



Report

Noise Impacts Assessment

Arrow Grain Facility Narrabri

Arrow Commodities Pty Ltd c/o SMK
Consultants Pty Ltd

13 November, 2020

Rev 1 (Final)

Report Details

Noise Impacts Assessment - Arrow Grain Facility Narrabri

Job #: J0200220, Folder #: F21334, Revision: 1 (Final), Date: 13 November, 2020

Filename: 21334 Arrow Grain NIA Rev1.docx

Prepared For

Arrow Commodities Pty Ltd c/o SMK Consultants Pty Ltd

c/o Peter Taylor, (SMK Consultants)

ptaylor@smk.com.au, Telephone: 02 675 210 21

39 Frome Street Moree NSW 2400

PO Box 774 Moree NSW 2400

Prepared By

Advitech Pty Limited t/a Advitech Environmental

ABN: 29 003 433 458

Louis Abell, Environmental Scientist

Email: louis.abell@advitech.com.au, Telephone: 02 4924 5400




Facsimile: 02 4967 3772, Web: www.advitech.com.au, General Email: mail@advitech.com.au

7 Riverside Drive Mayfield West NSW 2304 PO Box 207 Mayfield NSW 2304

History

Date	Revision	Comments
27 October, 2020	0	Draft Issue for Client Review
13 November, 2020	1	Final Issue

Endorsements

Function	Signature	Name and Title	Date
Prepared by		Louis Abell (Grad. M.A.A.S) Environmental Scientist	13 November, 2020
Checked by		Clayton Sparke (M.A.A.S) Environmental Specialist (Acoustics)	13 November, 2020
Authorised for Release by	 for	Dr Rod Bennison Lead Environmental Scientist	13 November, 2020

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EXECUTIVE SUMMARY

Advitech Environmental was engaged to prepare an assessment of potential noise impacts associated with the modification of the Arrow Grain rail loading terminal in Narrabri. The objective of this noise assessment was to identify noise impacts associated with the 24hr/7day operation of the site and provide advice regarding reasonable and feasible mitigation strategies where necessary.

The Arrow Grain rail loading terminal in Narrabri is currently in operation in accordance with activities outlined in Development Application No.15/2011. Activities approved under this application were assessed under the NSW Industrial Noise Policy (2000), however, the modification has requested assessment of noise impacts under the NSW Noise Policy for Industry (2017). Project Tigger Noise Levels for adjacent receiving environments were reviewed, and the assessment conservatively adopted the most stringent criteria for the project area. Modelling indicates that noise levels associated with the modification are expected to meet these criteria. Review of modelling results indicates that $L_{A_{Max}}$ noise levels at adjacent sensitive receivers will be less than the Maximum Noise Trigger Level. Adverse impacts are not expected, and detailed assessment of potential impact was not undertaken.

While adverse operational noise impacts are not expected during the day or evening period, this activity may be audible at some locations under adverse meteorological circumstances during the night period. It is recommended that operational mitigation measures outlined in this report be put in place to ensure the effective response to any concerns raised by adjacent receivers.

Assessment indicates that receivers along the proposed haulage route already experience high levels of noise associated with Wee Waa Road (the Kamilaroi Highway). Despite potential for high levels of traffic noise, increases of road traffic noise are expected to be no more than 2dB above the criteria are predicted at receivers in close vicinity to the haul route from the facility.

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1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by SMK Consultants on behalf of Arrow Commodities to prepare a noise impact assessment for the lodgement of a 4.55(2) modification application to extend rail freight terminal operating hours to 24hrs/7days and double haul truck deliveries via the Newell Highway.

It should be noted that this report was prepared by Advitech Pty Limited for Arrow Commodities Pty Ltd c/o SMK Consultants Pty Ltd ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. BACKGROUND AND OBJECTIVES

The Arrow Commodities Narrabri facility is situated on Lot 1023 Newell Highway (12169 Newell Highway) approximately 2km away from the town centre of Narrabri. Arrow Grain Commodities currently operate this facility under DA 15/2011, which permits the site to receive trucks loaded grain product in and load trains with the grain product leaving site.

Under current operational conditions, approximately 150,000mt (metric tonnes) of grain are delivered to site per annum which equates to approximately 3,000 truck movements. Truck movements are permitted between the following times:

- 7am to 6pm Monday to Friday; and
- 8am to 5pm, Saturday (with no operation on Sundays).

Arrow Commodities proposes to increase the operational hours of grain product receipt to a 24hr/7day activity and double deliveries from 150,000mt to 300,000mt/400,000mt, which equates to 3,000 truck movements per year to 6,000/8,000 truck movements per year. The bulk loading of trains is currently approved for 24hr/7day operation and there will be no modification to this activity.

The objective of this noise assessment was to identify noise impacts associated with the proposed modification and provide advice regarding reasonable and feasible mitigation strategies where necessary. As construction activities are not required for this modification, the assessment of construction noise impacts will not form part of the report.

3. METHODOLOGY

The report will be appended to a modification application to be submitted to Narrabri Shire Council (NSC). As part of pre-lodgement advice, NSC has indicated that the noise impacts assessment must include assessment of the potential noise impacts associated with the proposed activities in accordance with the NSW EPAs *Noise Policy for Industry 2017* (NPfI) and *Road Noise Policy 2011* (RNP).

3.1 Assessment Methodology

The methodology adopted to address the requirements established by the NSC includes:

- an assessment of the existing environment, including:
 - identification of potentially sensitive receivers adjacent to the operation;

- efforts to characterise the existing noise environment, identify relevant receiver types and establish Project Noise Trigger Levels (PNTL) for the assessment of potential impacts. This assessment includes the analysis of background noise levels in accordance with Fact Sheet A of the NPfl;
- analysis of prevailing meteorology: to identify significant meteorological conditions that may influence the way that impacts associated with the development may manifest;
- calculation of noise levels that may be generated by the development, including:
 - identification of significant operational and meteorological scenarios that may have potential to generate noise enhancing conditions;
 - development of a noise model: (ISO9613 and CoRTN calculation methodology) to derive predicted noise levels associated with the operational and road traffic noise impacts at adjacent sensitive receivers;
 - determination of premises based contributions from the development, using descriptors established by the relevant guidelines;
- assessment of results, including:
 - recommendations for noise criteria that may be written into a development consent;
 - comparison of noise predictions against these criteria, and evaluation of potential impacts; and
 - recommendations for management of potentially adverse or residual impacts.

3.2 Guidelines and Standards Referenced by this Assessment

The assessment was performed with reference to the following guidelines, policies and standards:

- AS1055:2018 Acoustics - Description and measurement of environmental noise.
- Implementation and transitional arrangements for the Noise Policy for Industry. NSW EPA, 2017.
- Noise Policy for Industry (NPfl). NSW EPA, 2017.
- Road Noise Policy (RNP). NSW EPA, 2011.

4. THE EXISTING ENVIRONMENT

4.1 Sensitive Receivers

Identification of potentially sensitive receivers was initially undertaken via cross referencing of:

- aerial imagery;
- the Geocoded National Address File (G-NAF) (an open source national database of address points), maintained by the Federal Department of Industry, Innovation and Science;
- Limited ground truthing during field inspection; and

4.1.1 Noise Environments Adjacent to the Facility

The receiving environment surrounding the facility included a mix of residential and commercial receivers located southwest of the facility in close vicinity to the Kamilaroi Highway and the Newell Highway. The receivers in this area and exposed to existing high levels of noise from the surrounding

commercial operations (gravel and soil material supplier and automotive workshops) and road traffic along Wee Waa Road (Kamilaroi Highway) and the Newell Highway. Buildings towards the southeast of the site have been identified as commercial non-sensitive receivers. **Table 1** provides the locations for each sensitive receiver. The nearest potentially affected sensitive receivers are shown in **Figure 1**.

Table 1: Sensitive Receiver Details

Receiver ID	Address	Approximate distance to site (m)	Direction from site	Receiver Type
R1	49 Wee Waa Rd	950	SW	Private Residence
R2	48 Wee Waa Rd	830	SW	Private Residence
R3	46 Wee Waa Rd	830	SW	Private Residence
R4	44 Wee Waa Rd	830	SW	Private Residence
R5	42 Wee Waa Rd	810	SW	Private Residence
R6	40 Wee Waa Rd	800	SW	Private Residence
R7	36 Wee Waa Rd	780	SW	Private Residence
R8	34 Wee Waa Rd	780	SW	Private Residence
R9	30 Wee Waa Rd	770	SSW	Private Residence
R10	19 Wee Waa Rd	840	SSW	Private Residence
R11	17 Wee Waa Rd	840	SSW	Private Residence
R12	13 Wee Waa Rd	850	SSW	Private Residence
R13	11 Wee Waa Rd	850	SSW	Private Residence



Figure 1: Facility and receiver locations.

4.2 Assessment of Existing Noise Environment

Short term operator attended noise monitoring was undertaken during a site inspection on 22 September 2020. The purpose of this monitoring was to identify and document predominant sources of noise, and thus characterise the noise environment at the facility and along the proposed haulage route. A summary of the results is presented in **Table 2**.

Table 2: Details of attended monitoring

Location	Date	Measured noise level dB(A)			Observations
		L _{A90}	L _{A1}	L _{Aeq}	
Narrabri Bearings & Ag Spares - 16 Wee Waa Rd	22/9/2020 15:45	44	72	60	Area heavily dominated by traffic along the Kamilaroi Highway. Noise contributions from existing industrial activities utilising power tools.
Arrow Grain Commodities Facility -12169 Newell Highway	22/9/2020 16:30	54	67	59	Auger motors present throughout measurement at background levels, with dominant contributions from pass by of vehicles along the Newell Highway.

4.3 Assessment of Prevailing Meteorology

The NPfI identifies that noise propagation may be enhanced under certain meteorological conditions, and that (if present) these conditions should be accounted for as part of the assessment process. The guide provides two options for the assessment of these impacts:

- a simple method, which adopts worst case noise enhancing conditions; and
- a more detailed analysis of prevailing meteorology, to identify whether enhancing conditions occur with adequate frequency to be considered a feature of the local environment:
 - where enhancing conditions occur with adequate frequency (over 30% of the period), noise enhancing meteorological parameters should be adopted by the noise modelling; and
 - where enhancing conditions are not a feature of the environment, modelling should adopt a set of standard meteorological parameters.

Definitions of the standard and enhancing conditions established by the NPfI are reproduced in **Table 3**.

Table 3: Standard and noise-enhancing meteorological conditions

Meteorological Condition	Meteorological Parameters
Standard conditions	Day/evening/night: stability categories A-D with wind speed up to 0.5 m/s at 10 m AGL.
Noise-enhancing conditions	Daytime/evening: stability categories A-D with light winds (up to 3 m/s at 10 m AGL) Night-time: stability categories A-D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

The nearest Bureau of Meteorology (BoM) Automatic Weather Station (AWS) is located at Narrabri Airport, approximately 5km east of the proposed development site. Monitoring records from Summer 2018 to Spring 2019 were analysed to identify whether any prevailing wind patterns may be considered a feature of this environment.

4.3.1 Prevailing Winds

Analysis of wind conditions and wind-roses for each season over the 2018-2019 period are presented in **Appendix I**. A summary of prevalent wind conditions is provided in **Table 4**. Although no prevailing winds with a frequency of over 30% were identified, there is an annual and seasonal trend of dominating winds about the south-south east for winds >3m/s. For this reason, operational scenarios were modelled using prevailing conditions with south east winds as a worst case scenario in addition to standard calm meteorological conditions.

Table 4: Summary of prevailing winds up to 3m/s 2018-2019

Season	Day	Evening	Night
Summer	west (3%), south-west (3%), south (3%)	south (1%), north-west (1%), north (<1%)	south-east (1%), south (<1%), north-east (<1%)
Autumn	south (9%), south-east (6%), south-west (5%)	south-east (1%), south (2%), north-west (<1%)	south (3%), south-east (3%), east (2%),
Winter	south (8%), south-east (7%), south-west (5%)	south (2%), south-west (1%), north (1%)	south (4%), south-east (4%), east (2%)
Spring	south (4%), south-west (3%), north-west (3%)	south, (1%), south-west (1%), east (<1%)	south (3%), south-east (3%), east (2%)

4.3.2 Temperature Inversion

The NPfI indicates that for temperature inversion to be a significant characteristic of the area it needs to occur for 30% or more of the total evening and night-time period (6:00 pm to 7:00 am) during winter. Pasquill-Gifford stabilities were generated from the standard deviation of the horizontal wind direction fluctuation data at the Narrabri AWS. Analysis indicates that less than inversions occur less than 30% of the time 6:00 pm to 7:00 am during winter and are therefore not considered a significant feature of the environment. Although assessment of 2018 to 2019 meteorological indicates that temperature inversions are not considered a significant feature of the environment, F class stability conditions were modelled during the night period as a worst-case scenario.

4.3.3 Drainage Flow Winds

The NPfI identifies that a default wind drainage value is to be applied where sources are situated at a higher altitude than receivers with no intervening topography. Limited ground truthing and desktop analysis of topographical contours within a 5km buffer of the subject site have identified that the area is relatively flat. Based on this examination, drainage-flow wind does was not considered to apply to this project.

4.3.4 Summary of Prevailing Weather Conditions

Meteorological conditions presented in **Table 5** were adopted for this assessment in accordance with the NPfI.

Table 5: Adopted meteorological conditions for assessment of noise impacts

Meteorological Condition	Day	Evening / Night
Standard conditions	Stability category D, no wind	Stability category D, no wind
Prevailing conditions	Stability category D with SE winds at 3 m/s 10 m AGL.	Stability category F with SE winds at 2 m/s 10 m AGL.
Temperature	25 °C	15 °C
Relative Humidity	70%	50%

5. ASSESSMENT CRITERIA

5.1 Noise Assessment Criteria

The Arrow Commodities Narrabri facility currently operates in accordance with DA 15/ 2011 which addresses the conditions of following noise limits:

The operation shall comply with the INP noise criteria established for urban environments (as defined). Acceptable noise limitations for the development shall be Day L_{Aeq} 60-65 decibels (dBA)); Evening L_{Aeq} 50-55 decibels (dBA)); and Night L_{Aeq} 45-50 decibels (dBA)). Day classified as 7am-6pm; Evening 6pm - 10pm and Night 10pm - 7am.

As the SEARs requests that assessment of this modification is to be conducted under NPfl, background noise levels where re-assessed to define the PNTL for the project. The EPA document *Implementation and transitional arrangements for the Noise Policy for Industry (2017)* outlines that the NPfl will be used to assess and develop requirements for existing industrial developments/activities under circumstances where the planning authority requires a noise impact assessment to support the modification *or* where a significant change to existing plant, equipment or processes is proposed.

5.2 Assessment of Project Noise Trigger Levels

The NSW Noise Policy for Industry (NPfl) presents a methodology for determining Project Noise Trigger Levels (PNTL) for industrial development. Ambient and background noise measurements were undertaken at 16 Wee Waa Rd on the 8 September, 2020. The noise environment at the monitoring location was considered similar to all receivers identified in **Table 1** in terms of exposure to nearby road traffic and industrial noise sources. These results were analysed in accordance with Fact Sheet A of the NPfl and used to determine PNTL relevant to the proposed development. Assessment in **Table 6** establishes the RBL for the project.

Table 6: Assessment of PNTL in adjacent receiving environment

Metric	Day	Evening	Night
Rating Background Level	40	40	30
Project Intrusiveness Criteria	45	45	35
Recommended Amenity Level	50	45	40
Project Amenity Criteria	48 ¹	43 ¹	38 ¹
Project Trigger Noise Level	45	45	35

Note: All criteria measured in dB(A).

Note 1: Project amenity level established as level equal to the Recommended Amenity Noise Levels for residential rural receivers minus 5dB(A) plus 3dB(A) to convert from a period level to a 15-minute level, in accordance with guidance established in Fact Sheet F of the NPfl.

The Project Intrusiveness Criterion is the more stringent of the two criteria and is thus adopted as the PNTL for the development.

