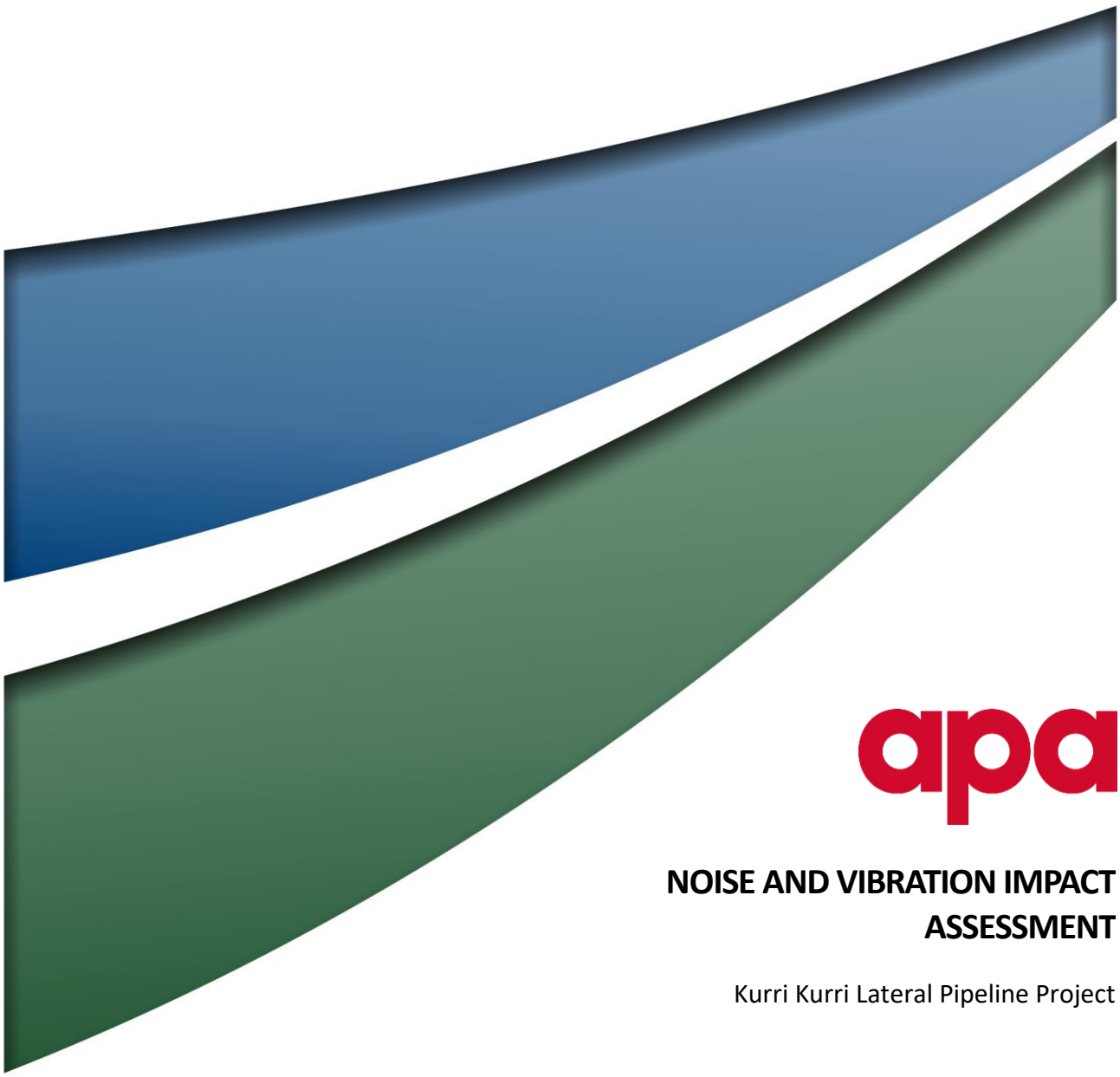
APPENDIX 11

Noise and Vibration Impact Assessment

umwelt
Environmental & Social Consultants



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NOISE AND VIBRATION IMPACT ASSESSMENT

Kurri Kurri Lateral Pipeline Project

FINAL

March 2022

NOISE AND VIBRATION IMPACT ASSESSMENT

Kurri Kurri Lateral Pipeline Project

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
APA GroupAPA GroupAPA GroupAPA Group

Project Director: Paul Douglass
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Report No. 21450/R03
Date: March 2022

Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Steve Lyons	08/03/2022	Paul Douglass	08/03/2022

Abbreviations and Glossary

Abbreviation	Definition
Background Noise Level	The underlying level of noise present in the ambient noise when extraneous noise is removed and excluding noise from the project under consideration.
Construction footprint	The area of land directly disturbed for construction of the Project consisting of the construction right of way, extra work spaces, temporary construction camps, temporary access tracks and any other ancillary facilities required to construct the pipeline.
Day	The period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
Decommissioning	The process by which a pipeline is made inoperative at the end of its useful life. Different options for decommissioning may be considered as part of this process.
Decibels (dB)	The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud.
Evening	The period between 6 pm and 10 pm
Horizontal Directional Drilling (HDD)	A 'trenchless technology' by which a pipeline tunnel is drilled at a shallow angle under a crossing (e.g., a waterway, wetland, road or railway) through which the pipe is then threaded.
Hydrostatic pressure testing	A pipeline testing process used to test welds and pipeline integrity in high pressure hydrocarbon pipelines. The process involves filling the newly constructed pipeline with pressurised water or other medium, enabling the detection of leaks.
LAeq(time period)	Equivalent continuous 'A-weighted' sound level. The noise level as perceived by the human ear over a time period, measured in decibels. This is the equivalent continuous sound which would contain the same energy as a varying sound over the specified time period.
LAmax	Maximum 'A-weighted' sound level. The maximum noise level as perceived by the human ear in a specific time period, measured in decibels.
Landholder	A general term used to refer to the legal owner or manager of a parcel of land. It may be a private landholder, Government or private utility, or a Government Agency responsible for management of a particular parcel of Crown land (e.g. National Parks or Forestry areas).
Mainline Valve	A surface facility consisting of a valve used to isolate sections of the pipeline, located at intervals along its length.
Negligible	Small and unimportant, such as to be not worth considering.
Night	The period between 10 pm and 7 am
Noise Management Level (NML)	The noise level (calculated from the RBL in accordance with the ICNG) representing the point at which there may be some community reaction to construction noise. If predicted noise levels are above the NML, alternatives or mitigation measures should be considered.
NVIA	Noise and Vibration Impact Assessment
(the) Project	The proposed construction and operation of the Kurri Kurri Lateral Pipeline (KKLP).
Project Amenity Noise Levels	The project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. Calculated as the recommended amenity noise level less 5 dB and refers to the day, evening and night periods.

Abbreviation	Definition
Project Area	Refers to the total area that will be taken up by the Project. This includes the site areas for the solar farm and BESS, the overhead transmission line alignment, and the electrical substation located in the Barneys Reef Wind Farm project area.
Project Intrusive Noise Levels	The project intrusiveness noise level aims to protect against significant changes in noise levels. Calculated as rated background level plus 5 dB and refers to a 15-minute period.
Project Noise Trigger Levels	Target noise levels for a particular noise-generating facility. They are based on the most stringent of the project intrusiveness noise level or the project amenity noise level.
(the) proponent	APA Group (APA).
Purging	Using gas to remove all air from the pipeline.
Rating Background Level (RBL)	The overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). This is the level used for assessment purposes.
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potenl improvements.
Receiver	A sensitive land use in close proximity to the development that has the potential to experience impacts associated with the development.
Sensitive receiver	This is a location where people are likely to work or live. They are defined by the occupancy and the activities performed at the location. Sensitive receivers can include dwellings, schools, hospitals, offices and parks.
Side boom	Construction equipment, consisting of a modified bulldozer with a boom crane, designed for lowering a pipe string into a trench.
Site Specific	Relating to conditions existing at a particular location.
Skids	Timber blocks used to keep pipe lengths off the ground.
Sound Power Level	The total sound energy radiated per unit time measured as 10 times a logarithmic scale, the reference power being 12 picowatts
Study area	The area of land constituting the Project's construction footprint which has been the subject of assessment and investigation to provide context for relevant technical disciplines. The boundaries of the study area will vary between technical disciplines depending on the environmental values of interest in the surrounding landscape. For example, the Study area for Aboriginal and Non-Aboriginal Heritage is likely to be larger than the study area for the Preliminary Hazard Analysis.
Trenching	Excavation of a trench for burial of a pipeline.

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1.0 Introduction

Snowy Hydro Limited (Snowy Hydro) is developing a gas-fired peaking power station, referred to as the Hunter Power Project (HPP), at the site of the former Hydro Australia Pty Ltd (Hydro) aluminium smelter at Kurri Kurri. The HPP aims to provide up to 750 megawatts (MW) of 'on-demand' electricity to supplement Snowy Hydro's generation portfolio with dispatchable capacity when the needs of electricity consumers are highest.

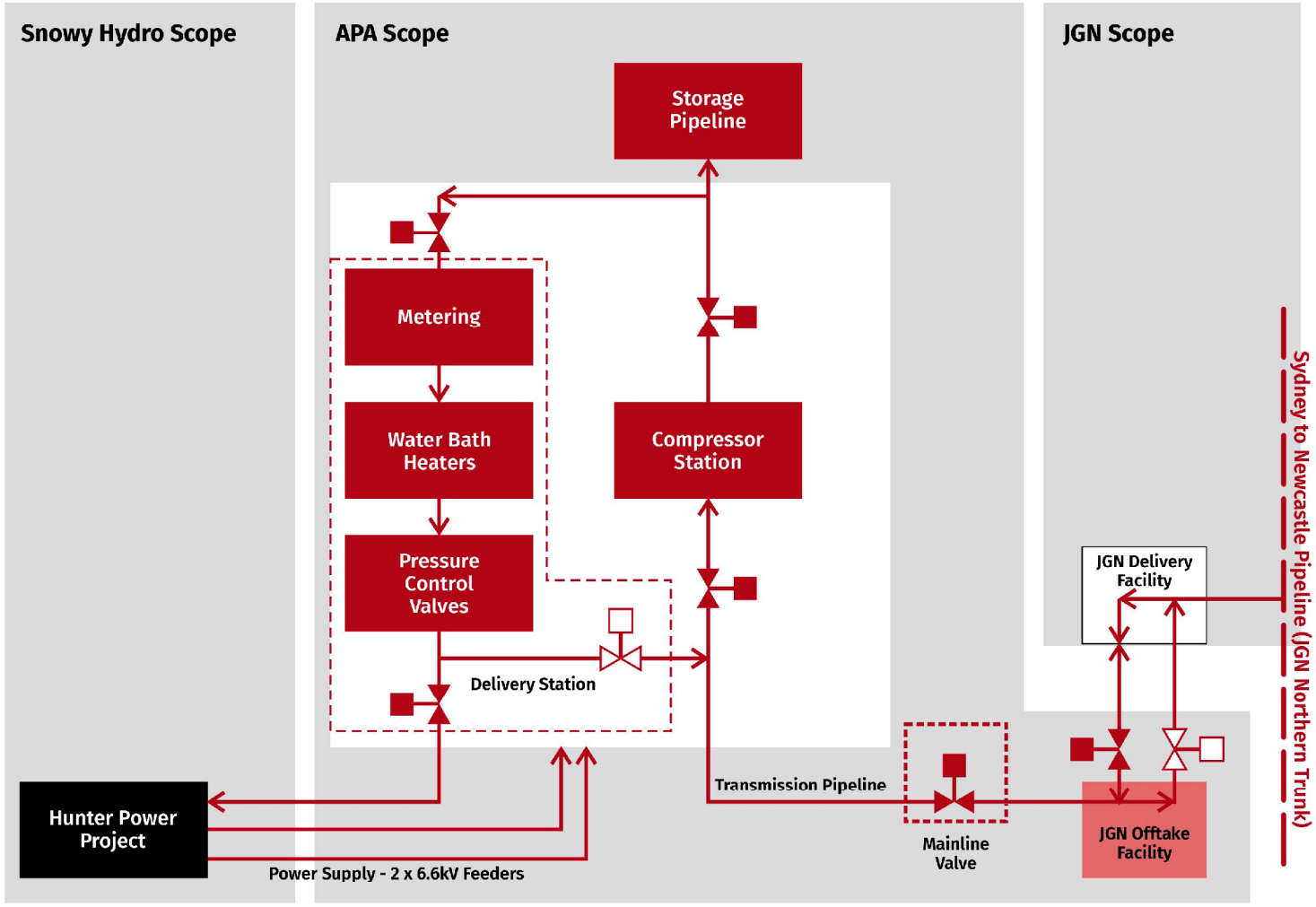
APA Group (APA) has been engaged by Snowy Hydro to develop a gas supply solution for the HPP. APA has proposed the Kurri Kurri Lateral Pipeline (KKPL) Project (the Project) as the gas supply solution for the HPP.

The Project comprises the following primary components:

- A buried, steel, medium diameter (up to nominal diameter (DN350), medium pressure (up to 6.9 megapascal (MPag)) transmission pipeline of approximately 20.1 km in length to provide a gas supply from the existing Sydney to Newcastle Pipeline (SNP), via receipt and delivery facilities, to the HPP site.
- A compressor station at the termination of the transmission pipeline to boost gas pressure prior to transfer to a storage pipeline.
- A buried, steel, medium diameter (up to DN350), high pressure (up to 15.3 MPag) interconnect pipeline of approximately 1.3 km in total length, providing an interface between the compressor station, storage pipeline and delivery station.
- A buried, steel, large diameter (up to DN1050), high pressure (up to 15.3 MPag) storage pipeline of approximately 24 km in total length downstream of the compressor station with approximately 70 terajoules (TJ) of useable gas storage ready to supply the HPP.
- A delivery station to receive gas from the storage pipeline and control temperature, pressure and flow rate prior to delivery of gas to the HPP.

The compressor station and delivery station are located within the HPP project site boundary.

A schematic outlining the relationship of these project components is provided in **Figure 1.1**.



Note: Not to Scale

FIGURE 1.1

Relationship of Project Components

A compressor station and storage pipeline are required as part of the proposal as the SNP does not provide sufficient gas volumes or pressure to meet the supply requirements of the HPP. As such, a direct pipeline connection between the SNP and the HPP is not a viable solution for gas supply to the HPP.

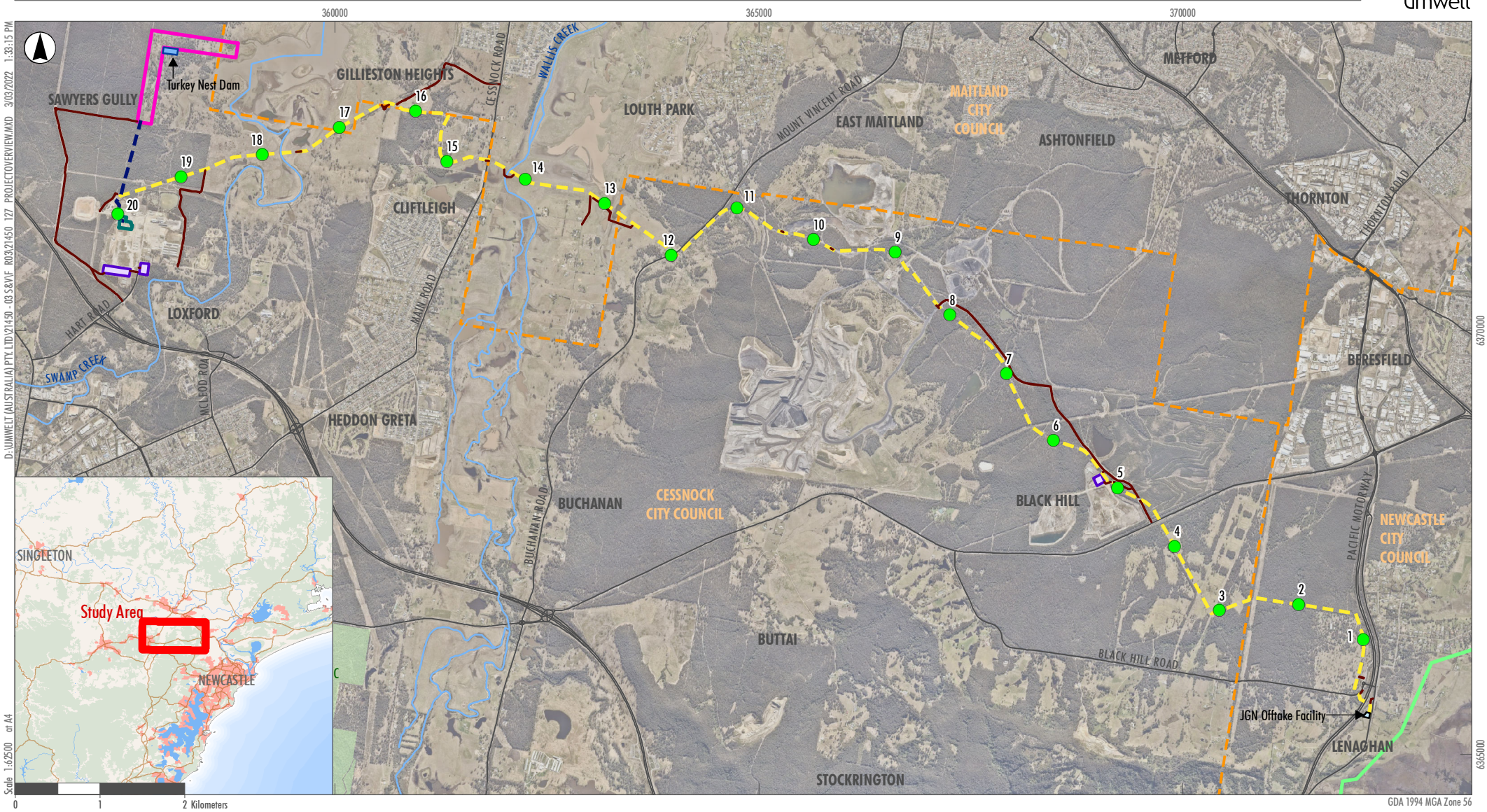
The proposed alignment of the transmission pipeline would commence at the offtake facility (referred to as the JGN offtake facility) near Black Hill, approximately 15 km northwest of Newcastle and terminate at the HPP, approximately 2 km north of Kurri Kurri, an overview of which is shown on **Figure 1.2**. Construction is planned to commence during Q4 2022 with a gas supply to the HPP provided during Q4 2023. The HPP is planned to be operational by the end of 2023.

The Project, including the ancillary surface facilities, would be designed, constructed, commissioned and operated in accordance with *Australian Standard 2885 Pipelines – Gas and Liquid Petroleum* (AS 2885 - a suite of standards outlining requirements for gas and petroleum pipelines which are designed, constructed and operated in Australia) and licensed under the *Pipelines Act 1967*.

This Noise and Vibration Impact Assessment (NVIA) has been prepared by Umwelt in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE) on 23 July 2021. This report provides an assessment of the potential noise and vibration impacts associated with the construction, operation and decommissioning of the Project and recommends mitigation measures where required.

This NVIA has been prepared in accordance with the following guidelines:

- *Interim Construction Noise Guideline* (ICNG), NSW Department of Environment and Climate Change (DECC), 2009.
- *Noise Policy for Industry* (NPfI), Environment Protection Authority (EPA), 2017.
- *Road Noise Policy* (RNP), Department of Environment, Climate Change and Water (DECCW), 2011.
- *Assessing Vibration: A Technical Guideline* (the vibration guideline), Department of Environment and Conservation (DEC), 2006.



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Local Government Area Boundary
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- Access Tracks
- Roads
- Watercourses

FIGURE 1.2

Project Overview

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

2.0 Assessment Framework

The Planning Secretary's Environmental Assessment Requirements (SEARs) for the Project identify matters that must be addressed in the assessment. **Table 2.1** lists those requirements relevant to the NVIA and the section of this report in which they are addressed.

Table 2.1 SEARs

Requirement	Section of this report
Assessment of the likely construction noise impacts of the project under the *Interim Construction Noise Guideline* (ICNG) (DECCW, 2009)	**Section 5.2**
Assessment of the likely operational noise impacts of the project under the *NSW Noise Policy for Industry* (NPfI) (EPA, 2017)	**Section 6.0**
Assessment of the likely road noise impacts of the project under the *NSW Road Noise Policy* (RNP) (EPA, 2011)	**Section 7.0**
Assessment of the likely vibration amenity and structural impacts of the project under *Assessing Vibration: A Technical Guideline* (DEC, 2006), *German Standard DIN 4150-3 Structural Vibration – effects of vibration on structures*, and *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990)	**Section 5.5**

3.0 Existing Environment

The eastern end of the Project, near the connection to the existing gas network, is located in the rural/residential area of Lenaghan, which is in close proximity to the M1 Motorway. The Project footprint then extends in a generally north-westerly direction, traversing the current mining operation areas of Donaldson Coal Pty Limited and Ashtonfields Pty Limited. From there the Project footprint extends in a generally westerly direction, passing near the residential areas of Louth Park, Cliftleigh and Gillieston Heights before connecting to the HPP. Land zonings in the vicinity of the Project are shown in **Figure 3.1**.

3.1 Measured Existing Noise Levels

Existing noise levels determined in the Noise Impact Assessment completed by Jacobs (2021) for the HPP Environmental Impact Assessment (EIS) have been used in this assessment for receivers at the western and southern ends of the Project. Additionally, background noise levels were sourced from a road construction assessment undertaken by Jacobs (2019) and these levels were used to determine background noise levels for receivers in the central and northern areas of the Project.

Background attended noise monitoring was undertaken by Umwelt at 146 Lenaghans Drive, Lenaghan, to determine noise levels at the eastern end of the Project, over a 10 day period in September 2021. Noise levels were measured in general accordance with Australian Standard 1055-2018 *Acoustics – Description and measurement of environmental noise* and the NPfI.

Meteorological data was obtained from the Bureau of Meteorology (BoM) Automatic Weather Station at Cessnock Airport, and periods of unsuitable weather conditions (high wind conditions or rainfall) were excluded from the noise monitoring data. The BoM measured windspeeds were adjusted from 10 m height to 3 m height using the method nominated by Gowan et al. (2004), to more appropriately reflect wind speeds at the microphone height.

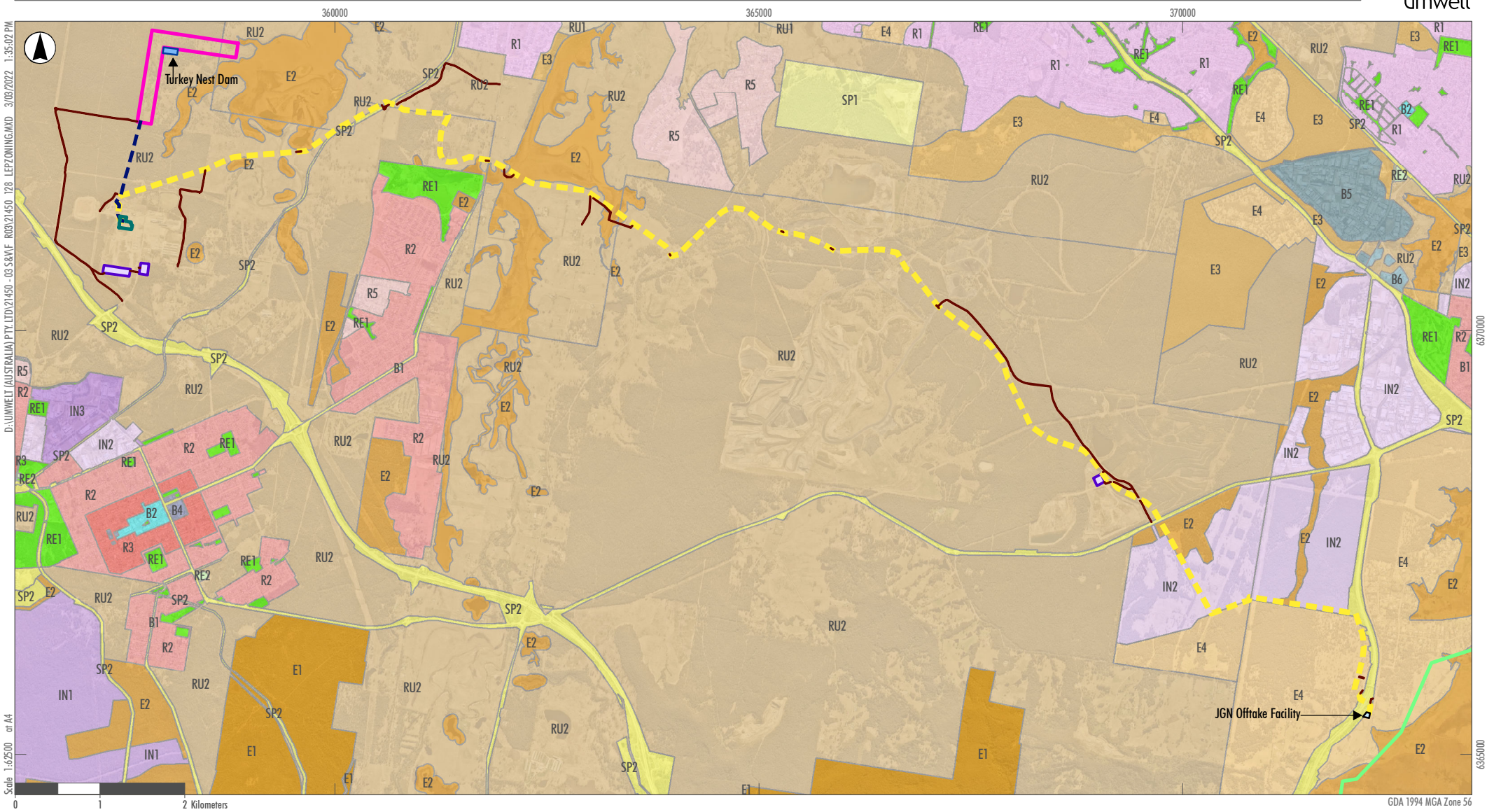
Measured noise levels (LAeq) and rating background levels (RBLs) for each period are shown in **Table 3.1**. Daily charts of noise logger data, including periods excluded due to extraneous meteorological conditions, are presented in **Appendix A**.

Table 3.1 Noise Monitoring Results and RBLs, dB(A)[1]

Location	LAeq Day 7 am-6 pm	LAeq Evening 6 pm-10 pm	LAeq Night 10 pm-7 am	RBL Day 7 am-6 pm	RBL Evening 6 pm-10 pm	RBL Night 10 pm-7 am
146 Lenaghans Drive, Lenaghan	55	55	54	48	44	42

Note: 1. noise levels measured during periods of unsuitable meteorological conditions were excluded from the data set.

A review of background noise data from Lenaghan noted lower background noise levels over the weekend period, particularly during the night period. A chart of the continuous logger data showing this trend is presented in **Appendix B**. It was considered that noise levels measured over the weekend period would provide a more conservative approach to determining the impact of continuous noise sources associated with the Project, particularly from the operation of the JGN offtake facility in this area. The adopted RBLs for receivers in this area, based on quieter weekend periods, are shown in **Table 3.2**.



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- Access Tracks

EPI Land Zoning

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- B5 Business Development
- B6 Enterprise Corridor
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

FIGURE 3.1

Land Zonings in the Vicinity of the Project

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021), NSW DPIE (2020)

Table 3.2 Adopted RBLs from logging undertaken by Umwelt[1,2]

Location	RBL Day 7 am-6 pm	RBL Evening 6 pm-10 pm	RBL Night 10 pm-7 am
146 Lenaghans Drive, Lenaghan	45	43	35

Notes: 1. noise levels measured during periods of unsuitable meteorological conditions were excluded from the data set
2. RBLs based on noise levels measured over a weekend period to more conservatively determine potential noise impacts.

3.2 Sensitive Receivers and Noise Catchment Areas

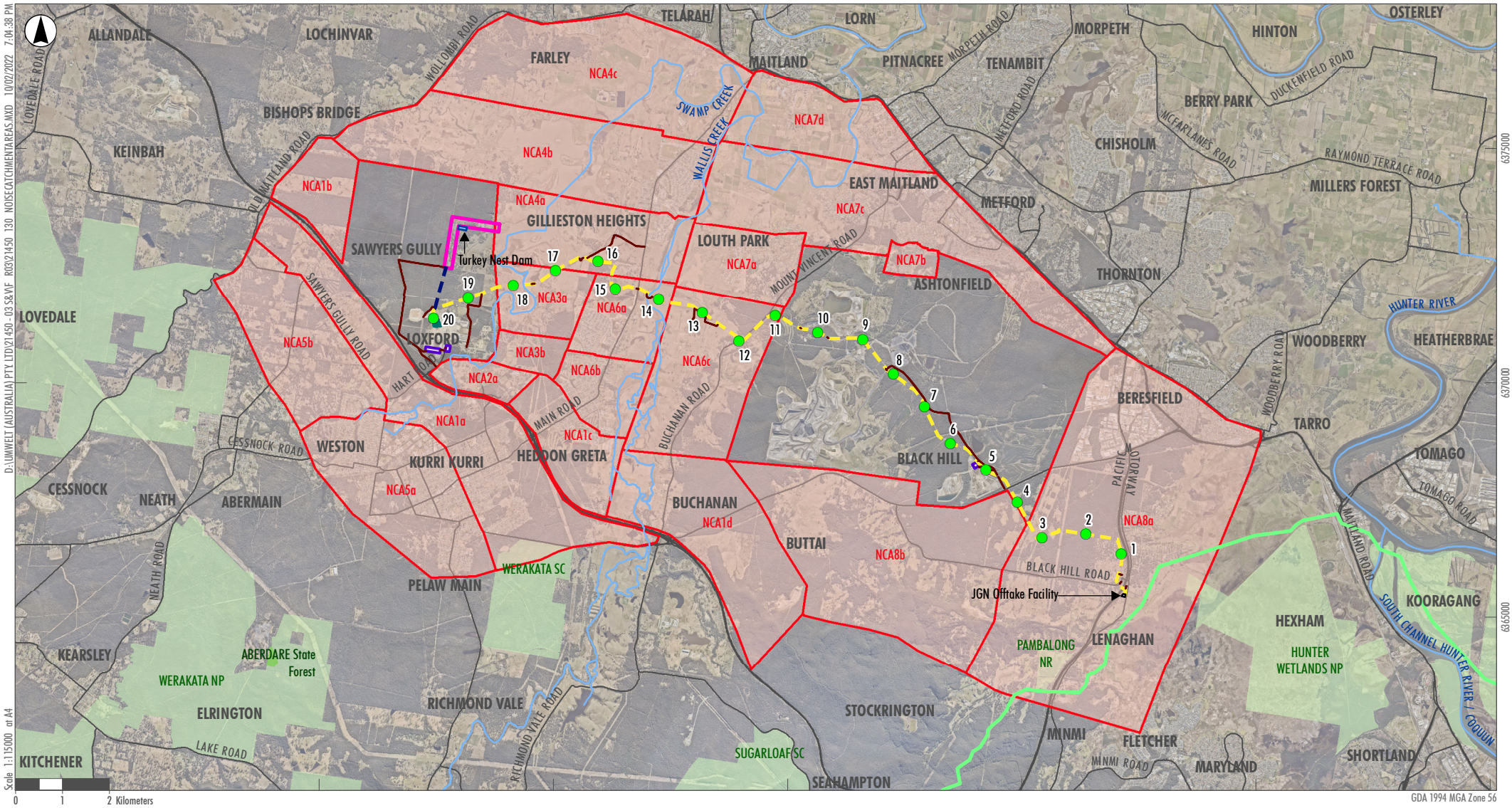
A review of land ownership and receiver locations in proximity to the Project was undertaken as part of the NVIA process using aerial imagery. The majority of sensitive receivers in the vicinity of the project are residential receivers.

Noise management levels and project noise trigger levels used to assess potential construction and operational noise impacts are based on residential receivers, as they typically have the most stringent noise limits. The mining areas of Donaldson Coal Pty Limited and Ashtonfields Pty Limited have not been considered sensitive receivers in this assessment, as noise levels in many areas of these active mining areas will likely exceed the noise levels of construction or operational activities associated with the Project.

The residential receiver areas that could potentially be affected by noise from the Project are shown in **Figure 3.1**. To simplify the assessment of residential noise impacts and the presentation of results, residential receivers were grouped. Noise Catchment Areas (NCAs) were determined based on areas of assumed similar background noise levels, based on background noise data from Jacobs (2019), Jacobs (2021) and logging undertaken by Umwelt. For some of these areas, the NCAs were further divided into smaller areas of similar set back distance from Project areas to simplify the discussion of results and potential noise impacts from the Project. The description of the NCAs and the background noise data source for each area is presented in **Table 3.3**, while the NCAs are also shown in **Figure 3.2**. NCAs 1 through to 5 in this assessment were kept consistent with the NCAs used in the Jacobs (2021) assessment.

Table 3.3 Noise Catchment Area descriptions

NCA	Description
1 (a,b,c,d)	Divided into four areas, representing acoustic environments adjacent to the Hunter Expressway. Background data sourced from Jacobs (2021).
2	A small area between the HPP site and the Hunter Expressway. Background data sourced from Jacobs (2021).
3 (a, b)	Two areas immediately east of the HPP site. Background data sourced from Jacobs (2021).
4 (a, b, c)	Three areas to the north of the Project area. Background data sourced from Jacobs (2019).
5	An area to the west of the Project, set back further from the Hunter Expressway than NCA1. Background data sourced from Jacobs (2021).
6 (a, b, c)	Three areas in the centre of the Project. Background data sourced from Jacobs (2019).
7 (a,b,c,d)	Four areas to the north of the Project area. Background data sourced from Jacobs (2019).
8 (a, b)	Two areas at the eastern end of the Project area. Background data measured by Umwelt as part of this assessment.



Legend

- Noise Catchment Areas
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

FIGURE 3.2

Noise Catchment Areas used in this Assessment

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

The adopted RBLs for each NCA are shown in **Table 3.4** and are shown in **Figure 3.3**.

Table 3.4 Noise Catchment Area RBLs for different time periods, dB(A)

NCA	Day 7 am - 6 pm	Evening 6 pm - 10 pm	Night 10 pm - 7 am
1a, 1b, 1c, 1d	45	45	36
2	40	43	38
3a, 3b	38	39	37
4a, 4b, 4c	38	36	32
5	37	41	35
6a, 6b, 6c	37	32	30
7a, 7b, 7c, 7d	37	33	30
8a, 8b	45	43	35

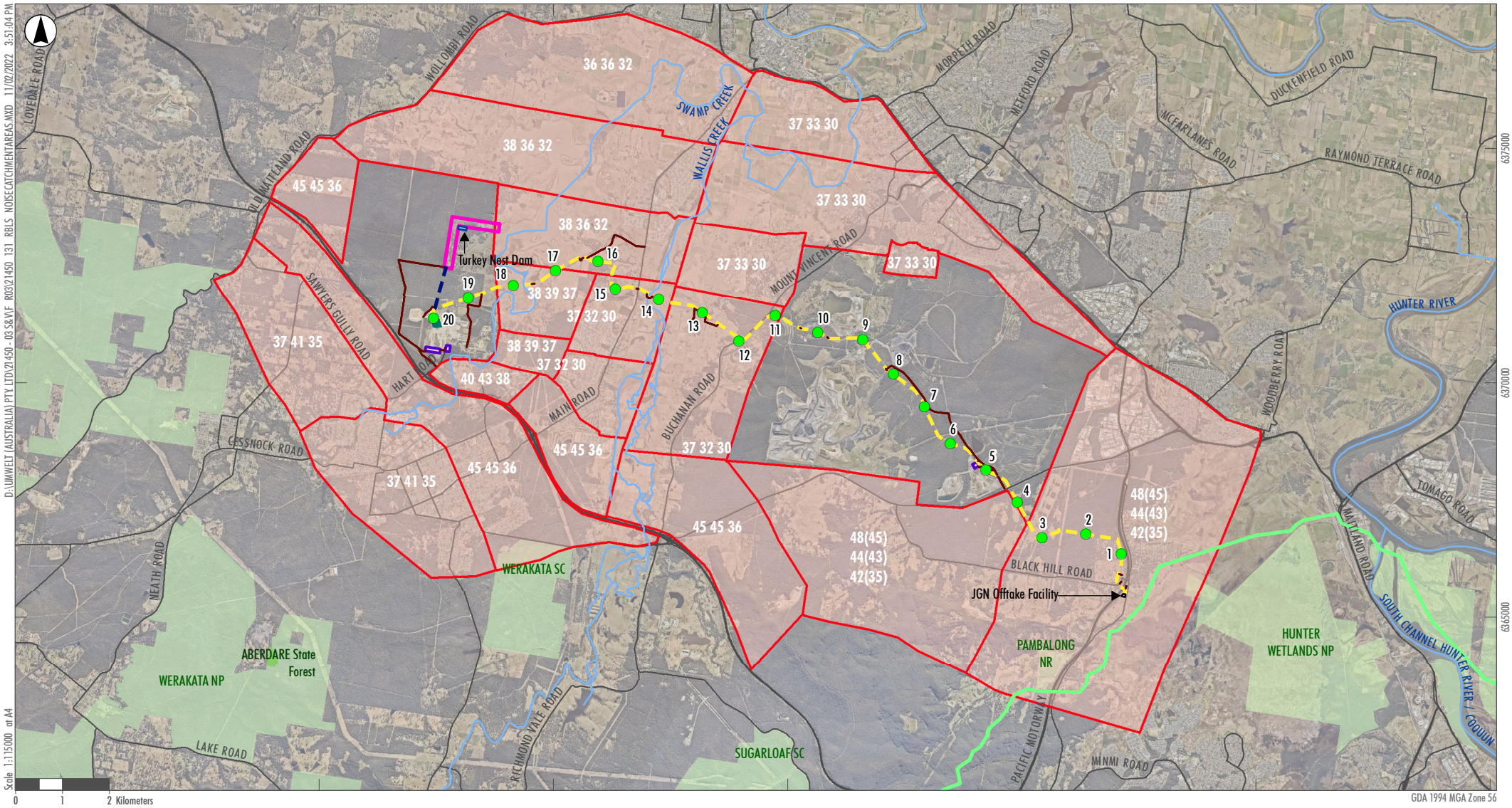


FIGURE 3.3

Adopted RBLs for Each Noise Catchment Area

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

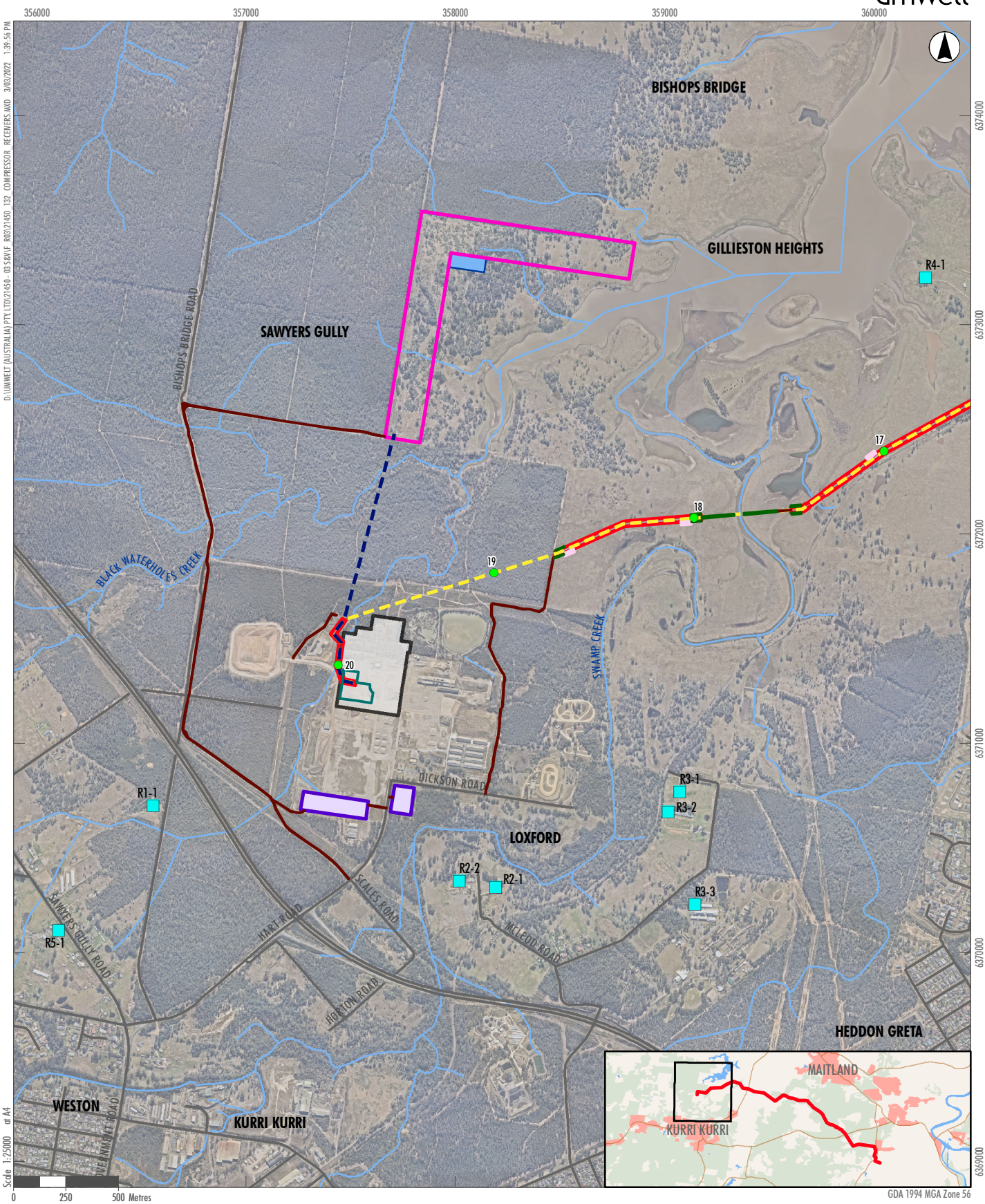
3.3 Representative Receivers – Fixed Facilities

3.3.1 Compressor Station and Delivery Station Receivers

An operational model has been used to determine the potential noise impacts from the compressor station and delivery station at the nearest receivers adjacent to this part of the Project. The receivers included in this model are detailed in **Table 3.5** and **Figure 3.4**. These representative receivers have been adopted to ensure there is consistency with the Supplementary Noise impact Assessment (Jacobs, 2021) prepared as part of the EIS for the HPP.

