21	16	6	Yes
26 Crescent Street	19	8	21	15	10	Yes
28 Crescent Street	21	10	23	15	12	Yes
29 Crescent Street	19	9	21	9	10	Yes
30 Crescent Street	18	8	20	13	11	Yes
32 Crescent Street	20	8	22	14	11	Yes
34 Crescent Street	19	9	22	13	10	Yes
36 Crescent Street	19	9	22	14	10	Yes
38 Crescent Street	18	8	20	8	9	Yes
1-5 Cudgen Road	30	14	27	17	26	Yes
7 Cudgen Road	27	14	25	16	23	Yes
11 Cudgen Road	18	10	20	16	10	Yes
463 Cudgen Road	26	23	27	19	22	Yes
480 Cudgen Road	25	20	25	15	21	Yes
480A Cudgen Road	26	21	26	16	22	Yes
482 Cudgen Road	27	25	28	18	24	Yes
501 Cudgen Road	27	24	27	17	24	Yes
529A Cudgen Road	32	29	34	26	28	Yes
529B Cudgen Road	35	34	36	26	32	Yes
531 Cudgen Road	31	28	31	21	29	Yes
535A Cudgen Road	32	30	31	18	29	Yes
535B Cudgen Road	33	30	32	21	29	Yes
535C Cudgen Road	33	31	37	27	30	Yes
542 Cudgen Road	32	29	30	19	29	Yes
543 Cudgen Road	37	34	37	27	34	Yes
576 Cudgen Road	32	30	30	19	28	Yes
592 Cudgen Road	32	29	30	18	28	Yes
604 Cudgen Road	28	23	27	16	24	Yes
607 Cudgen Road	37	35	34	24	34	Yes
609 Cudgen Road	32	28	30	20	28	Yes
611A Cudgen Road	32	28	29	18	28	Yes
611B Cudgen Road	37	33	33	23	34	Yes
626 Cudgen Road	29	25	28	17	25	Yes
647 Cudgen Road	30	26	28	17	26	Yes
5 Denman Drive	18	7	21	14	8	Yes
7 Denman Drive	19	9	21	14	9	Yes
9 Denman Drive	24	12	25	19	15	Yes
11 Denman Drive	28	16	25	16	24	Yes
13 Denman Drive	29	16	28	15	24	Yes
14 Denman Drive	33	26	32	24	30	Yes
15 Denman Drive	28	23	28	19	27	Yes
16 Denman Drive	33	26	32	24	29	Yes
17 Denman Drive	24	23	25	16	15	Yes
18 Denman Drive	32	26	33	24	27	Yes
19 Denman Drive	25	24	27	18	18	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
20 Denman Drive	31	26	32	24	27	Yes
21 Denman Drive	28	24	26	21	25	Yes
22 Denman Drive	31	26	31	24	26	Yes
23 Denman Drive	30	25	29	20	25	Yes
24 Denman Drive	31	26	31	24	26	Yes
25 Denman Drive	30	24	27	17	25	Yes
26 Denman Drive	31	26	30	24	26	Yes
27 Denman Drive	29	23	27	16	25	Yes
28 Denman Drive	31	26	30	24	26	Yes
30 Denman Drive	31	26	29	24	26	Yes
32 Denman Drive	31	26	29	21	26	Yes
34 Denman Drive	31	24	29	19	26	Yes
36 Denman Drive	28	21	28	19	23	Yes
38 Denman Drive	28	21	28	19	23	Yes
40 Denman Drive	29	23	27	18	25	Yes
42 Denman Drive	29	22	27	18	24	Yes
3 Murraya Way	17	7	19	11	8	Yes
6 Murraya Way	17	7	19	14	8	Yes
8 Murraya Way	18	7	20	13	9	Yes
9 Murraya Way	20	9	22	16	11	Yes
10 Murraya Way	18	8	26	11	9	Yes
12 Murraya Way	19	9	27	12	12	Yes
14 Murraya Way	20	11	23	16	13	Yes
15 Murraya Way	21	17	21	14	18	Yes
16 Murraya Way	24	21	24	16	17	Yes
17 Murraya Way	27	16	26	16	22	Yes
142 Plantation Road	25	20	25	15	21	Yes
154A Plantation Road	24	18	24	15	20	Yes
154B Plantation Road	24	19	25	17	20	Yes
2 The Village Lane	29	25	27	16	26	Yes
146 Tweed Coast Road	23	18	25	16	20	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	16	12	18	9	11	Yes
278B Cudgen Road	16	10	19	8	11	Yes
293 Cudgen Road	22	18	25	15	19	Yes
297 Cudgen Road	22	16	25	14	18	Yes
298A Cudgen Road	21	16	22	11	16	Yes
298B Cudgen Road	20	15	23	12	15	Yes
301 Cudgen Road	23	19	26	16	20	Yes
302 Cudgen Road	20	17	23	14	17	Yes
306 Cudgen Road	19	14	21	15	14	Yes
307 Cudgen Road	23	18	26	16	19	Yes
310 Cudgen Road	21	18	23	13	17	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
312 Cudgen Road	22	19	24	16	19	Yes
317 Cudgen Road	23	19	25	15	19	Yes
320 Cudgen Road	23	20	26	16	19	Yes
346 Cudgen Road	19	15	22	12	15	Yes
351 Cudgen Road	25	21	27	18	21	Yes
353 Cudgen Road	26	23	28	19	22	Yes
355 Cudgen Road	25	21	27	17	21	Yes
372 Cudgen Road	20	16	22	12	15	Yes
379 Cudgen Road	24	17	27	17	20	Yes
389 Cudgen Road	21	17	27	17	16	Yes
394 Cudgen Road	21	17	27	16	16	Yes
396 Cudgen Road	20	16	22	12	16	Yes
401 Cudgen Road	21	17	24	17	17	Yes
413A Cudgen Road	22	19	24	18	18	Yes
413B Cudgen Road	21	17	23	17	17	Yes
416 Cudgen Road	21	18	23	13	17	Yes
422 Cudgen Road	21	18	23	13	17	Yes
438 Cudgen Road	22	18	23	13	18	Yes
440A Cudgen Road	23	19	24	14	18	Yes
440B Cudgen Road	23	19	24	13	19	Yes
458A Cudgen Road	23	20	24	14	19	Yes
458B Cudgen Road	23	19	24	11	19	Yes
459 Cudgen Road	23	20	26	16	19	Yes
396 Melaleuca Road	16	6	18	7	8	Yes
37 Mccollums Road	17	12	19	9	12	Yes
41 Mccollums Road	16	11	19	7	10	Yes
54 Mccollums Road	17	12	20	9	12	Yes
52 Reardons Road	21	17	22	11	16	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	30	20	33	24	27	Yes
145 Plantation Road	26	22	25	14	23	Yes
155A Plantation Road	24	21	24	14	20	Yes
155B Plantation Road	24	20	24	13	20	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	22	7	24	15	17	Yes
139B Pacific Motorway	23	16	28	16	22	Yes
141 Pacific Motorway	22	15	27	16	21	Yes
9394 Tweed Valley Way	20	13	22	13	16	Yes

4.3.2 Scenario 2 (Year 4-8)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 6 (year 4-8), assessed against the project trigger levels, are presented in Table 4.6.

Table 4.6 Operational noise levels – L_{eq} assessment – Scenario 2 (year 4-8)

Receiver name	Calculated noise levels $L_{eq,adj,15min}$, dB(A)			Complies with project trigger levels?
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	22	25	25	Yes
3 Clarke Street	23	26	26	Yes
6 Clarke Street	22	25	25	Yes
1 Collier Street	27	30	30	Yes
2 Collier Street	25	28	28	Yes
4 Collier Street	26	29	29	Yes
6 Collier Street	25	28	28	Yes
8 Collier Street	25	28	28	Yes
10 Collier Street	25	28	28	Yes
16 Collier Street	24	27	27	Yes
17 Collier Street	17	20	20	Yes
18 Collier Street	24	27	27	Yes
20 Collier Street	21	24	24	Yes
22 Collier Street	23	26	26	Yes
24 Collier Street	21	24	24	Yes
1 Crescent Street	23	26	26	Yes
3 Crescent Street	21	24	24	Yes
4 Crescent Street	22	25	25	Yes
5 Crescent Street	21	24	24	Yes
7 Crescent Street	23	26	26	Yes
8 Crescent Street	22	25	25	Yes
9 Crescent Street	24	27	27	Yes
10 Crescent Street	21	24	24	Yes
11 Crescent Street	22	25	25	Yes
12 Crescent Street	20	23	23	Yes
13 Crescent Street	24	27	27	Yes
14 Crescent Street	22	25	25	Yes
16 Crescent Street	20	23	23	Yes
17 Crescent Street	18	21	21	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	21	24	24	Yes
20 Crescent Street	17	20	20	Yes
20A Crescent Street	13	16	16	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	19	22	22	Yes
22-24 Crescent Street	19	22	22	Yes
23 Crescent Street	14	17	17	Yes
26 Crescent Street	17	20	20	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	17	20	20	Yes
30 Crescent Street	16	19	19	Yes
32 Crescent Street	18	21	21	Yes
34 Crescent Street	18	21	21	Yes
36 Crescent Street	18	21	21	Yes
38 Crescent Street	16	19	19	Yes
1-5 Cudgen Road	25	28	28	Yes
7 Cudgen Road	24	27	27	Yes
11 Cudgen Road	18	21	21	Yes
463 Cudgen Road	27	30	30	Yes
480 Cudgen Road	22	25	25	Yes
480A Cudgen Road	25	28	28	Yes
482 Cudgen Road	27	30	30	Yes
501 Cudgen Road	27	30	30	Yes
529A Cudgen Road	32	35	35	Yes
529B Cudgen Road	35	38	38	Yes
531 Cudgen Road	30	33	33	Yes
535A Cudgen Road	31	34	34	Yes
535B Cudgen Road	32	35	35	Yes
535C Cudgen Road	36	39	39	Yes
542 Cudgen Road	30	33	33	Yes
543 Cudgen Road	36	39	39	Yes
576 Cudgen Road	31	34	34	Yes
592 Cudgen Road	30	33	33	Yes
604 Cudgen Road	25	28	28	Yes
607 Cudgen Road	35	38	38	Yes
609 Cudgen Road	30	33	33	Yes
611A Cudgen Road	28	31	31	Yes
611B Cudgen Road	35	38	38	Yes
626 Cudgen Road	27	30	30	Yes
647 Cudgen Road	27	30	30	Yes
5 Denman Drive	15	18	18	Yes
7 Denman Drive	16	19	19	Yes
9 Denman Drive	21	24	24	Yes
11 Denman Drive	24	27	27	Yes
13 Denman Drive	25	28	28	Yes
14 Denman Drive	31	34	34	Yes
15 Denman Drive	25	28	28	Yes
16 Denman Drive	30	33	33	Yes
17 Denman Drive	22	25	25	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	29	32	32	Yes
19 Denman Drive	23	26	26	Yes
20 Denman Drive	29	32	32	Yes
21 Denman Drive	25	28	28	Yes
22 Denman Drive	28	31	31	Yes
23 Denman Drive	27	30	30	Yes
24 Denman Drive	28	31	31	Yes
25 Denman Drive	26	29	29	Yes
26 Denman Drive	28	31	31	Yes
27 Denman Drive	26	29	29	Yes
28 Denman Drive	28	31	31	Yes
30 Denman Drive	28	31	31	Yes
32 Denman Drive	28	31	31	Yes
34 Denman Drive	27	30	30	Yes
36 Denman Drive	25	28	28	Yes
38 Denman Drive	25	28	28	Yes
40 Denman Drive	26	29	29	Yes
42 Denman Drive	26	29	29	Yes
3 Murraya Way	15	18	18	Yes
6 Murraya Way	15	18	18	Yes
8 Murraya Way	16	19	19	Yes
9 Murraya Way	17	20	20	Yes
10 Murraya Way	16	19	19	Yes
12 Murraya Way	17	20	20	Yes
14 Murraya Way	18	21	21	Yes
15 Murraya Way	20	23	23	Yes
16 Murraya Way	22	25	25	Yes
17 Murraya Way	24	27	27	Yes
142 Plantation Road	24	27	27	Yes
154A Plantation Road	23	26	26	Yes
154B Plantation Road	23	26	26	Yes
2 The Village Lane	27	30	30	Yes
146 Tweed Coast Road	22	25	25	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	17	20	20	Yes
278B Cudgen Road	18	21	21	Yes
293 Cudgen Road	25	28	28	Yes
297 Cudgen Road	24	27	27	Yes
298A Cudgen Road	21	24	24	Yes
298B Cudgen Road	22	25	25	Yes
301 Cudgen Road	26	29	29	Yes
302 Cudgen Road	22	25	25	Yes
306 Cudgen Road	22	25	25	Yes
307 Cudgen Road	25	28	28	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	23	26	26	Yes
312 Cudgen Road	25	28	28	Yes
317 Cudgen Road	25	28	28	Yes
320 Cudgen Road	26	29	29	Yes
346 Cudgen Road	22	25	25	Yes
351 Cudgen Road	28	31	31	Yes
353 Cudgen Road	28	31	31	Yes
355 Cudgen Road	27	30	30	Yes
372 Cudgen Road	21	24	24	Yes
379 Cudgen Road	26	29	29	Yes
389 Cudgen Road	25	28	28	Yes
394 Cudgen Road	25	28	28	Yes
396 Cudgen Road	22	25	25	Yes
401 Cudgen Road	25	28	28	Yes
413A Cudgen Road	27	30	30	Yes
413B Cudgen Road	23	26	26	Yes
416 Cudgen Road	22	25	25	Yes
422 Cudgen Road	23	26	26	Yes
438 Cudgen Road	23	26	26	Yes
440A Cudgen Road	24	27	27	Yes
440B Cudgen Road	23	26	26	Yes
458A Cudgen Road	23	26	26	Yes
458B Cudgen Road	21	24	24	Yes
459 Cudgen Road	23	26	26	Yes
396 Melaleuca Road	15	18	18	Yes
37 Mccollums Road	18	21	21	Yes
41 Mccollums Road	17	20	20	Yes
54 Mccollums Road	18	21	21	Yes
52 Reardons Road	21	24	24	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	30	33	33	Yes
145 Plantation Road	23	26	26	Yes
155A Plantation Road	24	27	27	Yes
155B Plantation Road	24	27	27	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	21	24	24	Yes
139B Pacific Motorway	24	27	27	Yes
141 Pacific Motorway	23	26	26	Yes
9394 Tweed Valley Way	20	23	23	Yes
School class room	38	38	38	
11A Collier Street	28	31	31	Yes
11B Collier Street	27	30	30	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 6 (year 4-8), assessed against the maximum noise level criteria, are presented in Table 4.7.

Table 4.7 Operational noise levels – L_{max} assessment – Scenario 2 (year 4-8)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	24	18	24	13	20	Yes
3 Clarke Street	26	20	24	11	20	Yes
6 Clarke Street	24	18	24	11	19	Yes
1 Collier Street	33	26	26	15	28	Yes
2 Collier Street	31	26	25	14	27	Yes
4 Collier Street	30	26	25	12	25	Yes
6 Collier Street	29	25	25	12	24	Yes
8 Collier Street	29	25	25	12	24	Yes
10 Collier Street	29	25	25	12	24	Yes
16 Collier Street	27	21	25	12	22	Yes
17 Collier Street	19	8	20	11	9	Yes
18 Collier Street	26	23	25	14	21	Yes
20 Collier Street	24	16	24	12	18	Yes
22 Collier Street	26	17	26	14	19	Yes
24 Collier Street	24	15	23	14	16	Yes
1 Crescent Street	27	20	24	13	22	Yes
3 Crescent Street	21	24	24	11	16	Yes
4 Crescent Street	26	16	24	12	20	Yes
5 Crescent Street	23	24	24	11	18	Yes
7 Crescent Street	26	21	24	11	20	Yes
8 Crescent Street	25	19	24	12	19	Yes
9 Crescent Street	28	21	25	13	23	Yes
10 Crescent Street	23	19	23	12	16	Yes
11 Crescent Street	26	18	24	11	19	Yes
12 Crescent Street	22	13	24	10	14	Yes
13 Crescent Street	27	21	25	11	21	Yes
14 Crescent Street	26	20	24	11	20	Yes
16 Crescent Street	23	12	23	11	15	Yes
17 Crescent Street	20	9	22	9	11	Yes
18 Crescent Street	20	13	22	10	13	Yes
19 Crescent Street	25	14	24	12	18	Yes
20 Crescent Street	19	10	21	10	10	Yes
20A Crescent Street	16	5	17	3	6	Yes
21 Crescent Street	21	17	22	12	12	Yes
22-24 Crescent Street	21	15	23	11	13	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
23 Crescent Street	17	6	17	5	6	Yes
26 Crescent Street	19	9	21	10	10	Yes
28 Crescent Street	21	12	23	11	12	Yes
29 Crescent Street	19	9	21	9	10	Yes
30 Crescent Street	18	9	21	8	11	Yes
32 Crescent Street	20	9	22	10	11	Yes
34 Crescent Street	19	10	22	10	10	Yes
36 Crescent Street	19	10	22	9	11	Yes
38 Crescent Street	18	9	20	6	9	Yes
1-5 Cudgen Road	30	15	24	12	26	Yes
7 Cudgen Road	28	16	24	11	23	Yes
11 Cudgen Road	18	11	24	10	11	Yes
463 Cudgen Road	28	24	29	20	23	Yes
480 Cudgen Road	26	20	25	16	21	Yes
480A Cudgen Road	28	22	26	17	23	Yes
482 Cudgen Road	29	26	29	18	25	Yes
501 Cudgen Road	29	24	29	18	25	Yes
529A Cudgen Road	34	30	35	24	29	Yes
529B Cudgen Road	38	35	36	24	34	Yes
531 Cudgen Road	33	29	32	19	29	Yes
535A Cudgen Road	34	31	31	18	30	Yes
535B Cudgen Road	34	31	33	19	30	Yes
535C Cudgen Road	35	32	39	24	31	Yes
542 Cudgen Road	34	30	28	17	30	Yes
543 Cudgen Road	39	34	38	24	35	Yes
576 Cudgen Road	34	31	29	16	29	Yes
592 Cudgen Road	33	30	29	17	28	Yes
604 Cudgen Road	29	25	25	12	24	Yes
607 Cudgen Road	39	37	33	21	35	Yes
609 Cudgen Road	33	30	29	18	28	Yes
611A Cudgen Road	33	29	27	14	28	Yes
611B Cudgen Road	39	37	33	20	35	Yes
626 Cudgen Road	30	26	26	13	25	Yes
647 Cudgen Road	31	27	26	14	26	Yes
5 Denman Drive	18	8	18	4	8	Yes
7 Denman Drive	19	9	20	8	9	Yes
9 Denman Drive	25	13	23	9	16	Yes
11 Denman Drive	29	17	24	14	24	Yes
13 Denman Drive	30	17	26	10	25	Yes
14 Denman Drive	35	28	30	17	31	Yes
15 Denman Drive	29	25	24	13	27	Yes
16 Denman Drive	35	28	30	17	30	Yes
17 Denman Drive	24	25	25	12	16	Yes
18 Denman Drive	32	27	30	18	27	Yes
19 Denman Drive	25	25	26	13	18	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
20 Denman Drive	32	27	30	18	27	Yes
21 Denman Drive	28	25	25	14	26	Yes
22 Denman Drive	32	27	28	18	27	Yes
23 Denman Drive	31	27	25	13	26	Yes
24 Denman Drive	32	28	29	17	27	Yes
25 Denman Drive	30	25	26	13	25	Yes
26 Denman Drive	32	28	27	14	27	Yes
27 Denman Drive	30	25	26	13	25	Yes
28 Denman Drive	32	28	27	14	27	Yes
30 Denman Drive	32	28	29	14	27	Yes
32 Denman Drive	32	28	27	14	27	Yes
34 Denman Drive	31	25	26	14	26	Yes
36 Denman Drive	28	22	26	13	23	Yes
38 Denman Drive	28	22	26	13	23	Yes
40 Denman Drive	30	24	26	14	25	Yes
42 Denman Drive	29	23	26	14	25	Yes
3 Murraya Way	17	8	18	7	8	Yes
6 Murraya Way	17	8	19	5	8	Yes
8 Murraya Way	19	9	19	6	9	Yes
9 Murraya Way	20	11	20	9	11	Yes
10 Murraya Way	18	9	20	7	9	Yes
12 Murraya Way	19	10	20	8	12	Yes
14 Murraya Way	20	12	22	11	13	Yes
15 Murraya Way	21	18	21	11	18	Yes
16 Murraya Way	24	22	24	12	17	Yes
17 Murraya Way	28	17	25	12	23	Yes
142 Plantation Road	27	21	26	15	22	Yes
154A Plantation Road	26	19	25	14	20	Yes
154B Plantation Road	26	19	26	16	21	Yes
2 The Village Lane	30	27	25	13	26	Yes
146 Tweed Coast Road	25	20	22	11	20	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	18	12	21	13	12	Yes
278B Cudgen Road	18	12	21	11	12	Yes
293 Cudgen Road	25	20	27	21	20	Yes
297 Cudgen Road	24	19	27	21	19	Yes
298A Cudgen Road	23	17	24	16	17	Yes
298B Cudgen Road	22	17	25	17	17	Yes
301 Cudgen Road	26	21	28	22	21	Yes
302 Cudgen Road	22	18	24	17	18	Yes
306 Cudgen Road	21	15	25	18	16	Yes
307 Cudgen Road	26	20	28	21	20	Yes
310 Cudgen Road	24	20	25	18	18	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
312 Cudgen Road	25	21	26	22	20	Yes
317 Cudgen Road	25	20	28	21	20	Yes
320 Cudgen Road	26	21	28	22	21	Yes
346 Cudgen Road	21	16	24	17	16	Yes
351 Cudgen Road	27	23	30	24	23	Yes
353 Cudgen Road	28	24	31	23	24	Yes
355 Cudgen Road	27	23	30	20	22	Yes
372 Cudgen Road	22	16	24	17	16	Yes
379 Cudgen Road	27	18	29	18	22	Yes
389 Cudgen Road	23	18	29	18	18	Yes
394 Cudgen Road	22	17	29	17	17	Yes
396 Cudgen Road	22	17	24	16	17	Yes
401 Cudgen Road	23	18	30	18	18	Yes
413A Cudgen Road	24	19	31	22	19	Yes
413B Cudgen Road	23	18	26	18	18	Yes
416 Cudgen Road	23	18	25	16	18	Yes
422 Cudgen Road	23	19	25	17	18	Yes
438 Cudgen Road	24	19	26	17	19	Yes
440A Cudgen Road	24	20	26	17	19	Yes
440B Cudgen Road	25	20	25	17	20	Yes
458A Cudgen Road	25	21	24	18	20	Yes
458B Cudgen Road	25	20	22	16	20	Yes
459 Cudgen Road	25	21	26	14	20	Yes
396 Melaleuca Road	17	6	19	8	8	Yes
37 Mccollums Road	19	13	21	12	13	Yes
41 Mccollums Road	18	12	20	11	12	Yes
54 Mccollums Road	19	13	21	13	13	Yes
52 Reardons Road	23	18	23	13	17	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	33	23	33	25	28	Yes
145 Plantation Road	28	22	25	13	24	Yes
155A Plantation Road	26	21	26	14	21	Yes
155B Plantation Road	26	21	26	14	21	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	24	9	24	15	18	Yes
139B Pacific Motorway	25	19	26	15	23	Yes
141 Pacific Motorway	25	17	26	15	22	Yes
9394 Tweed Valley Way	21	16	23	16	16	Yes

4.3.3 Scenario 3 (Year 9-13)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 7 (year 9-13), assessed against the project trigger levels, are presented in Table 4.8.

Table 4.8 Operational noise levels – L_{eq} assessment – Scenario 3 (year 9-13)

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	22	25	25	Yes
3 Clarke Street	22	25	25	Yes
6 Clarke Street	21	24	24	Yes
1 Collier Street	24	27	27	Yes
2 Collier Street	23	26	26	Yes
4 Collier Street	23	26	26	Yes
6 Collier Street	22	25	25	Yes
8 Collier Street	22	25	25	Yes
10 Collier Street	22	25	25	Yes
16 Collier Street	23	26	26	Yes
17 Collier Street	22	25	25	Yes
18 Collier Street	23	26	26	Yes
20 Collier Street	23	26	26	Yes
22 Collier Street	23	26	26	Yes
24 Collier Street	23	26	26	Yes
1 Crescent Street	23	26	26	Yes
3 Crescent Street	21	24	24	Yes
4 Crescent Street	23	26	26	Yes
5 Crescent Street	22	25	25	Yes
7 Crescent Street	21	24	24	Yes
8 Crescent Street	22	25	25	Yes
9 Crescent Street	23	26	26	Yes
10 Crescent Street	22	25	25	Yes
11 Crescent Street	22	25	25	Yes
12 Crescent Street	22	25	25	Yes
13 Crescent Street	22	25	25	Yes
14 Crescent Street	22	25	25	Yes
16 Crescent Street	22	25	25	Yes
17 Crescent Street	19	22	22	Yes
18 Crescent Street	22	25	25	Yes
19 Crescent Street	23	26	26	Yes
20 Crescent Street	21	24	24	Yes
20A Crescent Street	20	23	23	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	22	25	25	Yes
22-24 Crescent Street	24	27	27	Yes
23 Crescent Street	18	21	21	Yes
26 Crescent Street	22	25	25	Yes
28 Crescent Street	22	25	25	Yes
29 Crescent Street	20	23	23	Yes
30 Crescent Street	21	24	24	Yes
32 Crescent Street	22	25	25	Yes
34 Crescent Street	22	25	25	Yes
36 Crescent Street	22	25	25	Yes
38 Crescent Street	19	22	22	Yes
1-5 Cudgen Road	22	25	25	Yes
7 Cudgen Road	21	24	24	Yes
11 Cudgen Road	19	22	22	Yes
463 Cudgen Road	28	31	31	Yes
480 Cudgen Road	26	29	29	Yes
480A Cudgen Road	27	30	30	Yes
482 Cudgen Road	27	30	30	Yes
501 Cudgen Road	27	30	30	Yes
529A Cudgen Road	31	34	34	Yes
529B Cudgen Road	31	34	34	Yes
531 Cudgen Road	28	31	31	Yes
535A Cudgen Road	28	31	31	Yes
535B Cudgen Road	29	32	32	Yes
535C Cudgen Road	34	37	37	Yes
542 Cudgen Road	27	30	30	Yes
543 Cudgen Road	34	37	37	Yes
576 Cudgen Road	26	29	29	Yes
592 Cudgen Road	27	30	30	Yes
604 Cudgen Road	22	25	25	Yes
607 Cudgen Road	31	34	34	Yes
609 Cudgen Road	26	29	29	Yes
611A Cudgen Road	24	27	27	Yes
611B Cudgen Road	30	33	33	Yes
626 Cudgen Road	23	26	26	Yes
647 Cudgen Road	24	27	27	Yes
5 Denman Drive	17	20	20	Yes
7 Denman Drive	20	23	23	Yes
9 Denman Drive	23	26	26	Yes
11 Denman Drive	23	26	26	Yes
13 Denman Drive	22	25	25	Yes
14 Denman Drive	28	31	31	Yes
15 Denman Drive	22	25	25	Yes
16 Denman Drive	28	31	31	Yes
17 Denman Drive	23	26	26	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	28	31	31	Yes
19 Denman Drive	23	26	26	Yes
20 Denman Drive	28	31	31	Yes
21 Denman Drive	23	26	26	Yes
22 Denman Drive	28	31	31	Yes
23 Denman Drive	24	27	27	Yes
24 Denman Drive	26	29	29	Yes
25 Denman Drive	23	26	26	Yes
26 Denman Drive	26	29	29	Yes
27 Denman Drive	22	25	25	Yes
28 Denman Drive	25	28	28	Yes
30 Denman Drive	26	29	29	Yes
32 Denman Drive	25	28	28	Yes
34 Denman Drive	25	28	28	Yes
36 Denman Drive	24	27	27	Yes
38 Denman Drive	24	27	27	Yes
40 Denman Drive	23	26	26	Yes
42 Denman Drive	23	26	26	Yes
3 Murraya Way	17	20	20	Yes
6 Murraya Way	18	21	21	Yes
8 Murraya Way	20	23	23	Yes
9 Murraya Way	20	23	23	Yes
10 Murraya Way	20	23	23	Yes
12 Murraya Way	20	23	23	Yes
14 Murraya Way	21	24	24	Yes
15 Murraya Way	22	25	25	Yes
16 Murraya Way	23	26	26	Yes
17 Murraya Way	22	25	25	Yes
142 Plantation Road	25	28	28	Yes
154A Plantation Road	25	28	28	Yes
154B Plantation Road	26	29	29	Yes
2 The Village Lane	22	25	25	Yes
146 Tweed Coast Road	21	24	24	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	26	29	29	Yes
278B Cudgen Road	25	28	28	Yes
293 Cudgen Road	33	36	36	Yes
297 Cudgen Road	32	35	35	Yes
298A Cudgen Road	27	30	30	Yes
298B Cudgen Road	27	30	30	Yes
301 Cudgen Road	34	37	37	Yes
302 Cudgen Road	30	33	33	Yes
306 Cudgen Road	31	34	34	Yes
307 Cudgen Road	33	36	36	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	32	35	35	Yes
312 Cudgen Road	32	35	35	Yes
317 Cudgen Road	32	35	35	Yes
320 Cudgen Road	32	35	35	Yes
346 Cudgen Road	27	30	30	Yes
351 Cudgen Road	34	37	37	Yes
353 Cudgen Road	35	38	38	Yes
355 Cudgen Road	32	35	35	Yes
372 Cudgen Road	26	29	29	Yes
379 Cudgen Road	31	34	34	Yes
389 Cudgen Road	31	34	34	Yes
394 Cudgen Road	30	33	33	Yes
396 Cudgen Road	26	29	29	Yes
401 Cudgen Road	31	34	34	Yes
413A Cudgen Road	31	34	34	Yes
413B Cudgen Road	31	34	34	Yes
416 Cudgen Road	25	28	28	Yes
422 Cudgen Road	26	29	29	Yes
438 Cudgen Road	29	32	32	Yes
440A Cudgen Road	29	32	32	Yes
440B Cudgen Road	29	32	32	Yes
458A Cudgen Road	25	28	28	Yes
458B Cudgen Road	25	28	28	Yes
459 Cudgen Road	23	26	26	Yes
396 Melaleuca Road	21	24	24	Yes
37 Mccollums Road	23	26	26	Yes
41 Mccollums Road	23	26	26	Yes
54 Mccollums Road	23	26	26	Yes
52 Reardons Road	22	25	25	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	33	36	36	Yes
145 Plantation Road	24	27	27	Yes
155A Plantation Road	24	27	27	Yes
155B Plantation Road	24	27	27	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	25	28	28	Yes
139B Pacific Motorway	27	30	30	Yes
141 Pacific Motorway	28	31	31	Yes
9394 Tweed Valley Way	32	35	35	Yes
School class room	38	38	38	
11A Collier Street	23	26	26	Yes
11B Collier Street	23	26	26	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 7 (year 9-13), assessed against the maximum noise level criteria, are presented in Table 4.9.

Table 4.9 Operational noise levels – L_{max} assessment – Scenario 3 (year 9-13)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	21	14	26	12	17	Yes
3 Clarke Street	21	15	24	8	17	Yes
6 Clarke Street	21	14	24	10	17	Yes
1 Collier Street	24	18	27	15	21	Yes
2 Collier Street	22	15	25	13	18	Yes
4 Collier Street	22	15	25	12	18	Yes
6 Collier Street	22	15	25	11	18	Yes
8 Collier Street	22	16	25	11	18	Yes
10 Collier Street	23	17	25	9	20	Yes
16 Collier Street	22	17	25	11	18	Yes
17 Collier Street	22	16	23	7	18	Yes
18 Collier Street	23	18	25	10	20	Yes
20 Collier Street	23	17	25	11	20	Yes
22 Collier Street	22	16	24	12	18	Yes
24 Collier Street	21	15	23	11	17	Yes
1 Crescent Street	21	15	24	11	18	Yes
3 Crescent Street	20	14	24	8	17	Yes
4 Crescent Street	23	17	27	13	20	Yes
5 Crescent Street	20	14	23	9	16	Yes
7 Crescent Street	22	17	25	9	19	Yes
8 Crescent Street	23	17	26	9	20	Yes
9 Crescent Street	22	15	25	10	18	Yes
10 Crescent Street	22	17	25	9	19	Yes
11 Crescent Street	21	15	24	8	17	Yes
12 Crescent Street	21	14	24	8	17	Yes
13 Crescent Street	22	15	25	9	18	Yes
14 Crescent Street	21	15	24	8	17	Yes
16 Crescent Street	21	14	24	8	17	Yes
17 Crescent Street	17	8	19	7	9	Yes
18 Crescent Street	21	14	24	8	17	Yes
19 Crescent Street	22	15	25	9	18	Yes
20 Crescent Street	21	15	24	7	17	Yes
20A Crescent Street	21	15	24	2	17	Yes
21 Crescent Street	21	15	25	8	17	Yes
22-24 Crescent Street	23	17	24	10	20	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
23 Crescent Street	19	12	22	1	14	Yes
26 Crescent Street	21	15	23	8	16	Yes
28 Crescent Street	21	15	23	8	17	Yes
29 Crescent Street	19	10	22	7	12	Yes
30 Crescent Street	21	14	23	7	16	Yes
32 Crescent Street	21	14	23	8	17	Yes
34 Crescent Street	22	15	25	8	17	Yes
36 Crescent Street	22	16	25	8	19	Yes
38 Crescent Street	18	9	18	6	11	Yes
1-5 Cudgen Road	23	17	26	11	20	Yes
7 Cudgen Road	21	14	24	8	17	Yes
11 Cudgen Road	19	10	20	6	13	Yes
463 Cudgen Road	24	19	26	18	20	Yes
480 Cudgen Road	22	17	24	15	18	Yes
480A Cudgen Road	23	19	25	16	20	Yes
482 Cudgen Road	24	19	26	17	20	Yes
501 Cudgen Road	24	18	25	18	19	Yes
529A Cudgen Road	30	26	33	21	27	Yes
529B Cudgen Road	31	26	34	26	28	Yes
531 Cudgen Road	26	21	28	21	22	Yes
535A Cudgen Road	26	20	28	22	22	Yes
535B Cudgen Road	26	21	29	22	23	Yes
535C Cudgen Road	31	27	34	23	28	Yes
542 Cudgen Road	25	20	28	22	22	Yes
543 Cudgen Road	31	27	34	27	28	Yes
576 Cudgen Road	24	19	28	22	21	Yes
592 Cudgen Road	24	18	29	21	21	Yes
604 Cudgen Road	21	15	25	18	17	Yes
607 Cudgen Road	28	22	32	23	26	Yes
609 Cudgen Road	25	19	30	21	22	Yes
611A Cudgen Road	23	17	27	21	19	Yes
611B Cudgen Road	28	22	32	23	26	Yes
626 Cudgen Road	22	16	26	19	18	Yes
647 Cudgen Road	22	17	26	12	20	Yes
5 Denman Drive	22	15	23	3	8	Yes
7 Denman Drive	22	16	23	7	18	Yes
9 Denman Drive	23	16	26	10	19	Yes
11 Denman Drive	23	17	26	9	19	Yes
13 Denman Drive	23	17	26	8	19	Yes
14 Denman Drive	24	17	31	14	24	Yes
15 Denman Drive	23	17	24	9	19	Yes
16 Denman Drive	25	19	31	14	25	Yes
17 Denman Drive	23	17	25	10	19	Yes
18 Denman Drive	24	18	31	14	24	Yes
19 Denman Drive	24	17	26	10	19	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
20 Denman Drive	24	21	30	14	24	Yes
21 Denman Drive	24	17	27	12	20	Yes
22 Denman Drive	25	21	30	15	24	Yes
23 Denman Drive	25	19	27	10	22	Yes
24 Denman Drive	25	21	30	16	24	Yes
25 Denman Drive	24	17	26	10	20	Yes
26 Denman Drive	25	21	29	20	24	Yes
27 Denman Drive	23	16	26	13	19	Yes
28 Denman Drive	25	21	28	20	24	Yes
30 Denman Drive	25	21	27	19	24	Yes
32 Denman Drive	25	21	28	19	24	Yes
34 Denman Drive	24	18	27	17	20	Yes
36 Denman Drive	24	18	27	16	20	Yes
38 Denman Drive	23	17	26	15	20	Yes
40 Denman Drive	23	16	26	14	19	Yes
42 Denman Drive	22	16	24	14	19	Yes
3 Murraya Way	21	13	19	3	15	Yes
6 Murraya Way	23	16	24	3	19	Yes
8 Murraya Way	23	16	26	6	19	Yes
9 Murraya Way	20	13	25	7	15	Yes
10 Murraya Way	22	15	26	6	18	Yes
12 Murraya Way	22	16	25	6	18	Yes
14 Murraya Way	23	16	25	7	19	Yes
15 Murraya Way	22	16	25	9	18	Yes
16 Murraya Way	23	16	26	10	19	Yes
17 Murraya Way	22	16	23	9	18	Yes
142 Plantation Road	22	16	24	15	18	Yes
154A Plantation Road	22	16	24	14	17	Yes
154B Plantation Road	23	18	25	14	20	Yes
2 The Village Lane	21	16	24	10	18	Yes
146 Tweed Coast Road	21	15	24	7	16	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	19	13	21	14	14	Yes
278B Cudgen Road	19	12	21	13	14	Yes
293 Cudgen Road	25	20	27	21	22	Yes
297 Cudgen Road	24	19	27	20	20	Yes
298A Cudgen Road	21	15	25	15	16	Yes
298B Cudgen Road	21	14	24	15	16	Yes
301 Cudgen Road	26	21	28	22	22	Yes
302 Cudgen Road	23	17	26	18	18	Yes
306 Cudgen Road	24	19	28	19	21	Yes
307 Cudgen Road	25	19	29	21	21	Yes
310 Cudgen Road	25	19	27	20	21	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
312 Cudgen Road	25	20	27	20	21	Yes
317 Cudgen Road	25	20	28	20	21	Yes
320 Cudgen Road	25	20	28	20	22	Yes
346 Cudgen Road	21	15	24	15	17	Yes
351 Cudgen Road	27	22	29	22	23	Yes
353 Cudgen Road	28	23	31	23	25	Yes
355 Cudgen Road	26	21	29	20	22	Yes
372 Cudgen Road	21	15	23	14	16	Yes
379 Cudgen Road	25	20	28	18	21	Yes
389 Cudgen Road	25	20	28	18	21	Yes
394 Cudgen Road	25	19	28	18	21	Yes
396 Cudgen Road	22	15	23	13	17	Yes
401 Cudgen Road	25	20	28	19	22	Yes
413A Cudgen Road	25	21	29	19	22	Yes
413B Cudgen Road	25	20	28	18	21	Yes
416 Cudgen Road	21	15	23	13	16	Yes
422 Cudgen Road	21	16	24	13	17	Yes
438 Cudgen Road	22	15	28	17	17	Yes
440A Cudgen Road	21	15	24	17	17	Yes
440B Cudgen Road	21	15	27	17	16	Yes
458A Cudgen Road	21	16	23	14	17	Yes
458B Cudgen Road	21	15	22	13	16	Yes
459 Cudgen Road	22	16	24	13	17	Yes
396 Melaleuca Road	17	10	20	8	12	Yes
37 Mccollums Road	18	12	21	10	13	Yes
41 Mccollums Road	18	11	20	11	12	Yes
54 Mccollums Road	18	12	21	11	13	Yes
52 Reardons Road	19	12	21	10	14	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	37	32	34	24	35	Yes
145 Plantation Road	21	16	23	17	17	Yes
155A Plantation Road	21	15	23	14	16	Yes
155B Plantation Road	21	15	23	14	16	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	26	22	26	13	20	Yes
139B Pacific Motorway	31	24	26	13	27	Yes
141 Pacific Motorway	28	25	25	13	26	Yes
9394 Tweed Valley Way	25	20	27	20	22	Yes

4.3.4 Scenario 4 (Year 14-18)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 8 (year 14-18), assessed against the project trigger levels, are presented in Table 4.10.

Table 4.10 Operational noise levels – L_{eq} assessment – Scenario 4 (year 14-18)

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	18	21	21	Yes
3 Clarke Street	19	22	22	Yes
6 Clarke Street	18	21	21	Yes
1 Collier Street	20	23	23	Yes
2 Collier Street	20	23	23	Yes
4 Collier Street	20	23	23	Yes
6 Collier Street	19	22	22	Yes
8 Collier Street	19	22	22	Yes
10 Collier Street	19	22	22	Yes
16 Collier Street	20	23	23	Yes
17 Collier Street	19	22	22	Yes
18 Collier Street	20	23	23	Yes
20 Collier Street	19	22	22	Yes
22 Collier Street	19	22	22	Yes
24 Collier Street	18	21	21	Yes
1 Crescent Street	19	22	22	Yes
3 Crescent Street	18	21	21	Yes
4 Crescent Street	19	22	22	Yes
5 Crescent Street	18	21	21	Yes
7 Crescent Street	18	21	21	Yes
8 Crescent Street	19	22	22	Yes
9 Crescent Street	19	22	22	Yes
10 Crescent Street	18	21	21	Yes
11 Crescent Street	18	21	21	Yes
12 Crescent Street	18	21	21	Yes
13 Crescent Street	19	22	22	Yes
14 Crescent Street	19	22	22	Yes
16 Crescent Street	19	22	22	Yes
17 Crescent Street	14	17	17	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	19	22	22	Yes
20 Crescent Street	18	21	21	Yes
20A Crescent Street	17	20	20	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	19	22	22	Yes
22-24 Crescent Street	20	23	23	Yes
23 Crescent Street	15	18	18	Yes
26 Crescent Street	18	21	21	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	16	19	19	Yes
30 Crescent Street	18	21	21	Yes
32 Crescent Street	18	21	21	Yes
34 Crescent Street	19	22	22	Yes
36 Crescent Street	19	22	22	Yes
38 Crescent Street	14	17	17	Yes
1-5 Cudgen Road	19	22	22	Yes
7 Cudgen Road	18	21	21	Yes
11 Cudgen Road	15	18	18	Yes
463 Cudgen Road	22	25	25	Yes
480 Cudgen Road	21	24	24	Yes
480A Cudgen Road	22	25	25	Yes
482 Cudgen Road	23	26	26	Yes
501 Cudgen Road	22	25	25	Yes
529A Cudgen Road	29	32	32	Yes
529B Cudgen Road	28	31	31	Yes
531 Cudgen Road	24	27	27	Yes
535A Cudgen Road	24	27	27	Yes
535B Cudgen Road	25	28	28	Yes
535C Cudgen Road	30	33	33	Yes
542 Cudgen Road	23	26	26	Yes
543 Cudgen Road	30	33	33	Yes
576 Cudgen Road	22	25	25	Yes
592 Cudgen Road	24	27	27	Yes
604 Cudgen Road	19	22	22	Yes
607 Cudgen Road	27	30	30	Yes
609 Cudgen Road	23	26	26	Yes
611A Cudgen Road	21	24	24	Yes
611B Cudgen Road	26	29	29	Yes
626 Cudgen Road	20	23	23	Yes
647 Cudgen Road	20	23	23	Yes
5 Denman Drive	16	19	19	Yes
7 Denman Drive	17	20	20	Yes
9 Denman Drive	19	22	22	Yes
11 Denman Drive	19	22	22	Yes
13 Denman Drive	19	22	22	Yes
14 Denman Drive	24	27	27	Yes
15 Denman Drive	19	22	22	Yes
16 Denman Drive	24	27	27	Yes
17 Denman Drive	20	23	23	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	24	27	27	Yes
19 Denman Drive	20	23	23	Yes
20 Denman Drive	24	27	27	Yes
21 Denman Drive	20	23	23	Yes
22 Denman Drive	24	27	27	Yes
23 Denman Drive	22	25	25	Yes
24 Denman Drive	23	26	26	Yes
25 Denman Drive	19	22	22	Yes
26 Denman Drive	23	26	26	Yes
27 Denman Drive	18	21	21	Yes
28 Denman Drive	23	26	26	Yes
30 Denman Drive	23	26	26	Yes
32 Denman Drive	22	25	25	Yes
34 Denman Drive	21	24	24	Yes
36 Denman Drive	21	24	24	Yes
38 Denman Drive	20	23	23	Yes
40 Denman Drive	19	22	22	Yes
42 Denman Drive	19	22	22	Yes
3 Murraya Way	15	18	18	Yes
6 Murraya Way	18	21	21	Yes
8 Murraya Way	18	21	21	Yes
9 Murraya Way	17	20	20	Yes
10 Murraya Way	17	20	20	Yes
12 Murraya Way	18	21	21	Yes
14 Murraya Way	18	21	21	Yes
15 Murraya Way	17	20	20	Yes
16 Murraya Way	18	21	21	Yes
17 Murraya Way	18	21	21	Yes
142 Plantation Road	21	24	24	Yes
154A Plantation Road	20	23	23	Yes
154B Plantation Road	22	25	25	Yes
2 The Village Lane	17	20	20	Yes
146 Tweed Coast Road	18	21	21	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	18	21	21	Yes
278B Cudgen Road	18	21	21	Yes
293 Cudgen Road	24	27	27	Yes
297 Cudgen Road	24	27	27	Yes
298A Cudgen Road	21	24	24	Yes
298B Cudgen Road	20	23	23	Yes
301 Cudgen Road	25	28	28	Yes
302 Cudgen Road	22	25	25	Yes
306 Cudgen Road	24	27	27	Yes
307 Cudgen Road	25	28	28	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	24	27	27	Yes
312 Cudgen Road	24	27	27	Yes
317 Cudgen Road	25	28	28	Yes
320 Cudgen Road	25	28	28	Yes
346 Cudgen Road	20	23	23	Yes
351 Cudgen Road	26	29	29	Yes
353 Cudgen Road	28	31	31	Yes
355 Cudgen Road	26	29	29	Yes
372 Cudgen Road	20	23	23	Yes
379 Cudgen Road	25	28	28	Yes
389 Cudgen Road	25	28	28	Yes
394 Cudgen Road	24	27	27	Yes
396 Cudgen Road	20	23	23	Yes
401 Cudgen Road	25	28	28	Yes
413A Cudgen Road	25	28	28	Yes
413B Cudgen Road	25	28	28	Yes
416 Cudgen Road	20	23	23	Yes
422 Cudgen Road	21	24	24	Yes
438 Cudgen Road	23	26	26	Yes
440A Cudgen Road	21	24	24	Yes
440B Cudgen Road	23	26	26	Yes
458A Cudgen Road	20	23	23	Yes
458B Cudgen Road	19	22	22	Yes
459 Cudgen Road	20	23	23	Yes
396 Melaleuca Road	16	19	19	Yes
37 Mccollums Road	17	20	20	Yes
41 Mccollums Road	16	19	19	Yes
54 Mccollums Road	17	20	20	Yes
52 Reardons Road	17	20	20	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	31	34	34	Yes
145 Plantation Road	20	23	23	Yes
155A Plantation Road	19	22	22	Yes
155B Plantation Road	19	22	22	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	19	22	22	Yes
139B Pacific Motorway	24	27	27	Yes
141 Pacific Motorway	25	28	28	Yes
9394 Tweed Valley Way	25	28	28	Yes
School class room	38	38	38	
11A Collier Street	19	22	22	Yes
11B Collier Street	20	23	23	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 8 (year 14-18), assessed against the maximum noise level criteria, are presented in Table 4.11.