5.3 Maximum Noise Level Triggers

The NPfl provides updated guidance relating to the assessment of maximum noise level events that carry potential to cause sleep disturbance. In this context, potential for sleep disturbance is considered in terms of events that may induce awakenings or cause disturbance to sleep stages. The guide establishes the following requirements:

Where the subject development night-time noise levels at a residential location exceed:

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

... a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Table 7: Maximum Noise Level Triggers (MNLTL)

Metric	MNLTL
$L_{Aeq, 15minute}$	40 dB(A)
L_{AFMax}	52 dB(A)

5.4 Road Traffic Noise Criteria

Continuation of site generated road traffic up to historic approved traffic volumes requires assessment for potential noise impact. The principle guidance to assess the impact of the road traffic noise on assessment locations is in the NSW EPA's Road Noise Policy 2011 (RNP). The RNP provides a framework for the management of noise issues associated with road traffic from existing roads, new road projects, road redevelopment projects and new traffic-generating developments. The primary aim of the RNP is to provide assessment criteria for road traffic noise based on protecting amenity and wellbeing. **Table 8** presents the road noise assessment criteria for residential land uses nearest to roads that are potentially affected by an increase in traffic, reproduced from Table 3 of the RNP for road categories relevant to the project.

Table 8: Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project / Land Use	Assessment Criteria - dB(A)	
		Day 7am - 10pm	Night 10pm - 7am
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq, (15hour)}$ 60 (external)	$L_{Aeq, (9hour)}$ 55 (external)

Note: The Kamilaroi Highway and Newell Highway are the focus of road traffic noise assessment and have both been identified as arterial roads.

In addition to the assessment criteria outlined in **Table 8**, any increase in the total traffic noise level at a location due to a proposed project or traffic-generating development must be considered. A relative increase of 12dB represents slightly more than an approximate doubling of perceived loudness (AS2659.1-1988) and is likely to trigger community reaction, particularly in environments where there is a low existing level of traffic noise.

The relative increase criteria are primarily intended to protect existing quiet areas from excessive changes in amenity due to noise from a road project. Receivers experiencing increases in total traffic noise level above the relative increase criteria outlined in **Table 9** should be considered for mitigation.

Table 9: Relative increase criteria for residential land uses.

Road Category	Type of project/development	Total traffic noise level increase - dB(A)	
		Day 7am - 10pm	Night 10pm - 7am
Freeway/arterial/ sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic LAeq, (15 hour) + 12 dB (external)	Existing traffic LAeq, (9 hour) + 12 dB (external)

6. ASSESSMENT OF OPERATIONAL NOISE LEVELS

6.1 Operational Activities

Operational activities at the Arrow Commodities Narrabri facility includes grain unloading (grain receipt) via road trains and loading grain product to rail via grain hopper. The proponent is seeking 24hr/7 day operational hours for these activities, and as such, it can be expected that both grain receipt and train loading may occur simultaneously on occasion.

Advitech understands that the grain receipt activity involves of a truck unloading 400mt of grain product into a low-profile drive over road pit per hour. It is expected that truck unloading would take 15 to 20 minutes and comprise of entering site, unloading grain and then exiting site. Whilst the product is unloaded, it is transported to the bucket elevator via augers and distributed to a maximum of 4 silos at any one time. The electric motor distributing the product to the silos is located approximately 25m above ground level.

The grain loading activity involves a train (arriving 2 to 3 times a week at varying hours) moving under the overhead grain hopper which slowly distributes grain into carriages. The train is expected to approach from the southwest and slowly move to the northeast away from the site.

A model of operational noise impacts was constructed using the ISO9613 calculation method within the iNoise software package. **Table 1** outlines the modelled assumptions surrounding the plant, operational hours and Sound Power Levels (L_w) for each of the activities occurring at site.

Table 10: Operational plant at Narrabri rail terminal

Activity	Operational plant	Sound Power Level (L_w - dB(A))	Utilisation
Grain unloading	Auger motors (3)	91	100%
	Road train	108	4 movements/hr ¹
Simultaneous activities - loading grain product to rail & grain unloading	Auger motors (3)	91	100%
	Locomotive	108	100%
	Road train	108	4 movements/hr ¹
	Conveyor to rail loading hopper	81	100%

Note: This assumption is based on the worst-case peak rate which assumes a maximum capacity of 4 trucks onsite at any one time. Demand would fluctuate truck movements annually, resulting in less than 4 movements per hour in the majority of cases.

6.2 Noise Level Predictions

Table 11: Noise level predictions associated with grain unloading activity dB(A)

Receiver	Address	Day (Standard / Enhancing Met ¹)	Evening & Nigh (Standard / Enhancing Met ¹)	Criteria (D / E / N) ²
R1	49 Wee Waa Rd	<25 / <25	<25 / <25	45/ 45 / 35
R2	48 Wee Waa Rd	27 / 30	28 / 31	45/ 45 / 35
R3	46 Wee Waa Rd	28 / 30	29 / 31	45/ 45 / 35
R4	44 Wee Waa Rd	28 / 30	29 / 32	45/ 45 / 35
R5	42 Wee Waa Rd	28 / 31	29 / 32	45/ 45 / 35
R6	40 Wee Waa Rd	28 / 31	29 / 32	45/ 45 / 35
R7	36 Wee Waa Rd	28 / 31	29 / 32	45/ 45 / 35
R8	34 Wee Waa Rd	27 / 30	28 / 31	45/ 45 / 35
R9	30 Wee Waa Rd	25 / 25	26 / 28	45/ 45 / 35
R10	19 Wee Waa Rd	<25 / <25	<25 / <25	45/ 45 / 35
R11	17 Wee Waa Rd	25 / 25	26 / 29	45/ 45 / 35
R12	13 Wee Waa Rd	26 / 26	27 / 30	45/ 45 / 35
R13	11 Wee Waa Rd	27 / 27	28 / 31	45/ 45 / 35

Note¹: Worst case noise level under all assessed meteorological and operational conditions

Note²: Day period between 7am and 6pm, evening period 6pm to 10pm, night period 10pm to 7am.

Table 12: Noise level predictions associated with simultaneous grain unloading and train loading dB(A)

Receiver	Address	Day (Standard / Enhancing Met ¹)	Evening & Nigh (Standard / Enhancing Met ¹) ^t	Criteria (D / E / N) ²
R1	49 Wee Waa Rd	27 / 30	28 / 31	45/ 45 / 35
R2	48 Wee Waa Rd	34 / 37	35 / 38	45/ 45 / 35
R3	46 Wee Waa Rd	35 / 37	35 / 38	45/ 45 / 35
R4	44 Wee Waa Rd	35 / 38	35 / 38	45/ 45 / 35
R5	42 Wee Waa Rd	35 / 38	35 / 38	45/ 45 / 35
R6	40 Wee Waa Rd	35 / 38	35 / 38	45/ 45 / 35
R7	36 Wee Waa Rd	30 / 33	30 / 33	45/ 45 / 35
R8	34 Wee Waa Rd	28 / 31	29 / 31	45/ 45 / 35
R9	30 Wee Waa Rd	26 / 26	26 / 29	45/ 45 / 35
R10	19 Wee Waa Rd	<25 / <25	<25 / 25	45/ 45 / 35
R11	17 Wee Waa Rd	27 / 27	27 / 30	45/ 45 / 35
R12	13 Wee Waa Rd	28 / 28	28 / 31	45/ 45 / 35
R13	11 Wee Waa Rd	28 / 28	28 / 31	45/ 45 / 35

Note¹: Worst case noise level under all assessed meteorological and operational conditions.

Note²: Day period between 7am and 6pm, evening period 6pm to 10pm, night period 10pm to 7am.

Results indicate that under standard meteorological conditions, grain unloading activities are expected to be below the relevant criteria for all periods. It is predicted that when grain unloading is conducted in conjunction with rail loading activities under noise enhancing conditions during the night period, there is potential for exceedance of the noise criteria at the closest 5 receivers to the site (R2 to R6). It should be noted that the modelled noise enhancing conditions were considered a worst-case scenario and are not expected to occur for more than 30% of time when the facility is operational. Although the worst case scenario is unlikely to contribute to adverse noise at receivers, **Section 6.4** outlines mitigation measures to ensure that all potential impacts are addressed.

6.3 Maximum Noise Level Predictions

Assessment of predicted noise levels associated with short-term high-level events (L_{Amax}) with potential to cause sleep disturbance at adjacent sensitive receivers are provided in **Table 14**. The activity of trucks unloading grain over the low-profile drive over road pit was identified as the activity most likely to generate peak noise events. **Table 13** identifies the sound power levels for this activity (derived from the Advitech source database), and includes the operation of auger motors in conjunction with impact noise associated with grain unloading. Modelling results presented in **Table 14** indicate that maximum noise levels are not expected to exceed the MNLT of 52dB(A) at received adjacent to the proposed development, and further assessment of impacts is not undertaken.

Table 13: Operational plant at Narrabri rail terminal

Activity	Operational plant	Sound Power Level (L_w -dB(A))	Utilisation
Grain unloading	Auger motors (3)	91	100%
	Road train (L_{max})	112	100%

Table 14: Maximum noise level predictions, activities outside daytime hours (L_{Amax} dB(A))

Receiver	Address	Predicted L_{Amax} (Standard / Enhancing Met ¹)	Criteria (Night) L_{Amax}	Above MNLT?
R1	49 Wee Waa Rd	31 / 34	52	No
R2	48 Wee Waa Rd	37 / 40	52	No
R3	46 Wee Waa Rd	37 / 40	52	No
R4	44 Wee Waa Rd	38 / 40	52	No
R5	42 Wee Waa Rd	38 / 41	52	No
R6	40 Wee Waa Rd	38 / 41	52	No
R7	36 Wee Waa Rd	38 / 41	52	No
R8	34 Wee Waa Rd	34 / 37	52	No
R9	30 Wee Waa Rd	34 / 37	52	No
R10	19 Wee Waa Rd	31 / 34	52	No
R11	17 Wee Waa Rd	37 / 40	52	No
R12	13 Wee Waa Rd	38 / 40	52	No
R13	11 Wee Waa Rd	37 / 40	52	No

Note¹: Worst case noise level under all assessed meteorological and operational conditions

6.4 Operational Mitigation Measures

Considering the potential for exceedances of the night criteria at nearby sensitive receivers under-worst-case noise enhancing conditions during the simultaneous operation of grain rail loading and grain receipt, noise mitigation and management measures will be implemented where reasonable and feasible. Advitech makes the following recommendations to manage noise levels from site activities:

- truck unloading should be limited to 2 movements per hour when grain unloading and rail loading activities are occurring simultaneously during the night period (10pm to 6am);
- ensuring that trucks have the engine turned off when waiting for a truck to unload grain and leave site, or when waiting for periods for more than 5 minutes on the weighbridge;
- reducing the need for trucks to reverse on site by ensuring that the turning loop is utilised when trucks have finished unloading grain;
- planning grain deliveries to minimise the occurrence of rail loading occurring in conjunction with grain unloading during the night period;
- limiting the simultaneous operation of auger motors on individual silos and the conveyor running grain to the rail loading hopper during the night period (10pm to 6am); and
- limiting the operation of empty augers (augers operating without grain present in system) during the night period (10pm to 6am).

7. ROAD TRAFFIC NOISE IMPACTS

7.1 Road Traffic Noise Criteria

Vehicle movements would be determined by product demand and the availability of the resource. Increases to site hours would double deliveries from 150,000mt to 300,000mt/400,000mt, which is equal to 3,000 trucks per year to 6,000/8,000 truck movements. Notwithstanding this, the road traffic assessment has assumed a maximum number of vehicle movements based on the threshold production rate of 400,000mt per annum. The road traffic noise assessment was based on the following parameters:

- 2 heavy vehicles accessing and exiting the site per hour;
 - this figure was established by dividing the maximum number of production vehicles per year (8,000) by operational days (365) over a 12hr period;
- it is anticipated that there would be a 50% / 50% split of vehicles accessing and exiting the site via Wee Waa Rd (Kamilaroi Highway) from the east and the Newell Highway from south;
- the sign posted speed limit on approach to site roads is 50km/h.

A road traffic noise model was constructed within the Predictor environmental noise modelling software package using the Calculation of Road Traffic Noise (CoRTN) method. A summary of the modelling assumptions is included in **Table 16**. A model based on existing traffic conditions was initially constructed in order to validate predictions against available measurement data. Results presented in **Table 15** **Table 1** indicates a variance between the model and noise logger data.

It is expected that this variance is due to differences in traffic volumes observed during the noise monitoring period compared to the volumes reported in the 2008 data. For this reason, the model was subsequently corrected based on the variation for the day and night periods and used to characterise existing levels of road traffic noise across the study area, and evaluate potential impacts associated with the proposed development.

Table 15: Validation of road traffic noise model (dB(A))

Scenario	Measured Level Day / Night ¹	Model Prediction Day / Night ¹	Variance dB(A) Day / Night ¹
Existing road traffic noise adjacent to 16 Wee Waa Road	57.9 / 52.5	53.2 / 48.7	-4.7 / - 3.8

Note¹: Day L_{Aeq}(15hours), Night L_{Aeq}(9hours)

Table 16: Operational noise model parameters

Parameter	Details
Traffic Volumes (Existing)	Refer to Appendix IV
Traffic Volumes (Proposed)	Refer to Appendix IV
Traffic Speed	50km/hr
Modelling Method	CoRTN (Predictor v8.11)
Split Height Sources	Cars (RL+0.5m) Trucks (RL+1.5m) Truck Exhaust RL(+3.6m)
Road Surface Corrections	None applied, assume standard asphalt surface
Ground Absorption	0.8
Receiver Locations	1m from building Height RL +1.5m
Facade Correction	+2.5dB at 1m from building

Table 17: Road traffic noise levels on the Golden Highway (Day L_{Aeq}, (15 hour) / Night L_{Aeq}, (9 hour), dB(A))

Receiver	Address	Existing (no build) Day / Night	Predicted (build) Day / Night	Criteria Day / Night	Exceedance ?
R1	48 Wee Waa Rd	58 / 53	58 / 53	60 / 55	No
R2	46 Wee Waa Rd	57 / 51	57 / 51	60 / 55	No
R3	44 Wee Waa Rd	58 / 52	59 / 51	60 / 55	No
R4	42 Wee Waa Rd	59 / 51	60 / 52	60 / 55	No
R5	40 Wee Waa Rd	60 / 51	60 / 52	60 / 55	No
R6	36 Wee Waa Rd	59 / 51	60 / 52	60 / 55	No
R7	34 Wee Waa Rd	60 / 51	59 / 52	60 / 55	No
R8	30 Wee Waa Rd	60 / 51	59 / 51	60 / 55	No
R9	19 Wee Waa Rd	60 / 51	60 / 51	60 / 55	No
R10	17 Wee Waa Rd	59 / 53	60 / 51	60 / 55	No
R11	13 Wee Waa Rd	59 / 51	60 / 51	60 / 55	No
R12	11 Wee Waa Rd	60 / 52	60 / 51	60 / 55	No
R13	49 Wee Waa Rd	60 / 52	60 / 51	60 / 55	No

This assessment indicates that levels associated with current road traffic noise are likely to approach exceedances of the day period criteria, and although minor increases are expected under the build option, the significance is less than 1dB(A). It is expected that road traffic noise will not approach the night criteria at the properties along Wee Waa Road as a result of the modification.

7.2 Relative Increase Impacts

Project generated traffic has the potential to increase noise levels on existing public roads. For sensitive land uses affected by additional traffic on existing roads (which is generated by land use developments), any increase in the total traffic noise levels should be limited to 2 dB above that of the corresponding 'no build option'.

As the longest Highway in NSW, The Newell Highway is a major road link between south-eastern Queensland and Victoria via central NSW and carries large amounts of freight as well as local and holiday traffic. Based on 2008 traffic data provided by the Transport for NSW Traffic Volume Viewer (TVV), the annual average daily traffic (AADT) volumes along the Narrabri section of Newell Highway of approximately 3,000 vehicles, with approximately 38% heavy vehicles. Similarly, the 2008 TVV dataset indicates AADT volumes of approximately 1,300 vehicles along Wee Waa Road (Kamilaroi Highway), with 13% of the traffic being heavy vehicles.

Based on these volumes, the maximum traffic generated by the proposed development (maximum 11 movements along each road per day) would be less than 1% of the AADT. It is expected that both roads have experienced an increase in both traffic levels and heavy vehicle haulage over the last twelve years since the original traffic count data was recorded and therefore the additional heavy vehicle movements grain receival facility may pose less of an impact under assumptions made for 2008 data.

Typically, an increase in traffic noise level above the 2 dB increase criteria is expected where traffic volumes increase by 20% or more. Since the project is expected to increase traffic by a much lower amount than this, it is likely to comply with the RNP relative increase criteria.