Table 3.5 Operational receivers adjacent to the compressor station and delivery station

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Receiver details	Approximate Separation Distance, m
NCA 1	R1-1	Residential	103 Bishops Bridge Rd, Sawyers Gully	1,075
NCA 2	R2-1	Residential	10 Dawes Ave, Loxford	1,175
	R2-2	Commercial	6 Dawes Ave, Loxford	1,050
NCA 3	R3-1	Residential	20 Bowditch Ave, Loxford	1,650
	R3-2	Commercial	18 Bowditch Ave, Loxford	1,625
	R3-3	Education	TAFE Kurri Kurri, McLeod Road, Loxford	1,950
NCA 4	R4-1	Residential	464 Cessnock Road, Gillieston Heights	3,375
NCA 5	R5-1	Residential	59 Sawyers Gully Road, Sawyers Gully	1,800



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

FIGURE 3.4

Representative Receivers for the Operational Noise Modelling for the Compressor Station and Delivery Station

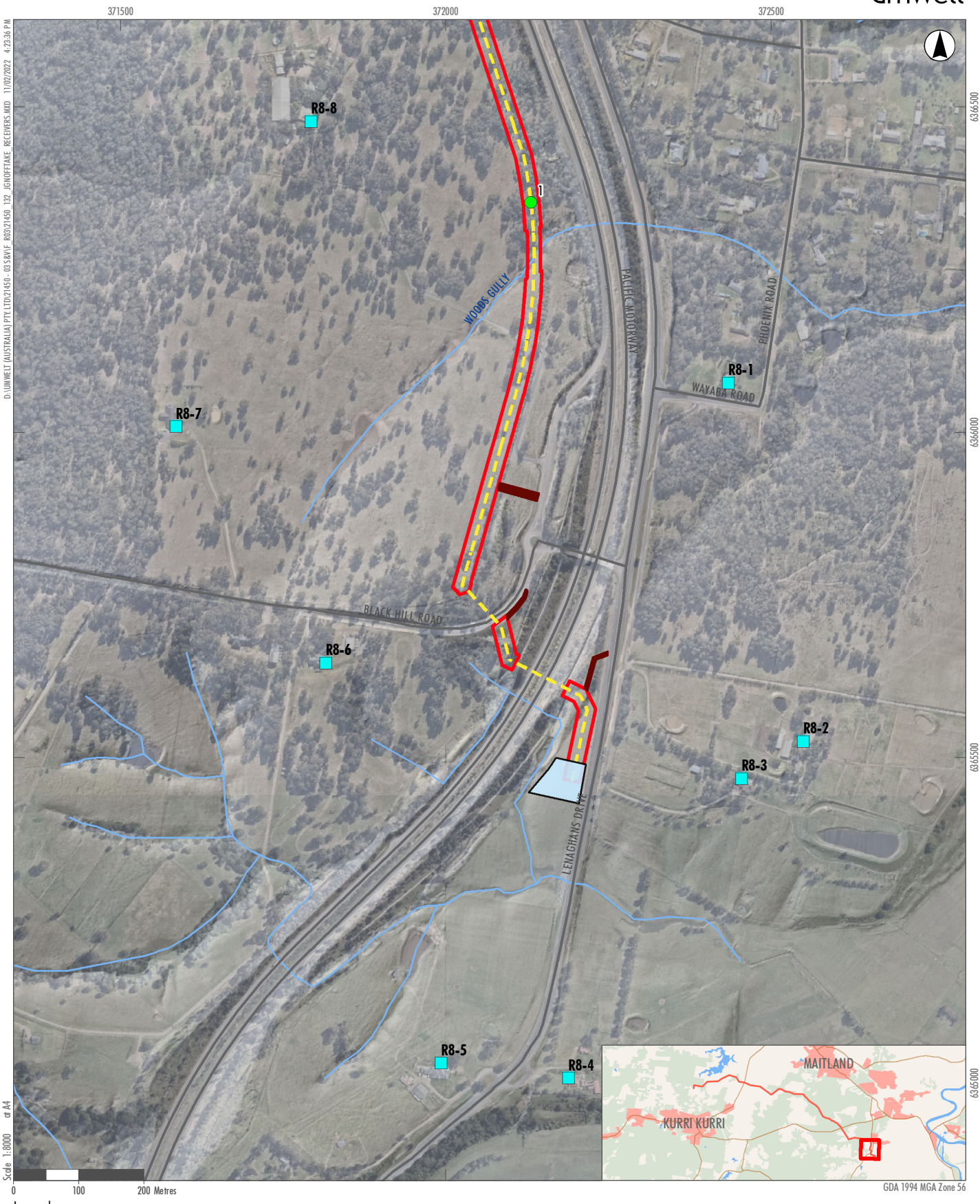
Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

3.3.2 JGN Offtake Facility Receivers

An operational model has been used to determine the potential noise impacts from the JGN offtake facility at the nearest receivers adjacent to this part of the Project. The receivers included in this model are detailed in **Table 3.6** and **Figure 3.5**.

Table 3.6 NCA8 operational receivers adjacent to the JGN offtake facility

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Receiver details	Approximate Separation Distance, m
NCA8	R8-1	Residential	2 Phoenix Road, Black Hill	650
	R8-2	Residential	159 Lenaghans Drive, Lenaghan	350
	R8-3	Residential	153 Lenaghans Drive, Lenaghan	250
	R8-4	Residential	141a Lenaghans Drive, Lenaghan	450
	R8-5	Residential	146 Lenaghans Drive, Lenaghan	475
	R8-6	Residential	21 Black Hill Road, Lenaghan	400
	R8-7	Residential	4 Black Hill Road, Black Hill	800
	R8-8	Residential	Hunter Valley Equestrian Centre (2 Black Hill Road, Black Hill)	1,075



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Receivers
- Kilometre Point
- Access Tracks
- Roads
- Watercourses

FIGURE 3.5

Representative Receivers for the Operational Noise Modelling for the JGN Offtake Facility

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

4.0 Noise and Vibration Criteria

4.1 Construction

4.1.1 Construction Noise

The NSW EPA recognises that construction activities could potentially generate higher noise levels than those of an industrial operation. The ICNG provides noise management criteria for construction activities. The criteria are intended to guide the need for, and the selection of, feasible and reasonable work practices to minimise construction noise impacts.

The ICNG notes that a residential receiver is 'noise affected' if the $L_{Aeq(15min)}$ construction noise level exceeds the rating background noise level by more than 10 dB during recommended standard hours. A residential receiver is 'highly noise affected' if the $L_{Aeq(15min)}$ construction noise level exceeds 75 dB(A).

Outside recommended standard hours a residential area is 'noise affected' if the $L_{Aeq(15min)}$ construction noise level exceeds the rating background noise level by more than 5 dB(A). Standard construction hours defined by the ICNG are as follows:

- Monday to Friday: 7 am – 6 pm
- Saturday: 8 am – 1 pm
- Sunday and public holidays: No work.

Table 4.1 presents the ICNG construction noise assessment levels for representative receivers surrounding the Project area.

Table 4.1 ICNG Construction Noise Management Levels

Land use	Construction time	Noise Management Level $L_{Aeq\ (15min)}$
Residential	Recommended standard hours	RBL + 10 dB(A)
	Outside recommended standard hours	RBL + 5 dB(A)
Classrooms at schools and other educational institutions	Applicable when property is in use	Internal noise level[1] 45 dB(A)
Hospital wards and operating theatres	Applicable when property is in use	Internal noise level 45 dB(A)
Places of Worship	Applicable when property is in use	Internal noise level 45 dB(A)
Community Centres	Applicable when property is in use	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses[2]. Internal noise level 40 dB(A)
Industrial premises	Applicable when property is in use	External[3,4] $L_{Aeq(15min)}$ 75 dB(A)
Offices, retail outlets	Applicable when property is in use	External[4] $L_{Aeq(15min)}$ 70 dB(A)

Land use	Construction time	Noise Management Level LAeq (15min)
Other businesses that may be very sensitive to noise, where the noise level is project specific: **Childcare centres**	Applicable when property is in use	Internal[5] $L_{Aeq(15min)}$ ≤ 40 dB(A) External[6] $L_{Aeq(15min)}$ ≤ 55 dB(A)
Active recreation areas	Applicable when property is in use	External $L_{Aeq(15min)}$ 65 dB(A)
Passive recreation areas	Applicable when property is in use	External $L_{Aeq(15min)}$ 60 dB(A)

Notes
[1] Applies at the centre of the room in use, most exposed to the construction noise, and can include both airborne and ground-borne noise
[2] Community Centres generally provide community spaces for life-long learning, social and cultural activities and typically contain a multi-use hall. The assumed conservatively representative design use from AS2107 was for assembly halls and conference rooms within Educational Buildings, resulting in a recommended 'maximum' internal noise level of LAeq (15min) 40 dB(A).
[3] The external noise levels should be assessed at the most-affected occupied point of the premises.
[4] The external noise levels should be assessed at the most-affected occupied point of the premises.
[5] From the Association of Australian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment, September 2010, any location within the outdoor play or activity area of the Centre during the hours when the Centre is operating.
[6] Any location within the indoor play or sleeping areas of the Centre during the hours when the Centre is operating.

Approximately 14,200 potential receivers have been identified within a 5 km catchment zone surrounding the project area. Based on the land-use zones presented in **Figure 3.1**, the area is predominantly zoned for residential use. As a result of this large volume of potential sensitive receivers, the assessment of construction noise has assumed that all identified receivers are of residential use. In doing so, this will also address the potential impacts on other sensitive uses that have not otherwise been identified. Light Industrial, Heavy Industrial and Infrastructure land-use zones are identified in the land zoning for the area and are assessed separately to the residential receivers. Additionally, the Kurri Kurri Tafe and the Kurri Kurri High School have been assessed against the noise management levels for Educational facilities.

A graphical representation of standard and outside standard hours and the determination of residential receiver Noise Management Levels (NML) for each period is shown in **Figure 4.1**.

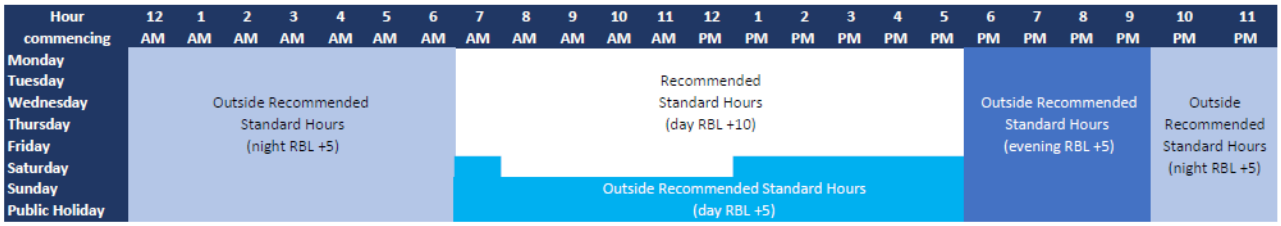


Figure 4.1 ICNG Recommended Standard Hours and Outside Recommended Standard Hours (and NML determination)

Additionally, the ICNG states the following with respect to the potential for sleep disturbance:

> *Where construction works are planned to extend over more than two consecutive nights, and a quantitative assessment method is used, the analysis should cover the maximum noise level, and the extent and the number of times that the maximum noise level exceeds the RBL. Some guidance indicating the potential for sleep disturbance is in the NSW Environmental Criteria for Road Traffic Noise (EPA 1999).*

The potential for both sleep disturbance and awakenings has been considered using a contemporary approach as nominated in the NPfI. The NPfI approach to assessing maximum noise level events for industrial noise sources includes a screening level test based on the following:

- 52 dB(A) L_{Amax} , or
- the prevailing ambient RBL noise level by more than 15 dB, whichever is greater.

For the purposes of this assessment, the 52 dB(A) L_{Amax} parameter has been adopted to assess the potential for sleep disturbance from construction noise during the night-time period in all NCAs except for NCA2, where the L_{Amax} parameter is 53 dB(A), based on the night period RBL in that NCA being slightly higher than other areas.

4.1.2 Construction Vibration

4.1.2.1 Vibration effects on structures

Criteria for vibration effects on building structures recommended in the DEC's *Assessing Vibration: A Technical Guideline* (the vibration guideline) are given in British Standard *BS7385 (1993) Part 2 Evaluation and measurement of vibration in buildings* (BS7385). The criteria in BS7385 are given in terms of peak component (x-, y- or z-axes separately) vibration velocity values from transient (impulsive) vibration events. The criteria for continuous vibration are recommended to be 50% lower than for impulsive vibration. The vibration criteria for the protection of structures and buildings from cosmetic damage (e.g. hairline cracks in drywalls, etc.) are given in **Table 4.2**.

Table 4.2 Vibration Criteria for Cosmetic Damage to Structures (peak vibration velocity, mm/s)

Type of Structure	Peak Component Particle Velocity (mm/s)		
	4 Hz – 15 Hz	15 Hz – 40 Hz	40 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings	50 (transient (impulsive) vibration) 25 (continuous vibration)		
Un-reinforced or light framed structures. Residential or light commercial type buildings.	15 - 20 (transient (impulsive) vibration) 7.5 - 10 (continuous vibration)	20 - 50 (transient (impulsive) vibration) 10 - 25 (continuous vibration)	50 (transient (impulsive) vibration) 25 (continuous vibration)

4.1.2.2 Heritage protected structures

Assessment guidelines for vibration damage to heritage-protected structures are commonly referenced from the German Institute for Standardisation *DIN 4150-3:1999-02 Structural vibration – Effects of vibration on structures* (DIN4150). This standard differentiates between short-term and long-term vibration, where short-term vibration is caused by sources such as drop-hammers, impact piling, etc. All other sources of vibration are considered to be long-term.

The guideline value for heritage-protected structures for long-term vibration is 2.5 mm/s peak particle velocity (PPV) in the horizontal plane at all frequencies. This guideline value is primarily intended for older, sensitive, above-ground structures (typically buildings).

4.1.2.3 Human perception of vibration

Criteria for the human perception of vibration from construction activities are given in the *Assessing Vibration: A Technical Guideline* (the vibration guideline). The criteria in the vibration guideline are given for continuous vibration, impulsive vibration and intermittent vibration. For continuous and impulsive vibration, the criteria are given in terms of root-mean-square (rms) vibration acceleration (m/s^2) in the frequency range 1 - 80 Hertz (Hz). For intermittent vibration, the criteria are given in terms of vibration dose value (VDV), which is a parameter used for assessing the combined magnitude and the total duration of vibration impacts.

The criteria given in the vibration guideline for continuous or impulsive vibration relevant to the receivers in the area are given in **Table 4.3**. The frequency weightings are given in Appendix B3 of the vibration guideline.

Table 4.3 Criteria for Continuous and Impulsive Vibration for Human Comfort (weighted vibration acceleration m/s^2 at 1-80 Hz)

Location	Assessment Period [1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Residences	Day	0.010	0.0071	0.020	0.014
	Night	0.007	0.005	0.014	0.010
Offices, schools, educational institutions or places of worship	Day or Night	0.020	0.014	0.040	0.028
Workshops	Day or Night	0.040	0.029	0.080	0.058
Impulsive vibration					
Residences	Day	0.30	0.21	0.60	0.42
	Night	0.10	0.071	0.20	0.14
Offices, schools, educational institutions or places of worship	Day or Night	0.64	0.46	1.28	0.92
Workshops	Day or Night	0.64	0.46	1.28	0.92

Notes: [1] Day time period is 7 am – 10 pm. Night time period is 10 pm – 7 am.

The criteria for intermittent vibration given in the vibration guideline for the relevant receivers in the area are shown in **Table 4.4**. The vibration dose value (VDV) is calculated using the frequency-weighted rms acceleration as described in the vibration guideline.

Table 4.4 Vibration Criteria for Intermittent Vibration (VDV $m/s^{1.75}$)

Location	Daytime period [1]		Night-time period [1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions or places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: [1] Day time period is 7 am – 10 pm. Night time period is 10 pm – 7 am

According to the vibration guideline, the 'preferred' vibration limits are not mandatory but should be sought to be achieved through reasonable mitigation measures. Where all possible and reasonable measures have been applied, values up to the 'maximum' value may be used if they can be justified. For values beyond the maximum value, direct negotiation with the affected receivers must be carried out.

4.2 Operational Noise

The operational noise criteria applicable to the project have been derived in accordance with the NPfI. The criteria for residential receivers are derived based on adopted background noise levels presented in **Section 3.0**.

The NPfI sets out two noise criteria to assess the potential noise impacts resulting from industrial activity. The first criterion is used to control short-term intrusive noise and its impacts on residences whilst the second criterion is used to protect against cumulative noise impacts and maintain noise level amenity for particular land uses including residences. Applying the more stringent of the two as the project noise trigger level ensures that intrusive noise is limited and amenity is protected and that no single industry can unacceptably change the noise level of an area.

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source, measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.

The project intrusiveness noise level ($L_{Aeq(15min)}$) is defined as the RBL + 5 dB. The RBL is determined by measurement of the long-term background noise level L_{A90} and calculated in accordance with the NPfI Fact Sheets A and B.

The derived project intrusiveness noise levels are presented in **Table 4.5**, based on the adopted background noise levels presented in **Section 3.0**.

Table 4.5 Derived Project Intrusiveness Noise Levels, dB(A)

Noise Catchment Area	Rating Background Level [1]			Project Intrusiveness Noise Level [2] $L_{Aeq(15min)}$		
	Day	Evening	Night	Day	Evening	Night
NCA1	45	45	36	50	50	41
NCA2	40	43	38	45	45[2]	43
NCA3	38	39	37	43	43[2]	42
NCA4	38	36	32	43	41	37
NCA5	37	41	35	42	42[2]	40
NCA6	37	32	30	42	37	35
NCA7	37	33	30	42	38	35
NCA8	45	43	35	50	48	40

Notes: [1] Day period is 7 am-6 pm Monday-Saturday and 8 am-6 pm Sunday and Public Holidays, evening period is 6 pm-10 pm and night period is 10 pm to commencement of day period.
[2] The project intrusiveness noise level for the evening period should be set to no greater than the project intrusiveness level for daytime, in accordance with the NPfI.

The $L_{Aeq(period)}$ project amenity noise levels at receivers are defined as the acceptable amenity noise levels taken from NPfI Table 2.2 minus 5 dB. In order to derive the project noise trigger levels, the period-based project amenity noise levels are converted to equivalent 15-minute levels ($L_{Aeq(15min)}$) by the addition of 3 dB.

The project amenity noise levels for all receivers surrounding the Project Area are shown in **Table 4.6**.

Table 4.6 Project Amenity Noise Levels, dB(A)

Receiver Type / Noise Catchment Area	Time of day [1]	Recommended amenity noise level LAeq(period)	Project amenity noise level LAeq(period)	Project amenity noise level LAeq(15min)
Urban Residential [3]/ NCA 1 and 2	Day	60	55	58
	Evening	50	45	48
	Night	45	40	43
Suburban Residential/ NCA 3, 5, 6 ,7, 8	Day	55	50	53
	Evening	45	40	43
	Night	40	35	38
Rural Residential/NCA 4	Day	50	45	48
	Evening	45	40	43
	Night	40	35	38
Industrial/NCA 2	When in use	70	65	65
Commerical/NCA 3	When in use	65	60	60
Education/NCA 3	When in use	35 (internal) 45 (external) [2]	40 (external)	40 (external)

Notes: [1] Day period is 7 am-6 pm Monday-Saturday and 8 am-6 pm Sunday and Public Holidays, evening period is 6 pm-10 pm and night period is 10 pm to commencement of day period.
[2] Assuming a 10 dB noise reduction across the building façade.
[3] The application of Urban Residential has been applied to these NCAs consistent with the approach adopted in Hunter Power Project Response to Submissions Noise Impact Assessment.

The project noise trigger level is the lower or most stringent value of the project intrusiveness noise level and the project amenity noise level. The derived project noise trigger levels are presented in **Table 4.7**.

The project noise trigger level provides a benchmark or objective for assessing a proposal or site and is not intended for use as a mandatory requirement (NPfI). The project noise trigger level, if exceeded, indicates a potential noise impact on the community and so triggers a management response e.g. further investigation of mitigation measures.

Table 4.7 Project Noise Trigger Levels, dB(A)

Noise Catchment Area	Time of day [1]	Project intrusiveness noise level LAeq(15min)	Project amenity noise level LAeq(15min)	Project noise trigger level LAeq(15min)
NCA1	Day	50	58	50
	Evening	50	48	48
	Night	41	43	41
NCA2	Day	45	58	45
	Evening	45	48	45
	Night	43	43	43
NCA3	Day	43	53	43
	Evening	43	43	43
	Night	42	38	38

Noise Catchment Area	Time of day [1]	Project intrusiveness noise level LAeq(15min)	Project amenity noise level LAeq(15min)	Project noise trigger level LAeq(15min)
NCA4	Day	43	48	43
	Evening	41	43	41
	Night	37	38	37
NCA5	Day	42	53	42
	Evening	42	43	42
	Night	40	38	38
NCA6	Day	42	53	42
	Evening	37	43	37
	Night	35	38	35
NCA7	Day	42	53	42
	Evening	38	43	38
	Night	35	38	35
NCA8	Day	50	53	50
	Evening	48	43	43
	Night	40	38	38

Notes: [1] Day period is 7 am-6 pm Monday-Saturday and 8 am-6 pm Sunday and Public Holidays, evening period is 6 pm-10 pm and night period is 10 pm to commencement of day period.

4.3 Road Traffic Noise

The EPA's *NSW Road Noise Policy* (RNP) (DECCW, 2011) sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments, or planned building developments. **Table 4.8** outlines the road traffic noise criteria relevant to the Project for residential land uses.

Table 4.8 Road Traffic Noise Assessment Criteria For Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria dB(A)	
		Day 7 am to 10 pm	Night 10 pm to 7 am
Freeway/arterial/ sub-arterial road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15\ hour)}$ 60 (external)	$L_{Aeq(9\ hour)}$ 55 (external)
Local road	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1\ hour)}$ 55 (external)	$L_{Aeq(1\ hour)}$ 50 (external)

Source: NSW Road Noise Policy (DECCW, 2011)

Section 3.4 of the RNP notes that where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, the RNP considers an increase of up to 2 dB as a minor impact that is barely perceptible to the average person.

5.0 Construction Noise and Vibration Assessment

5.1 Modelling Methodology

Noise modelling of construction activities was undertaken with the proprietary computer noise modelling software SoundPLAN version 8.2, using the CONCAWE noise prediction algorithms. The noise models were developed using 3-Dimensional terrain data provided by the project team. Ground absorption for the area was modelled as acoustically soft ground.

Construction noise levels have been predicted under default worst-case meteorological conditions (D-class with 3m/s windspeed or F-class with 2m/s windspeed) in accordance with the NPfI. These meteorological conditions represent worst-case enhancing conditions for both standard and outside standard hour construction activities.

5.2 Noise Management Levels

The construction NMLs for residential receivers are summarised in **Table 5.1** based on the adopted RBLs presented in **Table 3.4** and are shown in **Figure 5.1**.

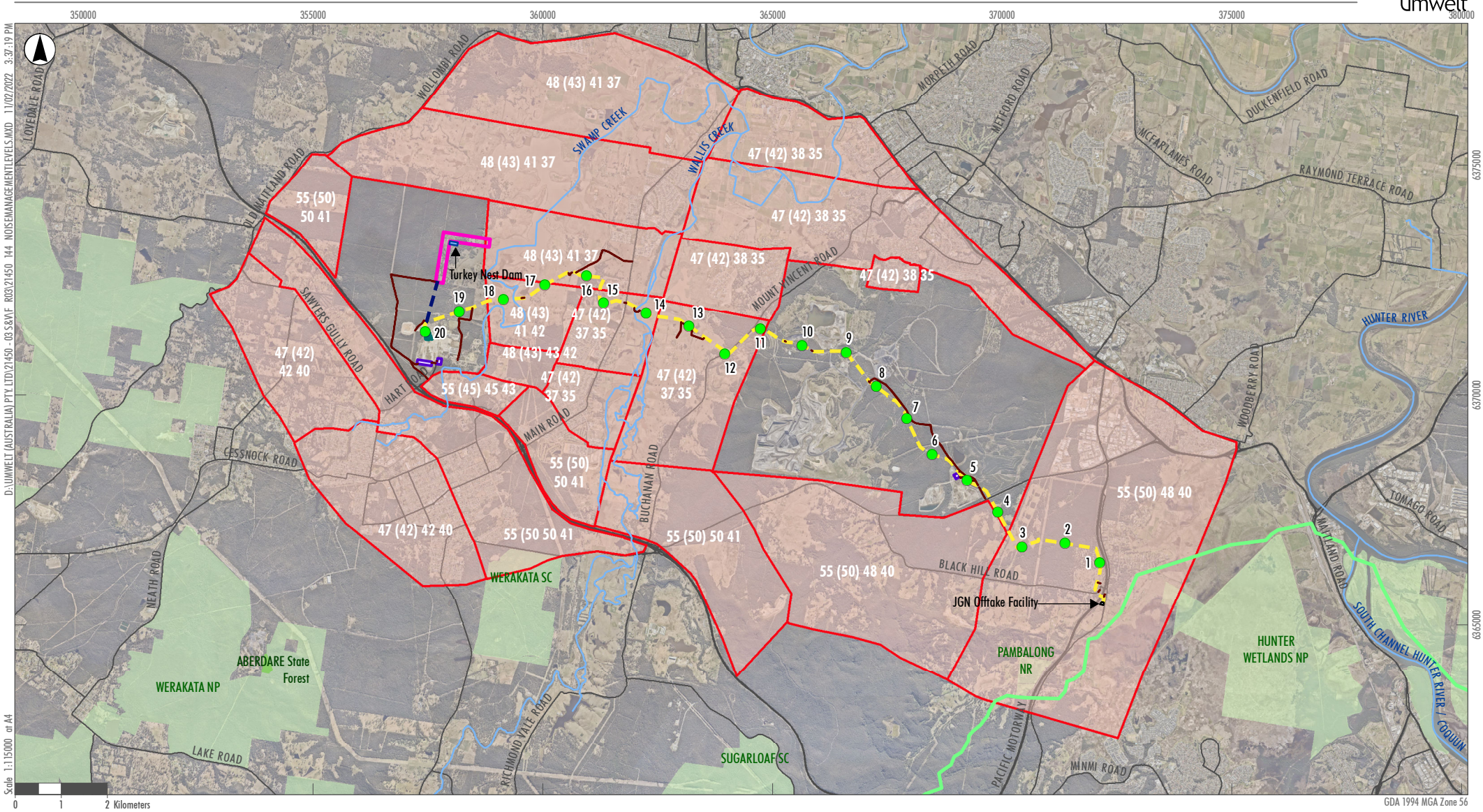
Table 5.1 Construction Noise Management Levels for Residential Receivers

Noise Catchment Area	Noise Management levels (NML), dB(A)					
	Standard hours of Construction[1]	Outside Standard Hours - Day Period	Outside Standard Hours - Evening Period	Outside Standard Hours -Night Period		Highly Noise Affected
	LAeq(15min)	LAeq(15min)	LAeq(15min)	LAeq(15min)	LAmax	LAeq(15min)
1a, 1b, 1c, 1d	55	50	50	41	52	75
2	50	45	45[2]	43	53	75
3a, 3b	48	43	43[2]	42	52	75
4a, 4b, 4c	48	43	41	37	52	75
5	47	42	42[2]	40	52	75
6a, 6b, 6c	47	42	37	35	52	75
7a, 7b, 7c, 7d	47	42	38	35	52	75
8a, 8b	55	50	48	40	52	75

Notes: [1] Recommended standard hours: Monday to Friday 7 am – 6 pm; Saturday 8 am – 1 pm.
[2] Evening criterion set to be equal to the day outside of hours in accordance with the NPfI (evening criteria cannot exceed day criteria).

Light Industrial, Heavy Industrial and Infrastructure land use zones have been applied a noise management level of 75 dB(A) LAeq(15min) in accordance with the ICNG.

The Kurri Kurri Tafe is located in the NCA2a it has an internal noise level target of 45 dB(A) LAeq(15min), which translates to an external noise level target of 55 dB(A) LAeq(15min), assumed noise reduction of 10 dB(A) reduction across the building façade.



Legend

- NoiseCatchmentAreas_MGA56 Legend
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

FIGURE 5.1

Noise Management Levels for Each Noise Catchment Area

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

5.3 Construction Noise Inputs

5.3.1 Construction Staging

Construction for the Project is planned to occur over a 12 month period and will involve a range of activities (**Table 5.2**) along the transmission and storage pipeline footprints and also at associated surface facilities at either end.

It is likely that some of these stages may occur simultaneously through the progression of the construction program.

5.3.2 Construction Equipment and Sound Power sources

A range of plant and equipment will be used during the construction stages. APA provided details of the different construction stages including equipment types and numbers to be used in each stage.

Typical sound power levels for construction equipment associated with each stage were sourced from the NSW Roads and Maritime Services (RMS) *Construction Noise Estimator Tool* (CNET, 2017), or from Umwelt's technical database and are shown in **Appendix C**.

A combined sound power for all of the equipment to be used in each stage was then collated to determine the scenarios which may have the greatest impact on receivers in different areas of the Project during the different time periods each activity may occur.

As the combined sound powers assume all equipment will be in use 100% of the assessment period, the use of these levels is considered to be a conservative approach to predicting potential impacts. Combined sound powers for each of the construction scenarios detailed in **Appendix C** are shown in **Table 5.2,** sorted from lowest to highest combined sound power.

Horizontal directional drilling (HDD) and horizontal boring activities have the potential to cause annoyance due to the character of typical noise sources involved in these construction activities. As such, 5 dB(A) has been added to the sound power of the drilling and boring activities in accordance with the ICNG.

HDD is proposed to be undertaken at the following six locations:

- KP 4.4, John Renshaw Drive, including an unnamed tributary of Weakleys Flat Creek.
- KP 12.9, Buttai Creek.
- KP 14.2, Wallis Creek.
- KP 17.8 Swamp Creek.
- KP 18.7, Entry to the compressor station.
- Section of the DN350 interconnect pipeline between the compressor station and storage pipeline.

Horizontal boring is proposed to be undertaken at the following eight locations:

- KP 5.1, Chichester Gravity Trunk Main
- KP 6.1, Connecting pipe between the Chichester Gravity Trunk Main and Stony Pinch Reservoir
- KP8.2, Haul road of the Bloomfield Coal Mine
- KP 9.8, Hunter Water Corporation trunk main

- KP 10.4, Hunter Water Corporation trunk main
- KP 12.0, Buchanan Road
- KP14.5, Main Road
- KP16.3, South Maitland Railway (with concrete casing and grouting of bore).

Table 5.2 Combined Sound Power Levels for each construction stage

Construction Component	Construction Activity	Combined Sound Power Level $L_{Aeq(15min)}$ dB(A)
Transmission/ Storage Pipeline	Horizontal direction drilling (HDD) and horizontal boring	122 (117 + 5) [1]
	Clear and Grade	121
	Trenching	121
	Reinstatement	121
	Backfill	120
	Tree Clearing	119
	Bores/HDD - Rail Bore	119 (114 + 5) [1]
	Bores/HDD - Road	118 (113 + 5) [1]
	Fencing	118
	Lower In	118
	Fence reinstatement	118
	Stringing and bending	117
	Special Crossings Installation (road open cut and watercourses)	116
	Tie Ins (Lower In)	116
	Mainline Welding	115
	Coating	115
	Pipe Yard	114
	Hydrostatic Testing (pumps at specific locations)	113
JGN offtake facility	site set up	121
	earthworks and foundations	120
	structural, mechanical, piping, electrical, instrumentation (SMPEI)	118
	testing and commissioning	111
Storage pipeline header	site set up	120
	earthworks and foundations	117
	structural, mechanical, piping, electrical, instrumentation (SMPEI)	117
	testing and commissioning	108
Compressor station and delivery station	earthworks and foundations	121
	structural, mechanical, piping, electrical, instrumentation (SMPEI)	120
	site set up	118
	testing and commissioning	116

Note: [1] A modifying factor of 5 dB(A) has been applied to the sound power for these construction stages to factor in the annoying character of drilling machinery, in accordance with the ICNG.

5.3.3 Construction Hours

Standard construction hours under the ICNG are shown in **Figure 4.1** and are as follows:

- Monday to Friday: 7 am – 6 pm
- Saturday: 8 am – 1 pm
- Sunday and public holidays: No work.

Construction activities for the transmission pipeline will typically be undertaken within standard construction hours, from 6 am to 6 pm Monday to Friday on a 5 days on 2 days off basis. The 6 am to 7 am weekday period is outside of standard construction work hours but will typically be used for non-noise generating activities such as safety briefings and daily construction planning. To mitigate noise impacts to residential areas in proximity to the transmission pipeline construction footprint, work will not typically be undertaken during weekends unless applicable noise limits can be met or continuous work is required as described below.

Construction activities for the storage pipeline are proposed to be undertaken between 6 am and 6 pm, seven days per week, given the much larger separation distances to residential areas. Construction crews will typically work a rostered cycle of 21 days on/7 days off, as per the pipeline industry standard,

Construction shifts for the compressor station and delivery station are likely to comprise 6 days/week, with no work Sundays. Typical working hours are 6 am to 6 pm. Construction shifts for the JGN offtake facility will be the same as the transmission pipeline, following standard construction hours under the ICNG, given the proximity of residences.

In addition, some construction tasks for both the transmission pipeline and storage pipeline such as HDD, horizontal boring and hydrostatic testing will need to occur continuously, so will occur outside the recommended standard hours specified in the ICNG. Activities that may require construction outside the recommended standard hours are listed in **Table 5.3**.

Table 5.3 Activities Which May Require Extended Construction Hours

Activity	Justification
Construction of road crossings	Extended construction hours for road crossings will minimise the time that roads are closed.
Horizontal Directional Drilling (HDD)	Drilling of a HDD bore is required to be completed without interruption in order to maintain the integrity of the bore. This may require extended work hours and 24-hour operations.
Horizontal Boring	As with HDD, boring may need to be continued uninterrupted until completion to ensure the integrity of the bore.
Hydrostatic testing and drying	Hydrostatic testing must be completed as a single process and cannot cease midway as it is imperative that the pipeline is maintained at pressure during the testing procedures.
Non-destructive testing	Some NDT works including Ultrasonic Testing (UT) and Radiographic Testing (RT) may be completed outside standard construction hours to minimise the duration that the trench remains open.
Transportation by oversized trucks	The transportation of plant, equipment and pipe by oversized trucks as required for safety reasons.
Unexpected circumstances	In the unlikely event of an emergency, extended hours may be required.

5.4 Construction Noise Assessment

Construction activities will occur in different areas of the Project footprint during and outside of standard construction hours. Five scenarios have been modelled to determine worst-case construction noise levels for a range of construction scenarios to determine potential impacts and if mitigation measures are required.

The majority of construction activities planned along the transmission pipeline will occur during standard hours only. The key exceptions will be continuous drilling activities under road, rail and watercourses and continuous hydrostatic testing of the pipeline at the end of construction during commissioning works.

Construction of the storage pipeline and other infrastructure in the vicinity of the HPP is also planned to occur both during and outside of standard construction hours.

The five construction scenarios assessed are:

1. Standard Hours construction stages
2. Outside standard hours drilling and boring
3. Outside standard hours storage pipeline and associated plant construction works
4. Outside standard hours hydrostatic testing

In summarising the potential construction-related noise impacts on the communities surrounding the Project area, the approach from the TfNSW Construction Noise and Vibration Guideline (CVNG) has been adopted where a perception category is assigned to each receiver based on the difference between the predicted noise level and the noise management level. The noise perception categories from the CVNG are summarised for each time period in **Table 5.4**.

Table 5.4 Construction Noise Perception Categories

Noise Perception Category	Noise level range above NML, dB(A)			
	Standard hours of Construction	Outside Standard Hours – Day Period	Outside Standard Hours – Evening Period	Outside Standard Hours –Night Period
Noticeable	N/A	1 dB(A) to 5 dB(A) above NML		
Clearly Audible	1 dB(A) to 10 dB(A) above NML	5 dB(A) to 15 dB(A) above NML		
Moderately Intrusive	10 dB(A) to 20 dB(A) above NML	15 dB(A) to 25 dB(A) above NML		
Highly Intrusive	> 20 dB(A) above NML	> 25 dB(A) above NML		

5.4.1 Scenario 1 – Standard hours construction stages

This scenario represents construction activities that will occur during standard hours and incorporates the following construction elements:

- Transmission pipeline construction: A sound power of 124 dB(A) has been used to represent multiple and concurrent construction stages of the transmission pipeline, as a line source in the noise model. This sound power assumes that receivers may be impacted by up to three of the worst-case pipeline construction tasks (separated by 1,500m) being undertaken concurrently, based on the Project's proposed staging distances for activities along the pipeline footprint. This also includes the HDD and horizontal boring activities. This includes a light vehicle accessing works via an access track off Cessnock Road.

