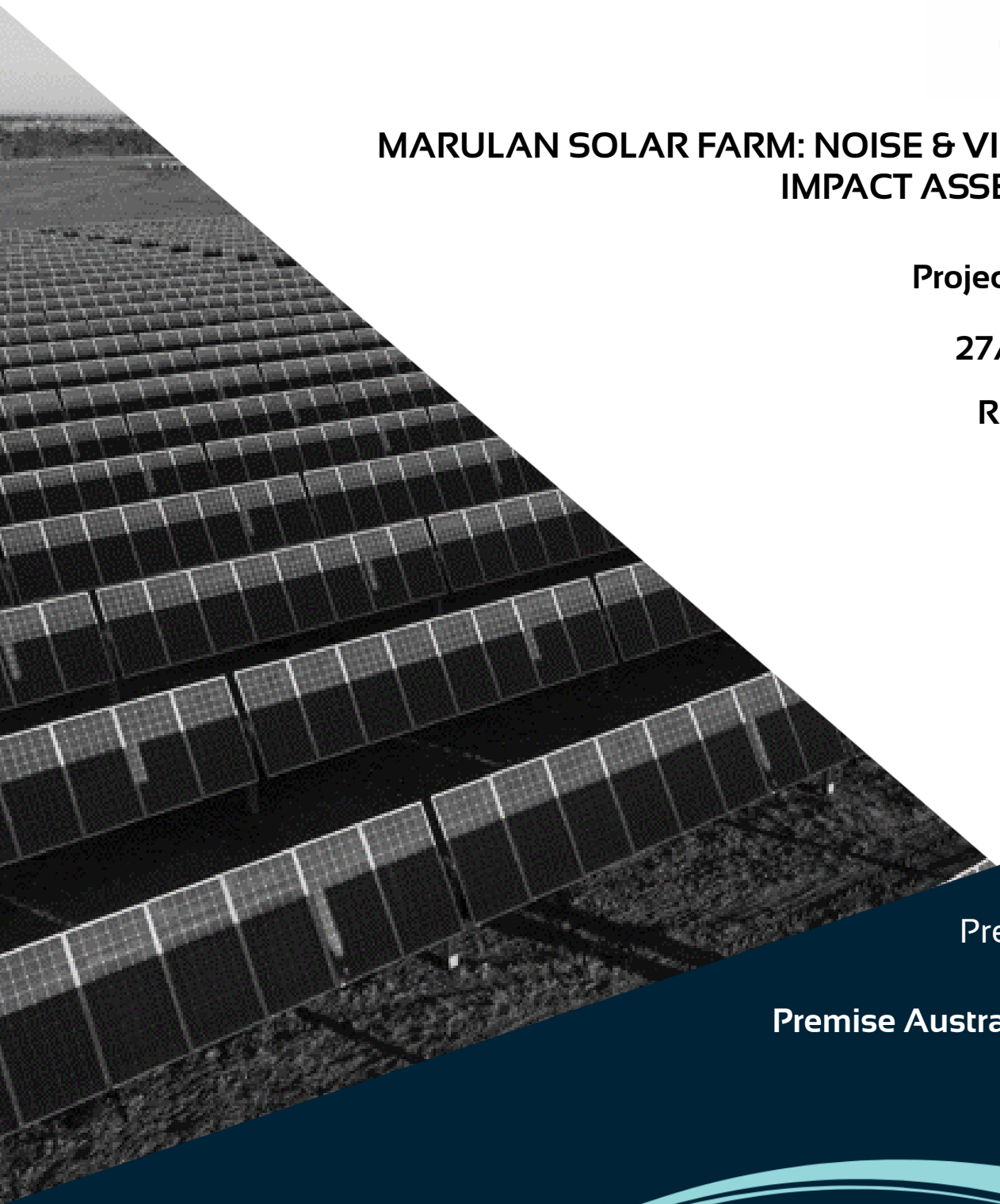

MARULAN SOLAR FARM: NOISE & VIBRATION IMPACT ASSESSMENT

Project ID: 13621

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Assured Environmental

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Table 1: History of Revisions

Revision	Date	Issued to	Changes
R0	12/04/2022	D. Walker	Initial Release
R1	6/05/2022	D. Walker	Revised SWL data
R2	8/05/2020	D. Walker	Comments
R3	12/05/2022	D. Walker	Comments
R4	27/06/2022	D. Walker	Draft CNVMP
R5	27/06/2022	D. Walker	Table 3 update

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GLOSSARY

A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002 N/m^2).
dB(A) or dBA	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Free-field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally, as measured outside and away from buildings.
L_{Aeq}	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. Noise levels often fluctuate over a wide range with time. Therefore, when a noise varies over time, the L_{Aeq} is the equivalent continuous sound which would contain the same sound energy as the time varying sound. Many studies show that human reaction to level-varying sounds tends to relate closer to the L_{Aeq} noise level than any other descriptor.
L_{A10}, L_{A90}, L_{An}	Noise level exceeded for n% of the measurement period with A-weighted, calculated by statistical analysis - where n is between 0.01% and 99.99%. For example, L_{A10} is the noise level just exceeded for 10% of the measurement period, calculated by statistical analysis and used to determine traffic noise and L_{A90} is the noise level exceeded for 90% of the measurement period, A-weighted and calculated by statistical analysis and used to determine background noise levels.
L_{AFmax}	A-weighted, fast response, maximum, sound level.
L_{AFmin}	A-weighted, fast response, minimum, sound level.
RBL	Rating background noise level – the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
SWL	Sound Power Level in decibels is ten times the logarithm of the ratio of the sound power to the sound power reference level of 1 pico Watt.

ABBREVIATIONS

EPA	Environmental Protection Authority (NSW)
ICNG	Interim Construction Noise Guidelines
MSF	Marulan Solar Farm
NPfI	Noise Policy for Industry

1 INTRODUCTION

1.1 Background

Terrain Solar is proposing to develop a 150-megawatt (MW) solar farm (approximate size), plus a battery energy storage system with a capacity of up to 600 MWh, on land approximately 5 kilometres (km) west of the town of Marulan, NSW. The development would be known as the Marulan Solar Farm (MSF).

1.2 Scope of Assessment

Assured Environmental (AE) was appointed by Premise Australia Pty Ltd on behalf of Terrain Solar to undertake a noise and vibration impact assessment for the proposed Marulan Solar Farm and Battery Energy Storage System (BESS). The project involves construction and operation of a solar farm and BESS on one land parcel. The assessment has been undertaken in accordance with the following guidelines:

- NSW Noise Policy for Industry (NPfI) (EPA, 2017)
- NSW Assessing Vibration: a technical guideline (DEC, 2006);
- NSW Road Noise Policy (DECCW, 2011); and
- Interim Construction Noise Guideline (ICNG) (DECC, 2009).

In accordance with the requirements of the above guidelines, computational modelling and first principle calculations have been undertaken to support the assessment of the potential for adverse amenity impacts as a result of the development.

1.3 This Report

This report presents the noise and vibration impact assessment in accordance with the agreed scope of work.

2 PROPOSED DEVELOPMENT SITE

2.1 Location

The MSF development site is proposed to be located on land at 740 Carrick Road/154 Munro Road, Carrick (also known as Lot 55 DP1141136). Lot 55 (hereafter referred to as the Subject Site) is part of a larger landholding in single ownership.

The site is located to the west of the town of Marulan and within the Goulburn Mulwaree Local Government Area (LGA). The Main Southern Railway is located to the north of the site. Transmission line easements intersect the site, connecting with a substation located approximately 1.3 km to the east of the site as shown in Figure 1.

The development site is accessible via Munro Road to the south, which links to the Hume Highway in the south.

To the west and north-west of the host lot are Holcim and Gunlake Quarries, which supply sand and aggregates to the construction industry.

2.2 Nearby Sensitive Receptors

The proposed solar farm is located on land directly adjacent to the Main Southern Railway and on land to the east of the village of Towrang.

Within a 2 km distance of the proposed solar farm there is one associated landowner and 18 non-associated residential receivers. Non-associated landowners are all located to the south and west of the site. Within 4 km, there are a further 29 non-associated receivers. Figure 1 illustrates the location of the sensitive receptors to the Subject Site. There are four residential receptors owned by the associated landowner which are associated with the Project (R1, R2, R3 and R4).

2.3 Terrain

The site is undulating with numerous watercourses acting as the low points throughout the site. The site rises to a high point of 680 metres Average Height Datum (AHD) in the south-west and falls to a low of 617 m AHD toward the centre of the site, along the alignment of Narambulla Creek.

The site features 22 small farm dams and a number of named and unnamed waterways located onsite. The most notable of which are Lockyersleigh Creek, Osborns Creek, and Narambulla Creek. These creeks drain generally northward towards the Wollondilly River.

Figure 2 presents the local terrain.