8. DISCUSSION AND RECOMMENDATIONS

8.1 Assessment Conditions and Criteria

Analysis of background noise monitoring indicates that the receiving environment adjacent to the proposed development site is rural in nature, influenced predominantly by environmental and distant transportation sources. In all cases, the PTNL were established in terms of the Intrusiveness Criteria. For the purposes of evaluating potential impacts, it is recommended that the PTNL be adopted as the assessment criteria for the development.

Although no prevailing winds with a frequency of over 30% were identified, there annual and seasonal trend of dominating winds about the south-south east for winds >3m/s was observed. For this reason, operational scenarios were modelled using prevailing conditions with south east winds as a worst-case scenario in addition to standard calm meteorological conditions. Analysis of activities occurring during the night period were also modelled to include strong to moderate F class stability temperature inversions.

8.2 Assessment of Impacts and Recommendations for Management

8.2.1 Operational Noise

Review of noise modelling indicates that the proposed operations will generate offsite noise levels below the PTNL at all receivers, during all assessment periods under standard meteorological conditions. Contributions at the nearest receivers (R2 to R6) may approach and marginally exceed the PNTL during the night period when both grain rail loading and unloading are occurring simultaneously, under noise enhancing conditions. It is expected that noise enhancing conditions will be present at a frequency of

less than 30% throughout the year, which would have minor impact of the nearby receivers. To ensure that all potential impacts are addressed, mitigation recommendations outlined in **Section 6.4** should be considered.

8.2.2 Maximum Noise Levels

Impact noise associated with trucks unloading grain over the low-profile drive over road pit was identified as the activity with greatest potential to generate maximum noise level impacts. It is important to note that these impacts may only manifest where operations are required to take place during the night period. Notwithstanding, review of modelling results indicates that $L_{A_{Max}}$ noise levels at adjacent sensitive receivers will be less than the Maximum Noise Trigger Level. Adverse impacts are not expected, and detailed assessment of potential impact was not undertaken.

8.2.3 Road Traffic Noise

Assessment indicates that receivers along the proposed haulage route already experience high levels of noise associated with both Wee Waa Road the Newell Highway. Despite potential for high levels of traffic noise, assessment indicates that most receivers will remain close to exceeding or marginally exceeding (less than 1%) the day period criteria. Levels below the night period criteria are expected at all receivers along Wee Waa Road. Increases of road traffic noise are expected to be no more than 2dB above the criteria at any receivers and are considered to comply with the RNP relative increase criteria.

9. CONCLUSION

Advitech Environmental was engaged to prepare an assessment of potential noise impacts associated with the modification of the Arrow Grain rail loading in Narrabri. The objective of this noise assessment was to identify noise impacts associated with the 24hr/7day operation of the site and provide advice regarding reasonable and feasible mitigation strategies where necessary.

Project Tigger Noise Levels for adjacent receiving environments were reviewed, and the assessment conservatively adopted the most stringent criteria for the project area. Modelling indicates that noise levels associated with the modification are expected to meet these criteria. Review of modelling results indicates that $L_{A_{Max}}$ noise levels at adjacent sensitive receivers will be less than the Maximum Noise Trigger Level. Adverse impacts are not expected, and detailed assessment of potential impact was not undertaken.

While adverse operational noise impacts are not expected during the day or evening period, this activity may be audible at some locations under adverse meteorological circumstances during the night period. It is recommended that operational mitigation measures outlined in this report be put in place to ensure the effective response to any concerns raised by adjacent receivers.

Assessment indicates that receivers along the proposed haulage route already experience high levels of noise associated with Wee Waa Road (the Kamilaroi Highway). Despite potential for high levels of traffic noise, increases of road traffic noise are expected to be no more than 2dB above the criteria are predicted at receivers in close vicinity to the haul route from the facility.

10. REFERENCES

The following information was used in the preparation of this report:

1. AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values*;
2. Bies, DA & Hansen, CH (2009). *Engineering Noise Control: Theory and Practice* (4th Edition), Spon Press;
3. Daniel Boyce (2020). *Prelodgement Advice - Proposed Modification to Rail Freight Terminal dated 10 June, 2020*; Narrabri Shire Council, Narrabri;
4. Narrabri Shire Council (2010). *Notice of Determination of a Development Application - DA 15/2011 dated 7 August 2010*, Narrabri Shire Council, Narrabri;
5. NSW Department of Environment, Climate Change and Water (2011), *NSW Road Noise Policy*, Department of Environment, Climate Change and Water, Sydney;
6. NSW Environment Protection Authority (2000). *NSW Industrial Noise Policy*, NSW Environment Protection Authority, Sydney;
7. NSW Environment Protection Authority (2017). *NSW Noise Guide for Industry*, NSW Environment Protection Authority, Sydney;
8. UK Department of Environment, Food and Rural Affairs (2005), *Update of noise database for prediction of noise on construction and open sites*, UK Department of Environment, Food and Rural Affairs, Norwich; and
9. L.Tan (2013). *Proposed Rail Loader at Lot 7 in DP736823, Moree NSW*, Vipak Engineers & Scientists Ltd, Toronto.



Appendix I

Seasonal Meteorological Analysis 2018-2019

Analysis of Windrose Data for Narrabri Airport - Summer18-19							Analysis of Windrose Data for Narrabri Airport - Autumn 19							Analysis of Windrose Data for Narrabri Airport - Winter 19							Analysis of Windrose Data for Narrabri Airport - Spring 19						
	Calm to < 0.76	0.76 to 1.5	1.5 TO 3.0	3.0 to 4.5	4.5 to 6.0	>6.0		Calm to < 0.76	0.76 to 1.5	1.5 TO 3.0	3.0 to 4.5	4.5 to 6.0	>6.0		Calm to < 0.76	0.76 to 1.5	1.5 TO 3.0	3.0 to 4.5	4.5 to 6.0	>6.0		Calm to < 0.76	0.76 to 1.5	1.5 TO 3.0	3.0 to 4.5	4.5 to 6.0	>6.0
Results Day Time Period							Results Day Time Period							Results Day Time Period							Results Day Time Period						
n		0.2%	1.9%	5.6%	3.9%	18.4%	n		0.2%	1.1%	1.6%	1.7%	5.1%	n		0.3%	1.2%	1.6%	1.3%	4.1%	n		0.3%	1.6%	1.9%	0.9%	15.2%
ne		0.1%	1.6%	1.5%	0.5%	0.9%	ne		0.3%	1.5%	0.5%	0.3%	0.5%	ne		0.4%	1.2%	0.2%	0.0%	-	ne		0.2%	1.2%	0.7%	0.1%	0.9%
e		0.1%	0.7%	0.9%	0.2%	0.4%	e		0.3%	1.6%	1.0%	-	0.2%	e		0.2%	0.9%	0.2%	0.1%	-	e		0.2%	1.4%	0.4%	-	0.2%
se	16%	0.4%	2.2%	5.4%	2.9%	4.3%	se	7.2%	1.2%	5.0%	11.9%	4.6%	3.0%	se	6.7%	1.6%	4.9%	8.1%	4.3%	7.6%	se	3.7%	0.8%	1.8%	5.8%	3.2%	3.1%
s		0.4%	2.4%	3.7%	0.9%	0.4%	s		1.0%	7.5%	8.3%	2.1%	0.7%	s		1.1%	5.6%	5.6%	1.9%	1.3%	s		0.5%	3.4%	5.6%	1.6%	2.7%
sw		0.4%	2.7%	3.3%	0.8%	0.8%	sw		0.6%	3.9%	3.2%	1.0%	1.2%	sw		1.0%	3.5%	3.6%	1.3%	3.2%	sw		0.2%	2.5%	3.6%	1.9%	6.6%
w		0.5%	2.6%	5.4%	0.8%	1.7%	w		0.7%	2.7%	4.0%	1.1%	2.9%	w		0.4%	2.9%	5.0%	2.1%	3.5%	w		0.3%	1.3%	4.4%	2.5%	5.8%
nw		0.1%	1.6%	8.7%	3.2%	6.3%	nw		0.5%	2.4%	3.1%	1.6%	2.4%	nw		0.3%	2.2%	4.8%	2.2%	3.3%	nw		0.1%	2.7%	4.2%	1.5%	5.6%
Results Evening Time Period							Results Evening Time Period							Results Evening Time Period							Results Evening Time Period						
n		-	0.8%	2.2%	5.9%	1.4%	n		0.3%	0.3%	2.2%	2.4%	1.6%	n		0.1%	1.2%	1.9%	3.0%	0.3%	n		-	0.1%	2.6%	3.6%	0.8%
ne		-	0.6%	1.4%	2.9%	1.1%	ne		-	-	2.0%	3.4%	0.3%	ne		0.3%	0.3%	4.5%	6.7%	0.4%	ne		0.1%	-	1.9%	3.6%	0.8%
e		-	0.7%	2.9%	4.2%	0.7%	e		-	0.4%	4.5%	5.4%	0.3%	e		-	0.5%	2.7%	9.3%	0.3%	e		0.6%	0.1%	2.5%	4.0%	0.4%
se	56%	-	0.4%	3.6%	5.6%	1.3%	se	7.3%	0.3%	1.1%	12.6%	16.0%	2.3%	se	10.4%	0.4%	0.3%	5.9%	14.0%	3.4%	se	3.0%	0.1%	0.3%	5.1%	7.1%	1.5%
s		0.3%	1.0%	3.4%	2.4%	0.8%	s		0.8%	0.7%	7.2%	3.8%	1.6%	s		0.1%	1.6%	4.4%	3.8%	0.5%	s		-	0.8%	3.2%	3.0%	1.2%
sw		-	0.6%	1.5%	1.8%	1.1%	sw		-	-	1.6%	2.7%	1.4%	sw		0.3%	1.1%	3.0%	5.6%	1.1%	sw		0.3%	1.0%	3.5%	6.8%	5.1%
w		-	0.6%	4.7%	4.3%	0.3%	w		0.3%	0.1%	1.4%	2.0%	0.3%	w		-	1.0%	1.6%	3.0%	-	w		0.4%	0.3%	3.2%	5.3%	2.2%
nw		0.3%	1.0%	5.6%	4.7%	1.7%	nw		-	0.7%	1.6%	2.4%	0.7%	nw		0.1%	0.5%	1.6%	1.0%	-	nw		0.1%	0.1%	3.2%	3.2%	0.6%
Results Night Time Period							Results Night Time Period							Results Night Time Period							Results Night Time Period						
n		0.1%	0.2%	2.1%	7.8%	4.8%	n		0.3%	0.6%	2.1%	2.5%	2.1%	n		0.3%	1.3%	1.1%	2.5%	1.4%	n		0.2%	0.7%	1.7%	2.0%	0.6%
ne		0.1%	0.4%	2.9%	10.2%	1.8%	ne		0.2%	0.8%	4.0%	5.7%	0.9%	ne		0.2%	0.8%	3.6%	4.8%	0.7%	ne		0.4%	0.7%	3.7%	6.8%	1.0%
e		0.3%	0.3%	3.4%	5.2%	1.0%	e		0.4%	1.2%	4.2%	4.9%	-	e		0.7%	1.5%	5.0%	4.5%	0.1%	e		0.4%	1.8%	4.6%	9.4%	1.3%
se	39%	0.6%	0.7%	3.8%	8.4%	5.4%	se	13.7%	0.7%	2.2%	6.6%	15.7%	7.3%	se	16.2%	1.3%	2.7%	5.3%	8.6%	7.0%	se	8.3%	0.7%	2.1%	5.2%	9.5%	3.7%
s		0.2%	0.6%	3.0%	2.0%	0.4%	s		0.6%	1.8%	4.9%	2.9%	0.4%	s		0.8%	2.8%	6.3%	3.8%	0.9%	s		0.6%	2.0%	6.1%	4.8%	1.0%
sw		-	0.1%	0.7%	0.7%	-	sw		0.2%	0.2%	0.4%	0.5%	0.2%	sw		0.2%	0.4%	1.1%	0.7%	0.4%	sw		0.2%	0.6%	1.0%	1.6%	0.2%
w		-	0.2%	0.4%	0.2%	-	w		0.1%	0.3%	0.2%	-	0.1%	w		-	0.1%	0.5%	0.6%	0.1%	w		0.1%	0.1%	0.1%	0.4%	-
nw		0.1%	0.3%	0.7%	1.6%	0.2%	nw		0.1%	0.1%	0.7%	0.8%	0.2%	nw		0.1%	0.2%	0.5%	1.5%	0.1%	nw		0.2%	0.1%	0.4%	0.4%	-

Figure 2:Seasonal analysis of prevailing winds, Narrabri AWS 2018 - 2019

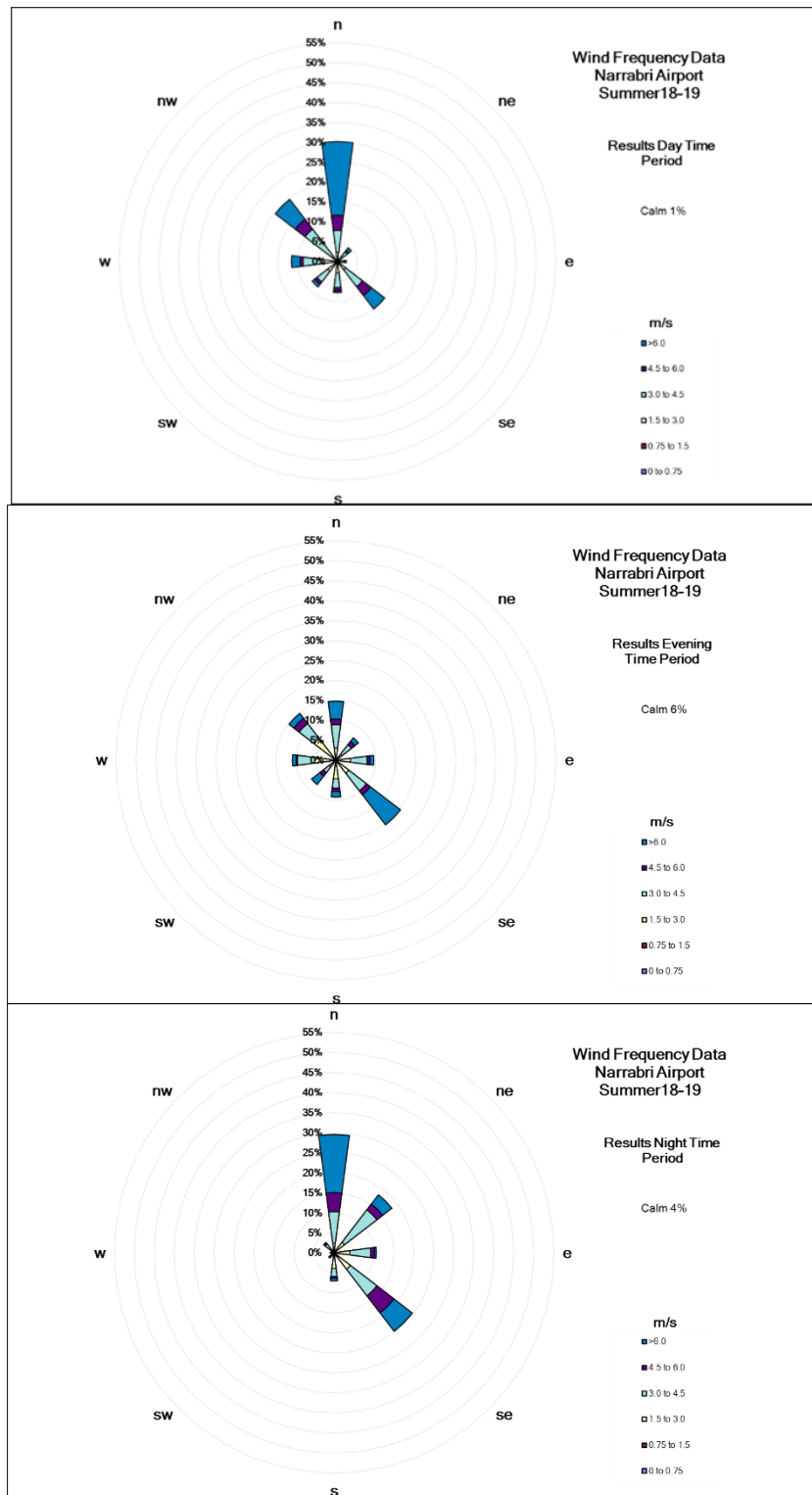


Figure 3: Day, evening and night period wind-roses for Narrabri AWS Summer, 2018 - 2019