Table 4.11 Operational noise levels – L_{max} assessment – Scenario 4 (year 14-18)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	21	14	22	8	17	Yes
3 Clarke Street	21	15	21	6	17	Yes
6 Clarke Street	21	14	21	6	17	Yes
1 Collier Street	24	18	23	8	21	Yes
2 Collier Street	22	15	22	8	18	Yes
4 Collier Street	22	15	22	7	18	Yes
6 Collier Street	22	15	21	6	18	Yes
8 Collier Street	22	16	21	6	18	Yes
10 Collier Street	23	17	21	6	20	Yes
16 Collier Street	22	17	22	7	18	Yes
17 Collier Street	22	16	21	7	18	Yes
18 Collier Street	23	18	22	8	20	Yes
20 Collier Street	23	17	21	7	20	Yes
22 Collier Street	22	16	23	8	18	Yes
24 Collier Street	21	15	22	8	17	Yes
1 Crescent Street	21	15	22	8	18	Yes
3 Crescent Street	20	14	21	6	17	Yes
4 Crescent Street	23	17	22	7	20	Yes
5 Crescent Street	20	14	21	6	16	Yes
7 Crescent Street	22	17	21	7	19	Yes
8 Crescent Street	23	17	22	6	20	Yes
9 Crescent Street	22	15	22	8	18	Yes
10 Crescent Street	22	17	21	7	19	Yes
11 Crescent Street	21	15	21	6	17	Yes
12 Crescent Street	21	14	21	6	17	Yes
13 Crescent Street	22	15	22	7	18	Yes
14 Crescent Street	21	15	21	6	17	Yes
16 Crescent Street	21	14	21	6	17	Yes
17 Crescent Street	17	8	20	4	9	Yes
18 Crescent Street	21	14	21	6	17	Yes
19 Crescent Street	22	15	22	7	18	Yes
20 Crescent Street	21	15	21	6	17	Yes
20A Crescent Street	21	15	17	6	17	Yes
21 Crescent Street	21	15	21	6	17	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
22-24 Crescent Street	23	17	21	8	20	Yes
23 Crescent Street	19	12	17	3	14	Yes
26 Crescent Street	21	15	21	6	16	Yes
28 Crescent Street	21	15	21	6	17	Yes
29 Crescent Street	19	10	20	6	12	Yes
30 Crescent Street	21	14	20	6	16	Yes
32 Crescent Street	21	14	21	6	17	Yes
34 Crescent Street	22	15	21	6	17	Yes
36 Crescent Street	22	16	20	8	19	Yes
38 Crescent Street	18	9	18	5	11	Yes
1-5 Cudgen Road	23	17	22	7	20	Yes
7 Cudgen Road	21	14	21	7	17	Yes
11 Cudgen Road	19	10	19	5	13	Yes
463 Cudgen Road	24	19	26	13	20	Yes
480 Cudgen Road	22	17	24	11	18	Yes
480A Cudgen Road	23	19	25	11	20	Yes
482 Cudgen Road	24	19	25	11	20	Yes
501 Cudgen Road	24	18	25	11	19	Yes
529A Cudgen Road	30	26	32	13	27	Yes
529B Cudgen Road	31	26	29	14	28	Yes
531 Cudgen Road	26	21	28	12	22	Yes
535A Cudgen Road	26	20	27	12	22	Yes
535B Cudgen Road	26	21	27	12	23	Yes
535C Cudgen Road	31	27	33	18	28	Yes
542 Cudgen Road	25	20	26	11	22	Yes
543 Cudgen Road	31	27	32	17	28	Yes
576 Cudgen Road	24	19	25	10	21	Yes
592 Cudgen Road	24	18	29	14	21	Yes
604 Cudgen Road	21	15	22	7	17	Yes
607 Cudgen Road	28	22	30	15	26	Yes
609 Cudgen Road	25	19	26	12	22	Yes
611A Cudgen Road	23	17	23	8	19	Yes
611B Cudgen Road	28	22	29	14	26	Yes
626 Cudgen Road	22	16	22	8	18	Yes
647 Cudgen Road	22	17	22	8	20	Yes
5 Denman Drive	22	15	18	5	8	Yes
7 Denman Drive	22	16	21	6	18	Yes
9 Denman Drive	23	16	21	8	19	Yes
11 Denman Drive	23	17	24	7	19	Yes
13 Denman Drive	23	17	21	8	19	Yes
14 Denman Drive	24	17	25	12	24	Yes
15 Denman Drive	23	17	23	7	19	Yes
16 Denman Drive	25	19	26	12	25	Yes
17 Denman Drive	23	17	23	8	19	Yes
18 Denman Drive	24	18	26	12	24	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
19 Denman Drive	24	17	22	9	19	Yes
20 Denman Drive	24	21	26	12	24	Yes
21 Denman Drive	24	17	23	9	20	Yes
22 Denman Drive	25	21	26	12	24	Yes
23 Denman Drive	25	19	23	8	22	Yes
24 Denman Drive	25	21	24	11	24	Yes
25 Denman Drive	24	17	23	7	20	Yes
26 Denman Drive	25	21	23	11	24	Yes
27 Denman Drive	23	16	22	7	19	Yes
28 Denman Drive	25	21	24	10	24	Yes
30 Denman Drive	25	21	24	8	24	Yes
32 Denman Drive	25	21	24	8	24	Yes
34 Denman Drive	24	18	23	9	20	Yes
36 Denman Drive	24	18	23	8	20	Yes
38 Denman Drive	23	17	23	8	20	Yes
40 Denman Drive	23	16	23	8	19	Yes
42 Denman Drive	22	16	23	9	19	Yes
3 Murraya Way	21	13	19	5	15	Yes
6 Murraya Way	23	16	18	6	19	Yes
8 Murraya Way	23	16	19	5	19	Yes
9 Murraya Way	20	13	20	6	15	Yes
10 Murraya Way	22	15	19	9	18	Yes
12 Murraya Way	22	16	20	7	18	Yes
14 Murraya Way	23	16	21	7	19	Yes
15 Murraya Way	22	16	21	7	18	Yes
16 Murraya Way	23	16	22	8	19	Yes
17 Murraya Way	22	16	22	7	18	Yes
142 Plantation Road	22	16	24	9	18	Yes
154A Plantation Road	22	16	23	9	17	Yes
154B Plantation Road	23	18	24	11	20	Yes
2 The Village Lane	21	16	22	8	18	Yes
146 Tweed Coast Road	21	15	21	5	16	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	19	13	22	14	14	Yes
278B Cudgen Road	19	12	22	9	14	Yes
293 Cudgen Road	25	20	28	19	22	Yes
297 Cudgen Road	24	19	28	17	20	Yes
298A Cudgen Road	21	15	25	15	16	Yes
298B Cudgen Road	21	14	24	13	16	Yes
301 Cudgen Road	26	21	29	17	22	Yes
302 Cudgen Road	23	17	26	14	18	Yes
306 Cudgen Road	24	19	28	14	21	Yes
307 Cudgen Road	25	19	29	16	21	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
310 Cudgen Road	25	19	27	17	21	Yes
312 Cudgen Road	25	20	27	17	21	Yes
317 Cudgen Road	25	20	28	16	21	Yes
320 Cudgen Road	25	20	29	17	22	Yes
346 Cudgen Road	21	15	24	13	17	Yes
351 Cudgen Road	27	22	30	19	23	Yes
353 Cudgen Road	28	23	31	20	25	Yes
355 Cudgen Road	26	21	29	18	22	Yes
372 Cudgen Road	21	15	23	13	16	Yes
379 Cudgen Road	25	20	28	16	21	Yes
389 Cudgen Road	25	20	28	16	21	Yes
394 Cudgen Road	25	19	28	15	21	Yes
396 Cudgen Road	22	15	23	12	17	Yes
401 Cudgen Road	25	20	29	16	22	Yes
413A Cudgen Road	25	21	29	17	22	Yes
413B Cudgen Road	25	20	28	15	21	Yes
416 Cudgen Road	21	15	23	12	16	Yes
422 Cudgen Road	21	16	25	12	17	Yes
438 Cudgen Road	22	15	28	12	17	Yes
440A Cudgen Road	21	15	24	15	17	Yes
440B Cudgen Road	21	15	28	14	16	Yes
458A Cudgen Road	21	16	23	15	17	Yes
458B Cudgen Road	21	15	22	14	16	Yes
459 Cudgen Road	22	16	24	11	17	Yes
396 Melaleuca Road	17	10	20	7	12	Yes
37 Mccollums Road	18	12	21	8	13	Yes
41 Mccollums Road	18	11	20	8	12	Yes
54 Mccollums Road	18	12	21	10	13	Yes
52 Reardons Road	19	12	21	8	14	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	37	32	29	16	35	Yes
145 Plantation Road	21	16	23	9	17	Yes
155A Plantation Road	21	15	23	9	16	Yes
155B Plantation Road	21	15	23	9	16	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	26	22	22	12	20	Yes
139B Pacific Motorway	31	24	25	12	27	Yes
141 Pacific Motorway	28	25	24	14	26	Yes
9394 Tweed Valley Way	25	20	26	27	22	Yes

4.3.5 Scenario 5 (Year 19-22)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 9 (year 19-22), assessed against the project trigger levels, are presented in Table 4.12.

Table 4.12 Operational noise levels – L_{eq} assessment – Scenario 5 (year 19-22)

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	17	20	20	Yes
3 Clarke Street	19	22	22	Yes
6 Clarke Street	18	21	21	Yes
1 Collier Street	20	23	23	Yes
2 Collier Street	20	23	23	Yes
4 Collier Street	20	23	23	Yes
6 Collier Street	19	22	22	Yes
8 Collier Street	19	22	22	Yes
10 Collier Street	19	22	22	Yes
16 Collier Street	20	23	23	Yes
17 Collier Street	19	22	22	Yes
18 Collier Street	20	23	23	Yes
20 Collier Street	18	21	21	Yes
22 Collier Street	19	22	22	Yes
24 Collier Street	19	22	22	Yes
1 Crescent Street	19	22	22	Yes
3 Crescent Street	18	21	21	Yes
4 Crescent Street	19	22	22	Yes
5 Crescent Street	18	21	21	Yes
7 Crescent Street	18	21	21	Yes
8 Crescent Street	19	22	22	Yes
9 Crescent Street	19	22	22	Yes
10 Crescent Street	18	21	21	Yes
11 Crescent Street	19	22	22	Yes
12 Crescent Street	18	21	21	Yes
13 Crescent Street	19	22	22	Yes
14 Crescent Street	19	22	22	Yes
16 Crescent Street	18	21	21	Yes
17 Crescent Street	15	18	18	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	19	22	22	Yes
20 Crescent Street	18	21	21	Yes
20A Crescent Street	17	20	20	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	18	21	21	Yes
22-24 Crescent Street	20	23	23	Yes
23 Crescent Street	15	18	18	Yes
26 Crescent Street	18	21	21	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	15	18	18	Yes
30 Crescent Street	18	21	21	Yes
32 Crescent Street	18	21	21	Yes
34 Crescent Street	18	21	21	Yes
36 Crescent Street	19	22	22	Yes
38 Crescent Street	14	17	17	Yes
1-5 Cudgen Road	19	22	22	Yes
7 Cudgen Road	18	21	21	Yes
11 Cudgen Road	15	18	18	Yes
463 Cudgen Road	24	27	27	Yes
480 Cudgen Road	22	25	25	Yes
480A Cudgen Road	23	26	26	Yes
482 Cudgen Road	23	26	26	Yes
501 Cudgen Road	24	27	27	Yes
529A Cudgen Road	28	31	31	Yes
529B Cudgen Road	29	32	32	Yes
531 Cudgen Road	25	28	28	Yes
535A Cudgen Road	24	27	27	Yes
535B Cudgen Road	25	28	28	Yes
535C Cudgen Road	31	34	34	Yes
542 Cudgen Road	23	26	26	Yes
543 Cudgen Road	30	33	33	Yes
576 Cudgen Road	23	26	26	Yes
592 Cudgen Road	22	25	25	Yes
604 Cudgen Road	19	22	22	Yes
607 Cudgen Road	27	30	30	Yes
609 Cudgen Road	23	26	26	Yes
611A Cudgen Road	21	24	24	Yes
611B Cudgen Road	26	29	29	Yes
626 Cudgen Road	20	23	23	Yes
647 Cudgen Road	20	23	23	Yes
5 Denman Drive	16	19	19	Yes
7 Denman Drive	17	20	20	Yes
9 Denman Drive	19	22	22	Yes
11 Denman Drive	18	21	21	Yes
13 Denman Drive	19	22	22	Yes
14 Denman Drive	24	27	27	Yes
15 Denman Drive	20	23	23	Yes
16 Denman Drive	24	27	27	Yes
17 Denman Drive	20	23	23	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	24	27	27	Yes
19 Denman Drive	20	23	23	Yes
20 Denman Drive	24	27	27	Yes
21 Denman Drive	20	23	23	Yes
22 Denman Drive	23	26	26	Yes
23 Denman Drive	22	25	25	Yes
24 Denman Drive	23	26	26	Yes
25 Denman Drive	20	23	23	Yes
26 Denman Drive	23	26	26	Yes
27 Denman Drive	18	21	21	Yes
28 Denman Drive	23	26	26	Yes
30 Denman Drive	23	26	26	Yes
32 Denman Drive	22	25	25	Yes
34 Denman Drive	21	24	24	Yes
36 Denman Drive	21	24	24	Yes
38 Denman Drive	20	23	23	Yes
40 Denman Drive	19	22	22	Yes
42 Denman Drive	19	22	22	Yes
3 Murraya Way	15	18	18	Yes
6 Murraya Way	18	21	21	Yes
8 Murraya Way	18	21	21	Yes
9 Murraya Way	17	20	20	Yes
10 Murraya Way	17	20	20	Yes
12 Murraya Way	18	21	21	Yes
14 Murraya Way	18	21	21	Yes
15 Murraya Way	17	20	20	Yes
16 Murraya Way	18	21	21	Yes
17 Murraya Way	18	21	21	Yes
142 Plantation Road	21	24	24	Yes
154A Plantation Road	21	24	24	Yes
154B Plantation Road	22	25	25	Yes
2 The Village Lane	18	21	21	Yes
146 Tweed Coast Road	18	21	21	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	20	23	23	Yes
278B Cudgen Road	19	22	22	Yes
293 Cudgen Road	26	29	29	Yes
297 Cudgen Road	26	29	29	Yes
298A Cudgen Road	22	25	25	Yes
298B Cudgen Road	22	25	25	Yes
301 Cudgen Road	27	30	30	Yes
302 Cudgen Road	24	27	27	Yes
306 Cudgen Road	26	29	29	Yes
307 Cudgen Road	27	30	30	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	26	29	29	Yes
312 Cudgen Road	27	30	30	Yes
317 Cudgen Road	27	30	30	Yes
320 Cudgen Road	28	31	31	Yes
346 Cudgen Road	23	26	26	Yes
351 Cudgen Road	31	34	34	Yes
353 Cudgen Road	35	38	38	Yes
355 Cudgen Road	32	35	35	Yes
372 Cudgen Road	23	26	26	Yes
379 Cudgen Road	29	32	32	Yes
389 Cudgen Road	30	33	33	Yes
394 Cudgen Road	27	30	30	Yes
396 Cudgen Road	23	26	26	Yes
401 Cudgen Road	30	33	33	Yes
413A Cudgen Road	28	31	31	Yes
413B Cudgen Road	29	32	32	Yes
416 Cudgen Road	22	25	25	Yes
422 Cudgen Road	22	25	25	Yes
438 Cudgen Road	25	28	28	Yes
440A Cudgen Road	25	28	28	Yes
440B Cudgen Road	25	28	28	Yes
458A Cudgen Road	23	26	26	Yes
458B Cudgen Road	22	25	25	Yes
459 Cudgen Road	21	24	24	Yes
396 Melaleuca Road	17	20	20	Yes
37 Mccollums Road	18	21	21	Yes
41 Mccollums Road	18	21	21	Yes
54 Mccollums Road	19	22	22	Yes
52 Reardons Road	19	22	22	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	31	34	34	Yes
145 Plantation Road	20	23	23	Yes
155A Plantation Road	20	23	23	Yes
155B Plantation Road	20	23	23	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	20	23	23	Yes
139B Pacific Motorway	25	28	28	Yes
141 Pacific Motorway	24	27	27	Yes
9394 Tweed Valley Way	25	28	28	Yes
School class room	38	38	38	
11A Collier Street	19	22	22	Yes
11B Collier Street	20	23	23	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 9 (year 19-22), assessed against the maximum noise level criteria, are presented in Table 4.13.

Table 4.13 Operational noise levels – L_{max} assessment – Scenario 5 (year 14-18)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	21	14	22	11	17	Yes
3 Clarke Street	21	15	21	9	17	Yes
6 Clarke Street	21	14	21	9	17	Yes
1 Collier Street	24	18	23	10	21	Yes
2 Collier Street	22	15	22	10	18	Yes
4 Collier Street	22	15	22	11	18	Yes
6 Collier Street	22	15	21	9	18	Yes
8 Collier Street	22	16	22	9	18	Yes
10 Collier Street	23	17	22	9	20	Yes
16 Collier Street	22	17	22	10	18	Yes
17 Collier Street	22	16	19	2	18	Yes
18 Collier Street	23	18	22	11	20	Yes
20 Collier Street	23	17	22	9	20	Yes
22 Collier Street	22	16	22	9	18	Yes
24 Collier Street	21	15	22	10	17	Yes
1 Crescent Street	21	15	22	9	18	Yes
3 Crescent Street	20	14	21	10	17	Yes
4 Crescent Street	23	17	22	9	20	Yes
5 Crescent Street	20	14	21	10	16	Yes
7 Crescent Street	22	17	22	9	19	Yes
8 Crescent Street	23	17	22	9	20	Yes
9 Crescent Street	22	15	22	9	18	Yes
10 Crescent Street	22	17	22	10	19	Yes
11 Crescent Street	21	15	21	9	17	Yes
12 Crescent Street	21	14	21	9	17	Yes
13 Crescent Street	22	15	22	9	18	Yes
14 Crescent Street	21	15	21	9	17	Yes
16 Crescent Street	21	14	21	9	17	Yes
17 Crescent Street	17	8	20	8	9	Yes
18 Crescent Street	21	14	21	9	17	Yes
19 Crescent Street	22	15	21	9	18	Yes
20 Crescent Street	21	15	20	4	17	Yes
20A Crescent Street	21	15	15	0	17	Yes
21 Crescent Street	21	15	22	8	17	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
22-24 Crescent Street	23	17	22	10	20	Yes
23 Crescent Street	19	12	17	4	14	Yes
26 Crescent Street	21	15	20	5	16	Yes
28 Crescent Street	21	15	21	7	17	Yes
29 Crescent Street	19	10	19	5	12	Yes
30 Crescent Street	21	14	20	7	16	Yes
32 Crescent Street	21	14	19	5	17	Yes
34 Crescent Street	22	15	20	7	17	Yes
36 Crescent Street	22	16	20	6	19	Yes
38 Crescent Street	18	9	19	3	11	Yes
1-5 Cudgen Road	23	17	22	9	20	Yes
7 Cudgen Road	21	14	22	10	17	Yes
11 Cudgen Road	19	10	21	10	13	Yes
463 Cudgen Road	24	19	28	21	20	Yes
480 Cudgen Road	22	17	26	17	18	Yes
480A Cudgen Road	23	19	26	19	20	Yes
482 Cudgen Road	24	19	27	18	20	Yes
501 Cudgen Road	24	18	27	20	19	Yes
529A Cudgen Road	30	26	30	19	27	Yes
529B Cudgen Road	31	26	30	20	28	Yes
531 Cudgen Road	26	21	30	18	22	Yes
535A Cudgen Road	26	20	28	15	22	Yes
535B Cudgen Road	26	21	28	18	23	Yes
535C Cudgen Road	31	27	34	23	28	Yes
542 Cudgen Road	25	20	26	16	22	Yes
543 Cudgen Road	31	27	34	22	28	Yes
576 Cudgen Road	24	19	26	14	21	Yes
592 Cudgen Road	24	18	26	13	21	Yes
604 Cudgen Road	21	15	22	10	17	Yes
607 Cudgen Road	28	22	30	14	26	Yes
609 Cudgen Road	25	19	26	13	22	Yes
611A Cudgen Road	23	17	24	12	19	Yes
611B Cudgen Road	28	22	29	17	26	Yes
626 Cudgen Road	22	16	23	10	18	Yes
647 Cudgen Road	22	17	22	10	20	Yes
5 Denman Drive	22	15	17	0	8	Yes
7 Denman Drive	22	16	17	0	18	Yes
9 Denman Drive	23	16	22	9	19	Yes
11 Denman Drive	23	17	22	8	19	Yes
13 Denman Drive	23	17	22	8	19	Yes
14 Denman Drive	24	17	27	11	24	Yes
15 Denman Drive	23	17	23	9	19	Yes
16 Denman Drive	25	19	26	11	25	Yes
17 Denman Drive	23	17	22	11	19	Yes
18 Denman Drive	24	18	26	11	24	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
19 Denman Drive	24	17	22	12	19	Yes
20 Denman Drive	24	21	26	11	24	Yes
21 Denman Drive	24	17	23	11	20	Yes
22 Denman Drive	25	21	24	11	24	Yes
23 Denman Drive	25	19	23	10	22	Yes
24 Denman Drive	25	21	24	11	24	Yes
25 Denman Drive	24	17	22	10	20	Yes
26 Denman Drive	25	21	24	11	24	Yes
27 Denman Drive	23	16	23	10	19	Yes
28 Denman Drive	25	21	23	11	24	Yes
30 Denman Drive	25	21	23	12	24	Yes
32 Denman Drive	25	21	23	11	24	Yes
34 Denman Drive	24	18	23	12	20	Yes
36 Denman Drive	24	18	23	10	20	Yes
38 Denman Drive	23	17	23	10	20	Yes
40 Denman Drive	23	16	22	10	19	Yes
42 Denman Drive	22	16	23	10	19	Yes
3 Murraya Way	21	13	18	2	15	Yes
6 Murraya Way	23	16	17	1	19	Yes
8 Murraya Way	23	16	17	4	19	Yes
9 Murraya Way	20	13	20	5	15	Yes
10 Murraya Way	22	15	17	3	18	Yes
12 Murraya Way	22	16	18	4	18	Yes
14 Murraya Way	23	16	19	8	19	Yes
15 Murraya Way	22	16	21	9	18	Yes
16 Murraya Way	23	16	20	8	19	Yes
17 Murraya Way	22	16	22	10	18	Yes
142 Plantation Road	22	16	25	16	18	Yes
154A Plantation Road	22	16	24	15	17	Yes
154B Plantation Road	23	18	25	17	20	Yes
2 The Village Lane	21	16	22	9	18	Yes
146 Tweed Coast Road	21	15	19	11	16	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	19	13	24	14	14	Yes
278B Cudgen Road	19	12	23	11	14	Yes
293 Cudgen Road	25	20	30	23	22	Yes
297 Cudgen Road	24	19	30	23	20	Yes
298A Cudgen Road	21	15	26	20	16	Yes
298B Cudgen Road	21	14	26	19	16	Yes
301 Cudgen Road	26	21	31	25	22	Yes
302 Cudgen Road	23	17	28	20	18	Yes
306 Cudgen Road	24	19	30	20	21	Yes
307 Cudgen Road	25	19	31	23	21	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
310 Cudgen Road	25	19	30	22	21	Yes
312 Cudgen Road	25	20	30	25	22	Yes
317 Cudgen Road	25	20	31	24	21	Yes
320 Cudgen Road	26	20	32	29	22	Yes
346 Cudgen Road	22	16	27	23	17	Yes
351 Cudgen Road	27	23	33	34	24	Yes
353 Cudgen Road	28	24	36	39	25	Yes
355 Cudgen Road	27	22	33	37	23	Yes
372 Cudgen Road	21	16	26	24	17	Yes
379 Cudgen Road	26	21	31	33	22	Yes
389 Cudgen Road	26	21	31	33	22	Yes
394 Cudgen Road	25	20	31	27	22	Yes
396 Cudgen Road	22	15	26	25	17	Yes
401 Cudgen Road	25	20	32	33	22	Yes
413A Cudgen Road	25	21	31	30	22	Yes
413B Cudgen Road	25	20	31	32	21	Yes
416 Cudgen Road	21	15	26	19	16	Yes
422 Cudgen Road	21	16	26	18	17	Yes
438 Cudgen Road	22	15	30	21	17	Yes
440A Cudgen Road	21	15	30	23	17	Yes
440B Cudgen Road	21	15	30	22	16	Yes
458A Cudgen Road	21	16	26	26	17	Yes
458B Cudgen Road	21	15	25	24	16	Yes
459 Cudgen Road	22	16	24	22	17	Yes
396 Melaleuca Road	17	10	21	10	12	Yes
37 Mccollums Road	19	12	22	13	13	Yes
41 Mccollums Road	18	11	22	13	12	Yes
54 Mccollums Road	18	12	23	14	14	Yes
52 Reardons Road	19	12	22	17	14	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	37	32	31	18	35	Yes
145 Plantation Road	21	16	24	14	17	Yes
155A Plantation Road	21	15	24	14	16	Yes
155B Plantation Road	21	15	24	17	16	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	26	22	25	12	20	Yes
139B Pacific Motorway	31	24	27	13	27	Yes
141 Pacific Motorway	28	25	22	11	26	Yes
9394 Tweed Valley Way	25	20	29	16	22	Yes

4.3.6 Scenario 6 (Year 23-26)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 10 (year 23-26), assessed against the project trigger levels, are presented in Table 4.14.

Table 4.14 Operational noise levels – L_{eq} assessment – Scenario 6 (year 23-26)

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	19	22	22	Yes
3 Clarke Street	19	22	22	Yes
6 Clarke Street	18	21	21	Yes
1 Collier Street	22	25	25	Yes
2 Collier Street	19	22	22	Yes
4 Collier Street	19	22	22	Yes
6 Collier Street	19	22	22	Yes
8 Collier Street	19	22	22	Yes
10 Collier Street	20	23	23	Yes
16 Collier Street	20	23	23	Yes
17 Collier Street	20	23	23	Yes
18 Collier Street	21	24	24	Yes
20 Collier Street	20	23	23	Yes
22 Collier Street	19	22	22	Yes
24 Collier Street	19	22	22	Yes
1 Crescent Street	19	22	22	Yes
3 Crescent Street	18	21	21	Yes
4 Crescent Street	20	23	23	Yes
5 Crescent Street	18	21	21	Yes
7 Crescent Street	20	23	23	Yes
8 Crescent Street	21	24	24	Yes
9 Crescent Street	19	22	22	Yes
10 Crescent Street	20	23	23	Yes
11 Crescent Street	18	21	21	Yes
12 Crescent Street	18	21	21	Yes
13 Crescent Street	19	22	22	Yes
14 Crescent Street	19	22	22	Yes
16 Crescent Street	19	22	22	Yes
17 Crescent Street	16	19	19	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	19	22	22	Yes
20 Crescent Street	19	22	22	Yes
20A Crescent Street	19	22	22	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	19	22	22	Yes
22-24 Crescent Street	21	24	24	Yes
23 Crescent Street	17	20	20	Yes
26 Crescent Street	19	22	22	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	17	20	20	Yes
30 Crescent Street	18	21	21	Yes
32 Crescent Street	19	22	22	Yes
34 Crescent Street	19	22	22	Yes
36 Crescent Street	20	23	23	Yes
38 Crescent Street	17	20	20	Yes
1-5 Cudgen Road	20	23	23	Yes
7 Cudgen Road	19	22	22	Yes
11 Cudgen Road	17	20	20	Yes
463 Cudgen Road	21	24	24	Yes
480 Cudgen Road	19	22	22	Yes
480A Cudgen Road	20	23	23	Yes
482 Cudgen Road	21	24	24	Yes
501 Cudgen Road	21	24	24	Yes
529A Cudgen Road	27	30	30	Yes
529B Cudgen Road	28	31	31	Yes
531 Cudgen Road	23	26	26	Yes
535A Cudgen Road	22	25	25	Yes
535B Cudgen Road	23	26	26	Yes
535C Cudgen Road	28	31	31	Yes
542 Cudgen Road	23	26	26	Yes
543 Cudgen Road	28	31	31	Yes
576 Cudgen Road	21	24	24	Yes
592 Cudgen Road	21	24	24	Yes
604 Cudgen Road	19	22	22	Yes
607 Cudgen Road	26	29	29	Yes
609 Cudgen Road	23	26	26	Yes
611A Cudgen Road	20	23	23	Yes
611B Cudgen Road	26	29	29	Yes
626 Cudgen Road	19	22	22	Yes
647 Cudgen Road	20	23	23	Yes
5 Denman Drive	19	22	22	Yes
7 Denman Drive	20	23	23	Yes
9 Denman Drive	21	24	24	Yes
11 Denman Drive	20	23	23	Yes
13 Denman Drive	21	24	24	Yes
14 Denman Drive	24	27	27	Yes
15 Denman Drive	21	24	24	Yes
16 Denman Drive	24	27	27	Yes
17 Denman Drive	21	24	24	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	24	27	27	Yes
19 Denman Drive	22	25	25	Yes
20 Denman Drive	24	27	27	Yes
21 Denman Drive	22	25	25	Yes
22 Denman Drive	24	27	27	Yes
23 Denman Drive	23	26	26	Yes
24 Denman Drive	24	27	27	Yes
25 Denman Drive	22	25	25	Yes
26 Denman Drive	24	27	27	Yes
27 Denman Drive	21	24	24	Yes
28 Denman Drive	24	27	27	Yes
30 Denman Drive	24	27	27	Yes
32 Denman Drive	23	26	26	Yes
34 Denman Drive	22	25	25	Yes
36 Denman Drive	21	24	24	Yes
38 Denman Drive	21	24	24	Yes
40 Denman Drive	21	24	24	Yes
42 Denman Drive	20	23	23	Yes
3 Murraya Way	18	21	21	Yes
6 Murraya Way	20	23	23	Yes
8 Murraya Way	20	23	23	Yes
9 Murraya Way	18	21	21	Yes
10 Murraya Way	19	22	22	Yes
12 Murraya Way	20	23	23	Yes
14 Murraya Way	20	23	23	Yes
15 Murraya Way	20	23	23	Yes
16 Murraya Way	20	23	23	Yes
17 Murraya Way	20	23	23	Yes
142 Plantation Road	19	22	22	Yes
154A Plantation Road	19	22	22	Yes
154B Plantation Road	20	23	23	Yes
2 The Village Lane	19	22	22	Yes
146 Tweed Coast Road	19	22	22	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	17	20	20	Yes
278B Cudgen Road	16	19	19	Yes
293 Cudgen Road	23	26	26	Yes
297 Cudgen Road	22	25	25	Yes
298A Cudgen Road	18	21	21	Yes
298B Cudgen Road	19	22	22	Yes
301 Cudgen Road	23	26	26	Yes
302 Cudgen Road	20	23	23	Yes
306 Cudgen Road	22	25	25	Yes
307 Cudgen Road	23	26	26	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	22	25	25	Yes
312 Cudgen Road	23	26	26	Yes
317 Cudgen Road	23	26	26	Yes
320 Cudgen Road	23	26	26	Yes
346 Cudgen Road	19	22	22	Yes
351 Cudgen Road	24	27	27	Yes
353 Cudgen Road	26	29	29	Yes
355 Cudgen Road	24	27	27	Yes
372 Cudgen Road	18	21	21	Yes
379 Cudgen Road	23	26	26	Yes
389 Cudgen Road	23	26	26	Yes
394 Cudgen Road	23	26	26	Yes
396 Cudgen Road	19	22	22	Yes
401 Cudgen Road	23	26	26	Yes
413A Cudgen Road	23	26	26	Yes
413B Cudgen Road	22	25	25	Yes
416 Cudgen Road	19	22	22	Yes
422 Cudgen Road	18	21	21	Yes
438 Cudgen Road	20	23	23	Yes
440A Cudgen Road	19	22	22	Yes
440B Cudgen Road	18	21	21	Yes
458A Cudgen Road	19	22	22	Yes
458B Cudgen Road	18	21	21	Yes
459 Cudgen Road	19	22	22	Yes
396 Melaleuca Road	15	18	18	Yes
37 Mccollums Road	16	19	19	Yes
41 Mccollums Road	15	18	18	Yes
54 Mccollums Road	16	19	19	Yes
52 Reardons Road	16	19	19	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	0	0	0	Yes
145 Plantation Road	19	22	22	Yes
155A Plantation Road	18	21	21	Yes
155B Plantation Road	18	21	21	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	31	34	34	Yes
139B Pacific Motorway	34	37	37	Yes
141 Pacific Motorway	32	35	35	Yes
9394 Tweed Valley Way	24	27	27	Yes
School class room	38	38	38	
11A Collier Street	20	23	23	Yes
11B Collier Street	20	23	23	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 10 (year 23-26), assessed against the maximum noise level criteria, are presented in Table 4.15.

Table 4.15 Operational noise levels – L_{max} assessment – Scenario 6 (year 23-26)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	21	14	21	10	17	Yes
3 Clarke Street	21	15	21	10	17	Yes
6 Clarke Street	21	14	21	9	17	Yes
1 Collier Street	24	18	23	13	21	Yes
2 Collier Street	22	15	21	10	18	Yes
4 Collier Street	22	15	21	10	18	Yes
6 Collier Street	22	15	21	10	18	Yes
8 Collier Street	22	16	21	10	18	Yes
10 Collier Street	23	17	22	11	20	Yes
16 Collier Street	22	17	22	12	18	Yes
17 Collier Street	22	16	22	11	18	Yes
18 Collier Street	23	18	22	12	20	Yes
20 Collier Street	23	17	22	12	20	Yes
22 Collier Street	22	16	22	10	18	Yes
24 Collier Street	21	15	21	10	17	Yes
1 Crescent Street	21	15	21	10	18	Yes
3 Crescent Street	20	14	21	11	17	Yes
4 Crescent Street	23	17	21	10	20	Yes
5 Crescent Street	20	14	21	9	16	Yes
7 Crescent Street	22	17	21	11	19	Yes
8 Crescent Street	23	17	22	11	20	Yes
9 Crescent Street	22	15	21	10	18	Yes
10 Crescent Street	22	17	22	11	19	Yes
11 Crescent Street	21	15	21	9	17	Yes
12 Crescent Street	21	14	20	9	17	Yes
13 Crescent Street	22	15	22	11	18	Yes
14 Crescent Street	21	15	21	9	17	Yes
16 Crescent Street	21	14	21	9	17	Yes
17 Crescent Street	17	8	21	9	9	Yes
18 Crescent Street	21	14	21	9	17	Yes
19 Crescent Street	22	15	22	11	18	Yes
20 Crescent Street	21	15	21	9	17	Yes
20A Crescent Street	21	15	21	10	17	Yes
21 Crescent Street	21	15	21	11	17	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
22-24 Crescent Street	23	17	22	12	20	Yes
23 Crescent Street	19	12	20	9	14	Yes
26 Crescent Street	21	15	21	10	16	Yes
28 Crescent Street	21	15	21	10	17	Yes
29 Crescent Street	19	10	21	9	12	Yes
30 Crescent Street	21	14	21	10	16	Yes
32 Crescent Street	21	14	21	10	17	Yes
34 Crescent Street	22	15	21	11	17	Yes
36 Crescent Street	22	16	21	11	19	Yes
38 Crescent Street	18	9	21	11	11	Yes
1-5 Cudgen Road	23	17	21	10	20	Yes
7 Cudgen Road	21	14	21	10	17	Yes
11 Cudgen Road	19	10	21	9	13	Yes
463 Cudgen Road	24	19	22	12	20	Yes
480 Cudgen Road	22	17	21	10	18	Yes
480A Cudgen Road	23	19	22	12	20	Yes
482 Cudgen Road	24	19	22	12	20	Yes
501 Cudgen Road	24	18	22	11	19	Yes
529A Cudgen Road	30	26	27	18	27	Yes
529B Cudgen Road	31	26	28	19	28	Yes
531 Cudgen Road	26	21	23	14	22	Yes
535A Cudgen Road	26	20	23	13	22	Yes
535B Cudgen Road	26	21	24	14	23	Yes
535C Cudgen Road	31	27	27	19	28	Yes
542 Cudgen Road	25	20	23	13	22	Yes
543 Cudgen Road	31	27	27	19	28	Yes
576 Cudgen Road	24	19	22	12	21	Yes
592 Cudgen Road	24	18	22	12	21	Yes
604 Cudgen Road	21	15	21	9	17	Yes
607 Cudgen Road	28	22	27	17	26	Yes
609 Cudgen Road	25	19	26	14	22	Yes
611A Cudgen Road	23	17	22	11	19	Yes
611B Cudgen Road	28	22	27	16	26	Yes
626 Cudgen Road	22	16	21	10	18	Yes
647 Cudgen Road	22	17	22	11	20	Yes
5 Denman Drive	22	15	22	11	8	Yes
7 Denman Drive	22	16	22	11	18	Yes
9 Denman Drive	23	16	24	13	19	Yes
11 Denman Drive	23	17	23	12	19	Yes
13 Denman Drive	23	17	23	12	19	Yes
14 Denman Drive	24	17	27	16	24	Yes
15 Denman Drive	23	17	23	11	19	Yes
16 Denman Drive	25	19	27	16	25	Yes
17 Denman Drive	23	17	23	13	19	Yes
18 Denman Drive	24	18	27	16	24	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
19 Denman Drive	24	17	25	12	19	Yes
20 Denman Drive	24	21	27	16	24	Yes
21 Denman Drive	24	17	25	13	20	Yes
22 Denman Drive	25	21	26	16	24	Yes
23 Denman Drive	25	19	25	14	22	Yes
24 Denman Drive	25	21	26	16	24	Yes
25 Denman Drive	24	17	25	12	20	Yes
26 Denman Drive	25	21	26	16	24	Yes
27 Denman Drive	23	16	23	11	19	Yes
28 Denman Drive	25	21	26	16	24	Yes
30 Denman Drive	25	21	25	15	24	Yes
32 Denman Drive	25	21	25	15	24	Yes
34 Denman Drive	24	18	24	14	20	Yes
36 Denman Drive	24	18	24	12	20	Yes
38 Denman Drive	23	17	24	12	20	Yes
40 Denman Drive	23	16	24	11	19	Yes
42 Denman Drive	22	16	22	11	19	Yes
3 Murraya Way	21	13	22	10	15	Yes
6 Murraya Way	23	16	22	10	19	Yes
8 Murraya Way	23	16	22	10	19	Yes
9 Murraya Way	20	13	21	10	15	Yes
10 Murraya Way	22	15	21	9	18	Yes
12 Murraya Way	22	16	21	11	18	Yes
14 Murraya Way	23	16	22	11	19	Yes
15 Murraya Way	22	16	21	10	18	Yes
16 Murraya Way	23	16	23	11	19	Yes
17 Murraya Way	22	16	22	12	18	Yes
142 Plantation Road	22	16	21	10	18	Yes
154A Plantation Road	22	16	20	9	17	Yes
154B Plantation Road	23	18	21	12	20	Yes
2 The Village Lane	21	16	21	9	18	Yes
146 Tweed Coast Road	21	15	23	12	16	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	19	13	19	7	14	Yes
278B Cudgen Road	19	12	19	7	14	Yes
293 Cudgen Road	25	20	24	14	22	Yes
297 Cudgen Road	24	19	24	13	20	Yes
298A Cudgen Road	21	15	19	9	16	Yes
298B Cudgen Road	21	14	21	9	16	Yes
301 Cudgen Road	26	21	25	15	22	Yes
302 Cudgen Road	23	17	22	11	18	Yes
306 Cudgen Road	24	19	24	13	21	Yes
307 Cudgen Road	25	19	25	14	21	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
310 Cudgen Road	25	19	23	15	21	Yes
312 Cudgen Road	25	20	24	13	22	Yes
317 Cudgen Road	25	20	24	13	21	Yes
320 Cudgen Road	26	20	25	13	22	Yes
346 Cudgen Road	22	16	20	9	17	Yes
351 Cudgen Road	27	23	25	13	24	Yes
353 Cudgen Road	28	24	25	13	25	Yes
355 Cudgen Road	27	22	24	12	23	Yes
372 Cudgen Road	21	16	20	9	17	Yes
379 Cudgen Road	26	21	24	11	22	Yes
389 Cudgen Road	26	21	24	11	22	Yes
394 Cudgen Road	25	20	23	11	22	Yes
396 Cudgen Road	22	15	22	9	17	Yes
401 Cudgen Road	25	20	24	11	22	Yes
413A Cudgen Road	25	21	24	11	22	Yes
413B Cudgen Road	25	20	23	11	21	Yes
416 Cudgen Road	21	15	21	8	16	Yes
422 Cudgen Road	21	16	20	9	17	Yes
438 Cudgen Road	22	15	23	10	17	Yes
440A Cudgen Road	21	15	20	9	17	Yes
440B Cudgen Road	21	15	20	9	16	Yes
458A Cudgen Road	21	16	20	9	17	Yes
458B Cudgen Road	21	15	20	9	16	Yes
459 Cudgen Road	22	16	20	9	17	Yes
396 Melaleuca Road	17	10	17	5	12	Yes
37 Mccollums Road	19	12	18	6	13	Yes
41 Mccollums Road	18	11	17	5	12	Yes
54 Mccollums Road	18	12	18	6	14	Yes
52 Reardons Road	19	12	18	6	14	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	0	0	0	0	0	Yes
145 Plantation Road	21	16	20	9	17	Yes
155A Plantation Road	21	15	20	8	16	Yes
155B Plantation Road	21	15	20	8	16	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	29	22	36	30	24	Yes
139B Pacific Motorway	29	25	38	31	27	Yes
141 Pacific Motorway	29	25	37	29	27	Yes
9394 Tweed Valley Way	25	20	26	17	22	Yes

4.3.7 Scenario 7 (Year 27-30)

L_{eq} noise level assessment

The noise levels associated with the HTSP during Phase 11 (year 27-30), assessed against the project trigger levels, are presented in Table 4.16.

Table 4.16 Operational noise levels – L_{eq} assessment – Scenario 7 (year 27-30)

Receiver name	Calculated noise levels $L_{eq,adj,15min}$, dB(A)			Complies with project trigger levels?
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project trigger levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	42	42	38	
2 Clarke Street	18	21	21	Yes
3 Clarke Street	18	21	21	Yes
6 Clarke Street	18	21	21	Yes
1 Collier Street	21	24	24	Yes
2 Collier Street	19	22	22	Yes
4 Collier Street	19	22	22	Yes
6 Collier Street	19	22	22	Yes
8 Collier Street	19	22	22	Yes
10 Collier Street	20	23	23	Yes
16 Collier Street	19	22	22	Yes
17 Collier Street	19	22	22	Yes
18 Collier Street	20	23	23	Yes
20 Collier Street	20	23	23	Yes
22 Collier Street	19	22	22	Yes
24 Collier Street	19	22	22	Yes
1 Crescent Street	19	22	22	Yes
3 Crescent Street	18	21	21	Yes
4 Crescent Street	20	23	23	Yes
5 Crescent Street	17	20	20	Yes
7 Crescent Street	19	22	22	Yes
8 Crescent Street	20	23	23	Yes
9 Crescent Street	19	22	22	Yes
10 Crescent Street	19	22	22	Yes
11 Crescent Street	18	21	21	Yes
12 Crescent Street	18	21	21	Yes
13 Crescent Street	19	22	22	Yes
14 Crescent Street	18	21	21	Yes
16 Crescent Street	18	21	21	Yes
17 Crescent Street	16	19	19	Yes
18 Crescent Street	18	21	21	Yes
19 Crescent Street	19	22	22	Yes
20 Crescent Street	18	21	21	Yes
20A Crescent Street	18	21	21	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
21 Crescent Street	19	22	22	Yes
22-24 Crescent Street	20	23	23	Yes
23 Crescent Street	17	20	20	Yes
26 Crescent Street	18	21	21	Yes
28 Crescent Street	19	22	22	Yes
29 Crescent Street	16	19	19	Yes
30 Crescent Street	18	21	21	Yes
32 Crescent Street	18	21	21	Yes
34 Crescent Street	19	22	22	Yes
36 Crescent Street	20	23	23	Yes
38 Crescent Street	16	19	19	Yes
1-5 Cudgen Road	20	23	23	Yes
7 Cudgen Road	18	21	21	Yes
11 Cudgen Road	16	19	19	Yes
463 Cudgen Road	21	24	24	Yes
480 Cudgen Road	19	22	22	Yes
480A Cudgen Road	20	23	23	Yes
482 Cudgen Road	21	24	24	Yes
501 Cudgen Road	20	23	23	Yes
529A Cudgen Road	28	31	31	Yes
529B Cudgen Road	28	31	31	Yes
531 Cudgen Road	23	26	26	Yes
535A Cudgen Road	22	25	25	Yes
535B Cudgen Road	23	26	26	Yes
535C Cudgen Road	28	31	31	Yes
542 Cudgen Road	22	25	25	Yes
543 Cudgen Road	28	31	31	Yes
576 Cudgen Road	21	24	24	Yes
592 Cudgen Road	21	24	24	Yes
604 Cudgen Road	18	21	21	Yes
607 Cudgen Road	25	28	28	Yes
609 Cudgen Road	23	26	26	Yes
611A Cudgen Road	20	23	23	Yes
611B Cudgen Road	25	28	28	Yes
626 Cudgen Road	19	22	22	Yes
647 Cudgen Road	20	23	23	Yes
5 Denman Drive	18	21	21	Yes
7 Denman Drive	19	22	22	Yes
9 Denman Drive	21	24	24	Yes
11 Denman Drive	20	23	23	Yes
13 Denman Drive	20	23	23	Yes
14 Denman Drive	24	27	27	Yes
15 Denman Drive	20	23	23	Yes
16 Denman Drive	24	27	27	Yes
17 Denman Drive	20	23	23	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
18 Denman Drive	24	27	27	Yes
19 Denman Drive	21	24	24	Yes
20 Denman Drive	24	27	27	Yes
21 Denman Drive	22	25	25	Yes
22 Denman Drive	24	27	27	Yes
23 Denman Drive	22	25	25	Yes
24 Denman Drive	24	27	27	Yes
25 Denman Drive	21	24	24	Yes
26 Denman Drive	24	27	27	Yes
27 Denman Drive	21	24	24	Yes
28 Denman Drive	23	26	26	Yes
30 Denman Drive	23	26	26	Yes
32 Denman Drive	23	26	26	Yes
34 Denman Drive	21	24	24	Yes
36 Denman Drive	21	24	24	Yes
38 Denman Drive	21	24	24	Yes
40 Denman Drive	20	23	23	Yes
42 Denman Drive	20	23	23	Yes
3 Murraya Way	18	21	21	Yes
6 Murraya Way	20	23	23	Yes
8 Murraya Way	20	23	23	Yes
9 Murraya Way	18	21	21	Yes
10 Murraya Way	19	22	22	Yes
12 Murraya Way	19	22	22	Yes
14 Murraya Way	20	23	23	Yes
15 Murraya Way	19	22	22	Yes
16 Murraya Way	20	23	23	Yes
17 Murraya Way	19	22	22	Yes
142 Plantation Road	19	22	22	Yes
154A Plantation Road	19	22	22	Yes
154B Plantation Road	20	23	23	Yes
2 The Village Lane	18	21	21	Yes
146 Tweed Coast Road	20	23	23	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	41	41	38	
278A Cudgen Road	17	20	20	Yes
278B Cudgen Road	16	19	19	Yes
293 Cudgen Road	22	25	25	Yes
297 Cudgen Road	22	25	25	Yes
298A Cudgen Road	18	21	21	Yes
298B Cudgen Road	19	22	22	Yes
301 Cudgen Road	24	27	27	Yes
302 Cudgen Road	20	23	23	Yes
306 Cudgen Road	22	25	25	Yes
307 Cudgen Road	23	26	26	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
310 Cudgen Road	22	25	25	Yes
312 Cudgen Road	23	26	26	Yes
317 Cudgen Road	23	26	26	Yes
320 Cudgen Road	23	26	26	Yes
346 Cudgen Road	19	22	22	Yes
351 Cudgen Road	24	27	27	Yes
353 Cudgen Road	26	29	29	Yes
355 Cudgen Road	24	27	27	Yes
372 Cudgen Road	18	21	21	Yes
379 Cudgen Road	23	26	26	Yes
389 Cudgen Road	23	26	26	Yes
394 Cudgen Road	23	26	26	Yes
396 Cudgen Road	19	22	22	Yes
401 Cudgen Road	23	26	26	Yes
413A Cudgen Road	23	26	26	Yes
413B Cudgen Road	22	25	25	Yes
416 Cudgen Road	18	21	21	Yes
422 Cudgen Road	18	21	21	Yes
438 Cudgen Road	20	23	23	Yes
440A Cudgen Road	19	22	22	Yes
440B Cudgen Road	20	23	23	Yes
458A Cudgen Road	18	21	21	Yes
458B Cudgen Road	18	21	21	Yes
459 Cudgen Road	19	22	22	Yes
396 Melaleuca Road	15	18	18	Yes
37 Mccollums Road	16	19	19	Yes
41 Mccollums Road	15	18	18	Yes
54 Mccollums Road	16	19	19	Yes
52 Reardons Road	16	19	19	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	42	42	38	
271 Pacific Motorway	0	0	0	Yes
145 Plantation Road	18	21	21	Yes
155A Plantation Road	18	21	21	Yes
155B Plantation Road	18	21	21	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	46	46	38	
139A Pacific Motorway	31	34	34	Yes
139B Pacific Motorway	33	36	36	Yes
141 Pacific Motorway	32	35	35	Yes
9394 Tweed Valley Way	25	28	28	Yes
School class room	38	38	38	
11A Collier Street	19	22	22	Yes
11B Collier Street	20	23	23	Yes

Maximum noise level assessment (night-time only)

The maximum noise levels associated with distinct night-time noise events at the HTSP during Phase 11 (year 27-30), assessed against the maximum noise level criteria, are presented in Table 4.17.