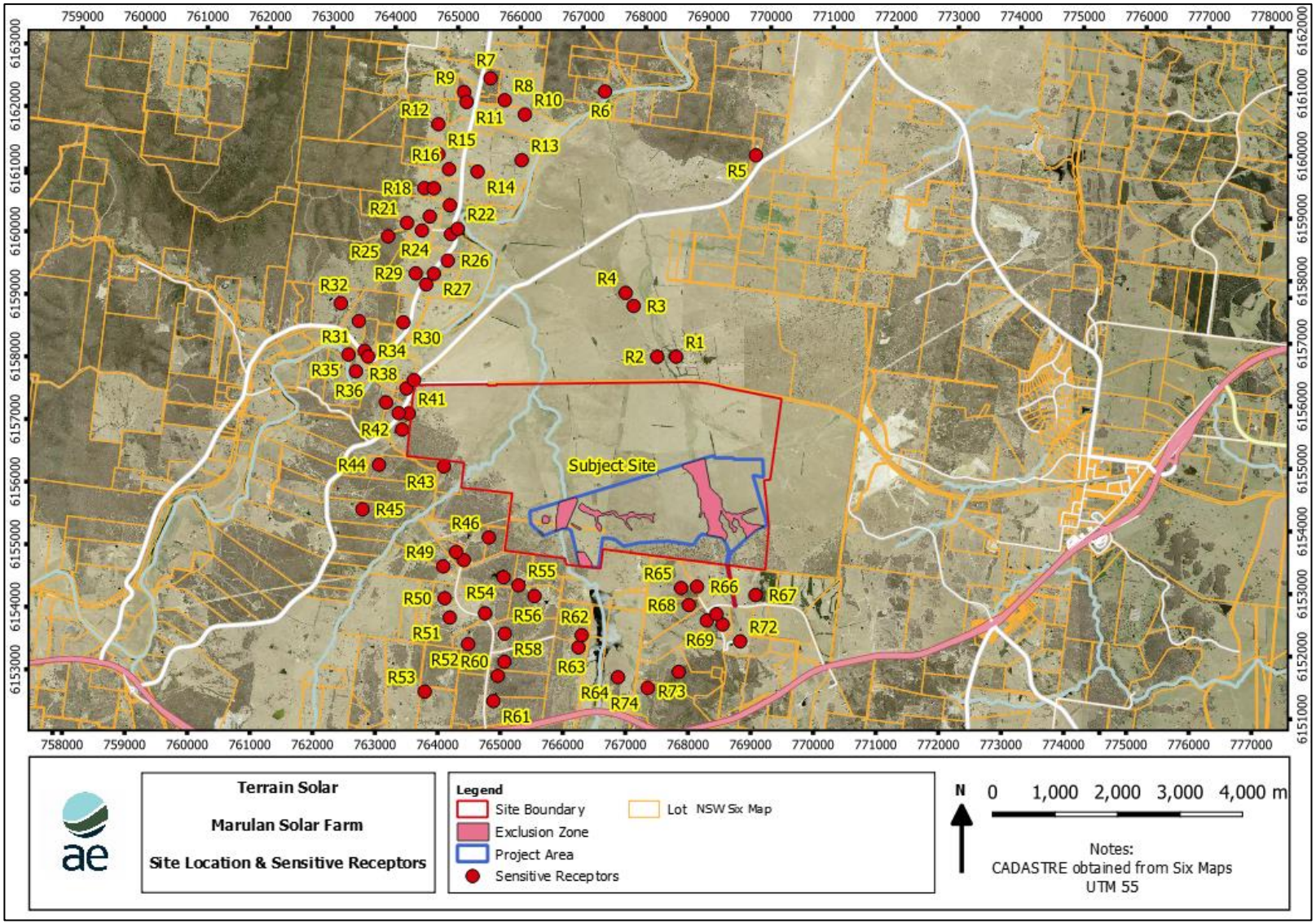


Figure 1: Receptors and Surrounding Land Use

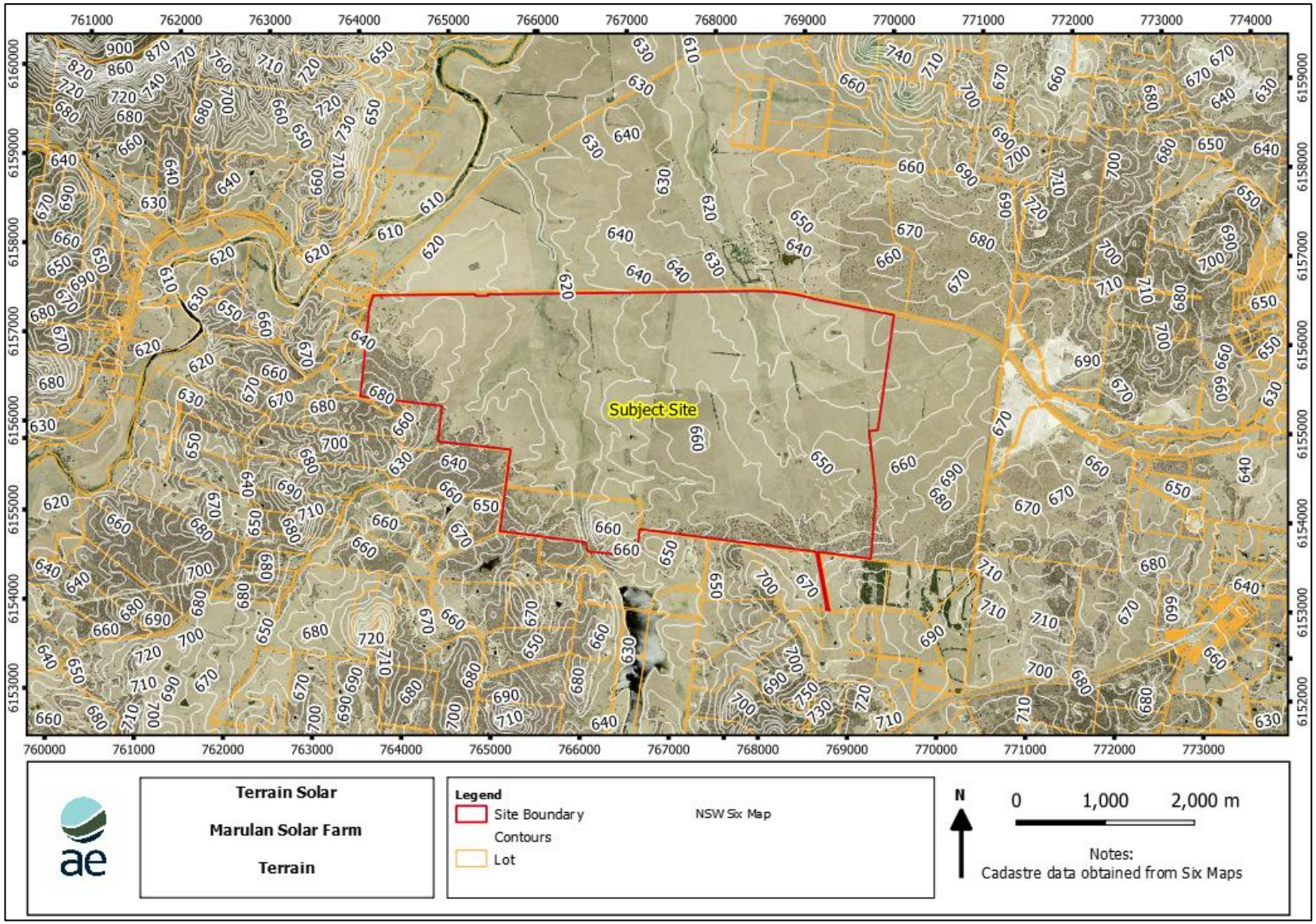


Figure 2: Terrain

3 CONSTRUCTION NOISE ASSESSMENT

3.1 Duration of Construction Works

The construction of the MSF is expected to take approximately 18 months, with a number of different activities undertaken over that time.

Construction would be restricted to what the EPA term 'recommended construction hours' (as described in Table 2 below), which are between 7 am and 6 pm Monday to Friday and 8 am to 1 pm Saturday, with no works on Sundays or Public Holidays.

The assessment has therefore considered the potential for adverse amenity impacts associated with construction during recommended standard hours only.

3.2 Interim Construction Noise Guideline

Guidance on the assessment and management of construction noise in NSW is provided in the Interim Construction Noise Guideline 2009 (ICNG) published by the NSW EPA.

The main objectives of the Guideline are to:

- Promote a clear understanding of ways to identify and minimise noise from construction works;
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts;
- Encourage construction to be undertaken only during the recommended standard hours, unless approval is given for works that cannot be undertaken during these hours;
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage;
- Provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts; and
- Provide guidelines for assessing noise generated during the construction phase of developments.

In achieving these objectives, the guideline provides a framework for the qualitative and quantitative assessment of potential construction noise impacts noting that, for major projects, a quantitative assessment is the preferred approach.

Table 2 presents construction noise criteria outlined in the guideline. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence.

Table 2: NSW EPA Construction Noise Criteria – Residential Receivers

Time of Day	Management Level (Free-field)	How to Apply
Recommended standard hours: Monday to Friday, 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

Where nearby sensitive receptors are predicted to be noise affected, the proponent of the project is required to apply reasonable and feasible noise mitigation measures, noting that a noise mitigation measure is feasible if it is capable of being put into practice and is practical to build given the project constraints.

Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic, and environmental effects.

For construction in standard operating hours, the assessment criteria has been determined based on the minimum allowable RBL as provided in the NPfI. That is, for the purposes of the assessment it is assumed that the RBL is 40 dB(A) for daytime periods (standard operating hours) thereby resulting in a noise affected management level of 50 dB(A) and a highly noise affected management level of 75 dB(A).

3.3 Construction Noise Sources

In terms of noise emissions, the site preparation activities and installation of the solar PV modules (specifically driving the support posts into the ground) are expected to represent those with the most significant potential for adverse impacts.

It is noted that construction works are expected to progress across the site such that plant and equipment would only be in a single area for a short period of time. For example, each post takes approximately 25-30 seconds to drive into the ground thereby providing the ability to install a new pile approximately every 2.5 minutes. Given this, the potential for adverse impacts at any one receptor is expected to only occur for a short period of time.

It's estimated a maximum of 4,676 trucks will enter the site during the 18-month period of construction (noting that the 18-month construction period would feature approximately 3-month shoulder periods at the beginning and end of mobilisation and de-mobilisation during which movements would be much lower). During peak construction, it is estimated that 85 trucks would be on site per day, which is based on Conditions of Approvals set for similar solar farms in NSW.

Table 3 below presents a summary of the plant and equipment likely to be required to complete the on-site construction works. The sound power levels presented have been sourced from published noise emission datasets and the library of source noise levels maintained by Assured Environmental.

Table 3: Construction Phases and Expected Equipment

Timeline	Construction Activity	Source	Number Operating	Usage Factors (%)	SWL dB(A)
Month 1	Site establishment	Bulldozer	1	40	104
		Loader	1	40	103
		Grader	1	40	104
		Vibratory Roller	1	20	96
		Water Cart	1	40	94
		Excavator	1	40	108
		Mulcher (as required)	1	10	105
		Franna Crane (20t)	1	16	99
		Diesel Generator	1	100	70
Month 2 to 3	Clearing Bulk earthworks	Bulldozer	4	40	104
		Loader	4	40	103
		Grader	4	40	104
		Vibratory Roller	3	20	96
		Water Cart	1	40	94
		Excavator	2	40	108
		Slasher	2	20	98
		Mulcher (as required)	1	10	105
		Diesel Generator	1	16	62
Month 4 to 7	Clearing Bulk earthworks and	Bulldozer	4	40	104
		Loader	5	40	103
		Grader	4	40	104

Timeline	Construction Activity	Source	Number Operating	Usage Factors (%)	SWL dB(A)
	construction of solar farm and grid connection	Vibratory Roller	3	20	96
		Water Cart	1	40	94
		Excavator	6	40	108
		Franna Crane (20t)	2	16	76
		Diesel Generator	2	100	87
Month 4 to 12	Piling	Piling Machine	6	20	112
		Trencher	2	40	96
Month 8 to 12	Construction of solar farm and grid connection	Loader	1	40	107
		Water Cart	1	40	98
		Excavator	4	40	112
		Franna Crane (20t)	2	16	107
		Diesel Generator	2	100	70
Month 13 to 16	Commissioning	Franna Crane (20t)	2	16	107
		Diesel Generator	2	100	70

3.4 Assessment of Impacts

For the purposes of predicting impacts associated with noise emissions from the Subject Site on nearby sensitive receptors, calculations of the noise impacts from construction activities have been undertaken using first principal calculations based on the distance separation of the receptor and the Project Area boundary (Figure 1).