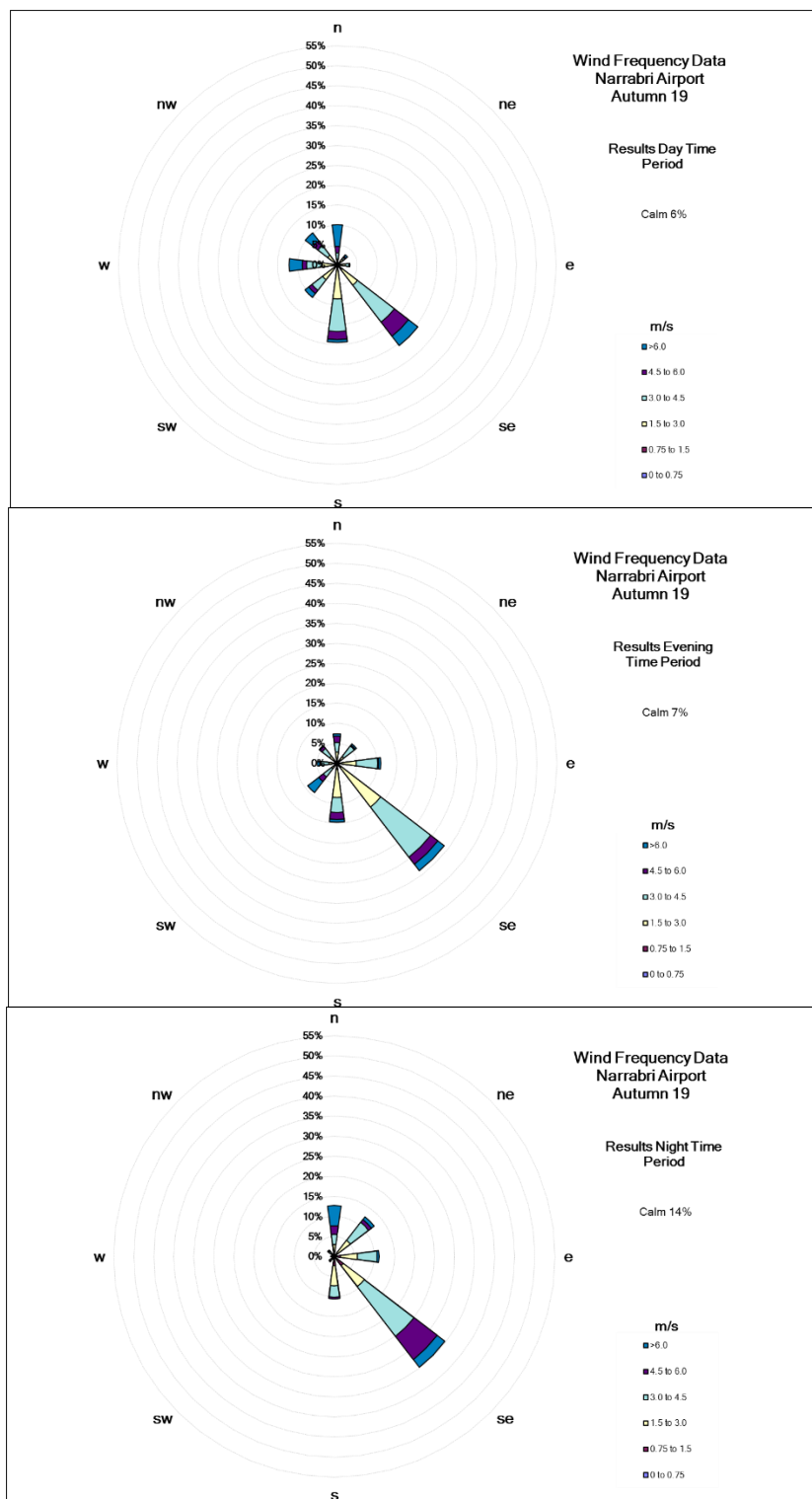


Figure 4: Day, evening and night period wind-roses for Narrabri AWS Autumn, 2019

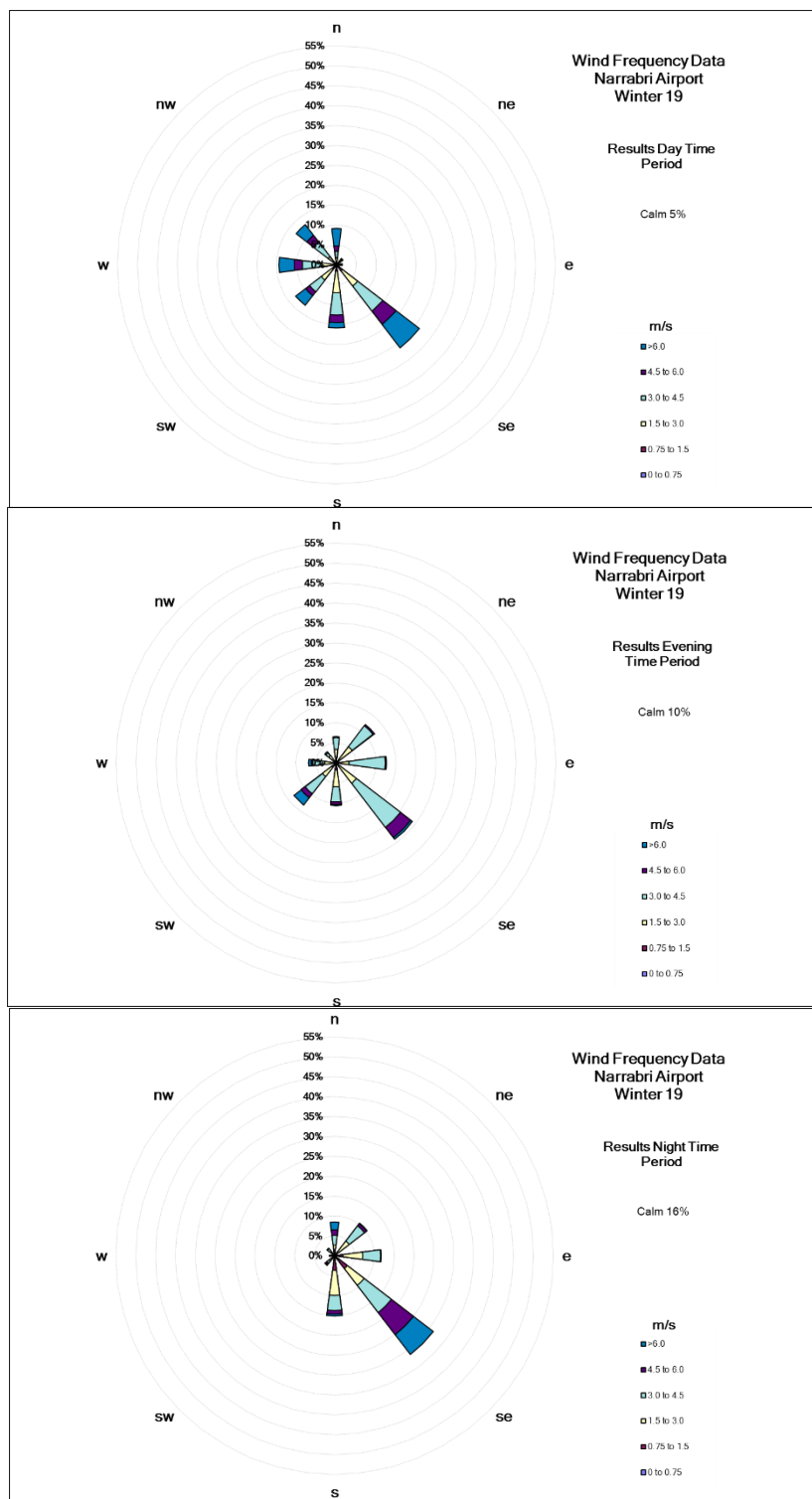


Figure 5: Day, evening and night period wind-roses for Narrabri AWS Winter, 2019

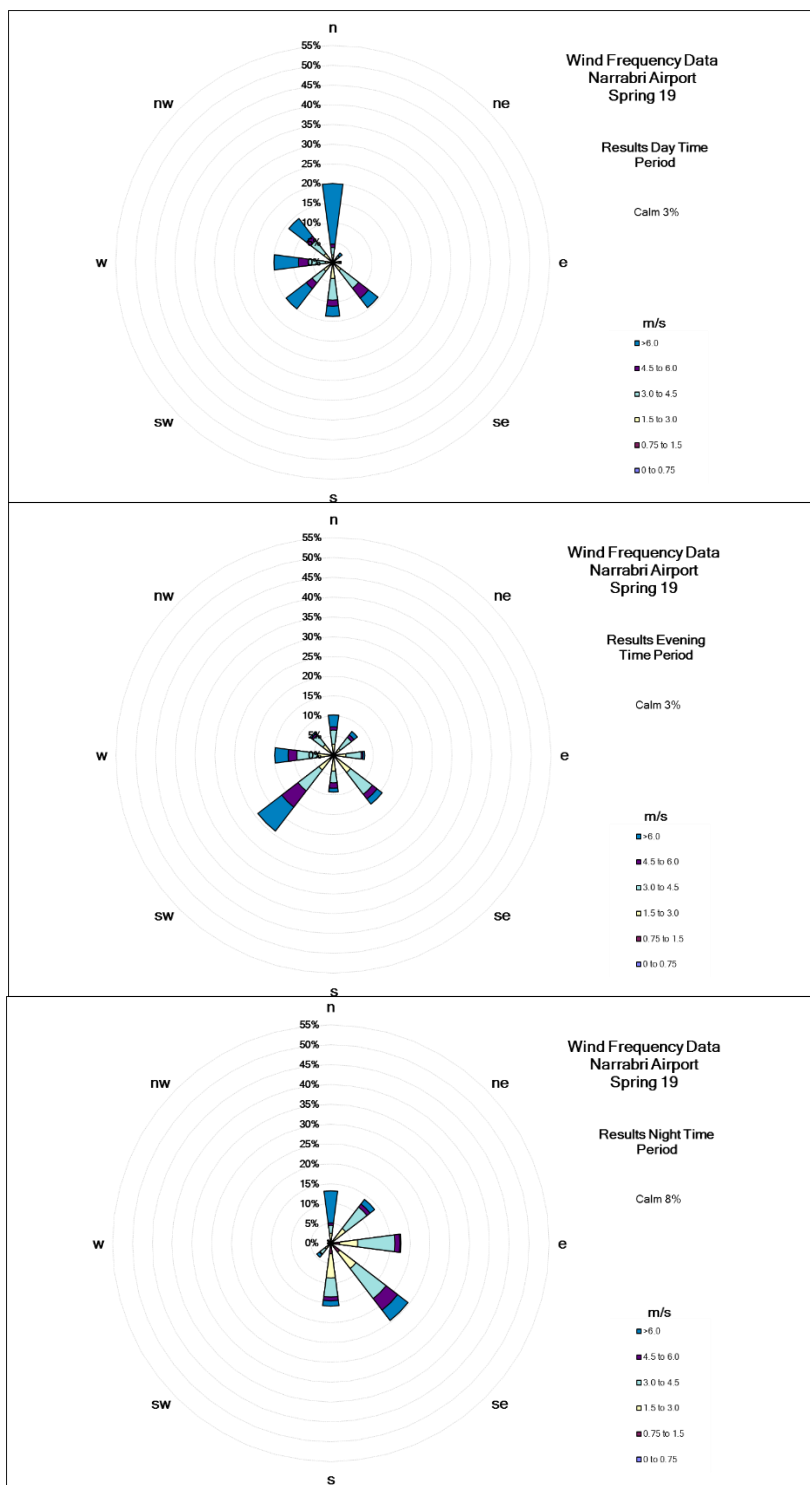


Figure 6: Day, evening and night period wind-roses for Narrabri AWS Spring, 2019

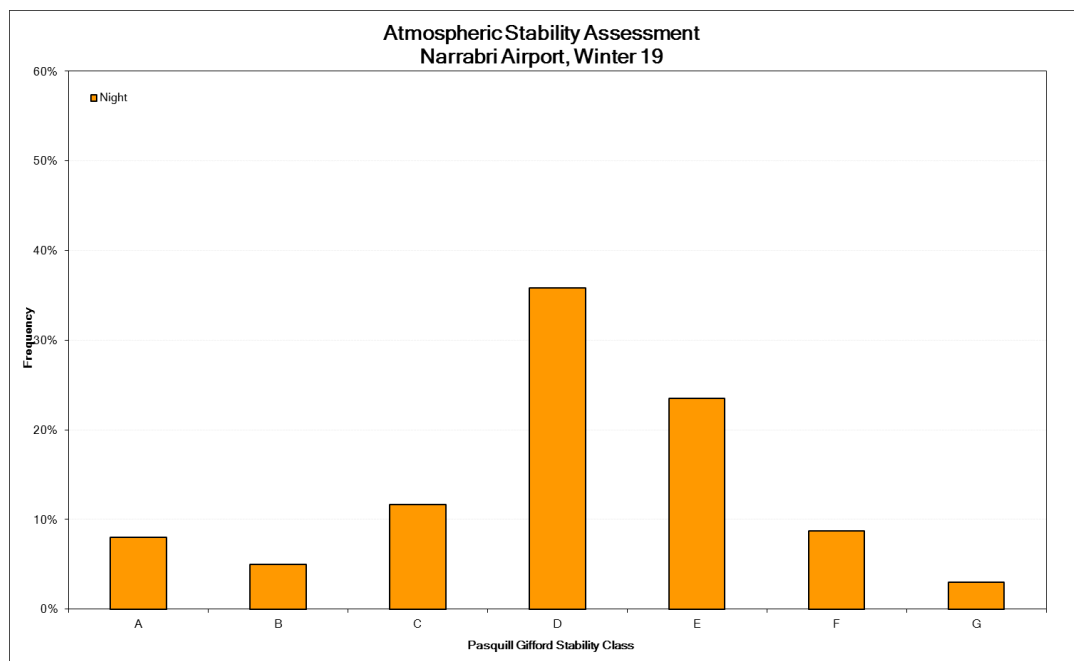


Figure 7: Atmospheric Stability Assessment Narrabri AWS Winter, 2019



Appendix II Unattended Noise logging

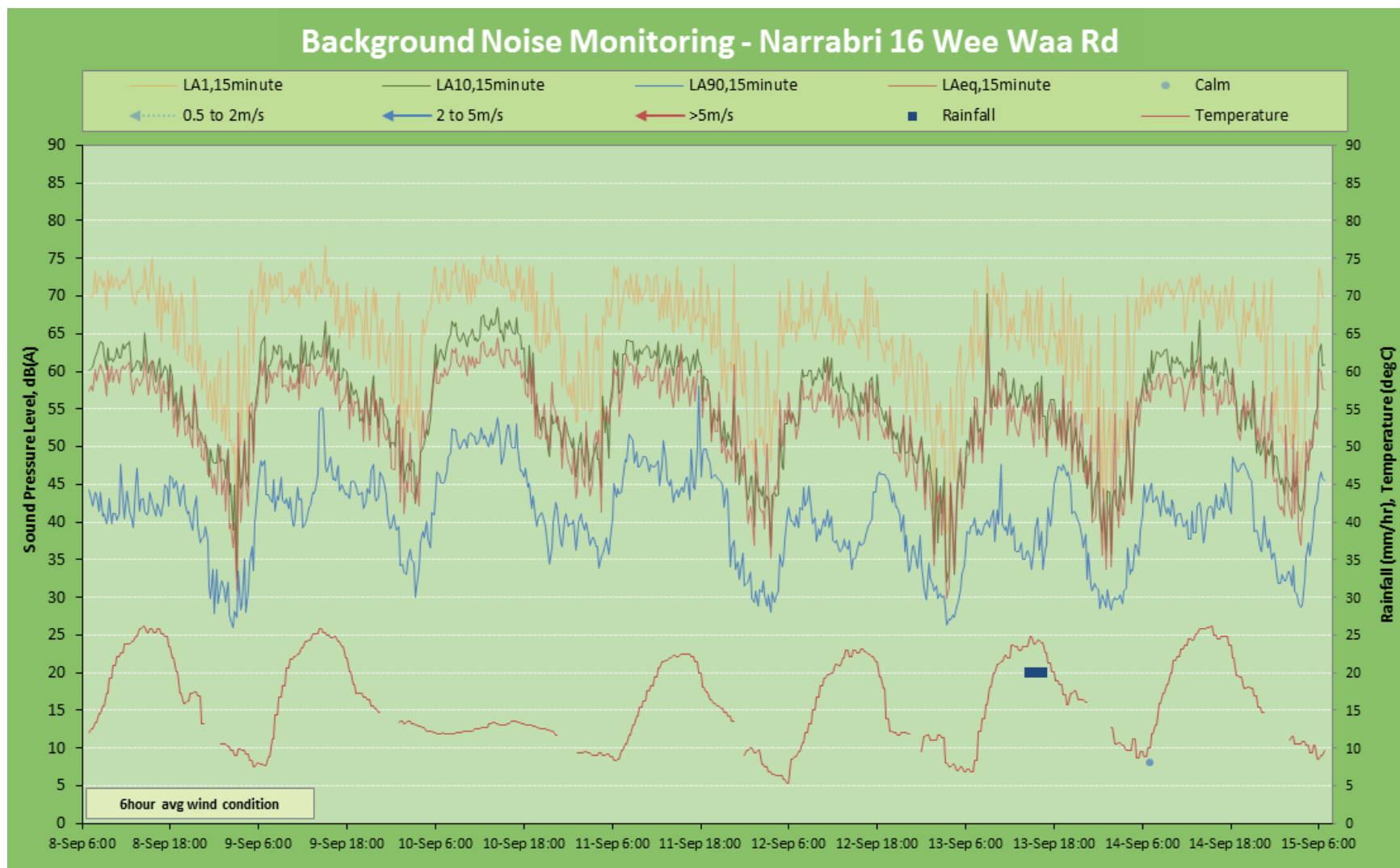