Table 4.17 Operational noise levels – L_{max} assessment – Scenario 7 (year 27-30)

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
NSW EPA Noise Policy for Industry – Maximum noise level criteria Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
2 Clarke Street	21	14	20	8	17	Yes
3 Clarke Street	21	15	20	7	17	Yes
6 Clarke Street	21	14	20	7	17	Yes
1 Collier Street	24	18	22	11	21	Yes
2 Collier Street	22	15	20	8	18	Yes
4 Collier Street	22	15	21	8	18	Yes
6 Collier Street	22	15	20	8	18	Yes
8 Collier Street	22	16	20	7	18	Yes
10 Collier Street	23	17	21	9	20	Yes
16 Collier Street	22	17	21	9	18	Yes
17 Collier Street	22	16	21	8	18	Yes
18 Collier Street	23	18	21	9	20	Yes
20 Collier Street	23	17	21	9	20	Yes
22 Collier Street	22	16	21	8	18	Yes
24 Collier Street	21	15	20	8	17	Yes
1 Crescent Street	21	15	20	8	18	Yes
3 Crescent Street	20	14	20	8	17	Yes
4 Crescent Street	23	17	20	8	20	Yes
5 Crescent Street	20	14	20	7	16	Yes
7 Crescent Street	22	17	20	8	19	Yes
8 Crescent Street	23	17	21	9	20	Yes
9 Crescent Street	22	15	20	8	18	Yes
10 Crescent Street	22	17	21	9	19	Yes
11 Crescent Street	21	15	20	7	17	Yes
12 Crescent Street	21	14	20	7	17	Yes
13 Crescent Street	22	15	21	9	18	Yes
14 Crescent Street	21	15	20	7	17	Yes
16 Crescent Street	21	14	20	7	17	Yes
17 Crescent Street	17	8	20	7	9	Yes
18 Crescent Street	21	14	20	7	17	Yes
19 Crescent Street	22	15	21	9	18	Yes
20 Crescent Street	21	15	20	7	17	Yes
20A Crescent Street	21	15	20	8	17	Yes
21 Crescent Street	21	15	20	8	17	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
22-24 Crescent Street	23	17	21	10	20	Yes
23 Crescent Street	19	12	20	7	14	Yes
26 Crescent Street	21	15	20	7	16	Yes
28 Crescent Street	21	15	20	8	17	Yes
29 Crescent Street	19	10	20	7	12	Yes
30 Crescent Street	21	14	20	7	16	Yes
32 Crescent Street	21	14	20	7	17	Yes
34 Crescent Street	22	15	20	8	17	Yes
36 Crescent Street	22	16	21	10	19	Yes
38 Crescent Street	18	9	20	8	11	Yes
1-5 Cudgen Road	23	17	20	7	20	Yes
7 Cudgen Road	21	14	20	7	17	Yes
11 Cudgen Road	19	10	19	6	13	Yes
463 Cudgen Road	24	19	21	10	20	Yes
480 Cudgen Road	22	17	20	8	18	Yes
480A Cudgen Road	23	19	21	9	20	Yes
482 Cudgen Road	24	19	21	9	20	Yes
501 Cudgen Road	24	18	21	9	19	Yes
529A Cudgen Road	30	26	27	15	27	Yes
529B Cudgen Road	31	26	28	16	28	Yes
531 Cudgen Road	26	21	23	12	22	Yes
535A Cudgen Road	26	20	22	11	22	Yes
535B Cudgen Road	26	21	23	11	23	Yes
535C Cudgen Road	31	27	28	16	28	Yes
542 Cudgen Road	25	20	22	10	22	Yes
543 Cudgen Road	31	27	28	16	28	Yes
576 Cudgen Road	24	19	22	10	21	Yes
592 Cudgen Road	24	18	22	9	21	Yes
604 Cudgen Road	21	15	20	7	17	Yes
607 Cudgen Road	28	22	26	14	26	Yes
609 Cudgen Road	25	19	24	12	22	Yes
611A Cudgen Road	23	17	21	9	19	Yes
611B Cudgen Road	28	22	26	14	26	Yes
626 Cudgen Road	22	16	20	8	18	Yes
647 Cudgen Road	22	17	20	9	20	Yes
5 Denman Drive	22	15	21	8	8	Yes
7 Denman Drive	22	16	21	9	18	Yes
9 Denman Drive	23	16	23	11	19	Yes
11 Denman Drive	23	17	22	9	19	Yes
13 Denman Drive	23	17	22	9	19	Yes
14 Denman Drive	24	17	26	13	24	Yes
15 Denman Drive	23	17	22	9	19	Yes
16 Denman Drive	25	19	26	13	25	Yes
17 Denman Drive	23	17	23	10	19	Yes
18 Denman Drive	24	18	26	13	24	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
19 Denman Drive	24	17	24	11	19	Yes
20 Denman Drive	24	21	26	13	24	Yes
21 Denman Drive	24	17	24	10	20	Yes
22 Denman Drive	25	21	25	13	24	Yes
23 Denman Drive	25	19	24	11	22	Yes
24 Denman Drive	25	21	25	13	24	Yes
25 Denman Drive	24	17	23	10	20	Yes
26 Denman Drive	25	21	25	13	24	Yes
27 Denman Drive	23	16	24	9	19	Yes
28 Denman Drive	25	21	25	13	24	Yes
30 Denman Drive	25	21	24	13	24	Yes
32 Denman Drive	25	21	24	13	24	Yes
34 Denman Drive	24	18	23	11	20	Yes
36 Denman Drive	24	18	22	10	20	Yes
38 Denman Drive	23	17	23	9	20	Yes
40 Denman Drive	23	16	23	9	19	Yes
42 Denman Drive	22	16	21	9	19	Yes
3 Murraya Way	21	13	20	8	15	Yes
6 Murraya Way	23	16	21	8	19	Yes
8 Murraya Way	23	16	21	8	19	Yes
9 Murraya Way	20	13	20	8	15	Yes
10 Murraya Way	22	15	21	8	18	Yes
12 Murraya Way	22	16	21	8	18	Yes
14 Murraya Way	23	16	21	9	19	Yes
15 Murraya Way	22	16	21	8	18	Yes
16 Murraya Way	23	16	22	9	19	Yes
17 Murraya Way	22	16	21	9	18	Yes
142 Plantation Road	22	16	20	8	18	Yes
154A Plantation Road	22	16	20	7	17	Yes
154B Plantation Road	23	18	21	10	20	Yes
2 The Village Lane	21	16	20	7	18	Yes
146 Tweed Coast Road	21	15	23	9	16	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	52	52	52	52	52	
278A Cudgen Road	19	13	19	8	14	Yes
278B Cudgen Road	19	12	19	8	14	Yes
293 Cudgen Road	25	20	24	14	22	Yes
297 Cudgen Road	24	19	24	13	20	Yes
298A Cudgen Road	21	15	20	9	16	Yes
298B Cudgen Road	21	14	22	9	16	Yes
301 Cudgen Road	26	21	25	15	22	Yes
302 Cudgen Road	23	17	23	13	18	Yes
306 Cudgen Road	24	19	24	11	21	Yes
307 Cudgen Road	25	19	25	14	21	Yes

Receiver name	Calculated noise levels					Complies with criteria?
	L_{AFmax}, dB(A)					
	Loader	Pump	Dredge	Booster	Wash plant	
310 Cudgen Road	25	19	24	14	21	Yes
312 Cudgen Road	25	20	25	13	22	Yes
317 Cudgen Road	25	20	24	13	21	Yes
320 Cudgen Road	26	20	25	13	22	Yes
346 Cudgen Road	22	16	20	9	17	Yes
351 Cudgen Road	27	23	25	11	24	Yes
353 Cudgen Road	28	24	25	13	25	Yes
355 Cudgen Road	27	22	24	11	23	Yes
372 Cudgen Road	21	16	20	8	17	Yes
379 Cudgen Road	26	21	23	11	22	Yes
389 Cudgen Road	26	21	24	11	22	Yes
394 Cudgen Road	25	20	23	10	22	Yes
396 Cudgen Road	22	15	22	8	17	Yes
401 Cudgen Road	25	20	24	11	22	Yes
413A Cudgen Road	25	21	23	11	22	Yes
413B Cudgen Road	25	20	23	10	21	Yes
416 Cudgen Road	21	15	19	8	16	Yes
422 Cudgen Road	21	16	19	8	17	Yes
438 Cudgen Road	22	15	23	10	17	Yes
440A Cudgen Road	21	15	20	8	17	Yes
440B Cudgen Road	21	15	23	9	16	Yes
458A Cudgen Road	21	16	19	7	17	Yes
458B Cudgen Road	21	15	19	7	16	Yes
459 Cudgen Road	22	16	20	8	17	Yes
396 Melaleuca Road	17	10	17	4	12	Yes
37 Mccollums Road	19	12	18	6	13	Yes
41 Mccollums Road	18	11	17	5	12	Yes
54 Mccollums Road	18	12	18	6	14	Yes
52 Reardons Road	19	12	18	5	14	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	52	52	52	52	52	
271 Pacific Motorway	0	0	0	0	0	Yes
145 Plantation Road	21	16	19	7	17	Yes
155A Plantation Road	21	15	19	7	16	Yes
155B Plantation Road	21	15	19	7	16	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	54	54	54	54	54	
139A Pacific Motorway	29	22	36	29	24	Yes
139B Pacific Motorway	29	25	38	29	27	Yes
141 Pacific Motorway	29	25	37	27	27	Yes
9394 Tweed Valley Way	25	20	28	21	22	Yes

4.3.8 Scenario 8 (Proposed Haulage Road)

The noise levels associated with the proposed HTSP haulage road assessed against the project amenity noise levels, are presented in Table 4.18.

Table 4.18 Operational noise levels – L_{eq} assessment – Scenario 8 (proposed haulage road)

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
NSW EPA Noise Policy for Industry – Project amenity noise levels Noise sensitive places to the east, and to the south-east (north of intersection between Cudgen Road and Plantation Road)	53	43	38	
2 Clarke Street	20	23	23	Yes
3 Clarke Street	20	23	23	Yes
6 Clarke Street	20	23	23	Yes
1 Collier Street	25	28	28	Yes
2 Collier Street	22	25	25	Yes
4 Collier Street	22	25	25	Yes
6 Collier Street	21	24	24	Yes
8 Collier Street	21	24	24	Yes
10 Collier Street	21	24	24	Yes
16 Collier Street	21	24	24	Yes
17 Collier Street	22	25	25	Yes
18 Collier Street	22	25	25	Yes
20 Collier Street	21	24	24	Yes
22 Collier Street	21	24	24	Yes
24 Collier Street	19	22	22	Yes
1 Crescent Street	20	23	23	Yes
3 Crescent Street	19	22	22	Yes
4 Crescent Street	21	24	24	Yes
5 Crescent Street	19	22	22	Yes
7 Crescent Street	20	23	23	Yes
8 Crescent Street	22	25	25	Yes
9 Crescent Street	21	24	24	Yes
10 Crescent Street	20	23	23	Yes
11 Crescent Street	19	22	22	Yes
12 Crescent Street	18	21	21	Yes
13 Crescent Street	20	24	24	Yes
14 Crescent Street	20	23	23	Yes
16 Crescent Street	20	23	23	Yes
17 Crescent Street	16	19	19	Yes
18 Crescent Street	19	22	22	Yes
19 Crescent Street	22	25	25	Yes
20 Crescent Street	20	23	23	Yes
20A Crescent Street	20	23	23	Yes
21 Crescent Street	20	23	23	Yes
22-24 Crescent Street	22	25	25	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
23 Crescent Street	18	21	21	Yes
26 Crescent Street	20	23	23	Yes
28 Crescent Street	20	23	23	Yes
29 Crescent Street	15	18	18	Yes
30 Crescent Street	19	22	22	Yes
32 Crescent Street	19	22	22	Yes
34 Crescent Street	19	22	22	Yes
36 Crescent Street	20	23	23	Yes
38 Crescent Street	16	19	19	Yes
1-5 Cudgen Road	20	23	23	Yes
7 Cudgen Road	20	23	23	Yes
11 Cudgen Road	18	21	21	Yes
463 Cudgen Road	20	23	23	Yes
480 Cudgen Road	17	20	20	Yes
480A Cudgen Road	19	22	22	Yes
482 Cudgen Road	20	23	23	Yes
501 Cudgen Road	19	22	22	Yes
529A Cudgen Road	25	28	28	Yes
529B Cudgen Road	27	30	30	Yes
531 Cudgen Road	24	27	27	Yes
535A Cudgen Road	23	26	26	Yes
535B Cudgen Road	24	27	27	Yes
535C Cudgen Road	27	30	30	Yes
542 Cudgen Road	23	26	26	Yes
543 Cudgen Road	28	31	31	Yes
576 Cudgen Road	23	26	26	Yes
592 Cudgen Road	23	26	26	Yes
604 Cudgen Road	20	23	23	Yes
607 Cudgen Road	28	31	31	Yes
609 Cudgen Road	24	27	27	Yes
611A Cudgen Road	23	26	26	Yes
611B Cudgen Road	28	31	31	Yes
626 Cudgen Road	22	25	25	Yes
647 Cudgen Road	22	25	25	Yes
5 Denman Drive	20	23	23	Yes
7 Denman Drive	20	23	23	Yes
9 Denman Drive	21	24	24	Yes
11 Denman Drive	22	25	25	Yes
13 Denman Drive	21	24	24	Yes
14 Denman Drive	28	31	31	Yes
15 Denman Drive	22	25	25	Yes
16 Denman Drive	28	31	31	Yes
17 Denman Drive	22	25	25	Yes
18 Denman Drive	28	31	31	Yes
19 Denman Drive	22	25	25	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
20 Denman Drive	27	30	30	Yes
21 Denman Drive	23	26	26	Yes
22 Denman Drive	27	30	30	Yes
23 Denman Drive	23	26	26	Yes
24 Denman Drive	27	30	30	Yes
25 Denman Drive	22	25	25	Yes
26 Denman Drive	27	30	30	Yes
27 Denman Drive	21	24	24	Yes
28 Denman Drive	27	30	30	Yes
30 Denman Drive	26	29	29	Yes
32 Denman Drive	26	29	29	Yes
34 Denman Drive	23	26	26	Yes
36 Denman Drive	23	26	26	Yes
38 Denman Drive	22	25	25	Yes
40 Denman Drive	22	25	25	Yes
42 Denman Drive	22	25	25	Yes
3 Murraya Way	18	21	21	Yes
6 Murraya Way	20	23	23	Yes
8 Murraya Way	19	22	22	Yes
9 Murraya Way	18	21	21	Yes
10 Murraya Way	19	22	22	Yes
12 Murraya Way	20	23	23	Yes
14 Murraya Way	20	23	23	Yes
15 Murraya Way	19	22	22	Yes
16 Murraya Way	21	24	24	Yes
17 Murraya Way	20	23	23	Yes
142 Plantation Road	19	22	22	Yes
154A Plantation Road	18	21	21	Yes
154B Plantation Road	17	20	20	Yes
2 The Village Lane	19	22	22	Yes
146 Tweed Coast Road	21	24	24	Yes
Noise sensitive places to the south and south-west (south of intersection between Cudgen Road and Plantation Road)	48	43	38	
278A Cudgen Road	14	17	17	Yes
278B Cudgen Road	13	16	16	Yes
293 Cudgen Road	19	22	22	Yes
297 Cudgen Road	18	21	21	Yes
298A Cudgen Road	16	19	19	Yes
298B Cudgen Road	16	19	19	Yes
301 Cudgen Road	19	22	22	Yes
302 Cudgen Road	18	21	21	Yes
306 Cudgen Road	18	21	21	Yes
307 Cudgen Road	19	22	22	Yes
310 Cudgen Road	18	21	21	Yes
312 Cudgen Road	18	21	21	Yes

Receiver name	Calculated noise levels			Complies with project trigger levels?
	$L_{eq,adj,15min}$, dB(A)			
	Day	Evening	Night	
317 Cudgen Road	19	22	22	Yes
320 Cudgen Road	19	22	22	Yes
346 Cudgen Road	15	18	18	Yes
351 Cudgen Road	20	23	23	Yes
353 Cudgen Road	21	24	24	Yes
355 Cudgen Road	19	22	22	Yes
372 Cudgen Road	15	18	18	Yes
379 Cudgen Road	18	21	21	Yes
389 Cudgen Road	18	21	21	Yes
394 Cudgen Road	18	21	21	Yes
396 Cudgen Road	15	18	18	Yes
401 Cudgen Road	18	21	21	Yes
413A Cudgen Road	18	21	21	Yes
413B Cudgen Road	18	21	21	Yes
416 Cudgen Road	16	19	19	Yes
422 Cudgen Road	16	19	19	Yes
438 Cudgen Road	17	20	20	Yes
440A Cudgen Road	17	20	20	Yes
440B Cudgen Road	16	19	19	Yes
458A Cudgen Road	17	20	20	Yes
458B Cudgen Road	16	19	19	Yes
459 Cudgen Road	17	20	20	Yes
396 Melaleuca Road	11	14	14	Yes
37 Mccollums Road	12	15	15	Yes
41 Mccollums Road	12	15	15	Yes
54 Mccollums Road	13	16	16	Yes
52 Reardons Road	14	17	17	Yes
Noise sensitive places to the north at significant setback from Pacific Motorway	48	43	38	
271 Pacific Motorway	34	37	37	Yes
145 Plantation Road	18	21	21	Yes
155A Plantation Road	17	20	20	Yes
155B Plantation Road	18	21	21	Yes
Noise sensitive places to the north and west within proximity to Pacific Motorway	48	43	38	
139A Pacific Motorway	26	29	29	Yes
139B Pacific Motorway	27	30	30	Yes
141 Pacific Motorway	28	31	31	Yes
9394 Tweed Valley Way	25	28	28	Yes
School classroom	40	40	40	
11A Collier Street	21	24	24	Yes
11B Collier Street	22	25	25	Yes

SoundPLAN tabulated noise levels, ISO9613 calculation parameters and noise contour maps are presented in Appendix F.

5. Discussion and Recommendations

5.1 Operational Noise Criteria

Noise monitoring was carried out at the nearest noise sensitive places using automated noise loggers to obtain information about the existing background noise levels during day, evening and night-time. The Rating Background Levels (RBL) were calculated based on the background noise levels when there were no dredging operations taking place at the HTSP.

As per the NSW EPA *Noise Policy for Industry*, the intrusiveness, amenity and maximum noise level criteria were determined based on the results of the background noise monitoring, the methodology for which is presented in Section 3.

It is proposed that the project trigger levels, as per Table 3.5, be adopted as the new Operational Noise Criteria for the HTSP. It is important to note that special consideration is given to private haulage roads under the NSW EPA *Noise Policy for Industry*. To this end, the use of the proposed private haulage road should be assessed separately, against project amenity noise level criteria, which are presented in Table 3.4.

The noise criteria do not apply if the Tweed Sand Plant has an agreement with any impacted landowner to exceed the noise criteria, and the Tweed Sand Plant has advised the NSW Department of Planning, Industry and Environment in writing of the terms of this agreement.

5.2 Operational Noise Impact Assessment

Detailed noise propagation modelling was carried out to assess potential noise impacts from the future operation of the HTSP on the nearest sensitive land uses over the 30-year planning horizon.

In the 3D noise propagation model, all proposed activities at the site were considered, including dredging activities (dredge and booster), shoreline processing (water pump, wash plant and loader) and truck movements (trucks along the haulage route and dispatch of loaded trucks from the plant).

The relevant noise criteria from the NSW EPA *Noise Policy for Industry* was considered in this assessment. The results of the noise propagation modelling indicate that without noise control measures, there is a potential for noise impacts on the nearest noise sensitive receptors from the operation of the extended HTSP as per various planned phases of expansion.

The noise impacts on the nearest noise sensitive receptors are associated with the use of the dredge, the booster, and the wash plant, mainly during night-time operations, and when the dredge is operated at location nearest to the sensitive receptors. To protect the noise amenity at the nearest noise sensitive places (mainly residential dwellings), it is recommended to attenuate noise from the dredge, the booster, and the wash plant.

5.2.1 Noise Mitigation of Dredge

Recent noise attenuation works have been carried out on the dredge at the existing HTSP, including:

- Installation of a new exhaust silencer;
- Installation of an acoustic enclosure to the engine bay;

- Installation of acoustic louvres to the ventilation openings at the front and rear walls of the engine room;
- Acoustic lagging added to the external high-pressure line; and
- Acoustic upgrade to the engine room maintenance doors adjacent to the suction pipe.

The noise levels associated with the dredge, after the installation of the noise attenuation works, were assessed during the attended noise measurements carried out on 21 August 2020. The operational noise modelling was carried out considering the attenuated noise levels, assessed at the nearest noise sensitive receptors to the proposed expansions considering the proposed continuous operation, daytime, evening, and night-time.

The dredge as it operates now, is sufficiently attenuated to operate during daytime for all phases other than phase 9, as well as evening for phases 8 and 11, and night for phase 8. Should the existing dredge be further acoustically upgraded, it may expand its operations further.

However, under some scenarios (e.g. operating during evening or night time within close proximity to some receivers), the level of noise reduction required is not practicable with the current dredge. Therefore, it is recommended that the existing dredge be replaced with a dredge that has been acoustically treated to comply with the applicable noise limits.

The maximum allowable dredge noise levels to achieve compliance with the noise criteria during daytime, evening and night-time for each project phase are presented in Table 5.1.

Table 5.1 Operational noise level requirements for dredge

		Sound power level			Sound pressure level at 3m			Sound pressure level at 10m		
		dB(A)	dB(C)	dB(Z)	dB(A)	dB(C)	dB(Z)	dB(A)	dB(C)	dB(Z)
Phase 5	Day	108	115	115	90	97	97	80	87	87
	Evening	104	111	111	86	93	93	76	83	83
	Night	94	101	101	76	83	83	66	73	73
Phase 6	Day	108	115	115	90	97	97	80	87	87
	Evening	104	111	111	86	93	93	76	83	83
	Night	88	95	95	70	77	77	60	67	67
Phase 7	Day	108	115	115	90	97	97	80	87	87
	Evening	107	114	114	89	96	96	79	86	86
	Night	99	106	106	81	88	88	71	78	78
Phase 8	Day	108	115	115	90	97	97	80	87	87
	Evening	108	115	115	90	97	97	80	87	87
	Night	108	115	115	90	97	97	80	87	87
Phase 9	Day	96	103	103	78	85	85	68	75	75
	Evening	93	100	100	75	82	82	65	72	72
	Night	88	95	95	70	77	77	60	67	67
Phase 10	Day	108	115	115	90	97	97	80	87	87
	Evening	106	113	113	88	95	95	78	85	85
	Night	94	101	101	76	83	83	66	73	73
Phase 11	Day	108	115	115	90	97	97	80	87	87
	Evening	108	115	115	90	97	97	80	87	87
	Night	101	108	108	83	90	90	73	80	80

Note: Refer to Table 4.1 and Appendix A for phasing as it relates to lot plan numbers.

Based on the operational noise level requirements for the dredge presented in Table 5.1, ATP proposes the following five options for levels of noise attenuation in order to comply with the applicable noise criteria during different operating scenarios:

- Option 1 – Existing dredge – Existing dredge, which currently achieves a sound pressure level of 90dB(A), 97dB(C) or 97dB(Z) measured at a 3-metre setback, and 80dB(A), 87dB(C) or 87dB(Z) measured at a 10-metre setback.
- Option 2 – Existing dredge with acoustic upgrades – Existing dredge, with additional acoustic upgrades to achieve a sound pressure level of not more than 86dB(A), 93dB(C) or 93dB(Z) measured at a 3-metre setback, and no more than 76dB(A), 83dB(C) or 83dB(Z) measured at a 10-metre setback.
- Option 3 – Replacement dredge 1 – Replacement dredge which achieves a sound pressure level of not more than 78dB(A), 85dB(C) or 85dB(Z) measured at a 3-metre setback, and no more than 68dB(A), 75dB(C) or 75dB(Z) measured at a 10-metre setback.
- Option 4 – Replacement dredge 2 – Replacement dredge which achieves a sound pressure level of not more than 74dB(A), 81dB(C) or 81dB(Z) measured at a 3-metre setback, and no more than 64dB(A), 71dB(C) or 71dB(Z) measured at a 10-metre setback.
- Option 5 – Replacement dredge 3 – Replacement dredge which achieves a sound pressure level of not more than 70dB(A), 77dB(C) or 77dB(Z) measured at a 3-metre setback, and no more than 60dB(A), 67dB(C) or 67dB(Z) measured at a 10-metre setback.

Summary of the abovementioned options for levels of noise attenuation for the dredge, as they relate to the project phases and periods, is presented in Table 5.2.

Table 5.2 Summary of options for levels of noise attenuation for dredge

	Option 1 *Existing dredge*			**Option 2** *Existing dredge with acoustic upgrades*			**Option 3** *Replacement dredge 1*			**Option 4** *Replacement dredge 2*			**Option 5** *Replacement dredge 3*		
L_w, dB(A)	108			104			96			92			88		
$L_{p@3m}$, dB(A)	90			86			78			74			70		
$L_{p@10m}$, dB(A)	80			76			68			64			60		
	D	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
Phase 5	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phase 6	✓	✗	✗	✓	✓	✗	✓	✓	✗	✓	✓	✗	✓	✓	✓
Phase 7	✓	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phase 8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phase 9	✗	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	✓	✓
Phase 10	✓	✗	✗	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓
Phase 11	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: L_w: Sound power level; $L_{p@3m}$: Sound pressure level at 3m setback distance; $L_{p@10m}$: Sound pressure level at 10m setback distance; D: Daytime (7:00am to 6:00pm); E: Evening (6:00pm to 10:00pm); N: Night-time (10:00pm to 7:00am); ✓: appropriate option for project phase and period; ✗: inappropriate option for project phase and/or period.

Based on the information presented in Tables 5.1 and 5.2, it can be seen that for the existing dredge to be able to operate during the evening for phases 5, 6, 7 and 10, additional acoustic upgrades will be required to achieve a minimum 4dB noise attenuation (i.e. Option 2). After these upgrades, ATP does not expect that further significant improvement could be achieved with the existing dredge, and a replacement dredge would be required to operate under more stringent conditions.

For operations during daytime in phase 9, a replacement dredge would be required which has a sound power level in line with Option 3 presented above, as a minimum. If the replacement dredge can operate in line with the performance of Options 4 or 5, expanded operations into evening and night-time of phase 9 are also achievable.

ATP is aware of dredges that are available now that can operate at a sound power level of 92dB(A) (i.e. suitable for Option 4). Given that such a dredge would not be required until phase 9 (i.e. would not be required for at least 19 years), ATP anticipate that a quieter dredge would be available by this time, if it isn't on the market already.

5.2.2 Noise Mitigation of Booster

The results of the operational noise modelling indicate that during night-time, when the booster is positioned within proximity to the nearest noise sensitive receptors, a minor exceedance of the noise criteria may occur.

ATP has carried out assessment of the existing noise attenuation works installed on the booster and have deemed them to be state of the art and sufficient for most operational scenarios. Because the booster is always located between the dredge and the processing plant, the noise impacts from the booster can be readily managed by appropriate positioning. Therefore, it is recommended that maximum distance is maintained between the booster and the nearest noise sensitive receptors during daytime, evening and night time.

5.2.3 Noise Mitigation of Wash Plant

The results of the operational noise modelling indicate that during night-time operation the existing wash plant has the potential to cause minor exceedance of the noise criteria at the nearest noise sensitive receptors along Cudgen Road. To ensure the night-time operation of the wash plant does not impact the noise amenity at the nearest noise sensitive receptors it is recommended that a partial acoustic enclosure be installed around the wash plant motor, enclosing it on the south-east and south-west sides. The following design specifications are required for the acoustic enclosure:

- The enclosure is to be constructed using a material with minimum surface density of 15kg/m^2 (e.g. timber palings with minimum thickness of 22mm, fibre cement sheeting with minimum thickness of 12mm, or aerated concrete);
- The height of the enclosure is to be minimum 0.3m above the top of the wash plant motor, with returns along the south-east and south-west sides of the wash plant motor;
- The enclosure should be free of any gaps;
- If the walls of the enclosure are constructed of timber palings, planks should have minimum 35mm overlap; and

- The enclosure should be of durable construction.

5.2.4 Attended Compliance Noise Monitoring

To ensure ongoing compliance with the new Operational Noise Criteria (i.e. the project trigger levels, as per Table 3.5), annual attended compliance noise monitoring must be carried out at the nearest noise sensitive receivers (i.e. private residences or privately owned land).

Furthermore, attended compliance noise monitoring must be carried out at the nearest noise sensitive receivers following the commencement of dredging activities in new project phase areas (see Phasing Plan presented in Appendix A).

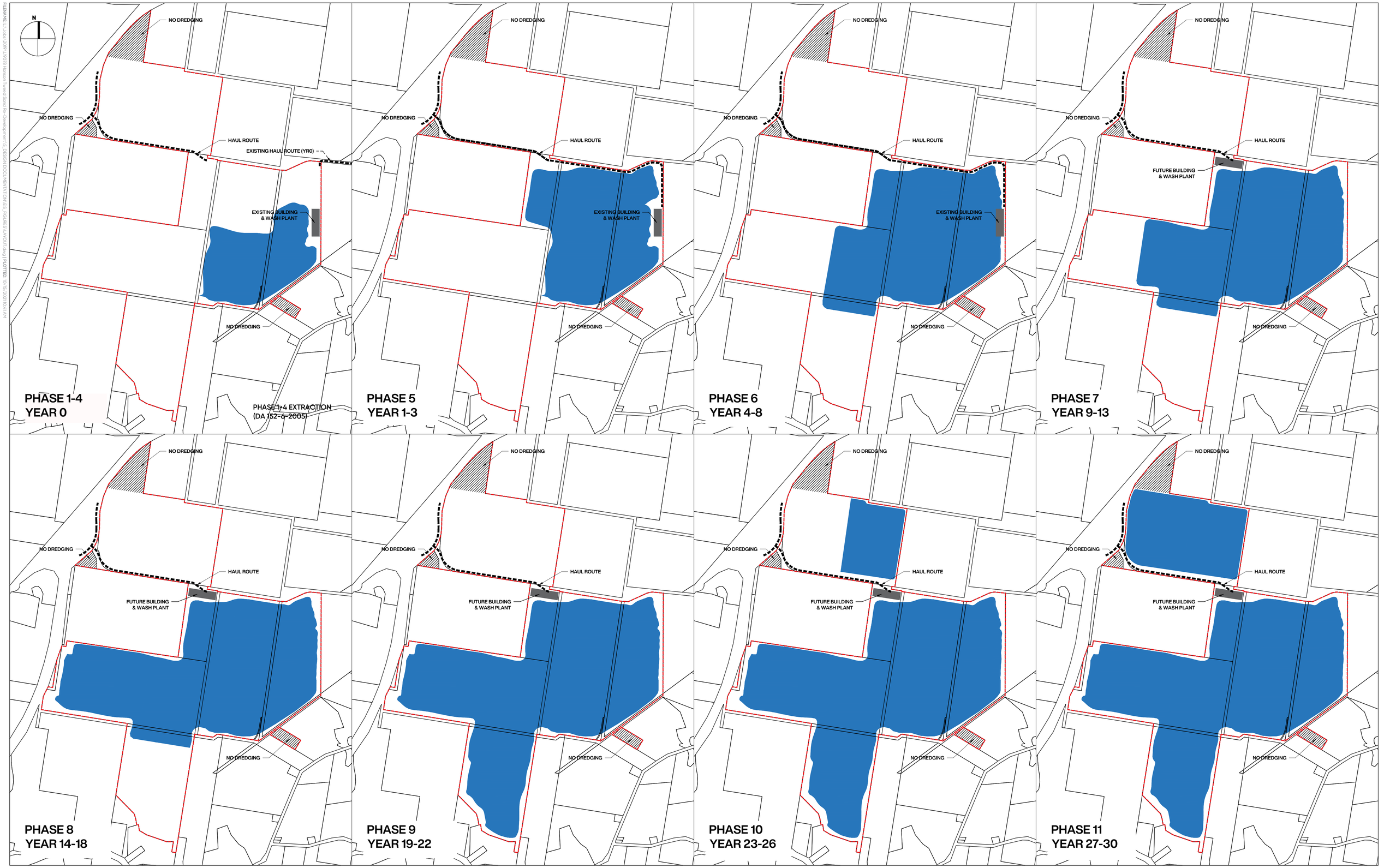
Noise generated by the development is to be measured in accordance with the *NSW Noise Policy for Industry 2017*.

Provided the recommended noise control measures are fully implemented at detailed design and construction, there are no further acoustic constraints on the establishment of the proposed expanded operations of the Hanson Tweed Sand Plant in Cudgen.

6. References

- Australian Standard AS 1055.1-2018 *(Acoustics – Description and measurement of environmental noise)*
- Australian Standard AS 2436-2010 (*Guide to noise and vibration control on construction, demolition and maintenance sites*)
- Australian Standard AS/NZS IEC61672.1-2019 (*Electroacoustics – Sound level meters – Specifications*)
- Bass, J., Bullmore, A., Robinson, P., & Sloth, E. (1996), *Development of a wind farm noise propagation prediction model,* Contract JOR3-CT95-0051
- International Standard ISO 9613 (*Acoustics – Attenuation of sound during propagation outdoors*)
- Kochanowski, R. & Mackenzie, N. (2008), *Atmospheric stability specific noise criteria and noise predictions for wind farms*, Technical Presentation at the Acoustics '08 Conference of the Australian Acoustical Society, 24 to 26 November 2008, Geelong, Australia
- NSW EPA, 2017 *Noise Policy for Industry* (2017)
- NSW EPA, 2009 *Interim Construction Noise Guideline* (2009)
- NSW EPA, 2013 *Noise Guide for Local Government* (2013)
- *NSW Government, 1979 Environmental Planning and Assessment Act 1979*
- *NSW Government, 1997 Protection of the Environment Operations Act 1997*
- NSW Government Transport for NSW, 2018 *Construction Noise and Vibration Strategy* (2018)
- Parry, G. (2008), *A review of the use of different noise prediction models for windfarms and the effects of meteorology*, Technical Presentation at the Acoustics '08 Conference of the European Acoustics Association, 29 June to 4 July 2008, Paris, France
- Pasquill, F. (1961), *The estimation of dispersion of windborne material*, Meteorological Magazine, Vol. 90 (1063), pp 33-49

Appendix A – Phasing Plan



PROJECT TITLE

HANSON TWEED SAND PLANT EXPANSION PHASE 5 TO PHASE 11

ENVIRONMENTAL IMPACT STATEMENT

DRAWING TITLE

FIGURE 19: EXTRACTION PHASES

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	PHASING ARRANGEMENT CHANGES - REQ. PLANNER	25/01/2021	ZP	LN	LN	LN
B	PHASING ARRANGEMENT CHANGES - REQ. PLANNER	15/10/2021	MS	LN	LN	LN

ISSUE: PRELIMINARY

CLIENT: HANSON CONSTRUCTION MATERIALS PTY LTD

BASE PROVIDED BY: SIXMAPS DCDB

MANAGER: LANCE NEWLEY

ZONE PLANNING GROUP

GOLD COAST
1638 Tweed Street, Burleigh Heads QLD 4220
PO Box 3805, Burleigh Town QLD 4220

GLADSTONE
2/172 Goondoon St, Gladstone, QLD 4680
PO Box 5332, Gladstone QLD 4680

zonelandscape.com.au | 07 55622303

JOB / DRAWING NO: Z19163- F119

SHEET NO. SHEET 17 OF 21

N

LEGEND

- SUBJECT SITE
- PHASE 1-4 (EXISTING APPROVAL AREA)
- PHASE 5 (YEAR 1-3)
- PHASE 6 (YEAR 4-8)
- PHASE 7 (YEAR 9-13)
- PHASE 8 (YEAR 14-18)
- PHASE 9 (YEAR 19-22)
- PHASE 10 (YEAR 23-26)
- PHASE 11 (YEAR 27-30)

50 DP1056966
51 DP1056966
51 DP1166990
1 DP1186419
20 DP1082482 (WASTEWATER TREATMENT PLANT)
2 DP1192506
23 DP1077599
22 DP1082435
3 DP1243752
1 DP1250570
494 DP720450
1 DP777905
2 DP568035
1 DP551126
13 DP1142639
3 DP416805
2 DP789457
2 DP1250570

10M BUFFER
20M BUFFER
5M BUFFER
ROAD 25 WIDE
ROAD VARIABLE WIDTH
ROAD 20.115 WIDE
PROPOSED SITE BUILDING LOCATION
PROPOSED WASH PLANT LOCATION
UNNAMED ROAD RESERVE
EXISTING POWERLINE
EXISTING SITE BUILDINGS
EXISTING WASH PLANT

0 200 400 600 800 1000 1200m
SCALE 1:6000 @A1

PROJECT TITLE
HANSON TWEED SAND PLANT EXPANSION PHASE 5 TO PHASE 11
ENVIRONMENTAL IMPACT STATEMENT

DRAWING TITLE
FIGURE 20: SITE LAYOUT

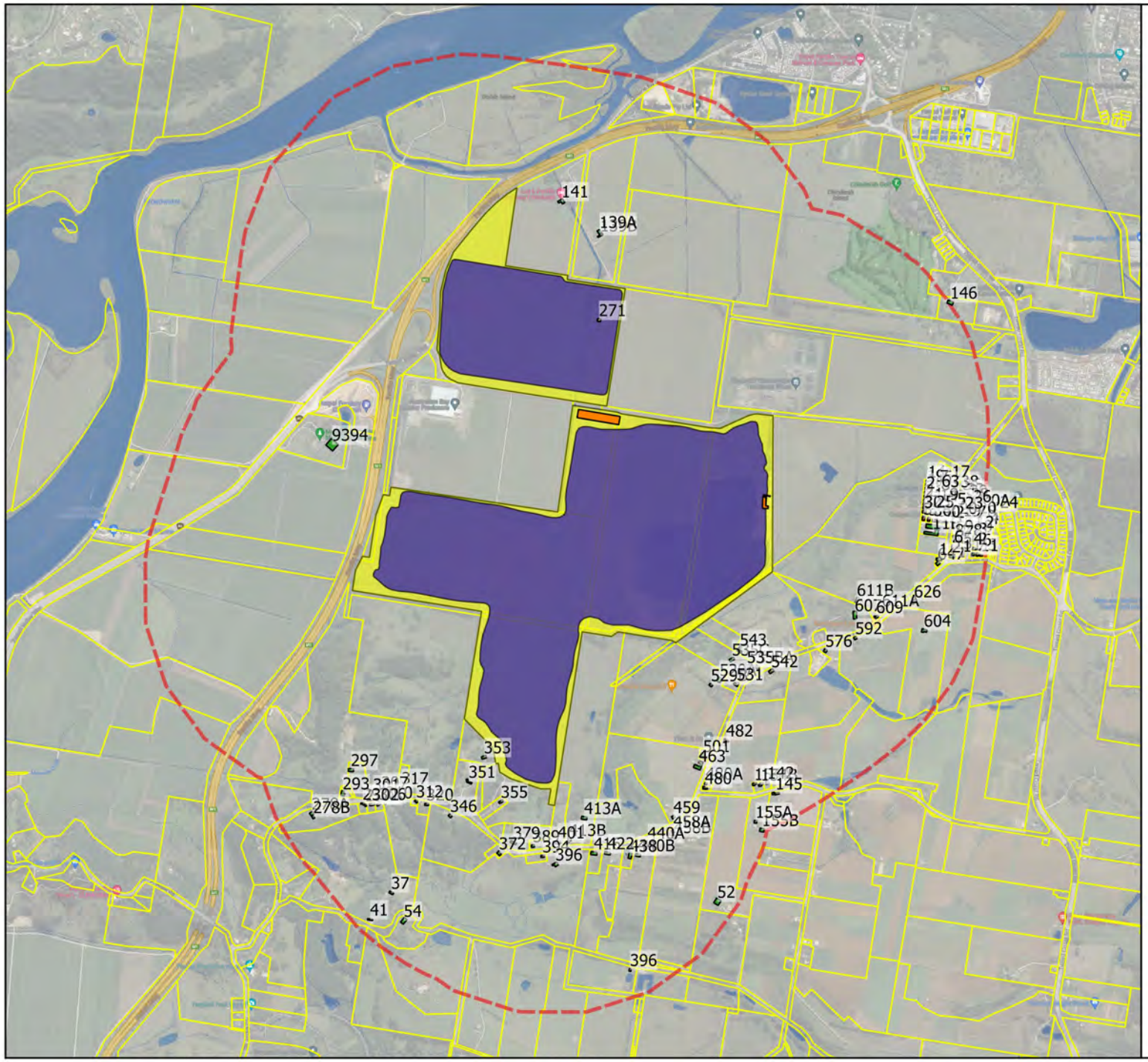
REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	PRELIMINARY ISSUE	17/03/21	ZP	LN	LN	LN
B	PRELIMINARY ISSUE	15/10/21	MS	LN	LN	LN

ISSUE: PRELIMINARY
CLIENT: HANSON CONSTRUCTION MATERIALS PTY LTD
BASE PROVIDED BY: SIXMAPS DCDB
MANAGER: LANCE NEWLEY

ZONE PLANNING GROUP
GOLD COAST
1638 Tweed Street, Burleigh Heads QLD 4220
PO Box 3805, Burleigh Town QLD 4220
GLADSTONE
2/172 Goondoon St, Gladstone, QLD 4680
PO Box 5332, Gladstone QLD 4680
zonelandscape.com.au | 07 55622303

JOB / DRAWING NO: Z19163- F120
SHEET NO. SHEET 18 OF 21

Appendix B – Nearest Noise Sensitive Places



ATP CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Overview

Legend

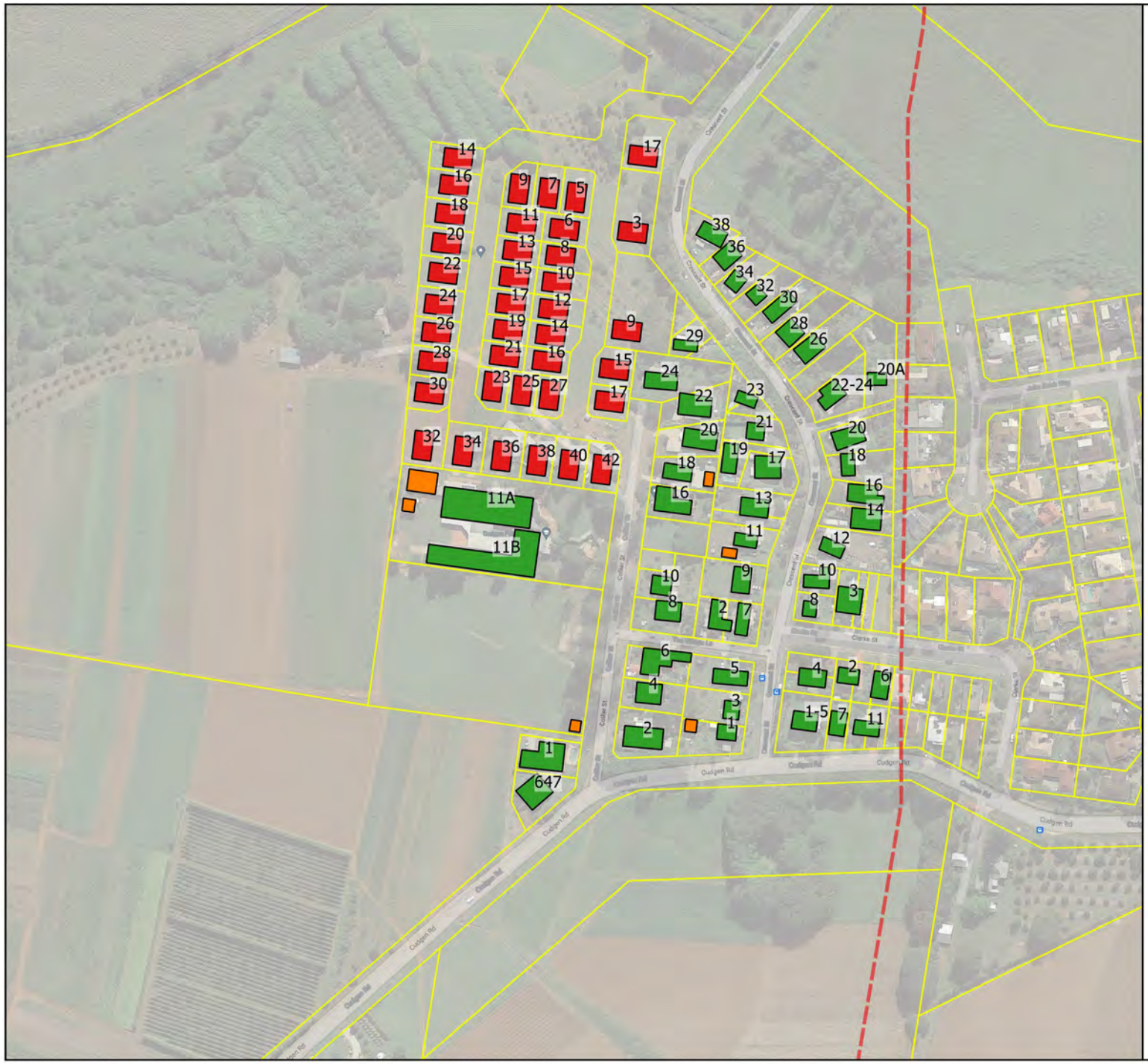
- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:27,000

0 250 500 750 1000 1250 1500 m

Created: 17-09-2021



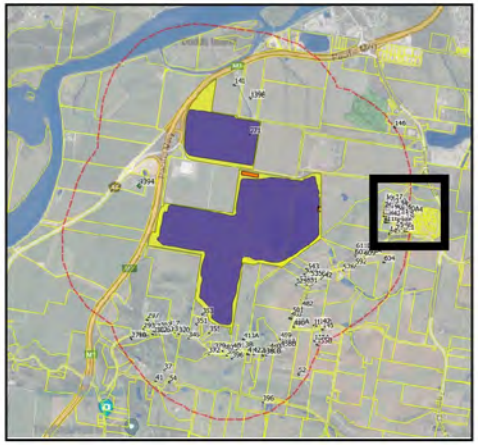
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 1