- Storage pipeline construction: Modelled as a line source along the extent of the storage pipeline footprint with a sound power of 124 dB(A) has been used to represent multiple stages of the storage pipeline construction, on the same basis as the transmission pipeline construction works as the process will be similar. This sound power assumes that receivers may be impacted by up to three of the worst-case pipeline construction scenarios at the same time.

- Storage pipeline access road and pipe laydown area: For this element, it has been assumed that a heavy vehicle, with a sound power of 108 dB(A) is using the access track from Hart Road, past a pipe laydown area and onto the storage pipeline area. This has been included in the model as a line source.

- Compressor station: A point source with a sound power of 121 dB(A) has been used to represent the construction of the compressor and delivery station.

- Storage pipeline header assembly: A point source with a sound power of 120 dB(A) has been used to represent the construction of the header assembly.

- HDD and horizontal boring activities under roads, railway lines and watercourses: Point sources were located at each drilling and boring site as follows:

    - HDD locations were allocated a sound power of 122 dB(A), which allows for a 5 dB(A) penalty under the ICNG for annoying characteristics.

    - The South Maitland Railway horizontal bore was allocated a sound power of 119 dB(A), which allows for a 5 dB(A) penalty under the ICNG for annoying characteristics.

    - Horizontal boring at road locations were allocated a sound power of 118 dB(A), which allows for a 5 dB(A) penalty under the ICNG for annoying characteristics.

- JGN Offtake Facility: The combined sound power of 121 dB(A) representing all construction equipment operating for this scenario was placed as a point source at the location of the JGN Offtake Facility.

Sound powers for these construction elements are as shown in **Table 5.2**, with equipment detailed in **Appendix C**. All equipment is assumed to be operating 100% of the time, at all points of the construction footprint, which provides a conservative overestimation of noise impacts.

The $L_{Aeq(15min)}$ noise level contours for Scenario 1 are shown in **Figure 5.2**.

The predicted noise levels are summarised in **Table 5.5** for construction activities during standard hours and indicate a range of potential noise levels across each NCA. As presented in **Table 5.5**, a number of sensitive receivers are predicted to experience noise levels above the applicable noise management levels in each period. The noise level perception for each construction period indicates the following:

- Standard Hours:

    - 1 receiver may find the noise levels are highly intrusive

    - 17 receivers may find the noise levels are moderately intrusive

    - 1,074 receivers may find the noise levels are clearly audible

The noise modelling results and analysis for average noise levels indicate that reasonable and feasible noise mitigation measures (**Section 5.6**) are required to minimise the potential impacts on the communities surrounding the project.

The predicted noise levels at the Industrial and Infrastructure land-use type receivers are summarised in **Table 5.6** for the various construction activities and indicate a range of potential noise levels across each NCA. As presented in **Table 5.6**, the noise levels are predicted to comply with the noise management level of 75dB(A) LAeq(15min) for these receivers.

The predicted noise levels at the Kurri Kurri Tafe are 49 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min). Similarly, the predicted noise levels at the Kurri Kurri High School are 42 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min).

Table 5.5 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 1

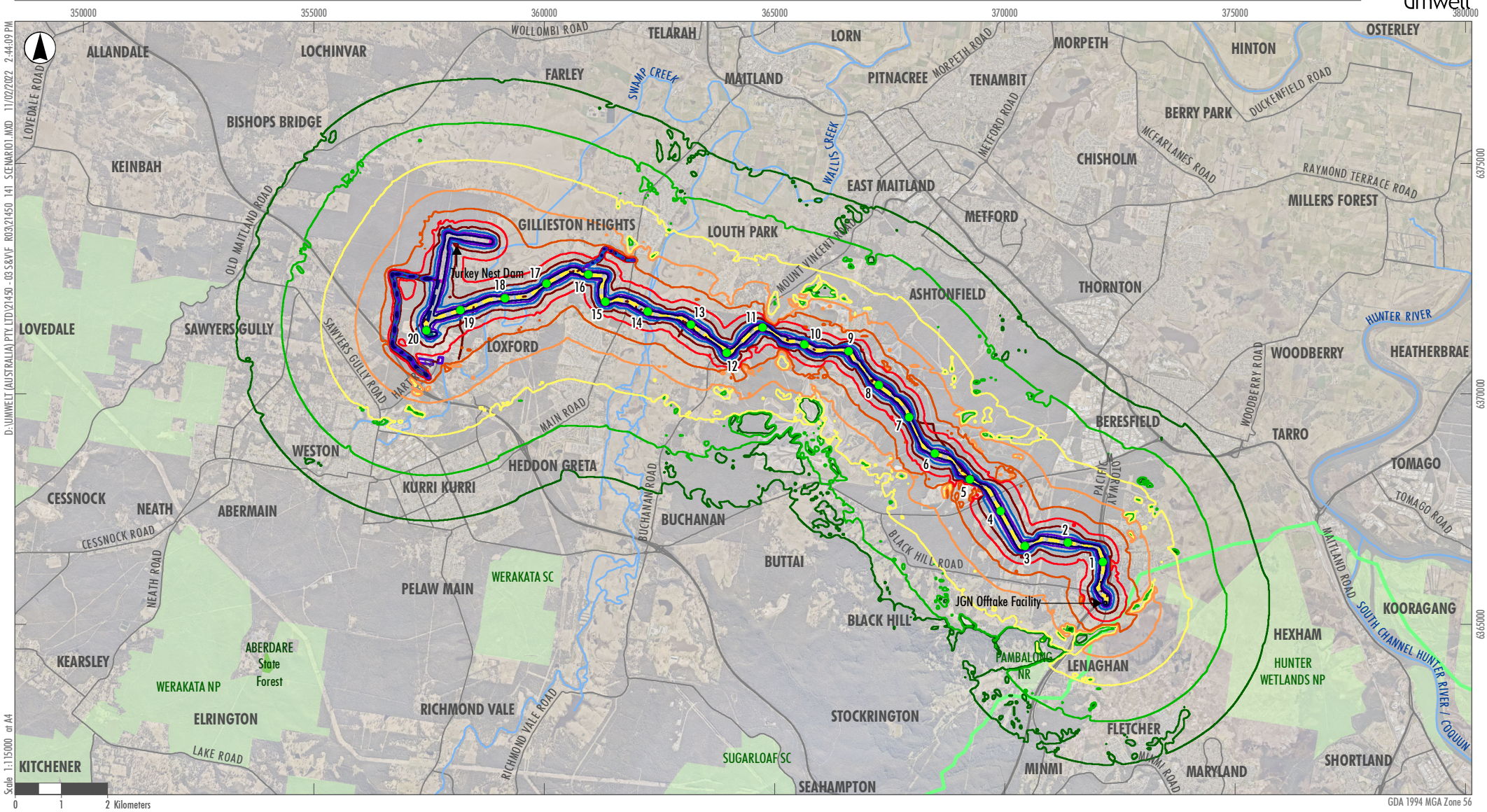
Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	Number of receivers within each Perception Category – Standard Hours [1]			
			HI	MI	CA	Total
NCA1a	1,504	35 - 53	-	-	-	-
NCA1b	6	35 - 40	-	-	-	-
NCA1c	240	35 - 42	-	-	-	-
NCA1d	7	35 - 37	-	-	-	-
NCA2a	20	49 - 55	-	-	8	8
NCA3a	1	53 - 53	-	-	1	1
NCA3b	4	49 - 52	-	-	4	4
NCA4a	484	39 - 63	-	4	262	266
NCA4b	1,509	35 - 48	-	-	-	-
NCA4c	57	< 35 - 39	-	-	-	-
NCA5a	3,263	< 35 - 44	-	-	-	-
NCA5b	311	< 35 - 48	-	-	3	3
NCA6a	727	47 - 73	1	6	674	681
NCA6b	841	38 - 47	-	-	-	-
NCA6c	25	38 - 63	-	4	7	11
NCA7a	204	43 - 61	-	2	75	77
NCA7b	277	39 - 44	-	-	-	-
NCA7c	2,832	< 35 - 43	-	-	-	-
NCA7d	1	35 - 35	-	-	-	-
NCA8a	1,248	< 35 - 67	-	1	40	41
NCA8b	66	35 - 52	-	-	-	-
Total	**13,627**	**-**	**1**	**17**	**1,074**	**1,092**

Notes: [1] HI is Highly Intrusive; MI is Moderately Intrusive; CA is Clearly Audible; N is Noticeable; Total is the number of receivers greater than the NML.

Table 5.6 Summary of predicted noise levels (dB(A)) for Industrial and Infrastructure Land-use receivers from Scenario 1

Land-use type	Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	Comply with NML
Heavy Industrial	NCA1a	15	42 - 46	Yes
Heavy Industrial	NCA5a	16	40 - 44	Yes
Infrastructure	NCA4a	1	62	Yes
Infrastructure	NCA5a	8	< 35 - 39	Yes
Infrastructure	NCA8a	8	35 - 40	Yes
Light Industrial	NCA1a	1	43 - 43	Yes
Light Industrial	NCA5a	134	40 - 43	Yes
Light Industrial	NCA7c	1	35	Yes
Light Industrial	NCA8a	461	35 - 55	Yes
Total	-	**645**	-	-

The noise level contour maps and the noise impact maps for this scenario are presented in **Appendix D**. The noise level contour maps for this scenario are presented in **Appendix D** (Figures D1.1 to D1.3). The noise level impact maps, highlighting the noise perception categories for construction activities during standard hours are presented in **Appendix D** (Figures D1.4 to D1.6).



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

FIGURE 5.2

Standard Hours Worst-case Construction LAeq(15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

5.4.2 Scenario 2 – Outside Standard Hours HDD and Horizontal Boring Construction Works

This scenario represents HDD and horizontal boring construction activities that will occur outside standard hours along the transmission pipeline and storage pipeline footprint. Point sources were located at each of the HDD and horizontal boring locations with the corresponding sound power allocated, depending on the type of construction work to occur at that location. Either side of each HDD or horizontal boring workspace was considered independently, this approach is conservative and allows for worst-case noise emission envelope from each workspace for each HDD or horizontal boring activity. Independent point sources were located at the entry and exit site of each HDD and horizontal boring site listed in Scenario 1. Sound powers used for each scenario are as shown in **Table 5.2**, with equipment detailed in **Appendix C**.

The $L_{Aeq(15min)}$ noise contours for outside of standard hours HDD and horizontal boring are shown in **Figure 5.3**.

The sound powers for each of the HDD and horizontal boring activities are based on construction equipment at each work site operating 100% of the time simultaneously, which may be considered a conservative estimate of potential maximum noise levels for the modelled scenario. Each HDD and horizontal boring worksite is considered independently (i.e. non-simultaneous).

In order to determine potential sleep disturbance impacts, a separate model was run to simulate a maximum noise level event at each of the construction areas. Typical L_{Amax} sound power levels from discrete events associated with construction activities like HDD and horizontal boring are in the order of 125 dB(A) and were modelled at these source locations to determine potential impacts. This maximum noise event sound power level is consistent with previous assessments, such as the *Noise and Vibration Technical Report* prepared for the Western Slopes Pipeline by GHD (2020).

The L_{Amax} noise contours for the potential sleep disturbance impacts of drilling and boring are shown in **Figure 5.4**. It should be noted that NCA2 has a sleep disturbance criterion of 53 dB(A), whereas all other NCAs have a criterion of 52 dB(A).

Table 5.7 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 2 - HDD and Horizontal Boring

NCA	No. Receivers in NCA	Range of Predicted Noise Levels	No. receivers within each Perception Category – Outside Standard Hours – Day [1]					No. receivers within each Perception Category – Outside Standard Hours – Evening					No. receivers within each Perception Category – Outside Standard Hours – Night				
			HI	MI	CA	N	Total	HI	MI	CA	N	Total	HI	MI	CA	N	Total
NCA1a	1,504	< 35 - 45	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6
NCA1b	6	< 35 - 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1c	240	< 35 - 36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1d	7	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA2a	20	40 - 45	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
NCA3a	1	47 - 47	-	-	-	1	1	-	-	-	1	1	-	-	-	1	1
NCA3b	4	43 - 47	-	-	-	2	2	-	-	-	2	2	-	-	-	4	4
NCA4a	484	34 - 57	-	-	7	66	73	-	1	16	277	294	-	4	194	266	464
NCA4b	1,509	< 35 - 41	-	-	-	-	-	-	-	-	-	-	-	-	-	563	563
NCA4c	57	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5a	3,263	< 35 - 36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5b	311	< 35 - 40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6a	727	41 - 55	-	-	48	534	582	-	7	575	145	727	-	20	707	-	727
NCA6b	841	< 35 - 43	-	-	-	1	1	-	-	1	410	411	-	-	137	546	683
NCA6c	25	< 35 - 58	-	1	6	5	12	-	4	8	8	20	-	4	12	6	22
NCA7a	204	35 - 46	-	-	-	46	46	-	-	18	109	127	-	-	80	115	195
NCA7b	277	< 35 - 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7c	2,832	< 35 - 39	-	-	-	-	-	-	-	-	2	2	-	-	-	19	19
NCA7d	1	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA8a	1,248	< 35 - 56	-	-	1	3	4	-	-	2	6	8	-	1	20	52	73
NCA8b	66	< 35 - 43	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Total	**13,627**	**-**	**0**	**1**	**62**	**658**	**721**	**0**	**12**	**620**	**960**	**1,592**	**0**	**29**	**1,150**	**1,582**	**2,761**

Notes: [1] HI is Highly Intrusive; MI is Moderately Intrusive; CA is Clearly Audible; N is Noticeable; Total is the number of receivers greater than the NML.

The predicted noise levels are summarised in **Table 5.7** for each period outside of standard hours and indicate a range of potential noise levels across each NCA. As presented in the table, a number of sensitive receivers are predicted to experience noise levels above the applicable noise management levels in each period. The noise level perception at residential receivers for each construction period indicates the following:

- Outside Standard Hours - Day:
    - 1 receiver may find the noise levels are moderately intrusive
    - 62 receivers may find the noise levels are clearly audible
    - 658 receivers may find the noise levels are noticeable
- Outside Standard Hours - Evening:
    - 12 receivers may find the noise levels are moderately intrusive
    - 620 receivers may find the noise levels are clearly audible
    - 960 receivers may find the noise levels are noticeable
- Outside Standard Hours - Night:
    - 29 receivers may find the noise levels are moderately intrusive
    - 1,150 receivers may find the noise levels are clearly audible
    - 1,582 receivers may find the noise levels are noticeable

The predicted sleep disturbance noise levels (LAmax) are summarised in **Table 5.8**. The modelling results indicate that 64 receivers across NCAs 4a, 6a, 6c and 8a are predicted to receive noise levels above the sleep disturbance noise management level of 52 dB(A) LAmax.

The noise modelling results and analysis for both the average noise levels and the sleep disturbance noise levels indicate that reasonable and feasible noise mitigation measures (see **Section 5.6**) are required to minimise the potential impacts on the communities surrounding the project.

The predicted noise levels at the Industrial and Infrastructure land-use type receivers are summarised in **Table 5.9** for the various construction activities and indicate a range of potential noise levels across each NCA. As presented in **Table 5.9**, the noise levels are predicted to comply with the noise management level of 75dB(A) LAeq(15min) for these receivers.

The predicted noise levels at the Kurri Kurri Tafe are 42 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min). Similarly, the predicted noise levels at the Kurri Kurri High School are less than 30 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min).

Table 5.8 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 2 – Sleep Disturbance Assessment

Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels, dB(A)	No. receivers above Sleep Disturbance Noise Management Level
NCA1a	1,504	< 40 - 48	-
NCA1b	6	< 40	-
NCA1c	240	< 40 - 40	-
NCA1d	7	< 40	-
NCA2a	20	43 - 48	-
NCA3a	1	50	-
NCA3b	4	46 - 50	-
NCA4a	484	39 - 62	8
NCA4b	1,509	< 40 - 47	-
NCA4c	57	< 40	-
NCA5a	3,263	< 40 - 40	-
NCA5b	311	< 40 - 43	-
NCA6a	727	44 - 59	30
NCA6b	841	< 40 - 46	-
NCA6c	25	< 40 - 61	6
NCA7a	204	41 - 50	-
NCA7b	277	< 40 - 42	-
NCA7c	2,832	< 40 - 42	-
NCA7d	1	< 40	-
NCA8a	1,248	< 40 - 63	21
NCA8b	66	< 40 - 50	-
Total	**13,627**	-	**65**

Table 5.9 Summary of predicted noise levels (dB(A)) for Industrial and Infrastructure Land-use receivers from Scenario 2

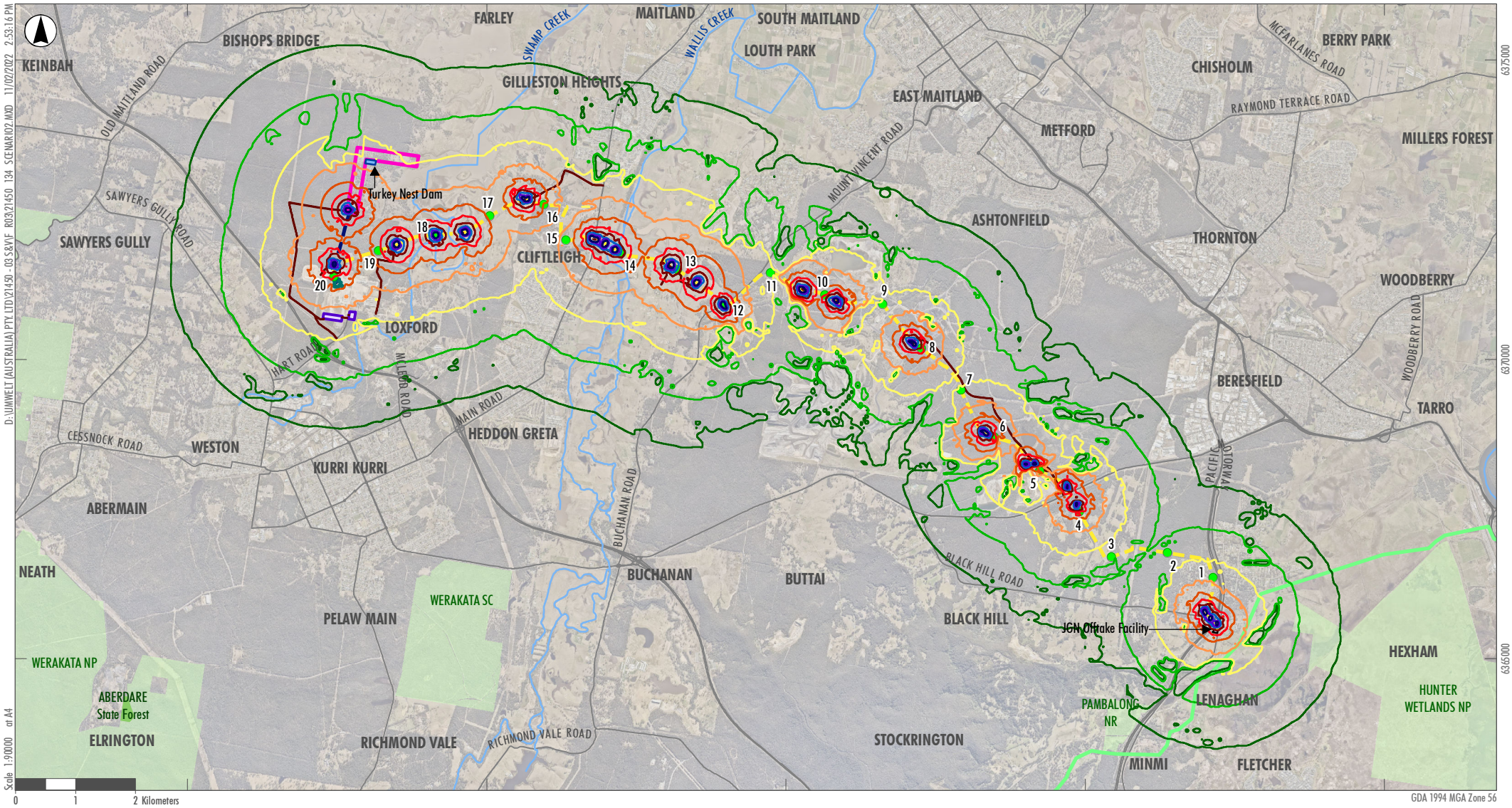
Land-use type	Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	Comply with NML
Heavy Industrial	NCA1a	15	35 - 38	Yes
Heavy Industrial	NCA5a	16	< 35 - 36	Yes
Infrastructure	NCA4a	1	53	Yes
Infrastructure	NCA5a	8	< 35	Yes
Infrastructure	NCA8a	8	< 35	Yes
Light Industrial	NCA1a	1	35 - 35	Yes
Light Industrial	NCA5a	134	< 35 - 35	Yes
Light Industrial	NCA7c	1	< 35	Yes
Light Industrial	NCA8a	461	< 35 - 39	Yes
Total	-	**645**	-	-

The noise level contour maps and the noise impact maps for this scenario are presented in **Appendix D**. The LAeq(15min) noise level contour maps for this scenario are presented in **Appendix D** - Figures D1.7 to D1.9. The Sleep Disturbance LAmax noise level contour maps for this scenario are presented in **Appendix D** - Figures D1.10 to D1.12.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours – Day period are presented in **Appendix D** - Figures D1.13 to D1.15.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Evening period are presented in **Appendix D** - Figures D1.16 to D1.18.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Night period are presented in **Appendix D** - Figures D1.19 to D1.21.



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

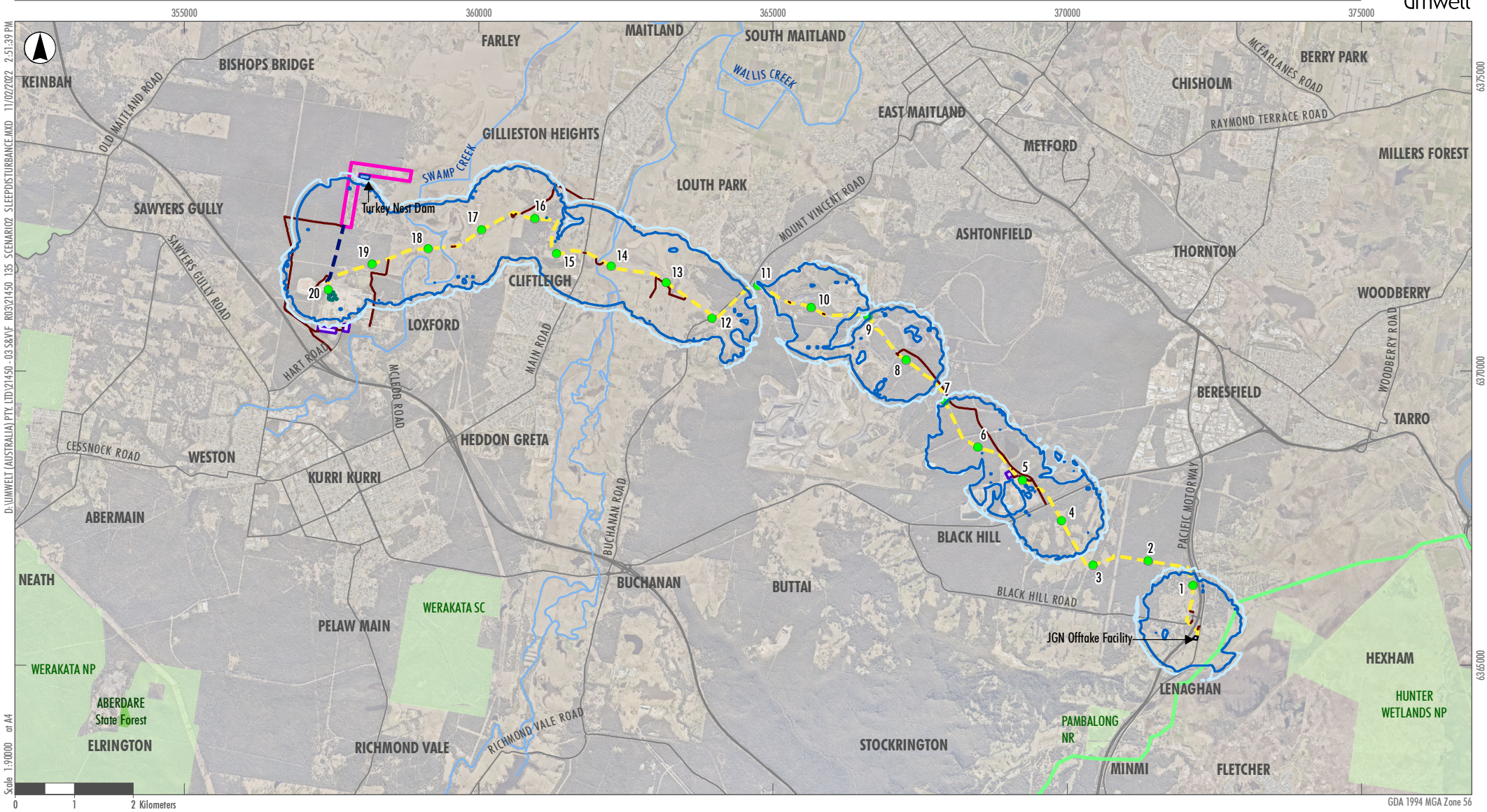
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

FIGURE 5.3

Outside Standard Hours HDD and Horizontal Boring Worst-case Construction LAeq (15min) Noise contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Alignment
- Interconnect Pipeline
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Compressor and Delivery Station
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- JGN Offtake Facility
- NSW Conservation Estates
- State Forest
- Access Tracks
- Roads
- Watercourses

Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

FIGURE 5.4

Sleep Disturbance LAmax Contours for Outside Standard Hours Drilling and Boring

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

5.4.3 Scenario 3 – Outside Standard Hours Storage Pipeline Construction

Scenario 3 represents construction activities associated with the storage pipeline. These construction activities were modelled as occurring concurrently during outside of standard hours, as storage pipeline construction is proposed to be undertaken between 6 am and 6 pm, seven days per week. Activities included in this scenario are the construction of the:

- Storage pipeline: Modelled as a line source along the extent of the storage pipeline footprint with a sound power of 124 dB(A) has been used to represent multiple stages of the storage pipeline construction, on the same basis as the transmission pipeline construction works as the process will be similar. This sound power assumes that receivers may be impacted by up to three of the worst-case pipeline construction scenarios at the same time.

The scenario sound power and equipment in each scenario is shown in **Table 5.2**, with equipment in each scenario detailed in **Appendix C**.

It assumes all equipment is in use concurrently, representing worst-case construction noise impacts outside of standard hours for the construction works listed.

The $L_{Aeq(15min)}$ noise contours for outside of standard hours construction of the storage pipeline are shown in **Figure 5.5.**

The sound powers for each of the storage pipeline construction activities are based on all construction equipment operating 100% of the time, with simultaneous utilisation at each worksite, and are considered to provide a conservative estimate of potential maximum noise levels for the modelled scenario. In order to determine potential sleep disturbance impacts, a separate model was run to simulate a maximum noise level from an event in each of the construction areas. A typical L_{Amax} sound power of 125 dB(A) was adopted (GHD, 2020).

The L_{Amax} noise contours for the potential sleep disturbance impacts from the construction of the storage pipeline are shown in **Figure 5.6**. It should be noted that NCA 2 has a sleep disturbance criterion of 53 dB(A), whereas all other NCAs have a criterion of 52 dB(A).

Table 5.10 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 3 – Storage Pipeline Construction

NCA	No. Receivers in NCA	Range of Predicted Noise Levels	No. receivers within each Perception Category – Outside Standard Hours – Day [1]					No. receivers within each Perception Category – Outside Standard Hours – Evening					No. receivers within each Perception Category – Outside Standard Hours – Night				
			HI	MI	CA	N	Total	HI	MI	CA	N	Total	HI	MI	CA	N	Total
NCA1a	1,504	< 35 - 41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1b	6	< 35 - 37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1c	240	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1d	7	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA2a	20	37 - 41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA3a	1	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA3b	4	39 - 41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA4a	484	< 35 - 46	-	-	-	1	1	-	-	-	1	1	-	-	1	3	4
NCA4b	1,509	< 35 - 46	-	-	-	3	3	-	-	-	5	5	-	-	4	43	47
NCA4c	57	< 35 - 37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5a	3,263	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5b	311	< 35 - 37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6a	727	< 35 - 38	-	-	-	-	-	-	-	-	25	25	-	-	-	215	215
NCA6b	841	< 35 - 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6c	25	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7a	204	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7b	277	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7c	2,832	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7d	1	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA8a	1,248	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA8b	66	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**13,627**	**--**	**0**	**0**	**0**	**4**	**4**	**0**	**0**	**0**	**31**	**31**	**0**	**0**	**5**	**261**	**266**

Notes: [1] HI is Highly Intrusive; MI is Moderately Intrusive; CA is Clearly Audible; N is Noticeable; Total is the number of receivers greater than the NML.

The predicted noise levels are summarised in Table 5.10 for each period outside of standard hours and indicate a range of potential noise levels across each NCA. As presented in the table, a number of sensitive receivers are predicted to experience noise levels above the applicable noise management levels in each period. The noise level perception for each construction period indicates the following:

- Outside Standard Hours - Day:
    - 4 receivers may find the noise levels are noticeable
- Outside Standard Hours - Evening:
    - 31 receivers may find the noise levels are noticeable
- Outside Standard Hours - Night:
    - 5 receivers may find the noise levels are clearly audible
    - 261 receivers may find the noise levels are noticeable.

The predicted sleep disturbance noise levels (LAmax) are summarised in **Table 5.11**. The modelling results indicate that the noise levels are predicted to comply with the applicable sleep disturbance noise management levels of 52 dB(A) LAmax (or 53 dB(A) LAmax for NCA 2a).

The noise modelling results and analysis for both the average noise levels and the sleep disturbance noise levels indicate that reasonable and feasible noise mitigation measures (see **Section 5.6**) are required to minimise the potential impacts on the communities surrounding the project.

The predicted noise levels at the Industrial and Infrastructure land-use type receivers are summarised in **Table 5.12** for the construction activities and indicate a range of potential noise levels across each NCA. As presented in **Table 5.12**, the noise levels are predicted to comply with the noise management level of 75dB(A) LAeq(15min) for these receivers.

The predicted noise levels at the Kurri Kurri Tafe are 39 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min). Similarly, the predicted noise levels at the Kurri Kurri High School are less than 35 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min).

Table 5.11 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 3 – Sleep Disturbance Assessment

Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	No. receivers above Sleep Disturbance Noise Management Level
NCA1a	1,504	< 40 - 43	-
NCA1b	6	< 40	-
NCA1c	240	< 40	-
NCA1d	7	< 40	-
NCA2a	20	37 - 42	-
NCA3a	1	41 - 41	-
NCA3b	4	40 - 42	-
NCA4a	484	< 40 - 47	-
NCA4b	1,509	< 40 - 47	-

Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	No. receivers above Sleep Disturbance Noise Management Level
NCA4c	57	< 40	-
NCA5a	3,263	< 40	-
NCA5b	311	< 40	-
NCA6a	727	< 40 - 40	-
NCA6b	841	< 40	-
NCA6c	25	< 40	-
NCA7a	204	< 40	-
NCA7b	277	< 40	-
NCA7c	2,832	< 40	-
NCA7d	1	< 40	-
NCA8a	1,248	< 40	-
NCA8b	66	< 40	-
Total	**13,627**	**-**	**0**

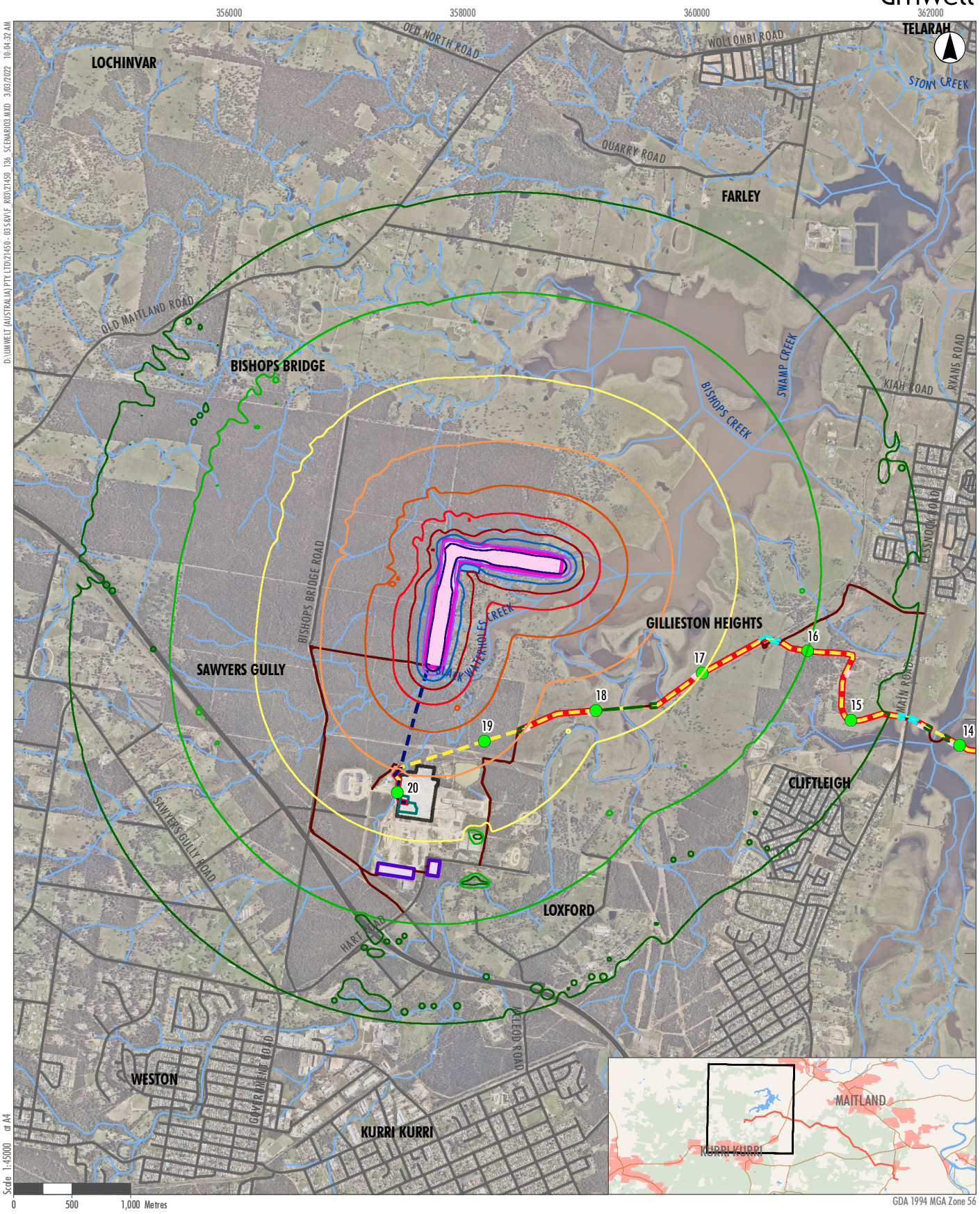
Table 5.12 Summary of predicted noise levels (dB(A)) for Industrial and Infrastructure Land-use receivers from Scenario 3

Land-use type	Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	Comply with NML
Heavy Industrial	NCA1a	15	< 35	Yes
Heavy Industrial	NCA5a	16	< 35	Yes
Infrastructure	NCA4a	1	40	Yes
Infrastructure	NCA5a	8	< 35	Yes
Infrastructure	NCA8a	8	< 35	Yes
Light Industrial	NCA1a	1	< 35	Yes
Light Industrial	NCA5a	134	< 35	Yes
Light Industrial	NCA7c	1	< 35	Yes
Light Industrial	NCA8a	461	< 35	Yes
Total	**-**	**645**	**-**	**-**

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Day period are presented in **Appendix D** - Figure D1.22.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Evening period are presented in **Appendix D** - Figure D1.23.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Night period are presented in **Appendix D** - Figure D1.24.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

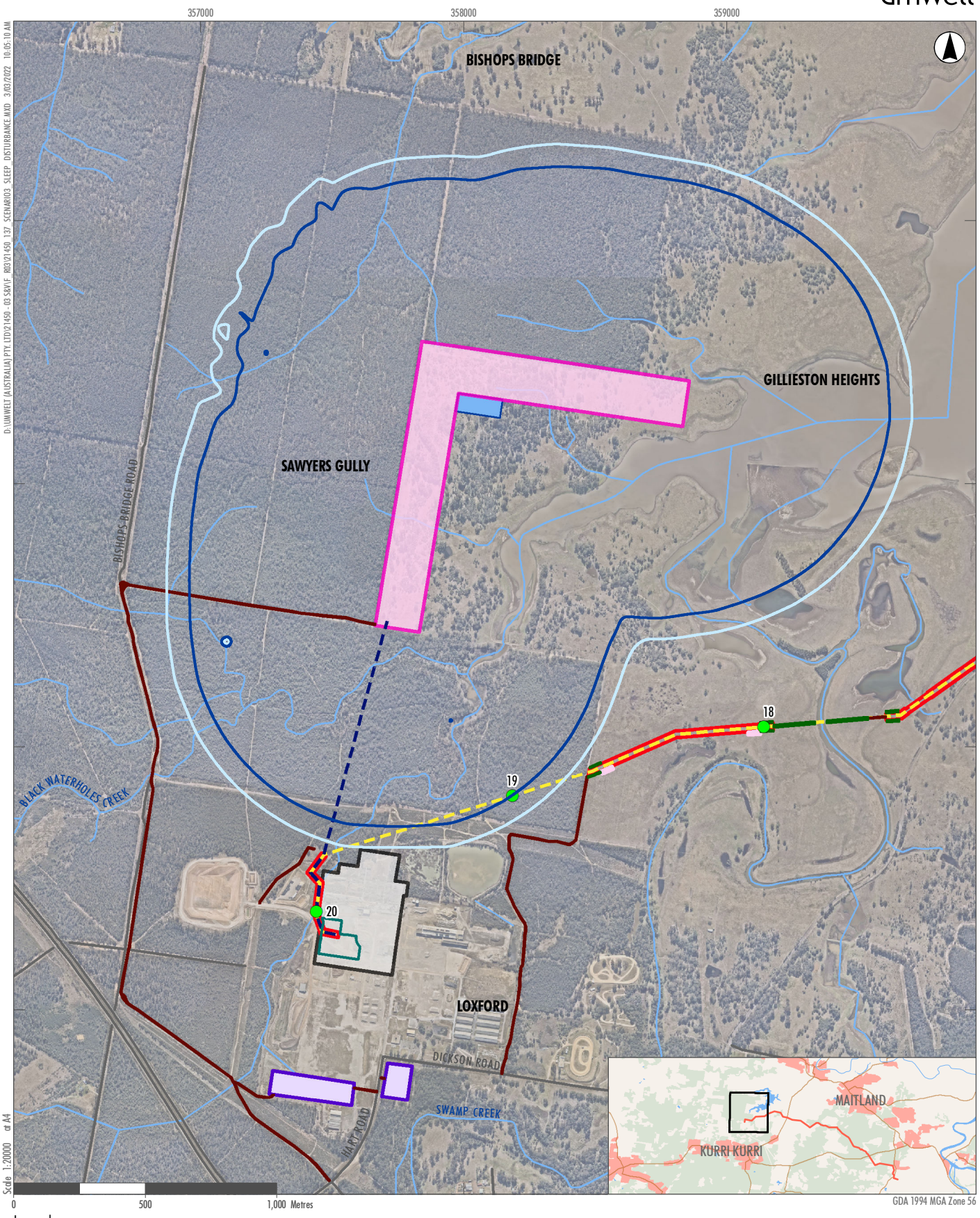
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

FIGURE 5.5

Outside Standard Hours Storage Pipeline and Associated Plant Worst-case Construction LAeq(15 min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

FIGURE 5.6

Sleep Disturbance LAmax Contours for Outside Standard Hours Storage Pipeline and Associated Plant Construction

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)

5.4.4 Scenario 4 – Outside Standard Hours Hydrostatic Testing

Scenario 4 represents hydrostatic testing outside of standard hours. Water pumps for hydrostatic testing may run for continuous periods extending over 24-hours. This scenario was modelled with a worst-case combined sound power of 113 dB(A), as shown in **Table 5.2** and with equipment detailed in **Appendix C**.