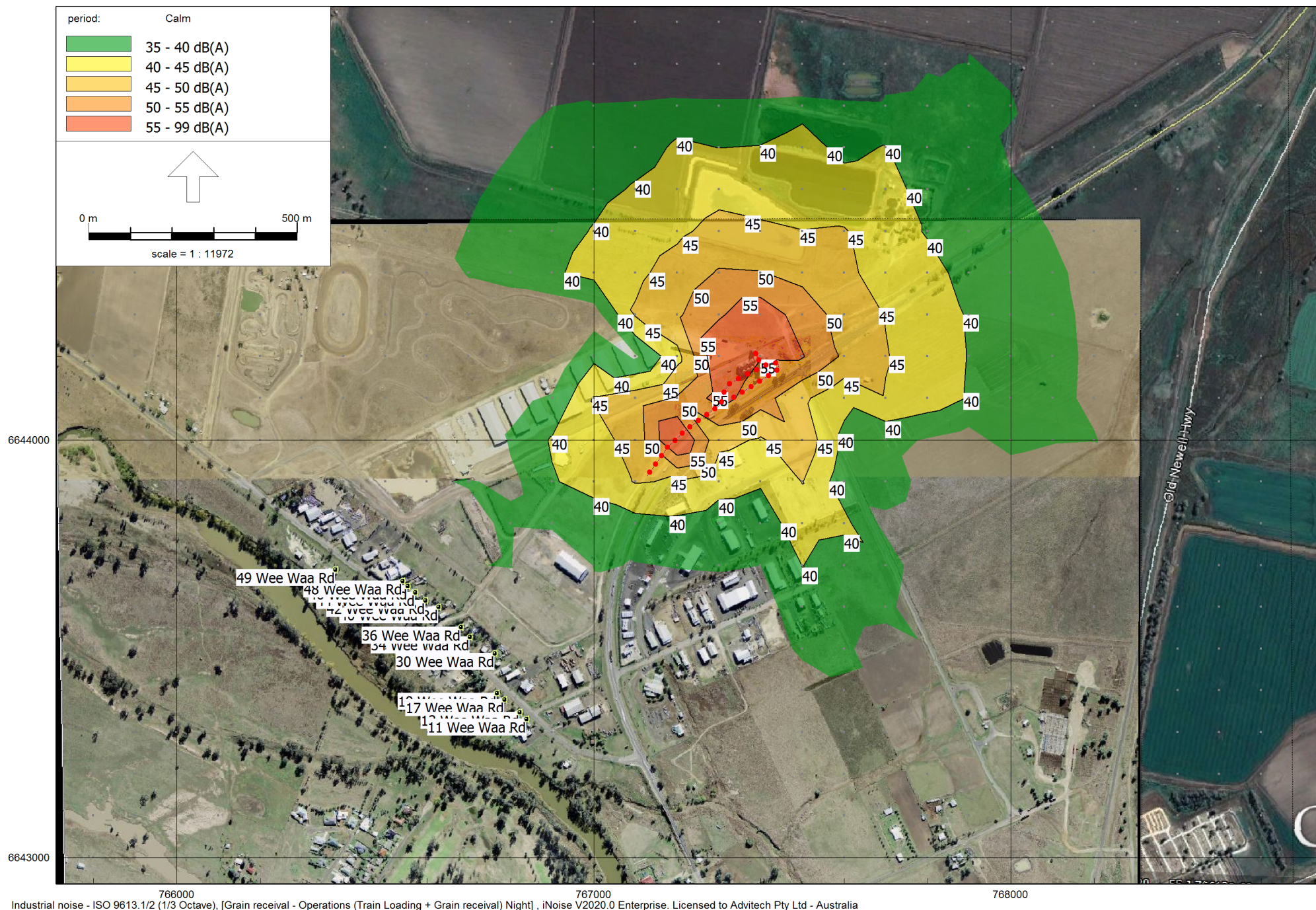
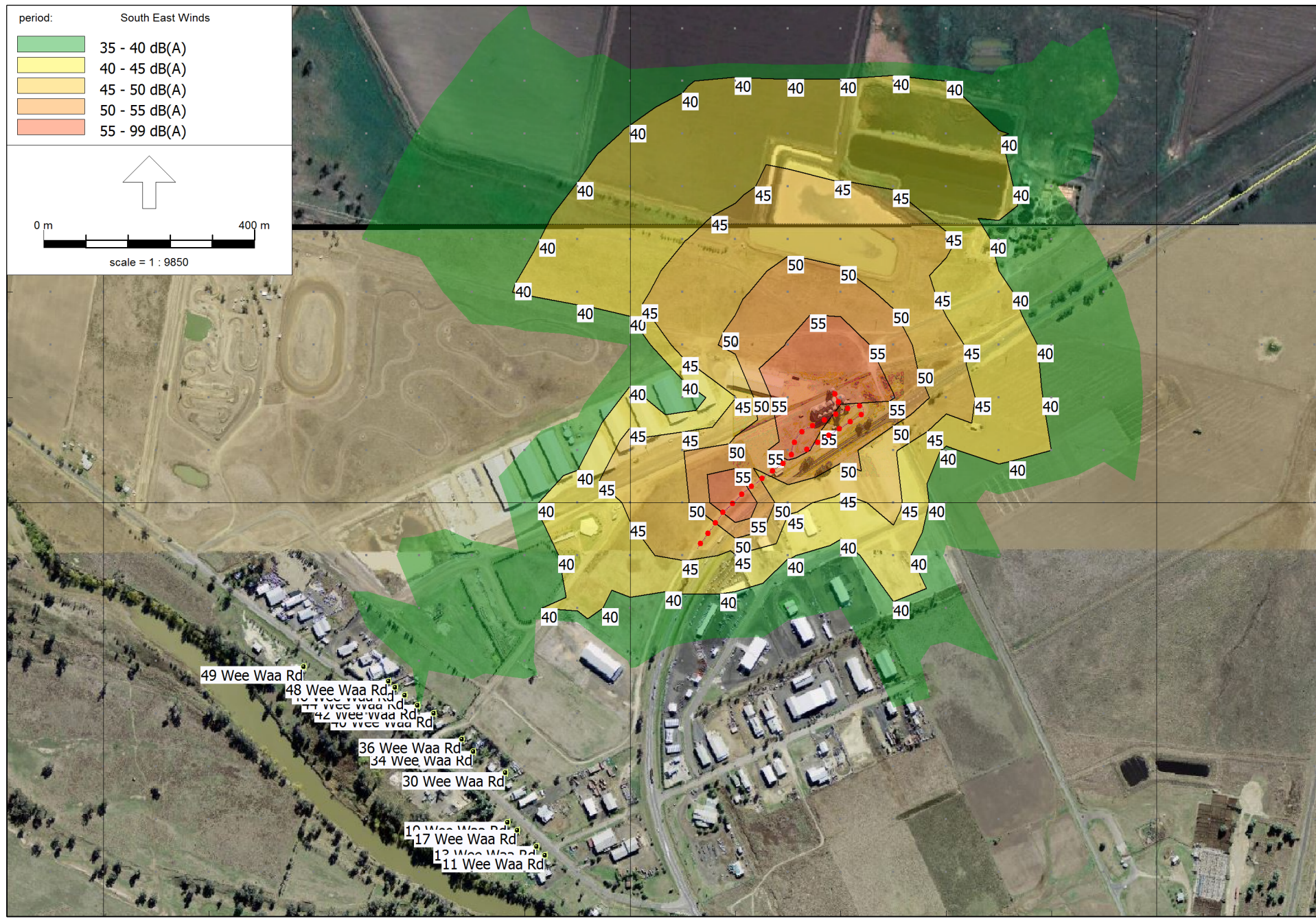


Figure 8: Unattended Logging 16 Wee Waa Rd, Narrabri



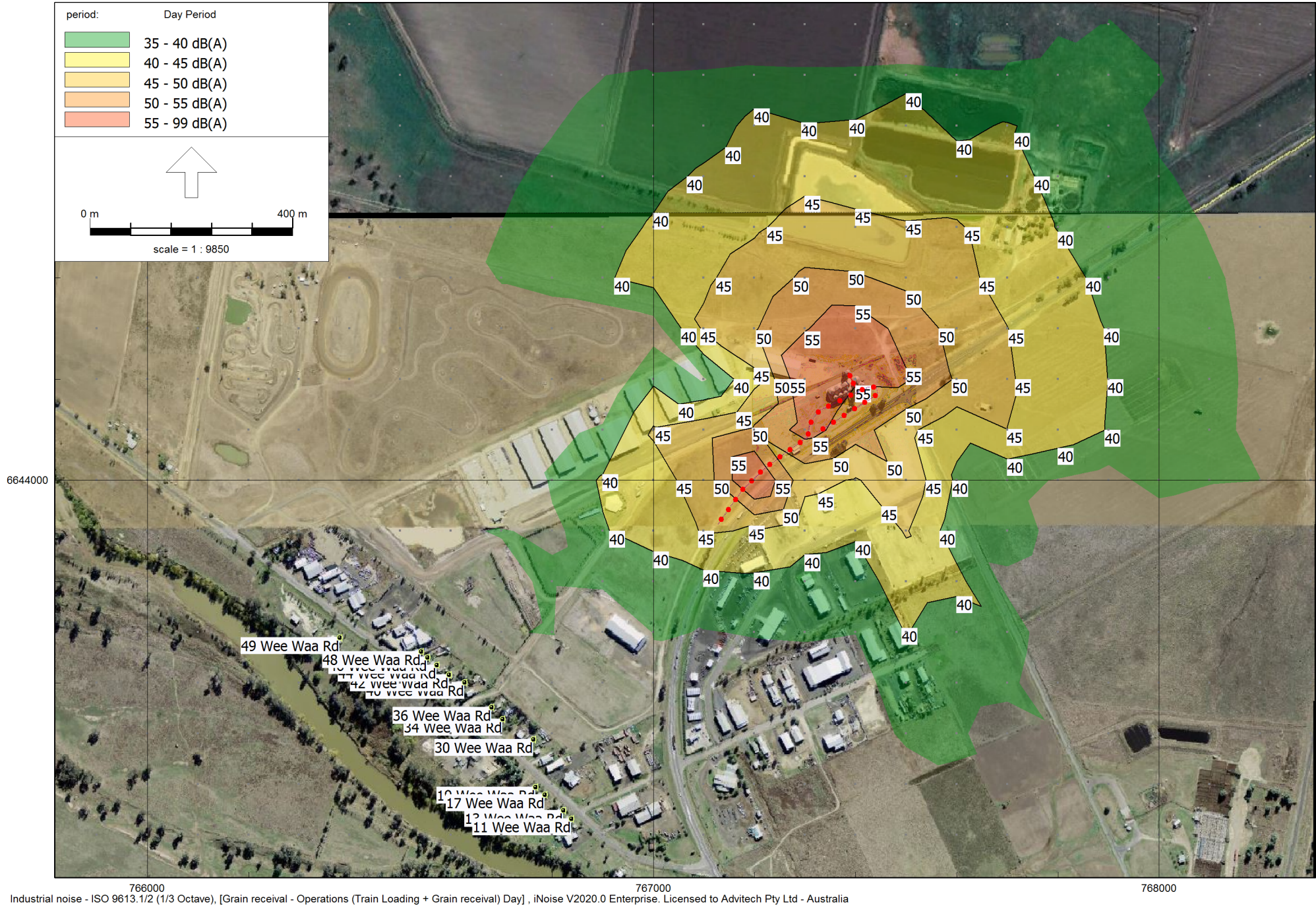
Appendix III Noise Contour Maps







766000 767000 768000
6644000

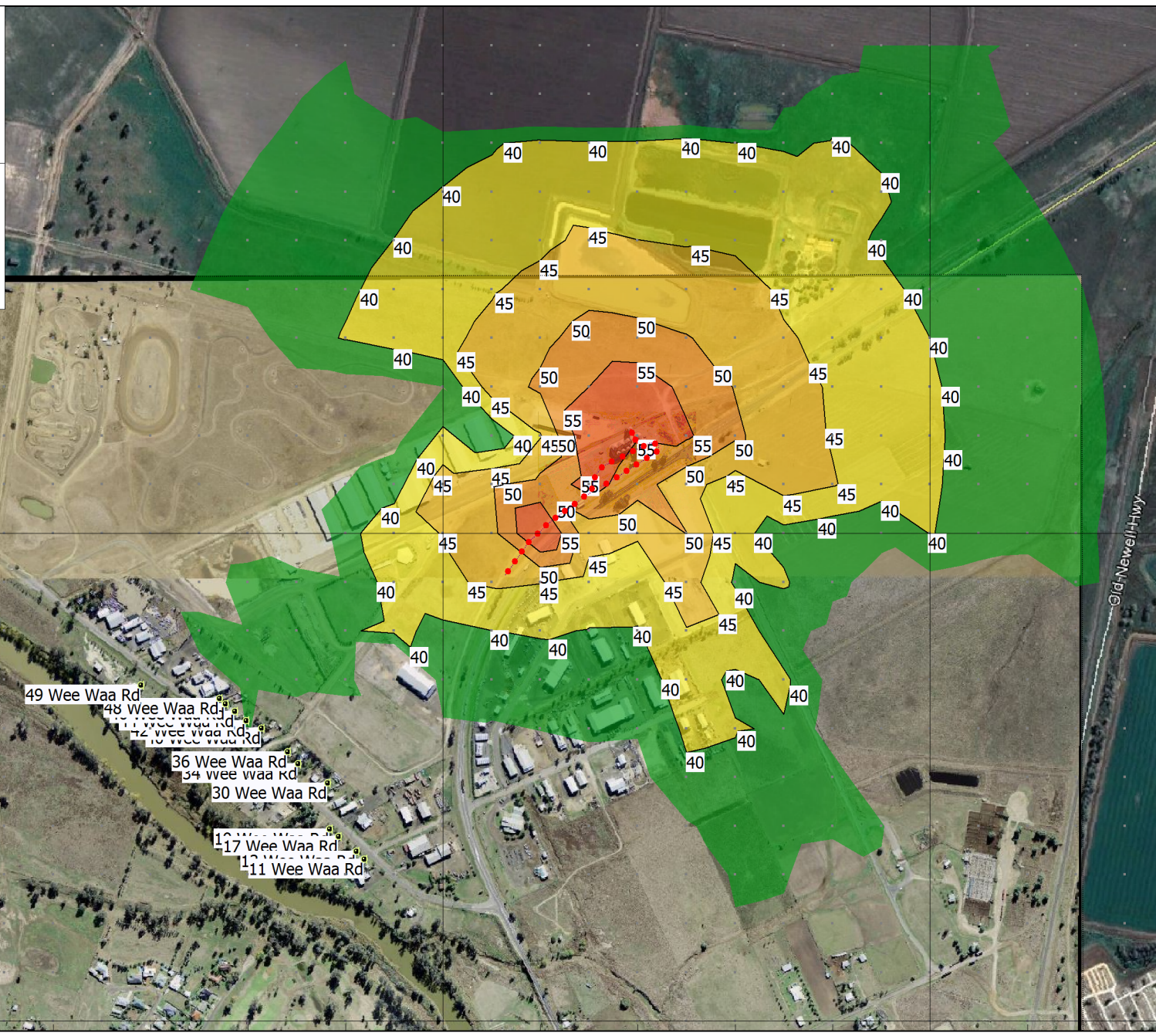
Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receival - Operations (Train Loading + Grain receival) Day], iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia



period: F stability Calm



35 - 40 dB(A)
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 99 dB(A)