Legend

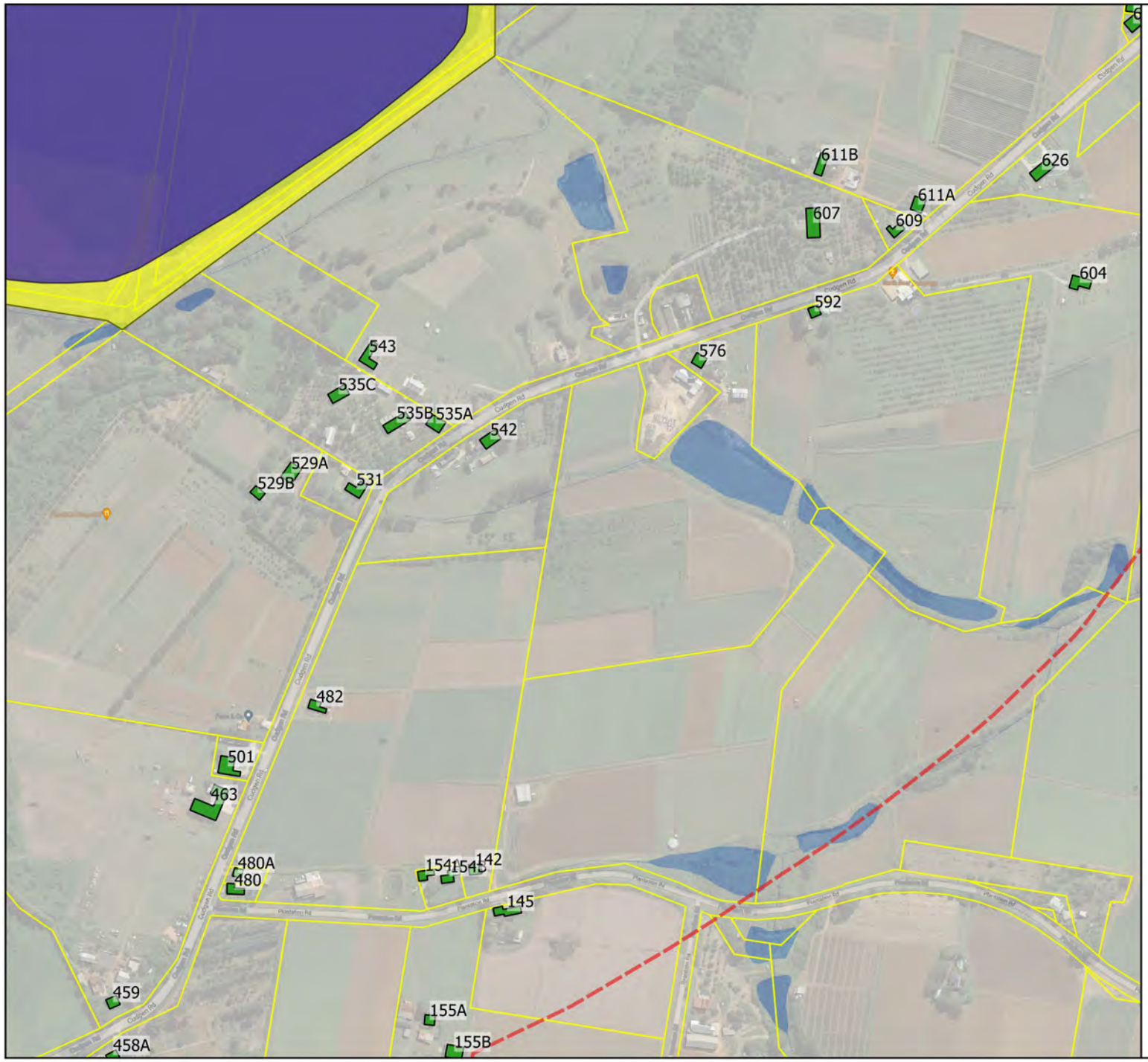
- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:3,500

0 50 100 150 200 m

Created: 17-09-2021



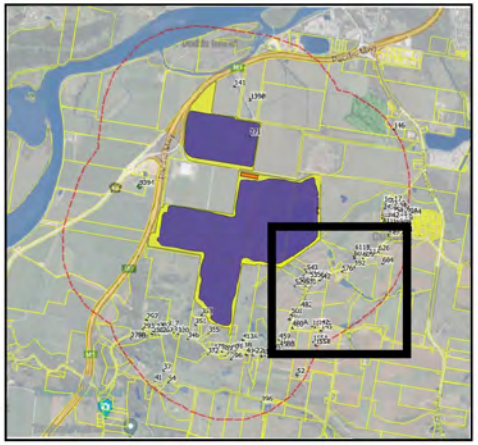
ATP
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 2



Legend

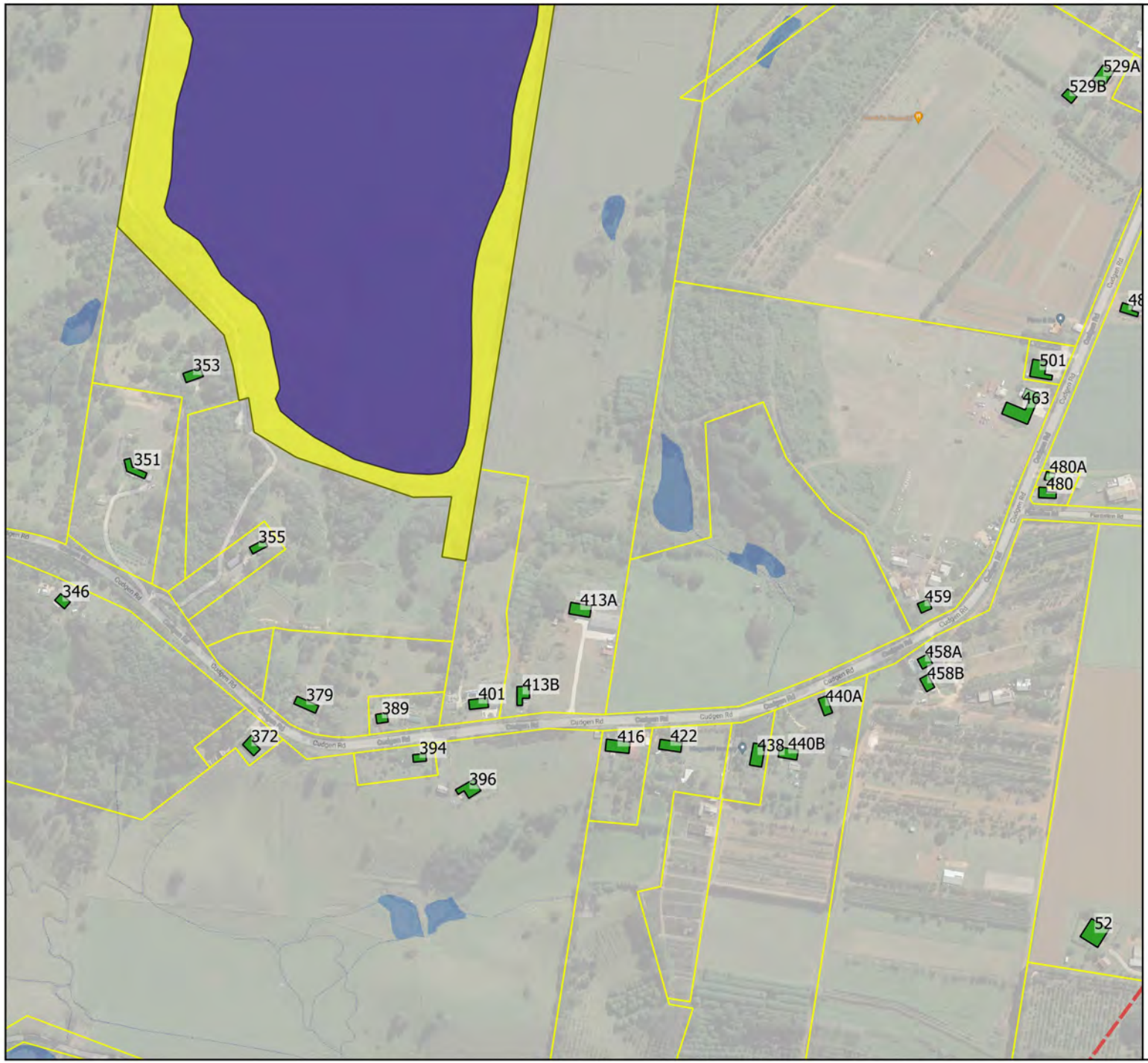
- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021



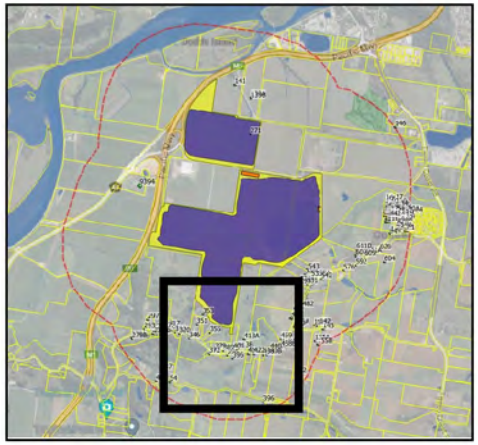
ATP
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 3



Legend

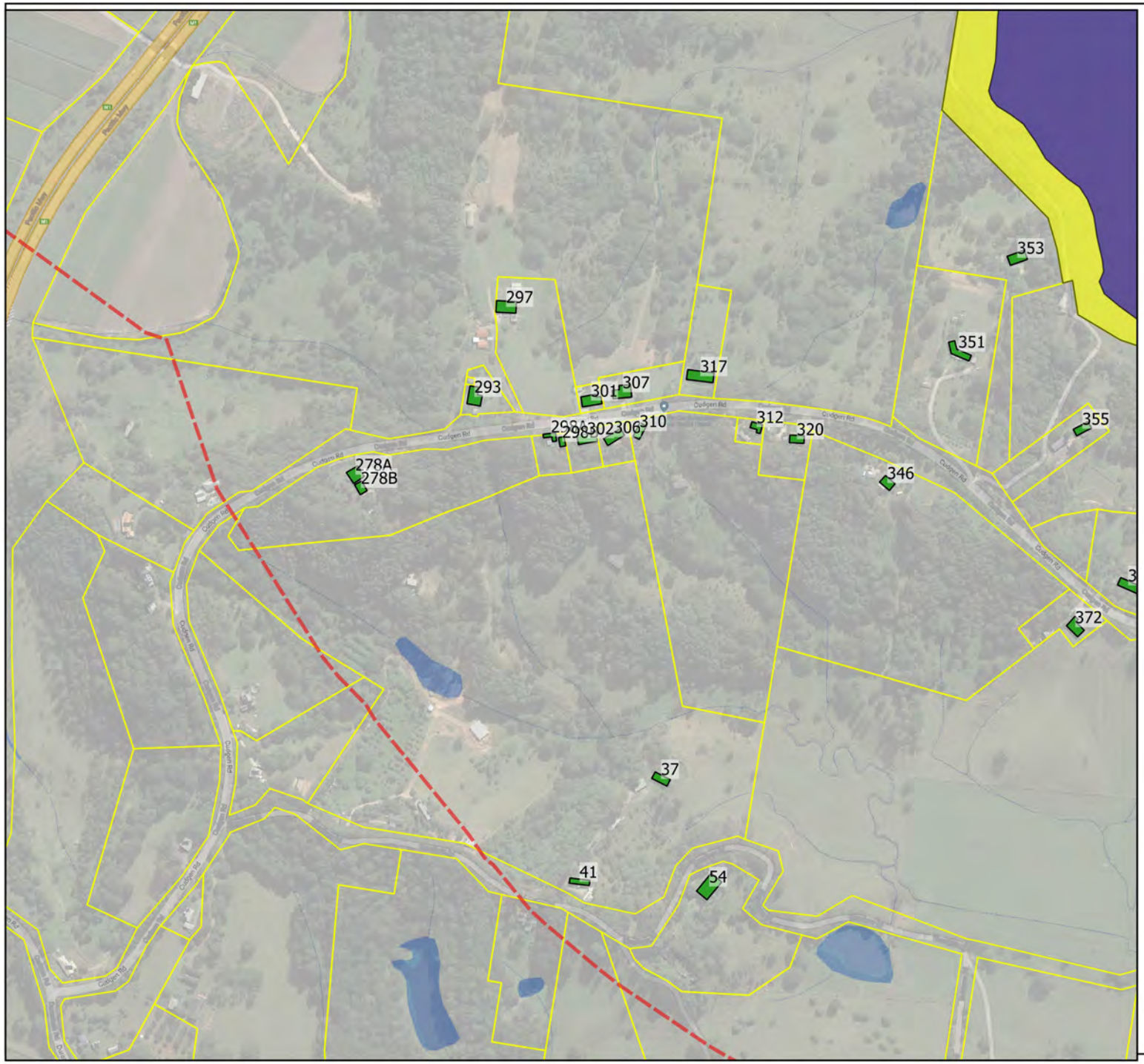
- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021



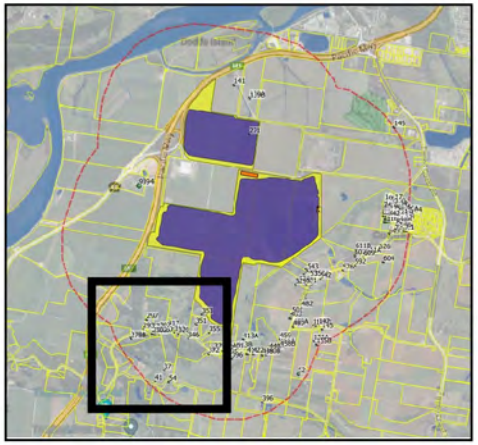
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 4



Legend

- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021

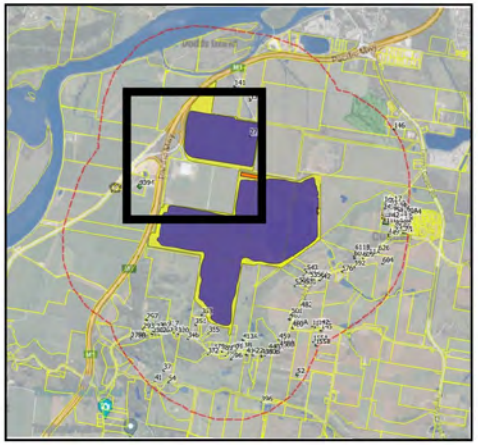
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 5



Legend

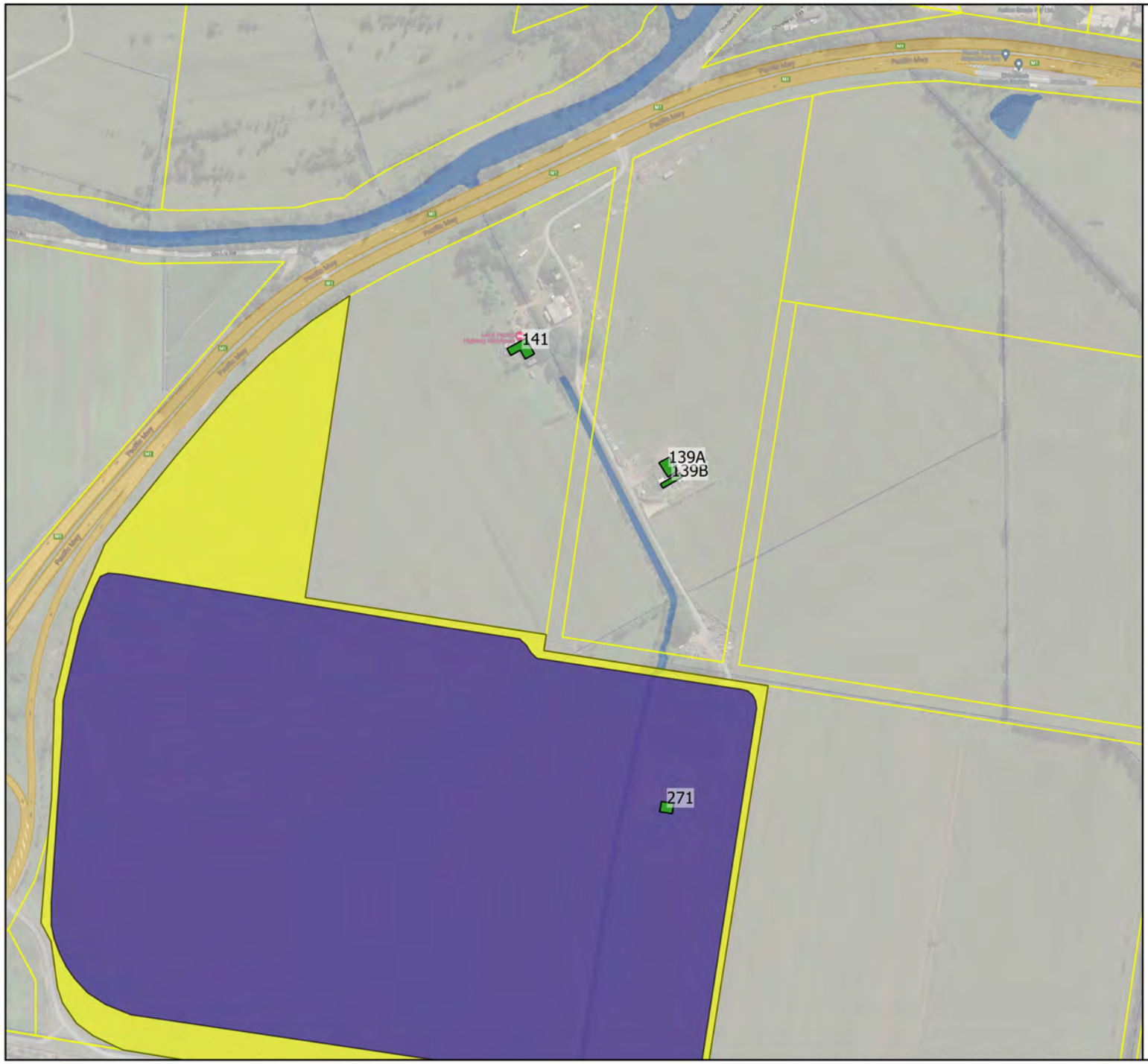
- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021



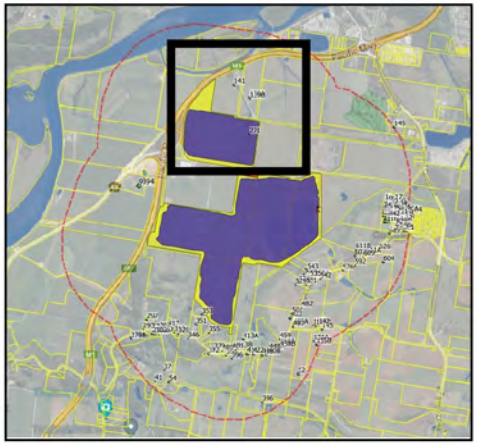
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 6



Legend

- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021

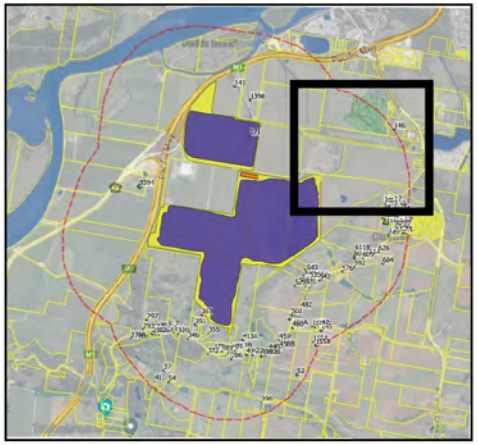
CONSULTING ENGINEERS

ATP190611

Tweed Sand Plant
Cudgen

Noise Sensitive Land Uses

Part 7



Legend

- Existing noise sensitive use
- Future noise sensitive use
- Other building
- Subject site
- Dredging area
- 1 km setback from subject site

N

Scale @ A4 1:7,000

0 100 200 300 400 m

Created: 17-09-2021

Appendix C – Site Photos

Photo 1: Noise monitoring location 1

Photo 2: Noise monitoring location 2

Photo 3: Noise monitoring location 3

Photo 4: Noise monitoring location 4

Photo 5: Noise monitoring location 5

Appendix D – Meteorological Data

Coolangatta, Queensland
September 2020 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	12.9	23.7	0			SE	46	12:06	20.8	65		SSW	22	1021.2	21.4	62	6	SE	30	1019.8
2	We	15.5	23.9	0			NNE	31	10:52	21.3	62	2	NNE	20	1025.4	22.4	59		NNE	22	1022.2
3	Th	16.2	24.9	0			N	37	15:00	23.0	59		NW	17	1024.6	22.9	65	1	N	28	1021.4
4	Fr	16.8	24.3	0			N	41	15:44	22.6	55		NNW	22	1023.2	22.7	63	8	N	31	1018.7
5	Sa	16.6	25.2	0			N	41	12:58	22.0	58		NW	22	1019.2	22.5	65		N	26	1016.2
6	Su	17.1	20.7	3.4			S	44	09:35	19.6	83	8	S	17	1023.8	17.4	84	8	SSW	22	1024.9
7	Mo	16.2	23.5	2.4			S	43	10:41	20.7	64	3	S	20	1030.5	20.4	61	8	SSE	22	1028.7
8	Tu	15.1	23.6	0.2			ESE	37	12:28	20.6	65	4	S	19	1030.7	22.0	60	2	ESE	20	1027.6
9	We	13.4	22.7	0			ENE	28	12:16	20.1	56	7	ESE	9	1025.6	21.2	55		ENE	19	1021.9
10	Th	11.6	20.5	0			S	50	15:18	17.8	74	8	SSW	20	1021.5	15.8	93	8	S	22	1020.3
11	Fr	14.1	22.0	28.6						20.4	53		SE	39	1025.9	20.8	51	8	SE	31	1024.9
12	Sa															20.9	50	1	SE	19	1025.2
13	Su	14.1	23.0				E	26	13:57	18.7	75	6	S	11	1026.7	21.5	57	6	ENE	19	1023.5
14	Mo	11.4	23.9	0			NE	26	13:12	21.9	58		NW	13	1024.7	23.0	64		NE	17	1022.2
15	Tu	13.4	24.7	0			SE	48	13:46	20.9	67		SSE	13	1027.6	21.5	59	8	SE	31	1025.4
16	We	12.7	24.3	0.2			ENE	22	15:03	19.9	73	8	S	13	1027.5	23.0	57	1	ENE	17	1023.6
17	Th	11.1	24.2	0			NE	28	12:05	22.5	63		NNE	15	1025.8	22.9	62		NE	19	1022.8
18	Fr	15.4	25.3	0.2						22.5	70		SSE	13	1028.1	23.2	60	1	SE	30	1025.0
19	Sa															23.0	57		ENE	17	1023.1
20	Su	17.0	25.3				N	30	02:04	22.2	72	3	ESE	6	1020.5	23.1	75	4	NNE	19	1015.7
21	Mo	19.8	26.3	0			N	48	15:19	24.9	64		NNW	24	1017.4	24.6	72		N	35	1014.1
22	Tu	20.8	26.8	0						22.8	79	8	NNW	30	1015.8	22.0	83	8	N	26	1012.8
23	We	18.8	25.7				ENE	22	12:23	21.1	89	7	NNW	6	1015.8	23.2	69	7	NE	15	1011.7
24	Th	14.8	25.7	0			E	28	11:52	23.6	29		SSE	15	1016.1	23.4	37		ENE	19	1012.9
25	Fr	10.8	24.9	0			N	50	15:27	23.7	63		N	22	1014.3	23.7	70		N	33	1007.8
26	Sa	10.9	24.4	0			NE	35	10:54	21.6	30		SSW	9	1013.4	22.7	28		E	17	1012.0
27	Su	3.8	21.8	0.2			E	31	13:17	19.1	27		SW	7	1021.8	20.2	32		SE	22	1019.4
28	Mo	11.2	22.9	0			SE	43	13:57	18.3	60	5	S	17	1025.8	19.3	57	8	SE	31	1023.0
29	Tu	13.5	23.0	0			ESE	41	12:27	20.2	50		S	19	1026.3	21.2	42		SE	24	1022.0
30	We	8.5	23.8	0			NNE	28	16:54	20.3	53	7	S	7	1022.6	20.7	50	8	NNE	17	1018.9
Statistics for September 2020																					
	Mean	14.1	24.0							21.2	61	5		16	1022.9	21.8	59	5		23	1020.3
	Lowest	3.8	20.5							17.8	27	2	#	6	1013.4	15.8	28	1	NE	15	1007.8
	Highest	20.8	26.8	28.6			#	50		24.9	89	8	SE	39	1030.7	24.6	93	8	N	35	1028.7
	Total			35.2																	

Observations were drawn from Coolangatta {station 040717}

Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day. Averages for Southport should be used as a guide only.

IDCJDW4036.202009 Prepared at 15:37 AEDT on 15 Oct 2020

Appendix E – Noise Measurement Results

Unattended Noise Measurements
Noise Logger Location 1 - 543 Cudgen Road, Cudgen

Environmental Noise Levels Day, Evening and Night

Logger Location - North-western side of existing dwelling on allotment

ARL Environmental Noise Logger	
Logger Serial Number	8781BC
Measurement Title	Location 1
Measurement started at	16/09/2020 - 13:17:04
Measurement stopped at	30/09/2020 - 13:00:26
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

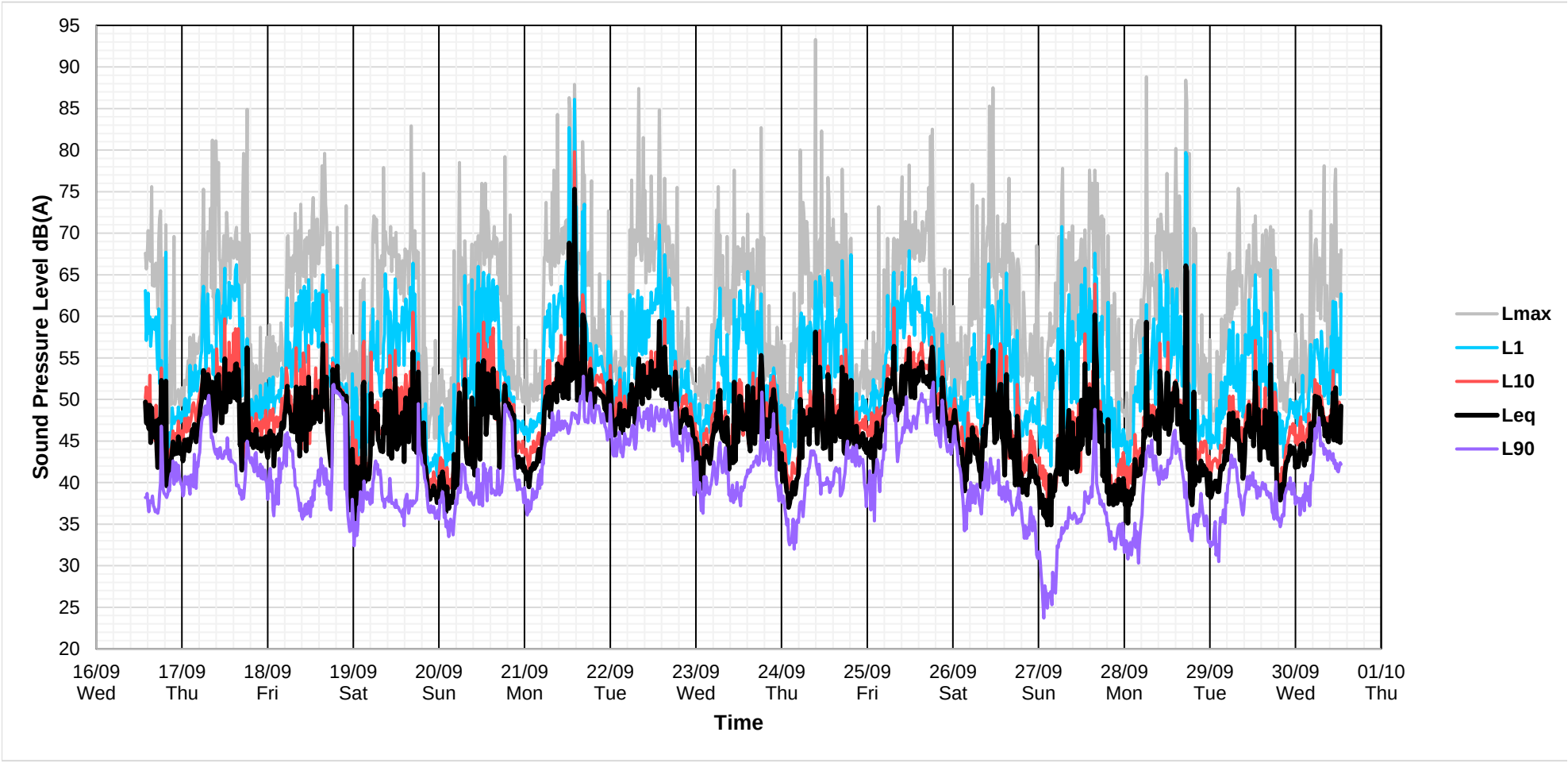
Data excluded due to meteorological effects or extraneous noise

Data excluded due to missing meteorological data

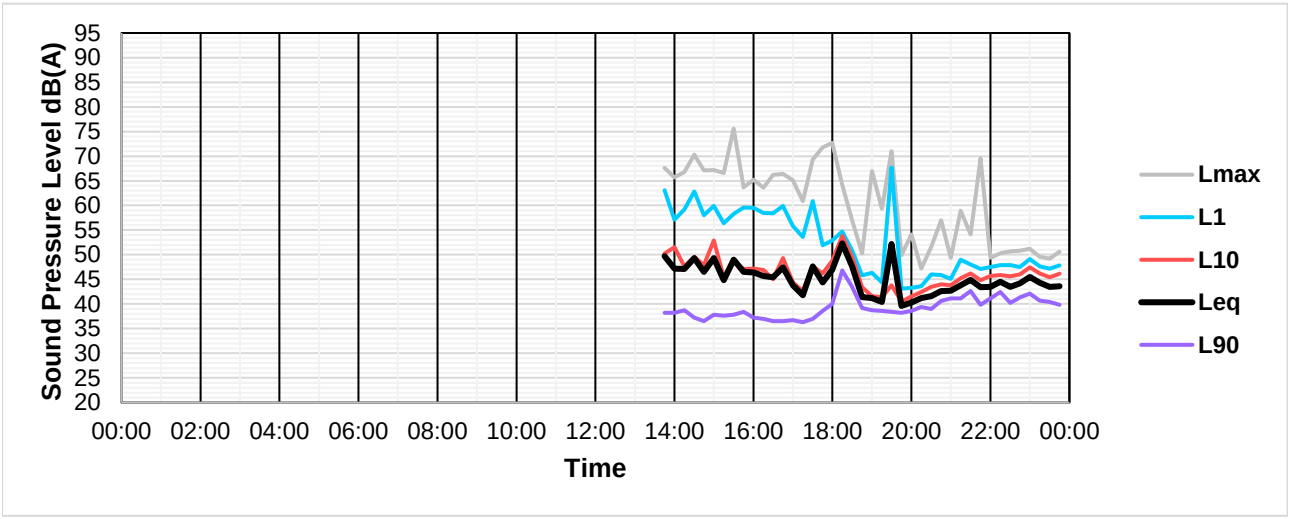
Data excluded due to dredging

		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Levels, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
16/09/2020	Wednesday	—	44	46	—	48	52	—	45	48	—	40	42	—	38	39
17/09/2020	Thursday	50	46	46	59	49	52	52	47	48	43	43	41	39	41	37
18/09/2020	Friday	48	51	43	59	53	50	50	52	44	39	49	38	36	41	34
19/09/2020	Saturday	47	43	40	58	46	46	49	44	42	38	41	37	37	37	34
20/09/2020	Sunday	48	48	44	58	50	49	49	49	45	39	46	40	38	40	37
21/09/2020	Monday	54	51	48	63	55	53	56	53	50	48	49	45	46	47	43
22/09/2020	Tuesday	52	48	45	60	52	50	53	50	47	47	45	41	46	44	39
23/09/2020	Wednesday	47	49	42	56	53	50	48	51	45	41	45	37	38	43	33
24/09/2020	Thursday	48	47	46	58	52	51	49	48	48	41	43	42	39	42	39
25/09/2020	Friday	52	50	45	61	54	50	54	52	46	48	48	41	45	45	37
26/09/2020	Saturday	46	41	40	56	48	50	48	44	42	39	36	30	37	33	25
27/09/2020	Sunday	46	40	41	57	48	48	48	41	43	38	35	35	35	33	32
28/09/2020	Monday	49	41	42	58	48	49	50	43	44	42	35	36	40	33	32
29/09/2020	Tuesday	46	41	45	55	47	51	48	43	47	39	37	40	37	35	37
Average		**47**	**44**	**44**	**56**	**49**	**50**	**48**	**46**	**46**	**39**	**41**	**39**	—	—	—
											Rating Background Levels, dB(A)			**37**	**38**	**37**

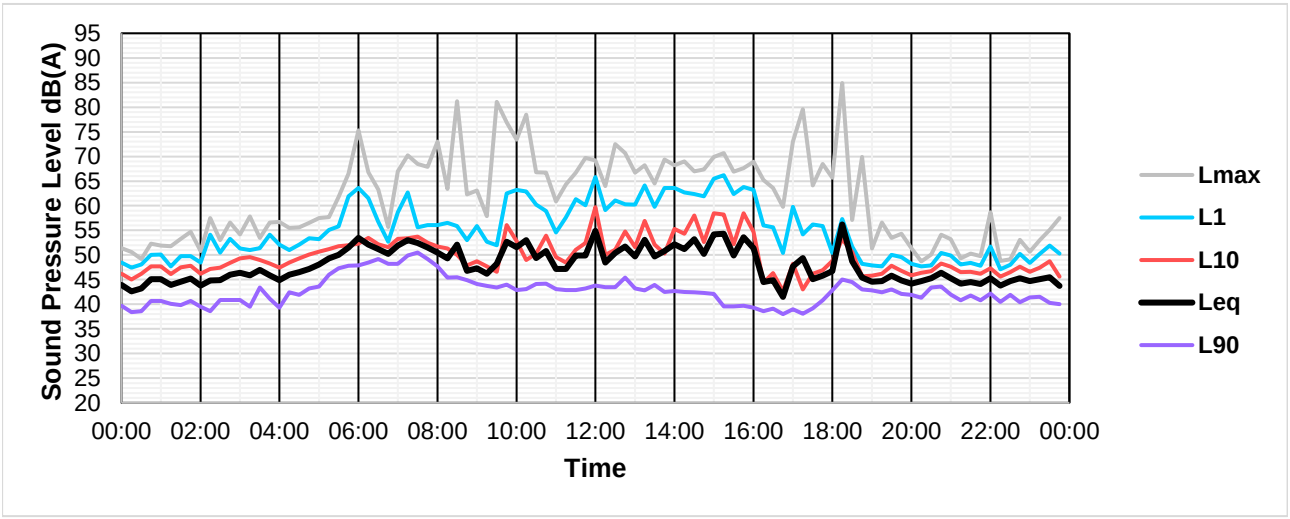
Unattended Noise Measurements
16 to 30 September 2020



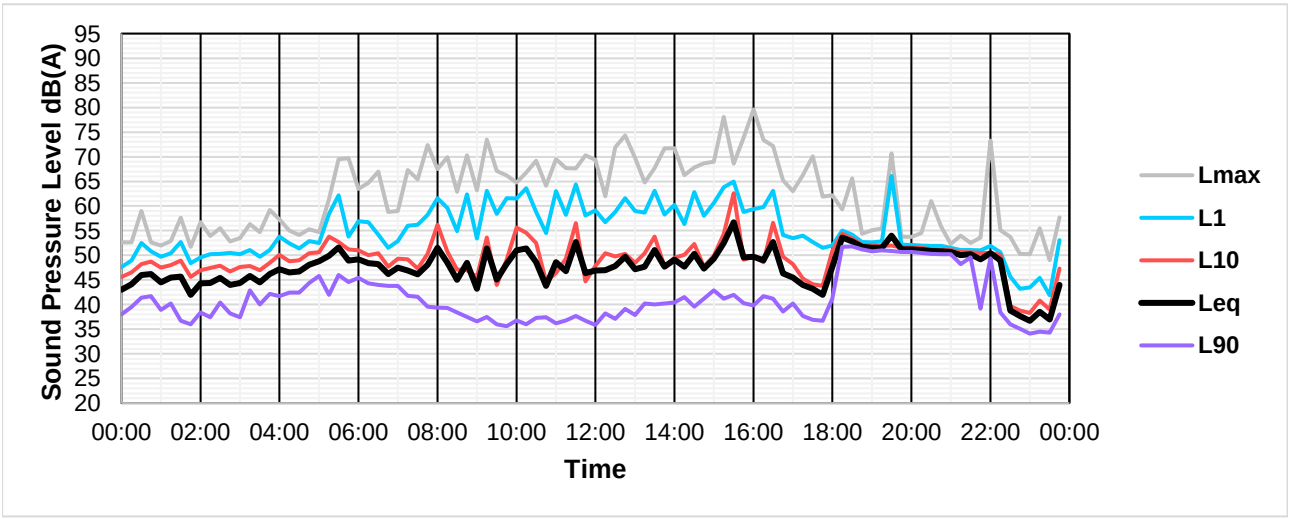
Unattended Noise Measurements
Wednesday 16 September 2020



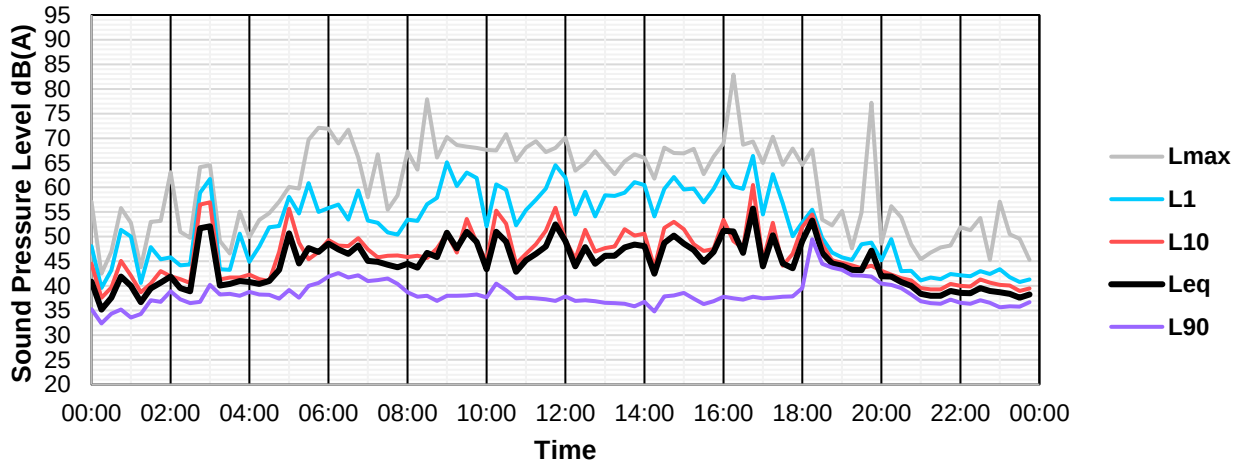
Thursday 17 September 2020



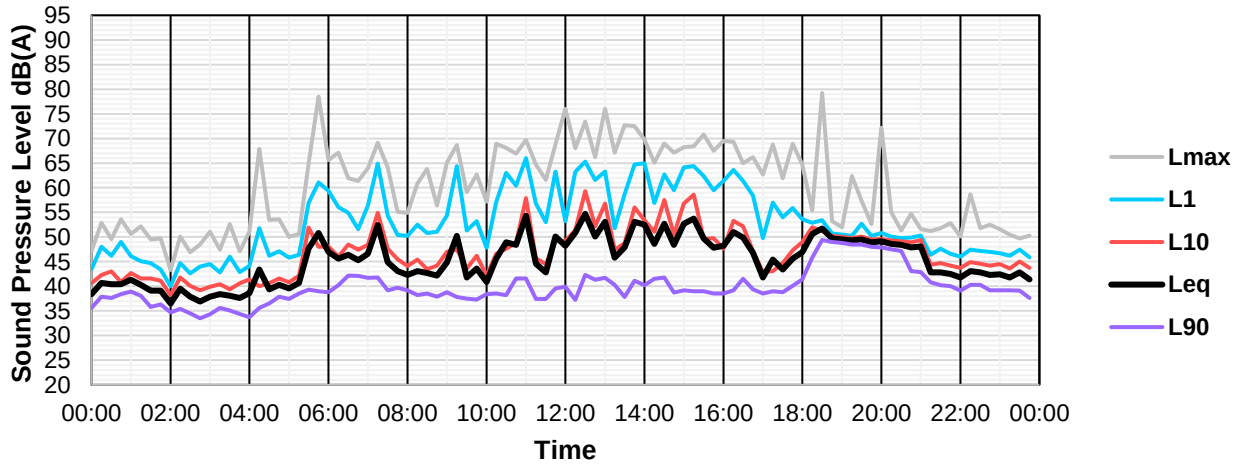
Friday 18 September 2020



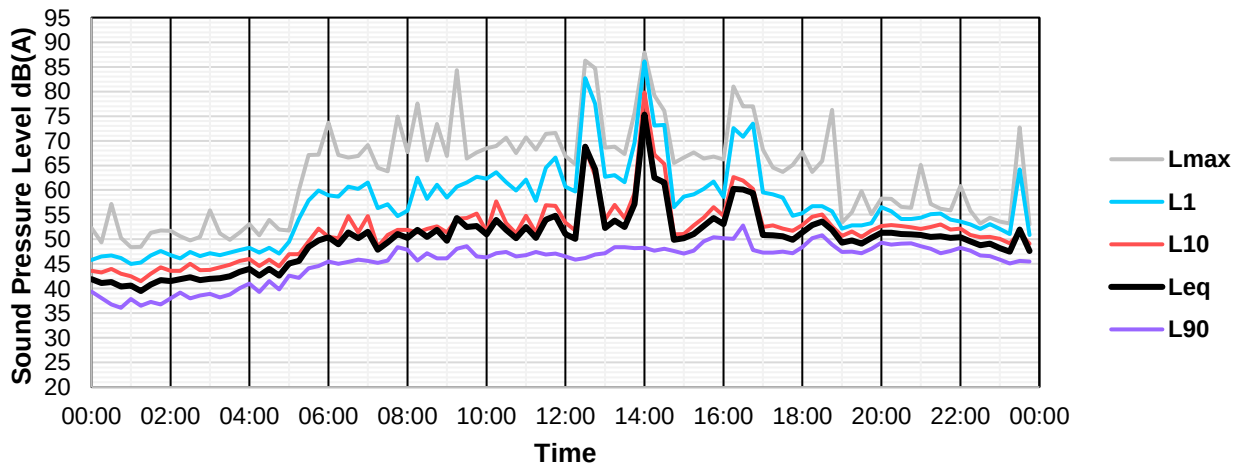
Unattended Noise Measurements
Saturday 19 September 2020



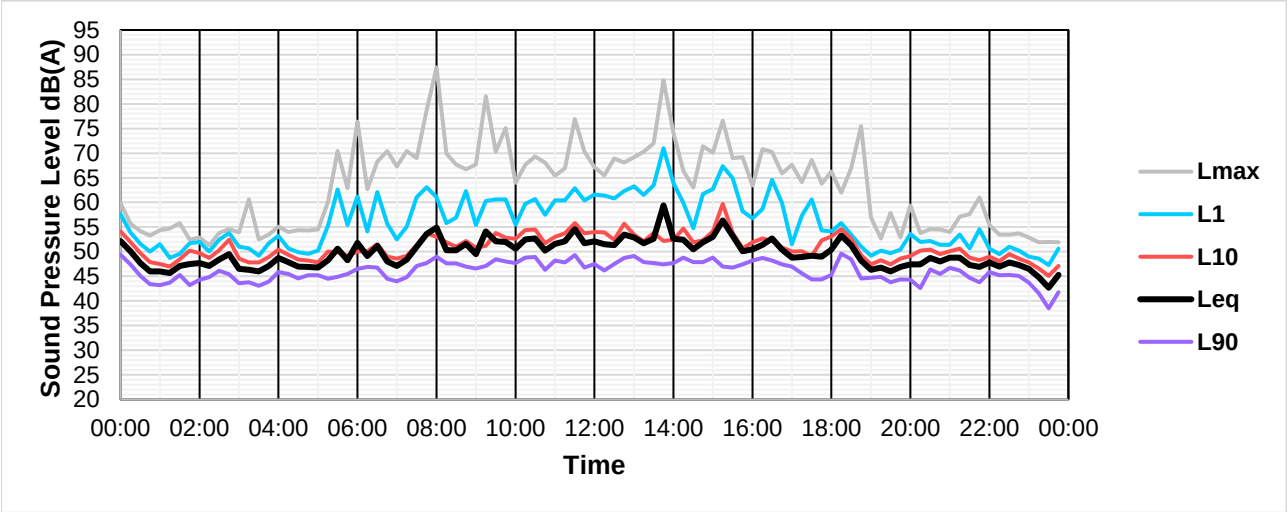
Sunday 20 September 2020



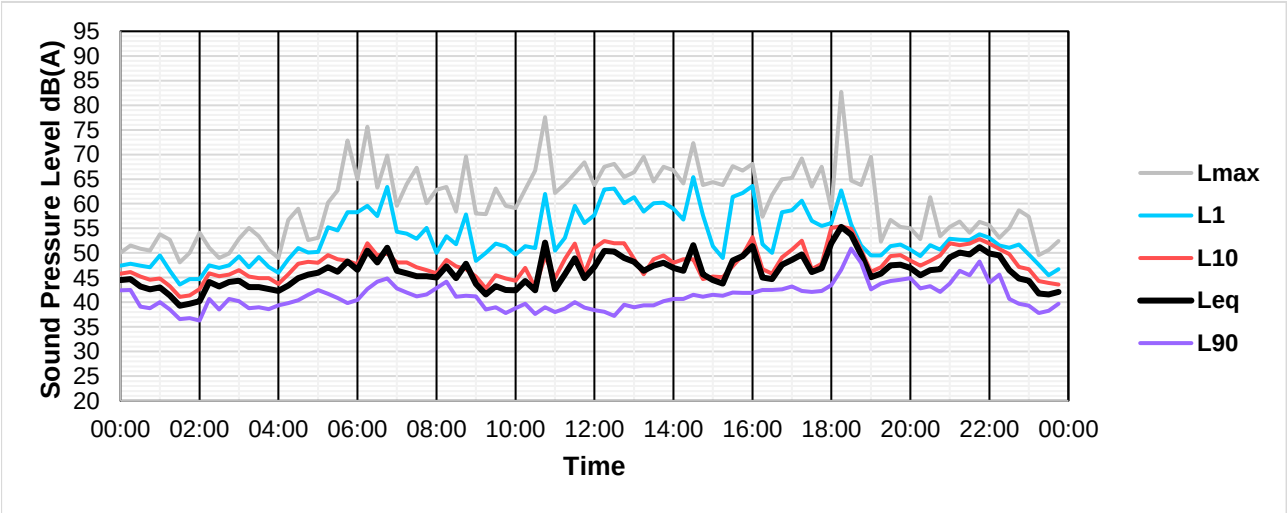
Monday 21 September 2020



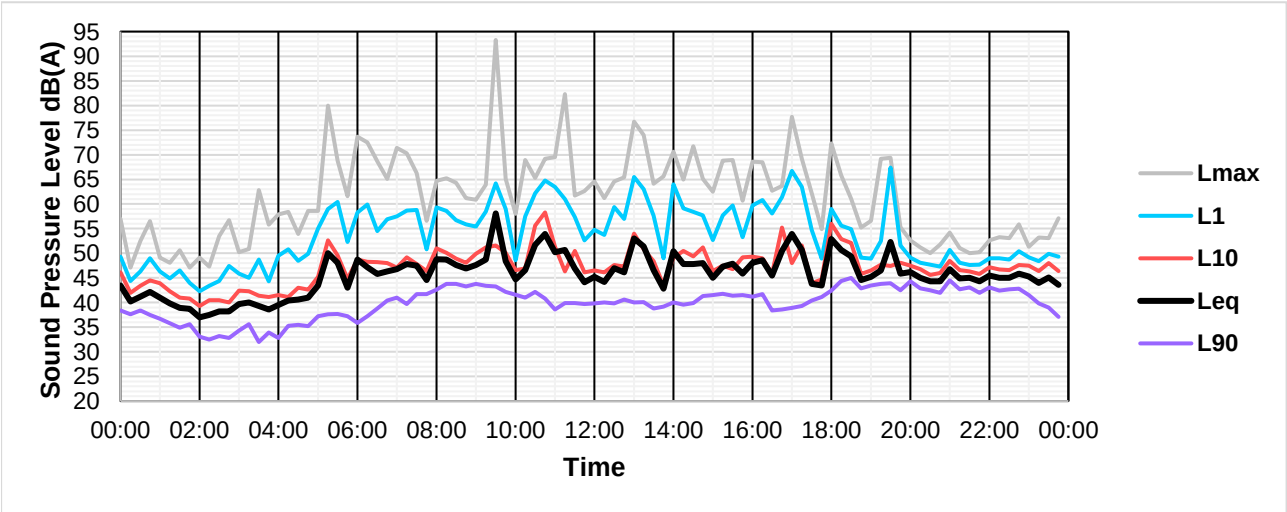
Unattended Noise Measurements
Tuesday 22 September 2020



