Acoustics RB Pty Ltd

Report No. 21-1249.R01

Proposed Research and Technology Industry Facility 34 Mill Street, Mossman

Environmental Noise Assessment

COPY 2

April 2021

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Report No. 21-1249.R01

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Status:	**Final**	**Author:**	**Russell Brown**
Copy No:	**2**	**Date of Issue:**	**6 April 2021**

History of Revisions

Date	Version	Changes / Page Reference
30 March 2021	Draft	
6 April 2021	Final	

Record of Distribution

Copy No.	Revision No.	Destination
1	Final	File - Controlled copy
2 = electronic	Final	CocoNutZ Australia and Canberra Town Planning

SUMMARY

CocoNutZ Australia Pty Ltd has made a Material Change of Use application to Douglas Shire Council for approval to develop a new Research and Technology Industry Facility at 34 Mill Street, Mossman.

Acoustics RB Pty Ltd has been engaged by CocoNutZ Australia Pty Ltd to conduct an assessment of the potential impact of noise from the proposed Research and Technology Industry Facility on the nearby residential premises.

This acoustical assessment has been based on limits for acceptable levels of noise emission tailored to the proposed development by reference to specific provisions of (i) *Environmental Protection (Noise) Policy* 2019 [EPP-N 2019], (ii) *Ecoccess Guideline Noise – Planning for noise control* [*Planning for Noise Control Guideline*], (iii) the standard noise level limit setting regime commonly adopted by DES for controlling noise emission from industry and (iv) *Environmental Protection (Noise) Policy 2008* [EPP-N 2008].

From the results this assessment, it has been determined that that compliance with the Phase 1 (ie 2021 crush) noise level limits is predicted to be achieved at all nearby residences.

Notwithstanding, for a number of reasons, there remains the possibility that minor and intermittent exceedances of the noise level limits may occur on occasions during Phase 1. In these circumstances, and for the reasons outlined in Section 7.0 of this report, it is recommended that operation of the new facility should be permitted up to the end of the 2021 crush without requiring that any supplementary noise control measures, notably acoustic barriers, be introduced into the current proposal.

Upon commencement of the 2021 crush, but before completion of commissioning of the new facility, monitoring of current ambient and background noise levels in the community should be undertaken to establish with a degree of accuracy the actual background noise levels to be used for setting limits for acceptable levels of noise emission from the facility during the crush. At that time, (i) a determination of the sound power level of the front end loader should be conducted as well and (ii) the requirement for any reasonably-required supplementary noise control treatment of the front end loader evaluated as a consequence.

Thereafter, upon commencement of operation of the new facility, accurate determinations should be made of (i) the source sound power levels of fixed plant, (ii) the internal reverberant noise levels within the processing sheds and (iii) the current level of noise emission to the nearest residential premises.

In the event that these further determinations establish that non-compliance with the relevant noise level limits is occurring, or may occur on occasions, remedial measures should be evaluated so that appropriate noise control measures can be developed and implemented prior to the commencement of the 2022 crush.

Furthermore, noise level limits for commencement of Phase 2 operations, ie the 2022 off-season, should be set by reference to the ambient and background noise levels measured during the 2021 off-season. In addition, appropriate noise control measures should be developed in order that successful operation of the proposed new facility may be conducted during the remainder of the 2022 off-season and thereafter.

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1.0 Introduction

CocoNutZ Australia Pty Ltd has made a Material Change of Use application to Douglas Shire Council for approval to develop a new Research and Technology Industry Facility at 34 Mill Street, Mossman.

Acoustics RB Pty Ltd has been engaged by CocoNutZ Australia Pty Ltd to conduct an assessment of the potential impact of noise from the proposed Research and Technology Industry Facility on the nearby residential premises.

This acoustical assessment has been based on limits for acceptable levels of noise emission tailored to the proposed development by reference to specific provisions of (i) *Environmental Protection (Noise) Policy* 2019 [EPP-N 2019], (ii) *Ecoccess Guideline Noise – Planning for noise control* [*Planning for Noise Control Guideline*], (iii) the standard noise level limit setting regime commonly adopted by DES for controlling noise emission from industry and (iv) *Environmental Protection (Noise) Policy 2008* [EPP-N 2008].

2.0 Subject Site and Proposed Development

2.1 Subject Site and Surrounding Uses

The subject site is located at 34 Mill Street, Mossman, approximately 80km north of Cairns.

The location of the subject site within the township of Mossman is shown in Figure 1. The local authority is Douglas Shire Council.

The proposed new facility will be located within the confines of the Mossman Sugar Mill on land owned by Far Northern Milling Pty Ltd, a subsidiary of Daintree Bio-Precinct. Daintree Bio-Precinct is a grower-owned company aiming to develop bio-technology investment in the region. Further details are provided in Section 2.4 following and Figure 2 attached.

The land for the proposed new facility is proposed to be leased from Far Northern Milling Ltd on a five year (plus five year) term.

Currently, the site is occupied by five sheds which will be converted for use as part of the proposed new facility.

2.2 Proposed Development

Application is being made for an environmentally relevant activity (ERA) for the establishment of a kecap manis[1] production plant (ERA 28 Sugar milling and refining). The development as a Research and Technology Industry Facility that, if successful, may lead to full commercial production of kecap manis.

[1] Kecap manis is an Asian condiment traditionally produced using coconut sugar. Gathering this feedstock is a relatively dangerous and difficult occupation usually carried out by small village-based land holders. The coconut tree is climbed to gather syrup from the cut flower before the flower grows into a coconut. Loss of flowers and the subsequent coconut fruit and can have adverse effects on both tree health and propagation of coconut trees.

Increasing demand in western countries driven by consumers seeking Low-GI alternatives to natural sugar has also contributed to premium prices for coconut sugar putting further pressure on the gathering of syrup from cut flowers. Overexploitation can result in environmental degradation as a result of loss of the coconut trees themselves. Increasing demand for traditional products in combination with young, expanding and increasingly for wealthy population of ASEAN countries is placing very significant pressure on this scarce agri-commodity.

2.3 Overview of Proposed Development

Details of the proposed Research and Technology Industry Facility are available in the documentation for the development application prepared by Canberra Town Planning.

In overview, the proposal is to develop a facility to be able to process up to 10,000 tonnes per year of sugar cane per year, expanding to 100,000 tonnes per year should the process be commercially viable.

Because the acoustical environment of the community is influenced significantly by the operation of the mill, it is expected that two sets of noise level limits will apply to the operation of the proposed new facility: one set of limits applying during the cane harvesting and crushing season, ie the "crush", when the mill is operational and another applying during the off-season when the mill is shut down.

Consequently, the DA seeks approval for operations in two phases as follows:-

1. Phase 1 – Operations up until the end of the 2021 crushing season
2. Phase 2 – Operations beyond the 2021 crushing season

This acoustical assessment addresses the impact of noise during Phase 1, ie the 2021 crush. During this time, which is expected to extend from approximately June to November, the mill will be operating a 24 hours per day. The proposed new facility is proposed to operate 24 hours per day as well.

A site plan showing the layout of the processing buildings and the fixed external plant proposed to be installed is presented in Figure 3.

The walls of all processing sheds will be constructed using Colorbond wall cladding. The roofs will be constructed using metal cladding lined on the underside with Polynum CLP insulation. During the detailed design phase, it may be necessary to incorporate supplementary or modified insulation to the roof/walls to address thermal design requirements and/or further reduce reverberant internal noise levels.

Roller doors will remain closed during processing operations. The details of the ventilation system for each building will be developed during the detailed design phase. At this stage, however, it is proposed to install within each shed a ducted crossflow fan assisted ventilation system comprising a filtered air-intake on the eastern side and floor-mounted fan units (approximately 10kW each) with a discharge to the western side of the shed. Intake and discharge attenuators, if any necessary, will be designed and installed as appropriate to adequately attenuate any fan noise and to preserve the acoustical integrity of the buildings.

During the crush, the sugar cane billets will be delivered from the mill to the cane bunkers by a rear tray-tip multi-lift vehicles. Typically, 25 tonnes of cane billets can be transferred each load. Three multi-lift loads will be required daily. Delivery times are dependent upon cane harvesting schedules, but an overnight storage capacity equating to 12 hours of production is to be installed to obviate the need to deliver cane to the facility during the night time period.

A single front end loader will be used for two prime purposes: (i) to transfer cane billets from the cane bunkers to the cane infeed into Shed-3 and (ii) to transfer mill mud and cane fibre (bagasse) from the mulch bunker to trucks for subsequent delivery to the mill mud pile and the bagasse storage area at the mill.