Construction activities across the site will vary in location and duration; mobile plant will move around the development site throughout the construction phase, whereas activities such as trenching, and piling will slowly move along the line of solar panels. As such, whilst the piling activities are noisy, once each pile is complete, the area is not revisited and therefore the highest predicted noise levels associated with piling (Section 3.3) will be short-lived for each receptor.

Table 4 below presents predicted most affected receptor noise levels taking into consideration the following assumptions:

- All equipment and plant are located in the same area – at the closest point to the Project Area boundary to the receptors. Where multiple mobile plant are used, the plant is spread out. This is considered to be a hypothetical worst-case scenario and unlikely to occur;
- The number of plant at this stage of development are estimates.

The results presented in Table 4 show the following:

- No receptors will experience noise levels >75 dB(A) for any stage during construction;
- The highest predicted noise level is 56 dB(A) at receptor R66 during months 4 to 7. This receptor is close to the Project Area boundary and the access road;

- Only 10 receptors (shaded on Table 4) are predicted to have noise levels >50 dB(A) during any stage of construction.

It is recommended that reasonable and feasible mitigation measures such as those presented in Section 3.5 are implemented to reduce the noise impact at all receptors.

Table 4: Predicted Receptor Noise Levels – Daytime, dB(A)

ID	Distance from Project Area (m)	Standard Hours Criteria		Construction Phase					
		Noise Affected	Highly Noise Affected	Month 1	Month 2 to 3	Month 4 to 7	Month 8 to 12	Month 13 to 16	Piling Only
R1	1710	50	75	48	48	47	45	34	43
R2	1820	50	75	47	47	46	45	34	43
R3	2700	50	75	44	44	43	41	30	39
R4	2910	50	75	43	43	42	40	30	39
R5	4880	50	75	39	39	38	36	25	34
R6	6100	50	75	37	37	36	34	23	32
R7	6800	50	75	36	36	35	33	22	31
R8	6450	50	75	36	36	35	34	23	32
R9	6740	50	75	36	36	35	33	22	31
R10	6100	50	75	37	37	36	34	23	32
R11	6600	50	75	36	36	35	33	23	32
R12	6420	50	75	36	36	36	34	23	32
R13	5430	50	75	38	38	37	35	24	33
R14	5500	50	75	38	38	37	35	24	33
R15	5870	50	75	37	37	36	34	24	33
R16	5610	50	75	38	37	37	35	24	33
R17	5400	50	75	38	38	37	35	24	33
R18	5430	50	75	38	38	37	35	24	33
R19	5070	50	75	38	38	38	36	25	34
R20	4980	50	75	39	39	38	36	25	34
R21	5100	50	75	38	38	37	36	25	34
R22	4660	50	75	39	39	38	36	26	35
R23	4670	50	75	39	39	38	36	26	35
R24	4750	50	75	39	39	38	36	26	34
R25	4930	50	75	39	39	38	36	25	34
R26	4180	50	75	40	40	39	37	27	36
R27	4100	50	75	40	40	39	38	27	36
R28	4010	50	75	40	40	40	38	27	36
R29	4230	50	75	40	40	39	37	27	35
R30	3640	50	75	41	41	40	39	28	37
R31	4130	50	75	40	40	39	37	27	36

ID	Distance from Project Area (m)	Standard Hours Criteria		Construction Phase					
		Noise Affected	Highly Noise Affected	Month 1	Month 2 to 3	Month 4 to 7	Month 8 to 12	Month 13 to 16	Piling Only
R32	4500	50	75	39	39	39	37	26	35
R33	3580	50	75	41	41	41	39	28	37
R34	3700	50	75	41	41	40	38	28	37
R35	3850	50	75	41	41	40	38	27	36
R36	3580	50	75	41	41	41	39	28	37
R37	2800	50	75	44	44	43	41	30	39
R38	2800	50	75	44	44	43	41	30	39
R39	2920	50	75	43	43	42	40	30	39
R40	2620	50	75	44	44	43	41	31	40
R41	2530	50	75	44	44	44	42	31	40
R42	2430	50	75	45	45	44	42	31	40
R43	1570	50	75	49	49	48	46	35	44
R44	2550	50	75	44	44	44	42	31	40
R45	2700	50	75	44	44	43	41	30	39
R46	730	50	75	55	55	54	52	42	51
R47	1270	50	75	50	50	50	48	37	46
R48	1290	50	75	50	50	49	48	37	46
R49	1670	50	75	48	48	47	45	35	44
R50	1850	50	75	47	47	46	44	34	43
R51	2050	50	75	46	46	45	44	33	42
R52	2170	50	75	46	46	45	43	32	41
R53	3200	50	75	42	42	42	40	29	38
R54	950	50	75	53	53	52	50	39	48
R55	1180	50	75	51	51	50	48	38	47
R56	1000	50	75	52	52	52	50	39	48
R57	1760	50	75	48	48	47	45	34	43
R58	1800	50	75	47	47	47	45	34	43
R59	2200	50	75	46	46	45	43	32	41
R60	2350	50	75	45	45	44	42	32	41
R61	2720	50	75	44	44	43	41	30	39
R62	1150	50	75	51	51	50	49	38	47
R63	1380	50	75	50	50	49	47	36	45
R64	1800	50	75	47	47	47	45	34	43
R65	750	50	75	55	55	54	52	42	50
R66	700	50	75	56	56	55	53	42	51
R67	850	50	75	54	54	53	51	40	49
R68	1000	50	75	52	52	52	50	39	48

ID	Distance from Project Area (m)	Standard Hours Criteria		Construction Phase					
		Noise Affected	Highly Noise Affected	Month 1	Month 2 to 3	Month 4 to 7	Month 8 to 12	Month 13 to 16	Piling Only
R69	1250	50	75	51	51	50	48	37	46
R70	1120	50	75	52	51	51	49	38	47
R71	1250	50	75	51	51	50	48	37	46
R72	1490	50	75	49	49	48	46	36	45
R73	2150	50	75	46	46	45	43	32	41
R74	2200	50	75	46	46	45	43	32	41

3.5 Mitigation of Construction Noise Levels

Given the variable and mobile nature of the construction works, the use of permanent or temporary acoustic barriers at source is not considered feasible. Potential controls available to the construction contractor to minimise potential impacts for construction works could include:

- Limiting the type and scale of concurrent activities undertaken close to sensitive receptors where possible;
- Using broad band reversing alarms on all mobile plant and equipment;
- Examine different types of machines that perform the same function and compare the noise level data to select the least noisy machine;
- Operating plant in a quiet and efficient manner;
- Reduce throttle setting and turn off equipment when not being used; and
- Regularly inspect and maintain equipment to ensure it is in good working order including checking the condition of mufflers.

It is recommended that during any work generating high noise levels that have impulsive, intermittent, low frequency or tonal characteristics, consultation with sensitive receptors occurs regularly.

The predicted noise levels from piling activities will exceed 50 dB(A) at two receptors (R65 and R66). When piling near these receptors, it is recommended that activities are restricted to standard operating hours during construction months 4-12. It should be noted that the construction assessment is conservative in nature and that the likelihood of exceeding these noise levels is low.

As highest predicted noise levels do not exceed the highly affected noise criteria of 75 dB(A) at any receptor, the implementation of additional noise controls (except those listed above) is not considered necessary.

4 OPERATIONAL NOISE ASSESSMENT

4.1 Operational Noise Criteria

4.1.1 Overview

The acoustic assessment has been completed in accordance with the procedure identified in the NPfI. The NPfI recognises that scientific literature has identified that both the increase in noise level above background levels (that is, intrusiveness of a source), as well as the absolute level of noise are important factors in how a community will respond to noise from industrial sources.

In response to this, the NPfI establishes two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses. These two criteria are then used to determine project triggers levels against which the proposed development will be assessed. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response.

The derivation of the two sets of criteria are presented below. For residential dwellings, the noise criteria are assessed at the most-affected point (i.e. highest noise level) on or within the property boundary. Where the property boundary is more than 30 metres from the house, then the criteria apply at the most-affected point within 30 m of the house.

4.1.2 Intrusiveness Noise Criteria

The project intrusiveness noise level is intended to protect against significant changes in noise levels as a result of industrial development. To achieve this, the NPfI describes intrusive noise as noise that exceeds background noise levels (as defined by the Rating Background Level or RBL) by more than 5 dB.

Given the rural location of the site, the impact assessment has assumed baseline noise levels equivalent to the minimum background noise levels provided in the NPfI. Therefore, Table 5 presents the derivation of the intrusiveness criteria based on the minimum background noise level established by the NPfI.

Table 5: Derived Intrusiveness Noise Criteria

Receptor	Intrusiveness $L_{Aeq,15\text{-minute}}$ Criteria		
	Day	Evening	Night
All nearby residential receptors [a)]	40 [b)]	35 [b)]	35 [b)]

a) Receptor noise criteria applied at a location 30 m from the dwelling façade.
b) Minimum background noise level established by the NPfI 2017 + 5 dB.

4.1.3 Amenity Criteria

The project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. The nearest industrial use is quarrying activities located 2 km to the west of the Subject Site boundary. For the purposes of this assessment, the cumulative noise impacts will be used for receptors on the western side of the development (R1-R6 and R65-R72).

Table 6: NPfI Amenity Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dB(A))	
			Total Industrial Noise	Project Specific
Residence	Rural (R1-R5 and R65-R72)	Day	50	45
		Evening	45	40
		Night	40	35
Residence	Rural (all other receptors)	Day	50	50
		Evening	45	45
		Night	40	40

4.1.4 Project Trigger Levels

The project trigger level (i.e. the noise criteria considered by the assessment) is the lower value of the project intrusiveness noise level and the project amenity level, after the conversion to $L_{Aeq,\ 15\ min}$ dB(A) equivalent level. Table 7 presents the standardised intrusiveness noise level and the project amenity level as derived by adding 3 dB to each period of the day.