The sound power has been modelled near the centre of the transmission pipeline and at the turkeys nest storage adjacent to the storage pipeline construction footprint assuming pumps are running 100% of the time.

The $L_{Aeq(15min)}$ noise contours for outside of standard hours hydrostatic testing are shown in **Figure 5.7**.

Noise levels generated during hydrostatic testing are expected to be relatively continuous in nature due to the type of equipment to be used (water pumps). To assess potential sleep disturbance impacts from hydrostatic testing during the night period, a maximum sound power level of 116 dB(A) was used. Acoustically, this represents a doubling of the scenario noise level and is therefore considered to be a conservative approach to determine potential sleep disturbance impacts.

The L_{Amax} noise contours for the potential sleep disturbance impacts from the construction of the hydrostatic testing are shown in **Figure 5.8**. It should be noted that NCA 2 has a sleep disturbance criterion of 53 dB(A), whereas all other NCAs have a criterion of 52 dB(A).

Table 5.13 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 4 – Hydrostatic Testing

NCA	No. Receivers in NCA	Range of Predicted Noise Levels	No. receivers within each Perception Category – Outside Standard Hours – Day [1]					No. receivers within each Perception Category – Outside Standard Hours – Evening					No. receivers within each Perception Category – Outside Standard Hours – Night				
			HI	MI	CA	N	Total	HI	MI	CA	N	Total	HI	MI	CA	N	Total
NCA1a	1,504	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1b	6	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1c	240	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA1d	7	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA2a	20	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA3a	1	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA3b	4	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA4a	484	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA4b	1,509	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA4c	57	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5a	3,263	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA5b	311	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6a	727	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6b	841	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA6c	25	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7a	204	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7b	277	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7c	2,832	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA7d	1	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA8a	1,248	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA8b	66	< 35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**13,627**	-	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Notes: [1] HI is Highly Intrusive; MI is Moderately Intrusive; CA is Clearly Audible; N is Noticeable; Total is the number of receivers greater than the NML.

The predicted noise levels are summarised in **Table 5.13** for each period outside of standard hours and indicate a range of potential noise levels across each NCA. As presented in the table, the noise levels at all receivers are predicted to be less than 35dB(A) and therefore below the NMLs for each NCA.

The predicted sleep disturbance noise levels (LAmax) are summarised in **Table 5.14**. The modelling results indicate that the noise levels are predicted to comply with the applicable the sleep disturbance noise management levels of 52 dB(A) LAmax (or 53 dB(A) LAmax for NCA 2a).

The noise modelling results and analysis for both the average noise levels and the sleep disturbance noise levels indicate that reasonable and feasible noise mitigation measures (see **Section 5.6**) are required to minimise the potential impacts on the communities surrounding the project.

The predicted noise levels at the Industrial and Infrastructure land-use type receivers are summarised in **Table 5.15** for the various construction activities and indicate a range of potential noise levels across each NCA. As presented in **Table 5.15**, the noise levels are predicted to comply with the noise management level of 75dB(A) LAeq(15min) for these receivers.

The predicted noise levels at the Kurri Kurri Tafe are less than 40 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min). Similarly, the predicted noise levels at the Kurri Kurri High School are less than 30 dB(A) LAeq(15min) which comply with the applicable noise management level of 55 dB(A) LAeq(15min).

Table 5.14 Summary of predicted noise levels (dB(A)) for Residential receivers from Scenario 4 – Sleep Disturbance Assessment

Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels	No. receivers above Sleep Disturbance Noise Management Level
NCA1a	1,504	< 40	-
NCA1b	6	< 40	-
NCA1c	240	< 40	-
NCA1d	7	< 40	-
NCA2a	20	< 40	-
NCA3a	1	< 40	-
NCA3b	4	< 40	-
NCA4a	484	< 40	-
NCA4b	1,509	< 40	-
NCA4c	57	< 40	-
NCA5a	3,263	< 40	-
NCA5b	311	< 40	-
NCA6a	727	< 40	-
NCA6b	841	< 40	-
NCA6c	25	< 40	-
NCA7a	204	< 40	-
NCA7b	277	< 40	-
NCA7c	2,832	< 40	-
NCA7d	1	< 40	-
NCA8a	1,248	< 40	-
NCA8b	66	< 40	-
Total	**13,627**	**-**	**0**

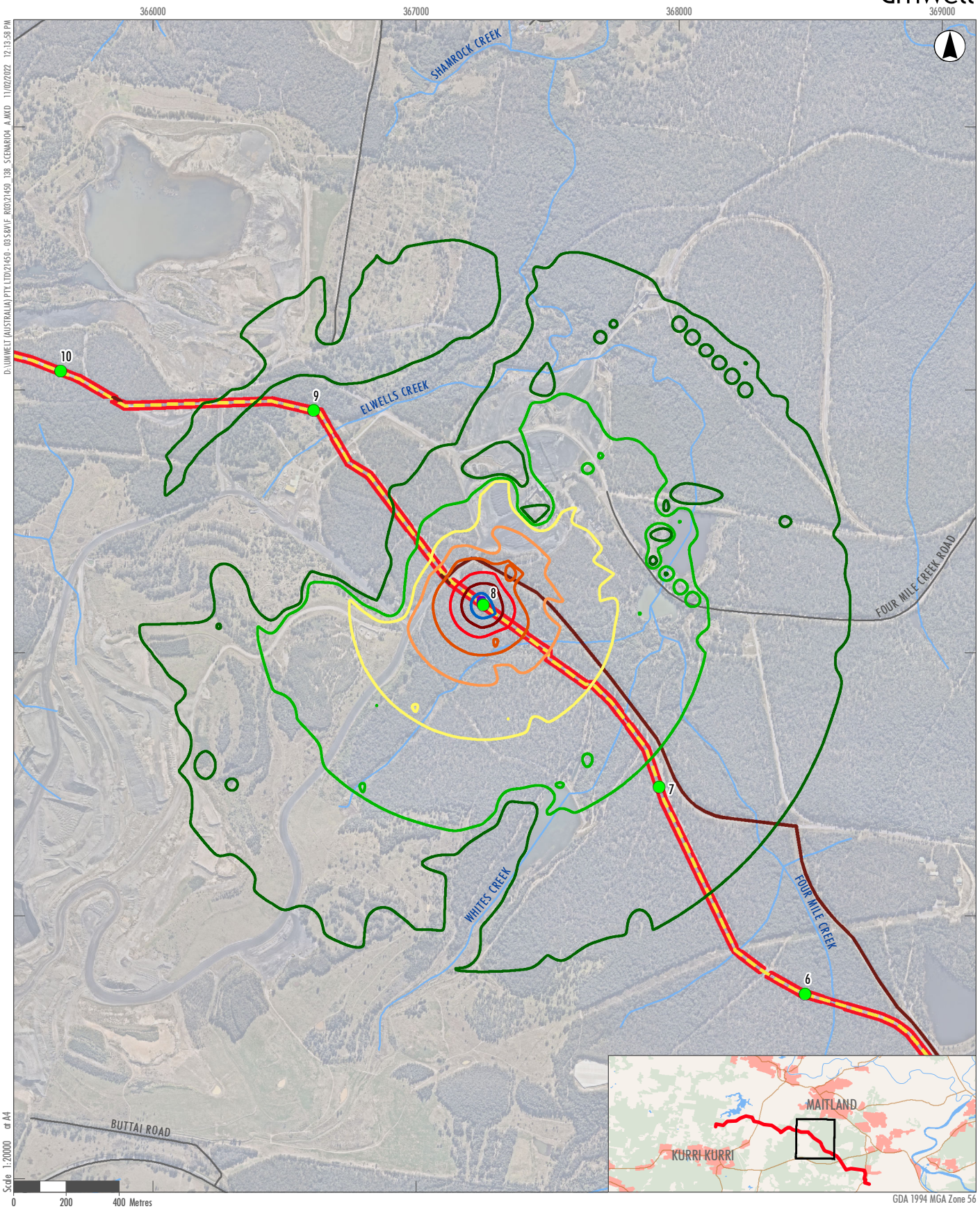
Table 5.15 Summary of predicted noise levels for Industrial and Infrastructure Land-use receivers from Scenario 4

Land-use type	Noise Catchment Area	No. Receivers within Noise Catchment Area	Range of Predicted Noise Levels, dB(A)	Comply with NML?
Heavy Industrial	NCA1a	15	< 35	Yes
Heavy Industrial	NCA5a	16	< 35	Yes
Infrastructure	NCA4a	1	< 35	Yes
Infrastructure	NCA5a	8	< 35	Yes
Infrastructure	NCA8a	8	< 35	Yes
Light Industrial	NCA1a	1	< 35	Yes
Light Industrial	NCA5a	134	< 35	Yes
Light Industrial	NCA7c	1	< 35	Yes
Light Industrial	NCA8a	461	< 35	Yes
Total	-	**645**	-	-

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Day period are presented in **Appendix D** - Figures D1.25 and D1.26.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Evening period are presented in **Appendix D** - Figures D1.27 and D1.28.

The noise level impact maps, highlighting the noise perception categories for construction activities undertaken during the Outside of Standard Hours - Night period are presented in **Appendix D** - Figures D1.29 and D1.30.



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

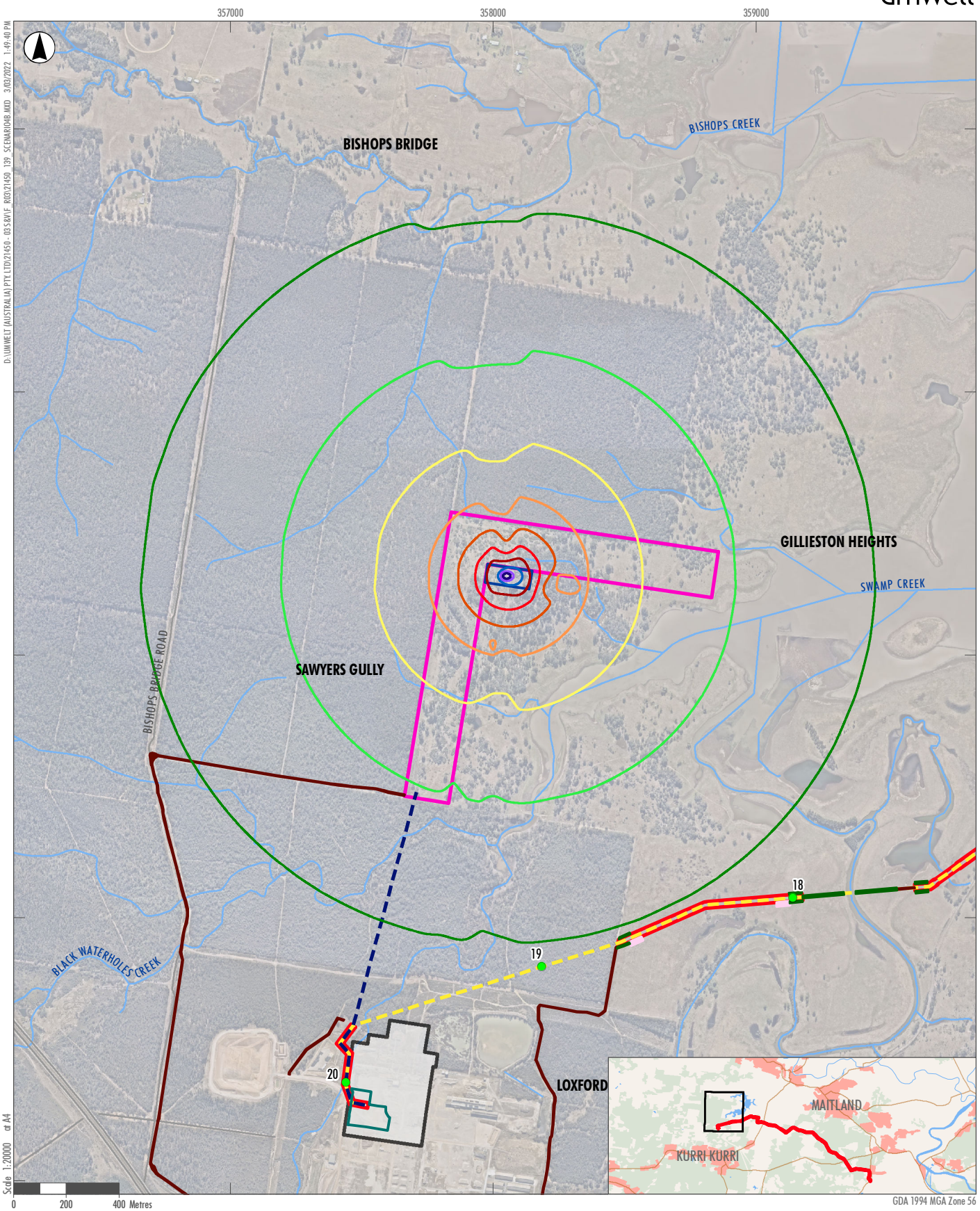
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

FIGURE 5.7A

Outside Standard Hours Hydrostatic Testing LAeq (15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

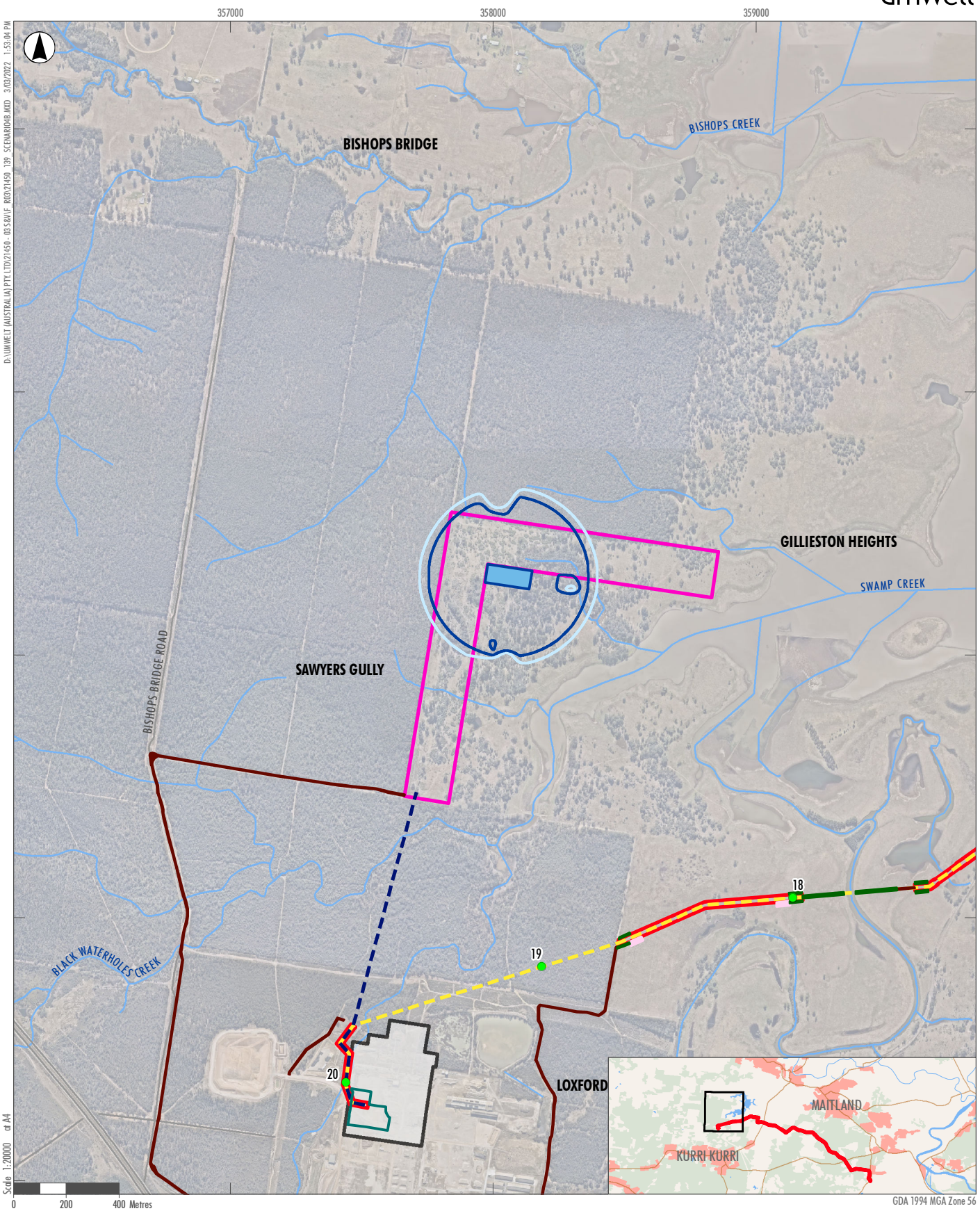
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

FIGURE 5.7B

Outside Standard Hours Hydrostatic Testing LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

FIGURE 5.8

Sleep Disturbance LAmax Contours for Outside Standard Hours Hydrostatic Testing

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

5.5 Construction Vibration

Many items of construction equipment generate vibration that may be perceptible to receivers and cause annoyance or cause structural damage to buildings or other structures.

The types of vibration-sensitive receivers in the Project area likely include:

- Residential dwellings (occupants)
- Residential dwellings (structures)
- Commercial/agricultural buildings.

The commercial buildings in the area are structurally similar to residential buildings, therefore the assessment for residential buildings is considered to be relevant for the commercial receivers as well.

Recommended safe working distances for vibration generating equipment from sensitive receivers (i.e. the receiver building or its occupants) are given in Table 2 of the NSW *Construction Noise and Vibration Guideline* (CNVG) (RMS, 2016) reproduced in **Table 5.16**.

Table 5.16 Recommended Minimum Working Distances for Vibration Generating Plant from a Residential Sensitive Receiver (CNVG Table 2)

Plant Item	Rating/Description	Minimum Working Distance [1]	
		Cosmetic Damage (Residential Building)	Human Response
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	300 kg - 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg – 18 to 34t excavator	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Handheld	1 m (nominal)	2 m

Notes: [1] More stringent conditions may apply to heritage or other sensitive structures

The separation distances between the Project and receivers is greater than the minimum working distance of 100 m for human response outlined in the CNVG, suggesting that vibration impacts from construction activities will be negligible.

Should more intensive vibration generating equipment be used for the Project, or at locations nearer to receivers or near identified heritage structures, it is recommended that a targeted vibration assessment be undertaken.

5.6 Mitigation Measures, Strategies and Commitments

5.6.1 Construction Noise and Vibration Mitigation

Noise and vibration mitigation measures to be implemented during construction of the Project include:

- A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The NVMP will generally follow the approach in the ICNG and identify:
    - all potential significant noise and vibration generating activities associated with the project
    - feasible and reasonable mitigation measures to be implemented
    - a monitoring program to assess performance against relevant noise and vibration criteria
    - arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures
    - contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.
- All sensitive receivers likely to be affected by highly or moderately intrusive noise levels, or noise levels above the Sleep Disturbance NMLs for work outside of standard construction hours (as identified in **Section 5.4** and **Appendix D**) will be notified at least 7 days prior to commencement of any planned works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:
    - the Project
    - the construction period and construction hours
    - contact information for project management staff
    - complaint and incident reporting
    - how to obtain further information.
- All employees, contractors and subcontractors are to receive an environmental induction. The induction must include at a minimum:
    - all applicable mitigation measures
    - hours of works
    - any limitations on high noise-generating activities
    - location of nearest sensitive receivers
    - designated parking areas
    - relevant approval conditions
    - incident procedures.
- Where feasible, contractors are to keep noise to a minimum including no shouting or the use of loud stereos/radios on site.

- No dropping of materials from height, throwing of metal items or slamming of car doors.
- In the event of noise complaints from the community, a noise verification program should be carried out in accordance with the NVMP for the Project.
- The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels consistent with those nominated in **Appendix C**.
- Non-tonal reversing beepers must be fitted and used on all construction vehicles and mobile plant used regularly on site and for any out of hours work.
- Limit the use of engine compression brakes at night.
- The CEMP and NVMP should be regularly updated to account for any changes in noise and vibration management of the Project.
- Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration should be scheduled during less sensitive time periods.
- Noise emitting plant to be directed away from sensitive receivers.
- Plant used intermittently to be throttled down or shut down when not in use.
- Where practical, loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.
- Given the distance between the project and receivers, no construction vibration impacts are anticipated based on the safe working distances outlined in the CNVG. Should more intensive vibration generating equipment be used for the Project, or at locations nearer to receivers or near identified heritage structures, it is recommended that a targeted vibration assessment be undertaken to determine impacts and specific mitigation measures, if required.
- Vibration generating plant listed in **Table 5.16** should not be used within the identified safe working distances. If vibratory rollers or other vibration inducing construction sources are required within the safe working distances for residential nominated in **Table 5.16** the following is recommended:
    - an independent specific structural assessment is undertaken on the structure to ascertain the structural integrity and its ability to withstand vibration, and establishment of an appropriate vibration criterion
    - a dilapidation survey is undertaken on the structure prior to works commencing, and regular inspection of the structure throughout the construction activities
    - pre-construction vibration monitoring to establish baseline vibration impacts induced on the structure from road traffic
    - where appropriate, continuous vibration monitoring is conducted on the structure for the duration of the period of construction while vibration generating equipment is used. The vibration logger should be equipped with the facility to remotely alert the site to reduce or cease construction activities if vibration levels are approaching the criterion threshold
    - stationary noise sources should be enclosed or shielded where feasible or reasonable.

5.6.2 Mitigation measures specific to drilling and boring

Drilling and boring activities have been assessed for both standard hours and outside of standard hours works as some activities are continuous and will extend across different periods of multiple days.

A qualitative mitigation measure to be adopted for the HDD locations that are closer to sensitive receivers (Swamp Creek, Wallis Creek, Buttai Creek and John Renshaw Drive) is to reduce the construction hours to 6 am to 6 pm seven days a week for most activities. The exception for these locations will be reaming and pullback works which are required to be continuous once commenced, so will need to occur at any time over a 24 hour period.

HDD locations that are remote from sensitive receivers (end of the transmission pipeline and interconnect pipeline HDDs) will be undertaken continuously for all construction activities.

5.6.3 Summary of Commitments relating to potential noise and vibration impacts

The environmental commitments for the Project which are relevant to this NVIA are summarised in **Table 5.17**. The summary identifies the technical discipline that the commitment is relevant to, a unique ID, the commitment itself and the stage of the Project when the commitment will be implemented.

Post-exhibition of the EIS, the commitments summarised in **Table 5.17** may be revised during the submissions phase. The final list of management measures and commitments will be incorporated into the CEMP and operations environmental management plan (OEMP) as appropriate. The CEMP and OEMP will be centralised, scope-specific documents that describe all environmental risks related to the Project and required actions to manage those risks, including conditions of approval.

The CEMP and OEMP will be supported by a number of sub-plans that will provide detailed environmental controls to manage key environmental issues. The CEMP and OEMP shall be reviewed and updated as necessary throughout the relevant phases of the Project.

Table 5.17 Summary of Project Commitments

Discipline	ID	Mitigation Measure	Timing
General	G01	The Project will be designed, constructed and operated in accordance with AS2885. Environmental management measures for the Project will be consistent with the APGA Code of Environmental Practice, 2017.	Pre-construction, Construction, Operations
General	G02	All Project personnel will undertake an induction that will include environmental management and cultural heritage management requirements.	Pre-construction, Construction
General	G03	Typical construction hours for the Project will be as follows: • Transmission pipeline and JGN offtake facility: 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturdays • Storage pipeline: 6 am to 6 pm 7 days per week • Compressor station and delivery station: 6 am to 6 pm weekdays and 8 am to 1 pm Saturdays.	Construction
General	G04	The following activities may extend beyond typical construction hours listed in G03: Trenchless crossings, hydrotesting, non-destructive testing (NDT), pipe transport from port to laydown areas, and activities delayed by extenuating circumstances beyond the control of the Project.	Construction
General	G05	Pipe laydown areas shall be located within the construction footprint identified within this EIS so that: • No impact to heritage items or sites, unless authorised through an appropriate agreement. • Located more than 50 m from a waterway, excluding access tracks. • Located above the 20 ARI flood level, excluding access tracks.	Construction
Air quality	AQ01	Plant and equipment will be maintained in good condition to minimise ignition risk, spills and air emissions that may cause a nuisance.	Construction, Operations
Noise and Vibration	NV01	Any pipeline construction activities proposed for non-standard hours (as defined in the NSW Interim Construction Noise Guideline) which are unlikely to meet noise criteria at residences will be conducted in consultation with affected landholders except in the event of an emergency.	Construction
Noise and Vibration	NV02	Construction activities will only be undertaken outside of standard construction hours (defined in the NSW Interim Construction Noise Guideline as 7 am to 6 pm weekdays and 8 am to 1 pm on Saturdays at no time on Sundays and public holidays) where feasible and reasonable noise mitigation measures are in place and approval conditions can be complied with.	Planning, Construction
Noise and Vibration	NV03	Blasting, if required, will be carried out in accordance with the following measures: • Conducted only where conventional excavation or trenching is ineffective or impractical, or if blasting will provide a reduction in environmental impacts. • Conducted with appropriate dust control measures. • Conducted according to a blast procedure prepared by a qualified person. • Conducted only where consultation has occurred with affected landholders.	Construction
Noise and Vibration	NV04	Broadband reversing alarms will be used in preference to 'beeper' reversing alarms on construction vehicles and machinery.	Construction
Noise and Vibration	NV05	As noise generated by venting at the JGN Offtake Facility, the compressor station, delivery station and storage pipeline is dependent upon the detailed design of these facilities, noise profiles will be reassessed during detailed design and management measures to mitigate noise from venting will be implemented if sensitive receptors are expected to be impacted.	Planning, Operations
Noise and Vibration	NV06	Pumps and compressors used for hydrotesting and pigging activities will be muffled or otherwise treated to reduce noise emissions.	Construction
Noise and Vibration	NV07	Additional noise modelling and, if required, mitigation will be undertaken during detailed design for the JGN offtake facility, compressor station and delivery station. Management measures to further mitigate noise emissions will be implemented if impacts to sensitive receptors are predicted to be above the relevant noise criteria.	Planning, Operations
Social Amenity	SA01	All reasonable steps will be undertaken to enter into an agreement with each landholder on fair and reasonable terms. Agreements will include commitments to agreed measures to minimise the impact of the Project on landholder activities which will be managed in a central database.	Planning, Construction
Social Amenity	SA02	A Schedule of Landholder Agreements will be compiled and maintained, documenting actions to be carried out on each property.	Planning, Construction
Social Amenity	SA03	A complaints management system will be put in place that documents: • Name of persons receiving the complaint. • Name of person making the complaint. • Date and time of the complaint. • Nature of the complaint. • Actions taken to rectify. • Actions to minimise risk of reoccurrence. • Name of person(s) responsible for undertaking the required actions.	Construction, Operations
Social Amenity	SA04	A stakeholder engagement plan will be implemented to facilitate ongoing consultation with relevant stakeholders throughout the Project so that stakeholders have access to information regarding the nature of the proposed Project activities and their likely impacts.	Planning, Construction, Operations
Social Amenity	SA11	Landholders will be provided with a dedicated point of contact for the duration of the Project.	Planning, Construction, Operations
HDD	HD01	A HDD management plan including drill profile design, work method statement, proposed volumetric drilling fluid tracking program and proposed intervention levels, will be prepared for each HDD prior to the commencement of HDD activities. The management plan will include specific noise mitigation requirements for each HDD.	Planning

6.0 Operational Noise Assessment

6.1 Modelling Methodology

As with the construction noise predictions, operational noise level predictions were undertaken with the proprietary computer noise modelling software SoundPLAN version 8.2, using the CONCAWE noise prediction algorithms. The noise models were developed using 3-Dimensional terrain data provided by the project team.

Operational noise levels have been predicted under default worst-case meteorological conditions (D-class with 3m/s windspeed or F-class with 2m/s windspeed) in accordance with the NPfI. These meteorological conditions represent worst-case enhancing conditions for either day, evening or night periods.

Three operational noise scenarios have been considered as part of this assessment to address operational noise emissions from the following project components:

- The compressor station and delivery station located adjacent to the HPP.
- The JGN offtake facility located near Lenaghans Road at the eastern end of the project.
- The Venting Facility located adjacent to the Storage Pipeline.

6.2 Compressor Station and Delivery Station Assessment

This assessment considers the compressor station and delivery station operating at full capacity whilst the HPP is not operating. Note that the delivery station will only operate in standby mode when the HPP is not operating, as no gas will be flowing through the delivery facility to the HPP. However, to provide a conservative assessment of noise impacts, the delivery facility has been modelled as operating at full capacity.

6.2.1 Project Noise Trigger Levels

Project noise trigger levels for receivers located near the compressor station and delivery station are based on RBLs determined for the noise catchment areas surrounding the HPP, as described in **Section 3.0** and are shown in **Table 6.1.**

Table 6.1 Trigger Noise Levels for Operational Noise Levels from the compressor station and delivery station

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Project Intrusiveness Noise Level (PINL) D/E/N LAeq(15min)	Project Amenity Noise Level (PANL) D/E/N LAeq(15min)	Project Noise Trigger Level (PNTL) D/E/N LAeq(15min)	Sleep Disturbance Limit LAmax
NCA 1	R1-1	Residential	50/50/41	58/48/43	50/48/41	52
NCA 2	R2-1	Residential	45/45/43	58/48/43	45/45/43	53
	R2-2	Commercial	-	60	60	N/A
NCA 3	R3-1	Residential	43/43/42	53/43/38	43/43/38	52
	R3-2	Commercial	-	60	60	N/A
	R3-3	Education	-	40	40	N/A

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Project Intrusiveness Noise Level (PINL) D/E/N LAeq(15min)	Project Amenity Noise Level (PANL) D/E/N LAeq(15min)	Project Noise Trigger Level (PNTL) D/E/N LAeq(15min)	Sleep Disturbance Limit LAmax
NCA 4	R4-1	Residential	43/41/37	48/43/38	43/41/37	52
NCA 5	R5-1	Residential	42/42/40	53/43/38	42/42/38	52

As indicated in **Table 6.1**, the noise limits for the night-time period are the most stringent. The proposed facility is able to operate at any time over the day, evening or night, therefore the night-time project noise trigger levels represent the design target for the facility.

6.2.2 Model Inputs

The operational noise model included the major noise sources presented in **Table 6.2**. The indicative sound power levels were provided to Umwelt by APA and are representative of the potential equipment to be installed at the facility. The final selection of equipment will be undertaken during the detailed design phase of the project. The facility includes acoustic enclosures for the compressors and electric drives, additionally, the pressure controls valves (PCVs) incorporate the Whisper Trim 3 Sound Attenuation package.

To assess potential sleep disturbance impacts from the facility during the night period, a maximum sound power level 3 dB greater than the combined sound power level of the facility was adopted. Acoustically, this represents a doubling of the operational noise level and is therefore considered to be a conservative approach to determine potential sleep disturbance impacts.

Table 6.2 Operational Sound Power Levels used for the Compressor Station and Delivery Station

Plant	Qty	Indicative Sound Power Levels dB(A)/unit										
		Total	Octave Band Center Frequency Hz									
		dB(A)	16	31	63	125	250	500	1k	2k	4k	8k
Compressor [1,2]	2	110	60	79	89	99	102	102	101	100	99	104
Electric Motor [2]	2	87	5	6	38	63	75	79	83	82	74	56
Compressor and electric drive attenuated enclosure [2]	2	95	-	88	92	90	83	72	62	61	59	64
Process Cooler	2	90	40	60	70	84	84	85	85	86	82	73
Delivery facility – Waterbath heater burner	2	92	-	-	40	58	68	76	86	87	87	67
Delivery facility – Waterbath heater fan	2	90	-	-	44	61	69	84	84	85	81	75
PCV – attenuated	2	93	58	75	86	85	85	81	83	82	84	84

Note: [1] Spectral content was not available for the compressor, a representative spectral shape has been applied from Umwelt's noise source library and adjusted to match the overall dB(A) sound power level.
[2] Noise modelling results are based on the compressor and electric drive located within an acoustic enclosure.

6.2.3 Predicted Noise Levels

Predicted operational LAeq(15min) and LAmax sleep disturbance noise levels for the operation of the compressor station and delivery station are shown in **Table 6.3** and **Table 6.5** respectively.

Modifying factors are applied to the predicted noise levels (LAeq) where the noise has an unbalanced spectrum and contains major components within the low-frequency range, in accordance with Factsheet C of the NPfI. Specifically, these are applied where dB(C) less dB(A) is 15 or more, and any of the low-frequency noise thresholds in NPfI Table C-2 are exceeded. The low-frequency modifying factor analysis is presented in **Table 6.4**.

Table 6.3 Predicted Operational Noise Levels LAeq(15min) from the compressor station and delivery station, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Night Period Project Noise Trigger Level LAeq(15min)	Predicted Noise Levels LAeq(15min)	Exceedance
NCA 1	R1-1	Residential	41	31 (29 + 2) [1]	Nil
NCA 2	R2-1	Residential	43	32 (30 + 2) [1]	Nil
	R2-2	Commercial	60	34 (32 + 2) [1]	Nil
NCA 3	R3-1	Residential	38	24	Nil
	R3-2	Commercial	60	26	Nil
	R3-3	Education	40	22	Nil
NCA 4	R4-1	Residential	37	16	Nil
NCA 5	R5-1	Residential	38	23	Nil

Note: [1] A modifying factor of +2 dB(A) is applicable due to low-frequency content, refer to **Table 6.4**.

Table 6.4 Low-Frequency Modifying Factor Analysis for Noise Levels LAeq(15min) from the compressor station and delivery station, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Predicted Noise Levels dB(C)	Difference dB(C) less dB(A)	Exceedance of Low-Frequency Threshold	Low Frequency Penalty, dB(A)
NCA 1	R1-1	Residential	58	28	Yes (<= 5 dB) [1]	2
NCA 2	R2-1	Residential	58	28	Yes (<= 5 dB) [1]	2
	R2-2	Commercial	59	27	Yes (<= 5 dB) [1]	2
NCA 3	R3-1	Residential	53	28	No	Nil
	R3-2	Commercial	54	28	No	Nil
	R3-3	Education	49	27	No	Nil
NCA 4	R4-1	Residential	44	29	No	Nil
NCA 5	R5-1	Residential	51	28	No	Nil

Note: [1] The predicted noise level spectrum indicates an exceedance of up to 5 dB above the low-frequency threshold levels from Table C-2 within Factsheet C of the NPfI, therefore a modifying factor of +2 dB(A) is applicable due to low-frequency content (NPfI Table C-1).

Table 6.5 Predicted Sleep Disturbance LAmax Noise Levels from the compressor station and delivery station, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Sleep Disturbance Noise Limit LAmax	Predicted Noise Levels LAmax	Exceedance
NCA 1	R1-1	Residential	52	34 (32 + 2) [1]	Nil
NCA 2	R2-1	Residential	53	35 (33 + 2) [1]	Nil
NCA 3	R3-1	Residential	52	27	Nil
NCA 4	R4-1	Residential	52	18	Nil
NCA 5	R5-1	Residential	52	25	Nil

Note: [1] A modifying factor of +2 dB(A) is applicable due to low-frequency content, refer to Table 6.4.

As demonstrated in **Table 6.3** and **Table 6.5**, the noise levels from the compressor station and delivery facility operating without the HPP are predicted to comply with the day, evening and night period noise limits at the nearest representative receivers in the area surrounding the Project.

6.3 JGN Offtake Facility Assessment

6.3.1 Project Noise Trigger Levels

Project noise trigger levels for receivers near the JGN offtake facility are based on RBLs determined for NCA 8 in **Sections 3.0** and **4.2**, and are shown in **Table 6.6.** As the offtake facility may operate at any time as required in a 24-hour period, predicted noise levels have been compared to the most restrictive night period project noise trigger level and also against the sleep disturbance parameter determined in accordance with the NPfI.

Table 6.6 Project Noise Trigger Levels for Operational Noise Levels from the JGN Offtake Facility, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Project Intrusiveness Noise Level (PINL) D/E/N LAeq(15min)	Project Amenity Noise Level (PANL) D/E/N LAeq(15min)	Project Noise Trigger Level (PNTL) D/E/N LAeq(15min)	Sleep Disturbance Limit LAmax
NCA 8	R8-1 to R8-8	Residential	50/48/40	53/43/38	50/43/38	52

As indicated in **Table 6.6**, the noise limits for the night-time period are the most stringent. The proposed facility is able to operate at any time over the day, evening or night, therefore the night-time project noise trigger levels represent the design target for the facility.

6.3.2 Model Inputs

APA advised that the JGN Offtake Facility would be operated by APA, with an adjacent facility, the JGN delivery facility, operated by Jemena. The design, construction and operation of the JGN delivery facility is subject to a separate planning and environmental approvals process.

The JGN delivery facility will operate when gas is being transported from the Sydney to Newcastle pipeline to the compressor station. The JGN offtake facility will operate when gas is flowed from the storage pipeline through the transmission pipeline and back into the Sydney to Newcastle pipeline. Therefore, there are no cumulative operational noise impacts from these facilities, as they will not be operating at the same time.

APA advised that primary noise sources at the JGN offtake facility would be two regulator valves, at a height of approximately 1.2m above ground level. As a minimum, the valves will be fitted with Whisper Trim 3 cages, so the sound power used for the PCV valves at the delivery station has been used at the offtake facility. This is considered a conservative approach as the PCVs at the delivery station will be operating under higher pressure. APA advised that there are no other significant noise sources proposed for the APA offtake facility.

Preliminary sound power levels used in the offtake facility model are shown in **Table 6.7**. A point source representing the two regulator valves were placed at the eastern end of the transmission pipeline, near the expected location of the JGN offtake facility to predicted night period LAeq(15min) noise levels.

The indicative sound power levels were provided to Umwelt by APA and are representative of the potential equipment to be installed at the facility. The final selection of equipment will be undertaken during the detailed design phase of the project.

To assess potential sleep disturbance impacts from the offtake facility during the night period, a maximum sound power level of 99 dB(A) was used. Acoustically, this represents a doubling of the operational noise level and is therefore considered to be a conservative approach to determine potential sleep disturbance impacts.