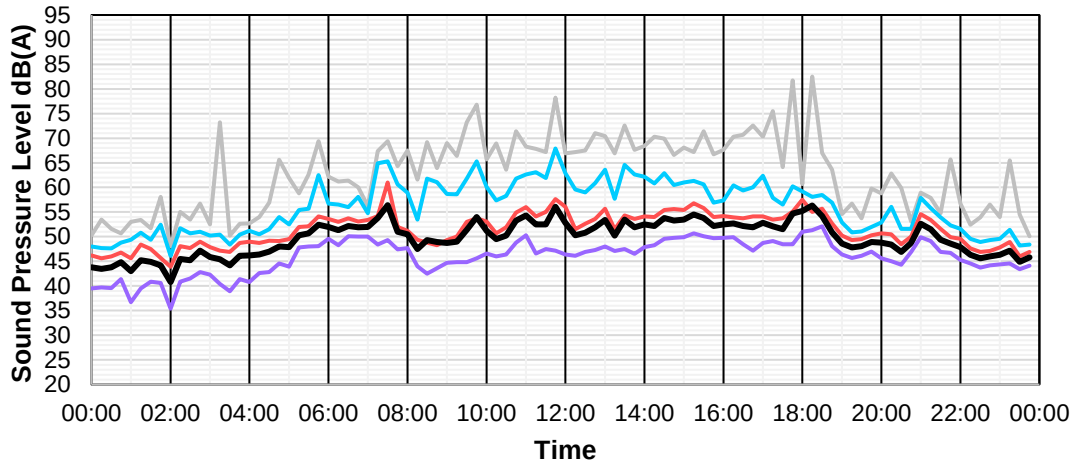
Wednesday 23 September 2020



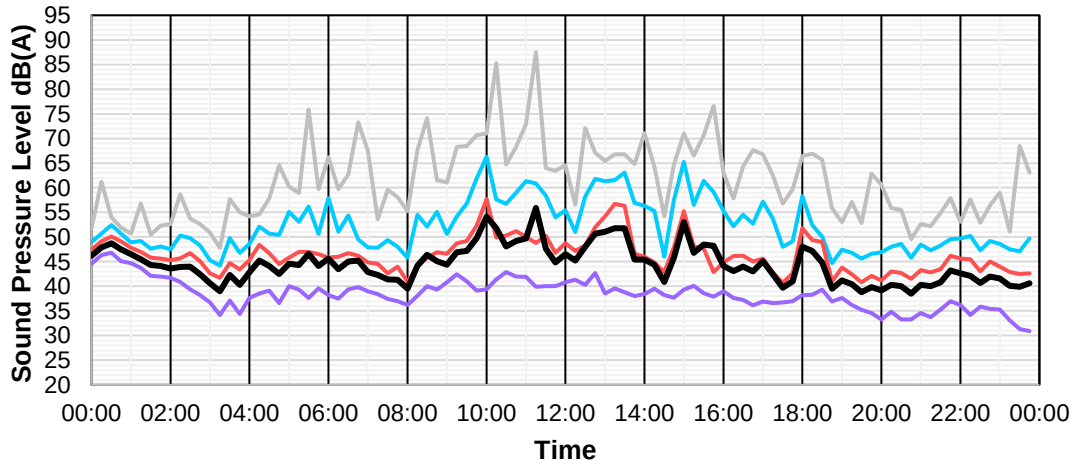
Thursday 24 September 2020



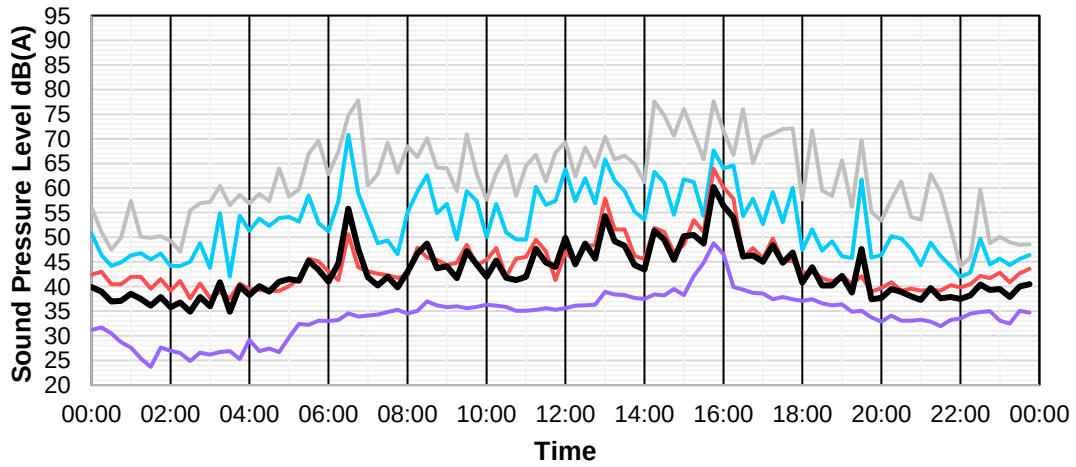
Unattended Noise Measurements
Friday 25 September 2020



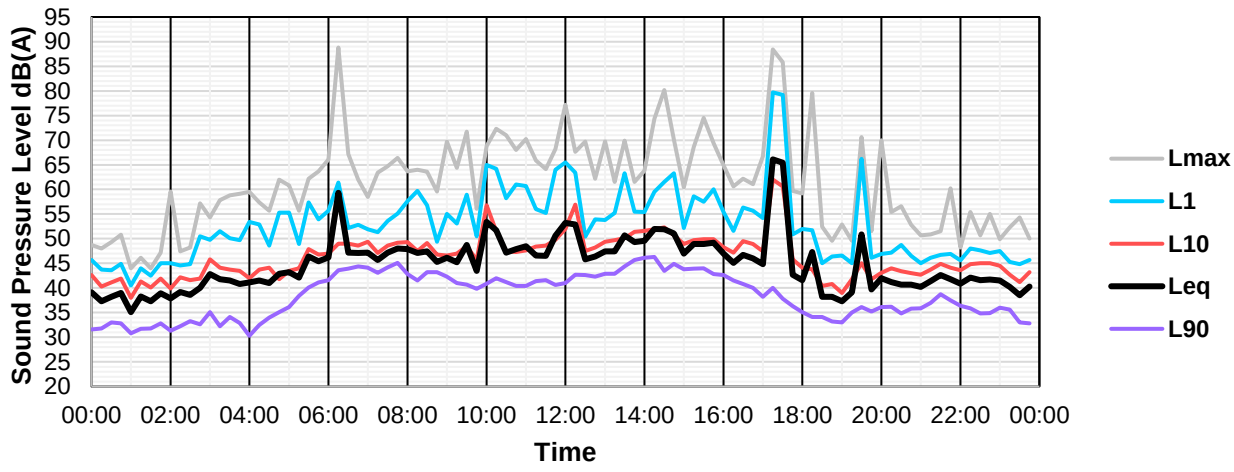
Saturday 26 September 2020



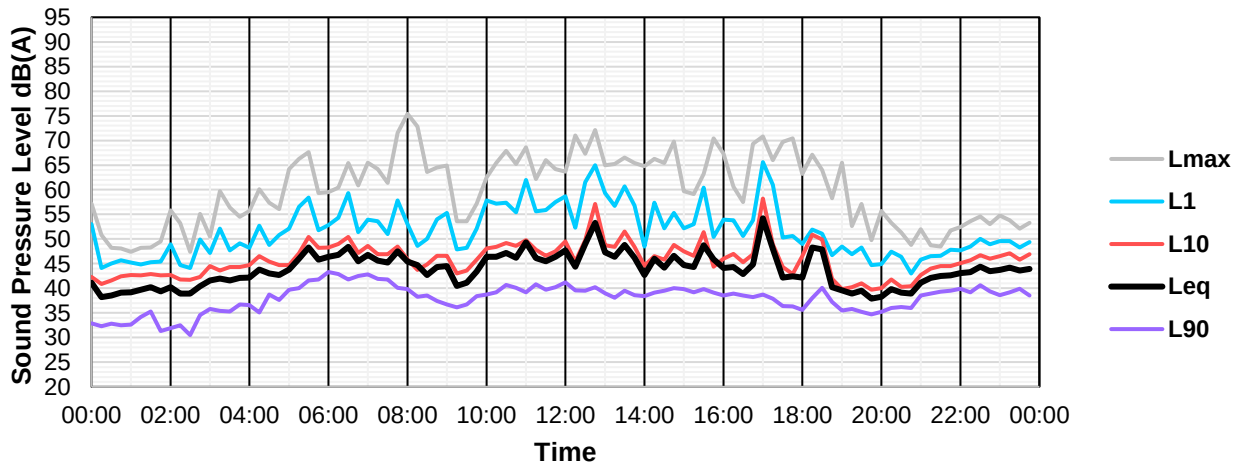
Sunday 27 September 2020



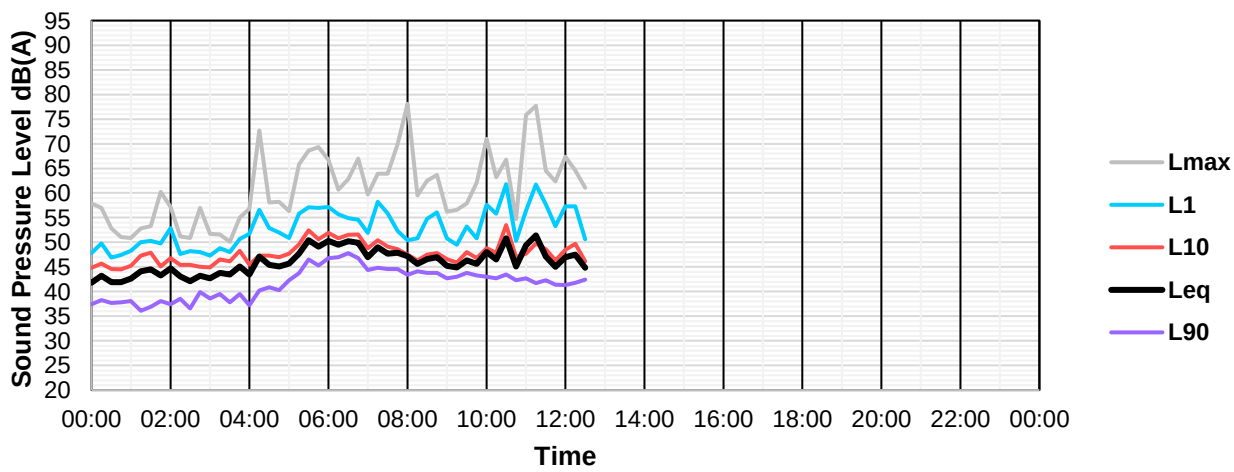
Unattended Noise Measurements
Monday 28 September 2020



Tuesday 29 September 2020



Wednesday 30 September 2020



Unattended Noise Measurements
Noise Logger Location 2 - Subject Site

Environmental Noise Levels Day, Evening and Night

Logger Location - South-eastern shoreline of lake on subject site

SVANTEK - 977A Class 1	Sound Level Meter
Logger Serial Number	81347
Measurement Title	Location 2
Measurement started at	16/09/2020 - 12:58:59
Measurement stopped at	30/09/2020 - 13:23:41
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

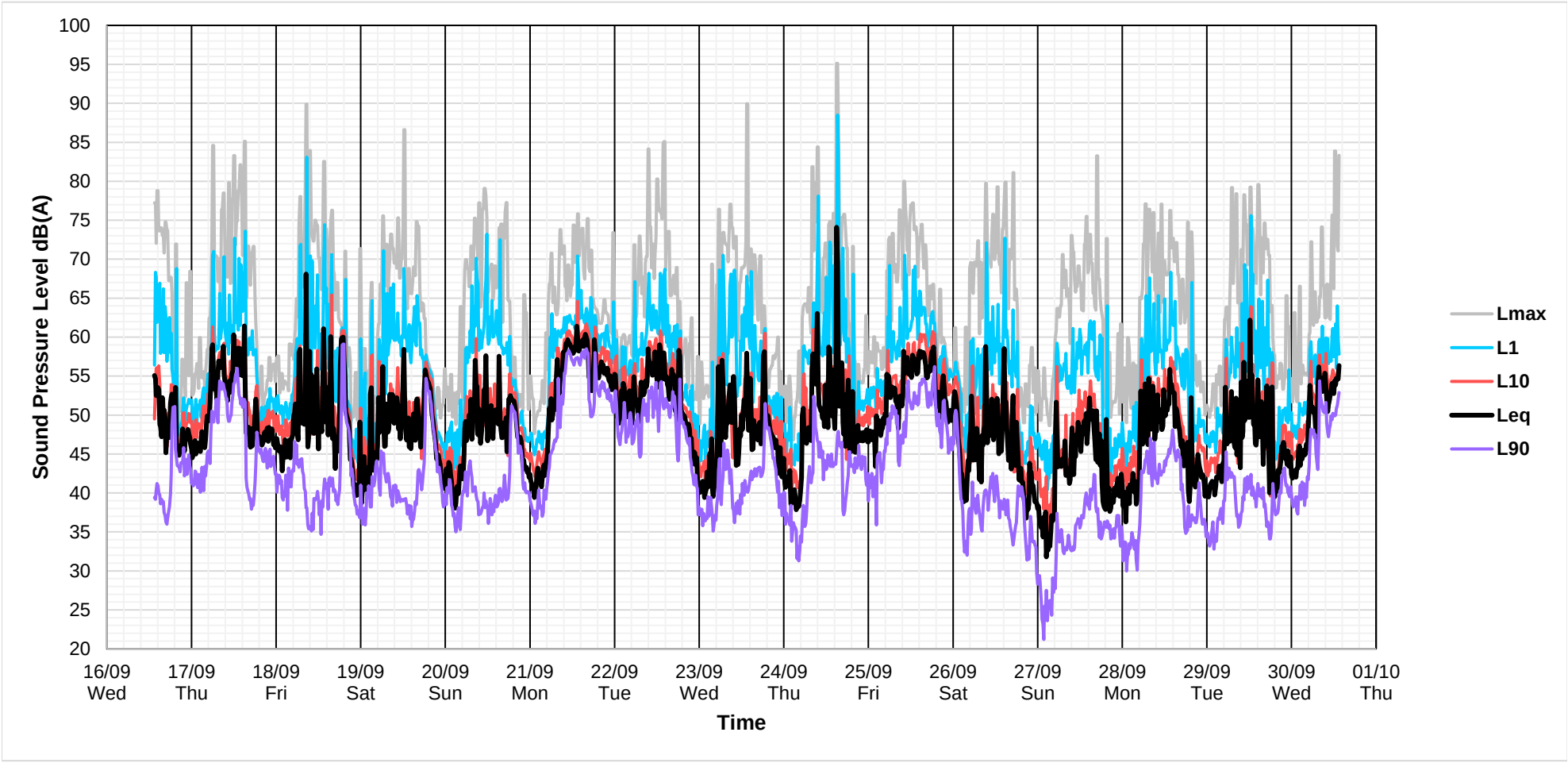
Data excluded due to meteorological effects or extraneous noise

Data excluded due to missing meteorological data

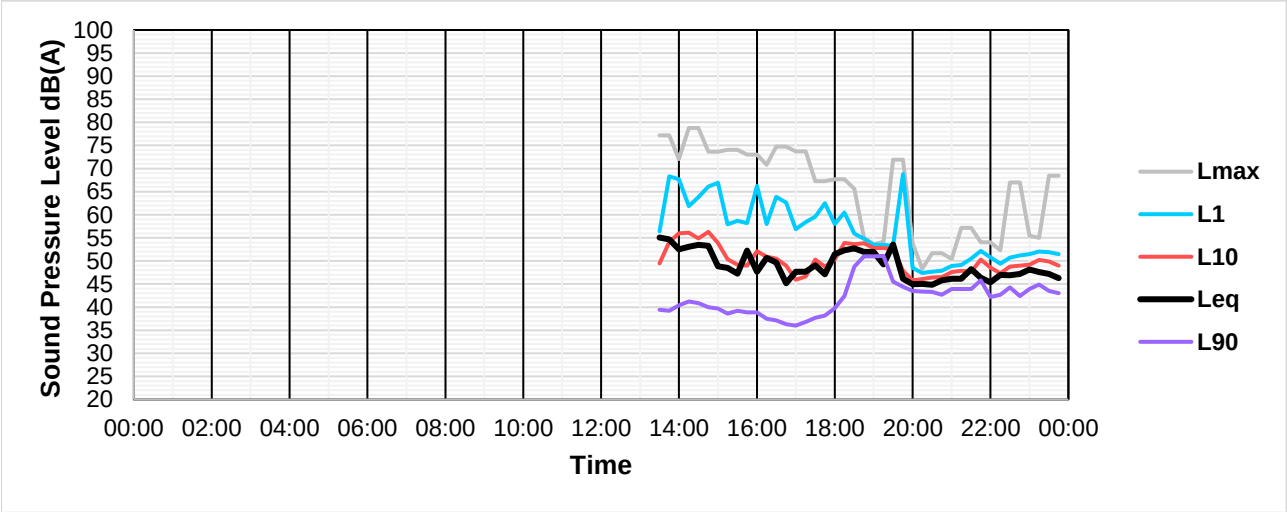
Data excluded due to dredging operations

		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Levels, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
16/09/2020	Wednesday	—	49	48	—	53	53	—	50	51	—	45	44	—	42	41
17/09/2020	Thursday	54	48	47	62	52	53	55	50	49	49	45	43	39	43	40
18/09/2020	Friday	51	51	45	62	55	51	52	53	47	39	49	40	36	42	37
19/09/2020	Saturday	49	51	43	60	54	48	51	53	44	40	49	39	37	44	36
20/09/2020	Sunday	50	50	44	62	53	49	51	51	46	39	47	40	38	43	37
21/09/2020	Monday	57	56	52	62	60	57	59	58	54	55	53	49	48	52	47
22/09/2020	Tuesday	55	50	44	61	54	50	56	52	46	51	48	39	48	44	36
23/09/2020	Wednesday	49	50	43	60	53	49	50	51	45	41	46	37	38	43	33
24/09/2020	Thursday	53	48	49	63	54	54	54	49	51	44	44	44	40	42	41
25/09/2020	Friday	55	54	47	62	58	53	57	56	49	51	51	42	47	48	34
26/09/2020	Saturday	48	41	39	59	47	48	49	44	42	38	37	30	35	32	24
27/09/2020	Sunday	46	40	42	57	48	49	49	42	45	36	35	36	33	34	31
28/09/2020	Monday	50	43	43	59	51	50	52	44	46	44	37	37	41	35	34
29/09/2020	Tuesday	49	44	46	59	49	51	51	46	48	39	39	42	36	35	38
Average		**49**	**47**	**45**	**59**	**52**	**51**	**50**	**48**	**48**	**39**	**43**	**40**	—	—	—
											Rating Background Levels, dB(A)			**36**	**42**	**36**

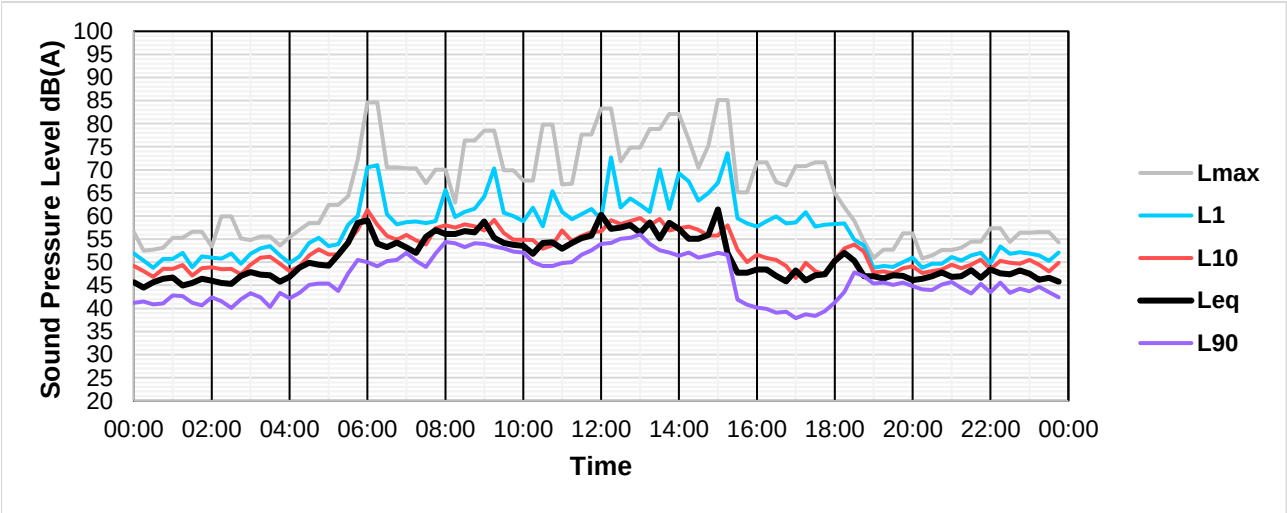
Unattended Noise Measurements
16 to 30 September 2020



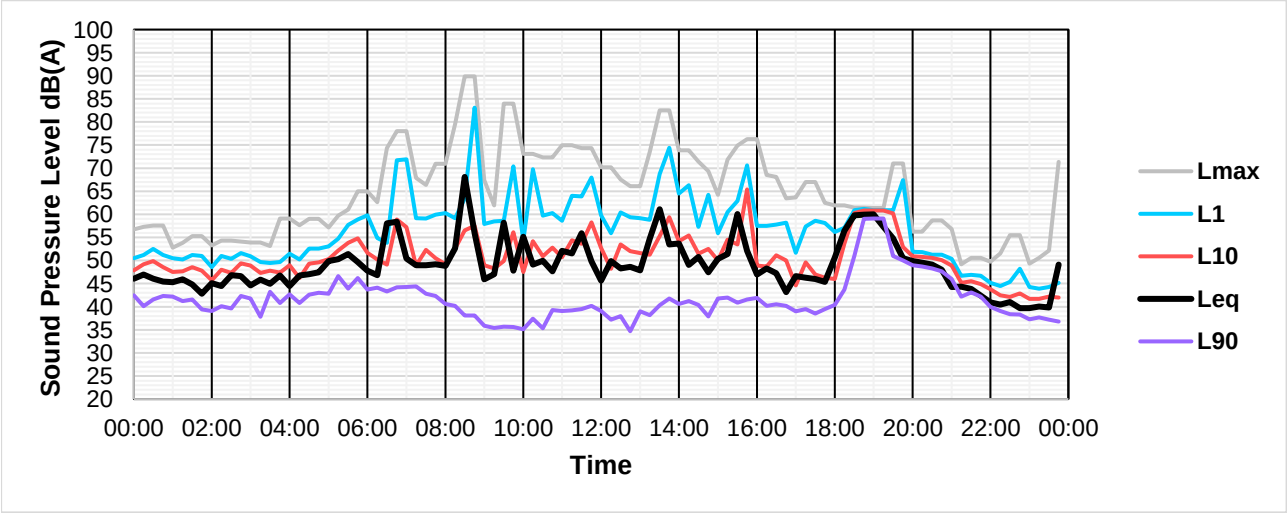
Unattended Noise Measurements
Wednesday 16 September 2020



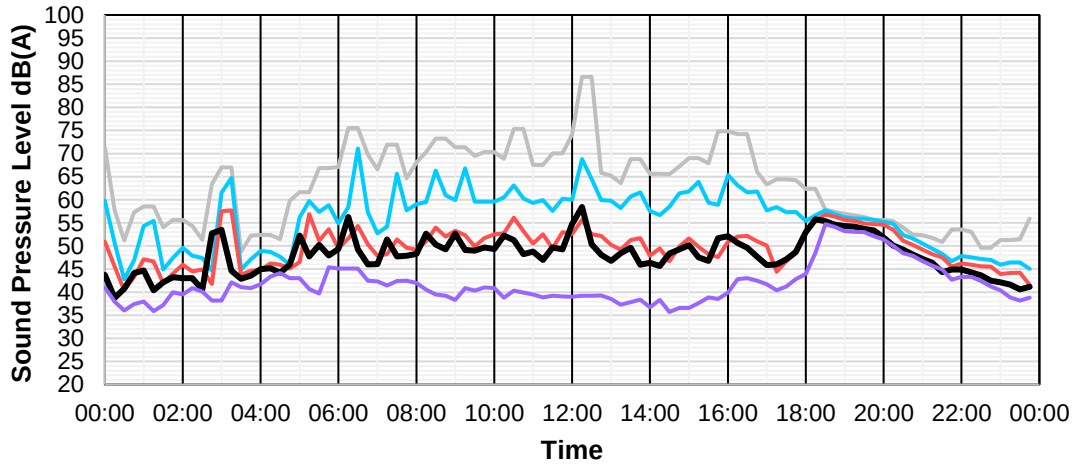
Thursday 17 September 2020



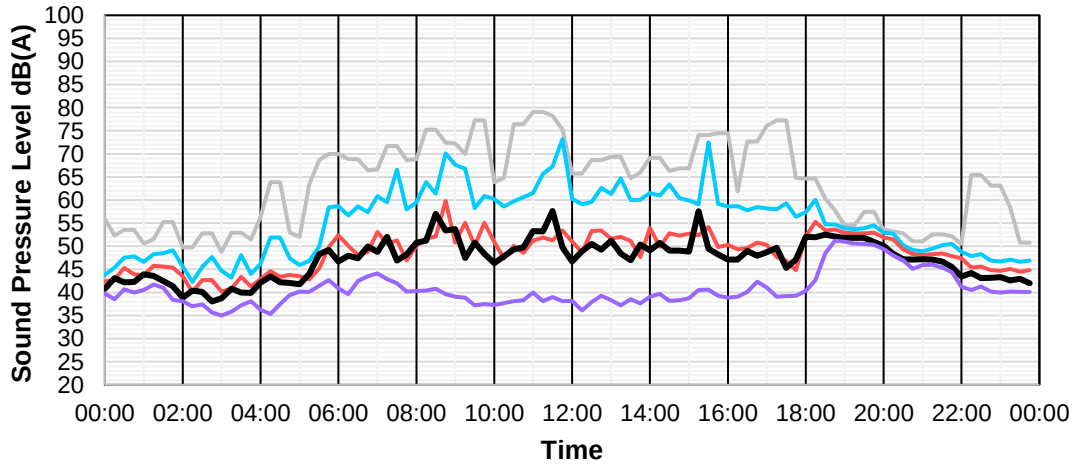
Friday 18 September 2020



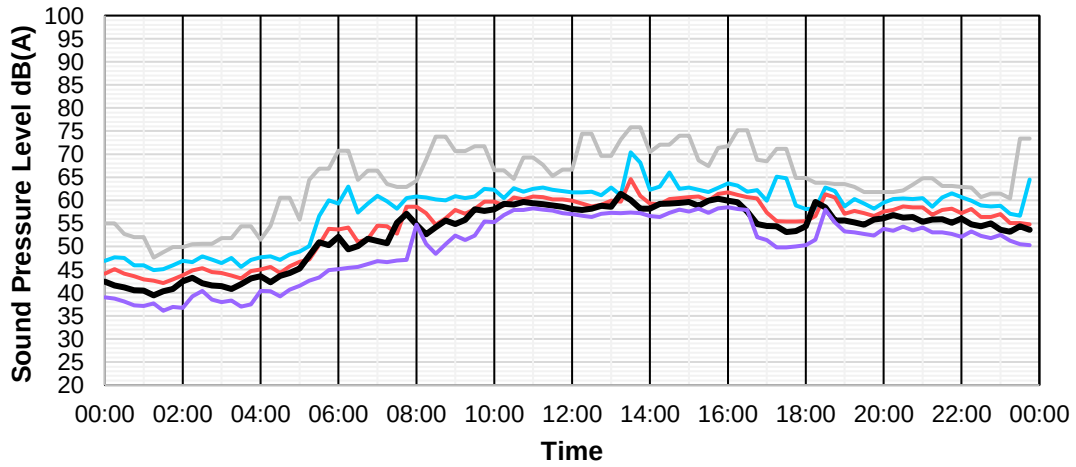
Unattended Noise Measurements
Saturday 19 September 2020



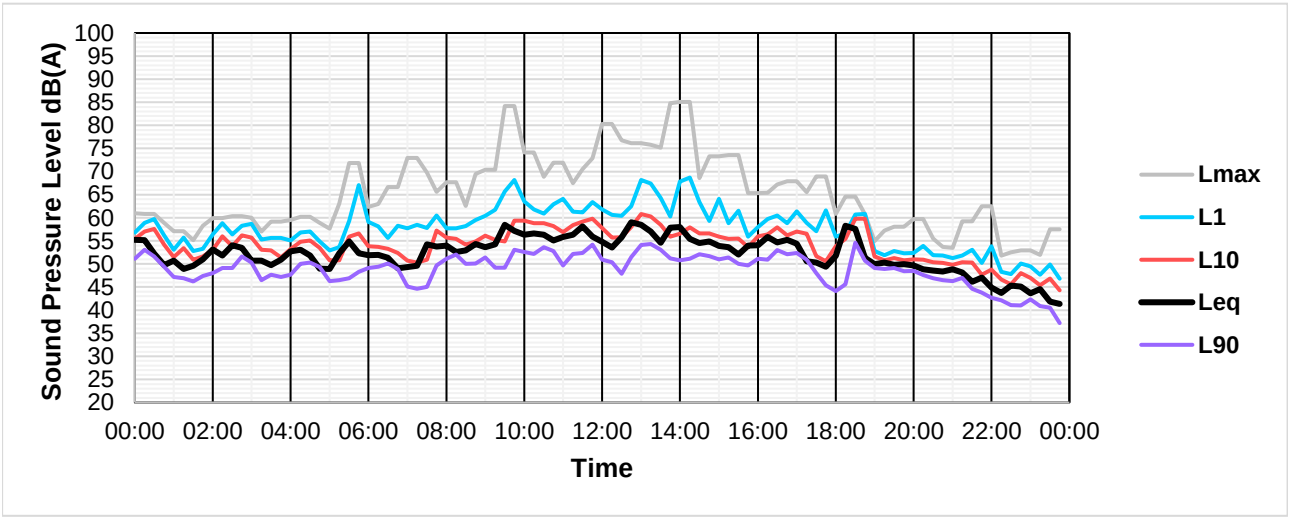
Sunday 20 September 2020



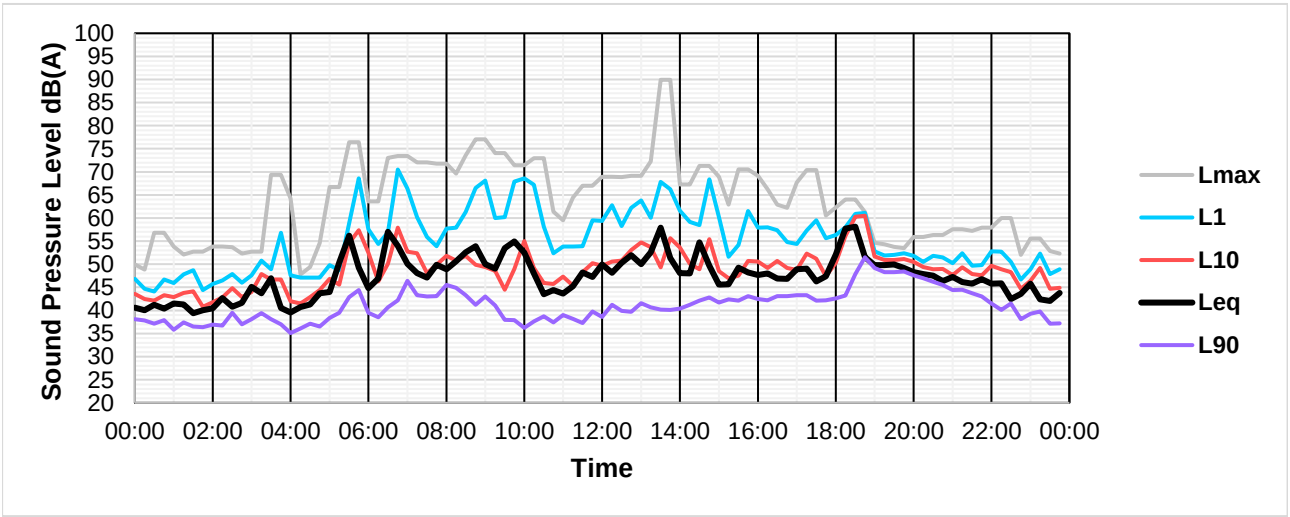
Monday 21 September 2020



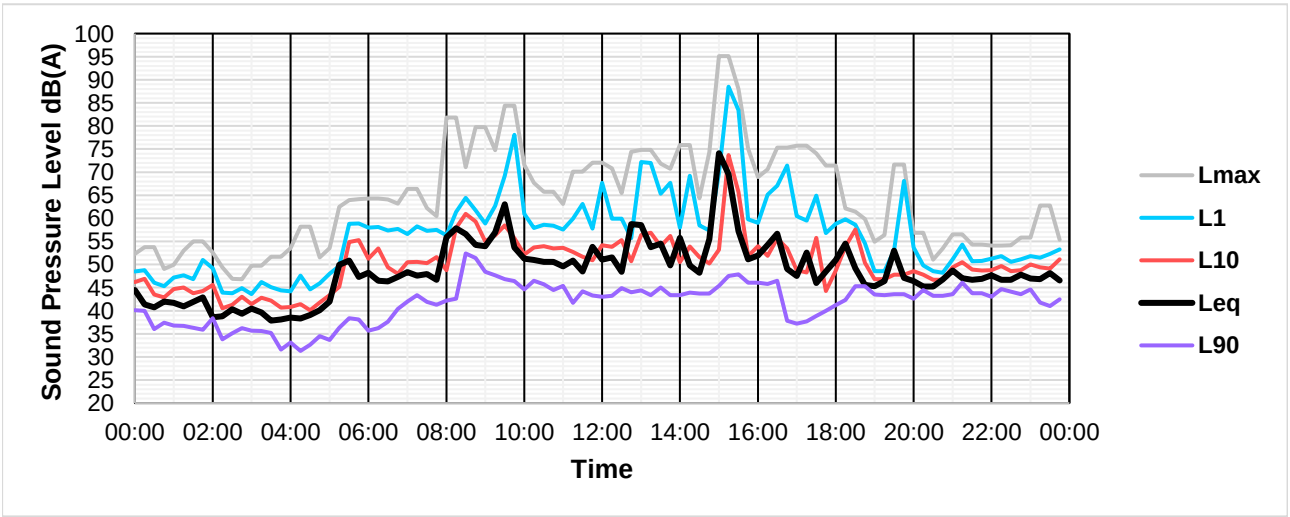
Unattended Noise Measurements
Tuesday 22 September 2020



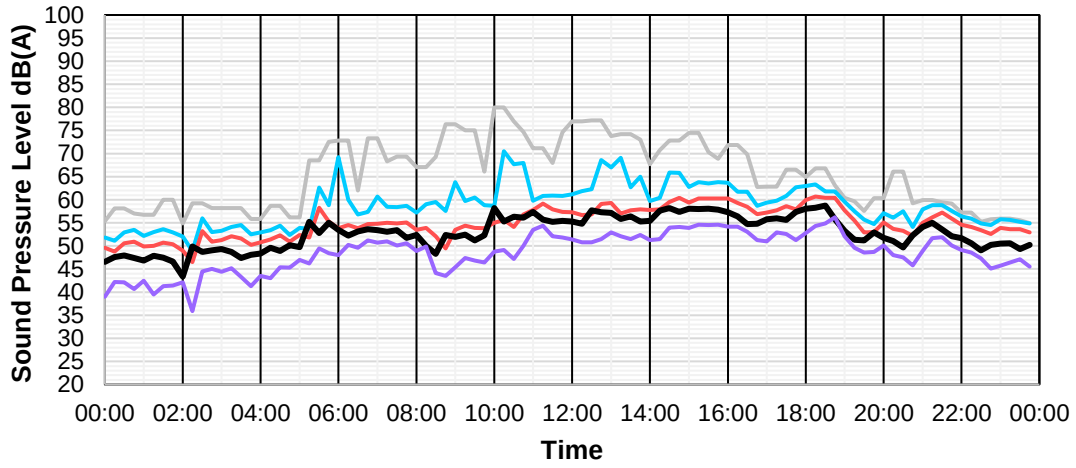
Wednesday 23 September 2020



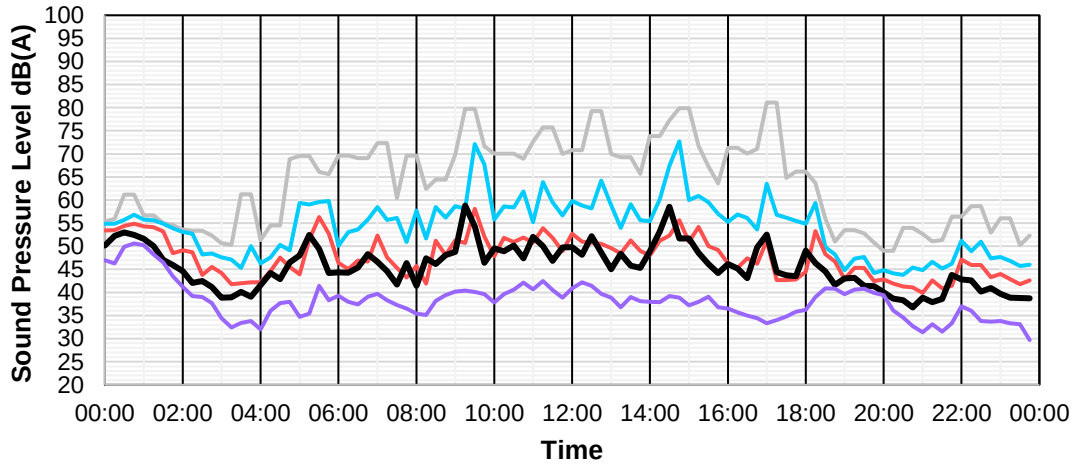
Thursday 24 September 2020



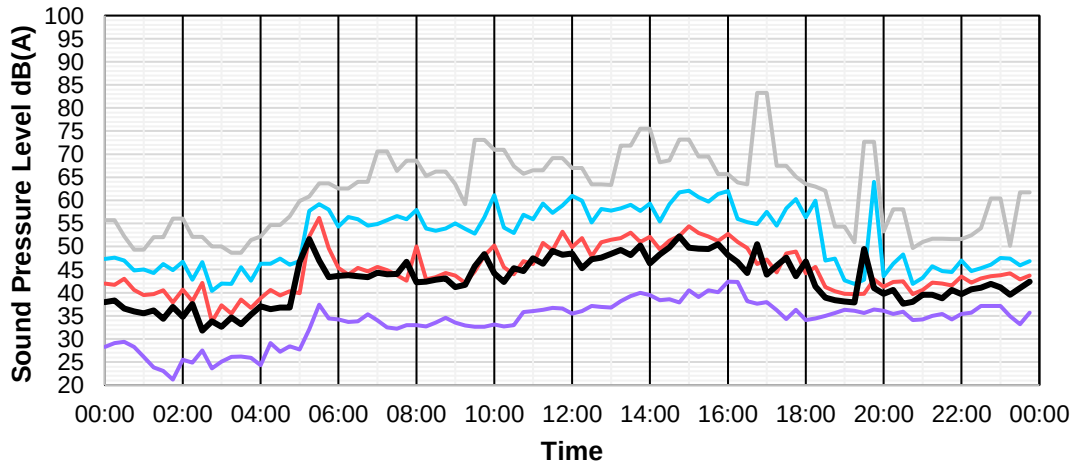
Unattended Noise Measurements
Friday 25 September 2020



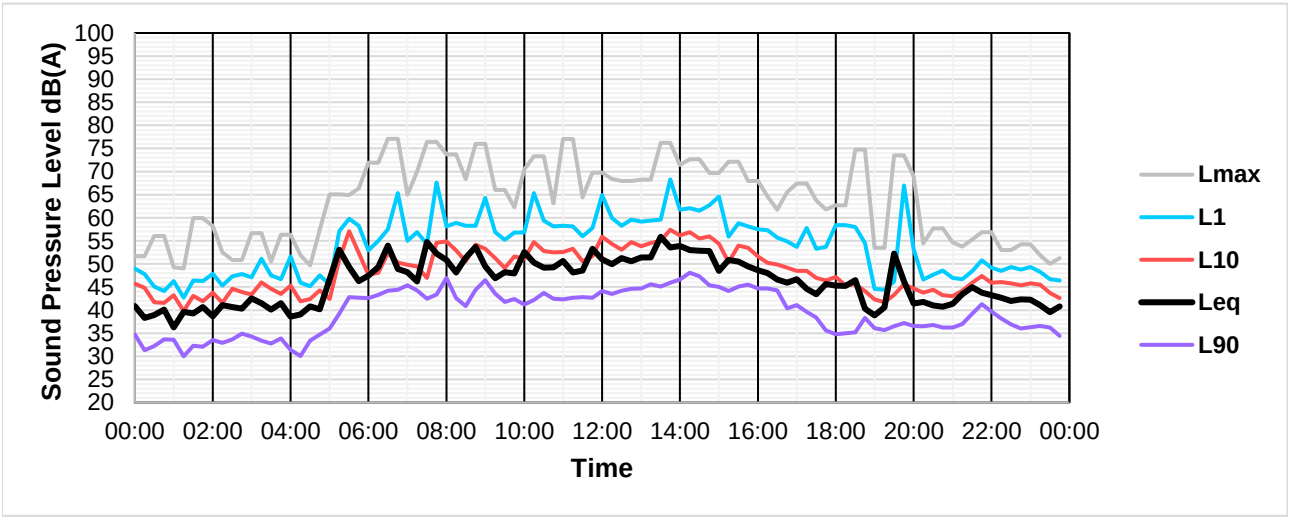
Saturday 26 September 2020



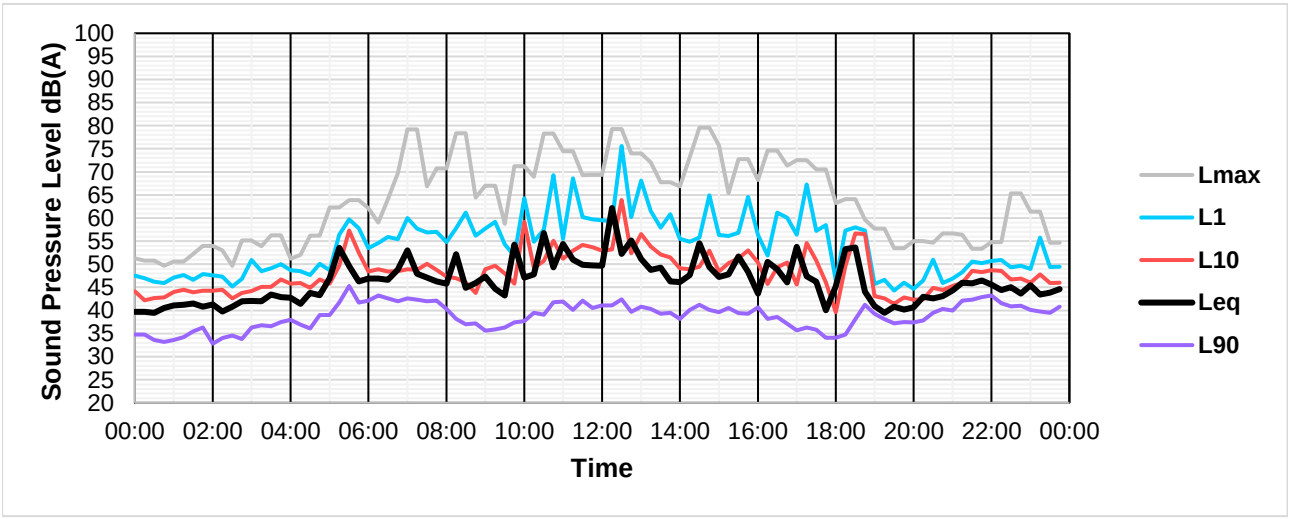
Sunday 27 September 2020



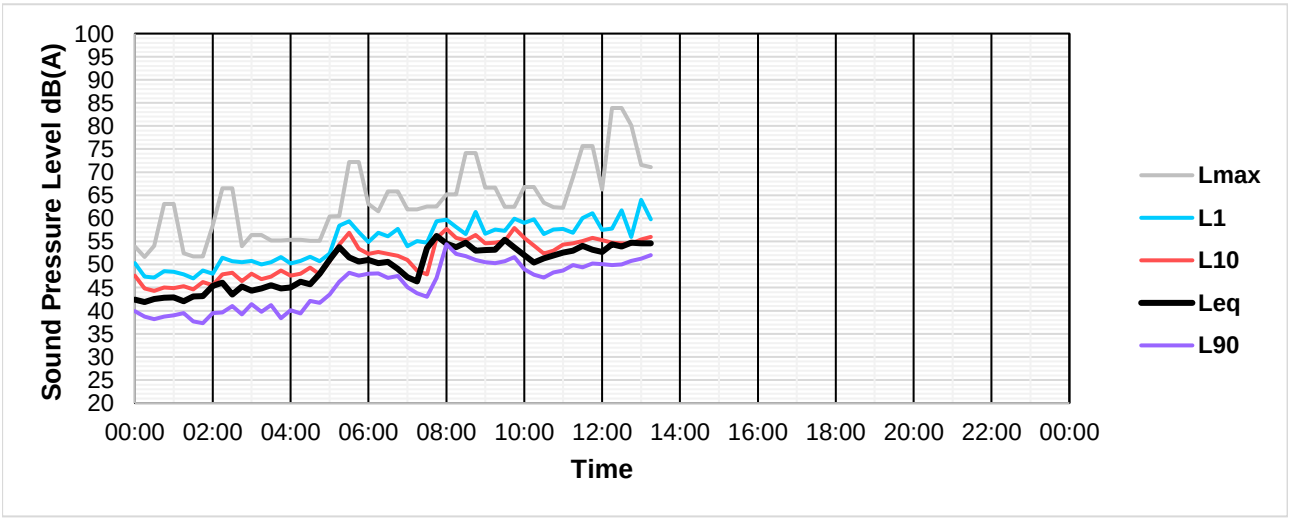
Unattended Noise Measurements
Monday 28 September 2020