Table 7: Determining Project Trigger Level

Receptors	Time of Day	Standardised $L_{Aeq,\ 15\ min}$ Noise Level (dB)		
		Intrusiveness Criteria	Project Specific ANL	Project Trigger Level
R1-R5 and R65-R72	Day	40	45 + 3 = 48	40
	Evening	35	40 + 3 = 43	35
	Night	35	35 + 3 = 38	35
All other receptors	Day	40	50 + 3 = 53	40
	Evening	35	45 + 3 = 48	35
	Night	35	40 + 3 = 43	35

4.1.5 Sleep Disturbance

NSW EPA have identified a screening assessment for sleep disturbance based on the night-time noise levels at a residential location. Where noise levels at a residential location exceed:

- $L_{Aeq,\ 15\ min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is greater; and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 whichever is the greater, a detailed maximum noise level event assessment should be undertaken.

As discussed in Section 4.4, the predicted noise levels at residential locations do not exceed 40 dB(A) $L_{Aeq,\ 15\ min}$, therefore a detailed sleep disturbance assessment is not required.

4.2 Noise Sources

The MSF is to consist of solar photovoltaic (PV) plant and associated infrastructure for storing energy and supplying it into the grid. It is expected that, at completion, infrastructure installed on site will incorporate:

- solar panels;
- tracker motors;

- inverter; and
- transformer.

The PV panels will be mounted onto fixed support structures by single axis tracking panels which track the suns movement across the day through the use of small motors which rotate the panel arc of the sun to maximise the solar effect. Noise emissions from the tracking motors are expected to occur for approximately one minute out of each 15-minute period (providing for up to five degrees' rotation per hour) during day periods.

There will be no permanent staff onsite, however occasional light vehicles will visit the site for maintenance purposes.

Two BESS layouts are being considered. These layouts are indicative and subject to final design:

- AC Couple layout comprises:
    - Substation located next to the solar array, approx. midway on the northern boundary
    - Centralised battery storage, located adjacent to substation
    - 28 x Power Conversion Units (PCU) distributed across the solar farm, consisting each of 1 x PCU Transformer and 4 x Inverters
- DC Coupled Layout comprises:
    - Substation located next to the solar array, approx. midway on the northern boundary
    - 28 x Power Conversion Units distributed across the solar farm, consisting each of 1 x PCU Transformer, 2 x Inverters, 2 x DC/DC Converters, and 3 x battery containers.

Table 8 presents a summary of the source noise levels considered in the assessment. The sound power levels for the plant and equipment presented in the table below are as provided by the manufacturer or taken from information held in AE's library.

Table 8: Source Noise Levels for Operational Phase

Design Option	Source	Qty	Height above ground level(m)	Acoustical Usage (%)			Sound Power Level dB(A)		Noise Characteristics (included)
				Day	Evening	Night	L_{Aeq}	L_{Amax}	
AC Coupled Option	Tracker motor	3000	1.5	100	-	-	65 (each)	70	-
	Transformer	1	1.5	100	100	100	90	92	-
	Light vehicle	1	0.5	1 / hour	1 / hour	1 / hour	92	93	-
	Power converter unit (PCU)	28	1	100	100	100	52 (each)	53	-
	Inverter	4 per PCU	1.5	100	100	100	99 (each)	101	+5 dB(A) for tonality
	Battery Container (each container has 2x HVAC units)	3 per PCU	2	100	100	100	87 (each HVAC)	89	+5 dB(A) for tonality
DC Coupled Option	Tracker motor	3000	1.5	100	-	-	65 (each)	70	-
	Transformer	1	1.5	100	100	100	90	92	-
	Light vehicle	1	0.5	1 / hour	1 / hour	1 / hour	92	93	-
	Power converter unit (PCU)	28	1	100	100	100	52 (each)	53	-
	Inverter	2 per PCU	1.5	100	100	100	99 (each)	101	+5 dB(A) for tonality
	Battery Container (each container has 2x HVAC units)	3 per PCU	2	100	100	100	87 (each HVAC)	89	+5 dB(A) for tonality
	DC/DC Converter	2 per PCU	1.5	100	100	100	99 (each)	101	-

4.3 Noise Modelling Methodology

For the purposes of predicting impacts associated with noise emissions from the Subject Site on nearby sensitive receptors, noise modelling of the sources was completed using the proprietary software CadnaA (2022 MR2 build 181.5221) developed by DataKustik. CadnaA incorporates the influence of meteorology, terrain, ground type and air absorption in addition to source characteristics to predict noise impacts at receptor locations. All predictions have been undertaken in accordance with CONCAWE. The ground absorption factor for this assessment is 1 (soft ground).

The model is utilised to assess the potential noise emissions from the Subject Site under a range of operating scenarios and meteorological conditions. The noise modelling also allows investigation of possible noise management solutions, in the event that non-compliance with the assessment criterion is predicted.

The NPfI presents guidelines for the consideration of meteorological effects on noise propagation, specifically, temperature inversions and/or gradient winds. NPfI provides two options for assessing meteorological effects as detailed in Table 9.

Table 9: Standard and Noise Enhancing Meteorological Conditions

Meteorological Conditions	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	Day/evening: stability categories A-D with light winds (up to 3 m/s at 10 m AGL).
	Night: stability categories A-D with light winds (up to 3 m/s at 10 m AGL). And/or stability category F with light winds (up to 2 m/s at 10 m AGL).

The following conditions have been modelled:

- Day Periods – Stability class D at 3 m/s;
- Evening Periods – Stability class D at 3 m/s; and
- Night period - Stability class F at 2 m/s

4.4 Predicted Noise Levels

Table 10 and Table 11 presents predicted receptor noise levels during the operational phase of the project. Review of the predicted noise levels identifies the following:

- For the AC coupled option, all receptors comply with the assessment criteria. The highest noise levels will be at R66, R1 and R2. Receptors R1 and R2 are associated with the project. Compliance is achieved at all other receptors.

- For the DC coupled option, all receptors comply with the assessment criteria.

Table 10: Predicted Receptor Noise Levels - Operational Phase for AC Coupled Option

Receptor	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Intrusive Noise Criteria			Comply (Y/N)
	Day	Eve	Night	Day	Eve	Night	
R01	33	33	32	40	35	35	Y | Y | Y
R02	31	31	31	40	35	35	Y | Y | Y
R43	24	24	24	40	35	35	Y | Y | Y
R46	28	28	28	40	35	35	Y | Y | Y
R47	14	14	14	40	35	35	Y | Y | Y
R48	17	17	17	40	35	35	Y | Y | Y
R49	13	13	13	40	35	35	Y | Y | Y
R50	10	10	10	40	35	35	Y | Y | Y
R54	27	27	27	40	35	35	Y | Y | Y
R55	32	32	32	40	35	35	Y | Y | Y
R56	28	28	28	40	35	35	Y | Y | Y
R57	14	14	14	40	35	35	Y | Y | Y
R62	21	21	21	40	35	35	Y | Y | Y
R63	17	17	17	40	35	35	Y | Y | Y
R64	19	19	19	40	35	35	Y | Y | Y
R65	30	30	29	40	35	35	Y | Y | Y
R66	35	35	35	40	36	35	Y | Y | Y
R67	30	30	30	40	35	35	Y | Y | Y
R68	21	21	21	40	35	35	Y | Y | Y
R69	23	23	23	40	35	35	Y | Y | Y
R70	31	31	31	40	35	35	Y | Y | Y
R71	26	26	26	40	35	35	Y | Y | Y
R72	19	19	19	40	35	35	Y | Y | Y
All other receptors	<10	<10	<10	40	35	35	Y | Y | Y

Table 11: Predicted Receptor Noise Levels - Operational Phase for DC Coupled Option

Receptor	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Intrusive Noise Criteria			Comply (Y/N)
	Day	Eve	Night	Day	Eve	Night	
R01	20	20	19	40	35	35	Y | Y | Y
R02	16	16	16	40	35	35	Y | Y | Y
R43	20	20	20	40	35	35	Y | Y | Y
R46	24	24	24	40	35	35	Y | Y | Y
R47	10	10	10	40	35	35	Y | Y | Y
R48	13	13	12	40	35	35	Y | Y | Y
R54	20	20	19	40	35	35	Y | Y | Y

Receptor	Predicted Operational Noise Levels, $L_{Aeq, 15min}$			Intrusive Noise Criteria			Comply (Y/N)
	Day	Eve	Night	Day	Eve	Night	
R55	24	24	24	40	35	35	Y | Y | Y
R56	24	24	23	40	35	35	Y | Y | Y
R62	16	16	16	40	35	35	Y | Y | Y
R63	12	12	12	40	35	35	Y | Y | Y
R65	27	27	26	40	35	35	Y | Y | Y
R66	32	32	32	40	36	35	Y | Y | Y
R67	28	28	27	40	35	35	Y | Y | Y
R68	20	20	19	40	35	35	Y | Y | Y
R69	22	22	22	40	35	35	Y | Y | Y
R70	29	29	28	40	35	35	Y | Y | Y
R71	24	24	23	40	35	35	Y | Y | Y
R72	17	17	16	40	35	35	Y | Y | Y
All other receptors	<10	<10	<10	40	35	35	Y | Y | Y

Given the predicted compliance with the noise criteria derived in accordance with the NPfI, no further noise mitigation is considered necessary.

5 ROAD TRAFFIC NOISE ASSESSMENT

5.1 Introduction

Noise impacts associated with vehicle movements during the operational phase of the MFS project are expected to be negligible as no staff will be permanently based on-site. Visitation will be limited to periodic maintenance and infrequent plant and equipment replacements. During construction and any future decommissioning of the farm however, traffic movements will be more significant.

Construction is expected to be completed over an 18-month period (excluding commissioning) and it's anticipated that up to 300 workers would be on-site daily. It is expected that staff will be transported to and from site either in private or fleet passenger vehicles and by shuttle buses.