Table 6.7 Operational Sound Power Levels used for the JGN Offtake Facility

Plant	Qty	Indicative Sound Power Levels dB(A)/unit									
		Total	Octave Band Center Frequency Hz								
		dB(A)	16	31	63	125	250	500	1k	2k	4k	8k
PCV – attenuated (each)	2	93	58	75	86	85	85	81	83	82	84	84
PCV – attenuated (Maximum noise level for sleep disturbance assessment)	2	99	64	81	92	91	91	87	89	88	90	90

6.3.3 Predicted Noise Levels

Predicted operational LAeq(15min) and sleep disturbance noise levels for the operation of the JGN offtake facility are shown in **Table 6.8** and **Table 6.10** respectively.

Modifying factors are applied to the predicted noise levels (LAeq) where the noise has an unbalanced spectrum and contains major components within the low-frequency range, in accordance with Factsheet C of the NPfI. Specifically, these are applied where dB(C) less dB(A) is 15 or more, and any of the low-frequency noise thresholds in NPfI Table C-2 are exceeded. The low-frequency modifying factor analysis is presented in **Table 6.9**.

Table 6.8 Predicted Operational Noise Levels LAeq(15min) from the JGN Offtake Facility, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Night Period Criteria LAeq(15min) dB(A)	Predicted Noise Level LAeq(15min) dB(A)	Exceedance
NCA 8	R8-1	Residential	38	21	Nil
	R8-2	Residential	38	39 (34+5) [1]	1
	R8-3	Residential	38	42 (37+5) [1]	4
	R8-4	Residential	38	37 (32+5) [1]	Nil

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Night Period Criteria LAeq(15min) dB(A)	Predicted Noise Level LAeq(15min) dB(A)	Exceedance
	R8-5	Residential	38	33 (31+2) [1]	Nil
	R8-6	Residential	38	38 (33+5) [1]	Nil
	R8-7	Residential	38	24	Nil
	R8-8	Residential	38	20	Nil

Note: [1] A modifying factor of +2 dB(A) / +5 dB(A) is applicable due to low-frequency content, refer to **Table 6.9**.

Table 6.9 Low-Frequency Modifying Factor Analysis for Noise Levels LAeq(15min) from the JGN Offtake Facility, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Predicted Noise Levels LCeq(15min) dB(C)	Difference dB(C) less dB(A)	Exceedance of Low-Frequency Threshold	Low-Frequency Penalty, dB(A)
NCA8	R8-1	Residential	49	28	No	N/A
	R8-2	Residential	60	26	Yes (> 5 dB) [2]	5
	R8-3	Residential	63	26	Yes (> 5 dB) [2]	5
	R8-4	Residential	58	26	Yes (> 5 dB) [2]	5
	R8-5	Residential	57	26	Yes (<= 5 dB) [1]	2
	R8-6	Residential	59	26	Yes (> 5 dB) [2]	5
	R8-7	Residential	51	27	No	N/A
	R8-8	Residential	47	27	No	N/A

Note: [1] The predicted noise level spectrum indicates an exceedance of up to 5 dB above the low-frequency threshold levels from Table C-2 within Factsheet C of the NPfI, therefore a modifying factor of +2 dB(A) is applicable due to low-frequency content (NPfI Table C-1).
[2] The predicted noise level spectrum indicates an exceedance by more than 5 dB above the low-frequency threshold levels from Table C-2 within Factsheet C of the NPfI, therefore a modifying factor of +5 dB(A) is applicable due to low-frequency content (NPfI Table C-1).

Table 6.10 Predicted Sleep Disturbance LAmax Noise Levels from the JGN Offtake Facility, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Sleep Disturbance Criterion LAmax dB(A)	Predicted noise level LAmax dB(A)	Exceedance
NCA8	R8-1	Residential	52	23	Nil
	R8-2	Residential	52	37	Nil
	R8-3	Residential	52	40	Nil
	R8-4	Residential	52	34	Nil
	R8-5	Residential	52	34	Nil
	R8-6	Residential	52	35	Nil
	R8-7	Residential	52	27	Nil
	R8-8	Residential	52	23	Nil

As demonstrated in **Table 6.8**, the operational noise levels from the JGN offtake facility are predicted to comply with the day and evening noise limits. However, it is predicted to exceed the night period noise limits at the two nearest representative receivers in the area surrounding the Project indicating further attenuation will likely be required.

As demonstrated in **Table 6.10**, sleep disturbance noise impacts from the operation of the JGN Offtake Facility are predicted to comply with the project noise trigger levels and sleep disturbance criteria.

6.4 Venting Facility Assessment

Venting of the storage pipeline will need to occur on an infrequent basis for testing and maintenance purposes.

Testing of the storage pipeline will be undertaken approximately every seven to 10 years. Prior to testing, gas held in the storage pipeline will be transferred to the HPP or into the SNP. The subsequent reduction in storage pipeline pressure will prevent all stored gas from being transferred, and approximately 5TJ of residual gas will remain the in the storage pipeline. The residual gas is proposed to be vented at the vent compound adjacent to the compressor station or at a vent located at the above ground connection header assembly. Once venting is completed, testing of the storage pipeline will occur.

As the detailed design of the venting facility has not yet been prepared, the sound power of venting activities is not currently known and it was not able to be modelled at this stage of the Project.

Reasonable and feasible noise control and mitigation are likely to be required for this activity, the specific mitigation measures are yet to be designed, however, they may include sacrificial noise attenuators, temporary localised noise barriers and time restrictions (i.e. day time only). The reasonable and feasible noise controls will be determined during the detailed design phase for the venting facility.

Through the inclusion of reasonable and feasible noise controls, this activity may still result in elevated noise impacts at the sensitive receivers surrounding the facility. These potential noise impacts may be above the operational noise limits described in **Section 4.2**. However, due to the rare occurrence of the venting activity (i.e. once every 10 years) combined with the incorporation of reasonable and feasible noise controls, elevated noise limits may be derived specifically for this venting activity during the detailed design phase.

6.5 Operational Noise Mitigation Measures and Strategies

The operational noise modelling discussed in **Section 6.2** for the compressor and delivery stations indicates that the noise levels are predicted to comply with the relevant noise criteria at the nearest sensitive receivers. The preliminary design for the compressor and delivery stations incorporate noise mitigation in the form of acoustic enclosures for each compressor and electric drive, as well as noise attenuation packages on the pressure control valves.

The operation noise modelling discussed in **Section 6.3** for the JGN Offtake Facility indicates that the noise levels are predicted to exceed the relevant noise criteria at two of the nearest sensitive receivers. An additional noise reduction of 4 dB(A) is required to achieve the noise criteria. The design for the JGN Offtake Facility incorporates noise mitigation in the form of noise attenuation packages on the pressure control valves. Additional noise controls can be incorporated during detailed design to further reduce the noise emission in order to comply with the relevant noise limits.

As discussed in **Section 6.5**, noise modelling and assessment of the Venting Facility is required during later phases of the project.

The operational noise modelling as part of this assessment is based on preliminary design information, therefore, it is recommended that further assessment of noise levels associated with operational activities is undertaken during the detailed design phase of the Project. At that stage when more Project details are confirmed, mitigation measures to reduce operational noise levels should be considered, where required, to achieve PNTLs. Mitigation measures may include the use of alternative equipment, the inclusion of acoustic enclosures or local noise barriers or restricting these activities to the least sensitive times of the day.

7.0 Road Traffic Noise Assessment

7.1 Supporting Information

A Traffic Impact Assessment (TIA) has been prepared by GHD (GHD, 2021). The TIA undertook a review of existing traffic conditions and site access arrangements, assessed traffic and transport implications arising from the construction and operation of the Project, and determined measures to mitigate and manage any adverse impacts to existing road users and road infrastructure.

7.2 Construction Traffic

The Project's traffic and transport impacts would primarily occur during the construction phase as a result of:

- delivery of plant, equipment and materials to the Project area
- transport of pipe segments from the Port of Newcastle to the Project area
- construction activities at or near a road
- transport of construction crews between the Project area and accommodation facilities.

To account for the worst-case scenario, traffic generation during the peak construction period (estimated to take place on the fourth month of construction works, around April 2023) has been analysed and assessed in the TIA. The TIA assumed that the Project area would primarily be accessed from:

- Main Road – providing access to the storage pipeline, the western part of the transmission pipeline and delivery station
- Buchanan Road, north of John Renshaw Drive – providing access to the central part of the transmission pipeline
- Lenaghans Drive, via John Renshaw Drive – providing access to the eastern part of the transmission pipeline and JGN offtake facility.

Based on these primary access points, the construction-related traffic movements were applied to the surrounding road network in year 2023. The forecast existing traffic volumes and construction-related traffic volumes for the surrounding road network are presented in **Table 7.1**.

The potential impacts from the construction-related road traffic noise have been evaluated based on the proposed access and transport routes with consideration of existing traffic volumes and the addition of construction-related traffic volumes. The relative increase in road traffic noise levels due to the addition of the construction-related traffic volumes for each road is presented in **Table 7.2**.

Table 7.1 Forecast existing traffic volumes and construction-related traffic volumes in Year 2023

Road	Direction	Future Traffic Volumes 2023 (vph)						Future Traffic Volumes including construction traffic 2023 (vph)_					
		AADT	HV%	15 hour (7am-10pm)	9 hour (10pm -7am)	AM Peak	PM Peak	AADT	HV%	15 hour (7am-10pm)	9 hour (10pm -7am)	AM Peak	PM Peak
Maitland Road	Southbound	11,625	4%	10,607	1,018	1,034	874	11,705	4%	10,683	1,022	1,038	904
	Northbound	11,859	4%	10,736	1,122	734	1,044	11,939	4%	10,782	1,156	764	1,048
New England Highway	Southbound	39,758	3%	28,645	11,113	1,668	3,072	39,838	3%	28,721	11,117	1,672	3,102
	Northbound	37,354	3%	30,614	6,740	3,260	2,569	37,434	3%	30,660	6,774	3,290	2,573
John Renshaw Drive	Eastbound	5,807	16%	4,616	1,192	473	438	6,019	16%	4,797	1,223	517	516
	Westbound	6,159	16%	5,054	1,104	379	576	6,371	16%	5,215	1,155	457	620
Hunter Expressway	Eastbound	15,663	12%	13,593	2,071	1,182	1,419	15,837	12%	13,720	2,118	1,250	1,475
	Westbound	15,629	12%	12,918	2,711	1,162	1,278	15,803	12%	13,055	2,748	1,218	1,346
M1 Pacific Motorway	Southbound	18,410	13%	16,090	2,321	1,163	1,630	18,564	13%	16,189	2,376	1,250	1,639
	Northbound	18,693	13%	15,491	3,202	1,225	1,161	18,847	13%	15,636	3,211	1,234	1,248
Weakleys Drive	Southbound	10,035	12%	8,324	1,711	896	1,111	10,071	12%	8,324	1,747	940	1,111
	Northbound	11,039	12%	9,157	1,882	1,253	955	11,075	12%	9,193	1,882	1,253	999
Buchanan Road	Southbound	3,869	5%	3,366	503	284	490	4,020	5%	3,493	527	318	545
	Northbound	3,443	5%	2,996	448	331	358	3,594	5%	3,110	485	386	392
Main Road	Southbound	8,567	8%	7,292	1,274	857	857	8,714	8%	7,391	1,322	932	866
	Northbound	8,712	6%	7,416	1,296	871	871	8,859	6%	7,554	1,305	880	946
Lenaghans Drive	Southbound	2,049	12%	1,728	321	209	244	2,203	12%	1,827	376	296	253
	Northbound	2,049	12%	1,728	321	221	209	2,203	12%	1,873	330	230	296

Table 7.2 Relative increase in road traffic noise levels including construction-related traffic volumes

Road	Direction	Noise level increase, dB(A)			
		15 hour (7am-10pm)	9 hour (10pm-7am)	AM Peak	PM Peak
Maitland Road	Southbound	0.0	0.0	0.0	0.1
	Northbound	0.0	0.1	0.2	0.0
New England Highway	Southbound	0.0	0.0	0.0	0.0
	Northbound	0.0	0.0	0.0	0.0
John Renshaw Drive	Eastbound	0.2	0.2	0.4	0.7
	Westbound	0.1	0.3	0.8	0.3
Hunter Expressway	Eastbound	0.0	0.1	0.2	0.2
	Westbound	0.1	0.1	0.2	0.2
M1 Pacific Motorway	Southbound	0.0	0.2	0.3	0.0
	Northbound	0.0	0.0	0.0	0.3
Weakleys Drive	Southbound	0.0	0.1	0.2	0.0
	Northbound	0.0	0.0	0.0	0.2
Buchanan Road	Southbound	0.2	0.3	0.5	0.5
	Northbound	0.2	0.5	0.7	0.4
Main Road	Southbound	0.1	0.2	0.4	0.0
	Northbound	0.1	0.0	0.0	0.4
Lenaghans Road	Southbound	0.2	1.0	1.5	0.2
	Northbound	0.4	0.1	0.2	1.5

As indicated in **Table 7.2**, the potential increase in road traffic noise levels for these roads is less than the 2 dB(A) relative increase criterion for both the Day and Night average noise levels, and the AM and PM peak hour noise levels. Therefore, the increase is only considered a minor impact that would be barely perceptible to the average person. Additionally, this relative increase is only temporary and applicable during the construction period for the project.

7.3 Operational Traffic

Road traffic, as a result of the operational stage of the Project, is not anticipated to materially increase from those already assessed as part of the HPP, therefore have not been assessed in this NVIA.

7.4 Road Traffic Noise Mitigation Measures and Strategies

Based on this assessment, additional mitigation of potential road traffic noise is not required.

8.0 Cumulative Assessment

8.1 Construction Noise

8.1.1 KKLP Construction and HPP Construction

This assessment has considered the potential for cumulative noise levels at the nearby sensitive receivers from the simultaneous construction activities for the KKLP project and HPP project. The approach has conservatively considered the highest predicted construction-related noise levels within each NCA surrounding the HPP (NCA 1 to NCA 5). The predicted construction noise levels for both projects are presented in **Table 8.1**.

Table 8.1 Potential Cumulative Construction Noise Levels from KKLP and HPP, dB(A)

Noise Catchment Area	HPP Predicted Construction Noise Levels	KKLP Predicted Construction Noise Levels	Potential Noise Level Increase
NCA1	47	53	1
NCA2	51	55	1
NCA3	45	53	1
NCA4	32	63	0
NCA5	41	48	1

As presented in **Table 8.1**, the potential nett increase in construction noise levels as a result of simultaneous construction activities is minor and is estimated to be between 0 and 1 dB(A).

The construction noise modelling discussion in **Section 5.4** has already identified that construction-related noise levels from activities for the KKLP project are greater than the noise management levels at sensitive receivers in NCA 2, NCA 3 and NCA 4. The KKLP project has already triggered the need for reasonable and feasible mitigation strategies to manage noise emissions from its construction activities, particularly for NCA 2, NCA 3 and NCA 4.

Therefore, to further minimise the potential construction-related noise levels at the nearby sensitive receivers in NCA1 to NCA5 requires collaboration between the two projects, so that collectively the two projects can implement reasonable and feasible noise mitigation strategies to minimise the combined noise emissions.

Where practical and feasible, this collaboration may include:

- both projects minimising the occurrence of simultaneous high noise activities,
- consideration of the active work areas for both projects and maximising the separation distance between these active work areas and the potentially affected sensitive receivers.

8.1.2 Transmission Pipeline and Black Hill Industrial Estate

Construction activities along the transmission pipeline between KP 0 and KP 5 are likely to be undertaken during the same time period as construction activities a the Black Hill Industrial Estate. The Black Hill Industrial Estate is located adjacent to the ROW between KP 1.5 and KP 2.5. There is potential for cumulative construction-related noise levels for sensitive receivers in NCA 8a from the simultaneous construction activities for both projects.

The construction noise modelling discussion in **Section 5.4** has already identified that construction-related noise levels from activities along the transmission pipeline are greater than the noise management levels at sensitive receivers in NCA 8a, which has already triggered the requirements for reasonable and feasible noise mitigation strategies for the KKLP project. The potential increase in construction-related noise levels due to the simultaneous construction activities from both projects cannot increase by more than 3 dB(A) at the nearest sensitive receiver to both projects.

The KKLP project has already triggered the need for reasonable and feasible mitigation strategies to manage noise emissions from its construction activities. Therefore, to further minimise the potential construction-related noise levels at the nearby sensitive receivers in NCA 8a requires collaboration between the two projects, so that collectively the two projects can implement reasonable and feasible noise mitigation strategies to minimise the combined noise emissions.

Where practical and feasible, this collaboration may include:

- both projects minimising the occurrence of simultaneous high noise activities
- consideration of the active work areas for both projects and maximising the separation distance between these active work areas and the potentially affected sensitive receivers.

8.2 Operational Noise

8.2.1 Compressor Station, Delivery Station and HPP Assessment

This assessment has considered the cumulative noise levels at the nearby sensitive receivers from the simultaneous operation of the compressor station, delivery station and the HPP.

The recommended amenity noise levels and project amenity noise levels for receivers located near the compressor station and delivery station for the noise catchment areas surrounding the HPP, as described in **Section 3.0** and are shown in **Table 8.2**.

Table 8.2 Recommended and Project Amenity Noise Levels for Operational Noise Levels from the Compressor Station and Delivery station

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Recommended Amenity Noise Level D/E/N LAeq(15min)	Project Amenity Noise Level (PANL) D/E/N LAeq(15min)
NCA 1	R1-1	Residential	63/53/48	58/48/43
NCA 2	R2-1	Residential	63/53/48	58/48/43
	R2-2	Commercial	65	60
NCA 3	R3-1	Residential	58/48/43	53/43/38
	R3-2	Commercial	65	60
	R3-3	Education	45	40
NCA 4	R4-1	Residential	53/48/43	48/43/38
NCA 5	R5-1	Residential	58/48/43	53/43/38

As indicated in **Table 8.2**, the noise limits for the night-time period are the most stringent. The proposed facility is able to operate at any time over the day, evening or night, therefore the night-time project amenity noise levels represent the design target for the compressor station and delivery station.

The predicted noise levels for the Compressor Station and Delivery Station compared with the project amenity noise level (PANL) are presented in **Table 8.3**.

Table 8.3 Predicted Noise Levels from the Compressor Station and Delivery Station, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Predicted Compressor Station and Delivery Station Noise Levels LAeq(15min)	Night-time PANL LAeq(15min)	Comply with PANL?	Noise Level range below the PANL, dB(A)
NCA 1	R1-1	Residential	31 [1]	43	Yes	-12
NCA 2	R2-1	Residential	32 [1]	43	Yes	-11
	R2-2	Commercial	34 [1]	60	Yes	-34
NCA 3	R3-1	Residential	24	38	Yes	-14
	R3-2	Commercial	26	60	Yes	-37
	R3-3	Education	22	40	Yes	-21
NCA 4	R4-1	Residential	16	38	Yes	-22
NCA 5	R5-1	Residential	23	38	Yes	-15

Note: [1] A modifying factor of +2 dB(A) is applicable due to low-frequency content, refer to **Table 6.4**.

As indicated in **Table 8.3**, the predicted noise levels from the Compressor Station and Delivery Station are predicted to comply with the Project Amenity noise levels and are at least 10 dB(A) below the Project Amenity noise levels.

The predicted noise levels from the simultaneous operation of the compressor station, delivery station and HPP are presented in **Table 8.4**.

Table 8.4 Predicted Noise Levels from the Compressor Station, Delivery Station and HPP, dB(A)

Noise Catchment Area	Representative Receiver ID	Nearest Receiver Type	Predicted Compressor Station and Delivery Station noise levels LAeq(15min)	Predicted HPP noise levels LAeq(15min)	Cumulative noise levels LAeq(15min)	Night-time Recommended Amenity Noise Level	Comply with Recommended Amenity noise level?
NCA 1	R1-1	Residential	31 [1]	41 [2]	41	48	Yes
NCA 2	R2-1	Residential	32 [1]	43 [2]	43	48	Yes
	R2-2	Commercial	34 [1]	44	44	60	Yes
NCA 3	R3-1	Residential	24	37	37	43	Yes
	R3-2	Commercial	26	39	39	60	Yes
	R3-3	Education	22	37	37	40	Yes
NCA 4	R4-1	Residential	16	30	30	43	Yes
NCA 5	R5-1	Residential	23	33	33	43	Yes

Note: [1] A modifying factor of +2 dB(A) is included due to low-frequency content, refer to **Table 6.4**.
[2] A modifying factor of +2 dB(A) is included due to low-frequency content (Jacobs, 2021).

The predicted cumulative noise levels indicate that the simultaneous operation of the compressor station, delivery station and HPP results in a negligible nett increase in cumulative noise levels at the nearby sensitive receivers. Additionally, the cumulative noise levels are predicted to comply with the recommended amenity noise levels at each of the nearby sensitive receivers.

8.2.2 JGN Offtake Facility and JGN Delivery Facility

The JGN Offtake Facility would be operated by APA, with an adjacent facility, the JGN Delivery Facility, operated by Jemena. The configuration of these two facilities is such that only one facility can operate at any one time. Therefore as these two facilities do not operate simultaneously the further assessment of cumulative noise emissions is not required.

9.0 Decommissioning

The decommissioning of the Project would involve undertaking the construction activities in reverse. From a noise and vibration generating perspective, the decommissioning activities are not as intensive as with construction. The reason being that no drilling, boring or piling or other noise intensive activities are involved. Noise emanating from decommissioning is therefore expected to be less than the construction activities.

The reasonable and feasible management and mitigation strategies discussed in this NVIA would be applicable to minimise any potential decommissioning-related noise impacts at the sensitive receivers.

10.0 Conclusions

Construction Noise

Construction-related noise levels have been assessed at nearby sensitive receivers surrounding the project area. This included the evaluation of four different construction scenarios that represent the various construction activities required for the project and considered the different time periods (i.e. Standard Hours, Outside Standard Hours – Day, Outside Standard Hours – Evening, and Outside Standard Hours – Night) that the activities will be required to be undertaken.

Without the application of noise mitigation measures, the noise levels from all construction activities during standard construction hours were predicted to be greater than the applicable noise management levels at 1,092 receivers across noise catchment areas (NCAs) 2a, 3a, 5b, 6b, 6c, 7a and 8a. Based on the level of noise predicted at the affected receivers it is estimated that 1,074 receivers may find the noise levels clearly audible, 17 receivers may find the noise levels are moderately intrusive and one receiver may find the noise levels highly intrusive.

The noise levels from HDD and Horizontal Boring were assessed during the outside standard hours period. The analysis indicated that the night period resulted in the greatest number of potentially affected receivers. Without the application of noise mitigation measures, the LAeq(15min) noise levels were predicted to be greater than the applicable noise management levels at 2,761 receivers across noise catchment areas (NCAs) 1a, 2a, 3a, 4a, 4b, 6a, 6b, 6c, 7a, 7c, 8a and 8b. Based on the level of noise predicted at the affected receivers it is estimated that 1,582 receivers may find the noise levels are noticeable, 1,150 receivers may find the noise levels clearly audible and 29 receivers may find the noise levels are moderately intrusive. The predicted sleep disturbance noise levels (LAmax) indicate that 64 receivers across NCAs 4a, 6a, 6c and 8a are predicted to receive noise levels above the sleep disturbance noise management level.

The noise levels from the construction of the Storage Pipeline were assessed during the outside standard hours period. The analysis indicated that the night period resulted in the greatest number of potentially affected receivers. Without the application of noise mitigation measures, the LAeq(15min) noise levels were predicted to be greater than the applicable noise management levels at 340 receivers across noise catchment areas (NCAs) 1a, 2a, 3b, 4a, 4b, 5b, 6a and 6b. Based on the level of noise predicted at the affected receivers it is estimated that 333 receivers may find the noise levels are noticeable and 7 receivers may find the noise levels are clearly audible. The sleep disturbance noise levels (LAmax) are predicted to comply with the sleep disturbance noise management levels.

The LAeq(15min) noise levels from the hydrostatic testing activity are predicted to comply with the noise management levels at all receivers. The sleep disturbance noise levels (LAmax) are predicted to comply with the sleep disturbance noise management levels.

The construction-related noise levels received at the Industrial and Infrastructure land-use type receivers were predicted to comply with the applicable noise management levels for each construction scenario.

The construction-related noise levels received at the Kurri Kurri Tafe were predicted to comply with the applicable noise management levels for each construction scenario.

The noise modelling results and analysis for unmitigated noise levels indicate that reasonable and feasible noise mitigation measures are required to minimise the potential impacts on the communities surrounding the project. The noise and vibration mitigation measures to be implemented during construction of the Project are identified in **Section 5.6**.

Construction Vibration

The separation distances between the Project and receivers is greater than the minimum working distance of 100 m for human response outlined in the CNVG, suggesting that vibration impacts from construction activities will be negligible.

Operational Noise

Noise emissions from the operation of the Compressor station and Delivery station located adjacent to the HPP have been assessed and are predicted to comply with the applicable project noise trigger levels at the nearest sensitive receivers.

Noise emissions from the operation of the JGN Offtake facility located at the eastern end of the project area, have been assessed and are predicted to comply with the applicable day and evening project noise trigger levels. However, the noise levels are predicted to exceed the applicable night-time noise limits at the nearest sensitive receivers by up to 4 dB(A). Further noise modelling and noise mitigation design is required during the detailed design phase for this facility. It is anticipated that this facility can comply with the night-time noise trigger levels through the selection of alternative equipment and/or the incorporation of suitable noise controls (i.e. attenuators or acoustic enclosures) to reduce the total emissions from the facility by 4 dB(A).

Noise emissions from the venting of the storage pipeline have been considered as part of this assessment. The venting activity will need to occur on an infrequent basis for maintenance purposes. As the sound power of venting activities is not currently known it was not able to be modelled at this stage of the Project. Reasonable and feasible noise control and mitigation are likely to be required for this activity, the specific mitigation measures are yet to be designed, however, they may include sacrificial noise attenuators, temporary localised noise barriers and time restrictions (i.e. day time only). The reasonable and feasible noise controls will be determined during the detailed design phase for the venting facility.

Road Traffic Noise

Road traffic noise during the construction phase of the Project is predicted to comply with the relative increase criterion of 2 dB(A). Similarly, road traffic resulting from the operational stage of the Project is not anticipated to increase from those already assessed as part of the HPP.

Cumulative Impacts

Potential cumulative impacts during both the construction and operation of the project have been considered and were found to result in a minor potential increase in noise impacts onto the surrounding community. During the construction phase for the KKLP project, collaboration with the construction activities at the HPP and the Black Hill Industrial Estate is recommended. A collaborative approach with the implementation of reasonable and feasible mitigation may lead to a minor reduction in cumulative construction noise levels at the nearby sensitive receivers.

Decommissioning

Noise emanating from decommissioning activities is expected to be far less than construction activities and therefore would comply with the NML's.

The reasonable and feasible management and mitigation strategies discussed in this NVIA would be applicable to minimise any potential decommissioning-related noise impacts at the sensitive receivers.

11.0 References

Australian Standard AS1055-2018 *Acoustics – Description and measurement of environmental noise.*

Australian Standard AS2436-2010 (R2016) *Guide to Noise Control on Construction, Demolition and Maintenance Sites.*

British Standard BS7385-2:1993 *Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground borne vibration*.

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GHD, 2020. *Western Slopes Pipeline EIS, Noise and Vibration Technical Report*.

GHD, 2021. Kurri Kurri Lateral Pipeline Project EIS, *Traffic Impact Assessment* Technical Report.

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NSW Roads and Maritime, 2016. *Construction Noise and Vibration Guideline (CNVG)*, v 1.0.

NSW Roads and Maritime, 2017. *Construction Noise Estimator Tool (CNET)* version 21/03/2017.

APPENDIX A

Daily background noise logging charts

The noise monitoring charts in this Appendix indicate periods where noise data was excluded due to meteorological conditions.