2.4 Mossman Mill

Mossman Mill is an active cane processing facility. Mossman Mill was built it 1896, with the first sugar being crushed on-site in 1897. Consequently, it has been integral feature of the township of Mossman more than 120 years.

Originally, Mossman Mill was a grower-owned cooperative, but was acquired by Mackay Sugar 2012. In 2019, local cane growers formed a cooperative, Far Northern Milling Pty Ltd, to buy back the mill from Mackay Sugar and, in so doing, becoming the first cooperative to buy back a sugar mill.

The Mossman Mill is characterised by the following:

- Existing rail infrastructure for cane supply
- Road access suitable for heavy vehicles
- Existing storage and processing of mill mud and cane fibre (bagasse)
- Housing provided on-site which is owned by Far Northern Milling Pty Ltd
- Operational 24/7 during the cane processing season (June-November), with only maintenance activities conducted during the off-season.

Mossman Mill currently operates under Environmental Authority EPPR00920713 which authorises the mill to undertake ERA 15 (fuel burning) and ERA 28 (sugar milling or refining). Under this EA, the mill is not obliged to meet any particular noise level limits. Rather, the activities of the mill must be carried out in accordance with a Noise Management Plan "which progressively reduces the total amount of noise generated in carrying out the environmentally relevant activities." The general intent of the NMP is to progressively reduce the level of noise emission from the activities of the mill over time as opportunities arise.

It is noted that the strategic goal of the cooperative is to transition the mill from an exporter of sugar onto the world market to a bio-precinct to tap into renewable energy opportunities, with by-products being created at processing facilities on adjacent land.

It is also noted that the proposed Research and Technology Industry Facility that is the subject of this acoustical assessment has both ministerial and financial support from the State government.

The importance of the mill to the economy of the township of Mossman and of the development of bio-precinct to the future prosperity of the township and the surrounding area is self-evident.

2.5 Nearby Residences

As is evident in Figure 1, the nearest residences are those located on the mill site. These residences are owned by Far Northern Milling Pty Ltd and occupied by mill employees. importantly, it is noteworthy that these residences are not separately titled but, rather, are all located on the land on which the mill has been constructed, ie Lot 27 on RP804231. Consequently, at present there is no ability for these residences to be sold to others.

The closest residence off-site is located to the SSW of the site on Lot 10 on RP706271. This residence is situated 130m from the closest building on the subject site, ie Shed-3.

Other nearby residences are also located to the west. The closest of these are situated on Lot 101 on SR221, Lot 102 on SR221, Lot 103 SR221 and Lot 104 SR221. Each of these residences will be located between 195m and 220m from the nearest shed on the subject site.

3.0 Noise Level Limits

Limits for acceptable levels of noise emission from industrial activities (including rural industries) may be drawn from several sources, eg (i) *Environmental Protection (Noise) Policy 2019* [EPP-N 2019], (ii) *Ecoaccess Guideline Noise – Planning for noise control* [Planning for Noise Control Guideline] and (iii) the standard noise level limit setting regime commonly adopted by DES for controlling noise emission from industry.

For this particular development, however, it is contended that *Environmental Protection (Noise) Policy 2008* [EPP-N 2008] will provide the most appropriate and rigorous set of noise level limits for controlling noise emission from proposed Research and Technology Industry Facility, especially during Phase 1. Further discussion regarding this matter is presented below.

EPP-N 2019 and EPP-N 2008

Environmental Protection (Noise) Policy 2019 [EPP-N 2019] is subordinate legislation under *Environmental Protection Act 1994* [EP Act]. It commenced on 1 September 2019.

It is noted that the purpose of EPP-N 2019 is stated at s.5 Purpose as follows:

"(1) The purpose of this policy is to achieve the object of the Act in relation to the acoustic environment.

"(2) The purpose is achieved by—

(a) identifying and declaring the environmental values of the acoustic environment; and

(b) stating acoustic quality objectives that are directed at enhancing or protecting the environmental values; and

(c) providing a framework for making consistent, equitable and informed decisions that relate to the acoustic environment."

As noted in EPP-N 2019 at s.6 *Environmental values*, "The environmental values to be enhanced or protected under this policy are -

"(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

"(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following -

(i) sleep;

(ii) study or learn;

(iii) be involved in recreation, including relaxation and conversation; and

"(c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community."

At s.7 A*coustic quality objectives for sensitive receptors,* EPP-N 2019 states:-

"(1) This section and schedule 1 state the acoustic quality objectives to be achieved and maintained under this policy.

"(2) For a sensitive receptor stated in schedule 1, column 1, the value stated in schedule 1, column 3 is the acoustic quality objective for the time of day mentioned in schedule 1, column 2 for the sensitive receptor.

"(3) The environmental value to be enhanced or protected by the acoustic quality objective is stated in schedule 1, column 4 for the sensitive receptor.

"(4) An acoustic quality objective stated in schedule 1 is expressed as a measurement of an acoustic descriptor.

"(5) If it is reasonable in the circumstances, an acoustic quality objective may be progressively achieved and maintained as part of achieving the object of this policy over the long term."

As noted at s.8 *Management hierarchy for noise* of EPP-N 2019:-

"To the extent it is reasonable to do so, noise must be dealt with in the following order of preference—

"(a) firstly—avoid the noise;

Example for paragraph (a)—

locating an industrial activity in an area that is not near a sensitive receptor

"(b) secondly—minimise the noise, in the following order—

(i) firstly—orientate an activity to minimise the noise;

Example for subparagraph (i)—

facing a part of an activity that makes noise away from a sensitive receptor

(ii) secondly—use best available technology to minimise the noise;

"(c) thirdly—manage the noise.

Example for paragraph (c)—

using heavy machinery only during business hours"

Further, at s.9 *Management intent for noise*, it is stated:-

"(1) This section states the management intent for an activity involving noise that affects, or may affect, an environmental value to be enhanced or protected under this policy.

Note—

See Section 35 of the Environmental Protection Regulation 2019.

"(2) To the extent it is reasonable to do so, noise must be dealt with in a way that ensures—

(a) the noise does not have any adverse effect, or potential adverse effect, on an environmental value under this policy; and

(b) background creep in an area or place is prevented or minimised.

"(3) Despite subsection (2)(b), if the acoustic quality objectives for an area or place are not being achieved or maintained, the noise experienced in the area or place must, to the extent it is reasonable to do so, be dealt with in a way that progressively improves the acoustic environment of the area or place.

"(4) In this section—

background creep, for noise in an area or place, means a gradual increase in the total amount of background noise in the area or place as measured under the document called the 'Noise measurement manual' published on the department's website."

Finally, the acoustic quality objectives for residences are stated at Schedule 1 as detailed in the extract that follows below.

Column 1	**Column 2**	**Column 3**			**Column 4**
Sensitive receptor	**Time of day**	**Acoustic quality objectives (measured at the receptor) *dB(A)***			**Environmental value**
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep

Extract from Schedule1 of EPP-N 2019 – Acoustic Quality Objectives for Residential Premises

Even though background creep is defined at s.9(4) of the current version of EPP-N, ie EPP-N 2019, this version does not provide any guidance with respect to the appropriate method for preventing or minimising background creep, ie controlling background creep, as required at s.9(2).

In these circumstances (that is, in the absence of any guidance whatsoever with respect to this matter), it is now common practice to continue to refer to s.10 of EPP-N 2008 when determining the appropriate method of controlling background creep.

This method is discussed below.

Environmental Protection (Noise) Policy 2008 [EPP-N 2008] commenced on 1 January 2009. It maintained currency until 1 September 2019 when it was replaced by EPP-N 2019.

The stated application of EPP-N 2008 was as follows: "This policy applies to the acoustic environment." (Ref. s.4) The stated purpose of the policy was as follows: "The purpose of this policy is to achieve the objective of the Act in relation to the acoustic environment." (Ref. s.5).

EPP-N 2008 introduced the notion of background creep into Queensland legislation – a matter which was first recognised in Australia as an important consideration in environmental noise control in 1972. It is noted that the general concept of "control and prevention of background noise creep" appeared prior to commencement of EPP-N 2008 in *Ecoaccess Guideline Noise – Planning for noise control* [Planning for Noise Control Guideline] [2], but EPP-N 2008 was the first document of a statutory nature that address the appropriate means of controlling background creep.