For the proportional split between transport modes, it will be assumed that 100 staff arrive/depart in light passenger vehicles with 2 people per each vehicle. This will generate 100 trips per day. The remaining staff will be transported to site in shuttle buses. The average and peak vehicle trip generation numbers are presented in Table 12 as provided by Premise (2022) *Traffic Impact Assessment – Marulan Solar Farm* dated 5 May 2022.

Table 12: Estimates of Average and Peak Vehicle Trip Generation

Vehicle Type	Average trips		Peak trips	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Passenger	100	20	160	35
Worker shuttle bus	40	5	50	8
Heavy vehicles	13	6	28	12
Total	**153**	**31**	**238**	**55**

Given this, the assessment has considered the potential impacts associated with noise emissions from the maximum expected 100 light and 68 heavy vehicle movements (28 heavy vehicles and 40 shuttle buses) from the site from Hume Highway via Munro Road and the site access road.

Following additional assumptions have been made with a summary of road traffic data presented in Table 13.

- Peak hourly shuttle buses – 8 per hour arriving before shift (night-time) and after shift (daytime)
- Peak daily heavy vehicles 28 trucks with a peak hourly of 12 heavy vehicles.
- All movements are expected to occur during standard construction hours (7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday).

Table 13: Road Traffic Data

Road Segment	Vehicle Type	Vehicle Speed	Number of Movements	
			Day (7 am to 6 pm)	Night (Peak 1-hour)
Hume Highway	Light	100 km/hr	160	35
	Heavy	100 km/hr	78	20
Munro Road	Light	100 km/hr	160	35
	Heavy	100 km/hr	78	20

5.2 Assessment Criteria

The ICNG does not provide criteria for the assessment of construction road traffic during the project. Given this, reference is made to the noise criteria provided in the NSW Road Noise Policy (RNP). Based on the type of roadway, Table 14 below presents the applicable road traffic noise criteria for existing residences affected by traffic on existing roadways generated by land use developments.

Table 14: Applicable Road Traffic Noise Criteria

Road Category	Type of Project & Land Use	Assessment Criteria
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	Day: $L_{Aeq,1\ hour}$ 55 dB(A) Night: $L_{Aeq,1\ hour}$ 50 dB(A) (external)
Freeway/arterial roads	Existing residences affected by additional traffic on existing freeways /arterial/sub-arterial roads generated by land use developments	Day: $L_{Aeq,15\text{-}hour}$ 60 dB(A) Night: $L_{Aeq,15\text{-}hour}$ 55 dB(A) (external)

5.3 Noise Modelling Methodology

For the purposes of predicting impacts associated with road traffic noise emissions was completed using the proprietary software CadnaA (2022 MR2 build 181.5221) developed by DataKustik. The model incorporates the influence of terrain, ground type and air absorption in addition to source characteristics to predict noise impacts at receptor locations. All predictions have been undertaken in accordance with Calculation of Road Traffic Noise (CRTN) methodology developed by the UK Department of Transport. In accordance with the requirements of the RNP, the predictive noise modelling incorporated the following assumptions:

- L_{Aeq} values were calculated from the L_{A10} values predicted by the CRTN methodology using the approximation $L_{Aeq,1\ hour} = L_{A10,1\ hour} - 3$.
- Noise source heights were set at 0.5 m above road level for cars, 1.5 m for heavy vehicle engines and 3.6 m for heavily vehicle exhausts.
- Noise from heavy vehicle exhausts is 8 dB lower than the steady continuous engine noise; and
- Corrections established for Australian conditions applied through a negative correction to the CRTN predations of -1.7 dB for façade-corrected levels (Samuels and Saunders, 1982).

Review of the predicted noise level presented in Table 15 below confirms that compliance with the RNP is achieved at the closest receptors to each potential route.

Table 15: Predicted $L_{Aeq,15\text{-}hour}$ Noise Levels - Road Traffic Noise

Sensitive Receptor	Setback from Roadway	Period	Parameter	Criteria	Predicted Noise Level	Comply (Y/N)
R67 (closest to Munro Road)	160 m	Day	$L_{Aeq,1\ hour}$	55 dB(A)	50	Y
		Night	$L_{Aeq,1\ hour}$	50 dB(A)	45	Y
Hume Highway	100 m	Day	$L_{Aeq,15\ hour}$	60 dB(A)	52	Y
		Night	$L_{Aeq,15\ hour}$	55 dB(A)	47	Y

6 VIBRATION ASSESSMENT

6.1 Introduction

A review of the proposal indicates there is potential for impacts as a result of vibration generated by plant and equipment during the construction phase. Given this, an assessment of the potential for vibration impacts has been undertaken. In particular, the assessment has considered the potential for impacts on both human comfort and structural damage for the nearest residence to the construction works.

6.2 Assessment Criteria

The vibration criteria presented in the Environmental Noise Management – *Assessing Vibration: A Technical Guideline* (2006) published by the NSW Department of Environment and Conservation (DEC) have been adopted for the assessment. The technical guide provides vibration criteria associated with amenity impacts (human annoyance) for the three categories of vibration:

- Continuous vibration (e.g. road traffic, continuous construction activity);
- Impulsive vibration includes less than 3 distinct vibration events in an assessment period (e.g. occasional dropping of heavy equipment); and
- Intermittent vibration includes interrupted periods of continuous vibration (e.g. drilling), repeated periods of impulsive vibration (e.g. pile driving) or continuous vibration that varies significantly in amplitude.

Table 16 and Table 17 present the criteria for continuous and impulsive vibration and intermittent vibration, respectively.

Table 16: Continuous & Impulsive Vibration Criteria for Residences – Peak Velocity

Location	Vibration Type	Preferred Limit (mm/s)	Maximum Limit (mm/s)
Residences	Continuous	0.28	0.56
Residences	Impulsive	8.6	17

Table 17: Intermittent Vibration Criteria for Residences

Location	Assessment Period	Preferred Value (m/s1.75)	Maximum Value (m/s1.75)
Residences	Daytime	0.20	0.40

The above criteria are suitable for assessing human annoyance in response to vibration levels. In order to assess potential damage to buildings, reference has been made to British Standard *BS 7385-2: 1993 Evaluation and measurement of vibration in buildings – Part 2: Guide to damage levels from ground borne vibration*. Table 18 presents vibration criteria for assessing the potential for building damage.

Table 18: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Particle Velocity (mm/s)	
	4 Hz to 15 Hz	15 Hz and above
Unreinforced or light framed structures – residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

6.3 Potential Vibration Sources

Table 19 identifies the vibration source levels for the equipment likely to be used for the construction of the solar farm.

Table 19: Vibration Source levels – Peak Particle Velocity

Equipment Item	PPV at 10 metres (mm/s)	Source
Piling (press-in method)	1 – 2	Rockhill, D.J. et. al. [b)]
Roller	5 – 6	DEC
7 tonne compactor	5 – 7	DEC
Loaded trucks (rough surface)	5	USA DT [a)]
Loaded trucks (smooth surface)	1 – 2	USA DT [a)]
Excavator	2.5 – 4	DEC

a) Transit Noise and Vibration Impact Assessment, US Department of Transportation, May 2006.
a) Rockhill, D.J., Bolton, M.D. & White, D.J. (2003) 'Ground-borne vibrations due to press-in piling operations'

6.4 Assessment of Potential Impacts

Based on the vibration source levels at 10 metres (presented in Table 19), peak particle velocities have been predicted at various separation distances. The NSW DEC indicates that in predicting vibration levels, it can be assumed that the vibration level is inversely proportional to distance (with the relationship varying between $d^{-0.8}$ to $d^{-1.6}$ based on field data).

The US Department of Transportation's Transit Noise and Vibration Impact Assessment (May 2006) presents the following construction vibration propagation formula assuming an inverse relationship:

$$PPV@d_2 = PPV@d_1 \times (d_1/d_2)^{1.5}$$

where: d_1 = distance 1 (reference distance for source data) (m)

d_2 = distance 2 (separation distance for predicted PPV) (m)

PPV = peak particle velocity (mm/s)

The above formula has been considered for predicted PPVs at various distances from construction equipment. Based on the above information, Table 20 presents PPV predictions for the various construction equipment.

Table 20: Predicted Peak Particle Velocity at Sensitive Receptors (mm/s)

Distance from Source (m)	Predicted Peak Particle Velocity (mm/s)					
	Roller	7 tonne compactor	Excavator	Piling (press-in method)	Loaded trucks (rough surfaces)	Loaded trucks (smooth surfaces)
10	6.00	7.00	4.00	0.35 - 0.71	5.00	1.00 – 2.00
20	2.12	2.47	1.41	0.19 - 0.38	1.77	0.35 – 0.71
30	1.15	1.35	0.77	0.13 - 0.25	0.96	0.19 – 0.38
40	0.75	0.88	0.50	0.09 - 0.18	0.63	0.13 – 0.25
50	0.54	0.63	0.36	0.07 - 0.14	0.45	0.09 – 0.18
60	0.41	0.48	0.27	0.05 - 0.11	0.34	0.07 – 0.14
70	0.32	0.38	0.22	0.04 - 0.09	0.27	0.06 – 0.11
80	0.27	0.31	0.18	0.04 - 0.07	0.22	0.05 – 0.09
90	0.22	0.26	0.15	0.03 - 0.06	0.19	0.04 – 0.07
100	0.19	0.22	0.13	0.02 - 0.03	0.16	0.03 – 0.06
150	0.1	0.12	0.07	0.35 - 0.71	0.09	0.02 – 0.03
Type	Continuous			Intermittent		
Nuisance Criteria	Residential 0.28 (preferred) / 0.56 (max)			Residential 0.20 (preferred) / 0.40 (max)		
Building Criteria	Residential 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above					

The predicted vibration levels presented in Table 20 indicate compliance with the continuous maximum vibration nuisance criteria for locations at a separation distance of 50-60 metres. Compliance with the building damage criteria is predicted at 10 metres from construction for each source. Therefore, as the closest receptor (R66) is 700m from the nearest vibration source, there will be no adverse impact

For intermittent vibration associated with haul vehicles and press-in piling method, it is difficult to provide an appropriate comparison with the relevant criteria (which is presented as a Vibration Dose Value (VDV) in $m/s^{1.75}$). The calculation of a VDV requires both the overall weighted RMS (root mean square) acceleration (m/s^2) typically obtained from on-site measurements and the estimated time period for vibration events.

It is noted, however, that the piling PPV at distances of 700 m (the distance to the nearest sensitive receptor from potential piling) is predicted to be within the maximum continuous criteria of 0.56 mm/s. This comparison with the continuous criteria (as a conservative approach) indicates that vibration levels associated with piling are not considered to be significant (which is expected given the significant separation distances).