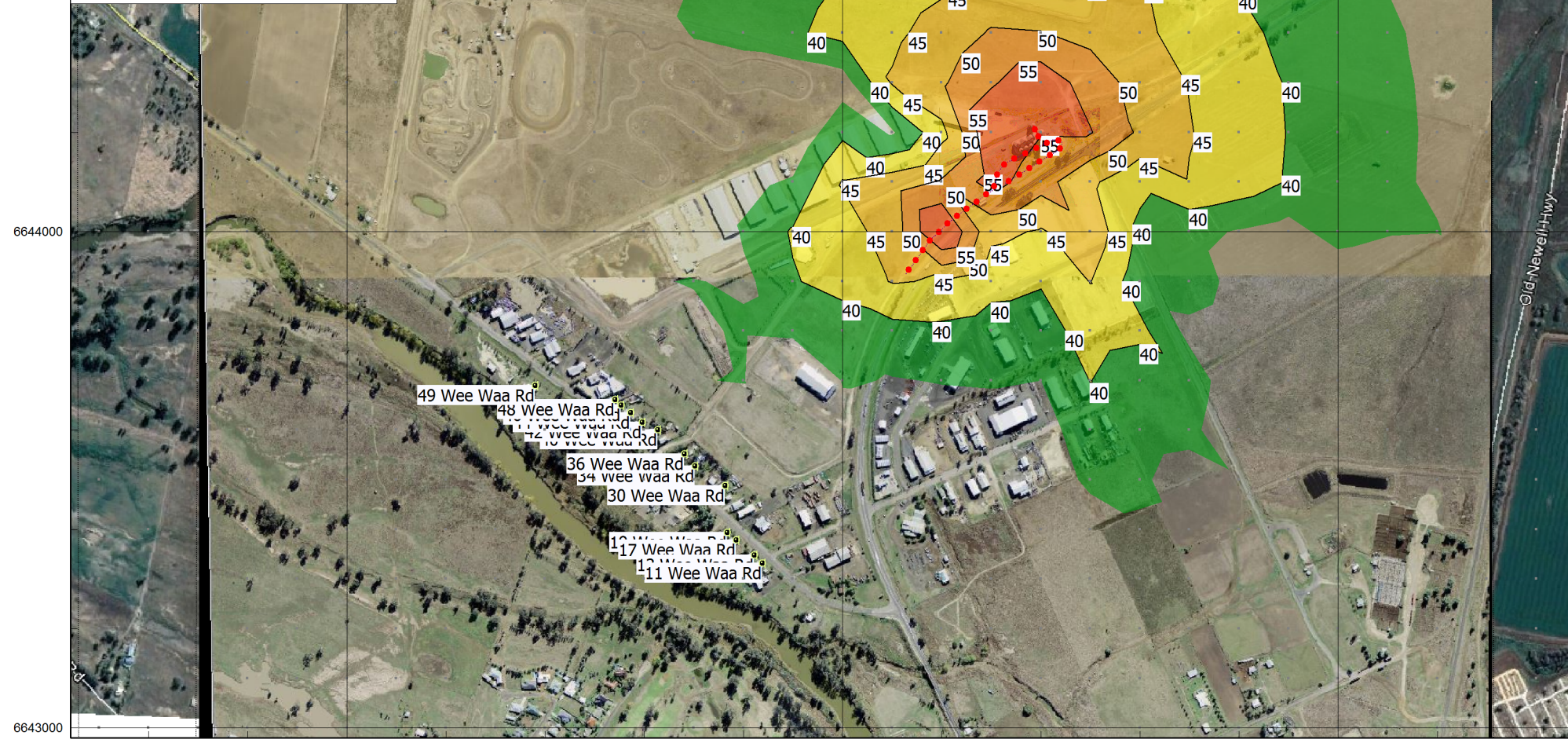


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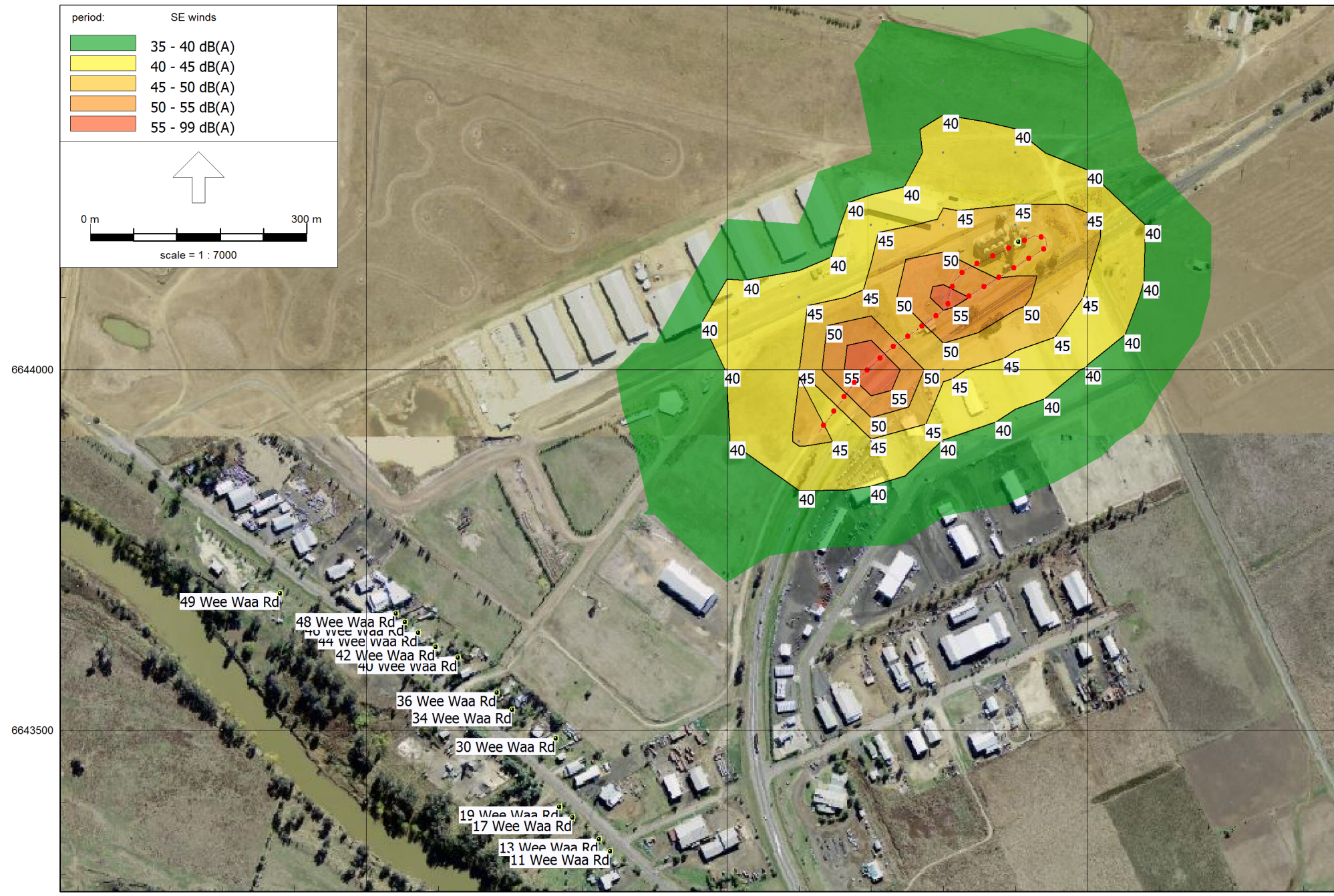
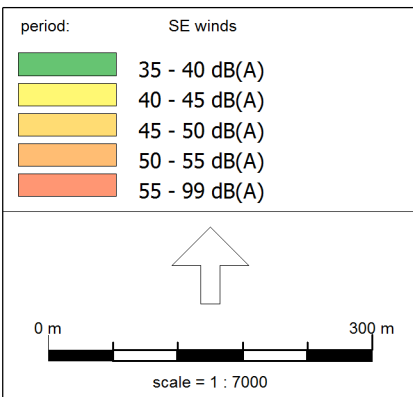
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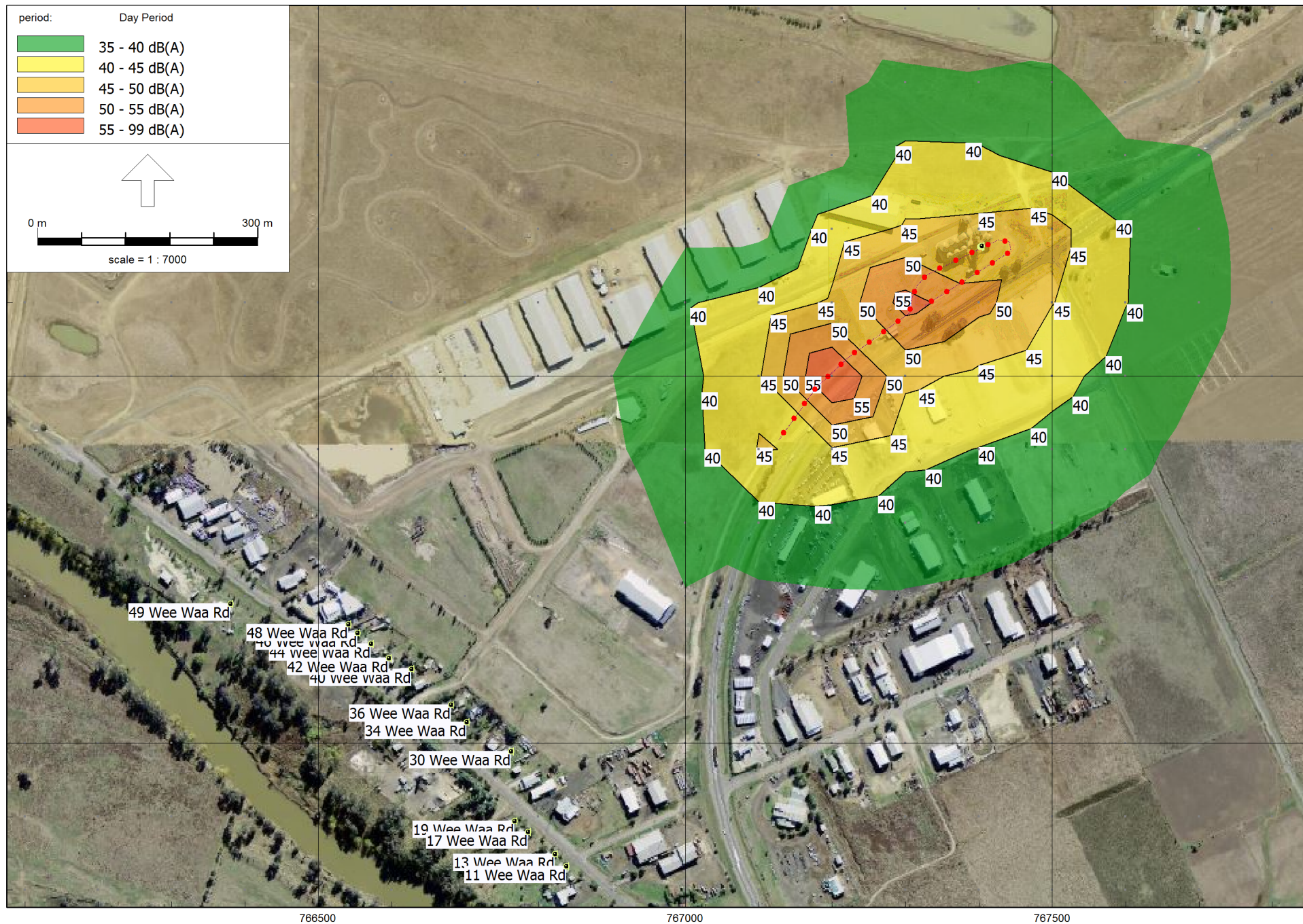
35 - 40 dB(A)
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 99 dB(A)



scale = 1 : 11972



Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receival - Operations (Train Loading + Grain receival) Night] , iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia





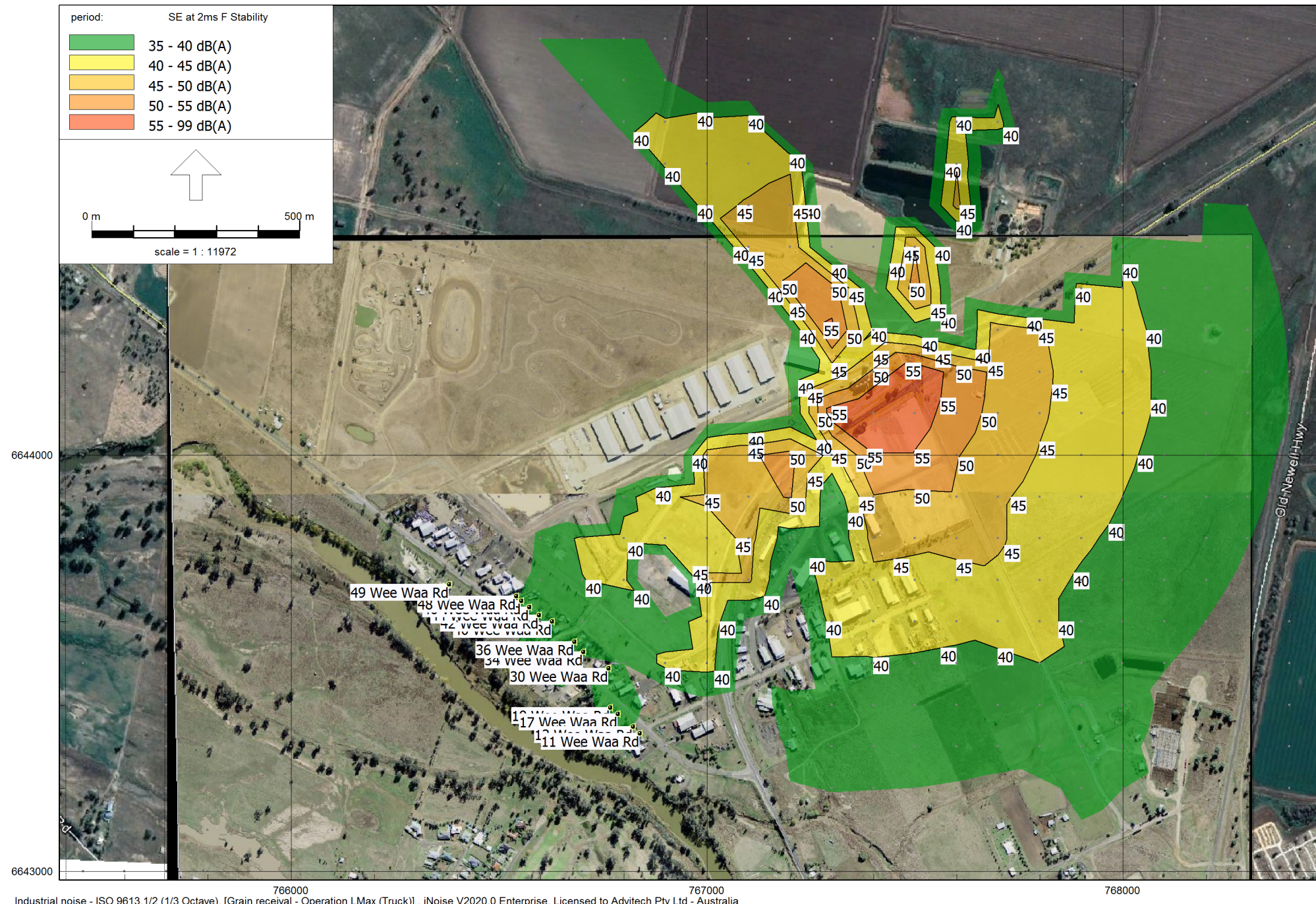


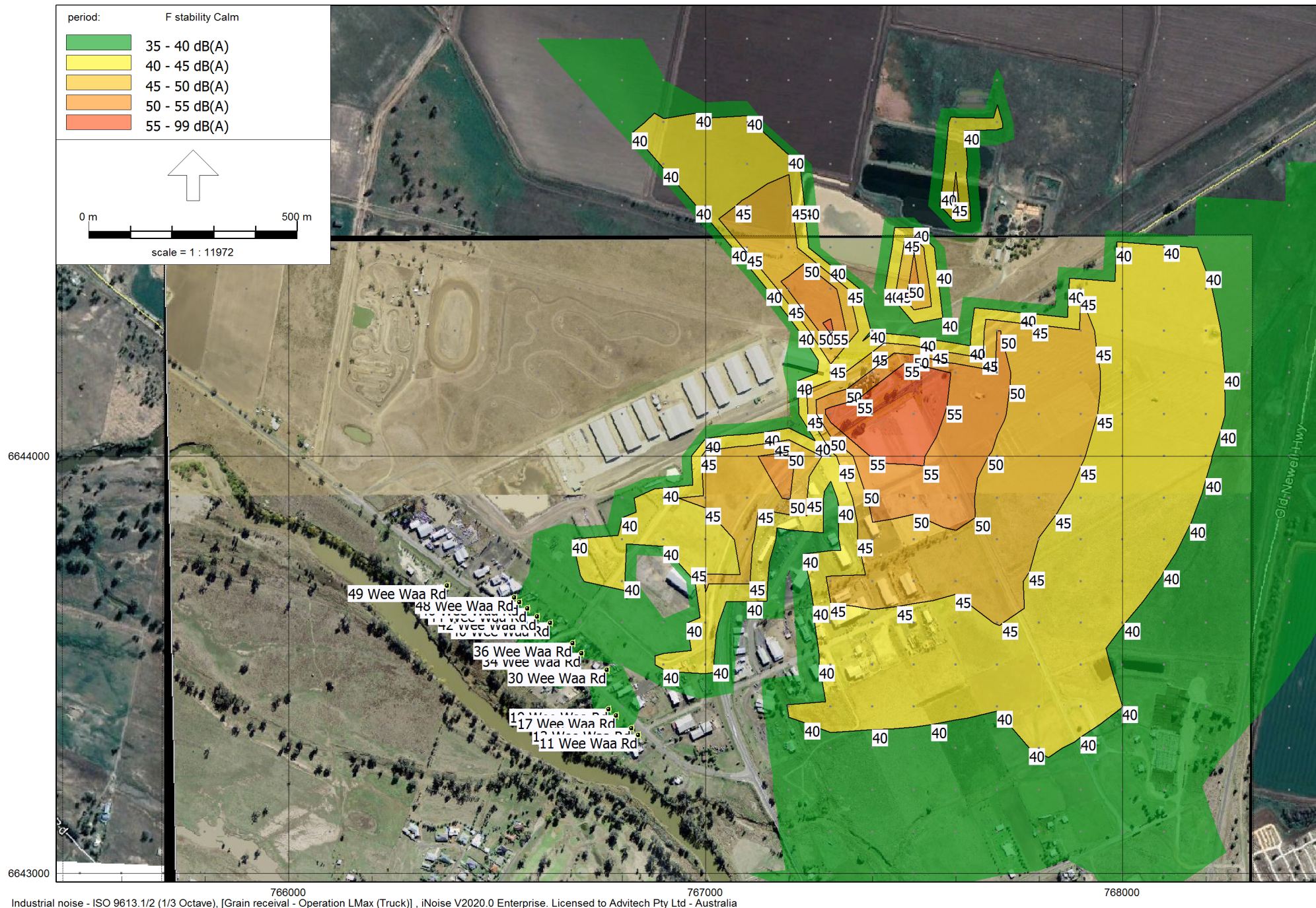
Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receipt - Operations (Grain receipt) Day] , iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia

period: SE at 2ms F Stability

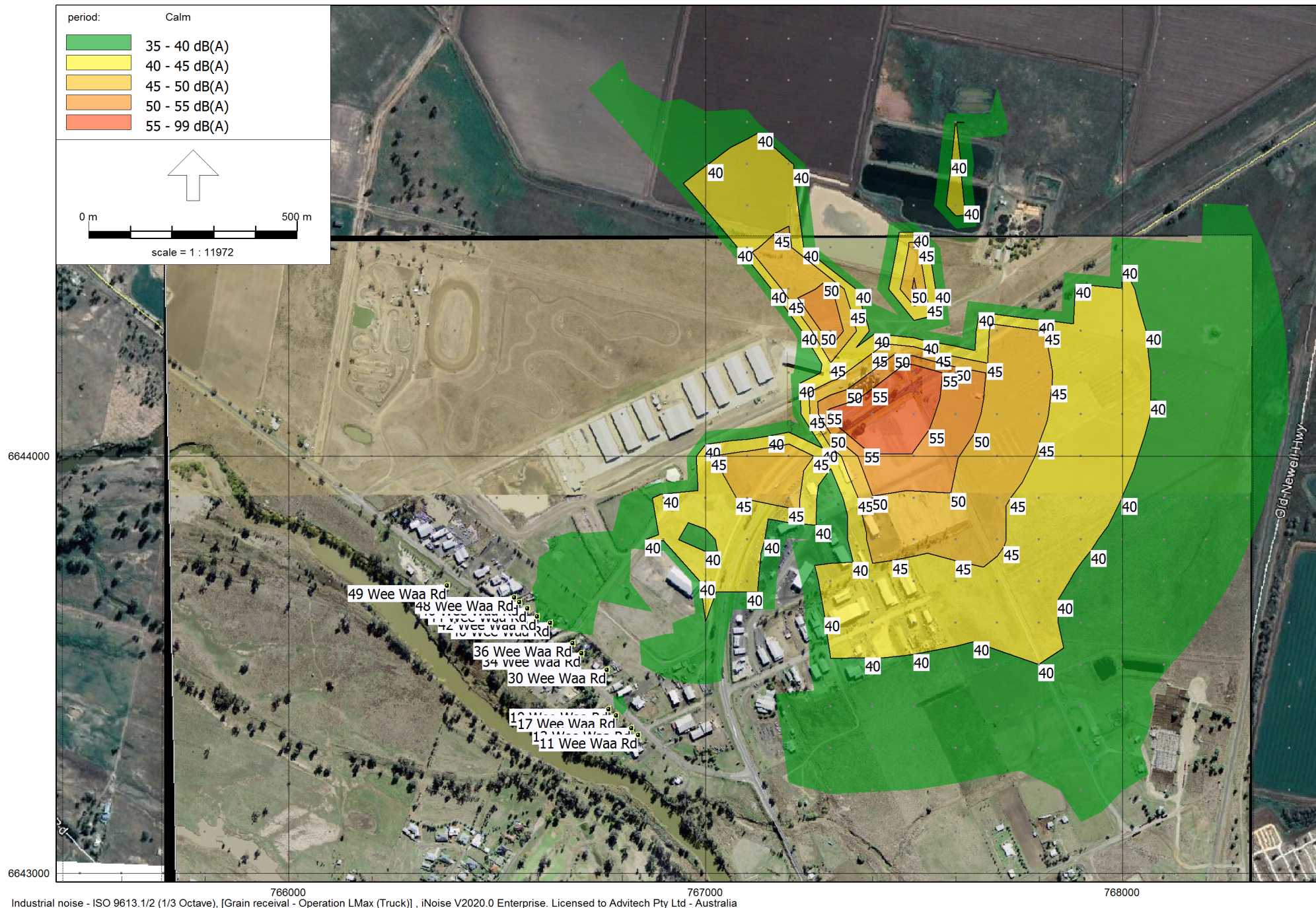
35 - 40 dB(A)
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 99 dB(A)



scale = 1 : 11972

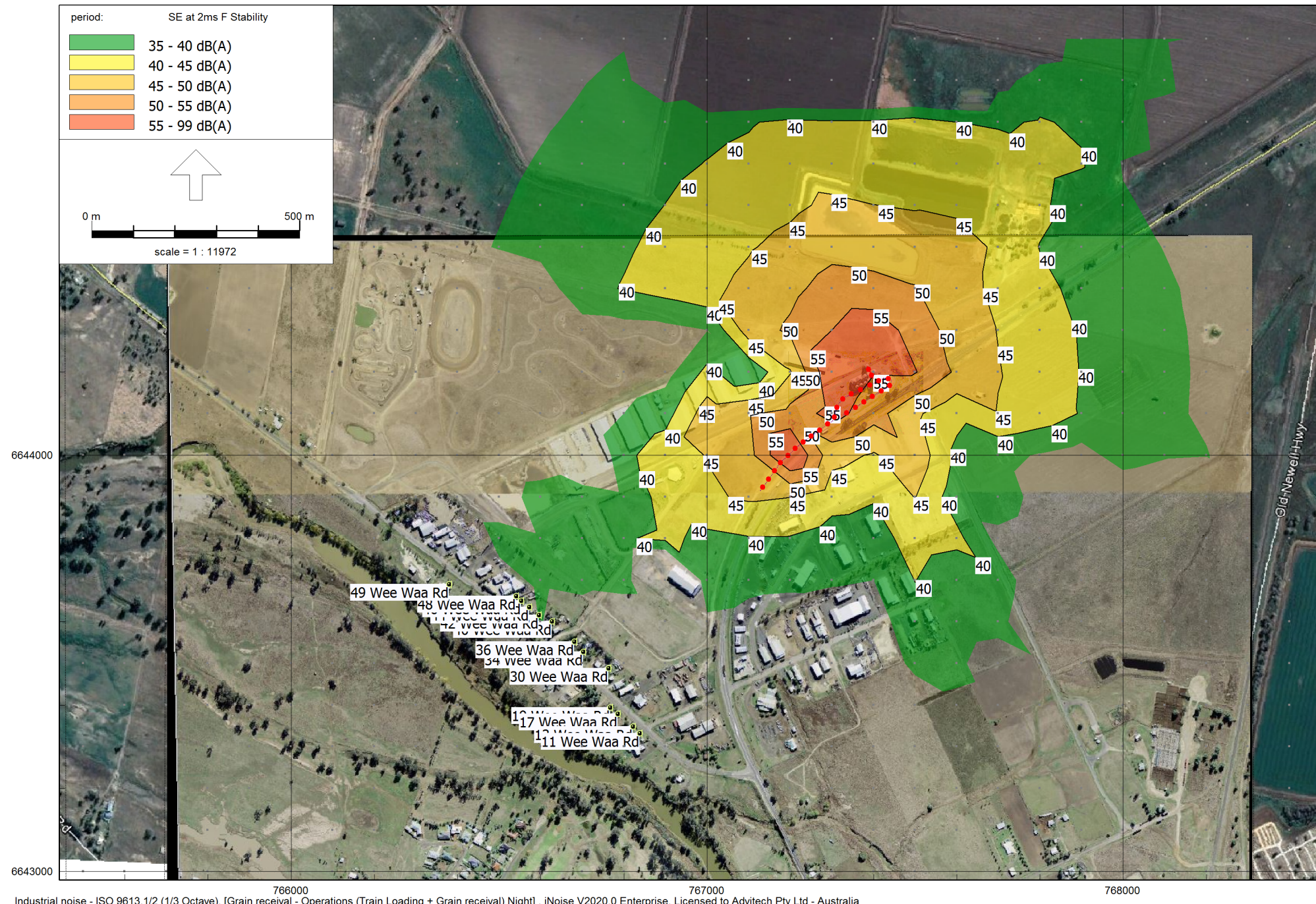




Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receival - Operation LMax (Truck)] , iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia


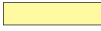






Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receival - Operation LMax (Truck)] , iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia




Industrial noise - ISO 9613.1/2 (1/3 Octave), [Grain receival - Operations (Train Loading + Grain receival) Night] , iNoise V2020.0 Enterprise. Licensed to Advitech Pty Ltd - Australia