[2] *Ecoccess Guideline Noise – Planning for Noise Control* [Planning for Noise Control Guideline] was published by Queensland Environmental Protection Agency on 20 July 2004. By reference to the website of Department of Environment and Science, it is stated that "Planning for noise control guideline" is currently under review. It cannot be accessed directly from the website and, hence, is not available for use. Regrettably, there were a large number of failings within this document. Specifically, it was convoluted and very difficult to use. It contained technical inconsistencies. It was open to misinterpretation: either accidentally or deliberately. And more concerningly, it led frequently to perverse outcomes, eg situations where, when applied unthinkingly, the guideline resulted in unreasonable and unjustifiably low noise level limits which would have the resultant effect of severely hampering appropriate industrial development within the State. Recognising some of these difficulties, an attempt was made in late 2013 to revise the guideline. Unfortunately, the revised guideline was still troubled by some of the shortcomings of the earlier document, albeit to a lesser degree. Further, it met with little to no support from the acoustical fraternity within the State. It did not progress past draft status. It is no longer available.

At stated in *Explanatory Notes for SL 2008 No. 442* to EPP-N 2008, "Background creep occurs when noise levels creep higher and higher over time with the establishment of new development in or near an area. To ensure that the level of noise in an area does not continue to increase unreasonably, background creep needs to be controlled."

At s.10 *Controlling background creep*, it was stated:-

(1) This section states the management intent for an activity involving noise.

Note—
See section 51 of the Environmental Protection Regulation 2008.

(2) To the extent that it is reasonable to do so, noise from an activity must not be—

(a) for noise that is continuous noise measured by $L_{A90,T}$ – more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or

(b) for noise that varies over time measured by $L_{Aeq,adj,T}$ – more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

Standard Industrial Noise Level Limit set by DES and Others

In instances where DES has considered that there is a likelihood of a complaint being lodged with the regulator in respect to noise from a specific noise generating activity, it is not unusual for the Environmental Authority to include limits for acceptable levels of noise emission from the specific activity.

Commonly, in such situations, the EA may include the following provision:-

> *In the event of a complaint about noise that the administering authority considers is reasonable, the emission of noise from the activity must not result in levels greater than those specified in **Table 1** of the Noise Schedule until circumstances which gave rise to the complaint are resolved.*

Table 1 has usually taken the following general form:

Noise Level at a Noise Sensitive Place, measured as $L_{Aeq\ adj,T}$	**Period**
Background noise level plus 5dBA	7 am - 6 pm
Background noise level plus 5dBA	6 pm - 10 pm
Background noise level plus 3dBA	10 pm - 7 am

Table 1 – Limits Set in Terms of Measured $L_{Aeq\ adj,T}$

Adoption of Controlling Background Creep Provisions of EPP-N 2008

Recognising that the proposed new facility will be located within the precincts of an existing industrial premises, ie Mossman Mill, which itself is a generator of not insubstantial noise levels in the community, it is considered reasonable to set the limits for acceptable levels of noise emission during the Phase 1 operations of the proposed new facility at a point which will adequately control background creep. In the absence of both (i) any guidance on this matter in EPP-N 2019 and (ii) a robust Planning for Noise Control Guideline free of technical inconsistencies and aberrant outcomes, the sole recourse for determining the appropriate means of achieving adequate control of background creep for Phase 1 is that prescribed at s.10 of EPP-N 2008.

Furthermore, recognising (i) that under s.10, the assessment metric for "noise that is continuous noise" is the $L_{A90,T}$ noise level parameter and (ii) that for any source of noise, the emitted $L_{Aeq\ adj,\ T}$ value will always be higher than the emitted $L_{A90,T}$ value – even if the difference is in the order of only 1dBA, a more conservative outcome will result if, when assessing the impact of noise that is continuous, the evaluation of the degree of compliance with the noise level limit is carried out using the $L_{Aeq\ adj,\ T}$ noise level parameter rather than the $L_{A90,T}$ metric.

In these circumstances, the resultant noise level limits for the Phase 1 operation of the proposed new Research and Technology Industry Facility will be as noted in Table 2 below.

No	Type of Noise	Noise Level Limit, dBA
1	Continuous noise, ie processing operations of the facility and fixed plant, but without operation of the front end loader, measured as $L_{Aeq\ adj,\ T}$:	Background noise level + 0dBA
2	Time-varying noise, ie processing operations of the facility and fixed plant and with operation of the front end loader measured as $L_{Aeq\ adj,\ T}$:	Background noise level + 5dBA

Table 2 – Limits for Acceptable Levels of Noise Emission from Facility (ref s.10 EPP-N 2008)

The noise level limits set in Table 2 have been adopted for the Phase 1 assessment that follows.

4.0 Background Noise Levels and Derived Noise Level Limits

As noted above in Section 2.3, the DA seeks approval for operations in two phases, ie Phase 1 for operations up to the end of the 2021 crush and Phase 2 for operations beyond the 2021 crush.

As also noted above, because the acoustical environment of the community is influenced significantly by the operation of the mill, it is expected that two sets of noise level limits will apply to the operation of the proposed new facility: one set of limits applying during the "crush" when the mill is operational (Phase 1) and another applying during the off-season when the mill is shut down (commencement of Phase 2).

As is evident in Table 2, the limits for acceptable levels of noise emission from industrial activities are set relative to the background noise level prevailing at the time. During the crush, the mill will be the dominant source of noise within Mossman. The level of noise generated by the mill during the crush will be very substantially greater than the level of noise emitted during the off-season when the noise generating activities will be confined to maintenance of plant, buildings and infrastructure.

Ordinarily in situations where there is no significant seasonal variation to the ambient and background noise levels, or where such seasonal effects such as the influence of insect noise can be readily addressed using appropriate acoustical techniques, there would be no temporal impediments to conducting monitoring of the ambient and background noise levels. That is, determination of the otherwise prevailing background and ambient noise levels could be undertaken at any time.

At the time of undertaking this noise impact assessment however, the commencement of the crush is still at least two months in the future. Consequently, at the current time, there is no scope to be able to measure directly the ambient and background noise levels that will prevail during the crush, ie at the time when the proposed facility will be first operational. Rather, any noise level measurements undertaken now, ie during the off-season, would capture only the noise generated by maintenance activities of the mill together with the noise from normal domestic and commercial activities in Mossman and from transport movements through Mossman during the off-season.

Fortunately, a web search has uncovered very useful material that can be used to develop a well-informed estimate of the expected level of noise emission from the mill during the crush. Specifically, part of the information submitted to Douglas Shire Council in support of the Development Application lodged in November 2013 seeking approval for Reconfiguration of a Lot (1 lot into 33, open space and new roads) over land at Lot 3 on RP720296, Junction Road, Mossman, presents the results of continuous noise level logging conducted during the 2007 crush. DA Report No 70 Q-07-0149-TRP-245437-0 dated 22 August 2007 prepared by Vipac Engineers & Scientists Ltd refers.

The stated purpose of this report was "to provide a noise impact assessment of the of the Mossman Central Mill Water Intake Pump onto Lots 15, 16, 17, 18, 19, 20 and 21 of the proposed residential development", ie Lot 3 on RP720296. This report presented the results of ambient noise level measurements conducted in late-July 2007 on Lot 3 on RP720296. Refer also Location "M" shown in Figure 1A.

The results of these noise level measurements were presented in the DA report in graphical format as well as in tabular format.

There are three points to make about the results of these noise level measurements.

Firstly, the measurements were conducted in late July during the crush.

Secondly, the reported average background levels ($L_{A90,T}$) measured in the absence of the operation of the water intake pump but while the mill was operating were tabulated to be as follows:-

- Day: 40dBA
- Evening: 42dBA
- Night: 41dBA

That is, there was a variation of only ±1dBA in the RBL values measured during the three time periods. This is an extremely small variation. It is one which would be expected to arise only when there is a dominant source of constant noise operating 24 hours per day.

Thirdly, measurements were at conducted 15 minute intervals continuously over each of the day, evening and night time periods. From an inspection of the graph showing the results of the noise logging conducted with the water intake pump shut down, it is evident that there was significant compression between the noise levels measured using the $L_{A90,T}$, $L_{Aeq,T}$ and $L_{A10,T}$ noise level parameters. On the great majority of occasions, the values of these noise level parameters were contained within a band <6dBA wide. This is a very narrow range.

Importantly, during the more critical evening and night time periods, the difference between the recorded average $L_{A90,T}$ level and the recorded average $L_{Aeq,T}$ level was 3dBA for both time periods. This is also very small difference.

This outcome, ie very narrow range of the $L_{A90,T}$, $L_{Aeq,T}$ and $L_{A10,T}$ noise level coupled with the very small difference between the average $L_{A90,T}$ level and the average $L_{Aeq,T}$ level, further supports the contention that, in the absence of the water intake pump, the dominant source of noise emitted to the logging location was the operation of Mossman Mill.