7 CONCLUSION

Terrain Solar is proposing to develop an approximately 150-megawatt (MW) solar farm, plus a battery energy storage system with a potential capacity of up to 600 MWh, on land approximately 5 kilometres (km) west of the town of Marulan, NSW.

The impact assessment has considered the potential for adverse impacts resulting from noise (construction, road traffic and operational) and vibration (construction) emissions on nearby residential uses.

The assessment of potential noise impacts has considered the construction phase should occur during standard hours only. For construction during standard hours, adverse amenity impacts during construction phases, the results identified:

- No receptors will experience noise levels >75 dB(A) for any stage during construction;
- The highest predicted noise level is 63 dB(A) at receptor R66 during months 4 to 7. This receptor is close to the Project Area boundary and the access road;
- Receptors R1 and R2 will experience maximum noise levels of 55 dB(A) and 54 dB(A) respectively.

It is recommended that reasonable and feasible mitigation measures such as those presented in Section 3.5 are implemented to reduce the noise impact at all receptors.

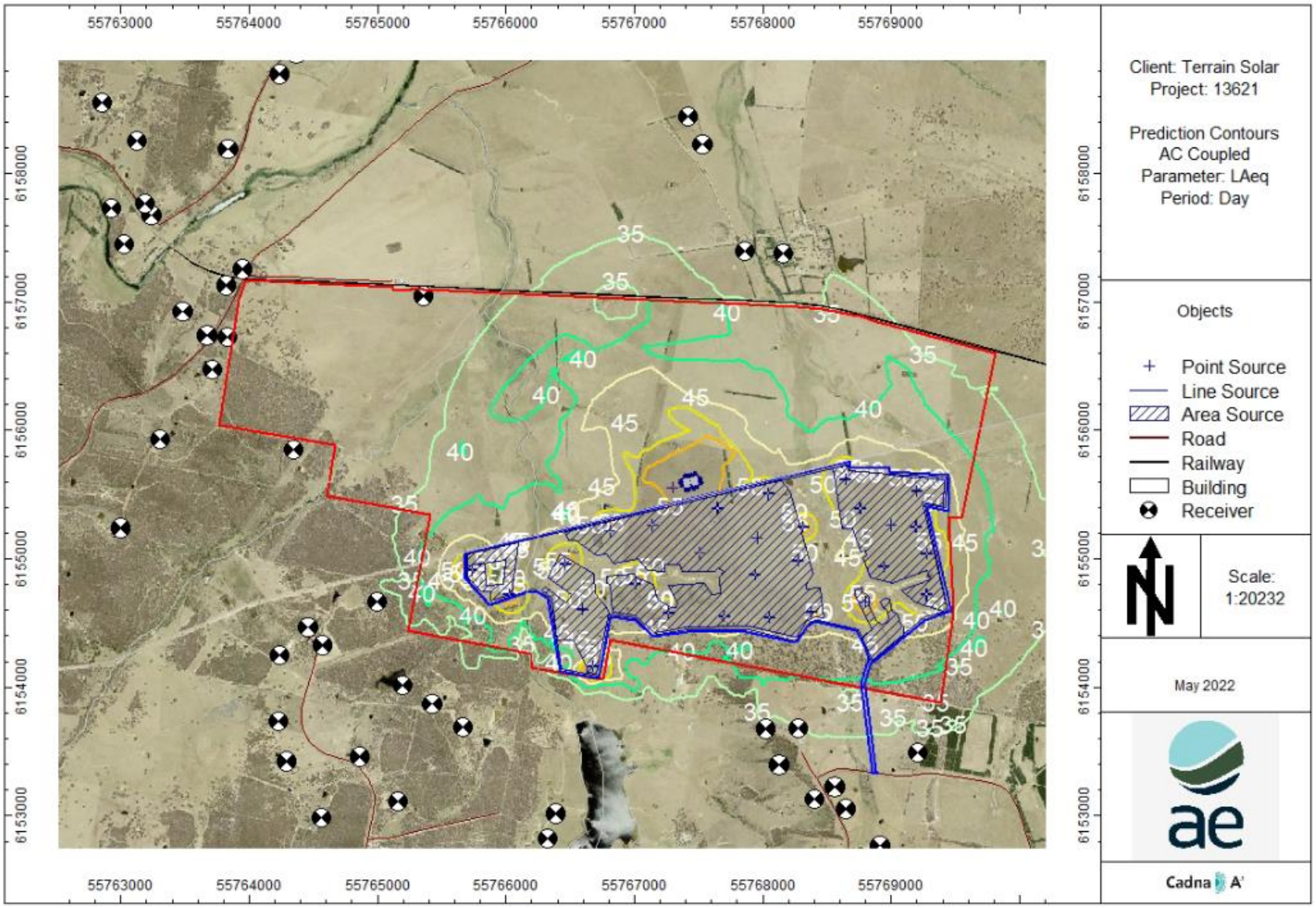
For the operational phase of the project, the results showed:

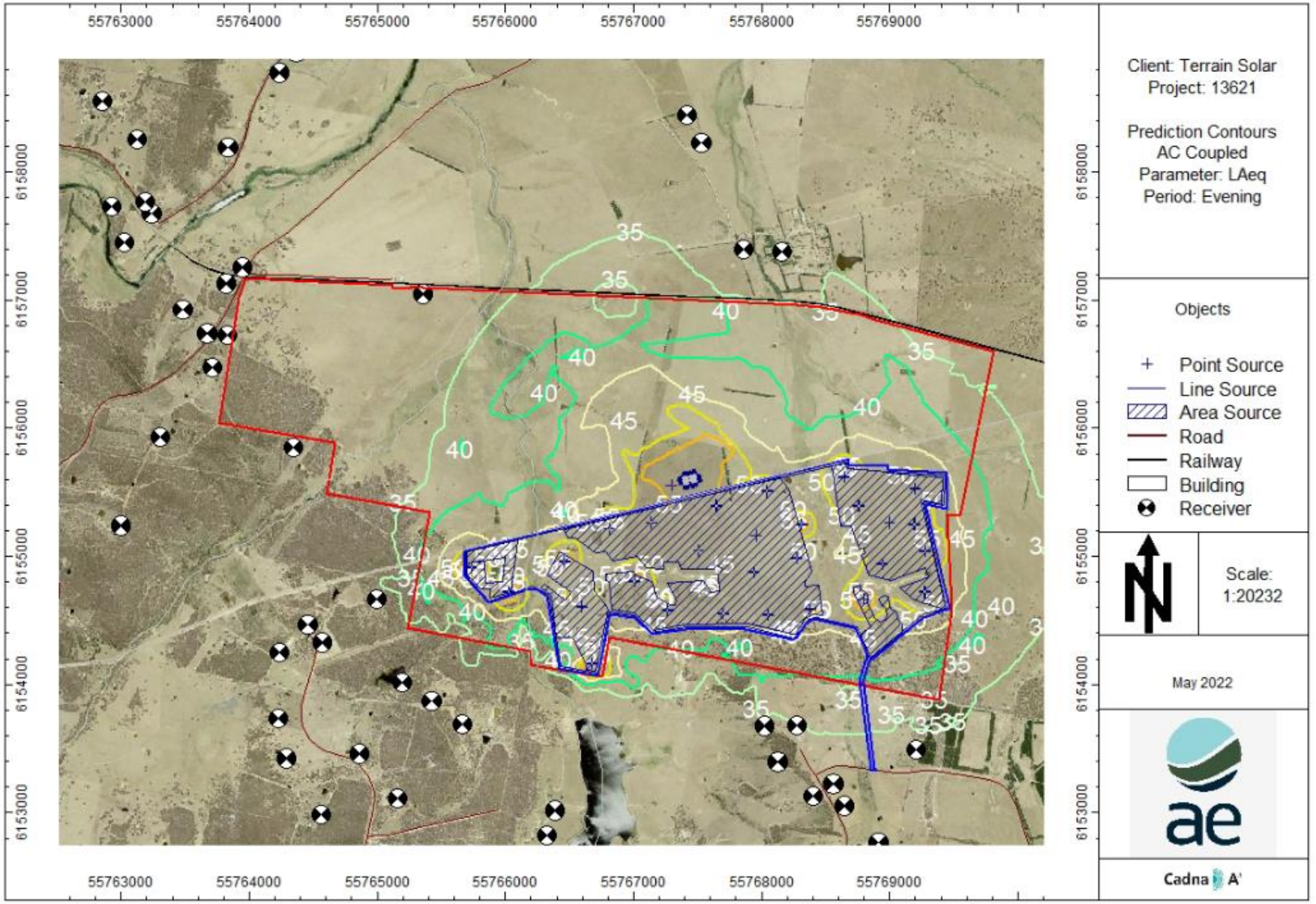
- For the AC coupled option, all receptors comply with the assessment criteria. The highest noise levels will be at R66, R1 and R2. Receptors R1 and R2 are associated with the project. Compliance is achieved at all other receptors.
- For the DC coupled option, all receptors comply with the assessment criteria.

Given the predicted compliance with the noise criteria derived in accordance with the NPfI, no further noise mitigation is considered necessary.

As the design layouts are indicative, it is recommended that once the final layout is approved, noise modelling is undertaken to ensure noise mitigation discussed in this report is still applicable and that compliance with the assessment criteria is achieved.