Tuesday 29 September 2020



Wednesday 30 September 2020



Unattended Noise Measurements
Noise Logger Location 3 - 139 Pacific Motorway, Chinderah

Environmental Noise Levels Day, Evening and Night

Logger Location - South-west of existing dwelling on allotment

ARL Environmental Noise Logger	
Logger Serial Number	16-707-017
Measurement Title	Location 3
Measurement started at	16/09/2020 - 14:23:48
Measurement stopped at	30/09/2020 - 14:20:00
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

Data excluded due to meteorological effects or extraneous noise

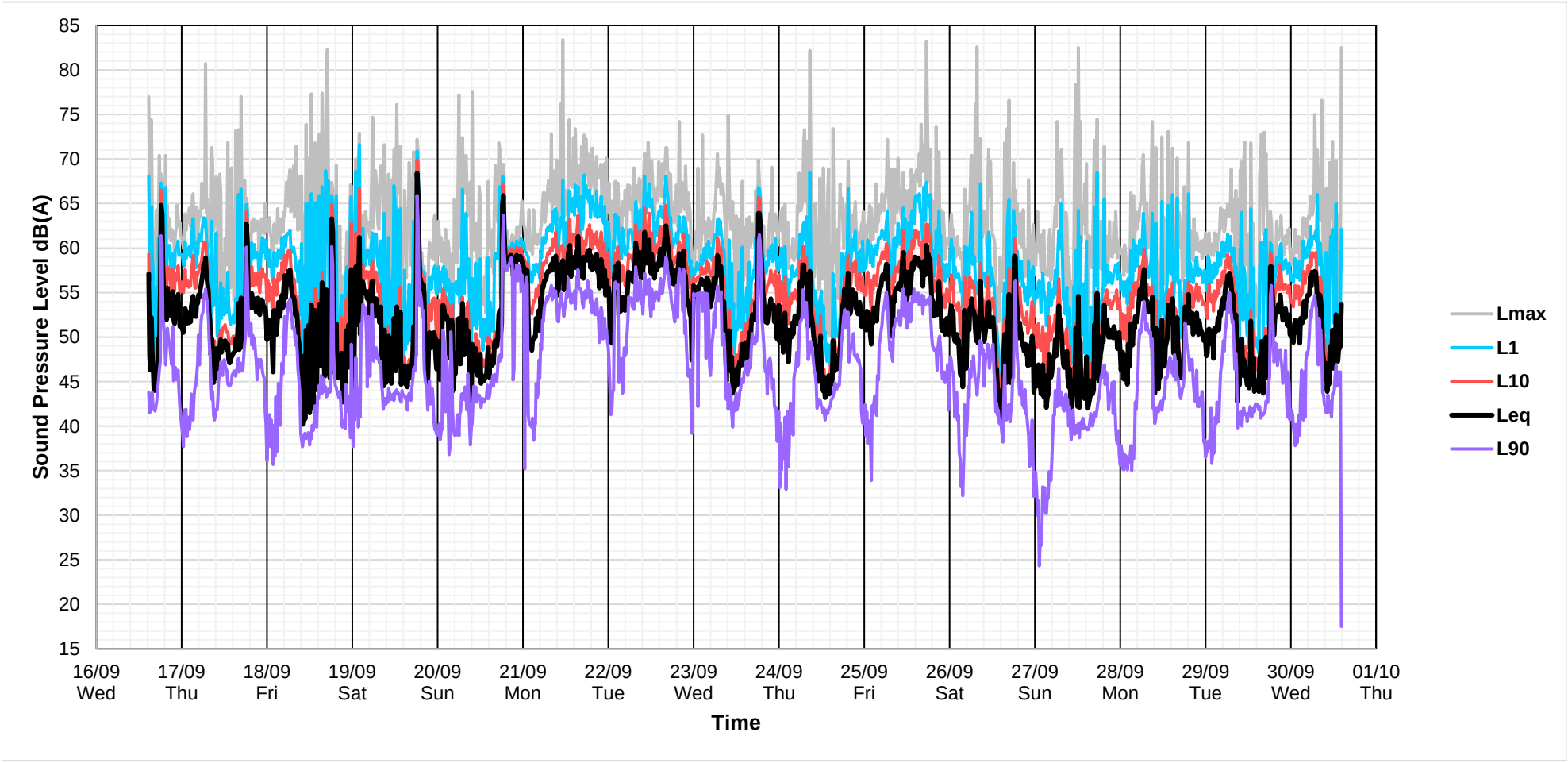
Data excluded due to missing meteorological data

Data excluded due to dredging

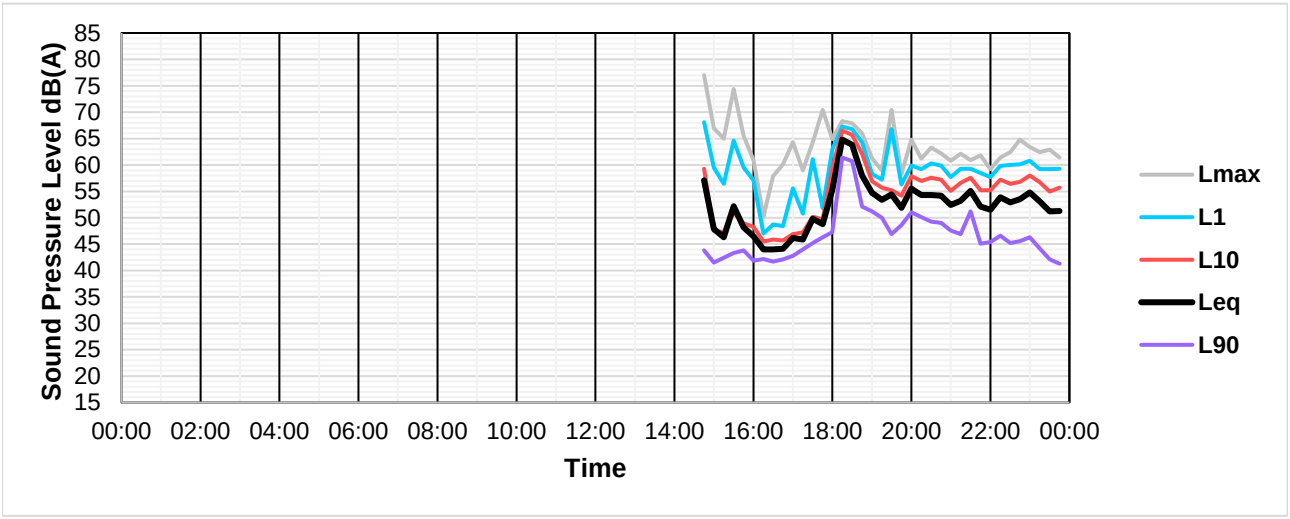
		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Levels, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
16/09/2020	Wednesday	—	55	54	—	61	60	—	58	57	—	51	45	—	47	40
17/09/2020	Thursday	49	55	53	55	60	59	51	57	57	46	50	44	42	47	37
18/09/2020	Friday	49	49	53	57	54	60	50	51	56	43	45	46	39	40	40
19/09/2020	Saturday	48	55	49	55	58	56	49	57	52	44	51	42	43	44	39
20/09/2020	Sunday	48	59	55	55	61	59	49	60	57	44	56	49	42	46	40
21/09/2020	Monday	58	58	55	64	65	61	60	61	58	55	54	50	53	52	44
22/09/2020	Tuesday	59	57	55	64	62	59	61	59	57	55	54	51	53	52	44
23/09/2020	Wednesday	50	56	52	56	61	58	51	59	55	46	51	43	42	46	35
24/09/2020	Thursday	49	54	54	54	60	60	50	57	57	45	50	45	42	48	40
25/09/2020	Friday	56	55	51	62	61	58	59	58	54	53	50	43	50	47	36
26/09/2020	Saturday	49	52	47	55	58	55	51	55	51	45	46	35	41	41	29
27/09/2020	Sunday	46	50	51	54	56	58	48	53	54	41	45	41	39	43	35
28/09/2020	Monday	50	52	52	56	58	58	52	55	55	46	47	43	42	43	37
29/09/2020	Tuesday	48	53	53	55	58	59	49	56	56	43	49	45	41	46	39
Average		**48**	**54**	**52**	**55**	**59**	**59**	**50**	**57**	**55**	**44**	**50**	**44**	—	—	—

Rating Background Levels, dB(A)	**41**	**46**	**39**

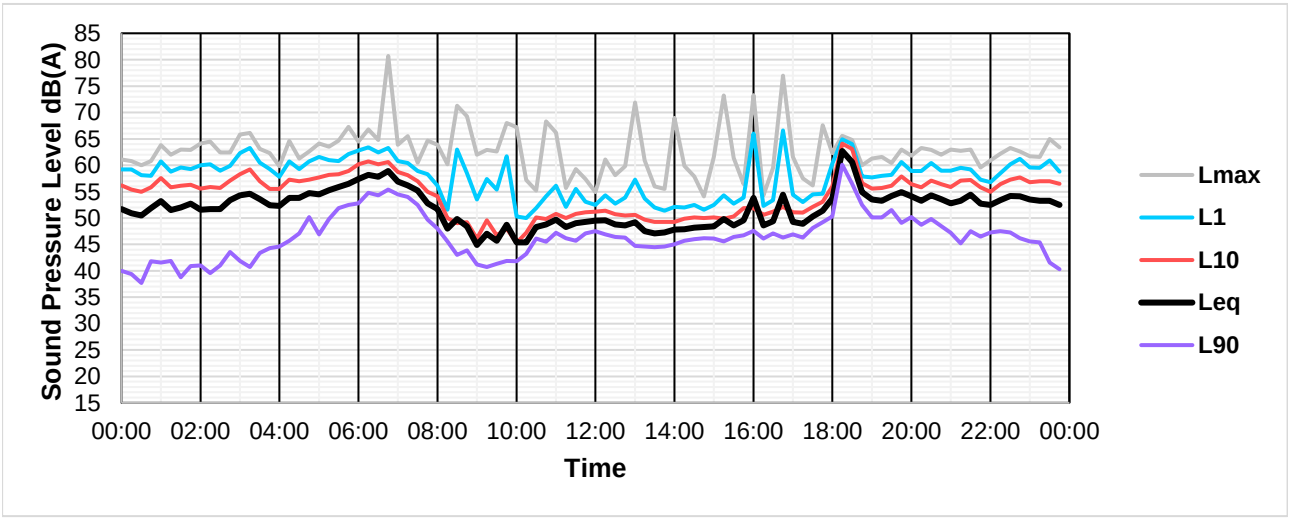
Unattended Noise Measurements
16 to 30 September 2020



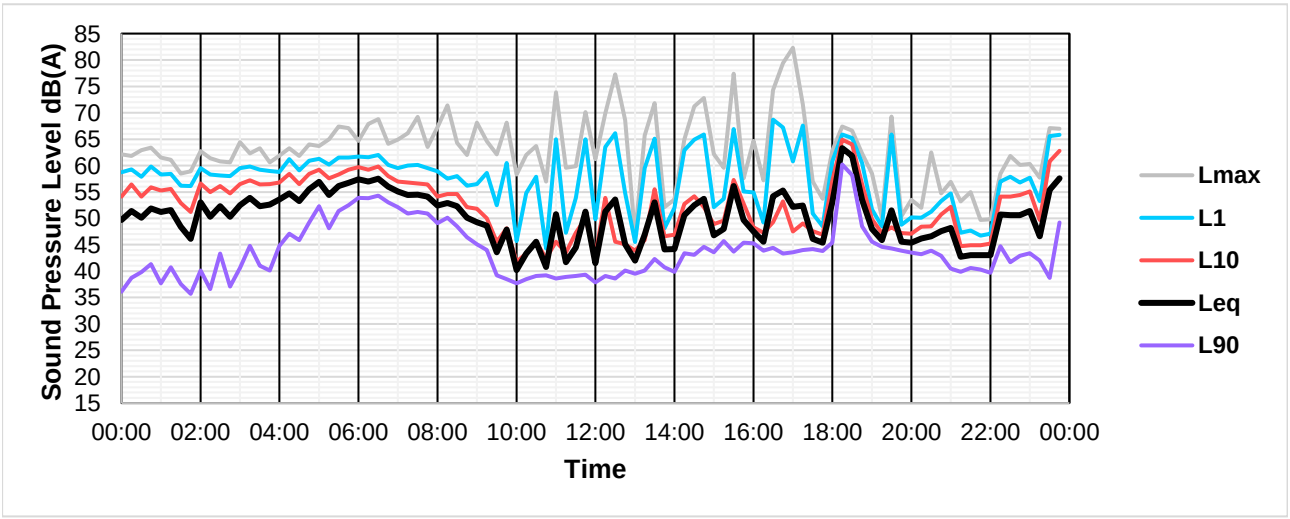
Unattended Noise Measurements
Wednesday 16 September 2020



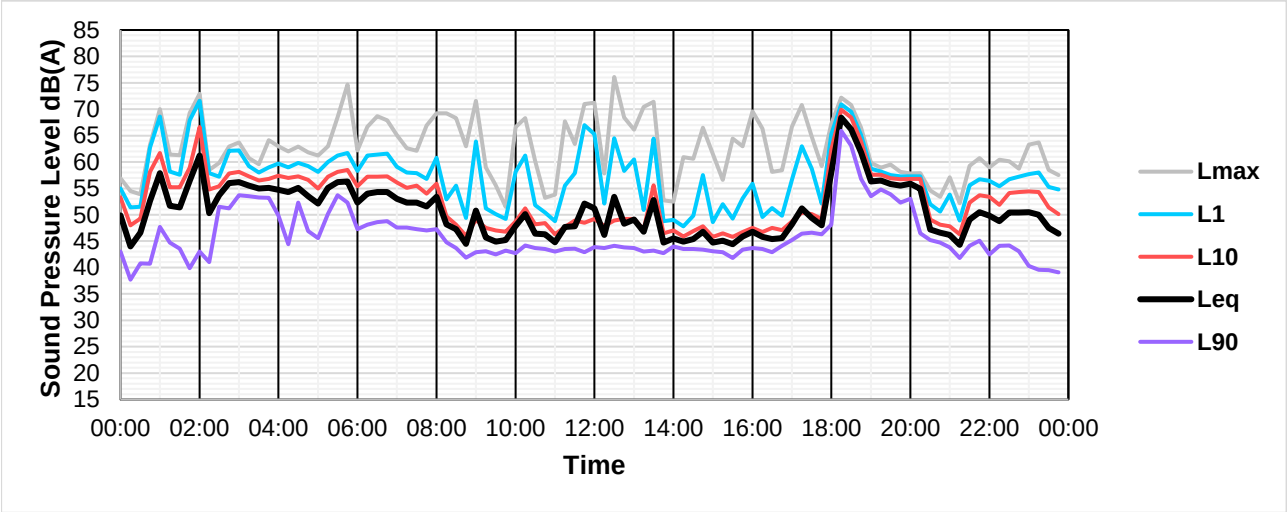
Thursday 17 September 2020



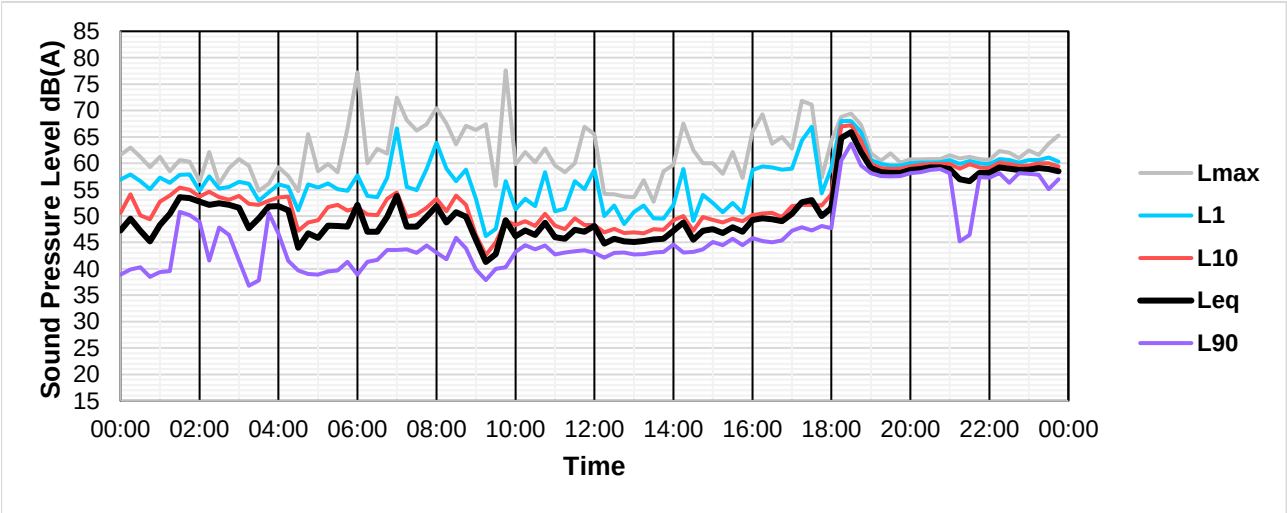
Friday 18 September 2020



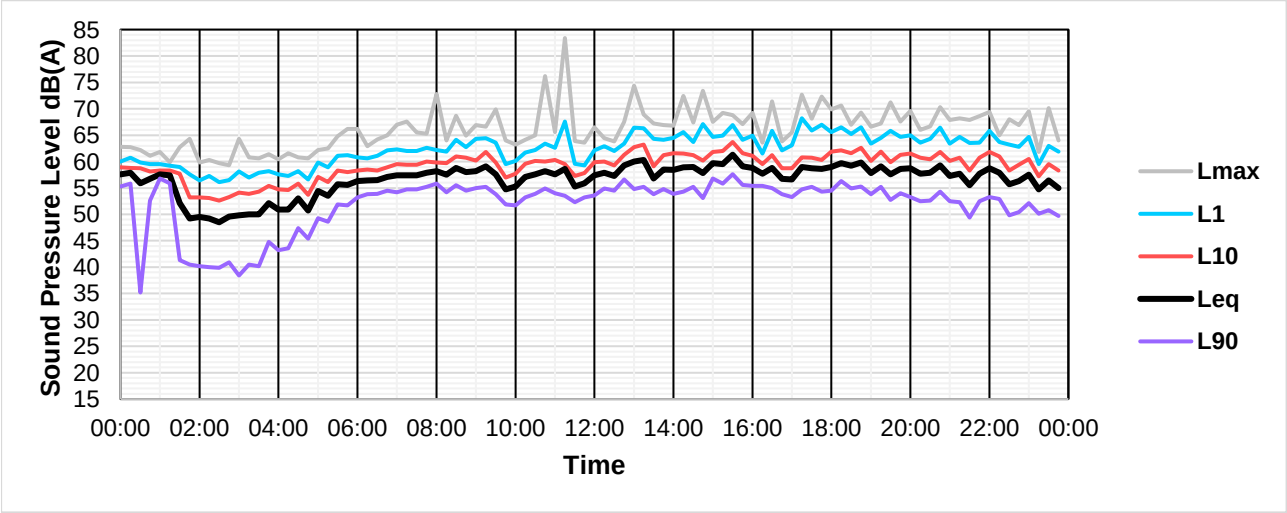
Unattended Noise Measurements
Saturday 19 September 2020



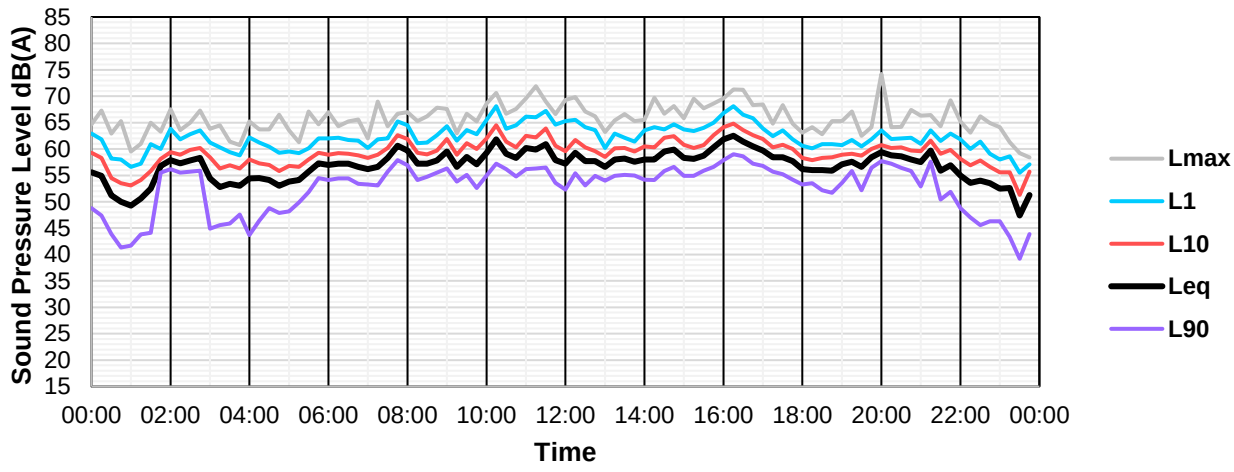
Sunday 20 September 2020



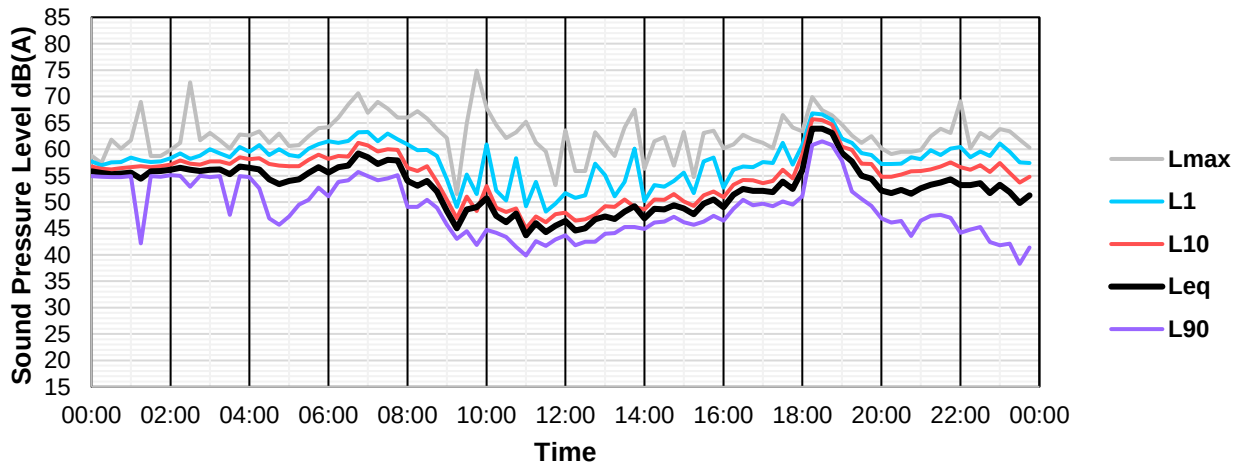
Monday 21 September 2020



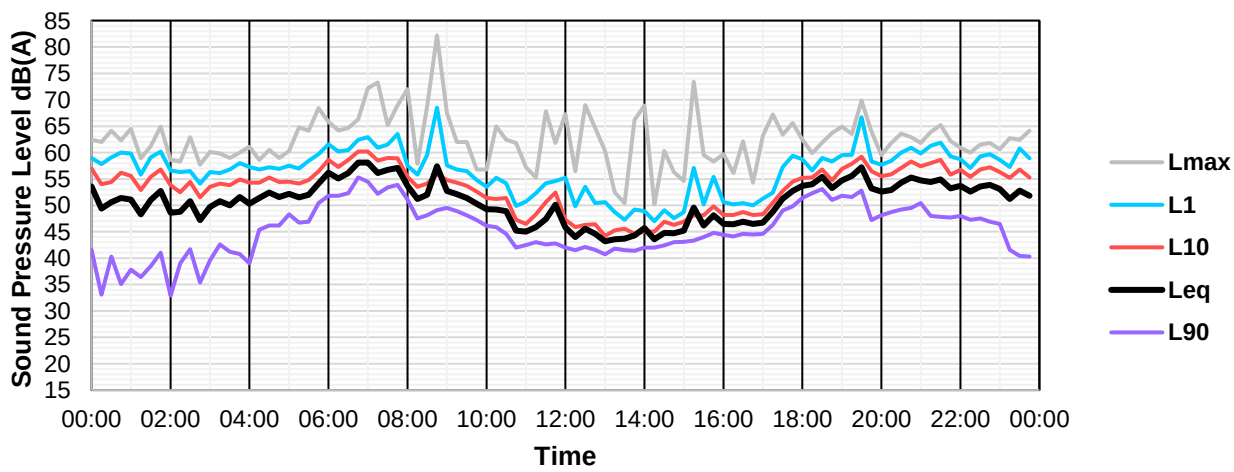
Unattended Noise Measurements
Tuesday 22 September 2020



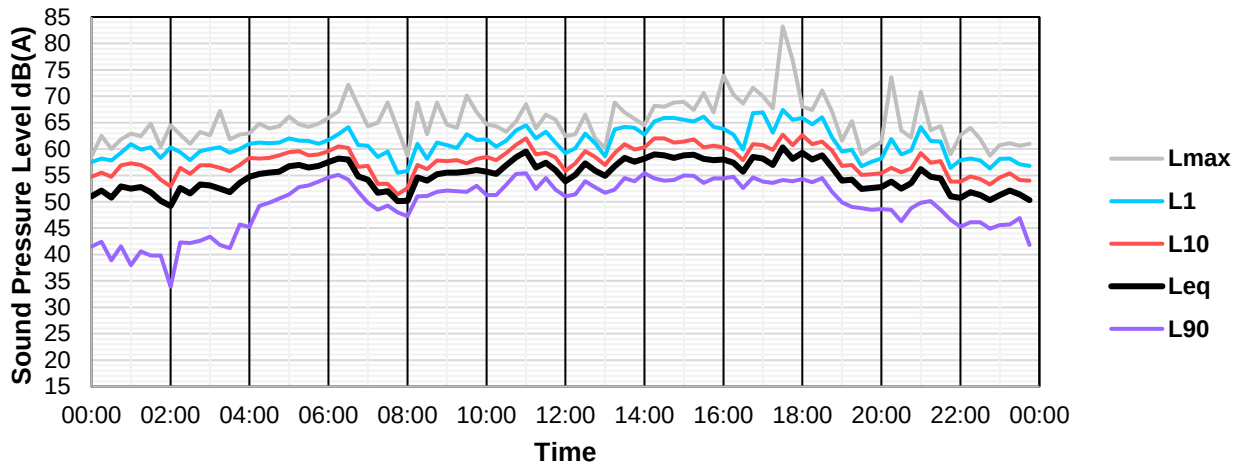
Wednesday 23 September 2020



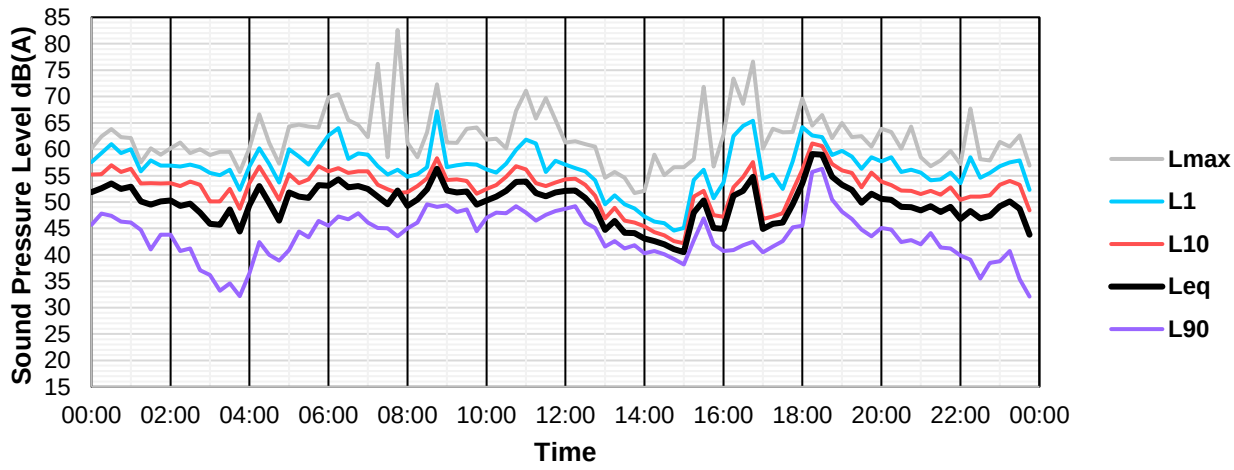
Thursday 24 September 2020



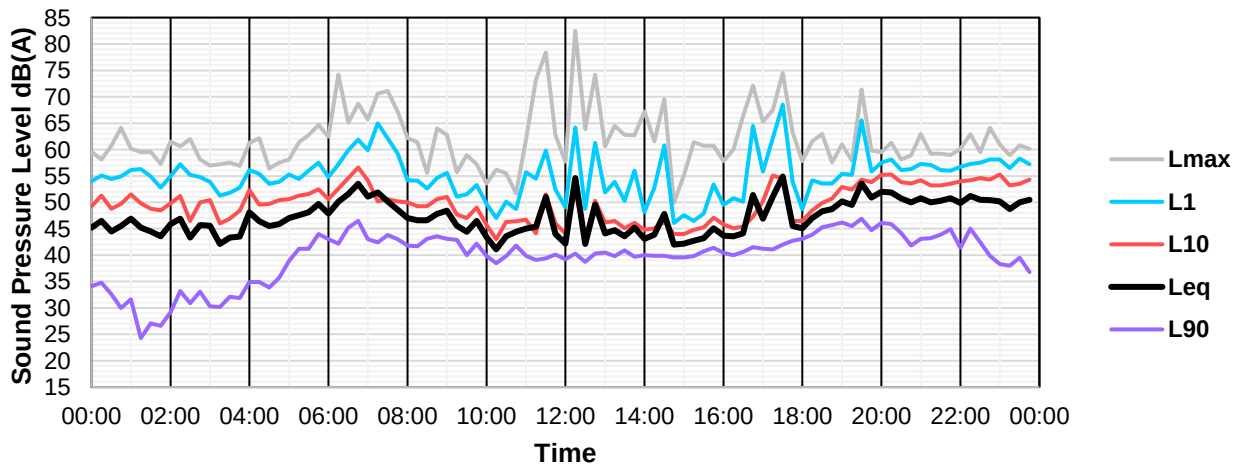
Unattended Noise Measurements
Friday 25 September 2020



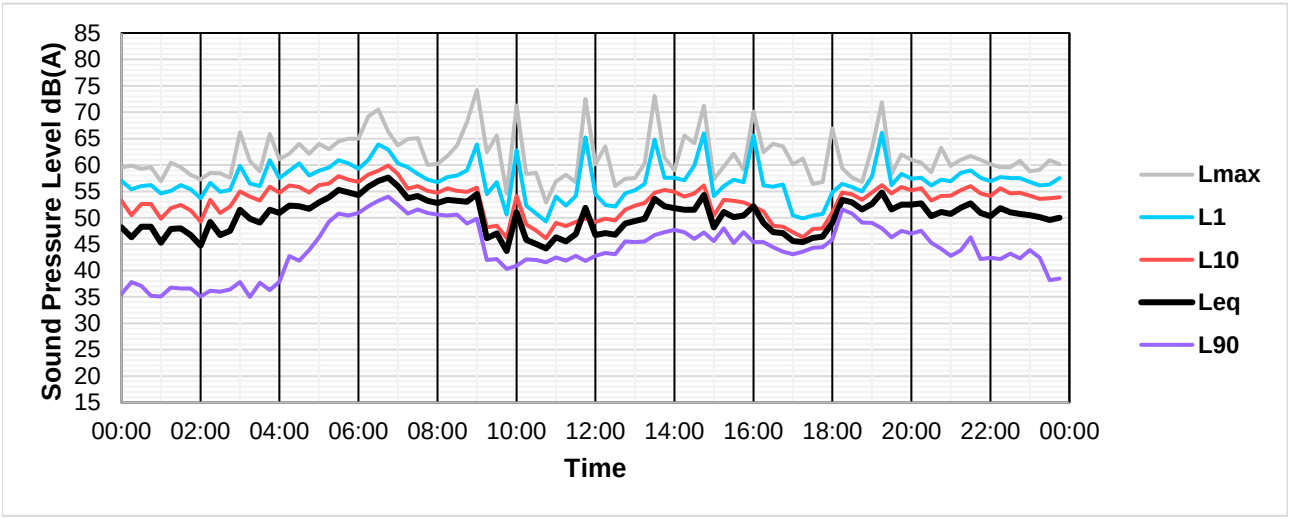
Saturday 26 September 2020



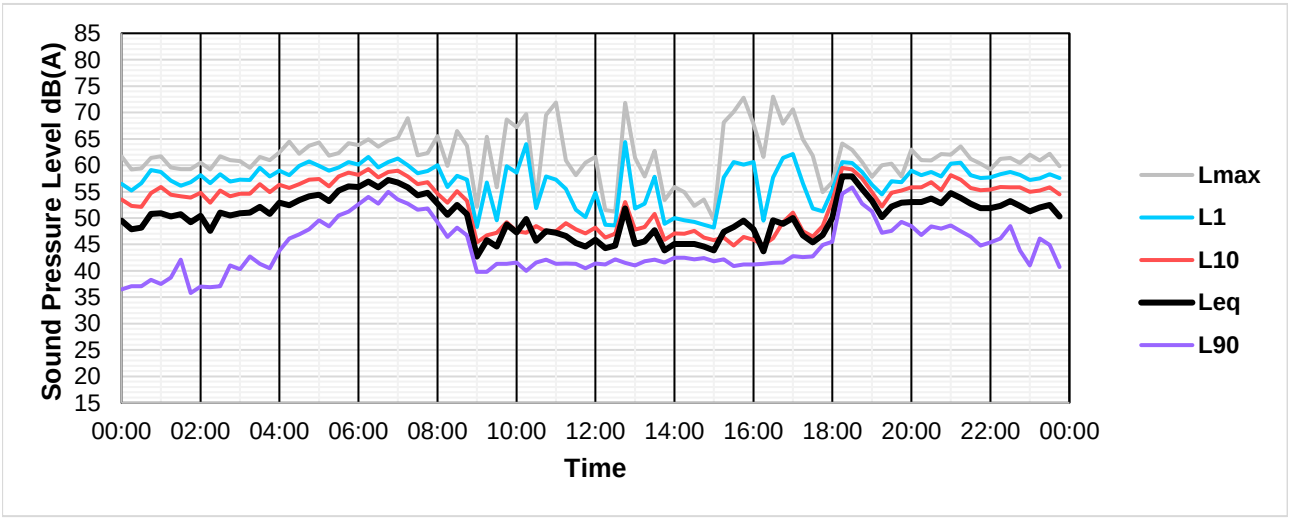
Sunday 27 September 2020



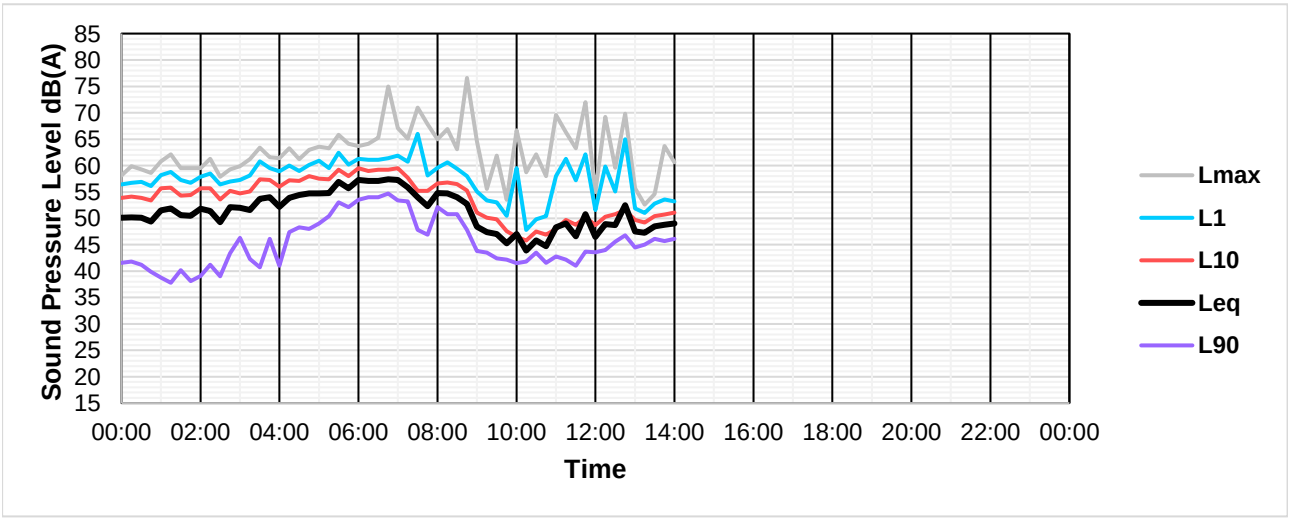
Unattended Noise Measurements
Monday 28 September 2020



Tuesday 29 September 2020



Wednesday 30 September 2020



Unattended Noise Measurements
Noise Logger Location 4 - 271 Pacific Motorway, Chinderah

Environmental Noise Levels Day, Evening and Night

Logger Location - North-east of existing dwelling on allotment

SVANTEK - 977A Class 1 Sound Level Meter	
Logger Serial Number	92176
Measurement Title	Location 4
Measurement started at	16/09/2020 - 15:09:18
Measurement stopped at	30/09/2020 - 14:23:41
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

Data excluded due to meteorological effects or extraneous noise

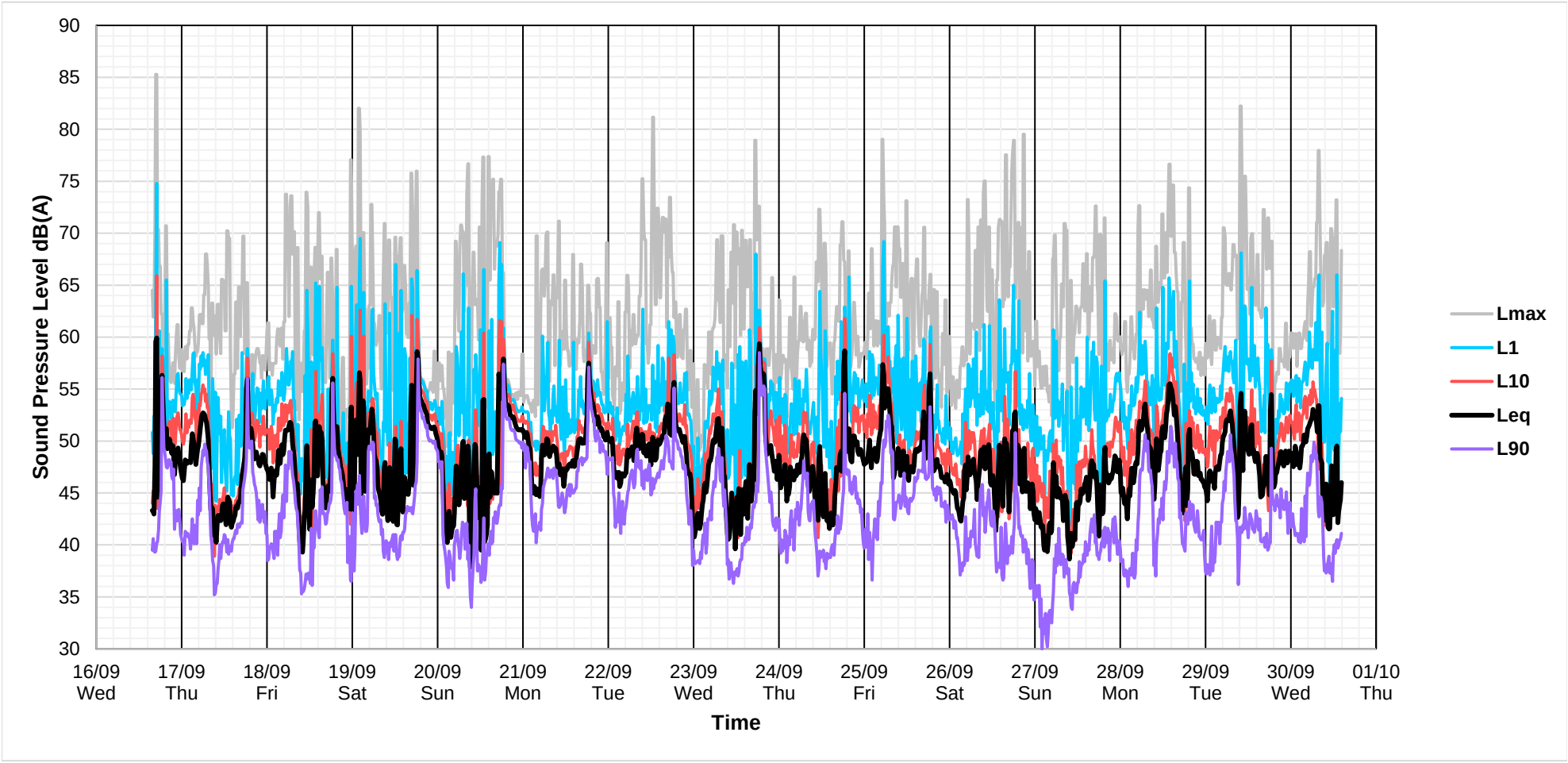
Data excluded due to missing meteorological data

Data excluded due to dredging

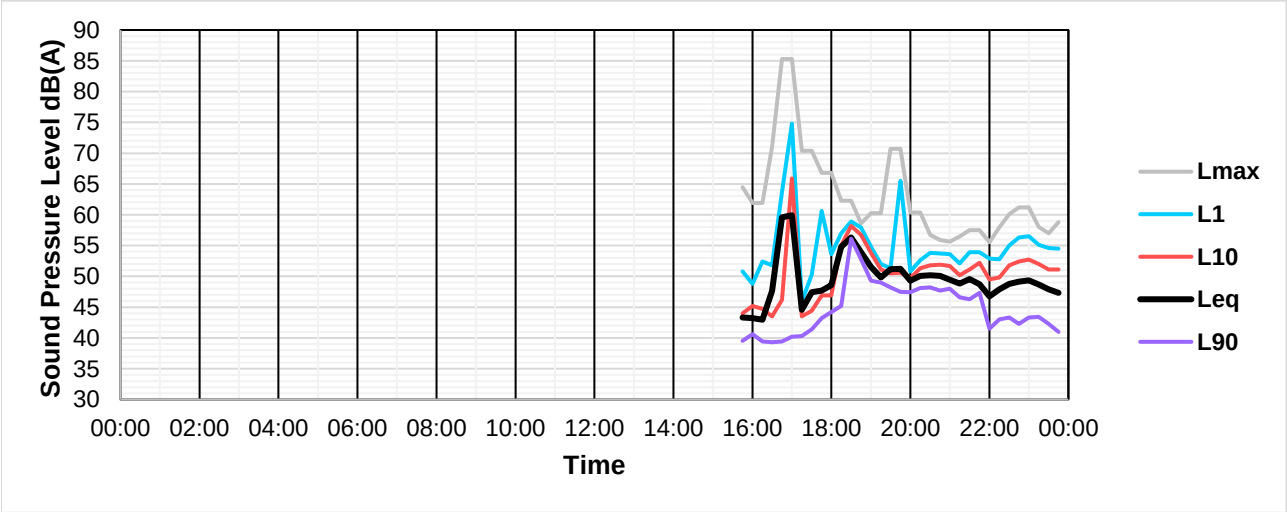
		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Levels, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
16/09/2020	Wednesday	—	51	49	—	55	56	—	52	52	—	48	43	—	45	40
17/09/2020	Thursday	44	50	48	50	54	55	45	52	51	41	48	43	38	44	39
18/09/2020	Friday	46	50	49	53	53	55	47	50	51	41	47	44	36	44	38
19/09/2020	Saturday	46	54	46	53	56	52	46	55	48	41	52	43	39	48	38
20/09/2020	Sunday	46	54	49	53	56	52	46	55	50	40	51	46	37	46	41
21/09/2020	Monday	48	53	49	53	56	53	50	54	50	46	52	46	44	49	42
22/09/2020	Tuesday	50	51	46	55	55	51	51	53	48	47	49	42	46	47	38
23/09/2020	Wednesday	46	53	47	52	57	53	46	55	50	41	50	42	37	45	40
24/09/2020	Thursday	46	51	50	53	56	57	47	52	53	41	47	44	38	45	40
25/09/2020	Friday	49	49	46	55	53	52	50	51	48	46	46	41	43	44	38
26/09/2020	Saturday	47	48	43	55	55	51	48	49	46	41	42	35	38	39	31
27/09/2020	Sunday	44	46	47	52	51	55	46	47	51	38	40	40	35	39	37
28/09/2020	Monday	50	48	48	57	54	54	52	49	51	45	42	42	40	40	38
29/09/2020	Tuesday	49	48	50	57	53	56	50	49	53	42	44	44	40	40	41
Average		**46**	**50**	**48**	**54**	**55**	**54**	**47**	**52**	**50**	**41**	**47**	**42**	—	—	—

Rating Background Levels, dB(A)	**37**	**45**	**39**

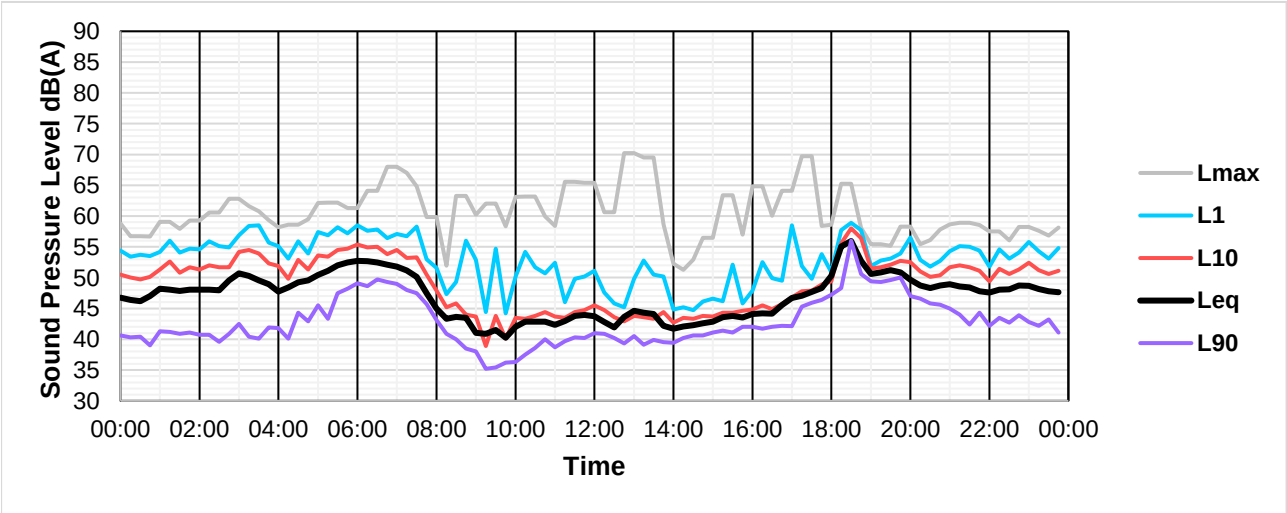
Unattended Noise Measurements
16 to 30 September 2020