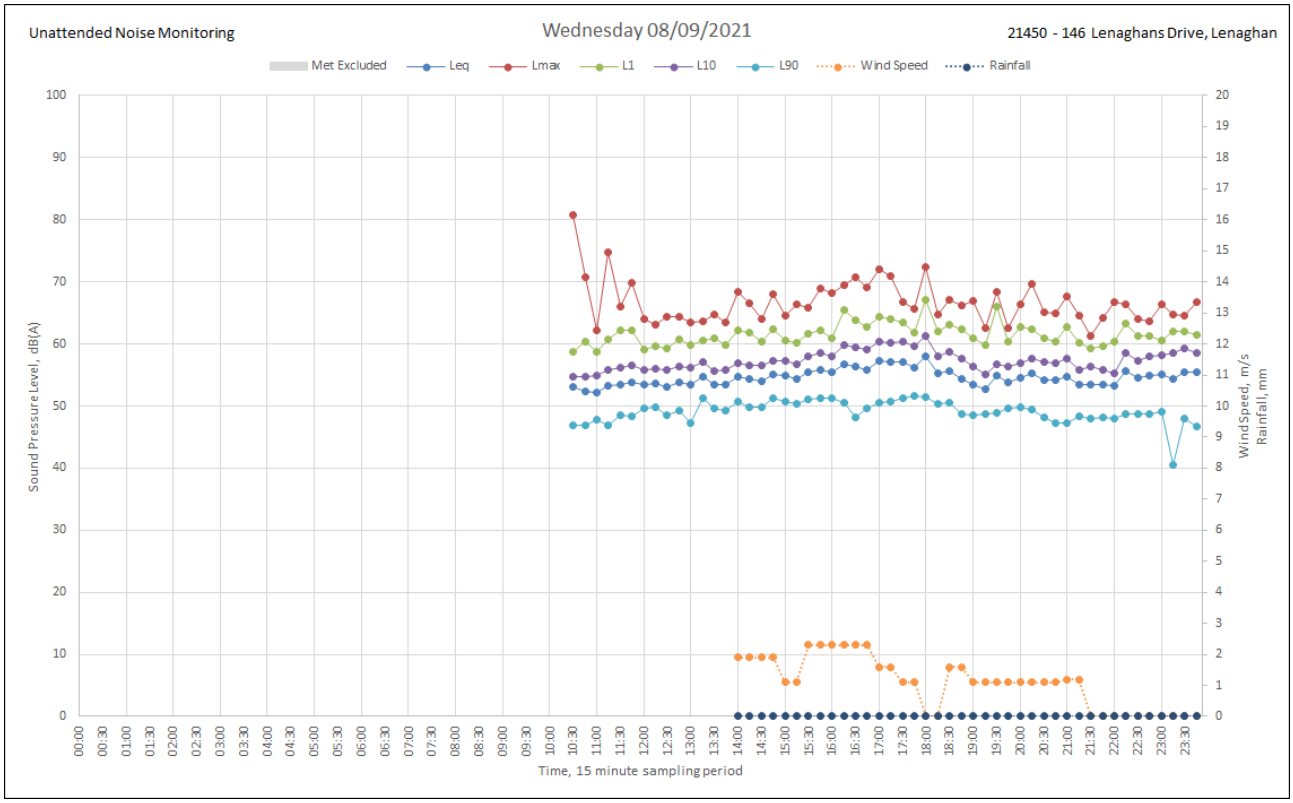


Figure A1.1 Unattended Monitoring Results – Wednesday 08/09/2021

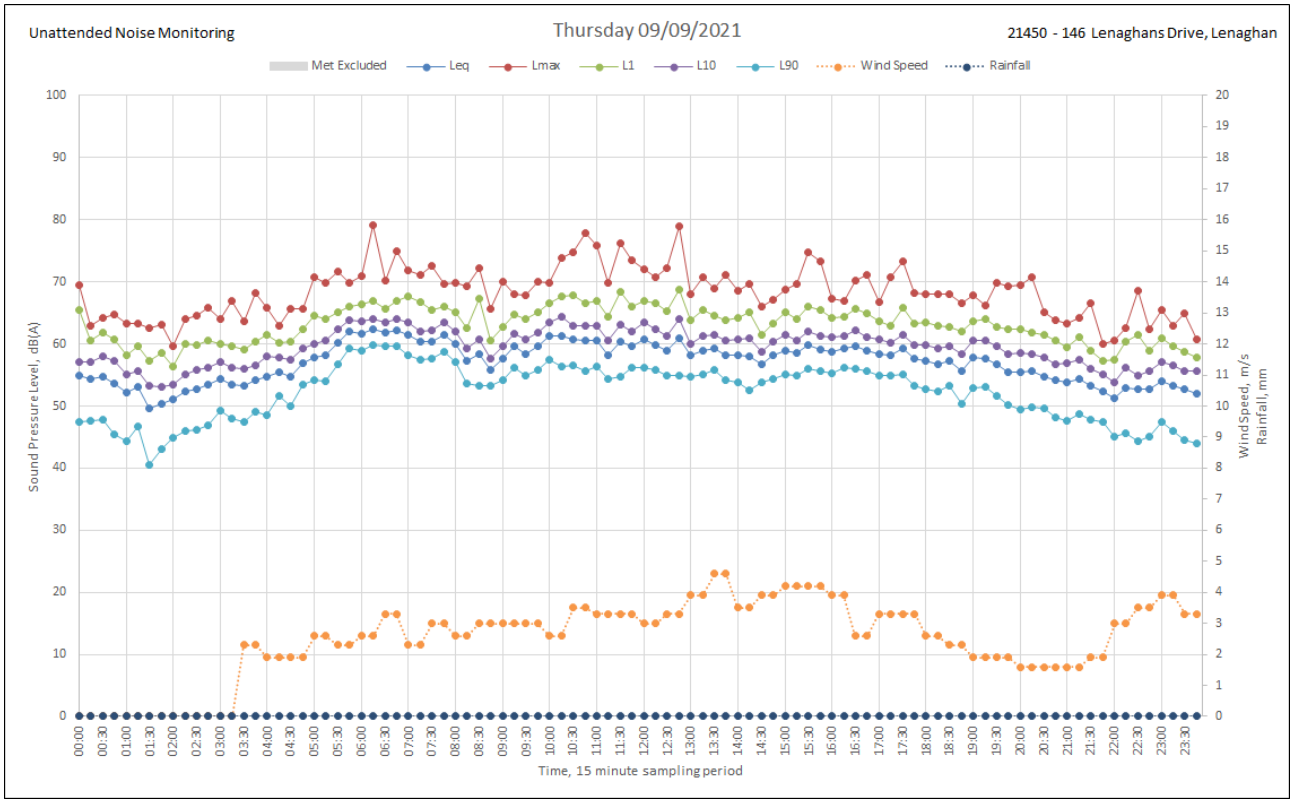


Figure A1.2 Unattended Monitoring Results – Thursday 09/09/2021

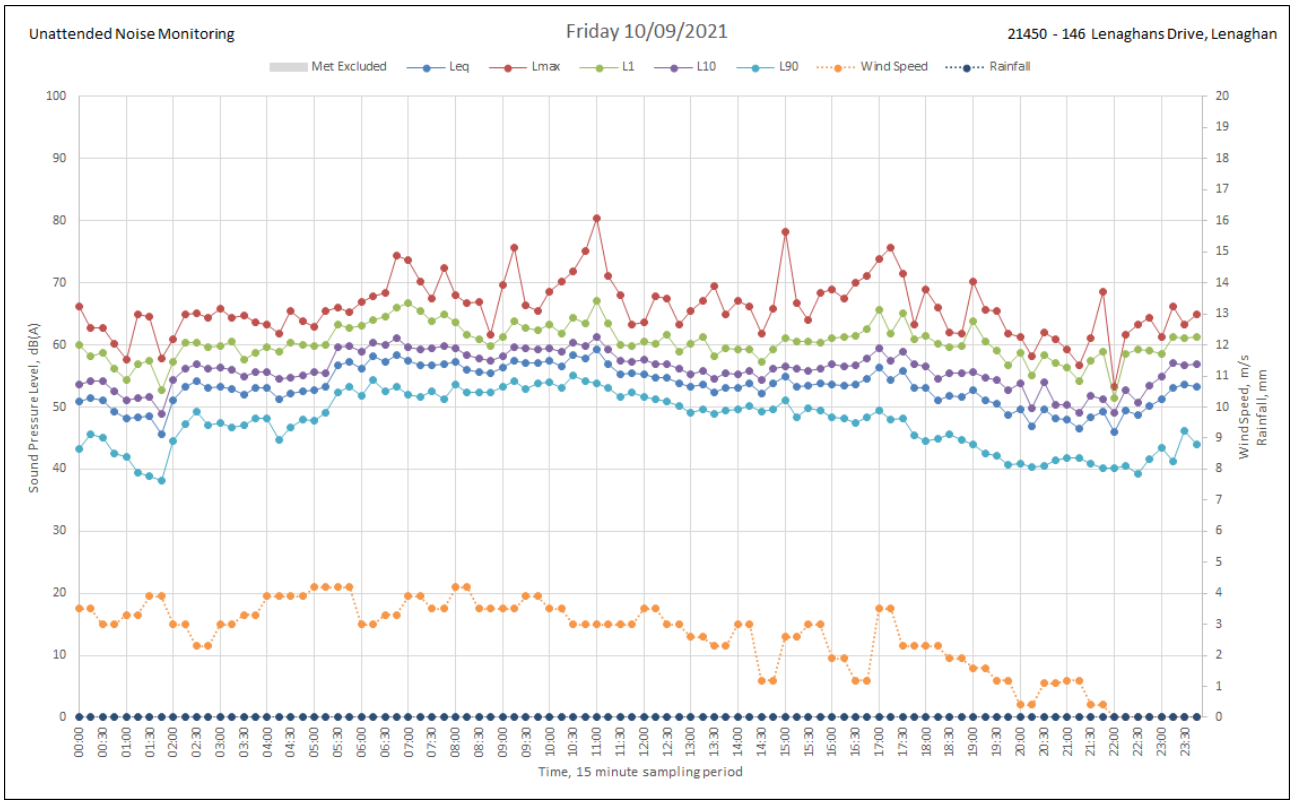


Figure A1.3 Unattended Monitoring Results – Friday 10/09/2021

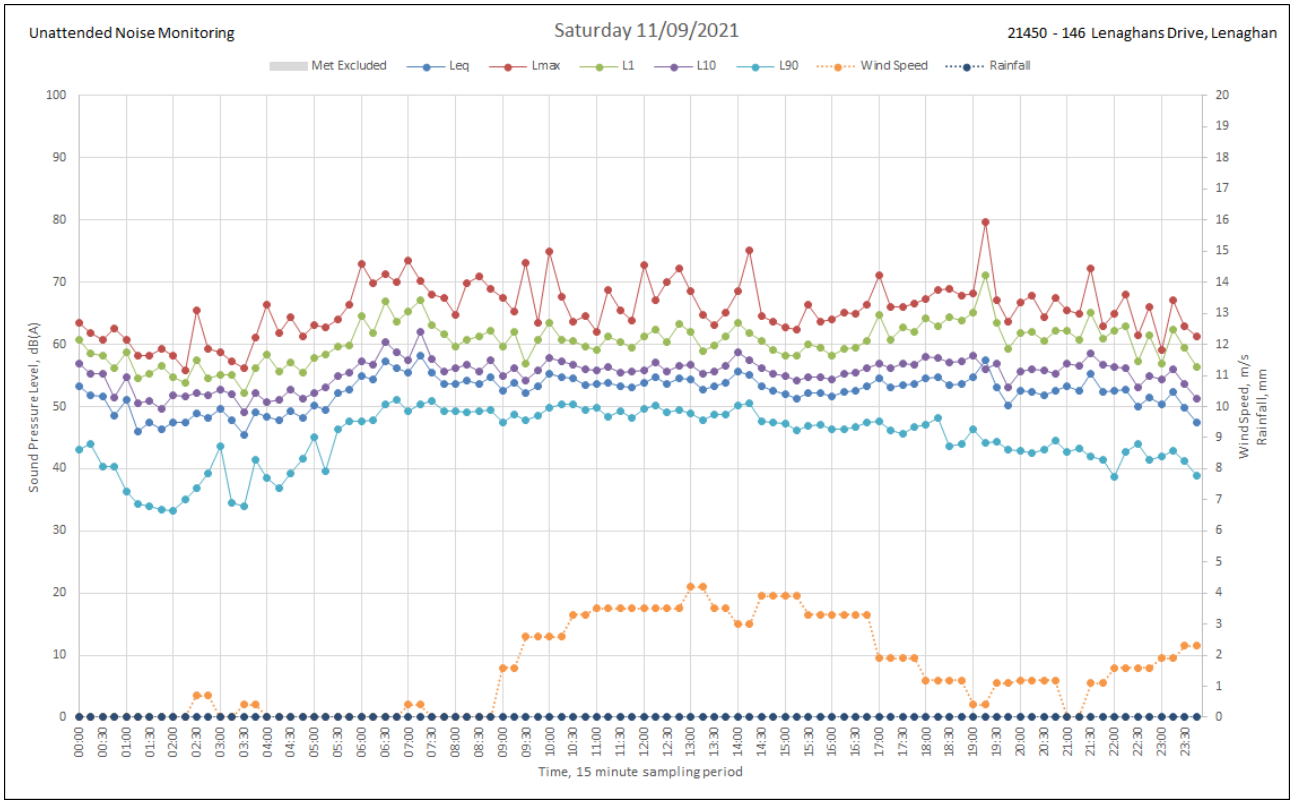


Figure A1.4 Unattended Monitoring Results – Saturday 11/09/2021

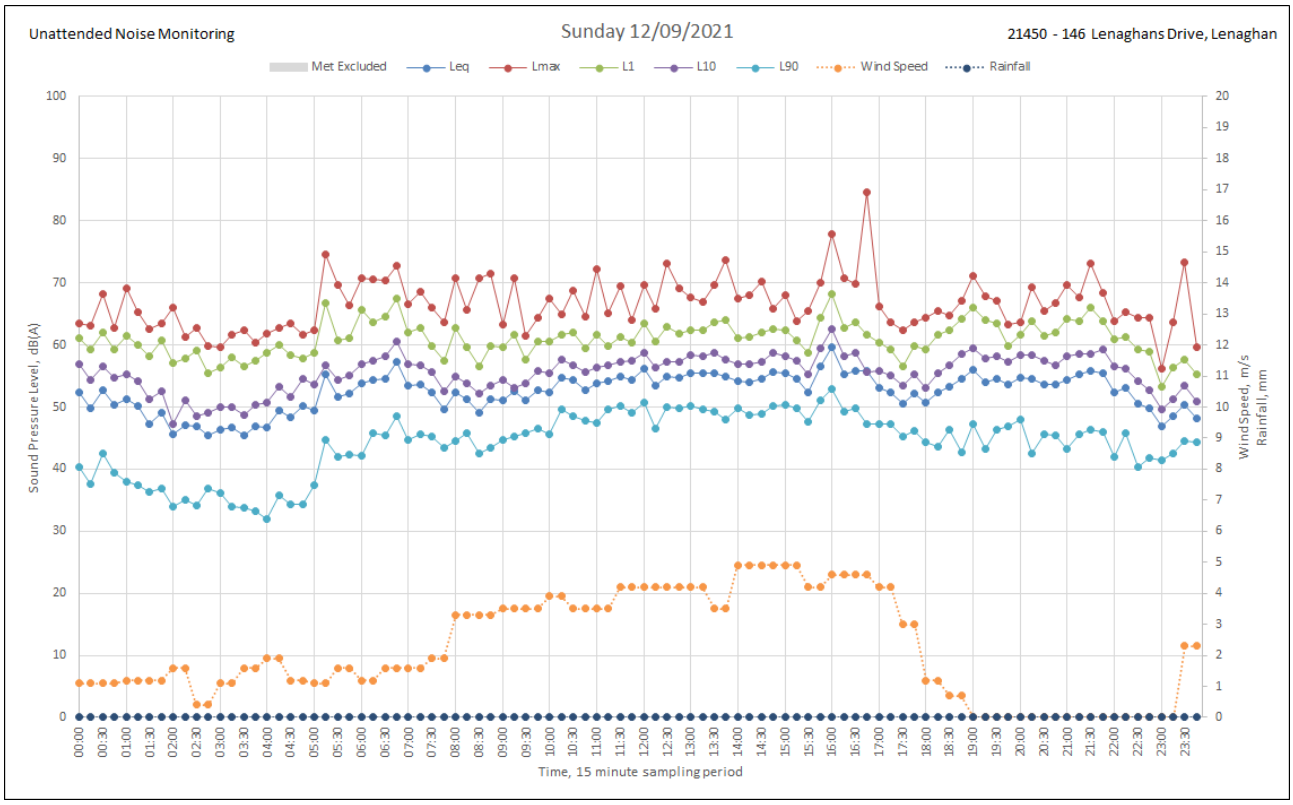


Figure A1.5 Unattended Monitoring Results – Sunday 12/09/2021

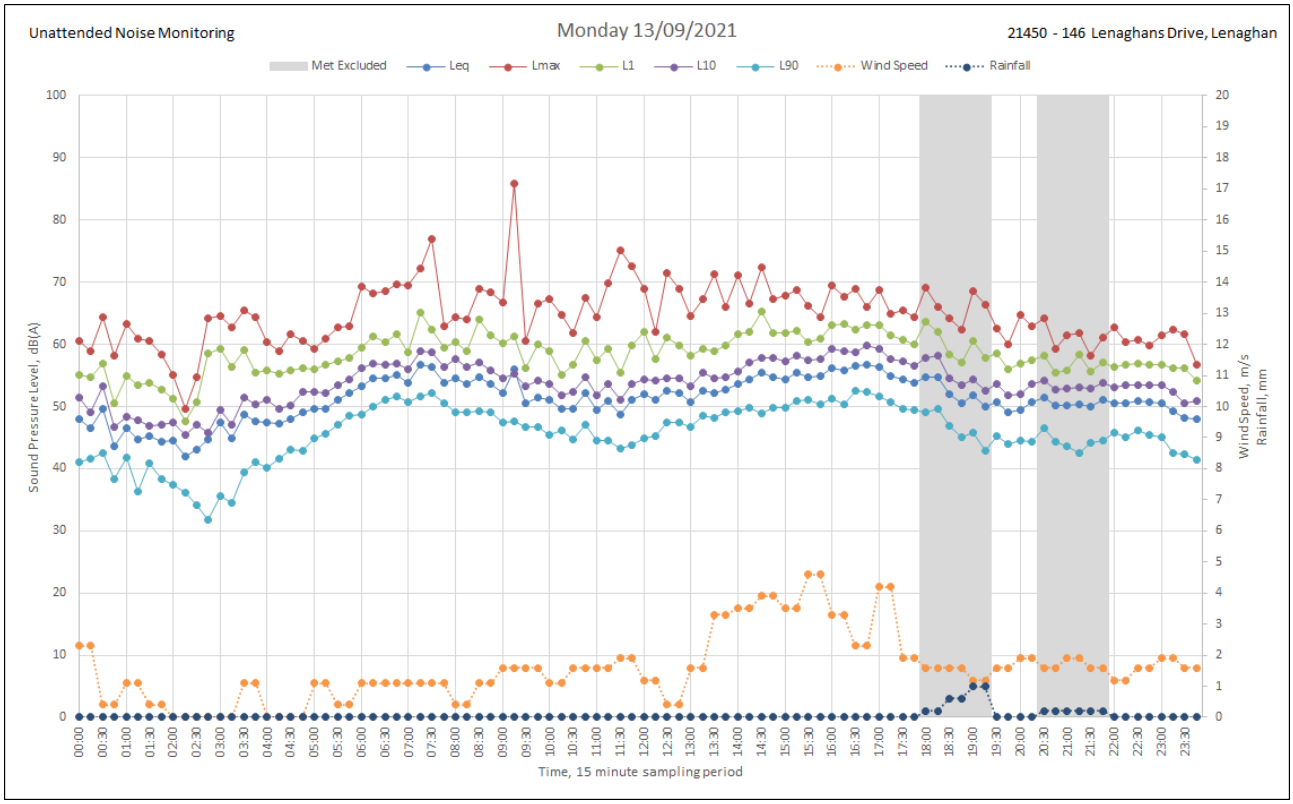


Figure A1.6 Unattended Monitoring Results – Monday 13/09/2021

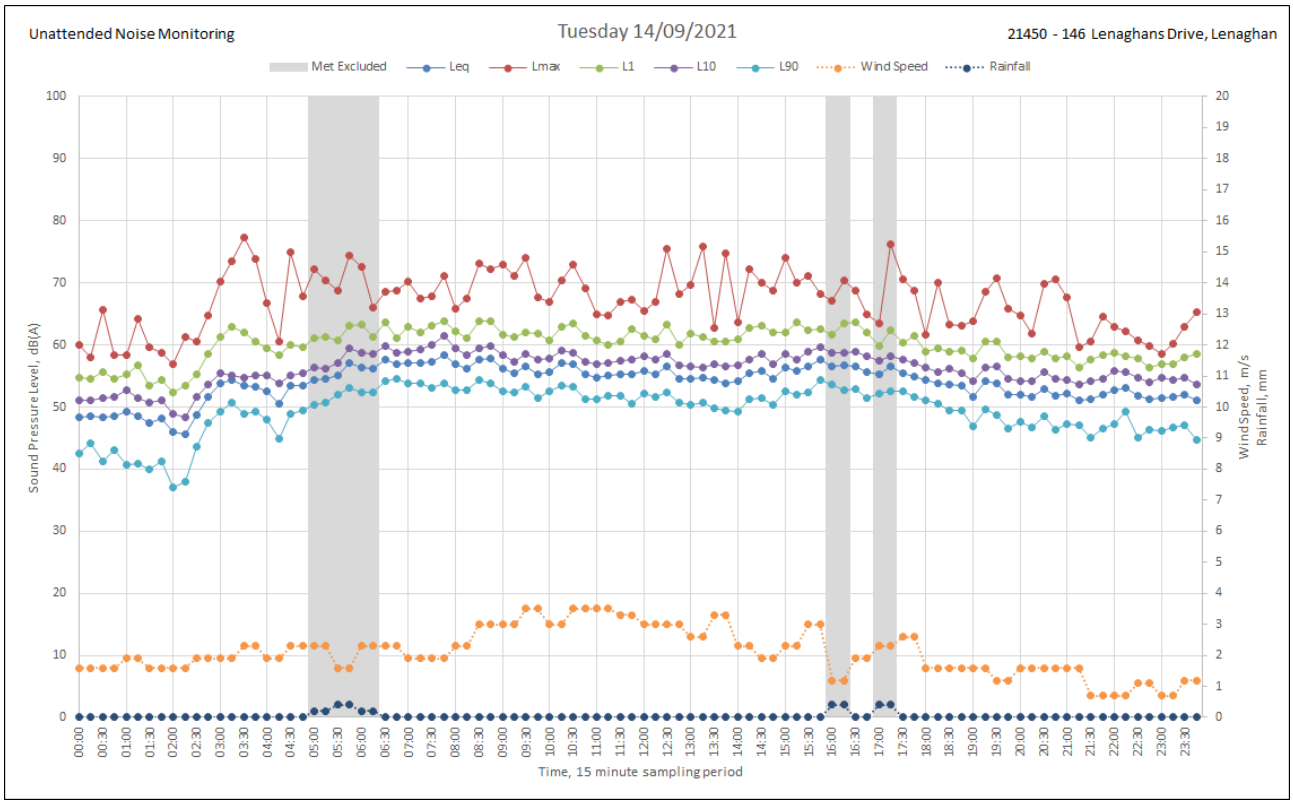


Figure A1.7 Unattended Monitoring Results – Tuesday 14/09/2021

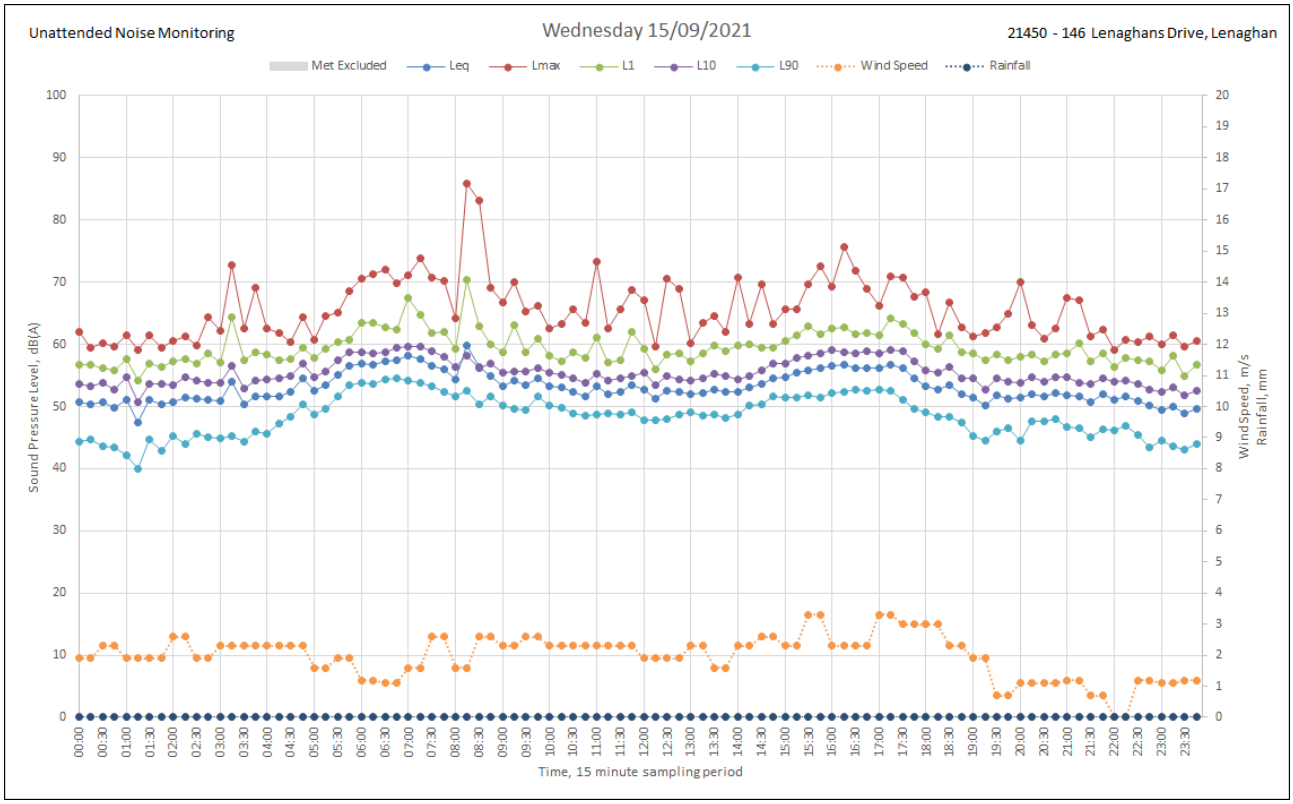


Figure A1.8 Unattended Monitoring Results – Wednesday 15/09/2021

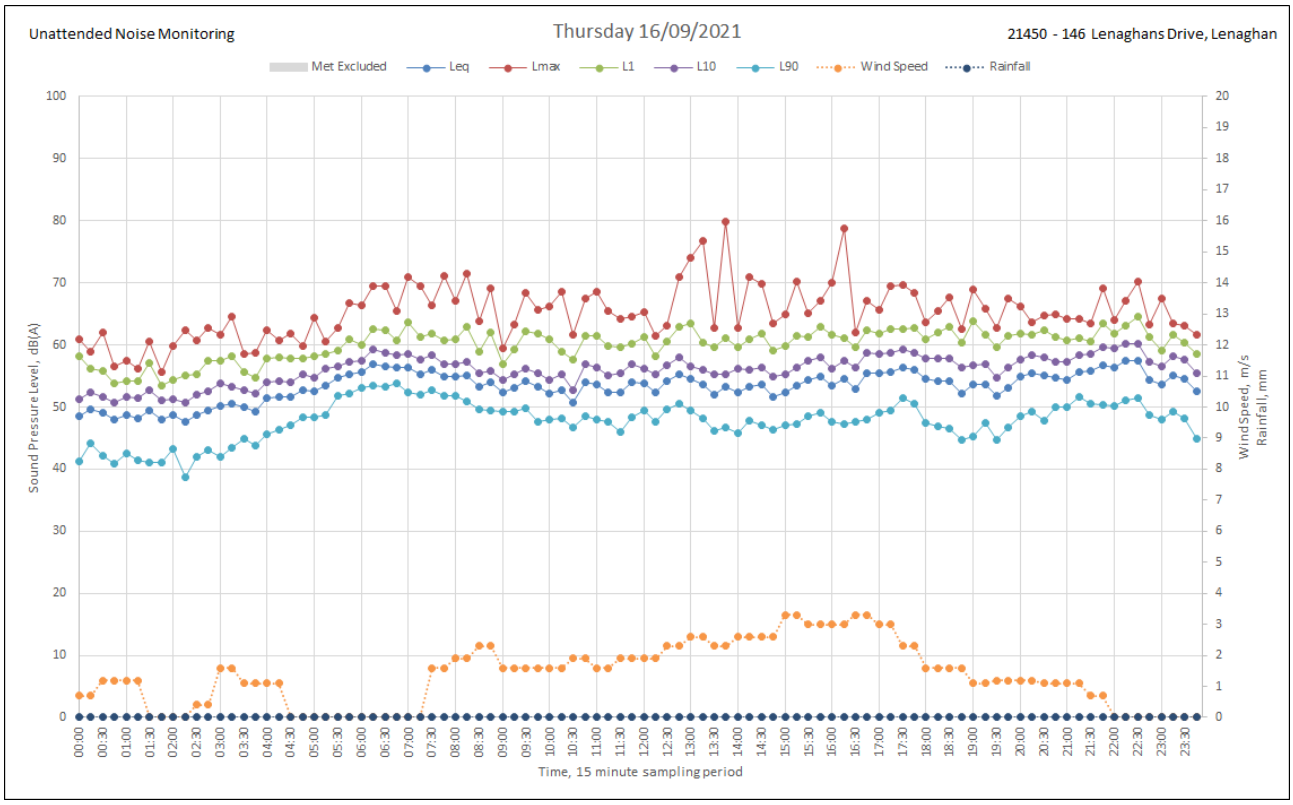


Figure A1.9 Unattended Monitoring Results – Thursday 16/09/2021

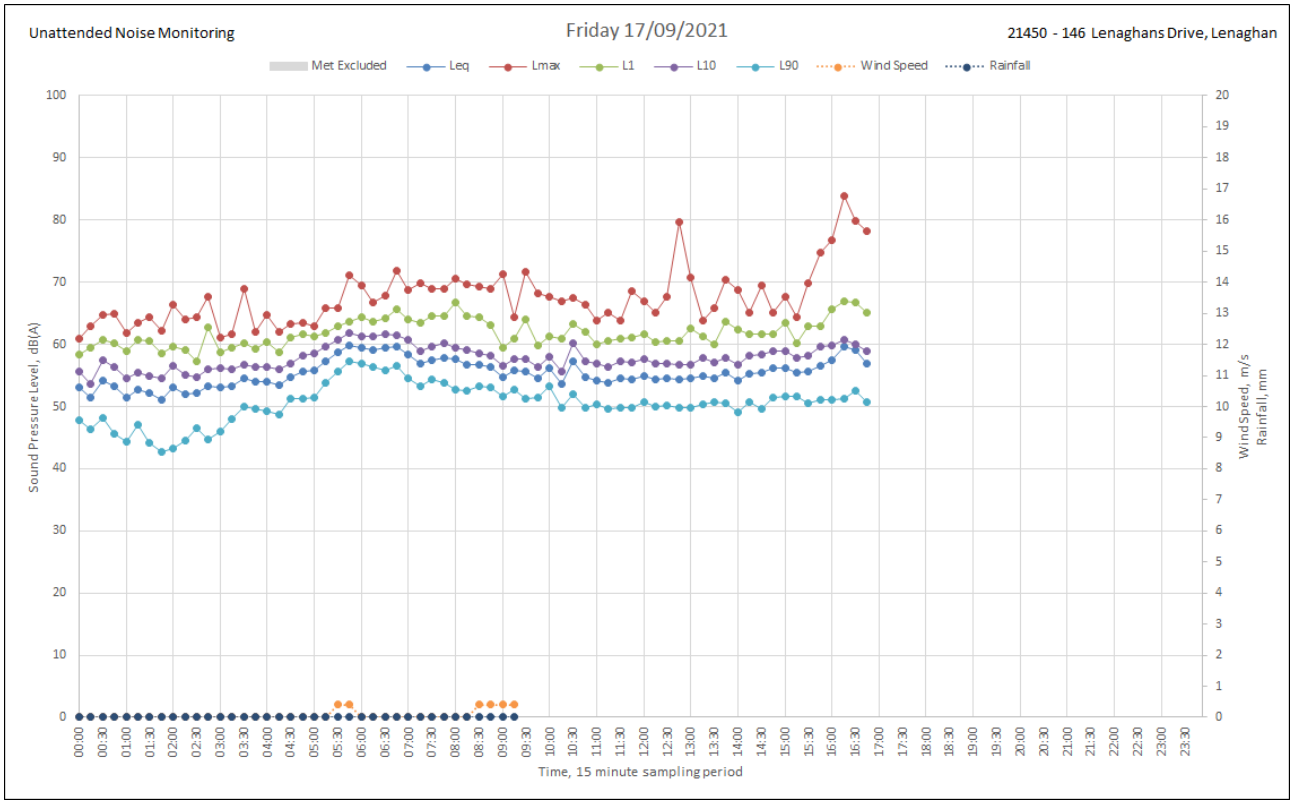
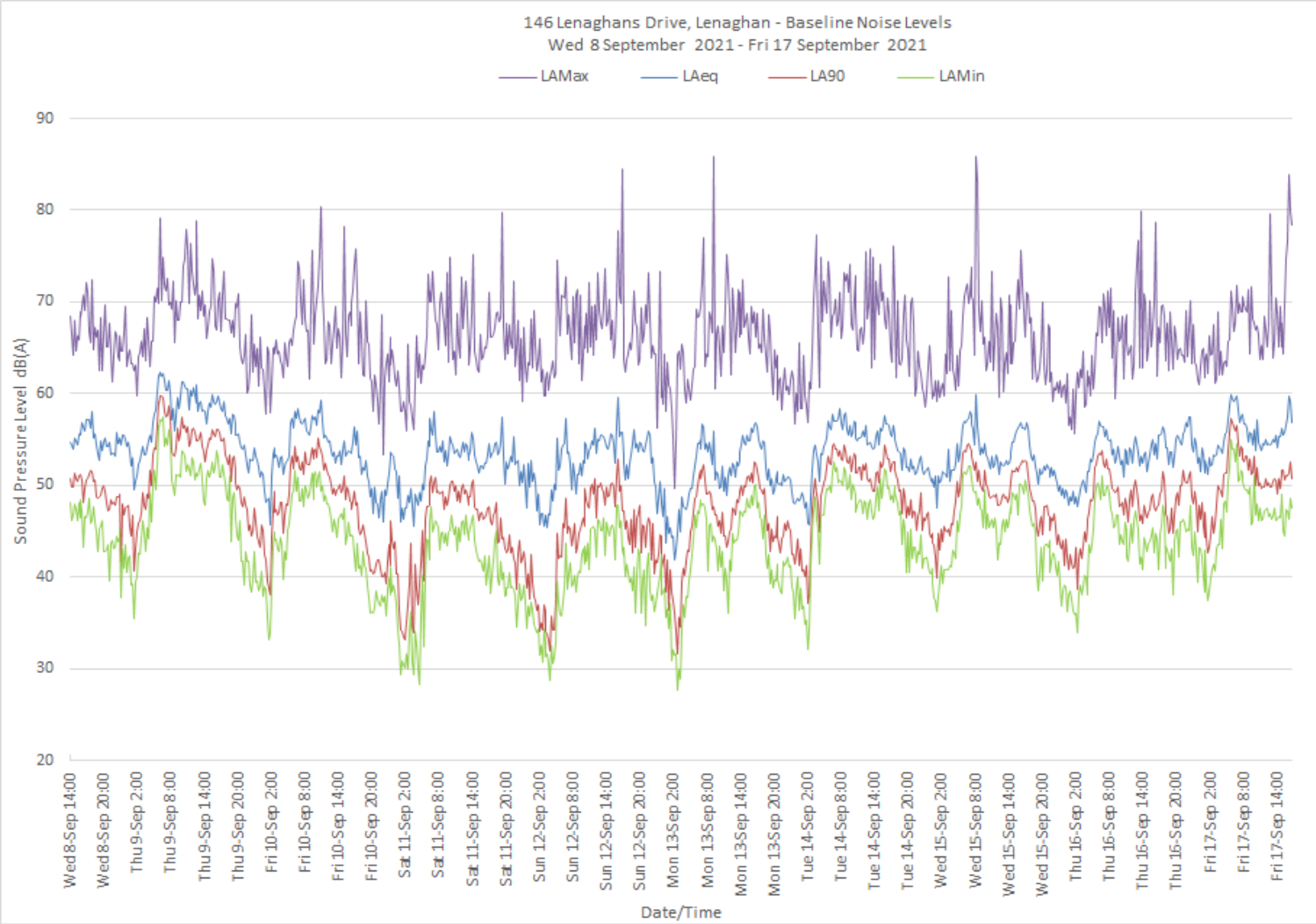


Figure A1.10 Unattended Monitoring Results – Friday 17/09/2021

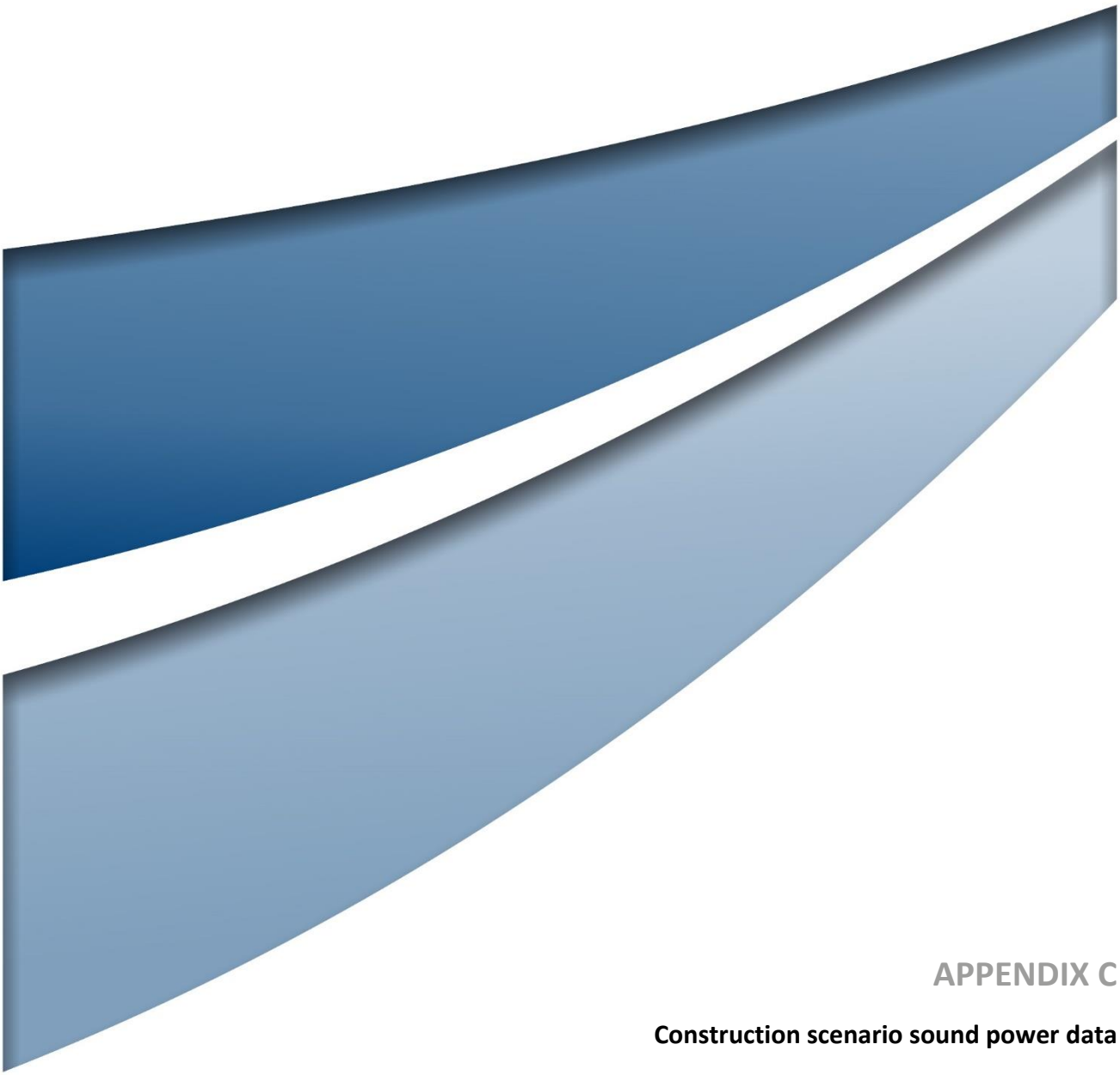
APPENDIX B

All data background noise logging chart

The noise monitoring chart in this Appendix shows the entire noise logging period, allowing daily trends to be observed.



FigureB1.1 Unattended Monitoring Results – 8 September to 17 September 2021



APPENDIX C

Construction scenario sound power data

Typical sound power levels for construction equipment associated with each stage were sourced from the CNET or from Umwelt's technical database and are shown in Table .

Table C1.1 Construction Stages and equipment to be used

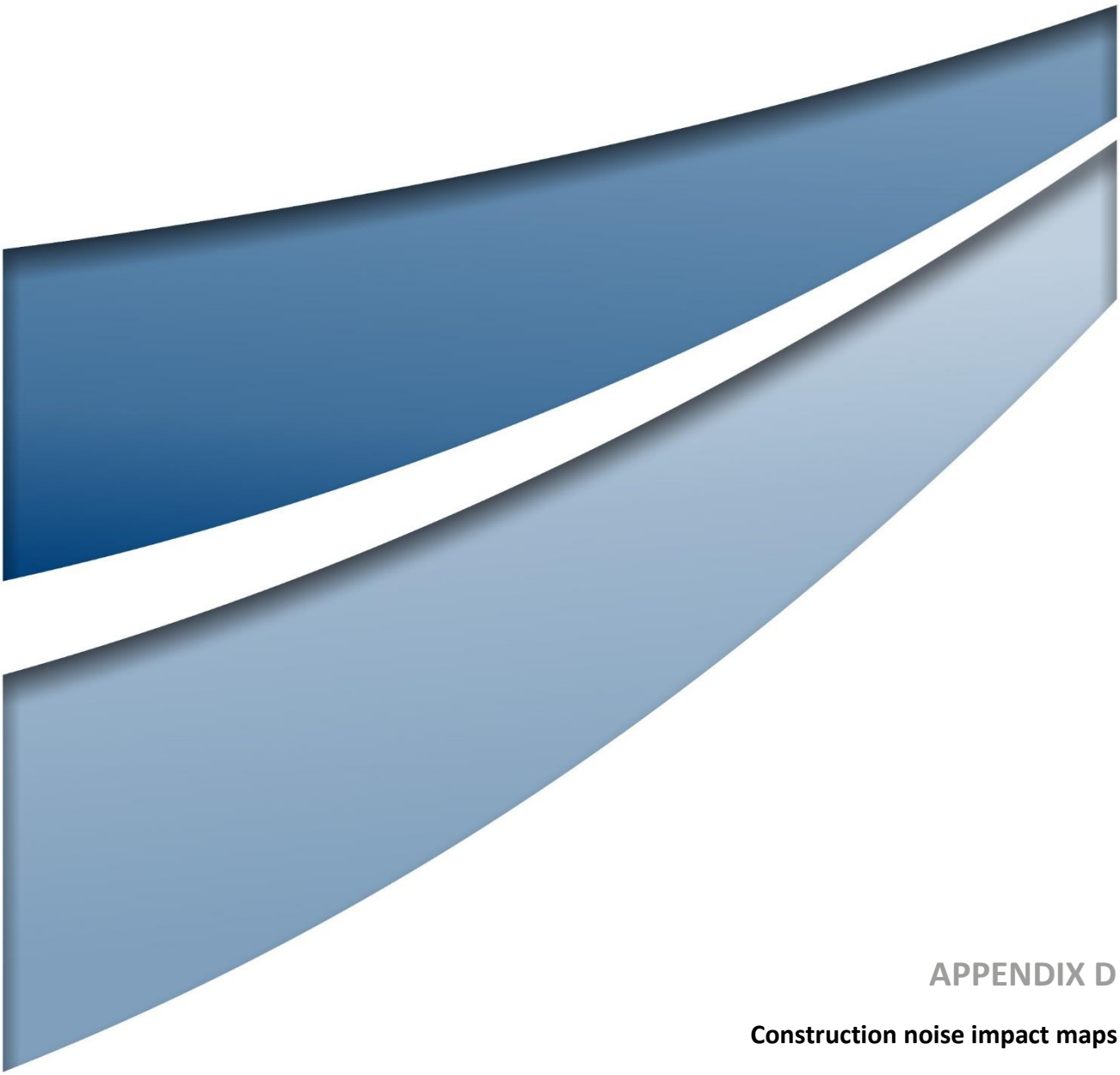
Construction Stage	Equipment to be used (and number to be used where more than one is planned)	Individual Item Sound Power dB(A)
Survey	Ute (2)	103
Fencing	Ute (2)	103
	Tractor post driver	117
	10t truck (2)	103
	Crew cab truck	103
Tree clearing	Ute (3)	103
	24T excavator (3)	110
	Hiab truck	103
	Mulcher	116
Clear and grade	Ute (2)	103
	30t excavator (3)	110
	Cat 16M Grader or equivalent	113
	Cat 14M Grader or equivalent	113
	Cat D6 dozer or equivalent	116
	Crew cab truck	103
	Cat 30t Moxy or equivalent	107
Pipe yard	Ute	103
	30t excavator	110
	Ext trailer and prime mover (2)	108
Stringing and bending	Ute (3)	103
	30t excavator	110
	Skid truck (2)	107
	561 side boom or equivalent	107
	Crew cab truck (2)	103
	CRC bending machine or equivalent	94
	572 side boom or equivalent	107
	15,000L water cart	107
Mainline welding	Ute (2)	103
	4 x 4 bus	103
	561 side boom or equivalent	107
	Crew cab truck	103
	Tac rig	109
	Welding equipment	105
	Welding truck (2)	105
Coating	Ute (2)	103
	Blast truck	109
	Spray truck	109
	4 x 4 bus	103
	Hiab truck	103
	15,000L water cart	107

Construction Stage	Equipment to be used (and number to be used where more than one is planned)	Individual Item Sound Power dB(A)
Trenching	Ute (3)	103
	35t excavator (3)	110
	Bucket wheel trencher	117
	Chain trencher	117
	Crew cab truck	103
	Hiab truck	103
Lower in	Ute (3)	103
	571 side boom or equivalent	107
	35t excavator (2)	110
	Superior 350 padder or equivalent	110
	Cat 572 side boom (2) or equivalent	107
	Crew cab truck	103
	15,000L water cart	107
Backfill	Crew cab truck (2)	103
	Cat D6 dozer or equivalent	116
	Cat 16M grader or equivalent	113
	Cat 930 Loader or equivalent	113
	35t excavator (2)	110
	15,000L water cart	107
Special crossings installation (road open cut and watercourses)	Ute (2)	103
	35t excavator (2)	110
	Cat 572 side boom (2) or equivalent	107
	Cat 30t Moxy or equivalent	107
	Crew cab truck	103
	Welding truck	105
Tie ins (lower in)	Ute (3)	103
	35t excavator (2)	110
	Cat 572 side boom (2) or equivalent	107
	Welding truck	105
Rail bore	Auger bore	111
	Ute	103
	Hiab truck	103
	30t excavator	110
Road bore	Mini horizontal directional drill (HDD)	110
	Ute	103
	30t excavator	110
Bores/HDD - Watercourse and 14" connecting HDD	Medium HDD	111
	Large HDD	113
	Ute (3)	103
	30t excavator	110
	Vacuum truck	106
Fence reinstatement	Ute (5)	103
	Tractor post driver	117
	10t truck	103

Construction Stage	Equipment to be used (and number to be used where more than one is planned)	Individual Item Sound Power dB(A)
Reinstatement	Ute (2)	103
	30t excavator (3)	110
	Cat 16M grader or equivalent	113
	Cat 14M grader or equivalent	113
	Cat D6 dozer or equivalent	116
	Crew cab truck	103
	Cat 30t Moxy or equivalent	107
Hydrostatic testing	Ute (5)	103
	Hiab for moving equipment	103
	Compressor	109
JGN receipt facility Site setup	24t excavator	110
	Cat 14M grader or equivalent	113
	Cat D6 dozer or equivalent	116
	Cat 30t Moxy or equivalent or 20t tipper truck	107
	15,000L water cart (2)	107
	Bobcat	104
	Air compressors, generators	109
	Low loader – heavy machinery mobilisation	108
	2/3 axle semi trailer – temporary offices	108
	Concrete delivery – heavy rigid trucks	109
	Gravel / sand material delivery – heavy rigid truck	106
JGN receipt facility Earthworks and foundations	24t excavator	110
	Cat 30t Moxy or equivalent or 20t tipper truck	107
	25t Franna crane or equivalent	98
	15,000L water cart	107
	Cat 914k loader or equivalent	91
	Cat CP76B compactor or equivalent or CP76B vibratory roller or equivalent	109
	Bobcat	104
	Air compressors, generators (2)	109
	Low loader – heavy machinery mobilisation	108
	Cranes – mobilisation	113
	Concrete delivery – heavy rigid trucks	109
	Gravel / sand material delivery – heavy rigid truck	106
JGN receipt facility Structural, mechanical, piping, electrical, instrumentation (SMPEI)	24t excavator	110
	25t Franna crane or equivalent	98
	Air compressors, generators (3)	109
	Low loader – heavy machinery de-mobilisation	108
	Cranes – de-mobilisation	113
	2/3 axle semi trailer – SMPEI, equipment skids	108
JGN receipt facility Testing and commissioning	Low loader – heavy machinery de-mobilisation	108
	2/3 axle semi trailer – SMPEI, equipment skids	108