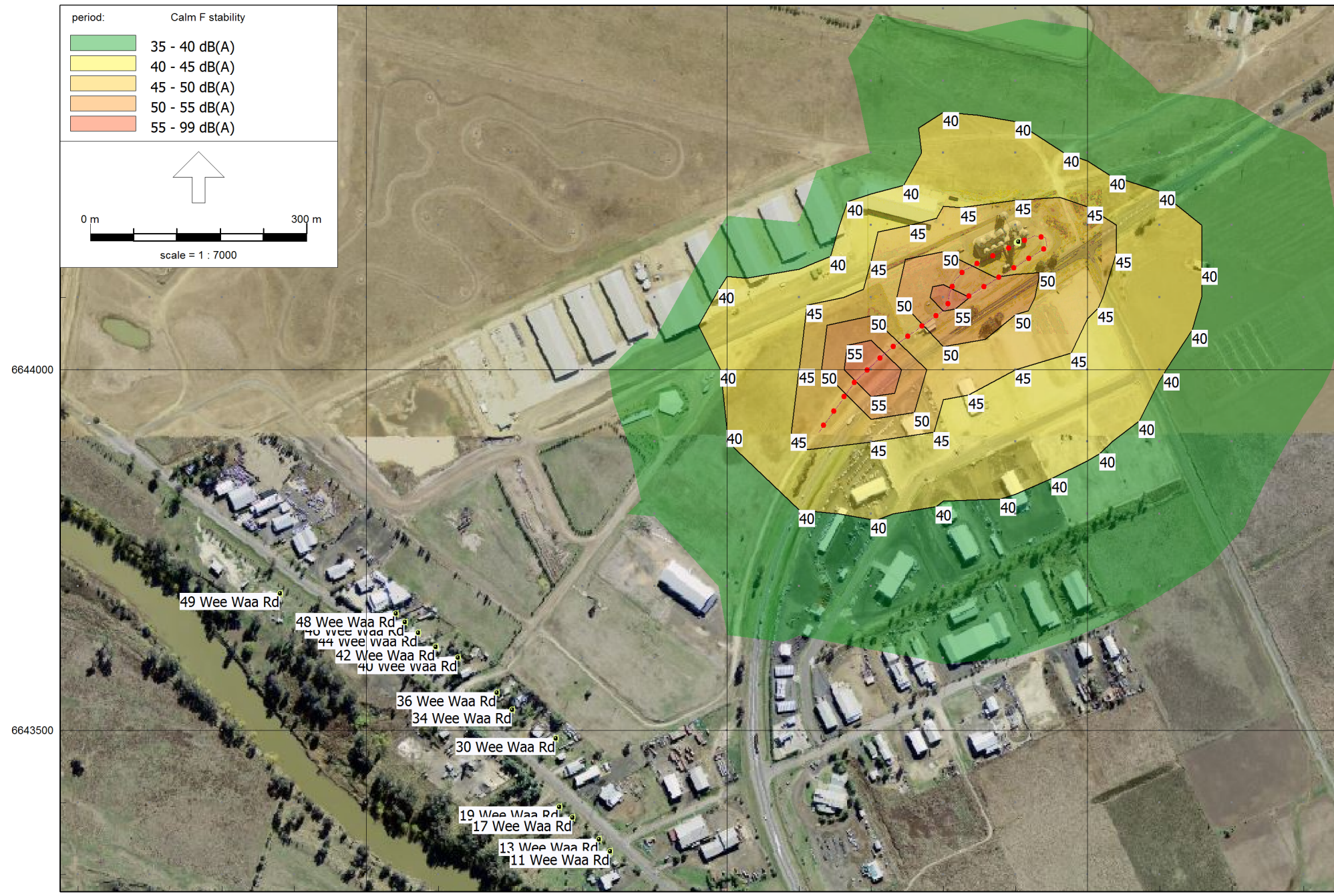
period: Calm F stability

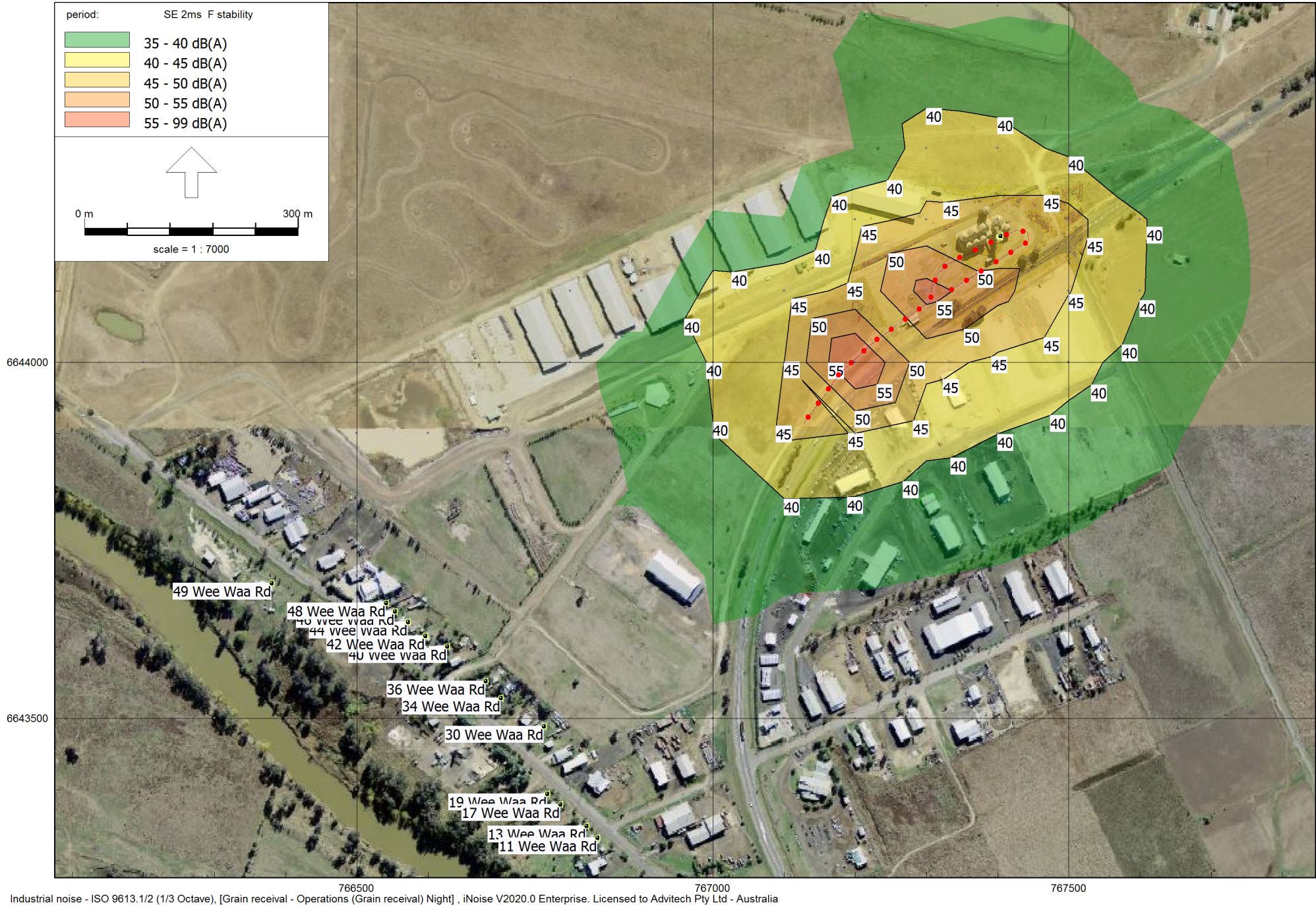
	35 - 40 dB(A)
	40 - 45 dB(A)
	45 - 50 dB(A)
	50 - 55 dB(A)
	55 - 99 dB(A)

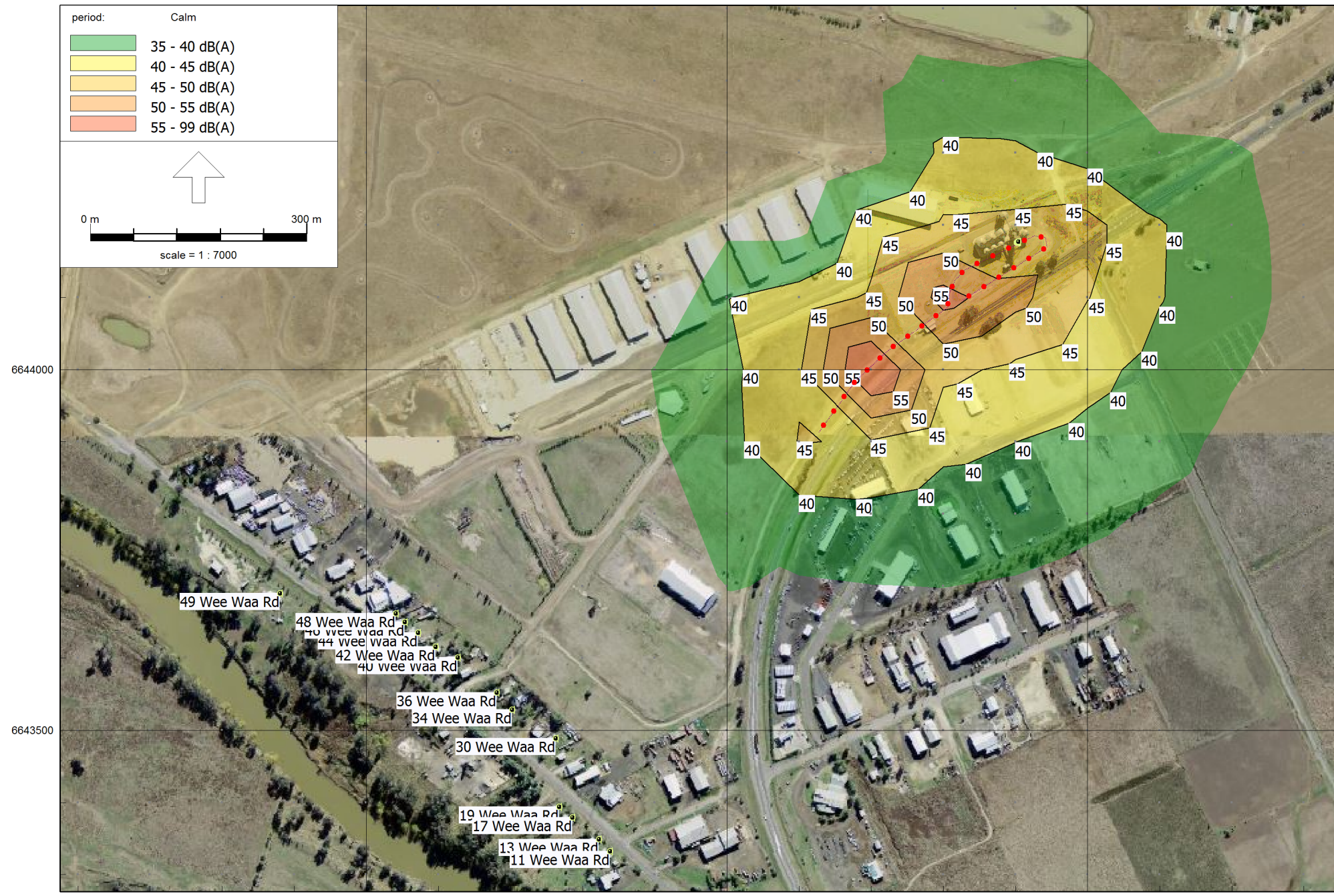
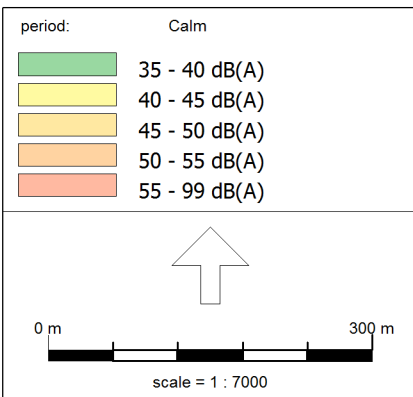




scale = 1 : 7000









Appendix IV Road Traffic Volumes

Daily Movements 22

Haulage Hours per Day 24

Movements per Hr 1 50/50 split along both roads

Newell Hwy

Narrabri

Offset

Hour of Day

Existing AADT

LV

HV

Total

%HV

0 hour_00

9

28

37

76%

1 hour_01

8

22

30

73%

2 hour_02

7

23

30

77%

3 hour_03

5

16

21

76%

4 hour_04

8

18

26

69%

5 hour_05

21

27

48

56%

6 hour_06

52

37

89

42%

7 hour_07

107

57

164

35%

8 hour_08

143

65

208

31%

9 hour_09

154

72

226

32%

10 hour_10

155

65

220

30%

11 hour_11

143

70

213

33%

12 hour_12

133

69

202

34%

13 hour_13

137

70

207

34%

14 hour_14

133

69

202

34%

15 hour_15

150

79

229

34%

16 hour_16

148

67

215

31%

17 hour_17

141

74

215

34%

18 hour_18

99

72

171

42%

19 hour_19

58

52

110

47%

20 hour_20

38

55

93

59%

21 hour_21

22

47

69

68%

22 hour_22

18

39

57

68%

23 hour_23

16

34

50

68%

Arrow Grain Addition

LV

HV

Existing + Arrow Grain

LV

HV

Total

%HV

0

0

9

28

37

76%

0

0

8

22

30

73%

0

0

7

23

30

77%

0

0

5

16

21

76%

0

0

8

18

26

69%

0

0

21

27

48

56%

0

0

52

37

89

42%

0

0

107

57

164

35%

0

0

143

65

208

31%

0

0

154

72

226

32%

0

1

155

66

221

30%

0

1

143

71

214

33%

0

1

133

70

203

34%

0

1

137

71

208

34%

0

1

133

70

203

34%

0

1

150

80

230

35%

0

1

148

68

216

31%

0

1

141

75

216

35%

0

1

99

73

172

42%

0

1

58

53

111

48%

0

1

38

56

93.9

60%

0

1

22

48

69.9

69%

0

0

18

39

57

68%

0

0

16

34

50

68%

Wee Waa Rd/Kamilaroi Hwy

Narrabri

Hour of Day

Existing AADT

LV

HV

%HV

hour_00

5

4

9

44%

hour_01

4

4

8

50%

hour_02

4

4

8

50%

hour_03

4

4

8

50%

hour_04

4

4

8

50%

hour_05

9

5

14

36%

hour_06

32

7

39

18%

hour_07

59

12

71

17%

hour_08

88

14

102

14%

hour_09

79

14

93

15%

hour_10

73

14

87

16%

hour_11

69

15

84

18%

hour_12

68

14

82

17%

hour_13

67

13

80

16%

hour_14

69

14

83

17%

hour_15

78

13

91

14%

hour_16

84

13

97

13%

hour_17

77

10

87

11%

hour_18

46

9

55

16%

hour_19

27

7

34

21%

hour_20

18

6

24

25%

hour_21

14

6

20

30%

hour_22

11

5

16

31%

hour_23

7

4

11

36%

Arrow Grain Addition

LV

HV

Existing + Arrow Grain

LV

HV

%HV

0

0

5

4

9

44%

0

0

4

4

8

50%

0

0

4

4

8

50%

0

0

4

4

8

50%

0

0

4

4

8

50%

0

0

9

5

14

36%

0

0

32

7

39

18%

0

0

59

12

71

17%

0

0

88

14

102

14%

0

0

79

14

93

15%

0

1

73

15

87.9

17%

0

1

69

16

84.9

19%

0

1

68

15

82.9

18%

0

1

67

14

80.9

17%

0

1

69

15

83.9

18%

0

1

78

14

91.9

15%

0

1

84

14

97.9

14%

0

1

77

11

87.9

12%

0

1

46

10

55.9

18%

0

1

27

8

34.9

23%

0

1

18

7

24.9

28%

0

1

14

7

20.9

33%

0

0

11

5

16

31%

0

0

7

4

11

36%

Figure 9: Existing and prediction traffic volumes along Wee Waa Road and Newell Highway

Table 18: 2008 AADT volumes Newell Highway (Station ID: 92725)

Station Id: 92725																										
110m North of Francis Street, Narrabri 2390																										
year	cardinal_c	hour_00	hour_01	hour_02	hour_03	hour_04	hour_05	hour_06	hour_07	hour_08	hour_09	hour_10	hour_11	hour_12	hour_13	hour_14	hour_15	hour_16	hour_17	hour_18	hour_19	hour_20	hour_21	hour_22	hour_23	daily_tot
2008	Southbou Heavy Vel	17	13	15	11	11	12	16	24	31	32	28	30	28	29	28	31	30	31	33	26	29	24	25	22	576
2008	Southbou Light Vehi	5	4	4	2	4	7	16	37	65	69	73	71	66	73	68	82	85	75	51	32	23	11	8	8	939
2008	Southbou All Vehicl	22	16	17	12	14	18	31	61	96	101	101	100	94	102	95	113	114	105	83	58	52	35	32	29	1501
2008	Northbou Heavy Vel	11	9	8	5	7	15	21	33	34	40	37	40	41	41	41	48	37	43	39	26	26	23	14	12	651
2008	Northbou Light Vehi	4	4	3	3	4	14	36	70	78	85	82	72	67	64	65	68	63	66	48	26	15	11	10	8	966
2008	Northbou All Vehicl	14	13	11	8	11	29	57	103	112	124	118	112	107	105	106	115	99	108	87	51	40	33	24	19	1606

Table 19: 2008 AADT volumes Kalimaroi Highway (Station ID: 92732)

Station Id: 92732																										
520m West of Minoru Lane, Narrabri 2390																										
year	cardinal_c	hour_00	hour_01	hour_02	hour_03	hour_04	hour_05	hour_06	hour_07	hour_08	hour_09	hour_10	hour_11	hour_12	hour_13	hour_14	hour_15	hour_16	hour_17	hour_18	hour_19	hour_20	hour_21	hour_22	hour_23	daily_tot
2006	Westbour Light Vehi	3	2	2	3	10	13	24	28	23	21	23	25	32	28	31	29	31	35	19	16	11	11	8	6	434
2006	Westbour Heavy Vel	1	1	1	2	2	2	4	8	7	7	6	6	5	5	3	4	3	2	3	1	1	2	2	1	79
2006	Westbour All Vehicl	3	2	2	4	10	14	28	35	29	26	27	28	37	31	33	33	33	37	21	16	11	12	8	6	486
2006	Eastbounc Light Vehi	2	3	2	2	2	5	12	17	31	41	41	33	26	27	29	34	35	30	20	12	9	5	4	4	426
2006	Eastbounc Heavy Vel	2	2	3	1	2	4	2	5	3	6	7	5	5	4	7	5	6	3	3	2	2	1	1	1	81
2006	Eastbounc All Vehicl	3	3	3	2	3	5	14	19	35	43	46	39	30	31	32	40	38	34	22	14	10	6	4	4	480
2008	Eastbounc Light Vehi	2	2	2	2	2	4	13	26	43	48	44	36	32	30	31	43	47	38	20	11	6	5	4	3	494
2008	Eastbounc Heavy Vel	2	2	2	2	2	3	4	6	7	7	8	8	7	7	7	8	6	5	4	3	3	3	3	2	110
2008	Eastbounc All Vehicl	3	2	2	2	2	5	15	29	48	54	50	43	40	37	37	49	54	43	24	14	9	7	5	4	578
2008	Westbour Light Vehi	3	2	2	2	2	5	19	33	45	31	29	33	36	37	38	35	37	39	26	16	12	9	7	4	502
2008	Westbour Heavy Vel	2	2	2	2	2	3	4	8	8	7	7	7	6	6	7	6	5	4	4	3	3	3	2	2	105
2008	Westbour All Vehicl	4	3	2	2	3	6	23	40	53	37	36	40	42	42	44	41	41	42	29	18	13	11	8	4	584
2009	Westbour All Vehicl	3	3	2	2	3	7	29	40	55	39	39	42	43	45	45	44	44	46	31	21	15	13	9	5	625
2009	Eastbounc All Vehicl	3	2	2	2	2	5	16	27	50	56	52	47	42	41	42	50	59	46	28	17	11	7	6	4	617
2012	Westbour Light Vehi	3	2	2	2	3	11	24	32	42	30	30	34	37	36	38	39	38	45	29	19	14	10	8	5	533
2012	Westbour Heavy Vel	3	2	2	2	2	3	5	9	10	12	10	8	8	9	8	8	7	6	4	3	3	3	3	3	133
2012	Westbour All Vehicl	4	3	3	2	3	12	28	41	51	41	38	41	45	44	46	47	45	50	32	21	17	12	10	6	642
2012	Eastbounc Light Vehi	2	2	2	2	3	6	17	29	49	50	49	42	39	38	37	41	51	41	24	13	9	6	4	3	559
2012	Eastbounc Heavy Vel	2	2	2	1	2	3	5	4	6	7	10	10	9	10	11	10	10	8	7	4	4	3	3	2	135
2012	Eastbounc All Vehicl	3	2	2	2	4	7	21	32	54	57	58	51	48	47	47	50	60	48	29	16	12	8	5	3	666