In these circumstances, and given that is not possible to make a direct determination of the ambient and background noise levels during the crush, it has been concluded that a reasonable, ie relatively conservative, first approximation of the background noise level to adopt at the noise monitoring location during the crush – especially during the more critical night time period – would be 40dBA.

This is a valuable benchmark from which the background noise levels throughout the rest of the community can be predicted. The predictions the background noise levels have been carried out using a SoundPLAN [3] noise level prediction model developed specifically for the proposed development. The noise levels emitted throughout the community were calculated using the CONCAWE [4] prediction algorithms as applied by SoundPLAN. The resultant background noise levels are presented in Figure 4.

Important Note:

> For the purposes of this modelling exercise, ie the determination of the noise levels throughout the community, it has been assumed that the entire sound power level of the mill has been concentrated at the discharge of the mill boiler stack. Doing so, however, will tend to result in elevated background noise levels at locations well removed from the mill where these locations are well protected by intervening built form, but will have little to no bearing on the accuracy of the predictions at the closest most affected residences.

From the results presented in Figure 4, the noise level limits applying to continuous noise sources, ie the processing operations carried out with the sheds and the operation of the fixed mechanical plant, at Phase 2 can be determined to be as shown in Figure 5.

Note:

> Because the noise level limit for continuous noise sources is set at background noise level plus 0dBA, there is no difference between the contours presented in Figure 4 and those shown in Figure 5. Only the contour description has changed.

The noise level limits applying at Phase 1 to time-varying noise sources, ie the operation of all noise sources including the processing operations and external plant as well as operation of the front end loader can also be determined by reference to the noise contours presented in Figure 4. In this case, because the noise level limit is set at a value equal to the background noise level plus 5dBA, the noise level limits applying to noise that varies over time will be 5dBA higher than those applying to continuous noise sources. The resultant noise level limits time-varying noise sources are presented in Figure 6.

From results presented in Figures 5 and 6, it can be seen that at the closest residence off-site, ie Lot 10 on RP706271, the resultant Phase 1 noise level limits will be 51-52dBA (continuous noise) and 56-57dBA (time-varying noise). At the nearby residences to the west, ie the residences Lots 101-104 on SR221, the resultant noise level limits will be 44-45dBA (continuous noise) and 49-50dBA (time-varying noise).

[3] SoundPLAN is an integrated software package for noise and air pollution evaluation developed in Germany by Braunstein + Berndt GmbH. It has been configured to predict the extent of (i) industrial noise emission using the CONCAWE algorithms (with appropriate modifications for short-distance noise level predictions) and (ii) road traffic noise intrusion by application of the CRTN '88 algorithms. It is in use in more than 48 countries and has had widespread application throughout Australia. It is endorsed by Department of Environment and Science (DES), most local authorities in Queensland as well as most other State environmental authorities.

[4] Conservation of Clean Air and Water in Europe. The CONCAWE methods were developed under funding from European and North American groups to quantify noise prediction procedures for emission from large industrial facilities such as oil refineries and petrochemical plants. The methods were first published in 1981 in research paper CONCAWE Report No. 4/81 entitled *The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities*. In contrast to the methods of ISO 9613-2:1996, the CONCAWE algorithms allow prediction of noise emission under calm conditions and specified stability class conditions. The CONCAWE algorithms are endorsed by DES and most State environmental authorities.

5.0 Noise Level Prediction Methodology

5.1 Noise Model

The extent of noise intrusion into the community from the proposed new Research and Technology Industry Facility was calculated using a second SoundPLAN noise model developed specifically for the proposed development.

Again, the noise levels throughout the community surrounding the site were calculated using the CONCAWE prediction algorithms as applied by the SoundPLAN.

The inputs for the noise prediction model comprised:-

1. The layout of the Research and Technology Industry Facility as shown in the design drawings provided by CocoNutZ Australia.
2. The anticipated internal reverberant sound pressure levels within each of the three process buildings, ie Shed-1, Shed-2 and Shed-3, based on an examination of the proposed items of processing equipment and experience gathered elsewhere in similar food processing facilities.
3. The sound transmission loss performance of the envelope of each building having regard to (i) materials of construction, (ii) placement of roller doors (closed) and (iii) appropriate measures to address sound leakage via ventilation parts.
4. The source sound power level [5] of each of the major items of external plant and equipment – both fixed and mobile – and the boiler stack by reference to in-house sound power data gathered at other comparable sites.
5. 3-D topographical contours for the site and surrounding community derived from LiDAR data topographical contour file obtained from Q Spatial.
6. Source heights set relative to (i) the appropriate height above ground level for the sources at ground, (ii) building and building roof height for elevated and roof-mounted sources, (iii) likely top of boiler stack and (iv) typical engine and exhaust heights for mobile plant.
7. Locations of nearby sensitive residential receptor locations derived from aerial photography.

The sound power levels for the major noise sources and the anticipated internal reverberant sound pressure levels within each of the three process buildings are presented overpage in Table 2.

Note:

As discussed above in Section 4.0, the acoustical environment of the community is influenced significantly by the operation of the mill. To quantify directly the ambient and background noise levels prevailing in the community during the crush, the noise level monitoring will be conducted soon as feasible after commencement of the 2021 crush. Thereafter, the results of the noise monitoring will be used to refine the assumptions adopted above with respect to the applicable noise level limits for operations during the crush. In addition, to ensure that appropriate noise level limits can be set for the commencement of Phase 2, ie the 2022 off-season, noise level monitoring will be conducted during April/May this year, ie during the quiet period of the 2021 off-season. It is anticipated that a determination of the sound power level of the front-end loader will be conducted during this time as well.

[5] Sound **power** level is a measure of how powerful the source is acoustically. It is measured in dBA (re 10^{-12}W, ie 1 picowatt). By contrast, the actual sound **pressure** level that would be measured at any point will depend on the sound power level and the distance between the source and the receiver. The significance of the difference between these two parameters can be illustrated by drawing the analogy to a light bulb (electric lamp). The difference between sound power level and sound pressure level can be compared to the difference between the power of a light bulb (which is fixed and is measured in Watts) and how bright it appears (which depends on its power as well as the distance from the light bulb).

No.	Location	Source	No of Items	Internal Reverberant Sound Pressure Level, dBA	Sound Power Level, dBA re 10^{-12}W
1	Mill	Entire Mill	1		108 (a)
2	Shed-1	Shed-1	1	90	
3	Shed-2	Shed 2	1	85	
4	Shed-2	Shed 3	1	85	
5	Rear of Shed-2	Cooling Tower	1		90
6	Rear of Shed-2	Pump	1		83
7	Rear of Shed-2	Vacuum Pump	1		85
8	Rear of Shed-2	Elements of Concentrator	5		85, ea
9	Adjacent Shed-3	Front End Loader Exhaust	1		105
10	Adjacent Shed-3	Front End Loader Engine Casing	1		105
11	Adjacent Shed-2	Tray-Tip Multi-Lift/Truck Exhaust (b)	1		98
12	Adjacent Shed-2	Tray-Tip Multi-Lift/Truck Engine (b)	1		98
13	Adjacent Shed-1	Conveyors	2		75.0/m

Table 2 – Noise Sources and Corresponding Source Sound Power Levels

Notes: (a) The sound power level of the entire mill was determined by back calculation from the 40dBA background noise level derived from the work by Vipac. The reasonableness of the derived sound power level was checked against results of determinations of the sound power emitted by the openings in the mill building having regard to the results of hearing conservation surveys conducted at five yearly intervals by the mill during the crush. An adequate degree of correlation was determined.

(b) For all practical purposes, the operation of the tray-tip multi-lift/truck and the front end loader can be considered to occur independently of each other. Having regard to the duration of operation of each of these two items of plant as well as the source sound power levels of each, it is evident that the worst-case situation would arise when the front end loader is operating. This is the situation that has been modelled.

Where the particular noise source will be operated intermittently or cyclically, judgement has been exercised to determine the full suite of noise sources and the number of items of each source that reasonably would be expected to be operated simultaneously under expected worst-case circumstances. In each instance, a conservative approach to setting the relevant source sound power levels was adopted.

5.2 Effect of Particular Atmospheric Conditions

It is noted that, in coastal Far North Queensland, the prevailing winds are east to SE with the highest speed winds excluding cyclones (ie the trade winds) usually occurring during the cooler months, ie April and August. During the summer months, north to NE sea breezes dominate in the local area.

Consequently, the changes to atmospheric conditions will tend to affect the level of noise emitted by the mill in the same way as the level of noise emitted by the proposed new development.