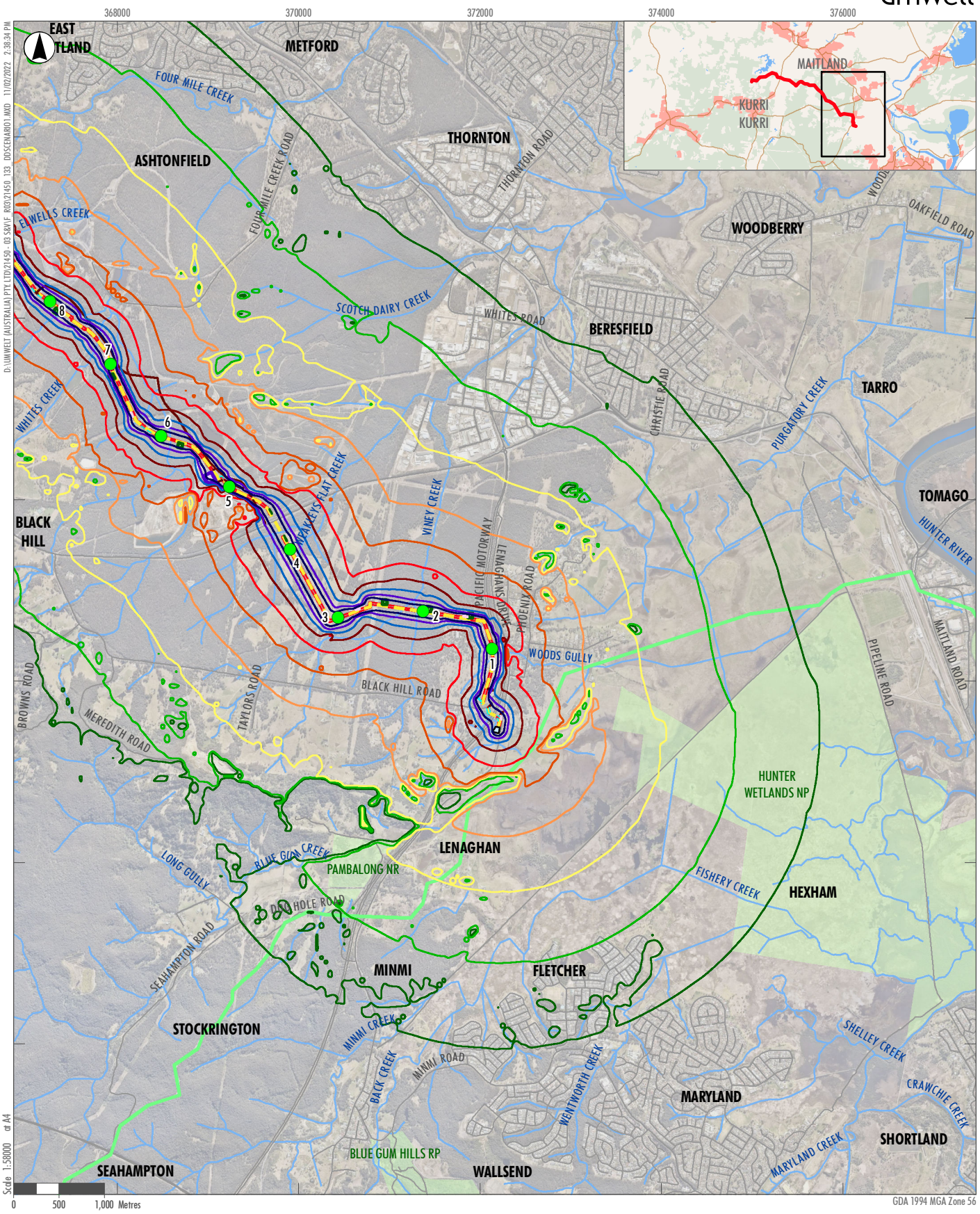
Construction Stage	Equipment to be used (and number to be used where more than one is planned)	Individual Item Sound Power dB(A)
Compressor station Site setup	24t excavator	110
	Cat 14M grader or equivalent	113
	15,000L water cart	107
	Bobcat	104
	Air compressors, generators	109
	Low loader – heavy machinery mobilisation	108
	Low loader – heavy machinery de-mobilisation	108
	2/3 axle semi trailer – temporary offices	108
	Gravel / sand material delivery – heavy rigid truck	106
Compressor station Earthworks and foundations	24t excavator	110
	25t Franna crane	113
	15,000L water cart	107
	Bobcat	104
	RGZ crane or equivalent – driven (steel) piling	116
	Air compressors, generators (2)	109
	Low loader – heavy machinery mobilisation	108
	Low loader – heavy machinery de-mobilisation	108
	Cranes – mobilisation	113
	2/3 axle semi trailer – SMPEI, equipment skids	108
	Concrete delivery – heavy rigid trucks	109
	Gravel/sand material delivery – heavy rigid truck	106
Compressor station SMPEI	24t excavator	110
	25t Franna crane or equivalent	98
	40t Franna crane or equivalent	100
	Elevated work platform	98
	150t crane	113
	Air compressors, generators (3)	109
	Low loader – heavy machinery mobilisation	108
	Low loader – heavy machinery de-mobilisation	108
	Cranes – de-mobilisation	113
	2/3 axle semi trailer – SMPEI, equipment skids	108
Compressor station Testing and commissioning	25t Franna crane	113
	Elevated work platform	98
	Air compressors, generators	109
	Low loader – heavy machinery de-mobilisation	108
	Cranes – mobilisation	113
	2/3 axle semi trailer – SMPEI, equipment skids	108
Storage Pipeline Site setup	24t excavator	110
	Cat 14M grader or equivalent	113
	Cat D6 dozer or equivalent	116
	Cat 30t Moxy or equivalent or 20t tipper truck	107
	15,000L water cart	107
	Bobcat	104
	Low loader – heavy machinery mobilisation	108
	Low loader – heavy machinery de-mobilisation	108
	2/3 axle semi trailer – temporary offices	108
	Gravel/sand material delivery – heavy rigid truck	106

Construction Stage	Equipment to be used (and number to be used where more than one is planned)	Individual Item Sound Power dB(A)
Storage Pipeline **Earthworks and foundations**	24t excavator Cat 30t Moxy or equivalent or 20t tipper truck 15,000L water cart Cat 914k loader or equivalent Cat CP76B compactor or equivalent or CP76B vibratory roller or equivalent Bobcat Low loader – heavy machinery de-mobilisation Concrete delivery – heavy rigid trucks Gravel / sand material delivery – heavy rigid truck	110 107 107 91 109 104 108 109 106
Storage Pipeline **SMPEI**	25t Franna crane or equivalent 40t Franna crane or equivalent Cranes – mobilisation Cranes – de-mobilisation 2/3 axle semi trailer – temporary offices	98 100 113 113 108
Storage Pipeline **Testing and commissioning**	2/3 axle semi trailer – temporary offices	108



APPENDIX D

Construction noise impact maps



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Scale 1:58000 at A4

Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

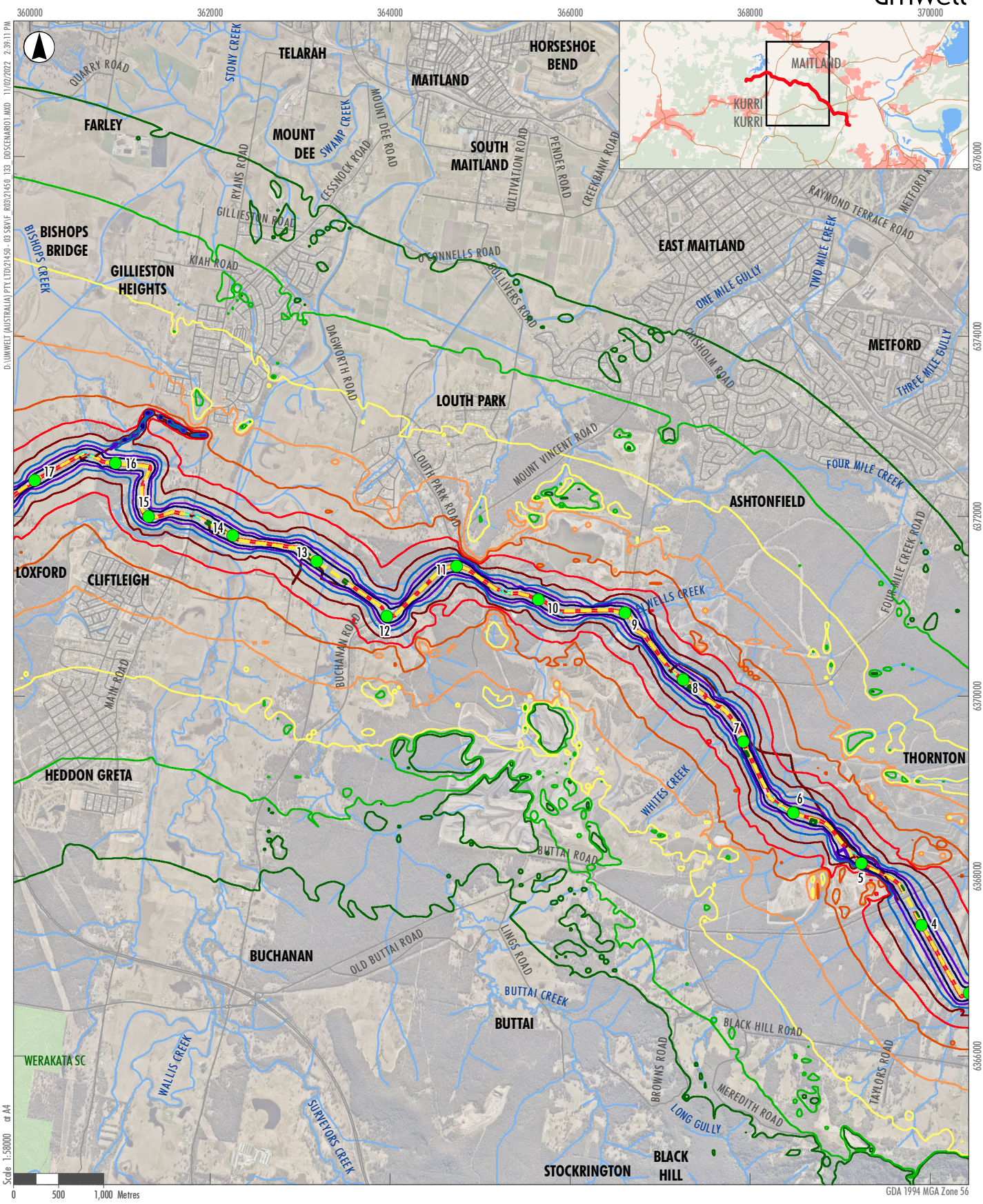
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.1

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

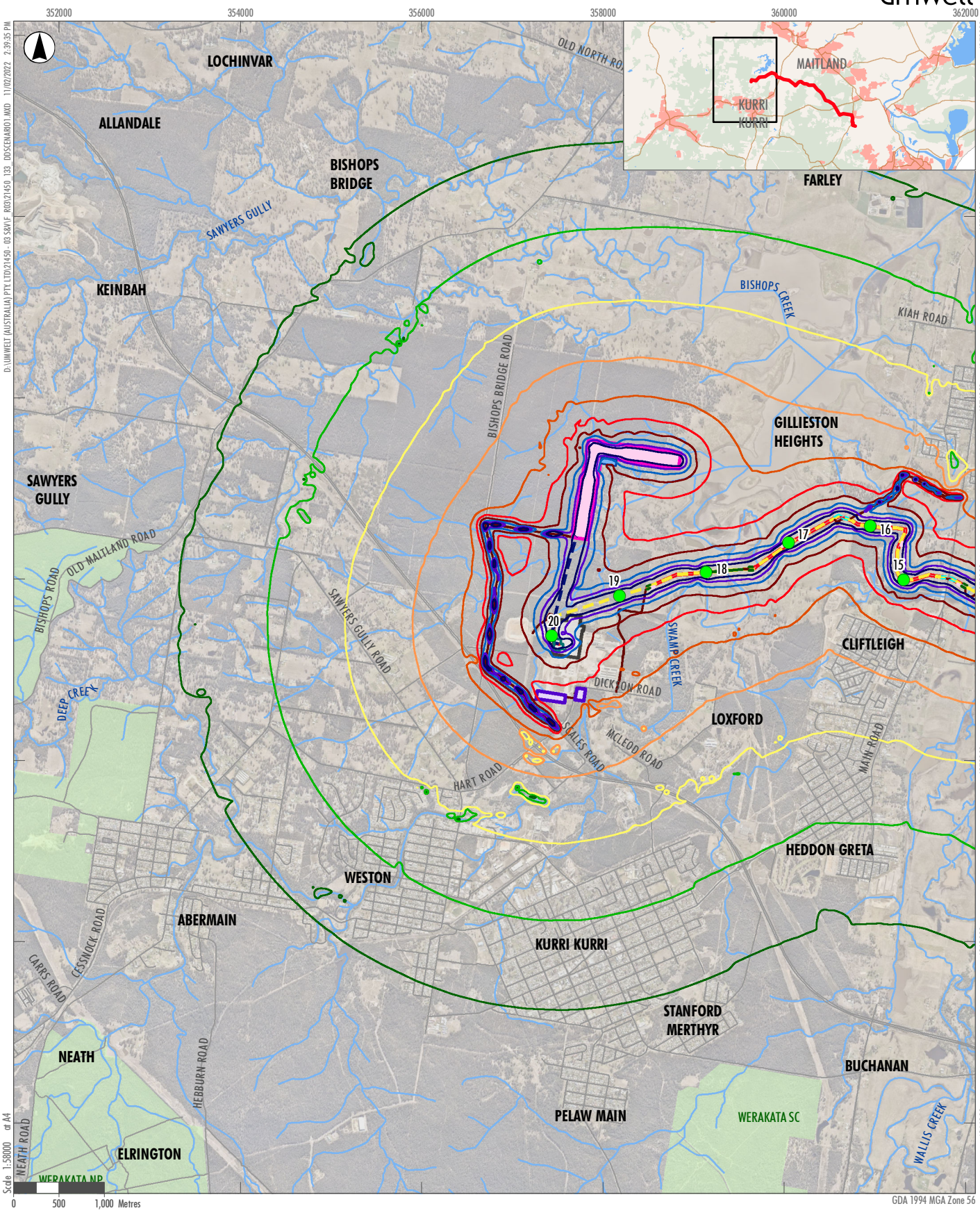
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.2

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



D:\UMWELT (AUSTRALIA) PTY LTD\21450 - 03 S&V\E R03\21450_133_DDSCENARIO1.MXD 11/02/2022 2:39:35 PM

Scale 1:58000 at A4

Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

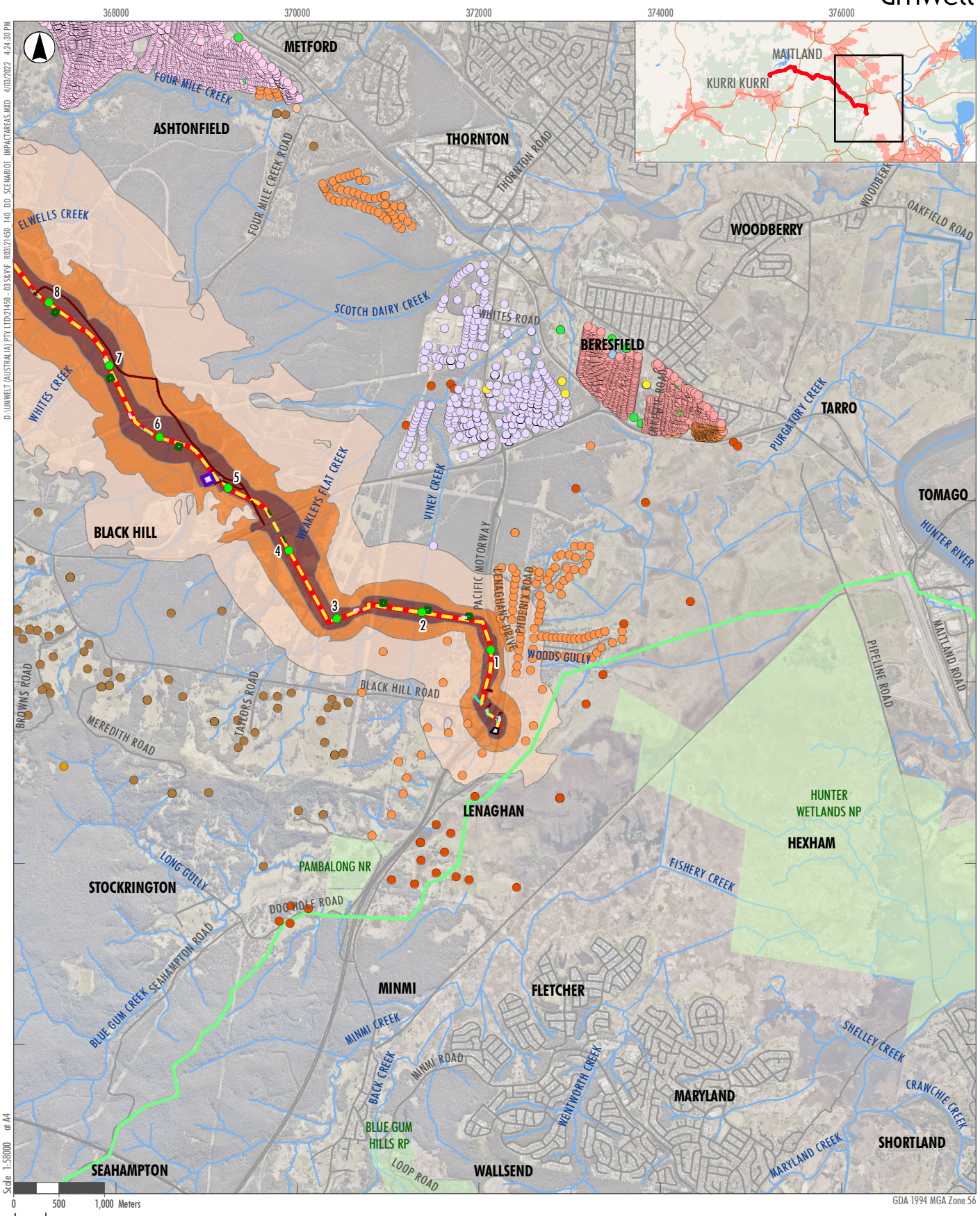
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.3

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

Noise Impact Areas

- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

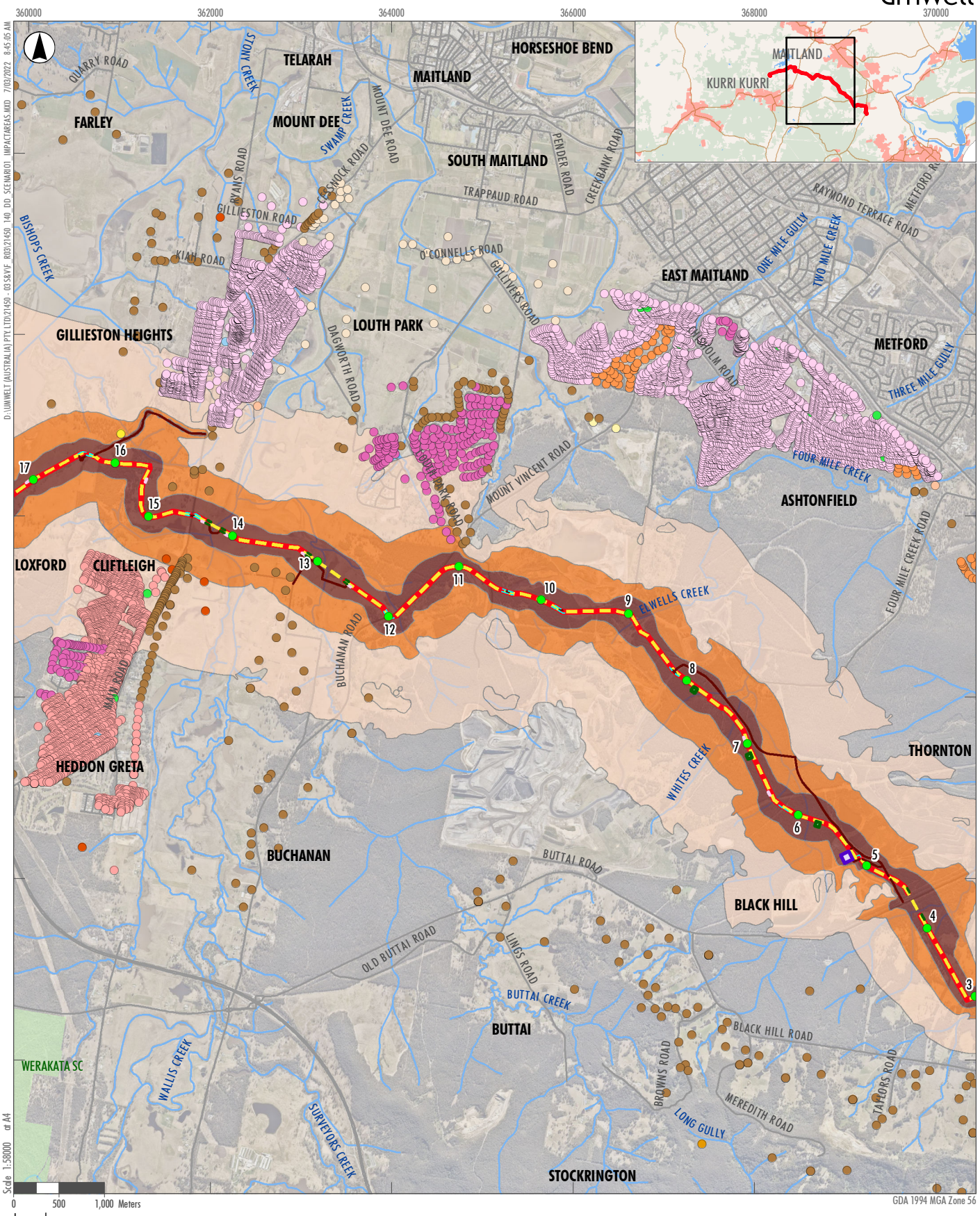
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN2 Light Industrial
- R1 General Residential
- R2 Low Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 4

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

Noise Impact Areas

- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

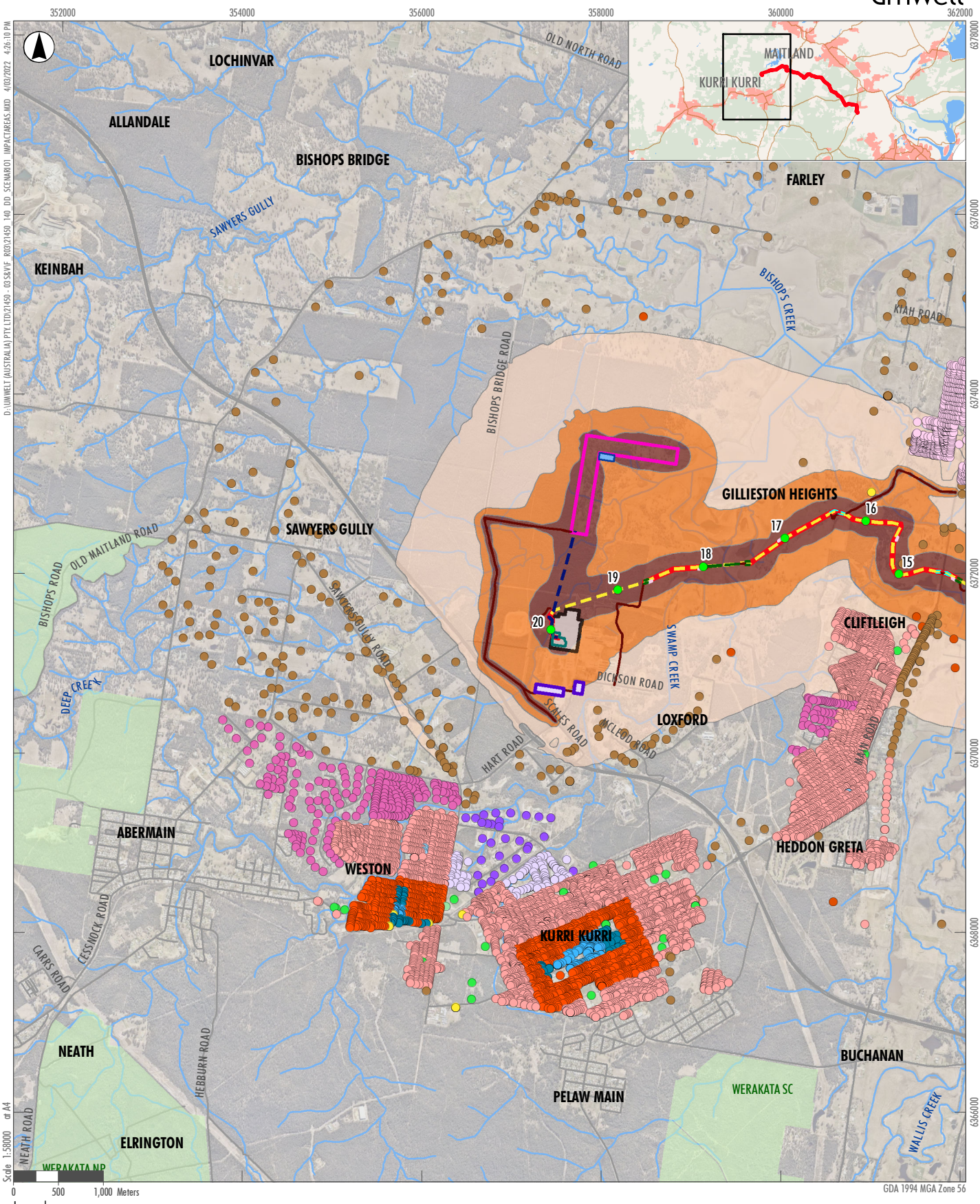
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

APPENDIX D1. 5

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

Noise Impact Areas

- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

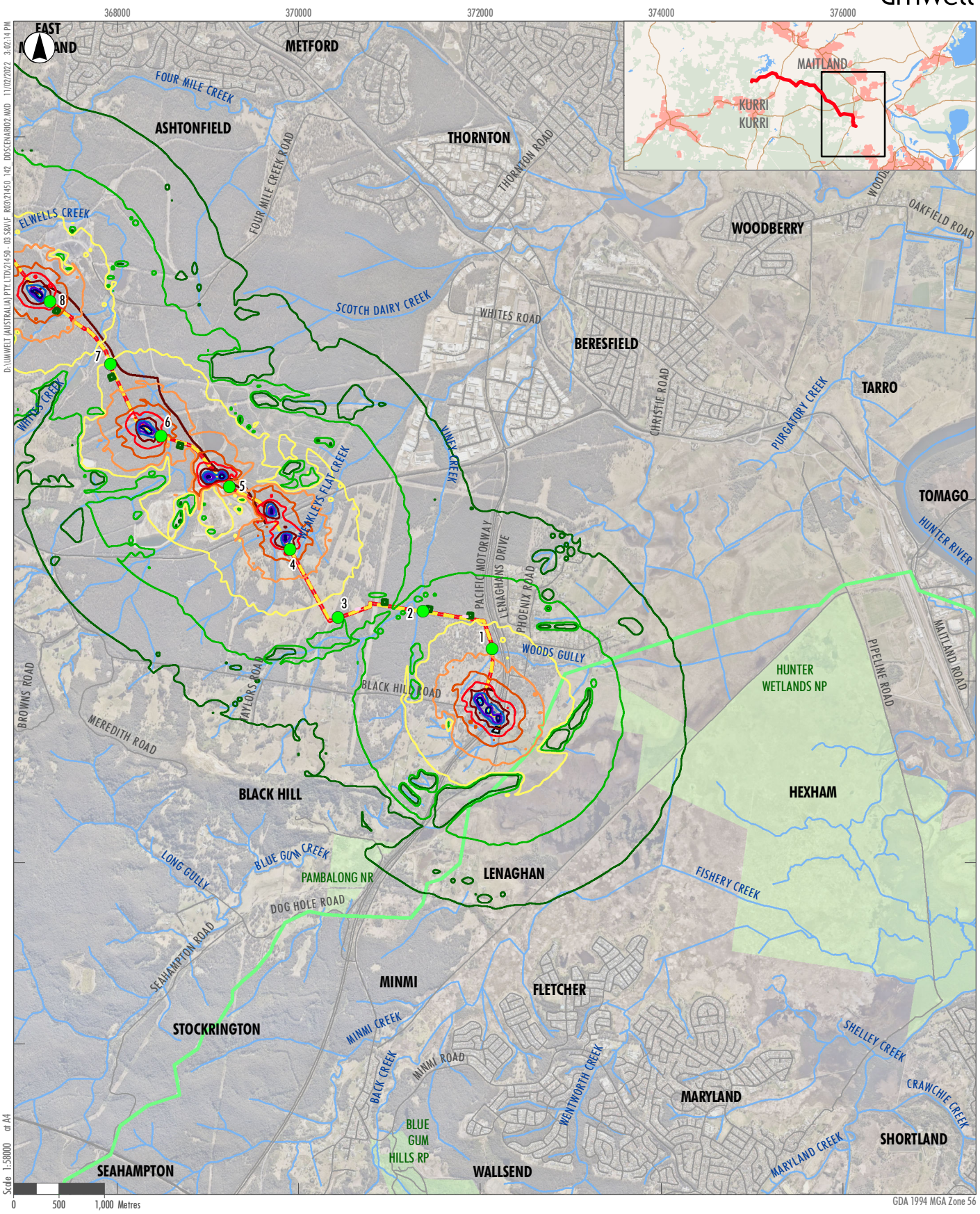
Receivers

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 6

Standard Hours Worst-case Construction LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

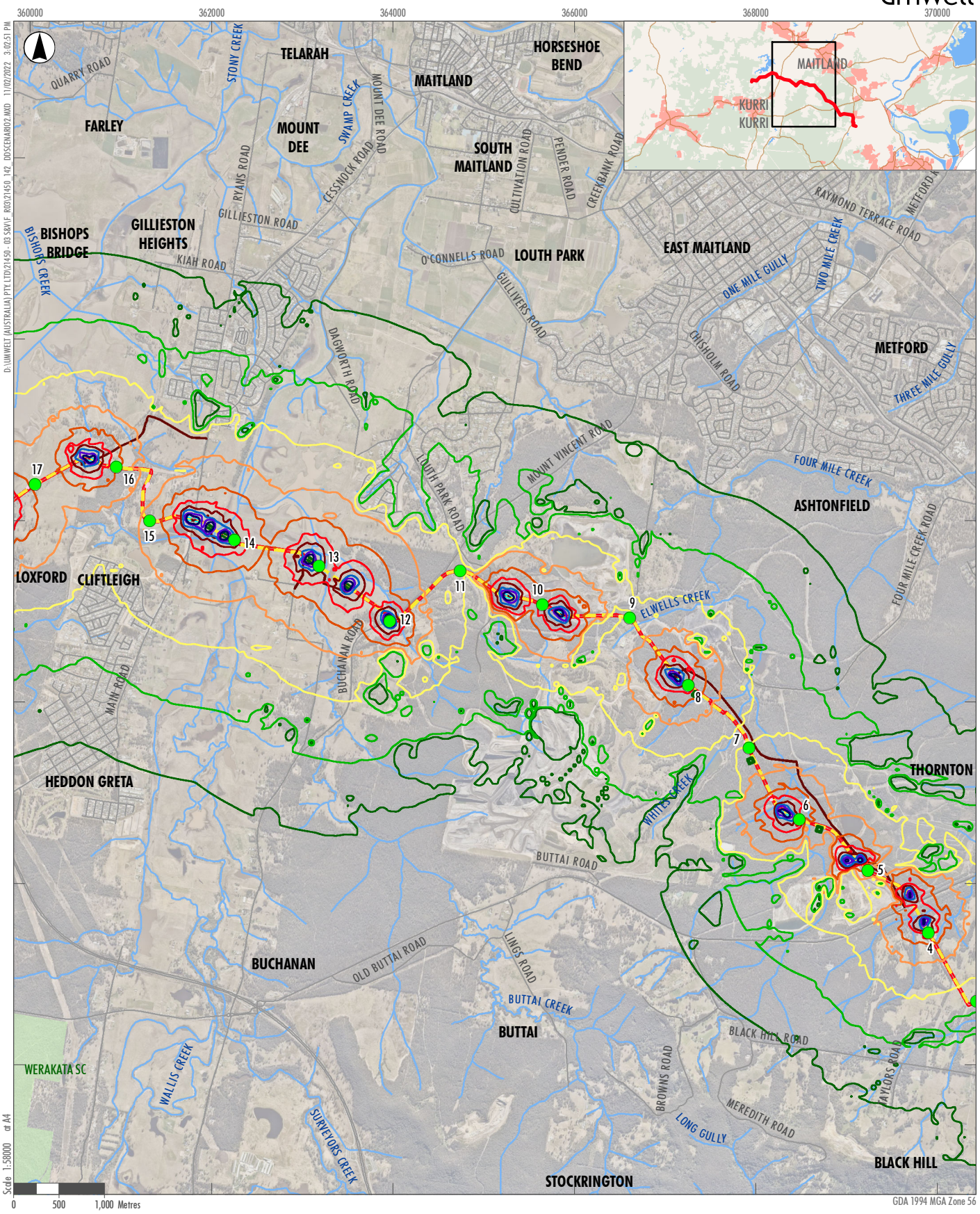
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.7

Outside Standard Hours HDD and Horizontal Boring Worst-case Construction LAeq (15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

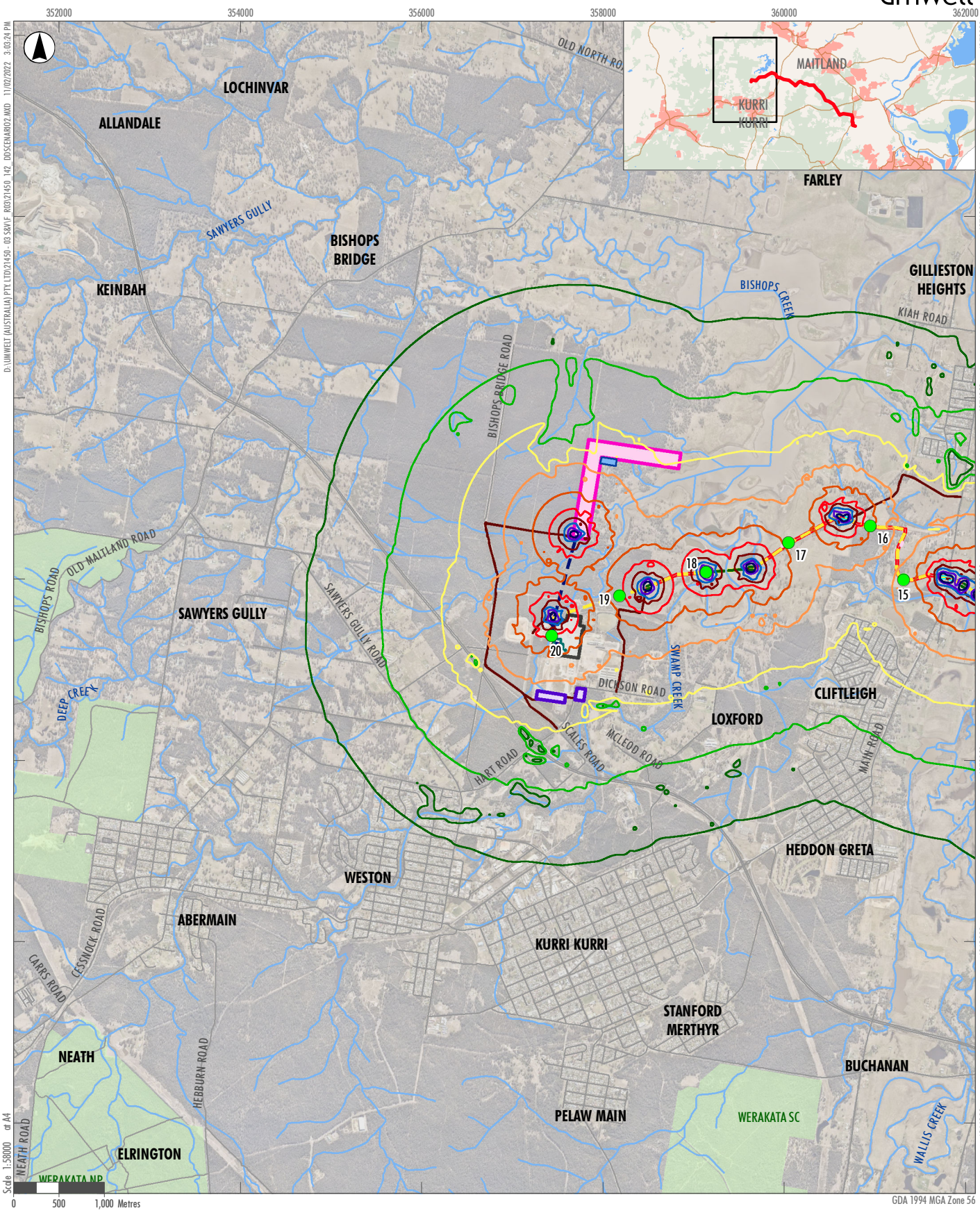
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.8

Outside Standard Hours HDD and Horizontal Boring Worst-case Construction LAeq (15min) Noise Contours

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

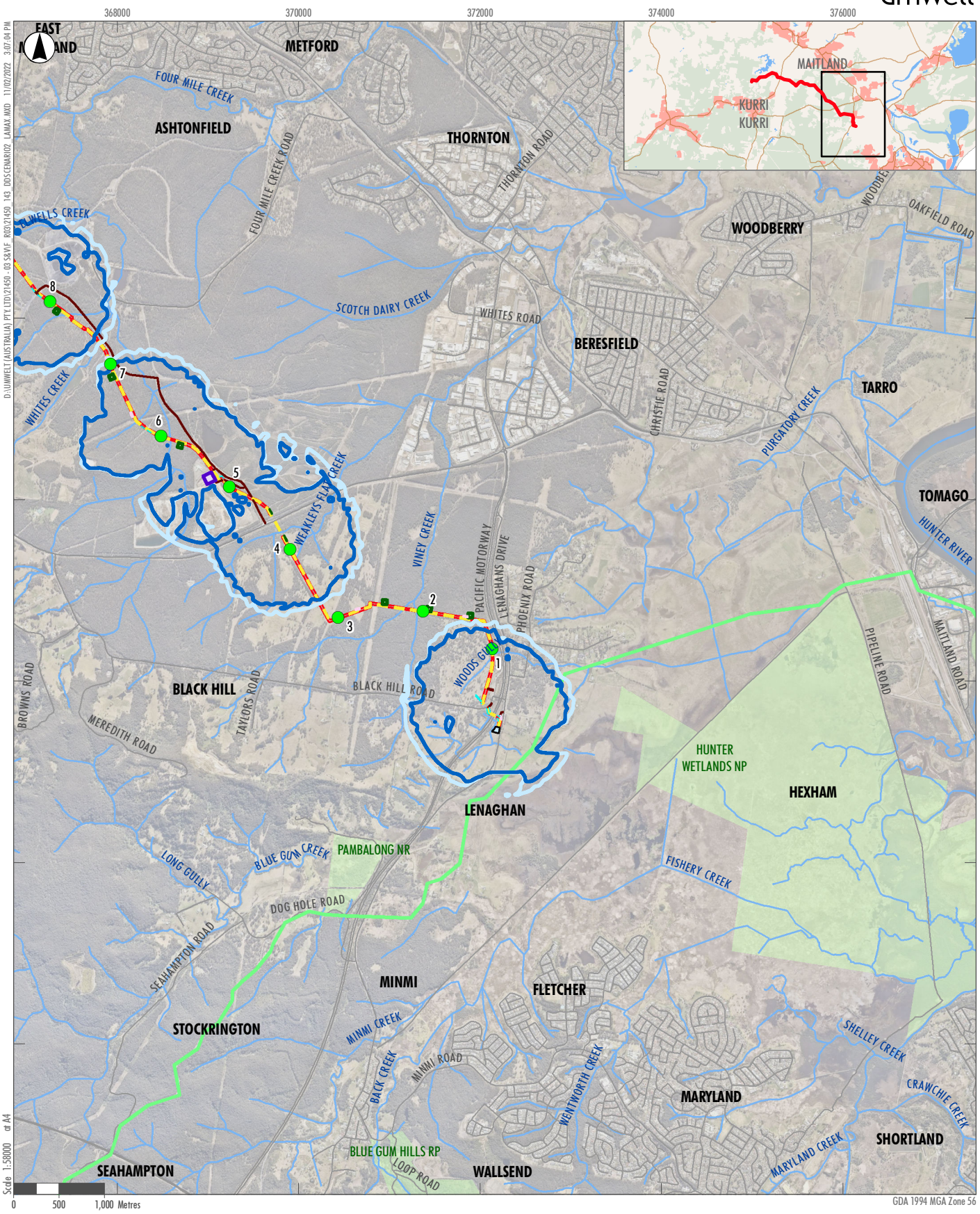
Predicted Noise Levels

- Noise Contour Level 35 dB(A)
- Noise Contour Level 40 dB(A)
- Noise Contour Level 45 dB(A)
- Noise Contour Level 50 dB(A)
- Noise Contour Level 55 dB(A)
- Noise Contour Level 60 dB(A)
- Noise Contour Level 65 dB(A)
- Noise Contour Level 70 dB(A)
- Noise Contour Level 75 dB(A)
- Noise Contour Level 80 dB(A)