APPENDIX A: NOISE CONTOURS

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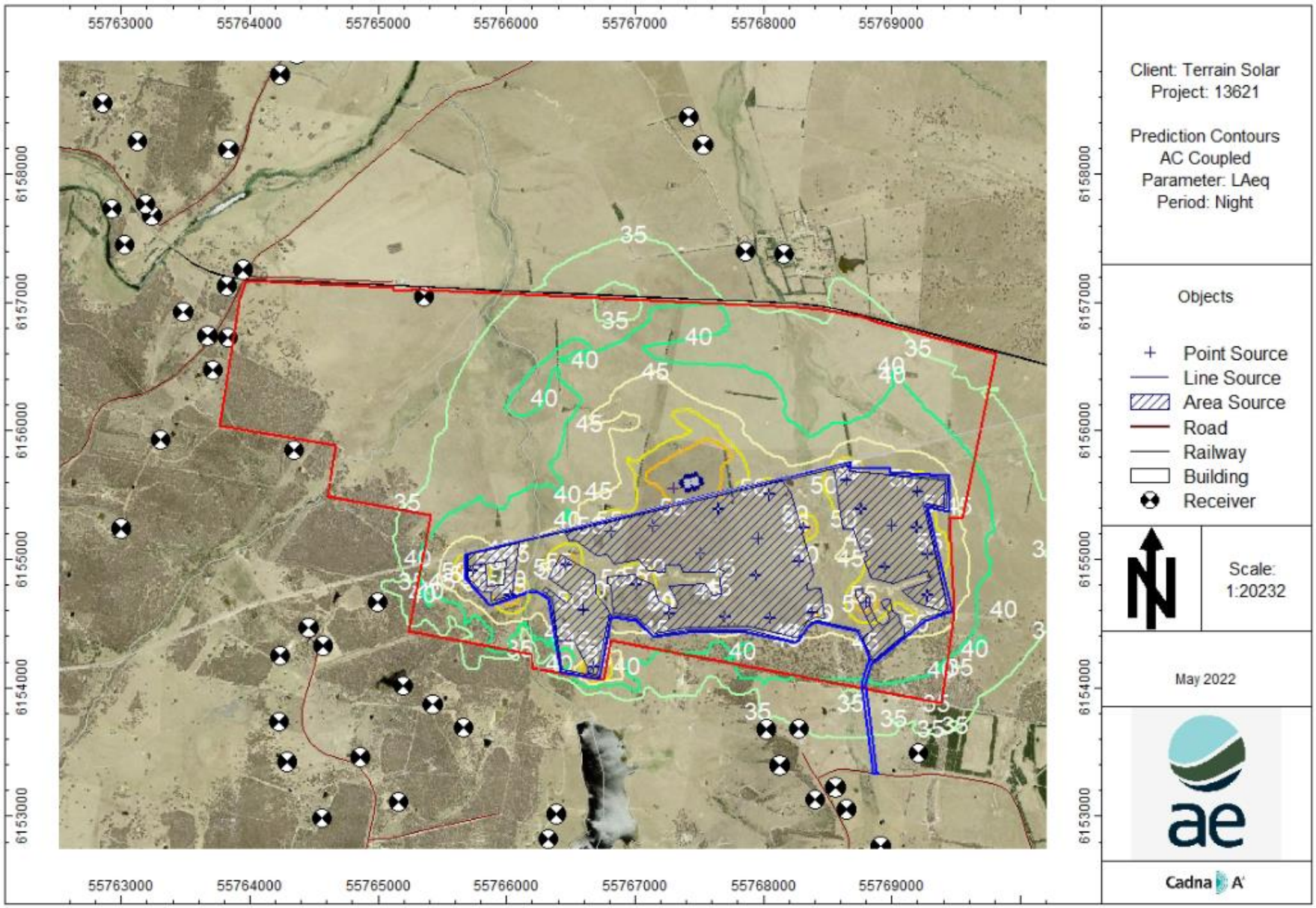
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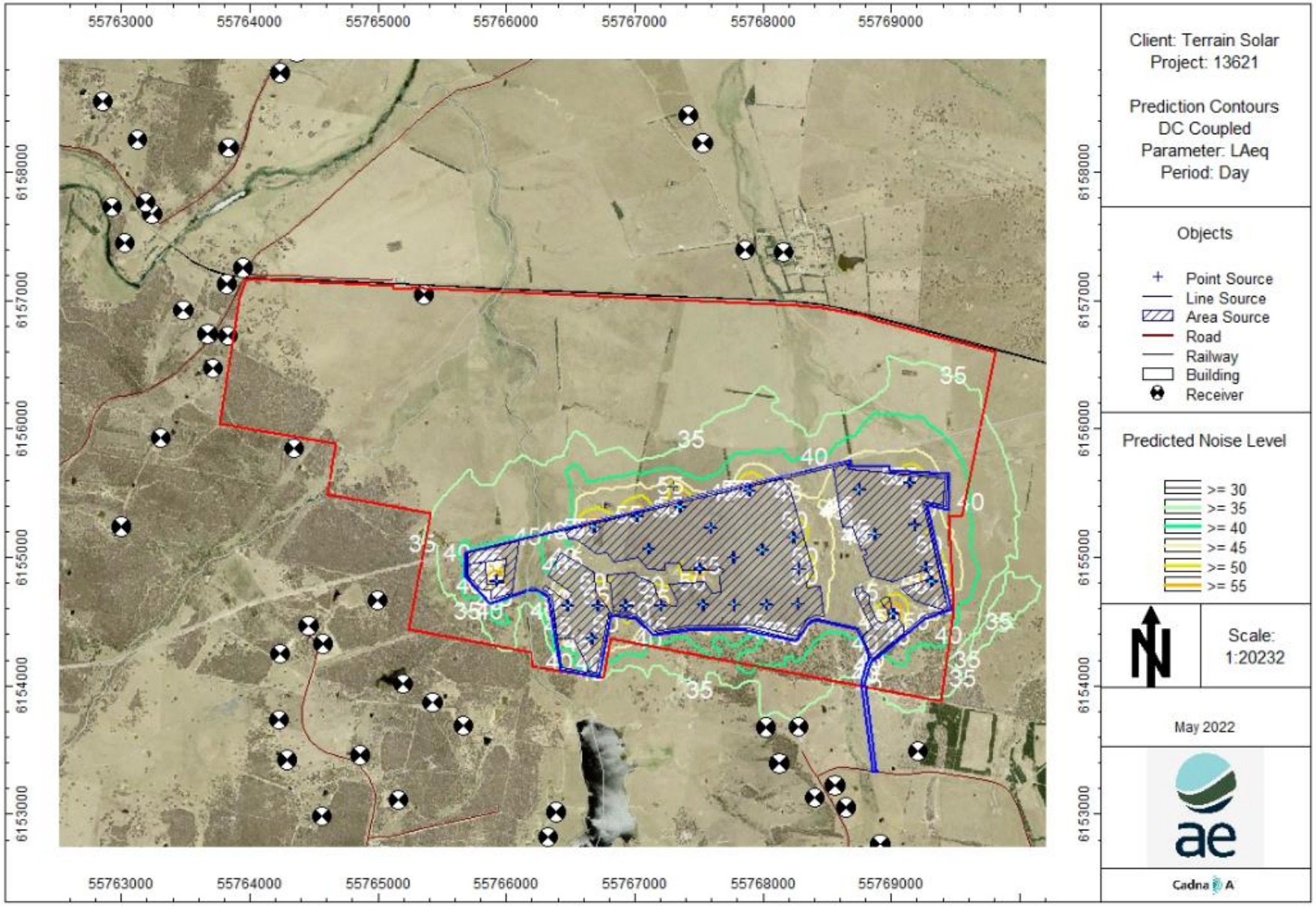
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Project: 13621
Prediction Contours
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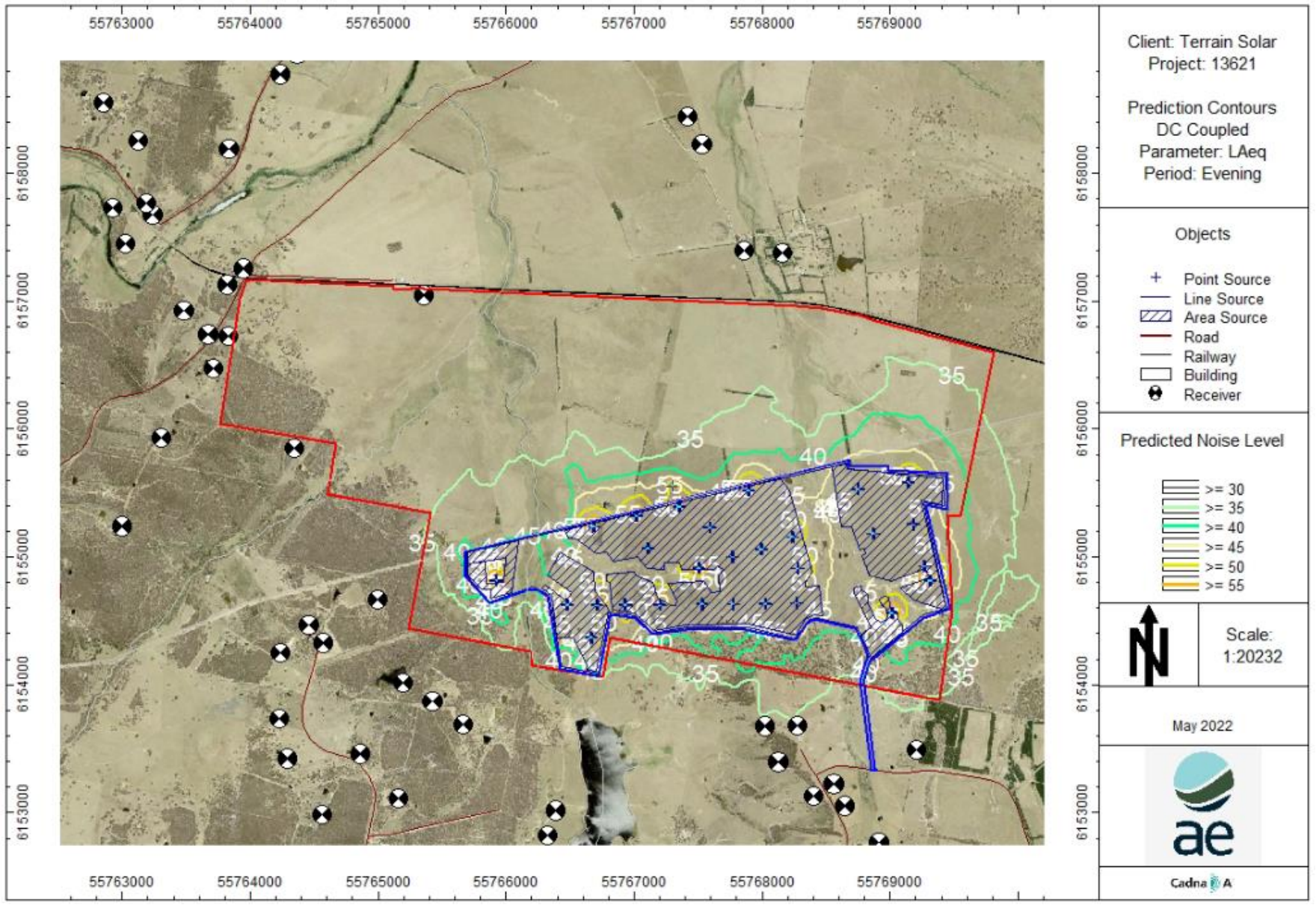
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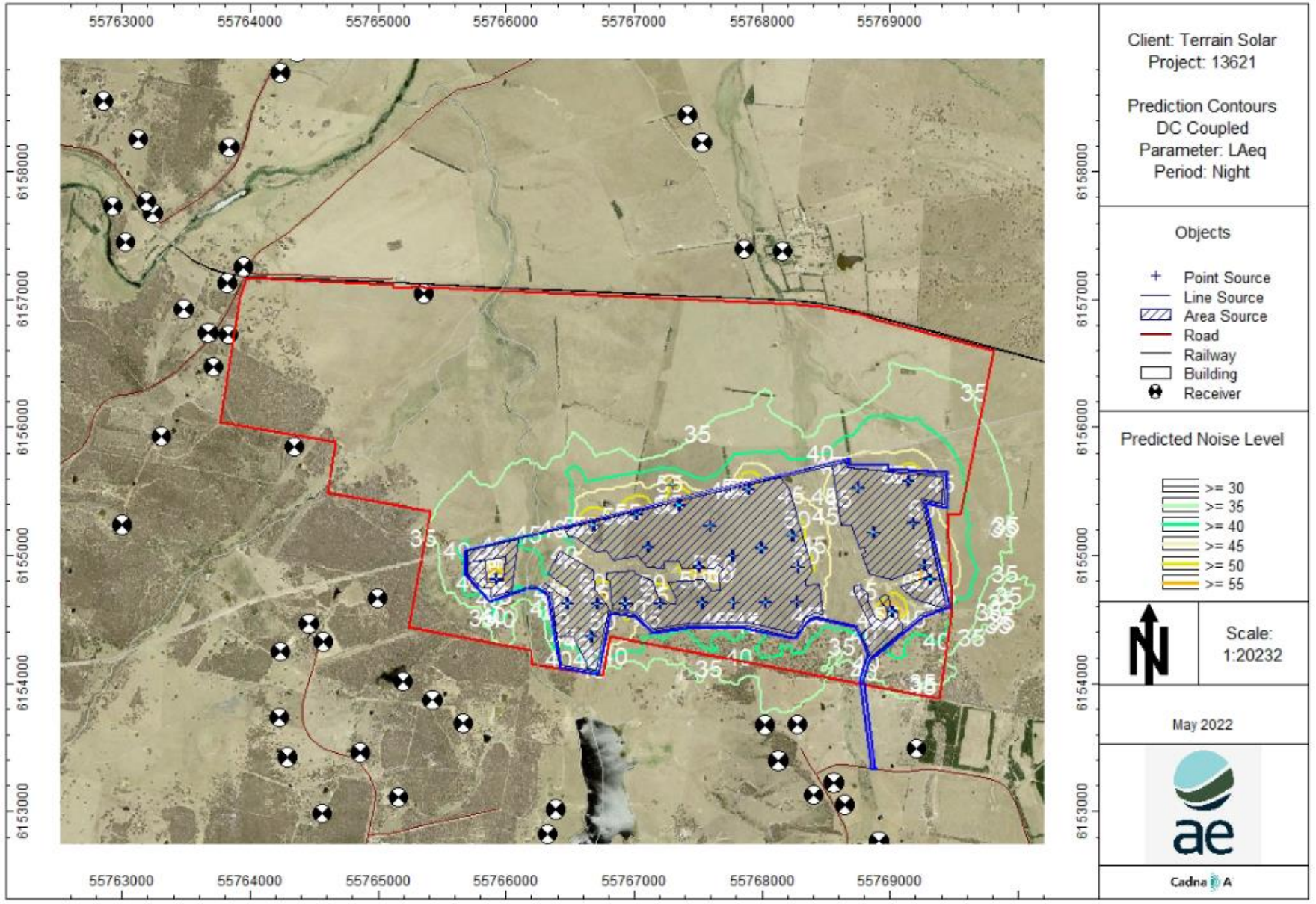
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Area Source
Road
Railway
Building
Receiver
Predicted Noise Level
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>= 40
>= 45
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APPENDIX B: DRAFT CONSTRUCTION NOISE MANAGEMENT PLAN