Only in instances of NW winds, and only in the case of the residences to the SSW would it be likely that there would be a reduction in the level of noise emission from the mill which would not be accompanied by a similar reduction in noise emission from the proposed new facility. In any event, it can be readily established that at the distances of separation currently contemplated, this effect will be very small. Furthermore, for the critical night time period, ie when calm winds will tend to prevail, the likelihood of adverse weather conditions arising is very low.

6.0 Results

The results of the environmental noise assessment are presented in the series of $L_{Aeq\ adj,T}$ noise contour plots in Figures 7-10 as described below.

- Figure 7: $L_{Aeq\ adj,\ T}$ noise levels due to processing operations of CocoNutZ Research and Technology Industry Facility and fixed plant, but without operation of front end loader.
- Figure 8: $L_{Aeq\ adj,\ T}$ noise levels due to processing operations of CocoNutZ Research and Technology Industry Facility and fixed plant with operation of front end loader.
- Figure 9: Degree of exceedance of noise level limits for continuous noise sources due to processing operations of CocoNutZ Research and Technology Industry Facility and fixed plant, but without operation of front end loader.
- Figure 10: Degree of exceedance of noise level limits for time-varying noise sources due to processing operations of CocoNutZ Research and Technology Industry Facility and fixed plant and with operation of front end loader.

7.0 Discussion and Conclusion

From the results presented in Figures 9 and 10, it can be seen that compliance with the Phase 1 noise level limits is predicted to be achieved at all nearby residences, albeit without any margin of safety.

Normally, in such circumstances, there would be no warrant to meet any specific noise control measures to achieve any further reduction in the level of noise emission from the proposed facility. In this instance, however, it is noted that there are two matters which need also to be taken into account. These are discussed below.

Firstly, as noted above in Section 4.0, the timing of the acoustic study outside the crushing season has prevented the collection of acoustic data during the crush, resulting in reliance being placed upon data gathered by others during an earlier crush to establish the community-wide background noise levels.

Secondly, even though compliance with the relevant noise level limits has been demonstrated as being achieved at all nearby residences, this result has been established without any margin of safety attached to the outcome. This outcome also hinges on the accuracy of the assumptions with respect to the source sound power levels and the internal reverberant levels within processing sheds: none of which can be checked with any degree of accuracy at this point of development of the proposal. Consequently, in the event that actual noise limits are lower than those currently established, and/or the source sound power levels and internal reverberant levels are higher than currently assumed, there is a risk that minor non-compliance may arise.

Taking account of the current constraints imposed by the site and the nature of the noise generating activities, is likely that, should minor exceedance of the noise level limits arise, the most appropriate means of ameliorating the impact is likely to be by, initially, upgrading of the exhaust muffler of the front end loader and, thereafter if necessary, by constructing a barrier along the southern boundary of the area of the lease for the facility with a return of that barrier constructed along part of the western boundary of the lease area.

While construction of an acoustic barrier prior to commencement of operations may be judged as a desirable measure to be incorporated into the current proposal, a more prudent approach – both commercially and operationally – would be to delay the implementation of any specific noise control measures until such time as environmental noise level monitoring can be carried out on-site during the crush.

There are a number of reasons for adopting this approach. These are as follows:

- It would allow for greater confidence to be gained in the accuracy of the acoustic modelling.
- It would ensure that any attenuation measures such as an acoustic barrier are tailored specifically to suit the degree of attenuation required.
- Because the capital required to construct an acoustical barrier will not be available until 2022, it would facilitate commencement of operations in 2021.
- On the basis of the assessment conducted to date, any exceedance of background noise during the 2021 crush is likely to be minor and of short term duration.

Consequently, and as discussed above, two operational phases are proposed in order to manage acoustical impacts:

1. Phase 1 – Operations up until the end of the 2021 crush
2. Phase 2 – Operations beyond the 2021 crush

It is envisaged that minor and intermittent exceedance of the noise level limits could be accommodated during Phase 1 on the basis that this impact would be temporary and would conclude with the 2021 crush, ie December 2021. Thereafter, with the advantage of having gathered both accurate measurements of the ambient and background noise levels during the crush as well as key noise data on the operations of the facility, the environmental noise impact during Phase 2, ie during the 2022 off-season and, subsequently, during the 2022 crush and beyond, would be regulated in compliance with the relevant criteria.

8.0 Recommendation

From the results presented above in Section 6.0 and by reference to the noise level contours shown in Figures 7-10, it can be seen that compliance with the relevant objective criteria is predicted to be achieved throughout the community during Phase 1.

Notwithstanding, as discussed above in Section 7.0, there remains the possibility that minor and intermittent exceedances of the noise level limits may occur on occasions during Phase 1.

In these circumstances, and for the reasons outlined above in Section 7.0, it is recommended that operation of the new facility be permitted up to the end of the 2021 crush without requiring that any supplementary noise control measures be introduced into the current proposal.

Upon commencement of the 2021 crush, but before completion of commissioning of the new facility, monitoring of current ambient and background noise levels in the community should be undertaken to establish with a degree of accuracy the actual background noise levels to be used for setting limits for acceptable levels of noise emission from the facility during the crush. At that time, (i) a determination of the sound power level of the front end loader should be conducted as well and (ii) the requirement for any reasonably-required supplementary noise control treatment of the front end loader evaluated as a consequence.

Thereafter, upon commencement of operation of the new facility, accurate determinations should be made of (i) the source sound power levels of fixed plant, (ii) the internal reverberant noise levels within the processing sheds and (iii) the current level of noise emission to the nearest residential premises.

In the event that these further determinations establish that non-compliance with the relevant noise level limits is occurring, or may occur on occasions, remedial measures should be evaluated so that appropriate noise control measures can be developed and implemented prior to the commencement of the 2022 crush.

Furthermore, noise level limits for commencement of Phase 2 operations, ie the 2022 off-season, should be set by reference to the ambient and background noise levels measured during the 2021 off-season. In addition, appropriate noise control measures should be developed in order that successful operation of the proposed new facility may be conducted during the remainder of the 2022 off-season and thereafter.

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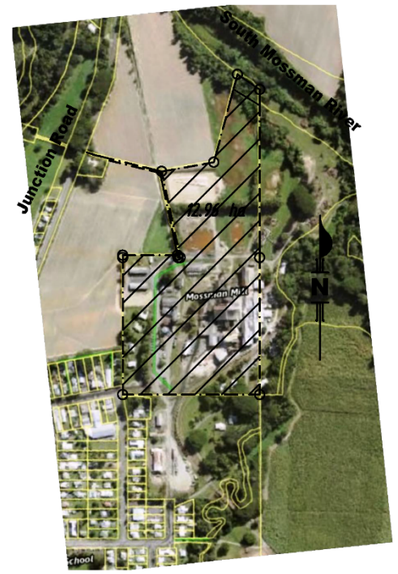
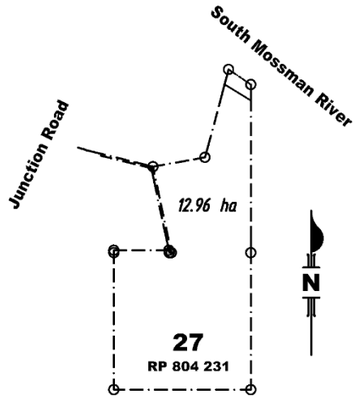
Figure 1 – Site Location, Mossman Mill and Nearby Residences in Adjoining Community

Figure 1A – Noise Level Monitoring Location "M" Adopted by Vipac





Lot 27 RP804231
PROPERTY BOUNDARIES
(SCALE 1:10,000 ON A3)

phone: 0428 294 235 EDMONTON 4869. QUEENSLAND
GREGORY G TERZI Building Design & Drafting
-Building Designer- -Medium Rise- -QBCC LICENCE: 1117048-