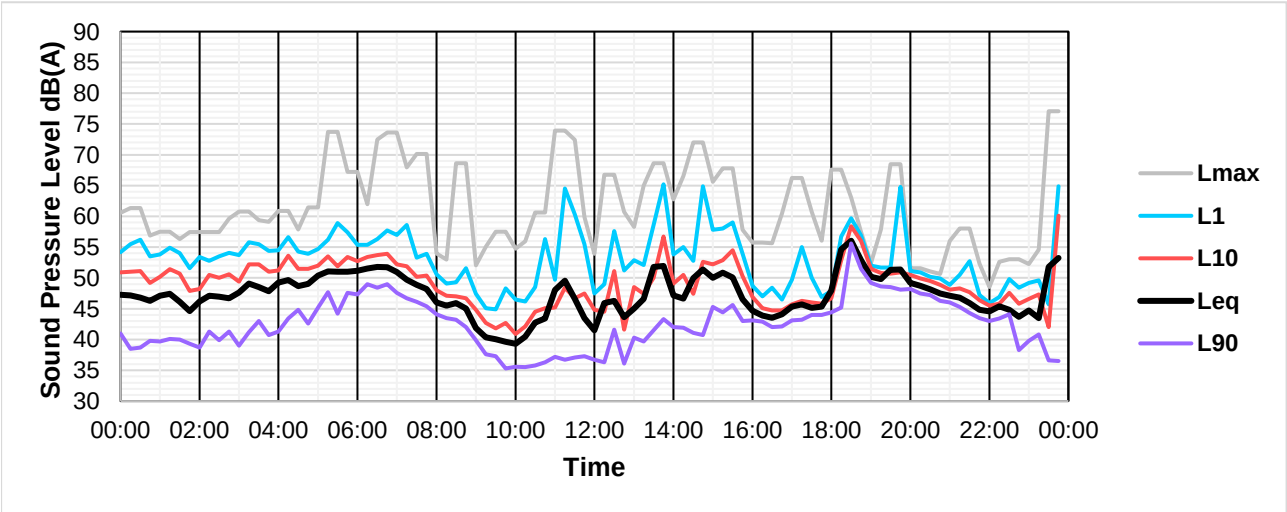
Unattended Noise Measurements
Wednesday 16 September 2020



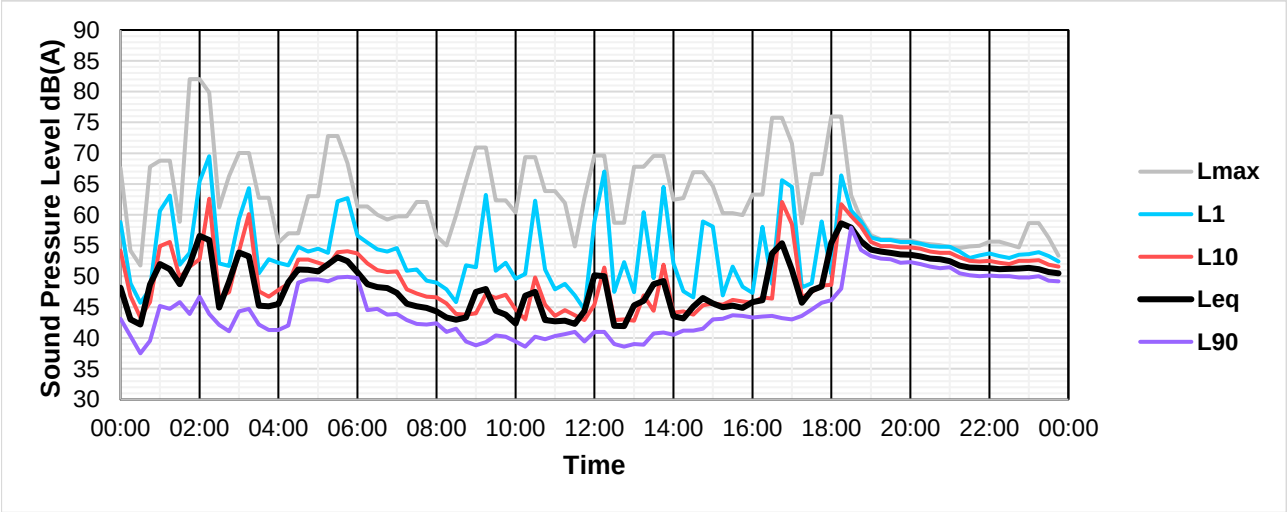
Thursday 17 September 2020



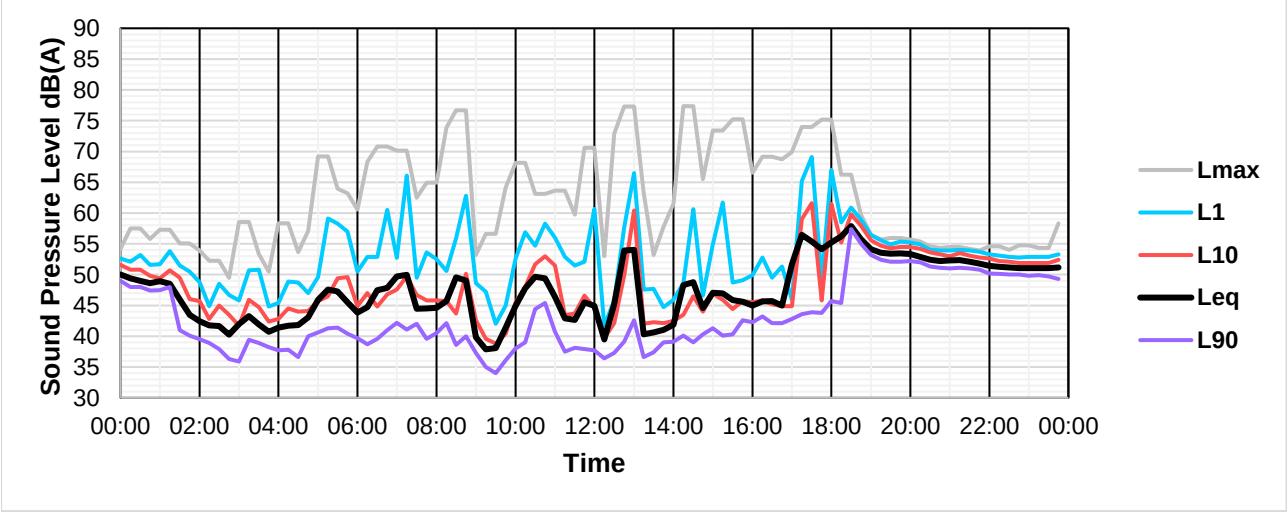
Friday 18 September 2020



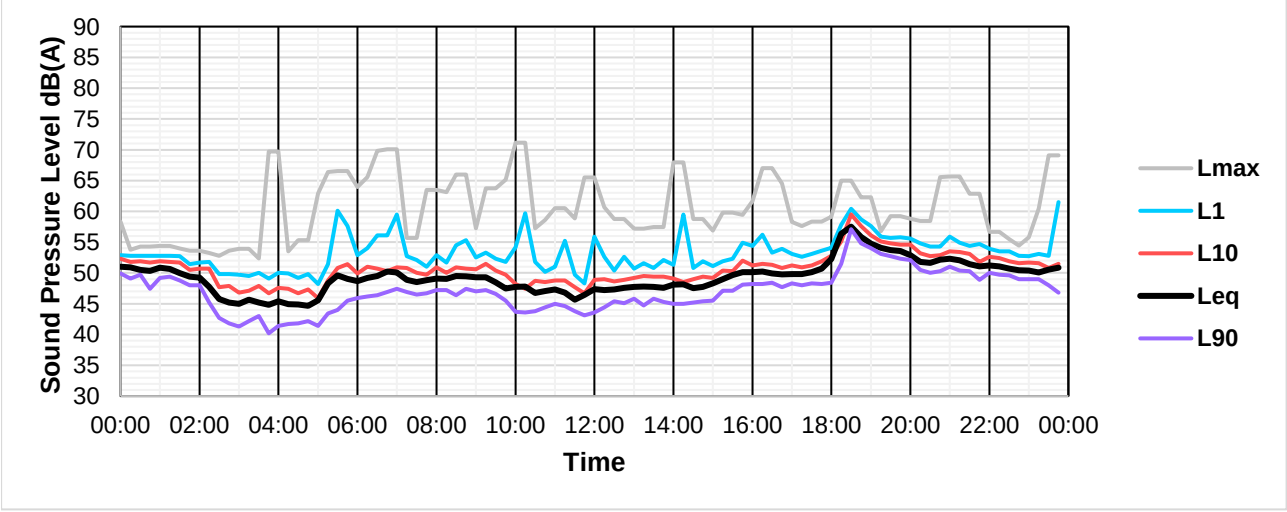
Unattended Noise Measurements
Saturday 19 September 2020



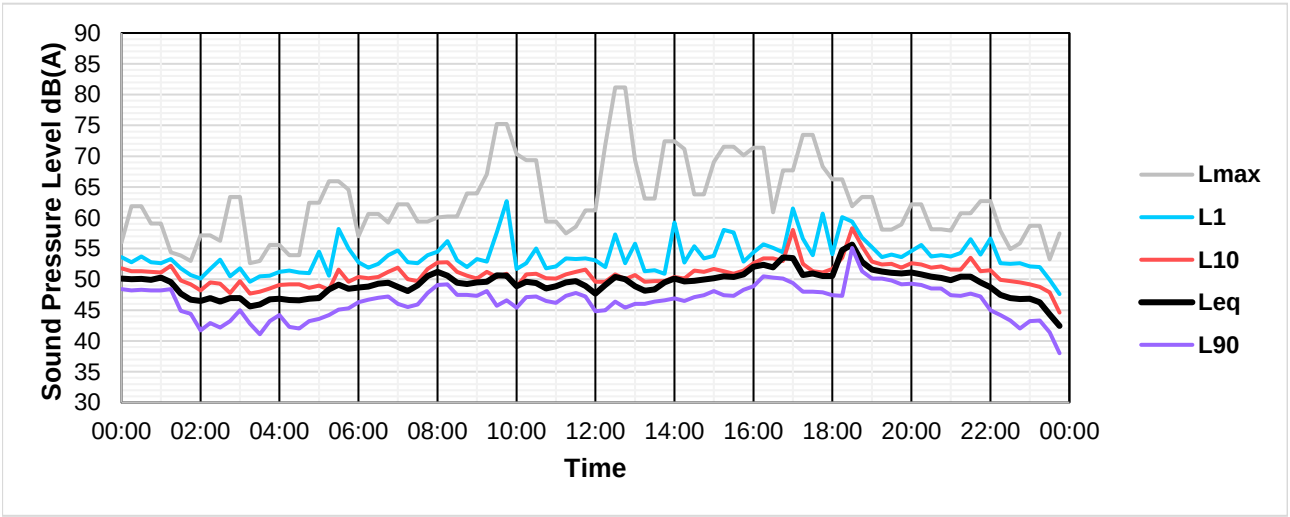
Sunday 20 September 2020



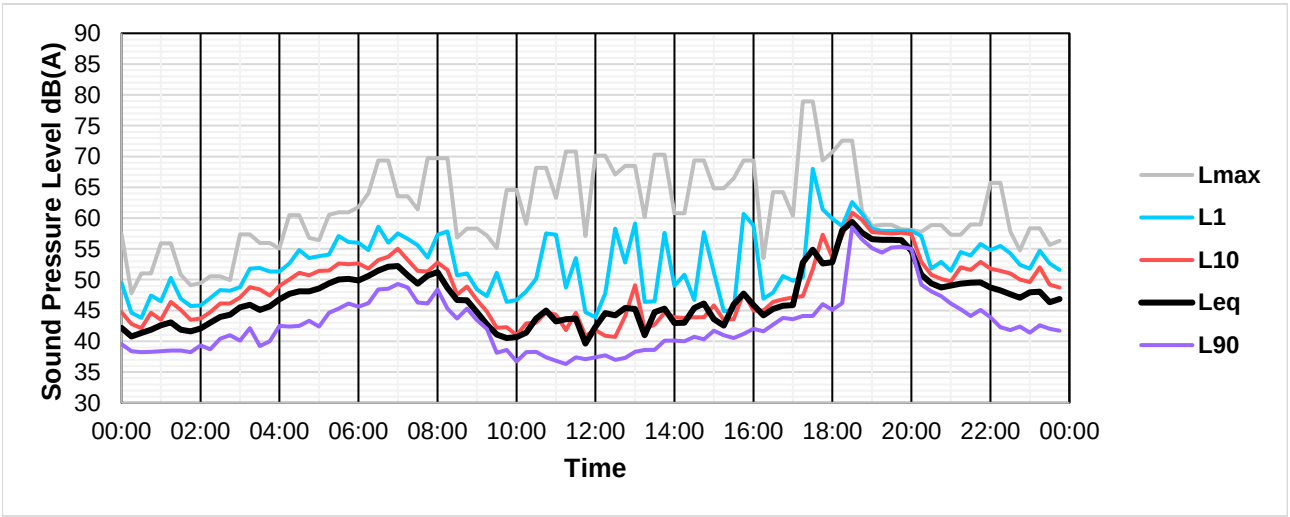
Monday 21 September 2020



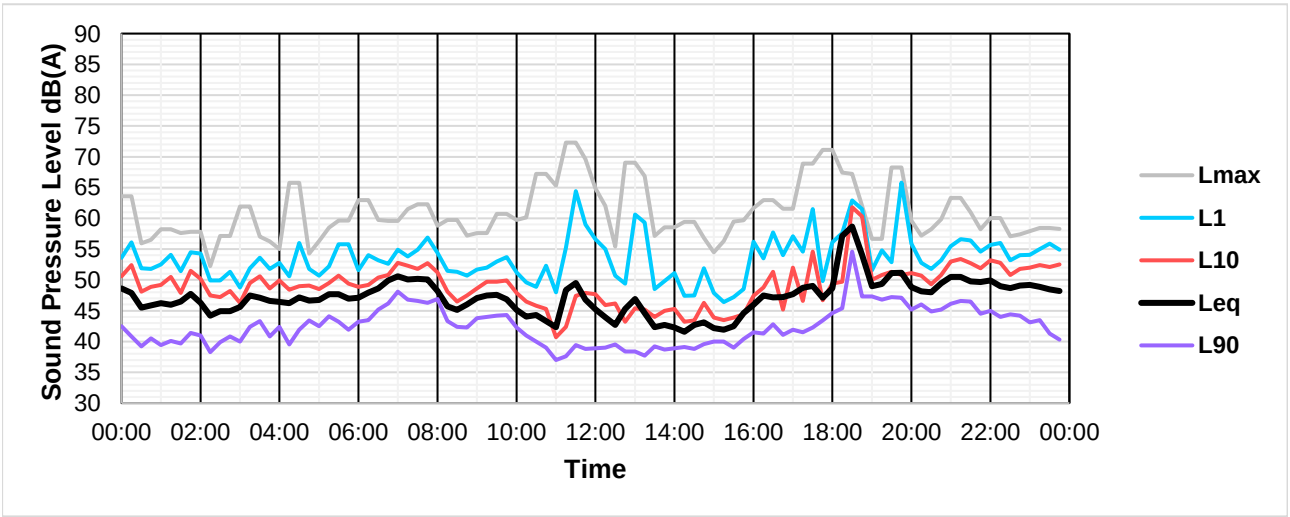
Unattended Noise Measurements
Tuesday 22 September 2020



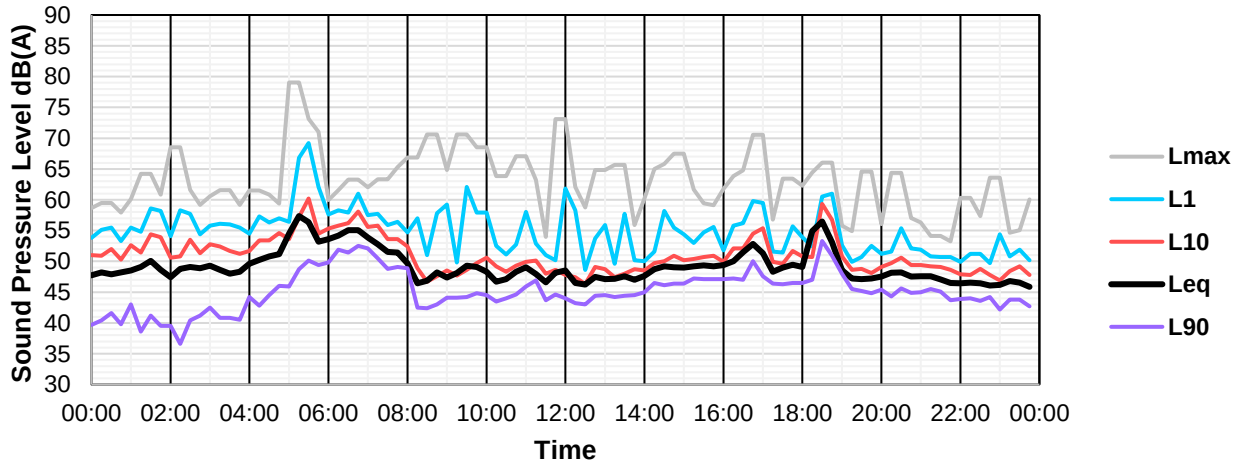
Wednesday 23 September 2020



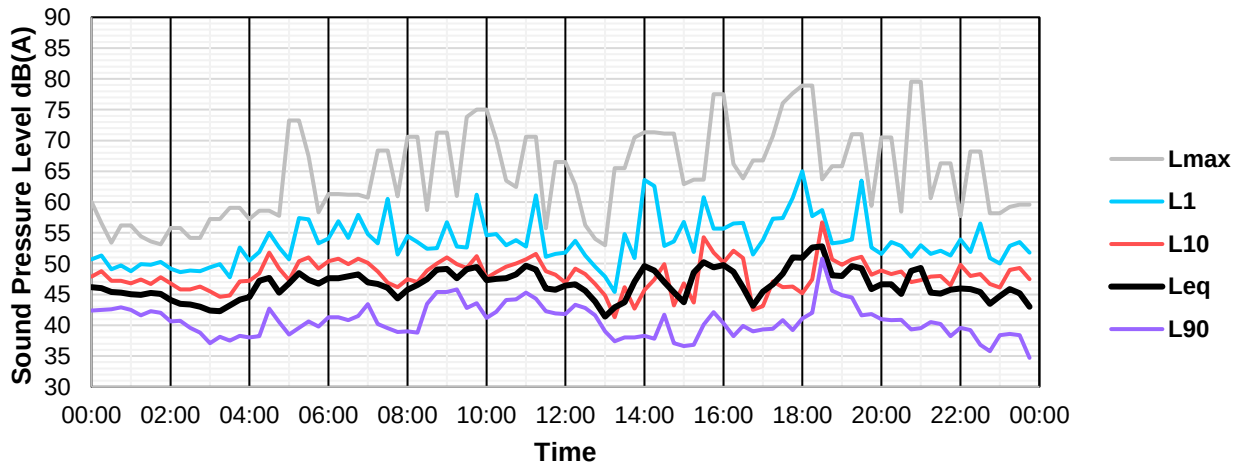
Thursday 24 September 2020



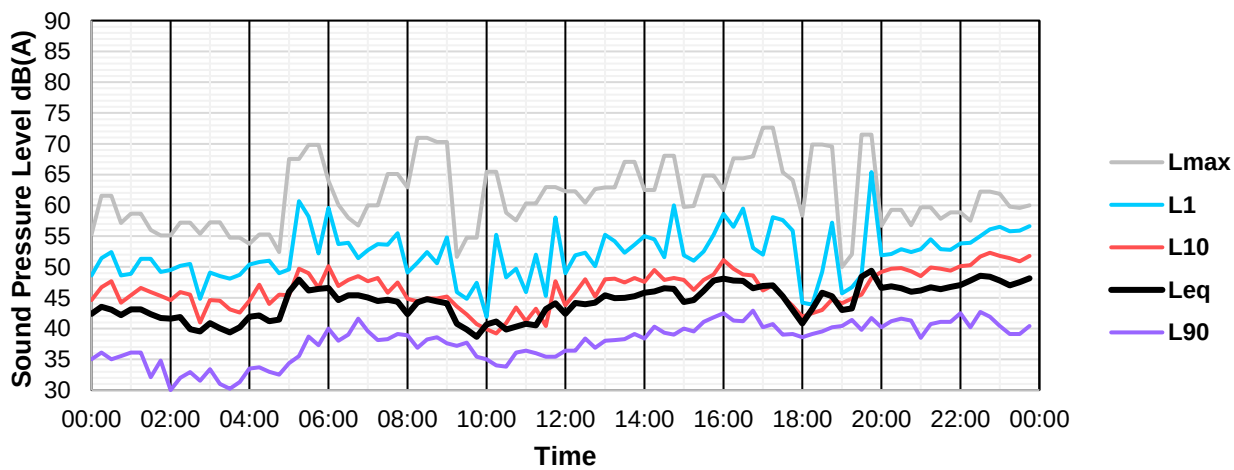
Unattended Noise Measurements
Friday 25 September 2020



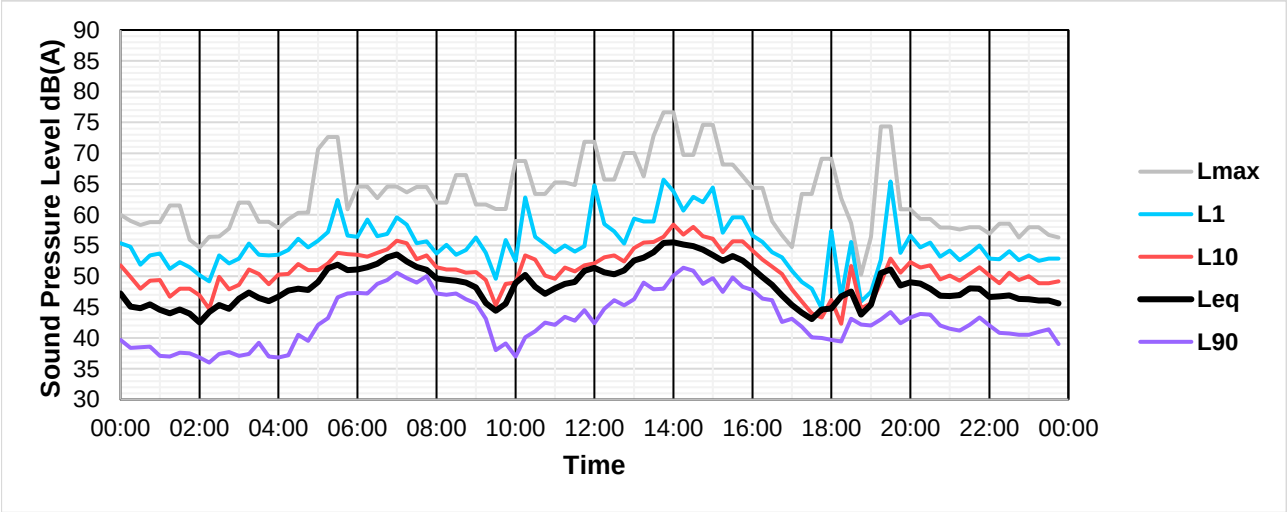
Saturday 26 September 2020



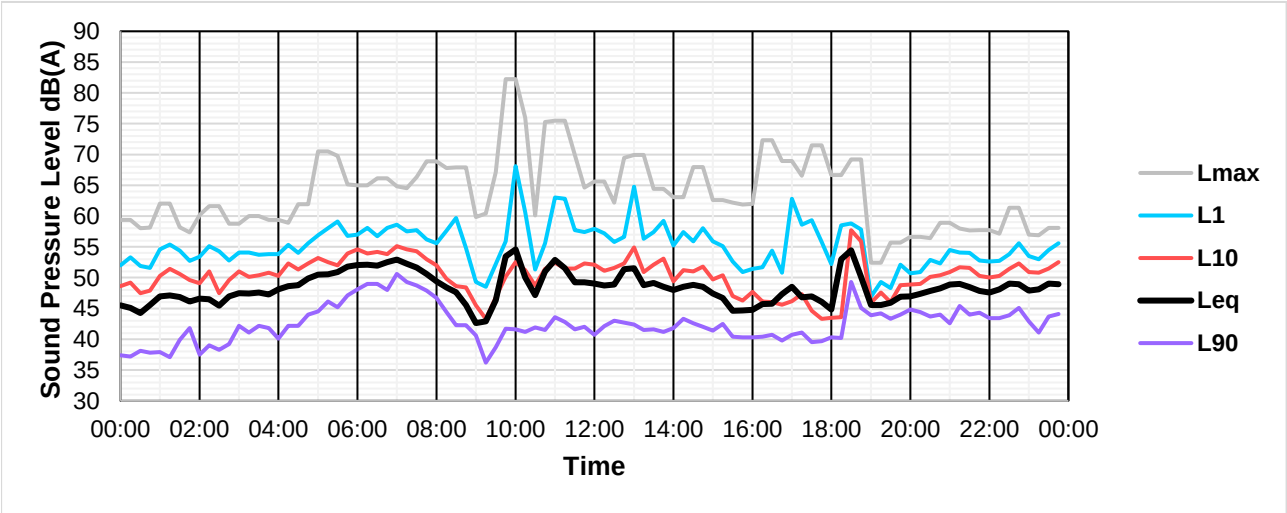
Sunday 27 September 2020



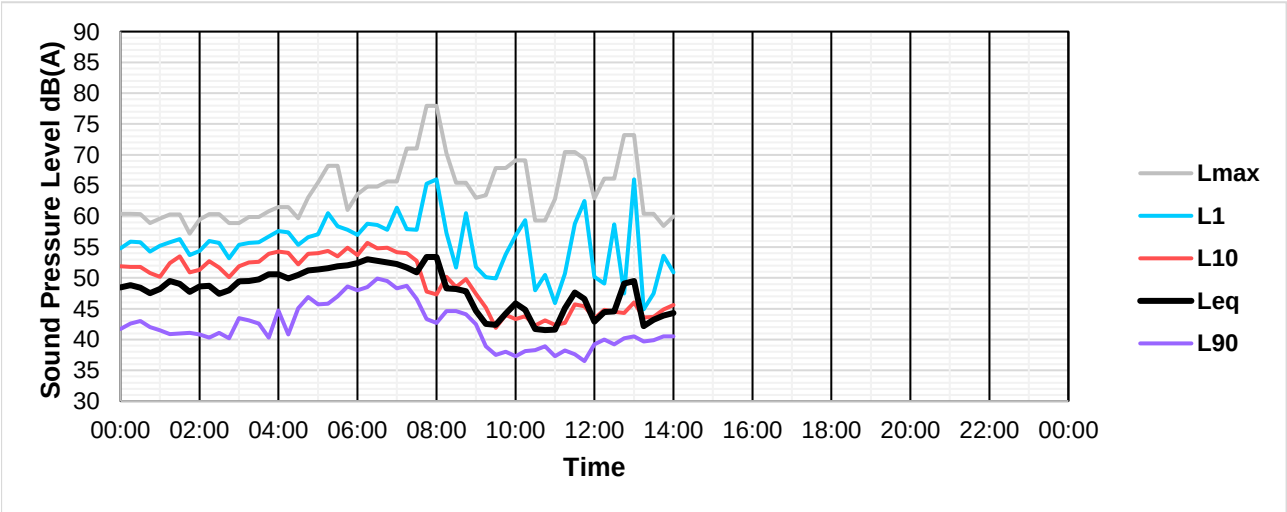
Unattended Noise Measurements
Monday 28 September 2020



Tuesday 29 September 2020



Wednesday 30 September 2020



Unattended Noise Measurements
Noise Logger Location 5 - 353 Cudgen Road, Cudgen

Environmental Noise Levels Day, Evening and Night

Logger Location - South-western boundary of subject site and 353 Cudgen Road

ARL Environmental Noise Logger	
Logger Serial Number	15-203-537
Measurement Title	Location 5
Measurement started at	16/09/2020 - 12:12:00
Measurement stopped at	30/09/2020 - 14:02:05
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

Data excluded due to meteorological effects or extraneous noise

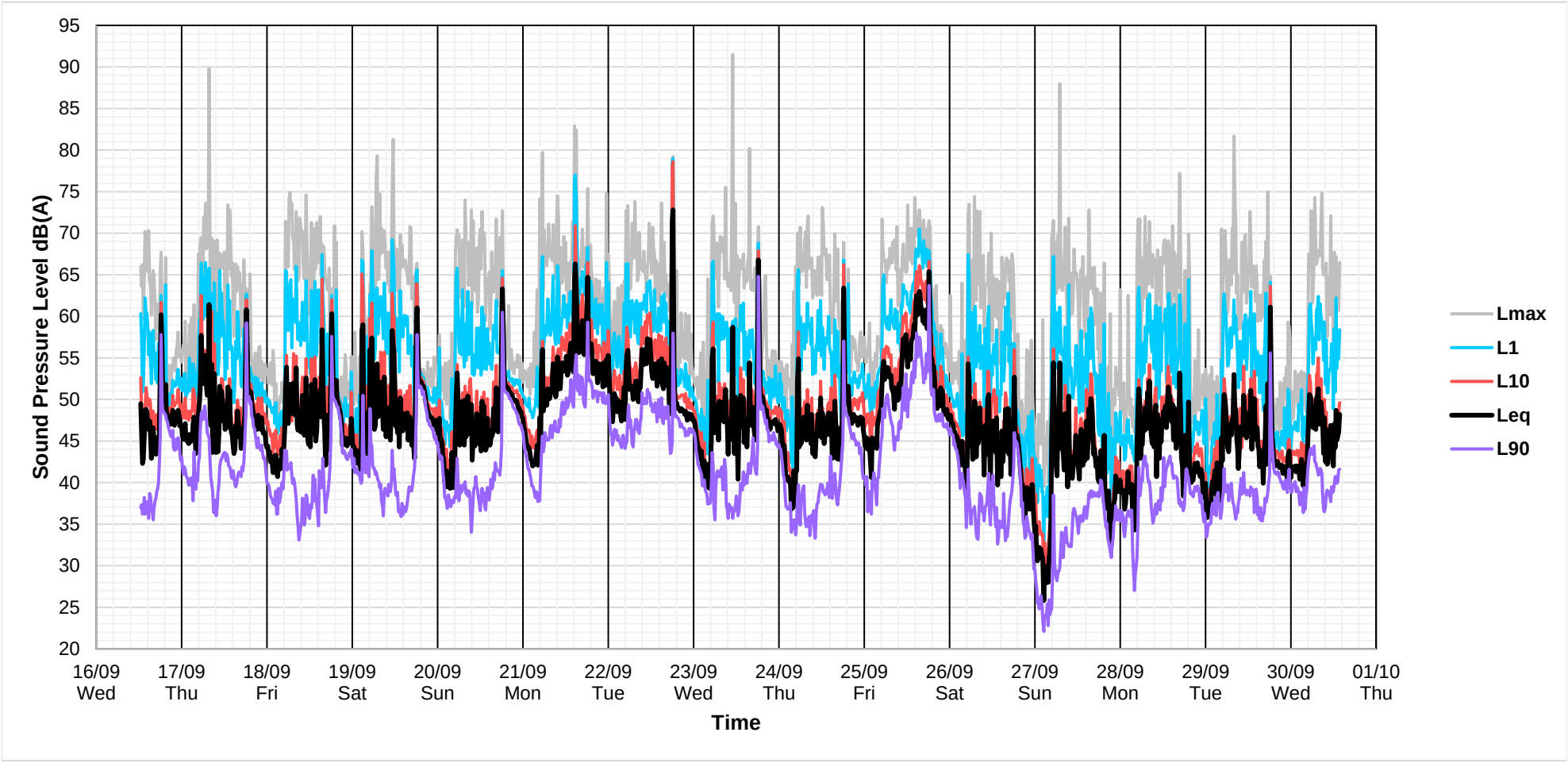
Data excluded due to missing meteorological data

Data excluded due to dredging operations

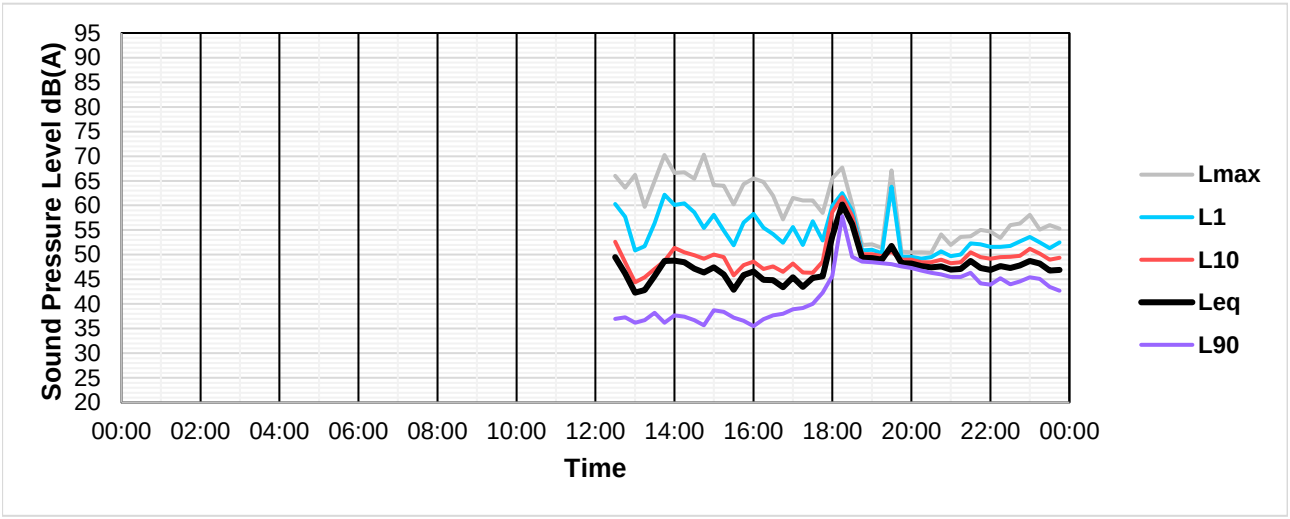
		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Levels, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
16/09/2020	Wednesday	—	50	48	—	53	54	—	51	50	—	48	43	—	46	40
17/09/2020	Thursday	48	50	45	57	54	52	49	52	47	41	48	40	38	44	38
18/09/2020	Friday	48	50	47	59	53	53	50	51	49	38	48	43	35	44	41
19/09/2020	Saturday	48	52	45	59	54	51	51	53	46	39	50	41	37	47	38
20/09/2020	Sunday	47	53	47	57	55	52	49	54	48	39	51	43	37	49	39
21/09/2020	Monday	55	56	51	62	61	58	57	58	54	49	52	47	46	50	45
22/09/2020	Tuesday	53	52	45	60	56	51	56	54	47	48	48	42	46	46	38
23/09/2020	Wednesday	48	51	44	57	54	51	49	52	46	40	49	40	37	45	35
24/09/2020	Thursday	46	50	48	56	55	54	48	52	50	38	47	43	35	45	39
25/09/2020	Friday	56	54	46	63	59	52	59	56	48	51	51	42	45	47	37
26/09/2020	Saturday	45	42	36	55	47	45	47	44	38	36	40	28	33	34	24
27/09/2020	Sunday	44	39	40	55	45	48	46	39	42	36	36	36	32	32	30
28/09/2020	Monday	47	42	41	57	48	49	48	43	43	39	39	37	37	38	35
29/09/2020	Tuesday	46	44	43	56	48	49	47	46	45	38	42	40	36	40	38
Average		**46**	**48**	**45**	**56**	**52**	**51**	**48**	**49**	**47**	**38**	**45**	**40**	—	—	—

Rating Background Levels, dB(A)	**36**	**45**	**38**

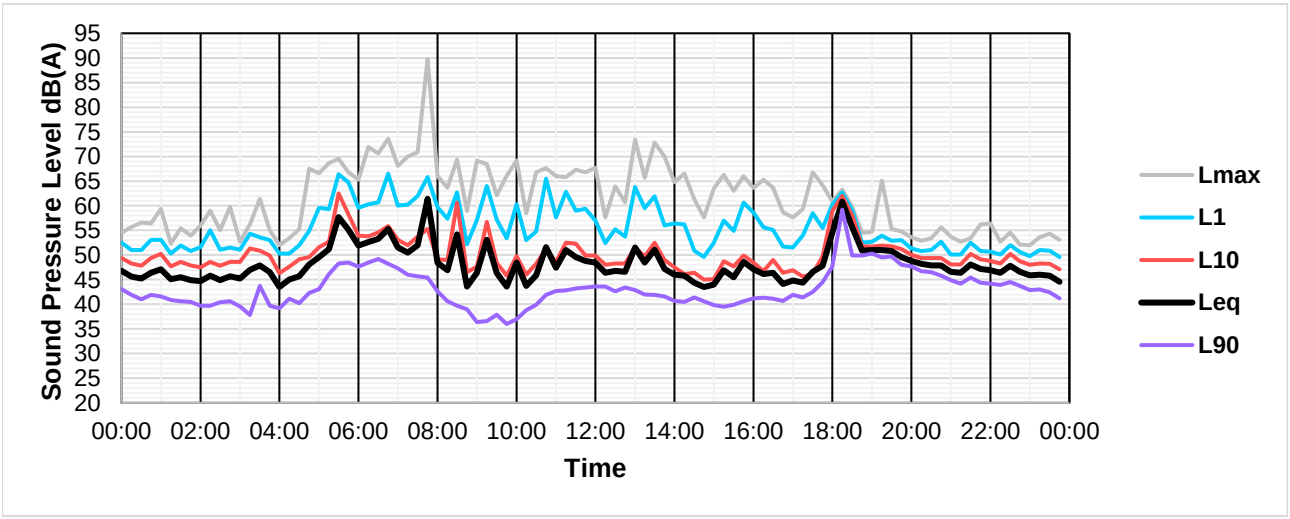
Unattended Noise Measurements
16 to 30 September 2020



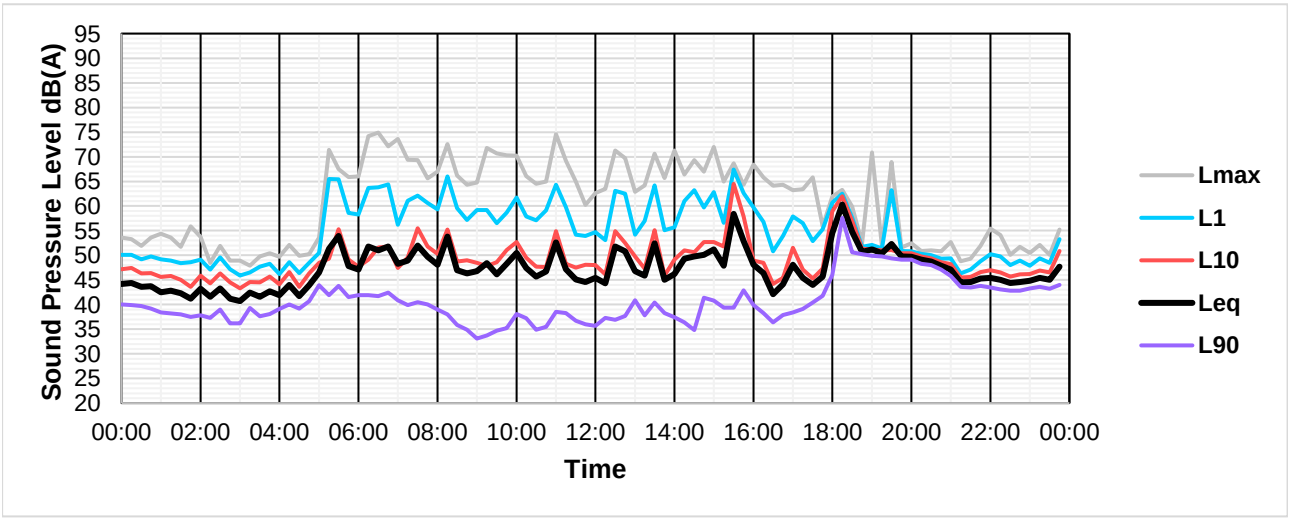
Unattended Noise Measurements
Wednesday 16 September 2020



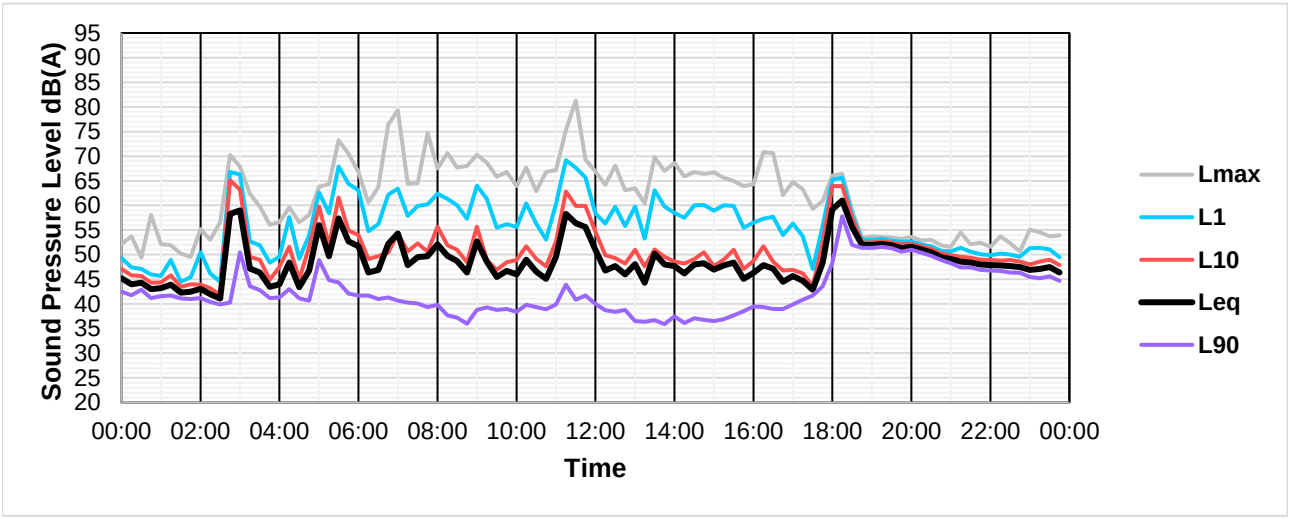
Thursday 17 September 2020



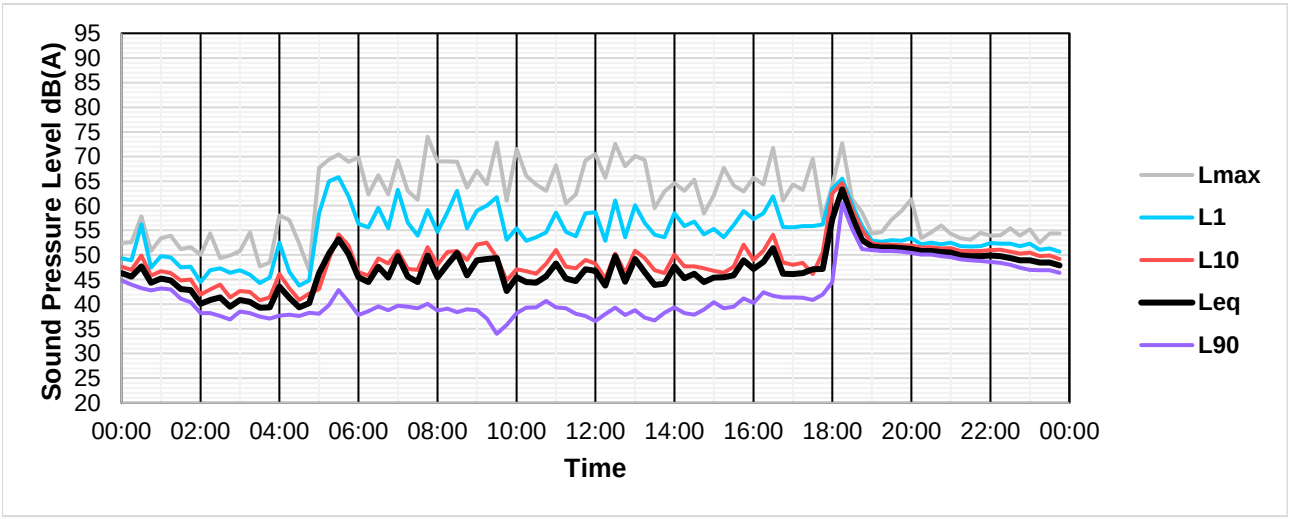
Friday 18 September 2020



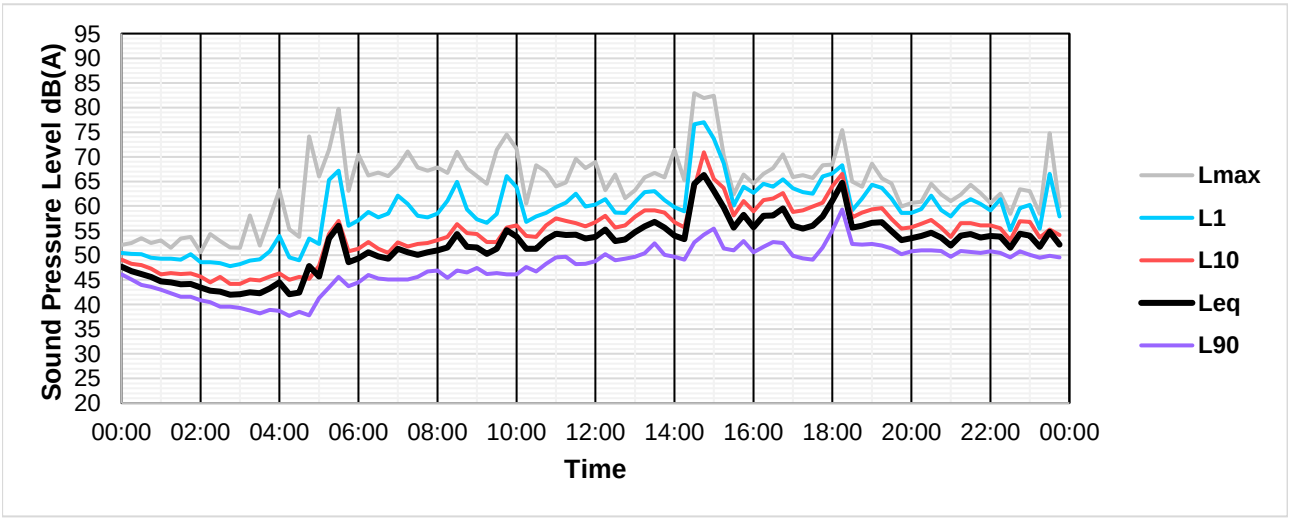
Unattended Noise Measurements
Saturday 19 September 2020