Objective

The objective of this Construction Noise and Vibration Management Plan (CNVMP) is to provide draft guidance. This CNVMP is a risk-based plan and the plan should be revisited when the once the construction contractor is appointed.

Noise Management Controls

The controls to be implemented during the construction of the project are provided in Table 21. Table 22 provides further detail with respect to timing and responsibility for each control, as well as monitoring and reporting requirements.

Table 21: Environmental Management Controls

Subject	Control Ref	Environmental Management Controls	Responsibility
Complaints	NV1	All potentially affected residences will be informed of the construction works including working hours to be adhered to, and the level and duration of noise to expect during construction at least 48 hours prior to the noise event.	Site Construction & Environmental Compliance Officer (SCECO)
	NV2	All potentially affected residences will be kept informed of any significant changes to construction activities.	SCECO
	NV3	Any complaints received related to noise or vibration will be dealt with.	SCECO
	NV4	All site personnel will be instructed during a general induction as to their responsibilities in minimising noise and adhering to the noise minimisation measures.	SCECO / Foreman
Timing	NV5	Low risk works as described in this CNVMP are to be undertaken during the hours of:	SCECO
		a) 7:00am to 6:00pm, Mondays to Fridays, inclusive;	
		b) 8:00am to 1:00pm on Saturday; and	
		c) at no time on Sundays or public holidays.	
	NV6	For high risk works, or works having not been assessed in accordance with this CNVMP, activities resulting in impulsive or tonal noise emission (such as rock blasting, pile driving) shall only be undertaken:	SCECO
		a) between the hours of 8:00 am to 5:00 pm Monday to Friday;	
		b) between the hours of 8:00 am to 1:00 pm Saturday; and	
Equipment	NV7	The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Table 3	SCECO

Subject	Control Ref	Environmental Management Controls	Responsibility
	NV8	Equipment operators are to report any faulty equipment.	Foreman
	NV9	There will be no dropping of materials from heights, throwing of metal items, or slamming of doors.	All site personnel
	NV10	Any equipment not in use for extended periods during construction work will be switched off.	All site personnel
	NV11	All vehicles and equipment will be regularly serviced, as per manufactures instructions and maintained in proper working order.	SCECO
	NV12	Ensure deliveries are within the standard hours of 7:00 am to 6:00 pm.	SCECO / Foreman
	NV13	Simultaneous operation of noisy plant will be avoided wherever practicable.	Foreman
	NV14	Wherever practicable, noisy equipment will be:	SCECO
		a) Positioned behind structures that act as barriers to identified receptors.	
		b) Positioned at the greatest distance from identified receptors.	
		c) Oriented to directed noise emissions away from identified receptors.	
	NV15	"Quiet" practices will be employed wherever practicable when operating equipment. Examples of quiet practices include (but are not limited to) avoiding unnecessary revving of engines, preventing forklift tines or excavator buckets from impacting on the ground, minimising the use of horns and/or tannoys where possible.	Foreman
	NV16	Any noisy construction activities will be completed in the shortest time possible.	All site personnel
Historical features	NV17	Prior and post construction, carry out a dilapidation survey on the Narambulla Creek historic bridge and Ruins of Kyle	SCECO
	NV18	When the piling locations are identified, carryout a detailed vibration study of the potential impacts on these historic features	SCECO
	NV19	Consider vibration monitoring during piling operations with suitable trigger levels for historic buildings	SCECO

Roles and Responsibilities

The roles and responsibilities relevant for the CNMP are outlined in Table 22.

Table 22: Roles and Responsibilities

Role	Responsibility
Construction Manager	• Overall implementation of the CNVMP
	• Authorise and confirm the implementation of mitigation measures
SCECO	• Implement methodology for avoiding excessive noise emissions
	• Coordinate monitoring and compile reports
	• Maintain internal records of monitoring
	• Collate and maintain records of complaints, respond to complainant
	• Identify non-conformances
	• Review and update the CNVMP as required
Environmental Representative	• monitor the implementation of the CNVMP;
	• monitor the outcome of the CNVMP and advise the Proponent upon the achievement of all project environmental outcomes;
	• be consulted in responding to the community concerning the environmental performance of the project; and
	• approve out-of-hour construction activities deemed to be low environment risk and refer high risk works for the Secretary's approval.

Training and Awareness

All Project personnel, subcontractors, consultants, and visitors will receive inductions prior to commencing on site. Project induction and training will fall under the following categories:

- General project induction; and
- Visitor induction.

Information specific to construction noise and vibration will be included in the general project induction and will include:

- Relevant approval conditions;
- Relevant legislation;
- All relevant project specific and standard noise and vibration mitigation measures;
- Location of nearest sensitive receptors;
- Designated loading/unloading areas and procedures;
- Standard construction hours (including deliveries); and
- Environmental incident and complaint procedures.

All inductions will be recorded in the training register held by the SCECO.

Non-Conformances

Non-conformances will be dealt with and documented in accordance with complaints management this CNVMP.

Complaints Management

Any complaints received from the community regarding noise shall be addressed in accordance with the Complaints Handling Procedures provided in the project Construction Environmental Management Plan.

Monitoring and Reporting

Where a complaint is unable to be resolved to the satisfaction of the complainant, noise monitoring shall be undertaken to determine the contribution of noise from construction activities at the complainant's premises.

The noise monitoring will be undertaken by competent personnel who have received training in environmental noise monitoring. The measurements will be conducted in accordance with the procedures outlines in Australian Standard AS 1055 "Acoustics – Description and measurement of environmental noise" and the NSW Industrial Noise Policy (INP). The following points should be followed when conducting noise monitoring:

- A field calibration should be conducted before and after measurements;
- The sound level meter must be set to an A-weighting and Fast;
- The sound level meter sample period should be set to 15-minutes;
- The following descriptors should be measured as a minimum: L_{A1}, L_{Aeq} and L_{A90}; and
- Measurements should be conducted a minimum of three metres from the nearest façade and/or solid fence/wall. If it is not possible to do this, corrections for façade reflection should be applied to the measurement results.

The results of the noise monitoring shall quantify the contribution of noise from construction works at complainant premises and assist in determining what corrective actions, if any, are required to address the complaint.