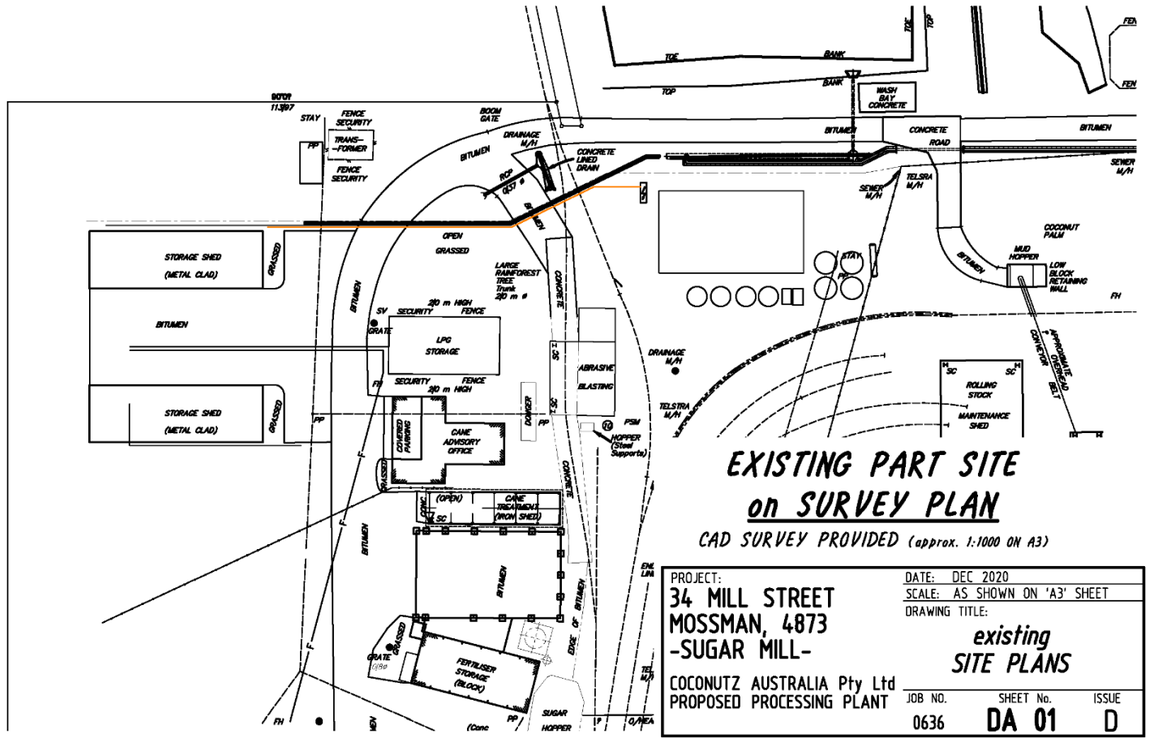


Figure 2 – Location of the Proposed New Facility within Mossman Mill Site

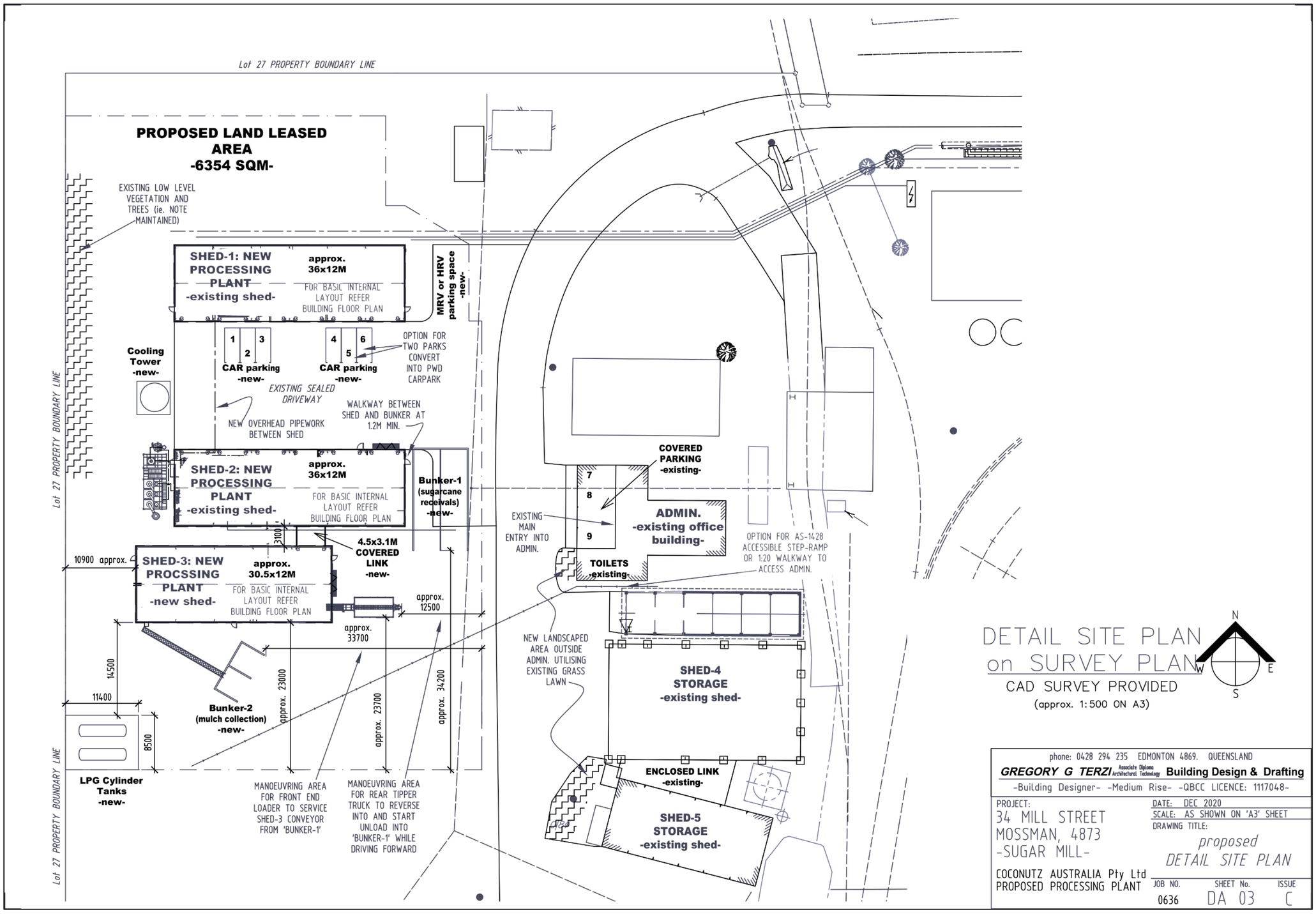


Figure 3 – Layout of Processing Buildings (Shed-1, Shed-2 and Shed-3) and Fixed External Plant