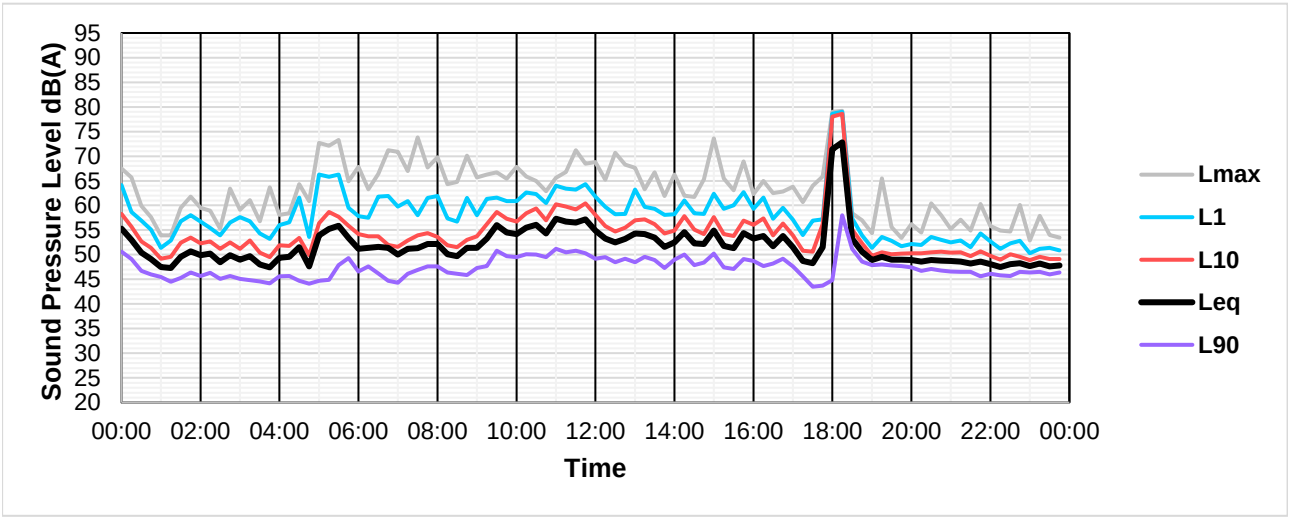
Sunday 20 September 2020



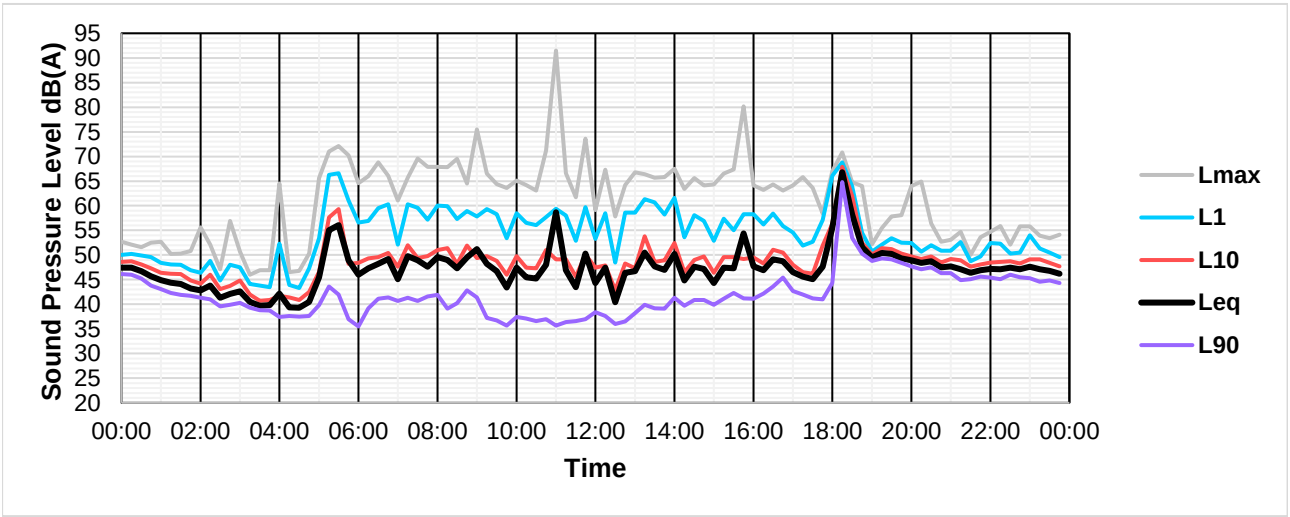
Monday 21 September 2020



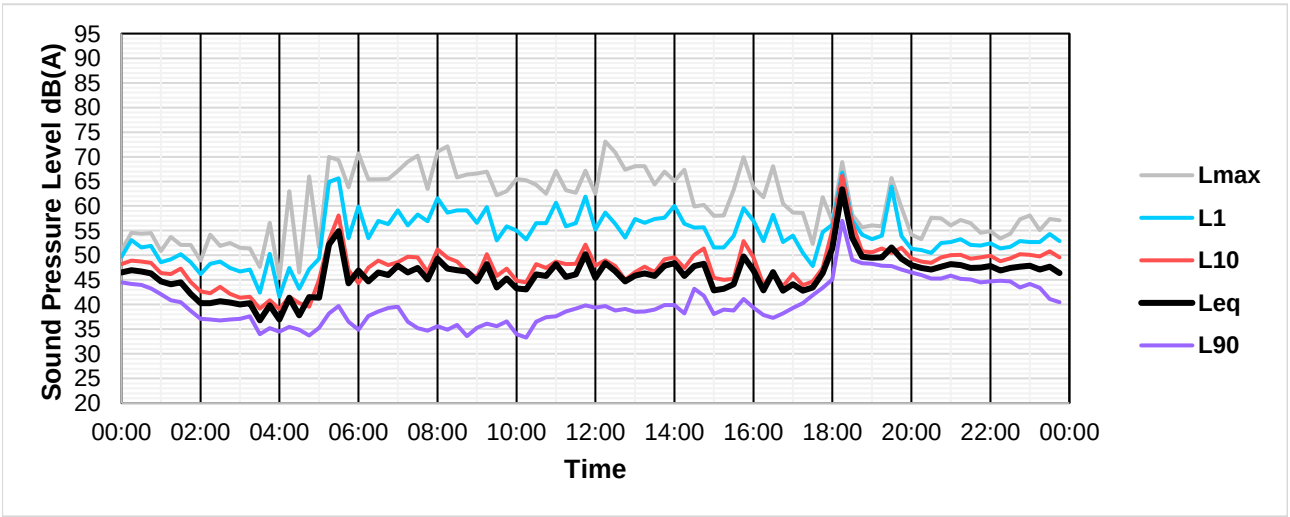
Unattended Noise Measurements
Tuesday 22 September 2020



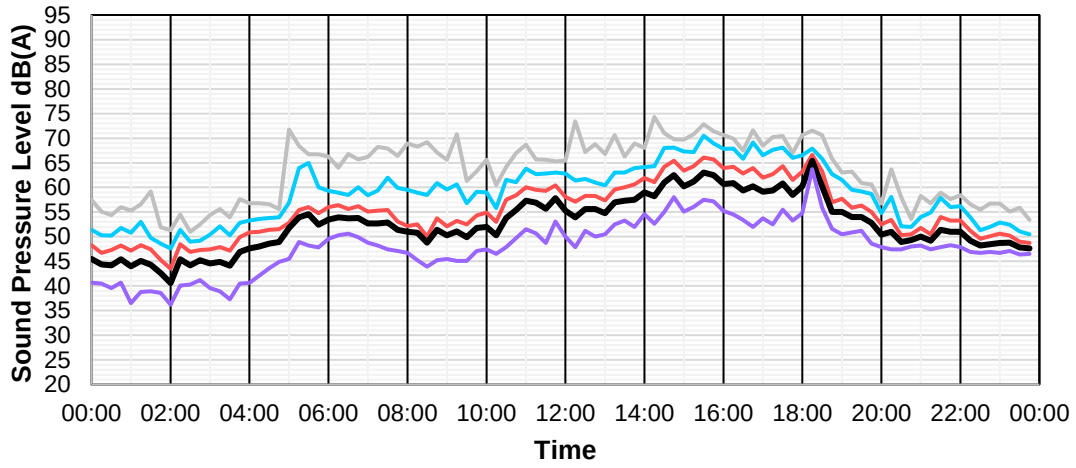
Wednesday 23 September 2020



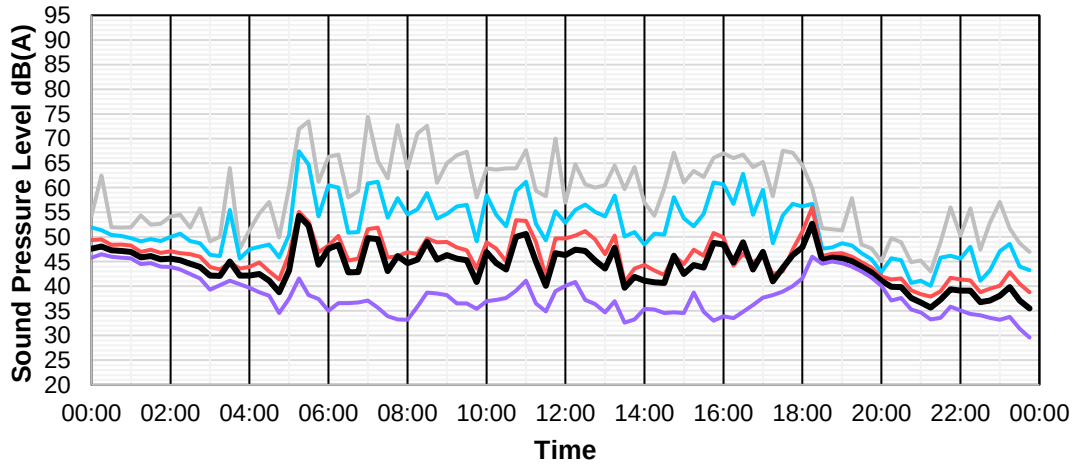
Thursday 24 September 2020



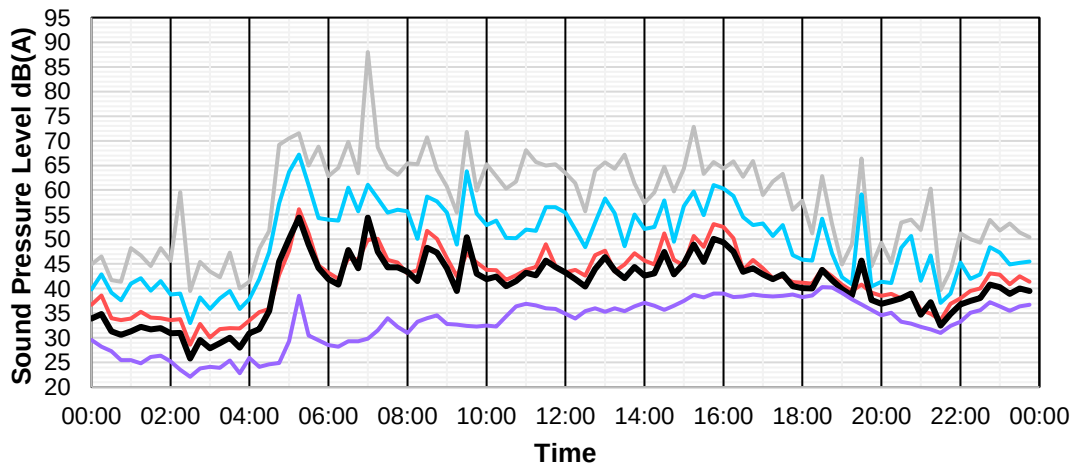
Unattended Noise Measurements
Friday 25 September 2020



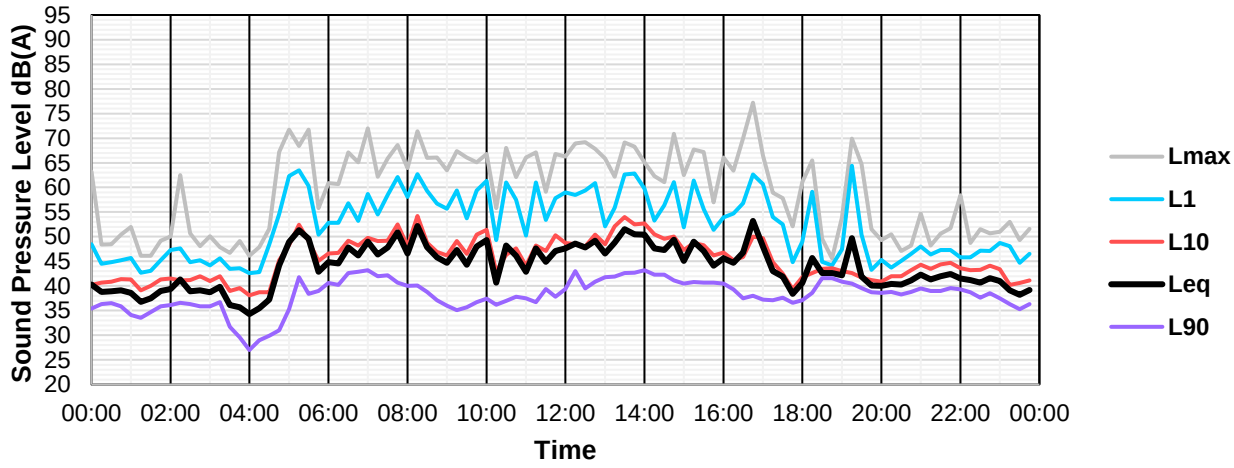
Saturday 26 September 2020



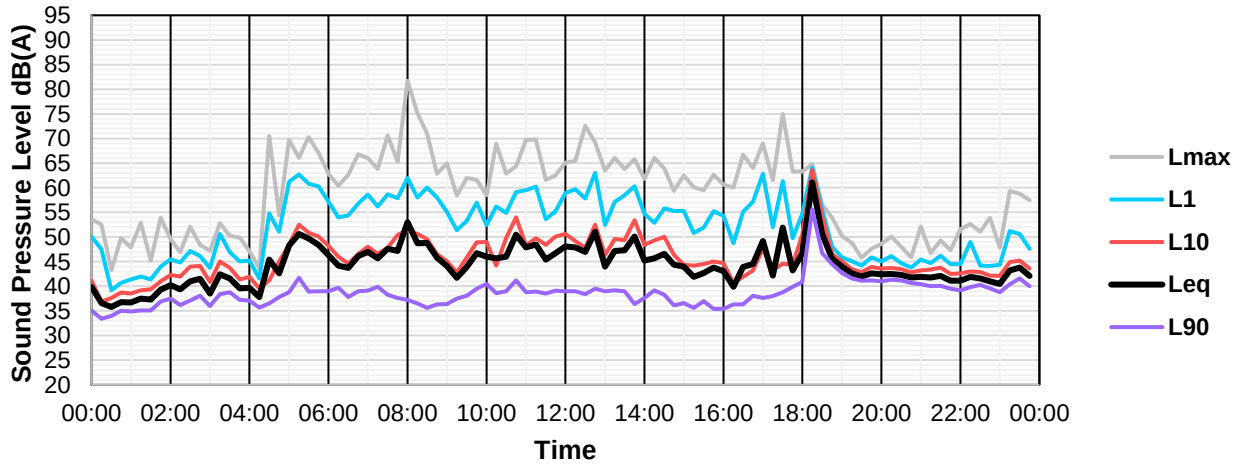
Sunday 27 September 2020



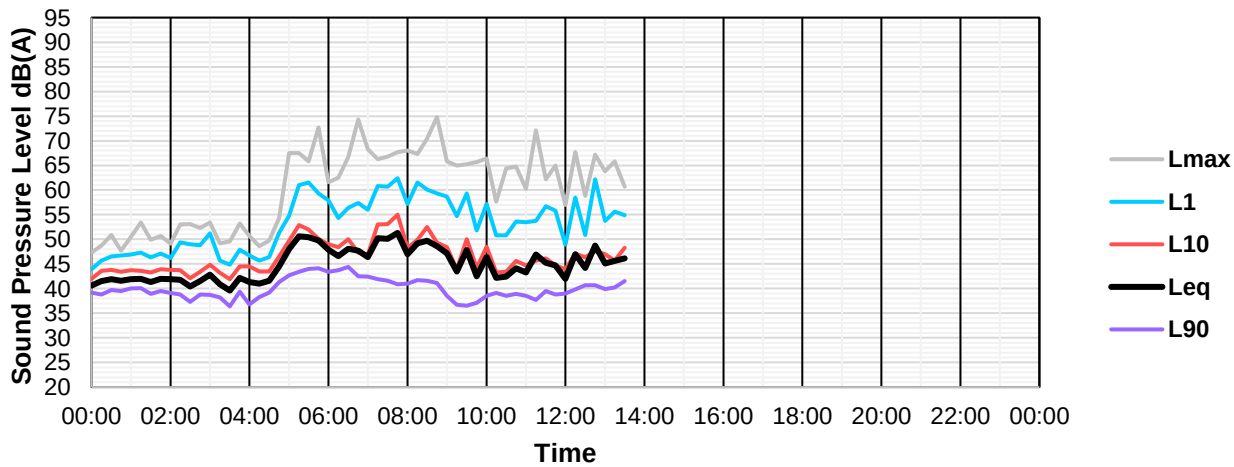
Unattended Noise Measurements
Monday 28 September 2020



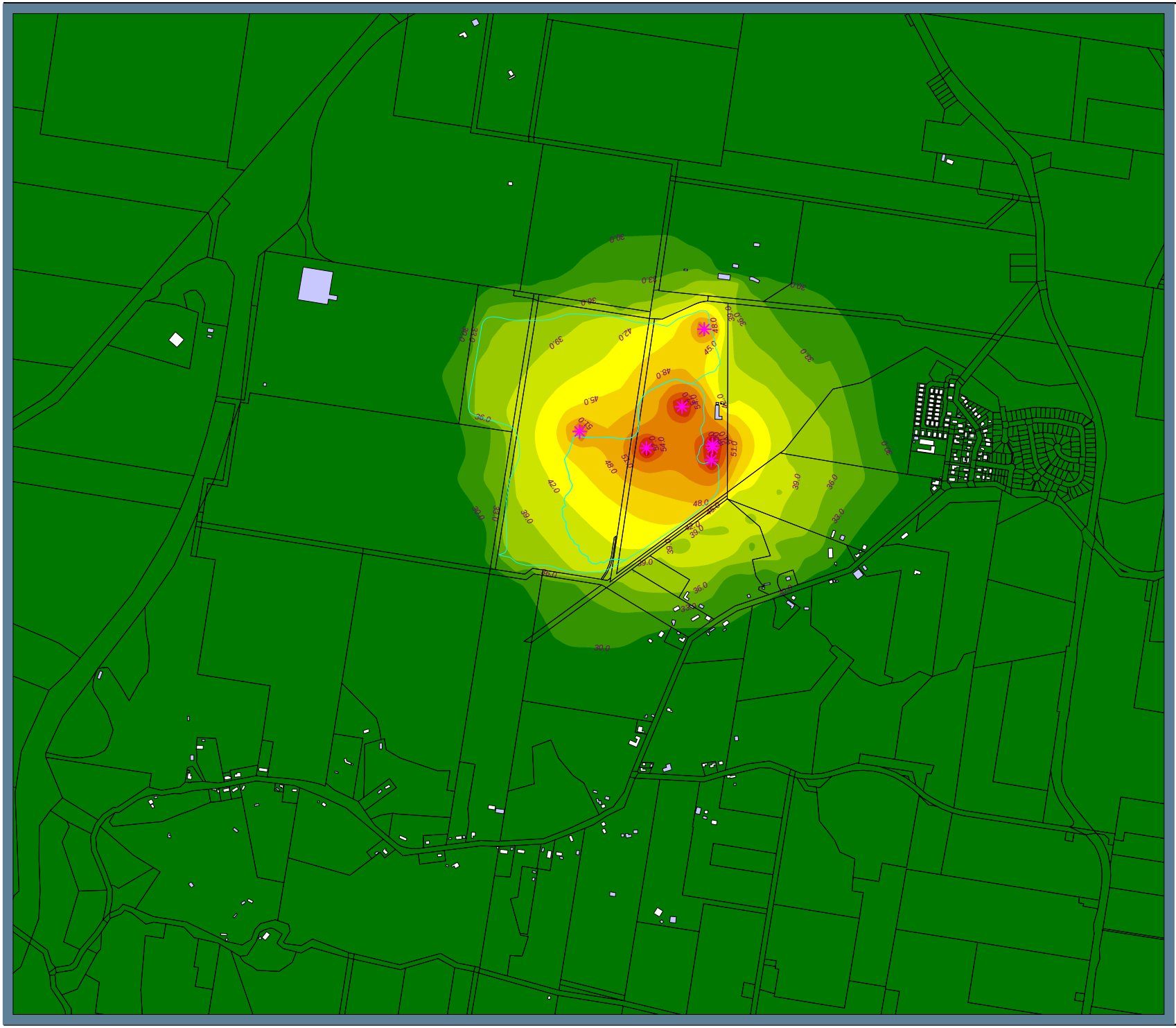
Tuesday 29 September 2020



Wednesday 30 September 2020



Appendix F – SoundPLAN Results – Operational Noise



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 1
Phase 5 (Year 1-3)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

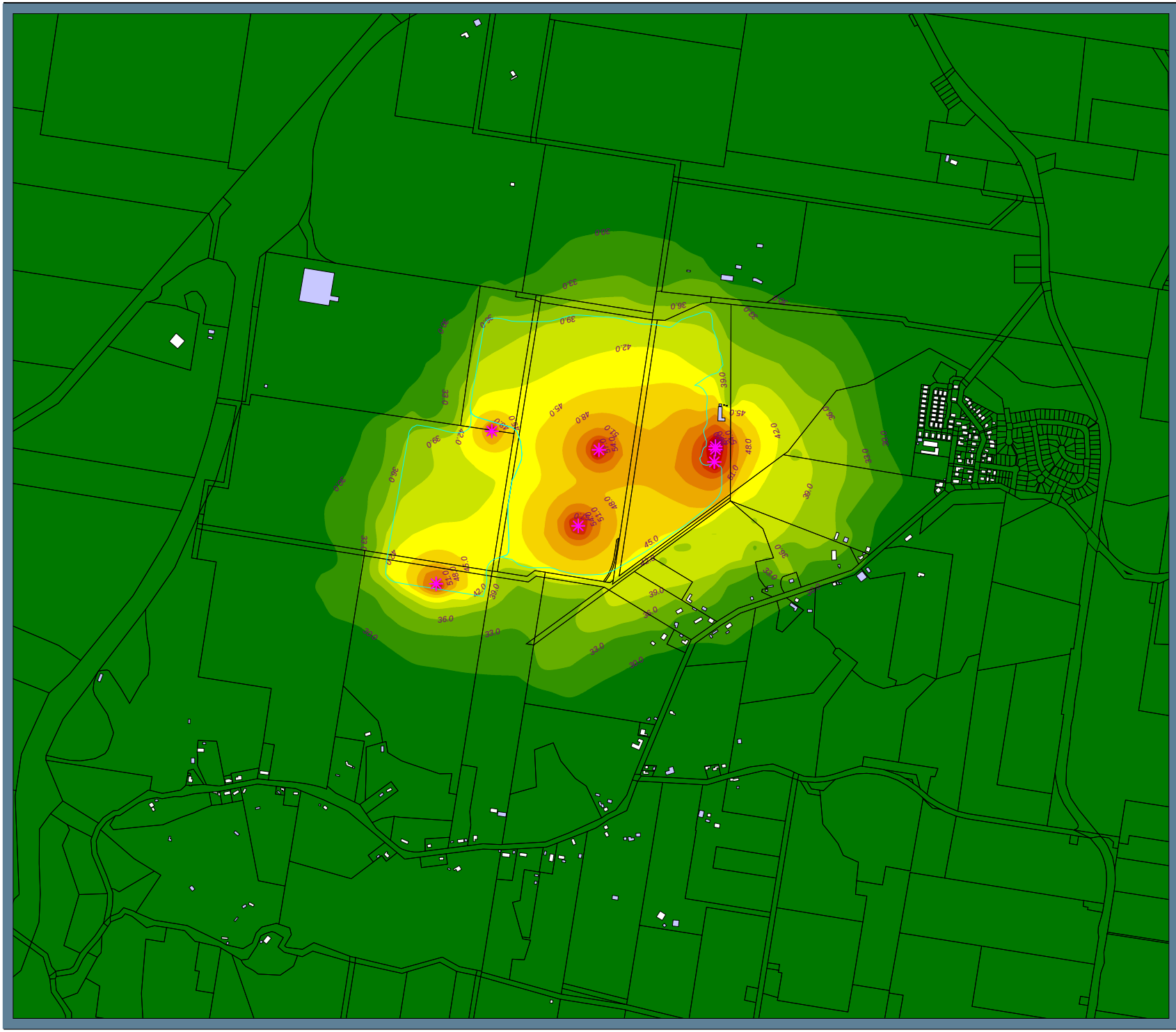
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 2
Phase 6 (Year 4-8)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

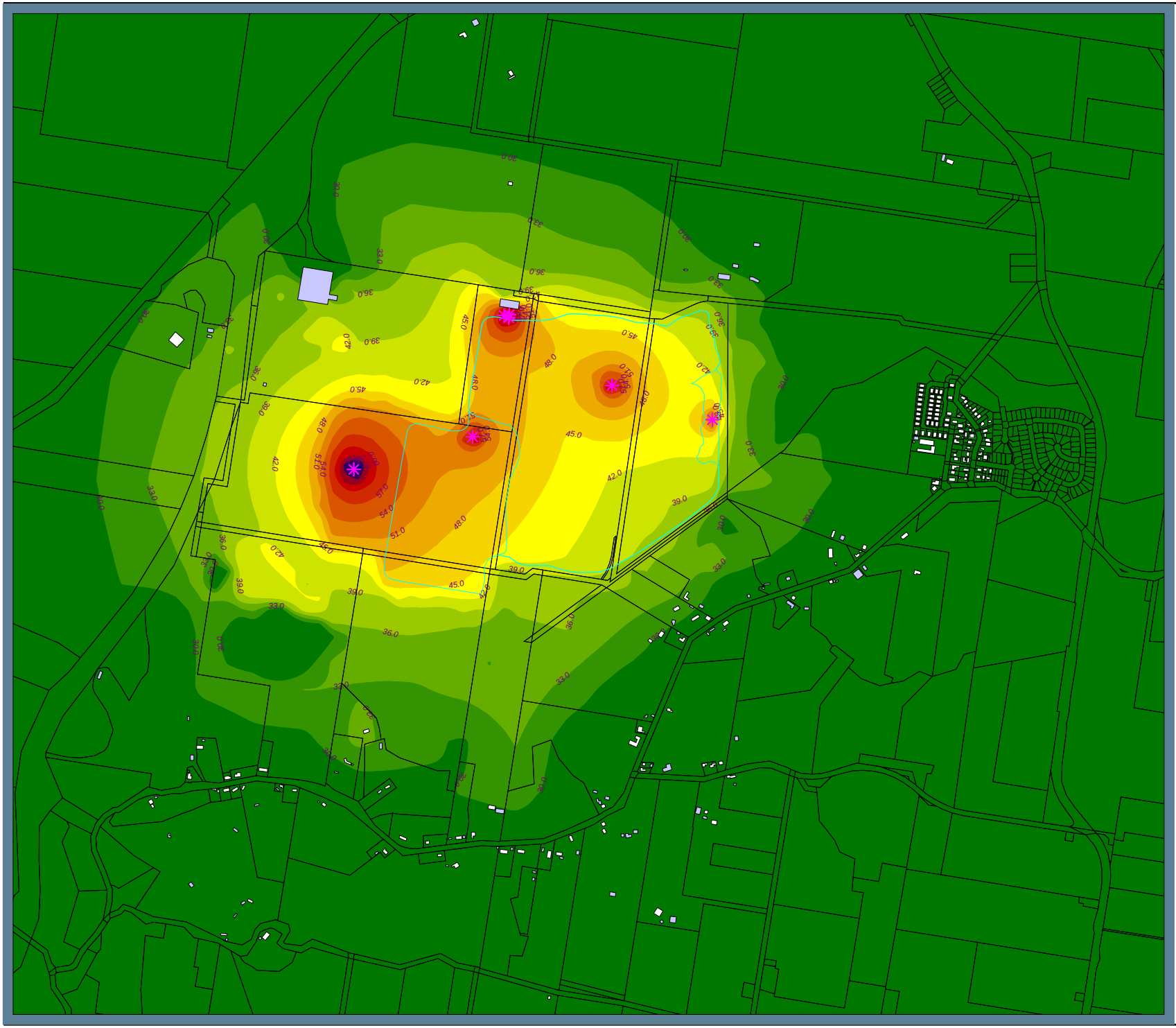
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 3
Phase 7 (Year 9-13)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

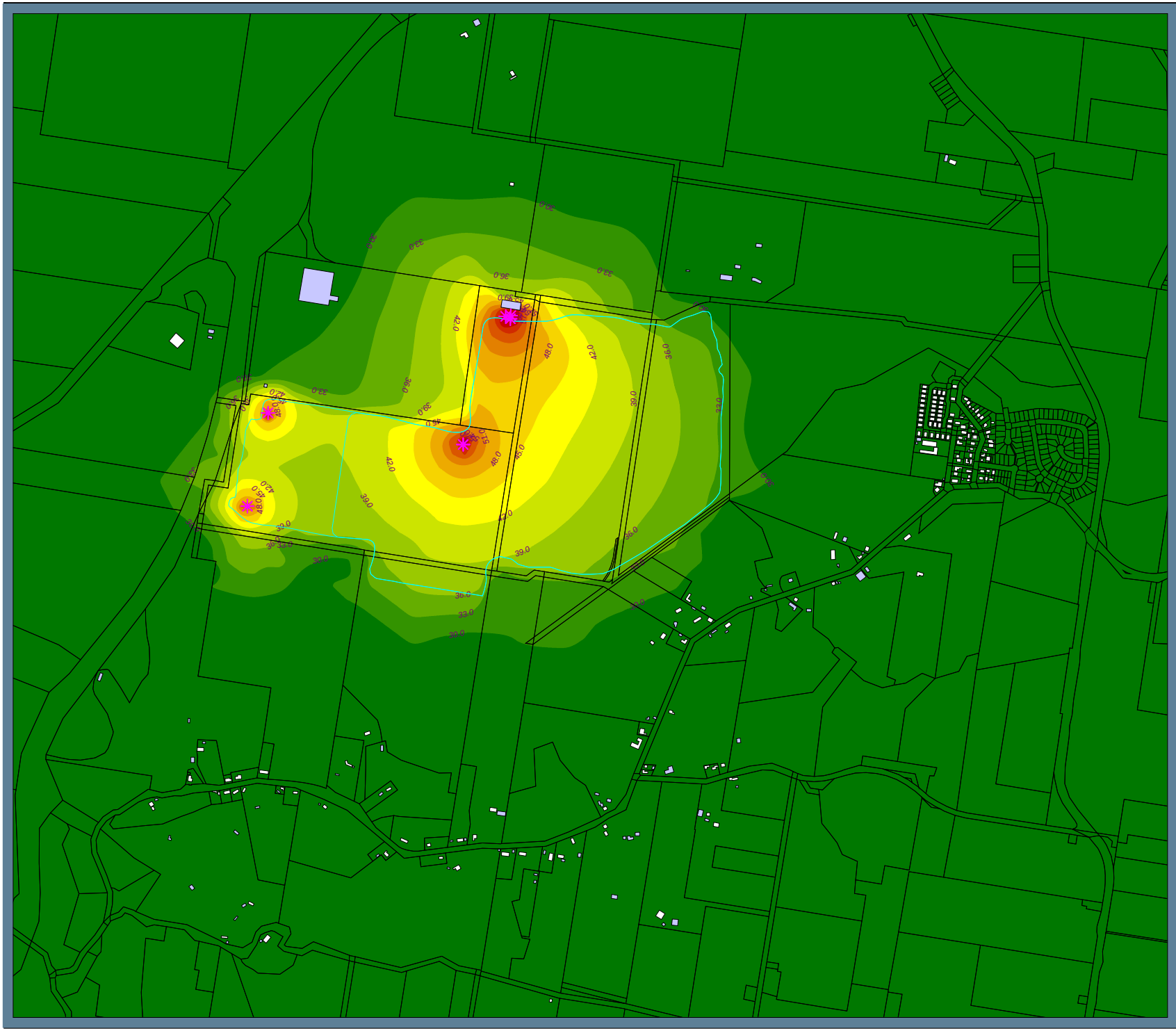
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 4
Phase 8 (Year 14-18)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

	<=	30
30	<	33
33	<	36
36	<	39
39	<	42
42	<	45
45	<	48
48	<	51
51	<	54
54	<	57
57	<	60
60	<	63
63	<	66
66	<	69

Legend

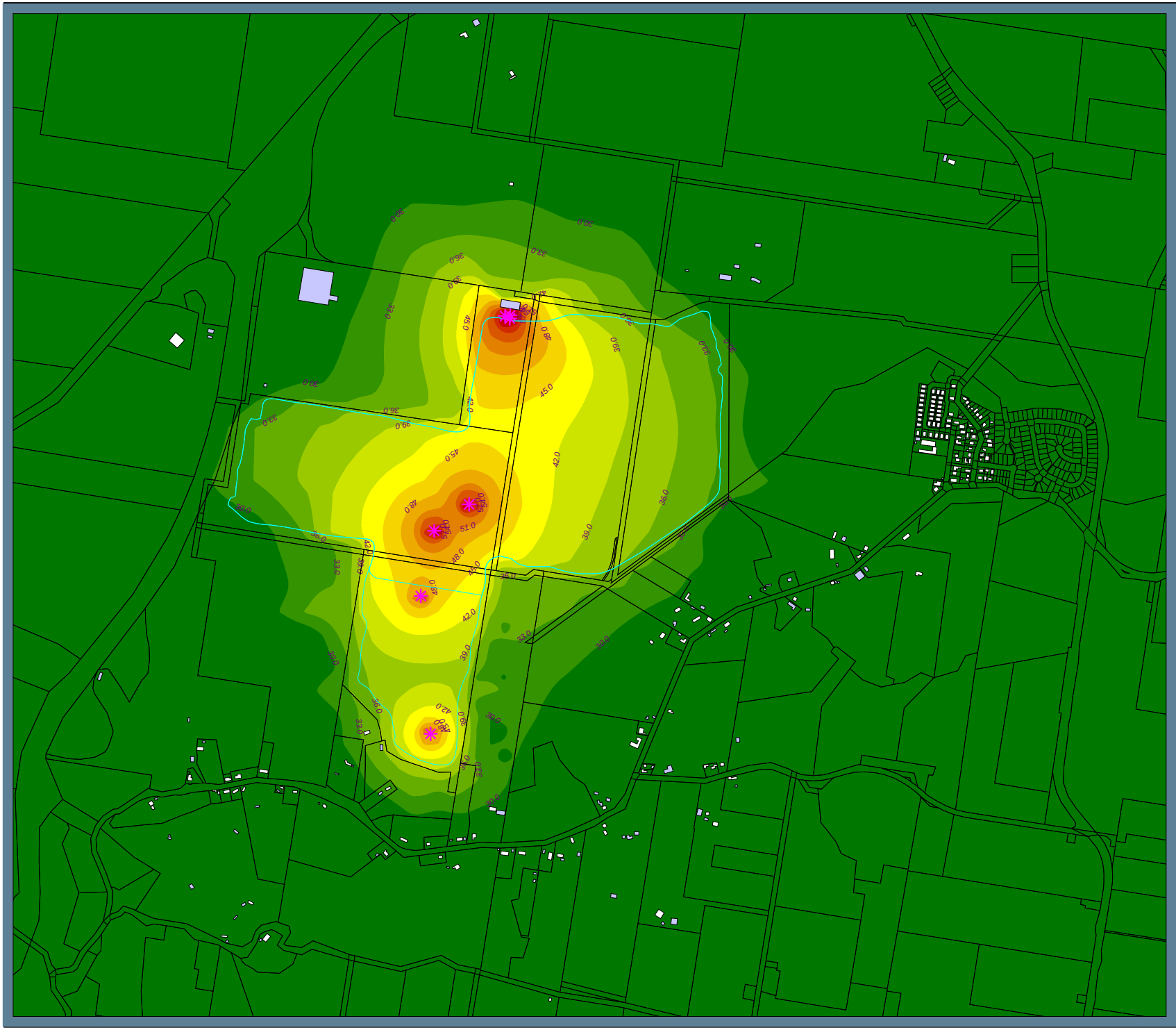
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 5
Phase 9 (Year 19-22)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

	<= 30
30 <	<= 33
33 <	<= 36
36 <	<= 39
39 <	<= 42
42 <	<= 45
45 <	<= 48
48 <	<= 51
51 <	<= 54
54 <	<= 57
57 <	<= 60
60 <	<= 63
63 <	<= 66
66 <	<= 69
69 <	

Legend

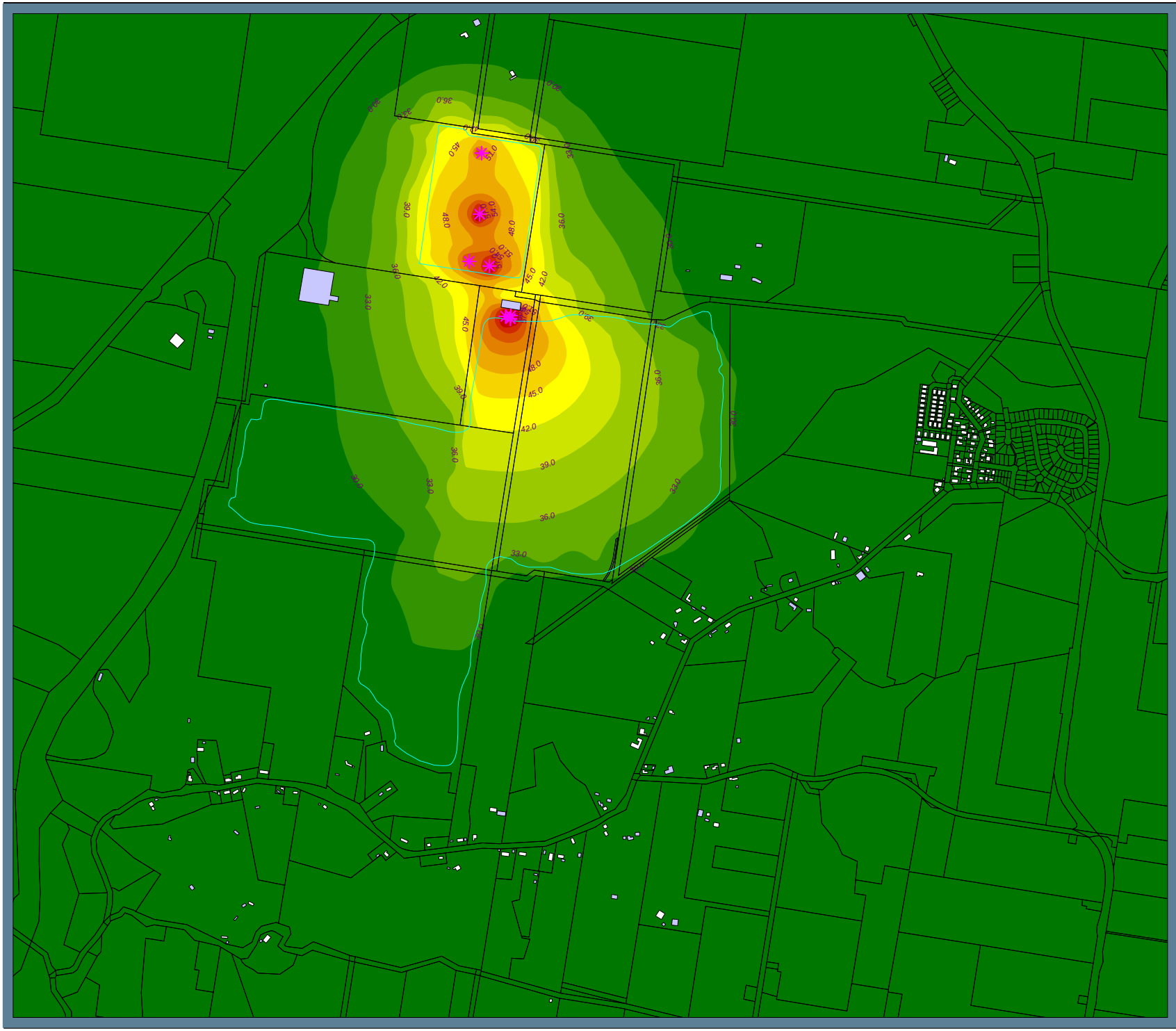
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 6
Phase 10 (Year 23-26)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

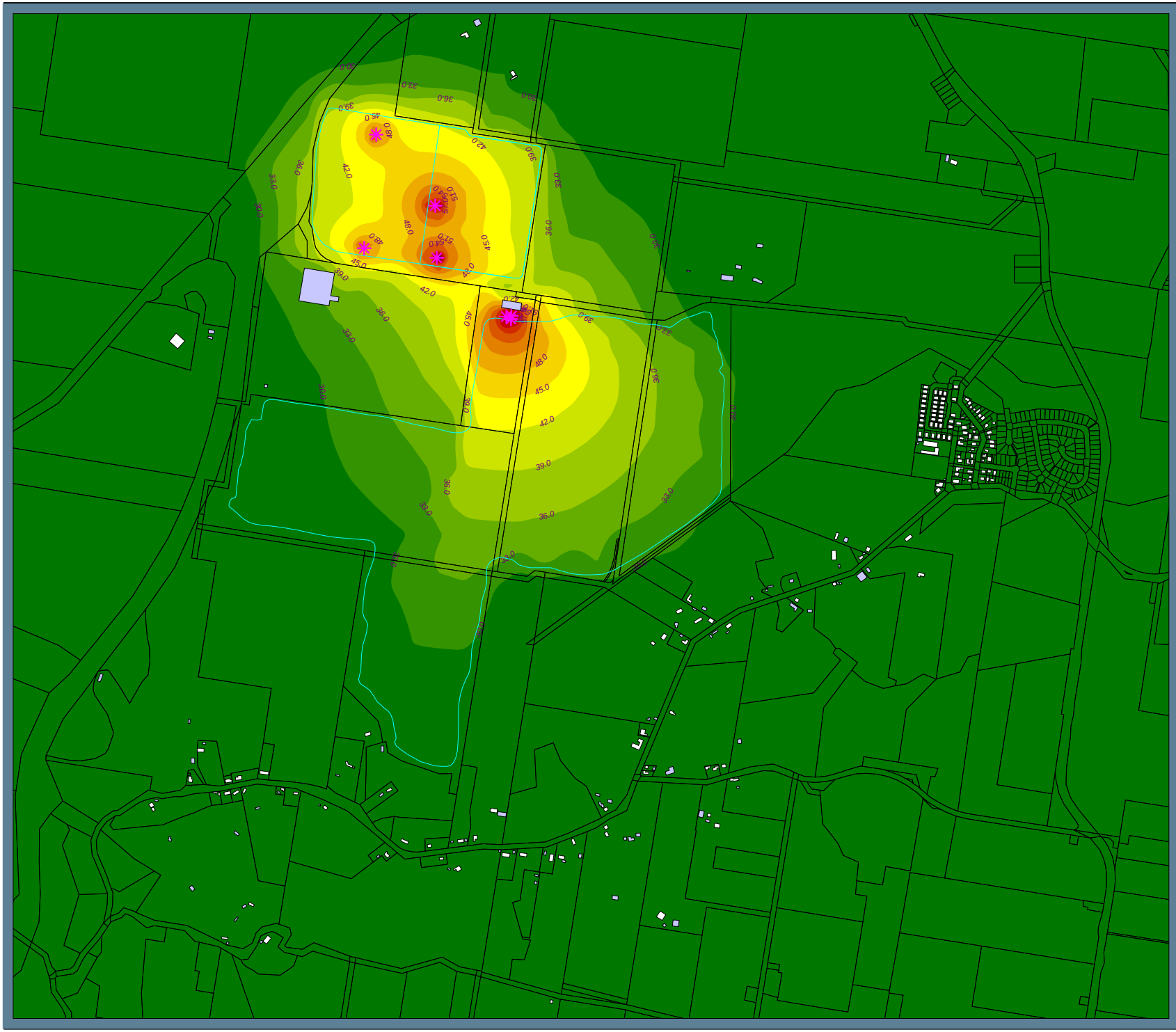
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 7
Phase 11 (Year 27-30)

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

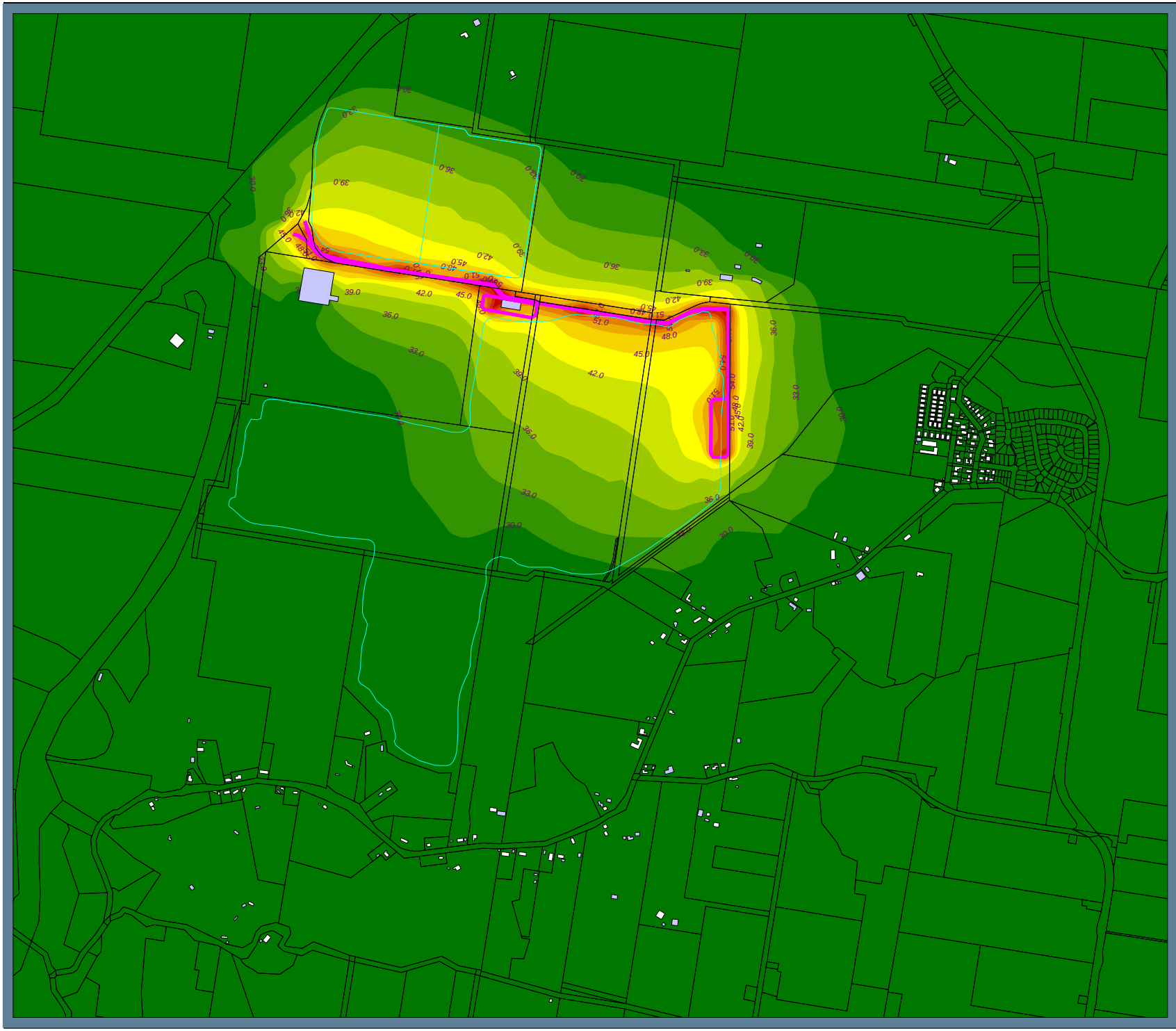
- Dredge area
- Line
- Noise sensitive building
- Non noise sensitive building
- Point source

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2



ATP190611

Hanson Tweed Sand Plant
Altona Road, Cudgen

Scenario 8
Proposed Haulage Route

Operational noise level
$L_{eq,adj,15min}$ dB(A)

		<= 30
30	<	<= 33
33	<	<= 36
36	<	<= 39
39	<	<= 42
42	<	<= 45
45	<	<= 48
48	<	<= 51
51	<	<= 54
54	<	<= 57
57	<	<= 60
60	<	<= 63
63	<	<= 66
66	<	<= 69
69	<	

Legend

- Dredge area
- Line
- Line source
- Noise sensitive building
- Non noise sensitive building

SCALE @ A4 1:20000

0 125 250 500 750 1000 m

N

Grid Spacing: 50m
Project Engineer: Aidan Daniels
Created: 18/10/2021
Processed with SoundPLAN 8.2