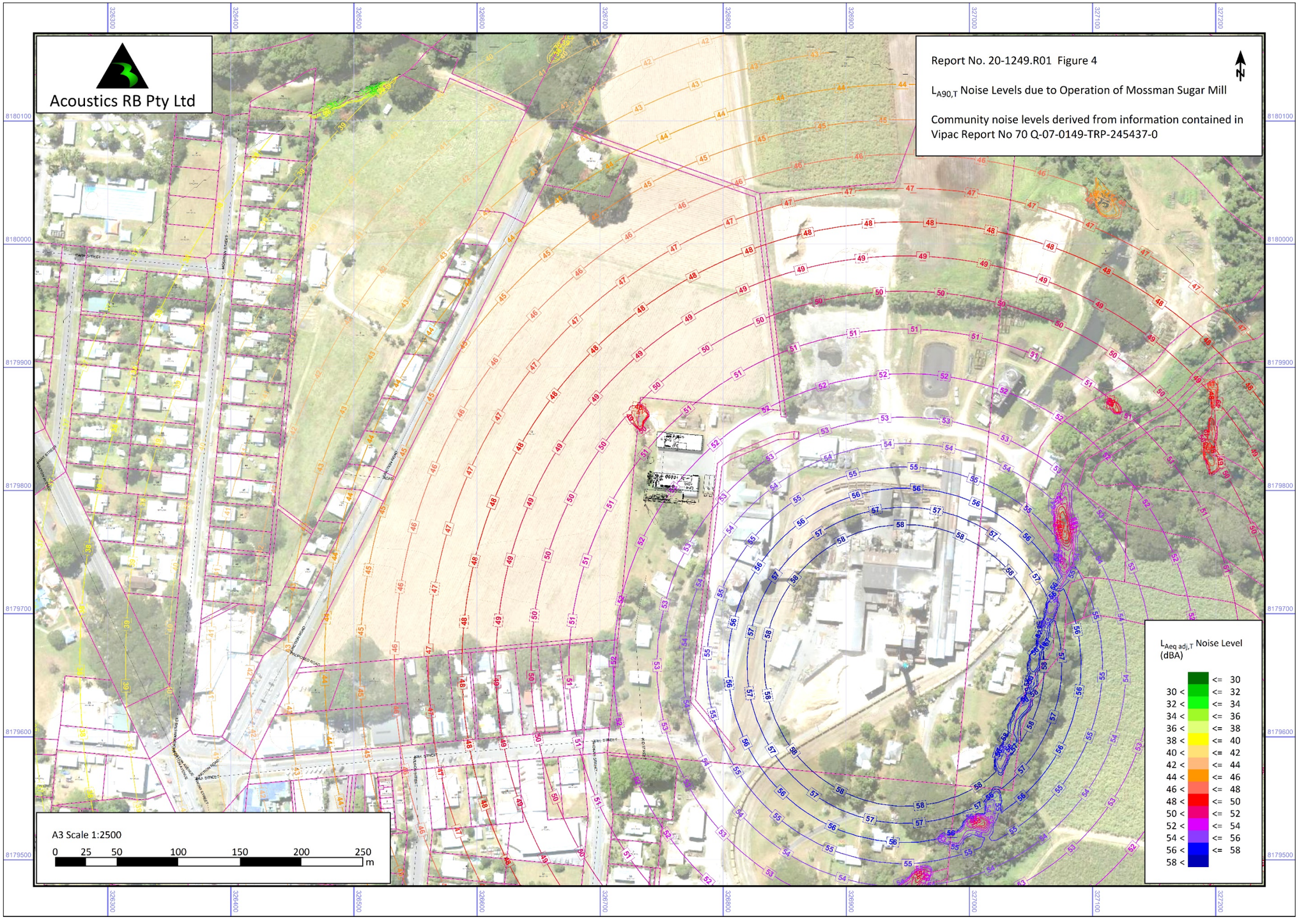


Figure 4 – Resultant Background Noise Levels due to Operation Mill

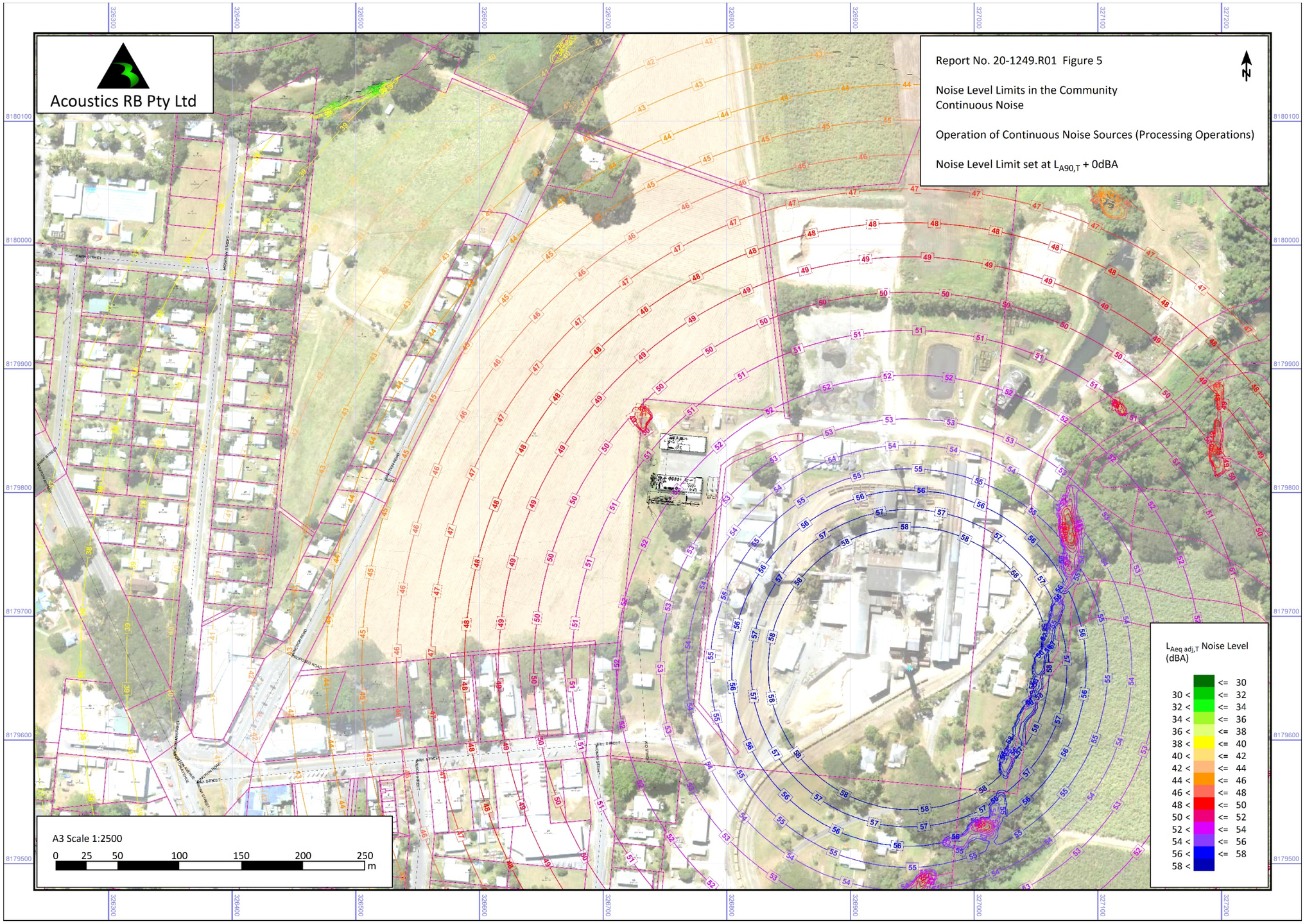


Figure 5 – Noise Level Limits Applying to Continuous Noise Sources

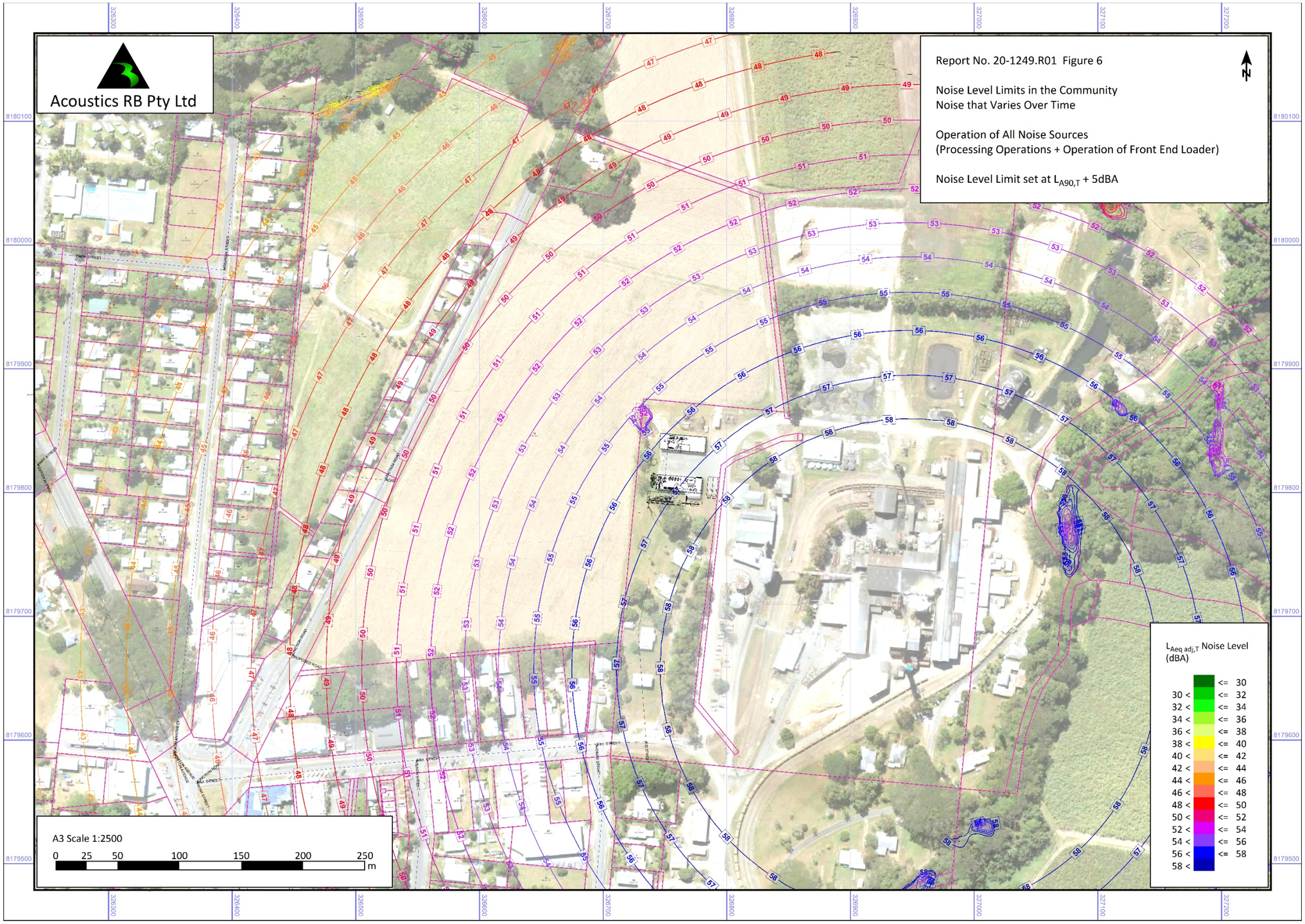


Figure 6 – Noise Level Limits Applying to Time-Varying Noise Sources

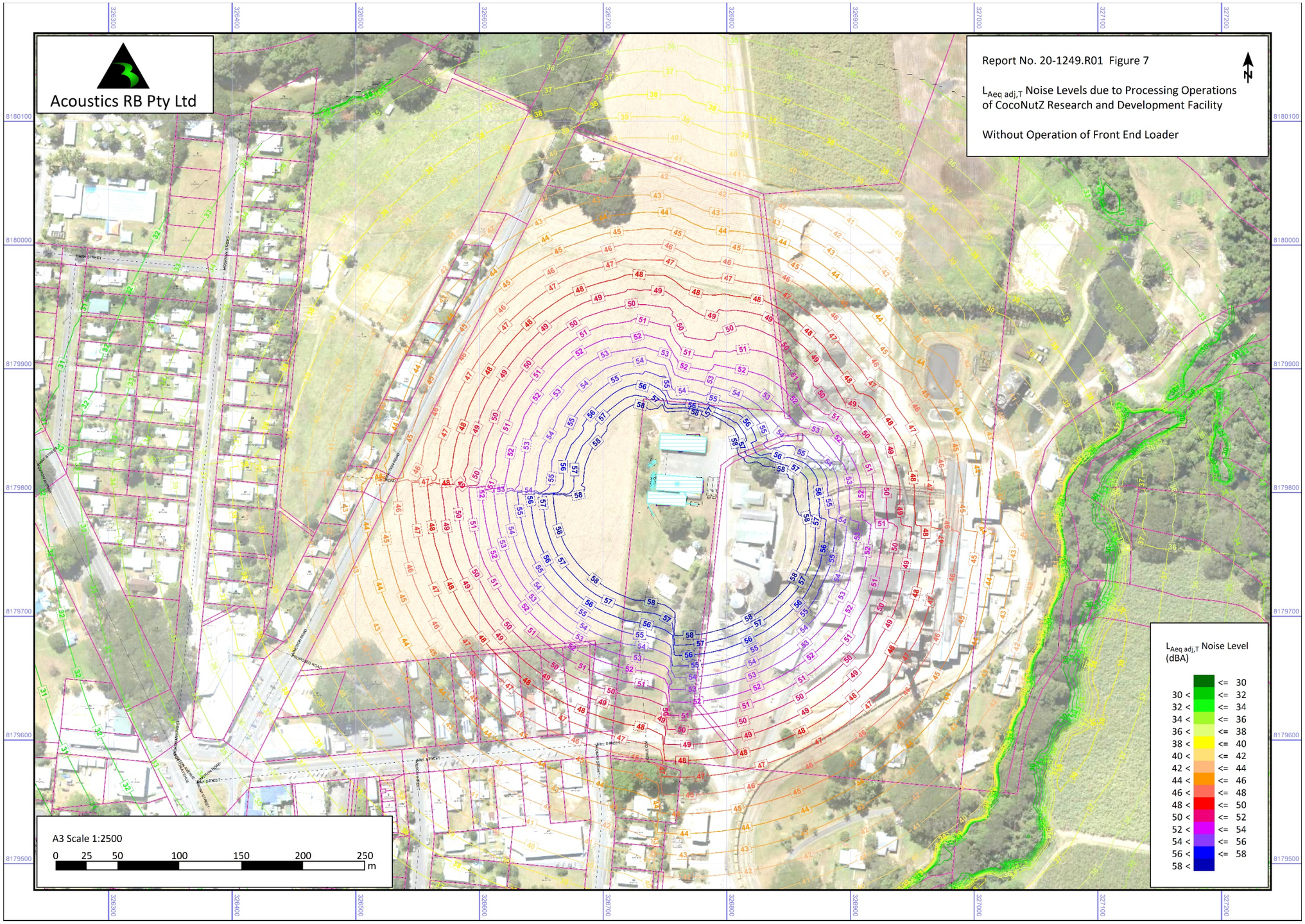


Figure 7 – $L_{Aeq\ adj,\ T}$ Noise Levels Due to Continuous Noise (Processing Operations and Fixed Plant)

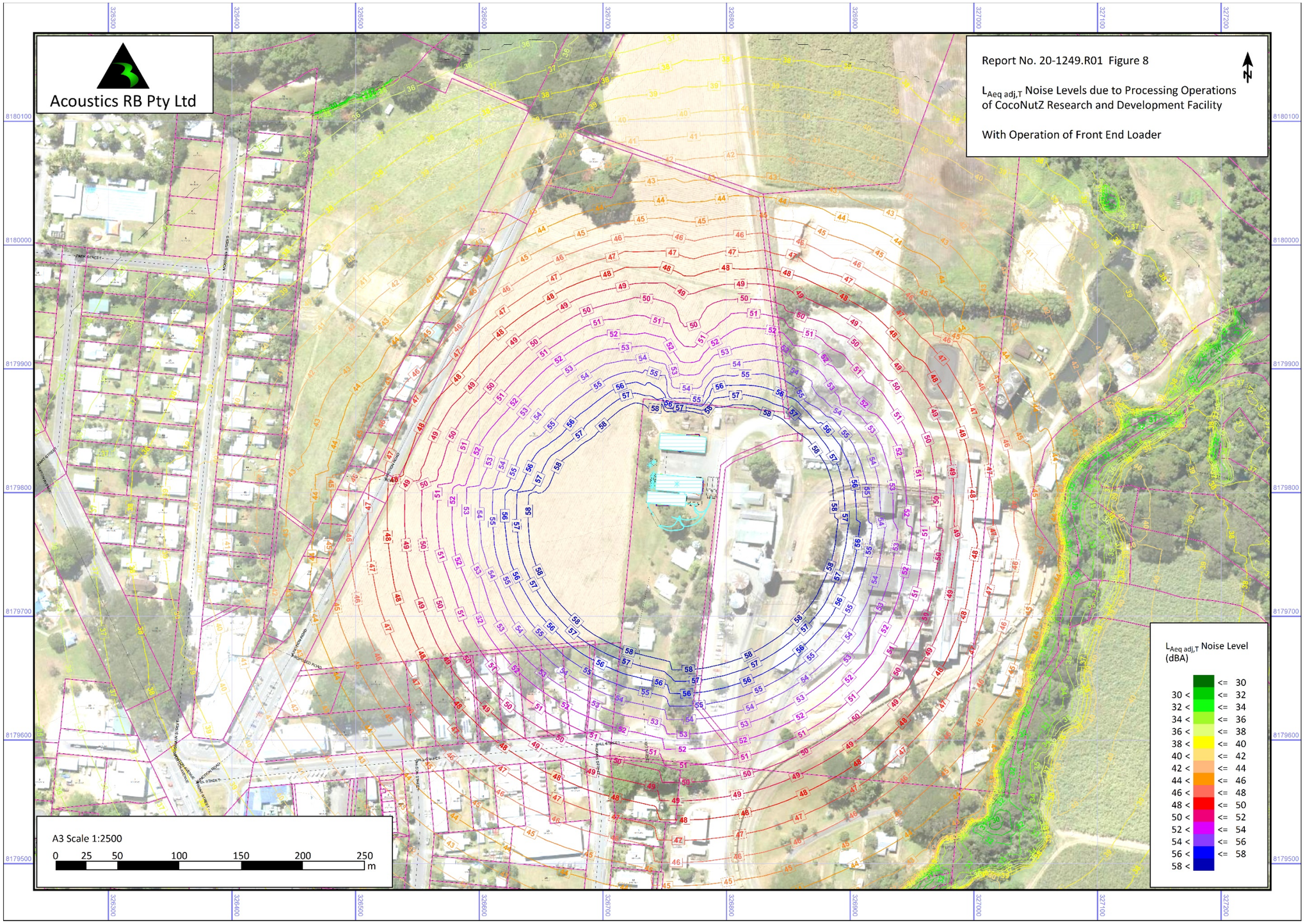


Figure 8 – $L_{Aeq\ adj,\ T}$ Noise Levels Due to Time-Varying Noise (Processing Operations, Fixed Plant and Front End Loader)

Figure 9 – Degree of Compliance with Noise Level Limits for Continuous Noise

Figure 10 – Degree of Compliance with Noise Level Limits for Time-Varying Noise