APPENDIX D1.9

Outside Standard Hours HDD and Horizontal Boring Worst-case Construction LAeq (15min) Noise Contours

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

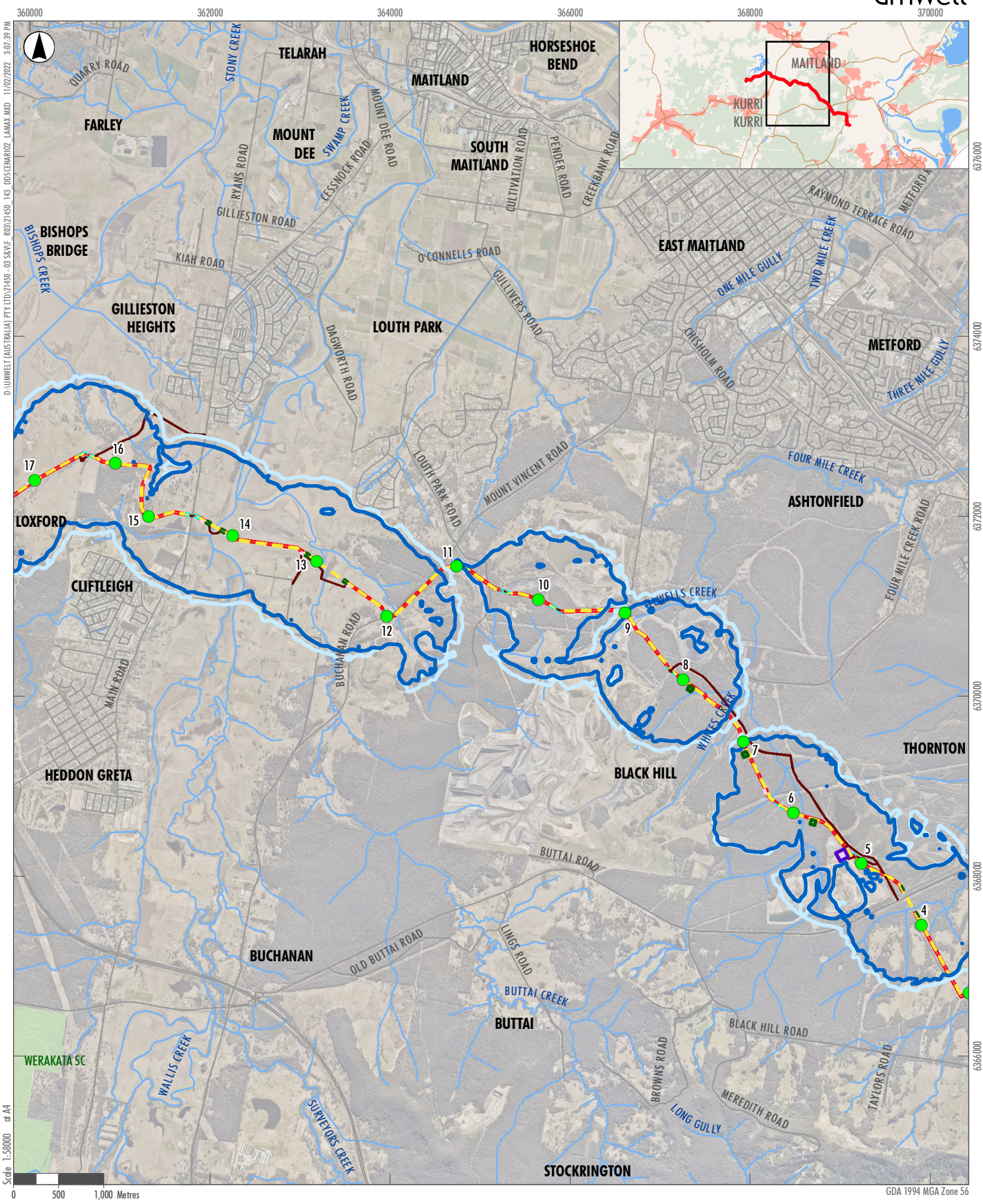
Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

APPENDIX D1.10

Sleep Disturbance LAmax Contours for Outside Standard Hours Drilling and Boring

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

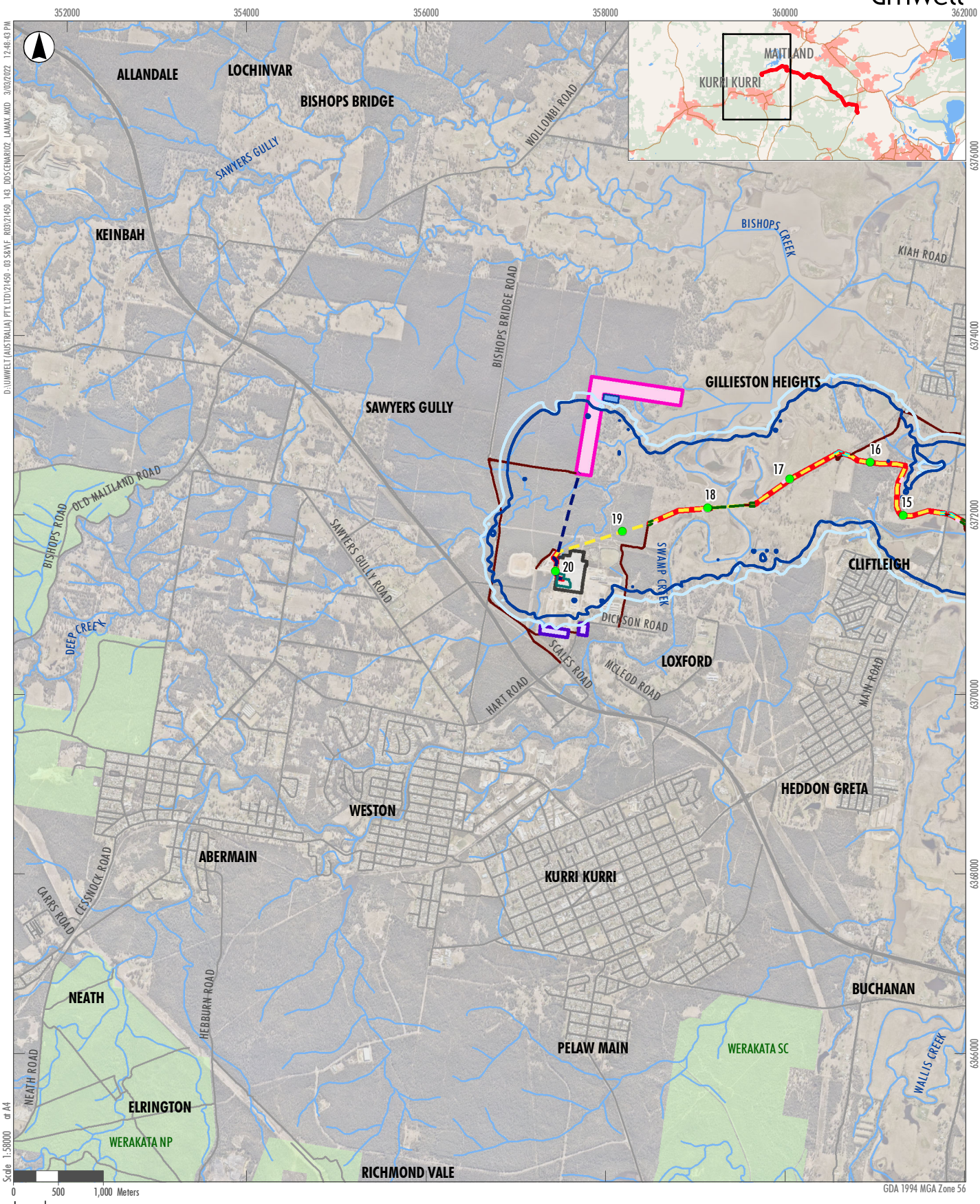
Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

APPENDIX D1.11

Sleep Disturbance LAmax Contours for Outside Standard Hours Drilling and Boring

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

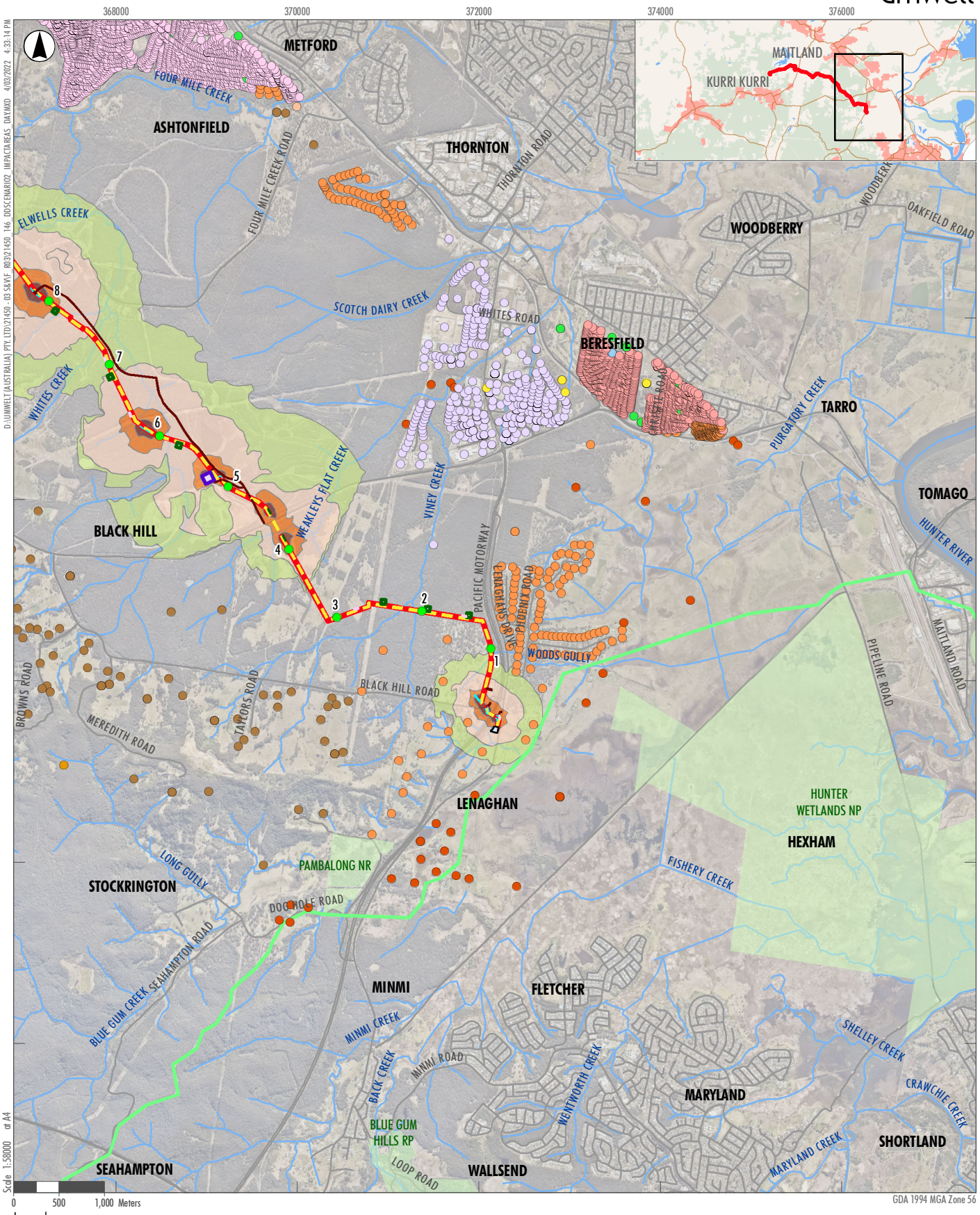
Predicted Noise Levels

- 52 dB(A)
- 53 dB(A)

APPENDIX D1. 12

Sleep Disturbance LAmax Contours for Outside Standard Hours Drilling and Boring

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

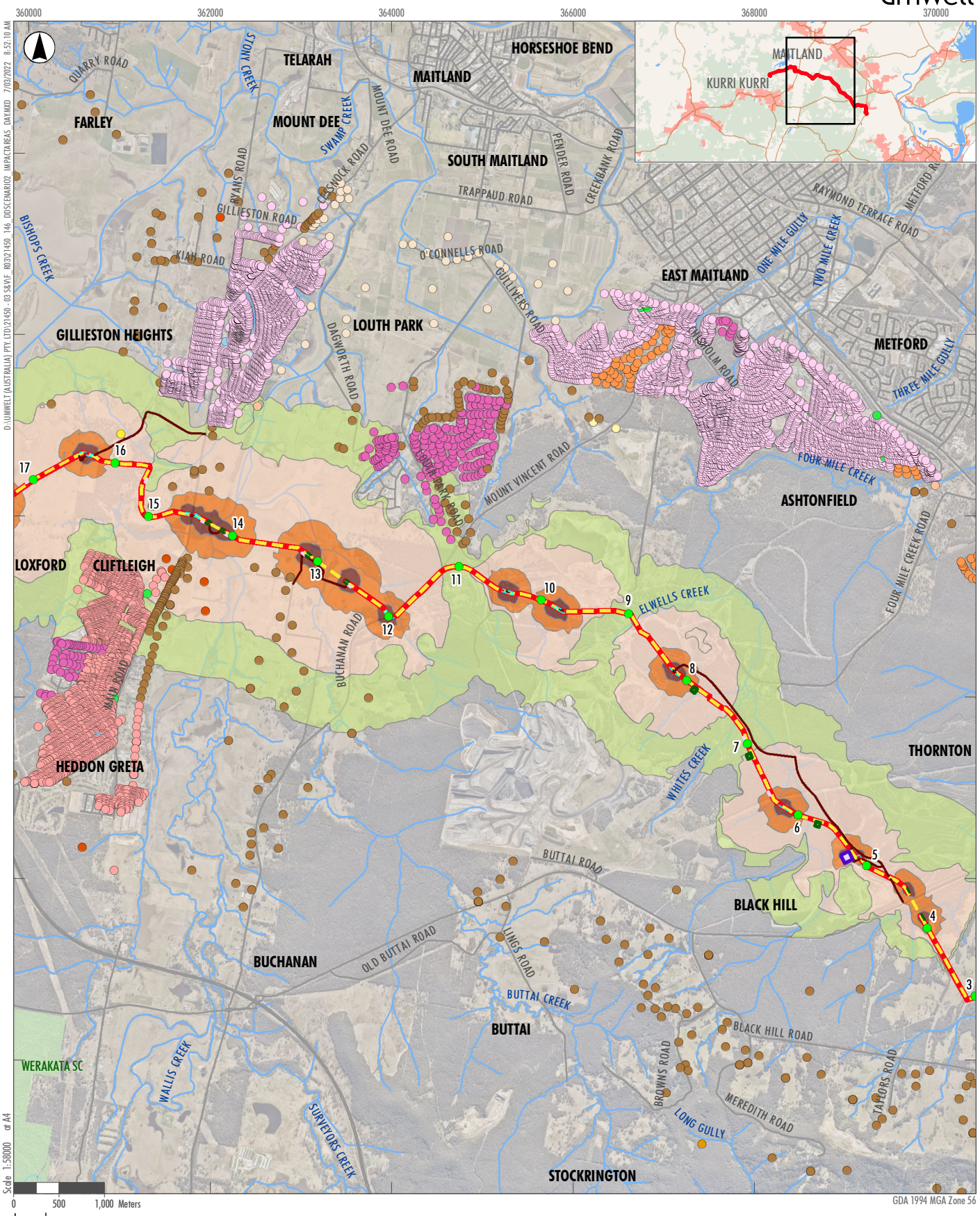
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN2 Light Industrial
- R1 General Residential
- R2 Low Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 13

Scenario 2 Outside of Standard Hours Day

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

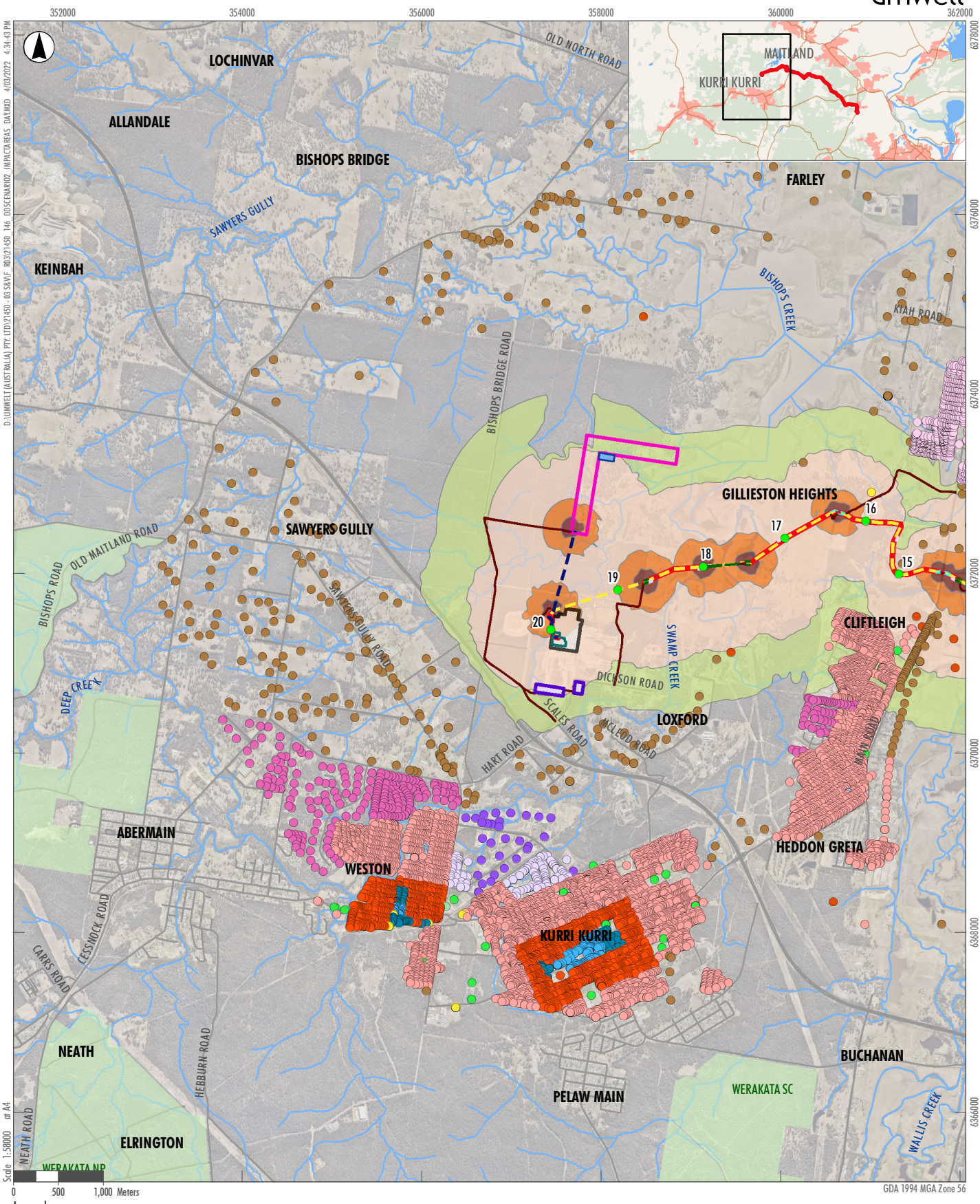
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

APPENDIX D1. 14

Scenario 2 Outside of Standard Hours Day

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

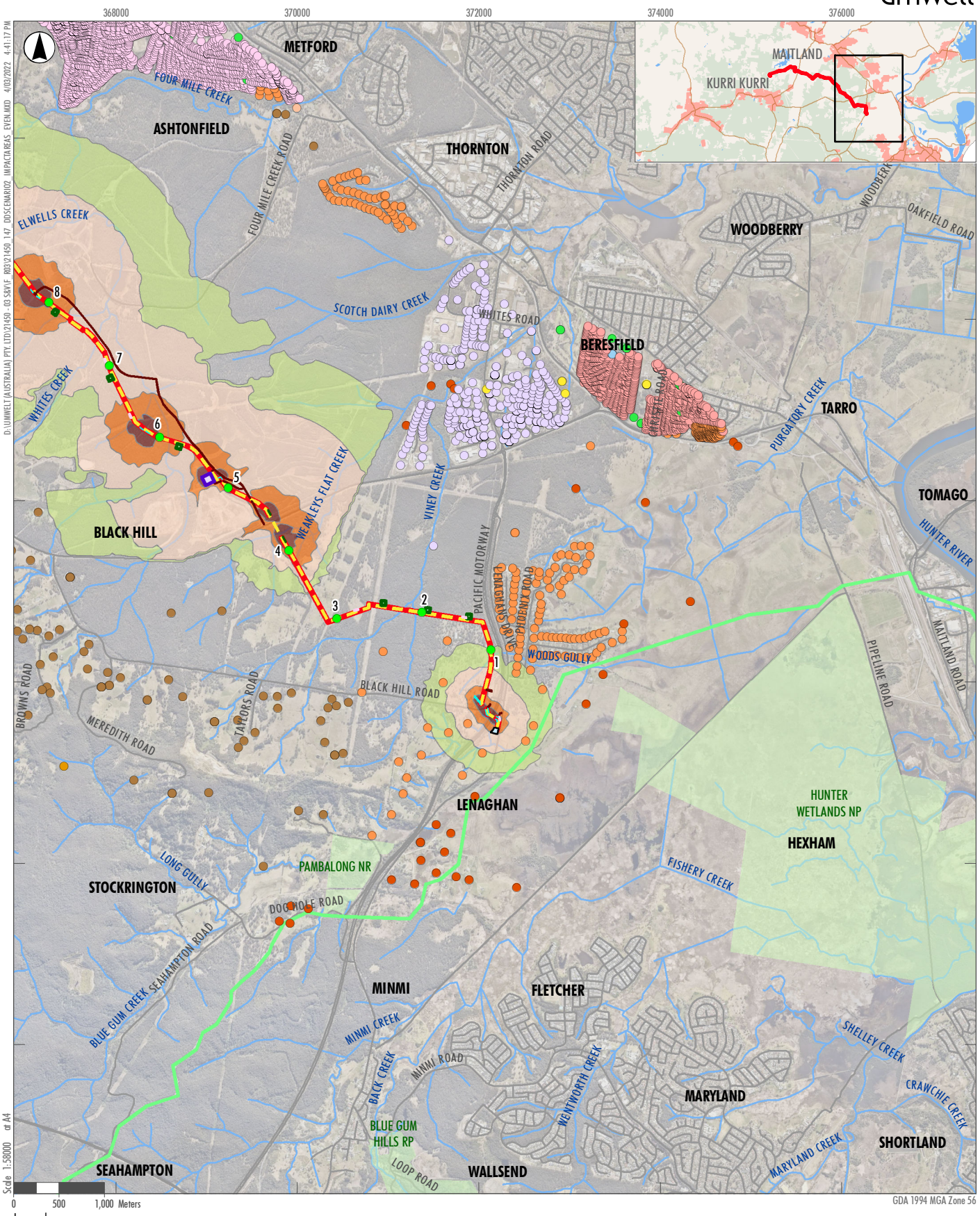
Receivers

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 15

Scenario 2 Outside of Standard Hours Day

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

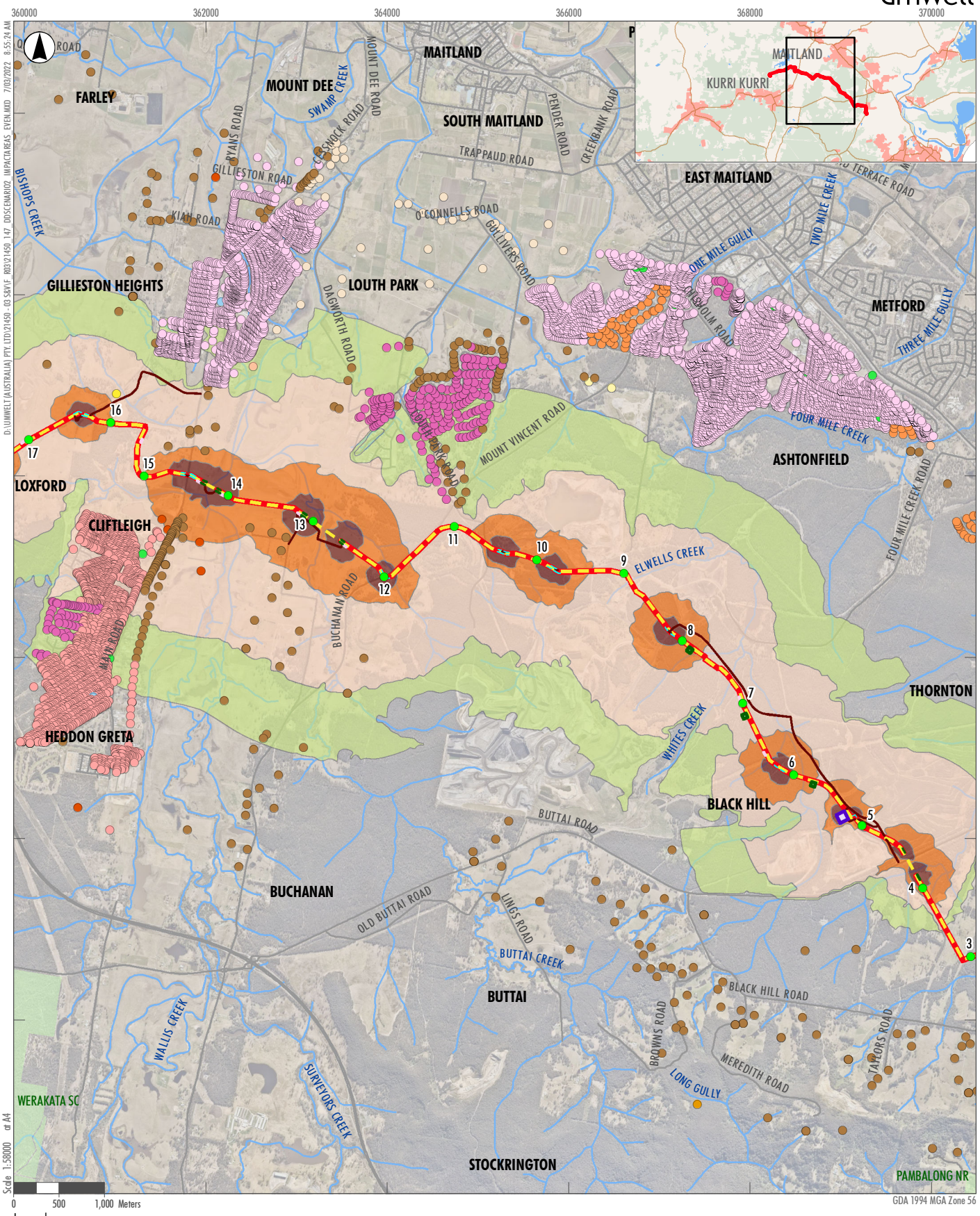
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN2 Light Industrial
- R1 General Residential
- R2 Low Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 16

Scenario 2 Outside of Standard Hours Evening

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

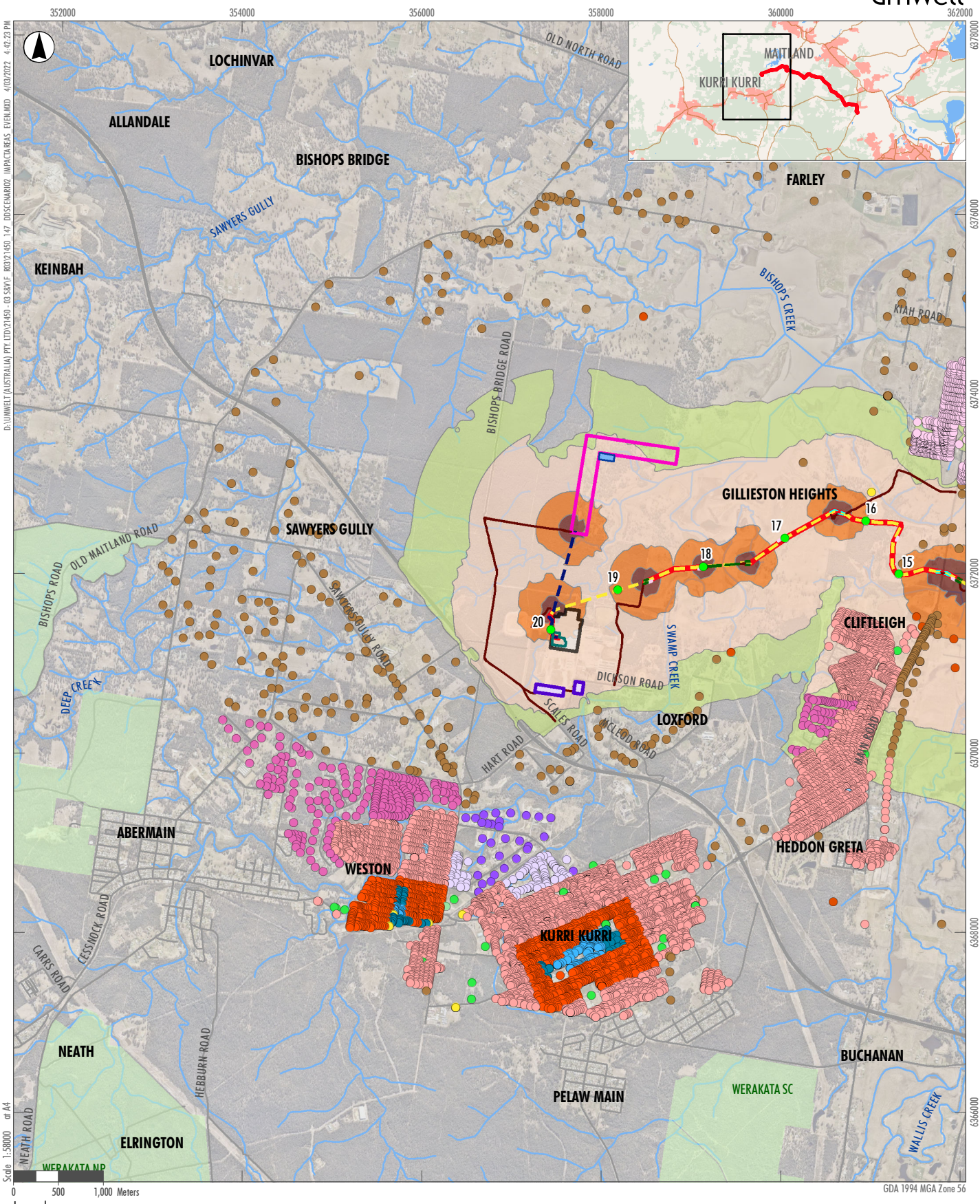
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

APPENDIX D1. 17

Scenario 2
Outside of Standard Hours
Evening

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

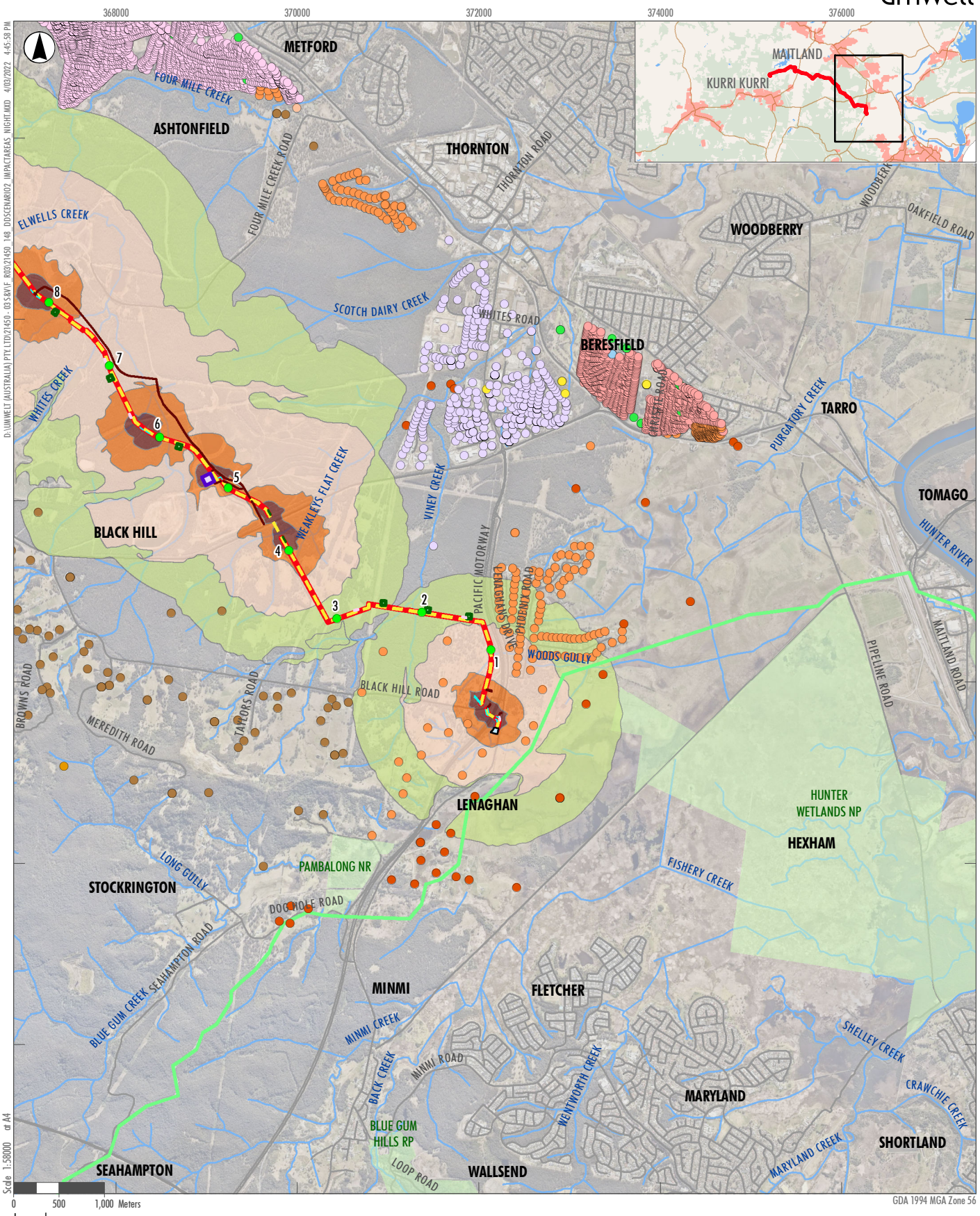
Receivers

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 18

Scenario 2
Outside of Standard Hours
Evening

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Sydney to Newcastle Pipeline (JGN Northern Trunk)
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS
- JGN Offtake Facility

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

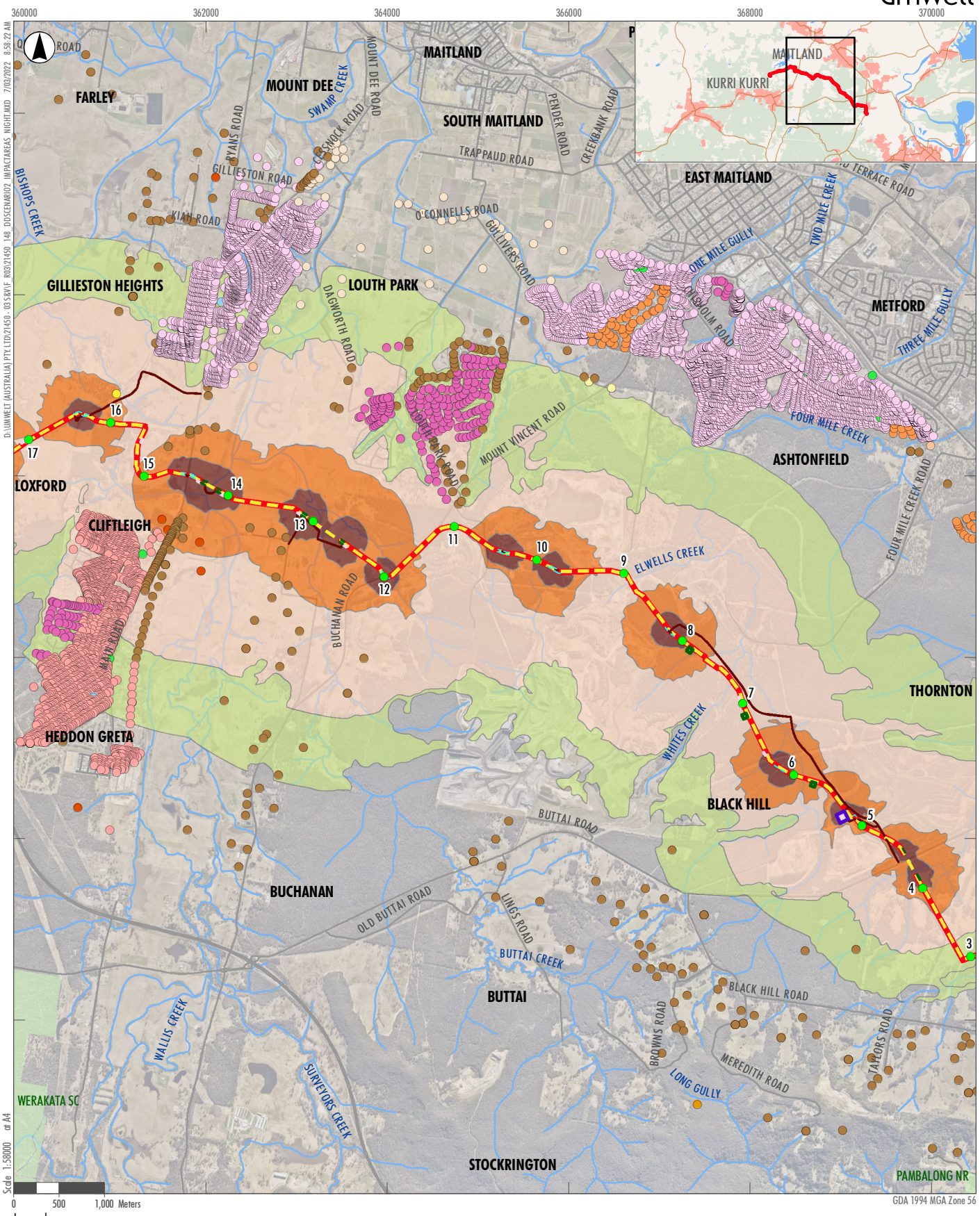
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN2 Light Industrial
- R1 General Residential
- R2 Low Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 19

Scenario 2 Outside of Standard Hours Night

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Pipe Laydown Areas
- Truck Turnarounds
- Vegetation EWS

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

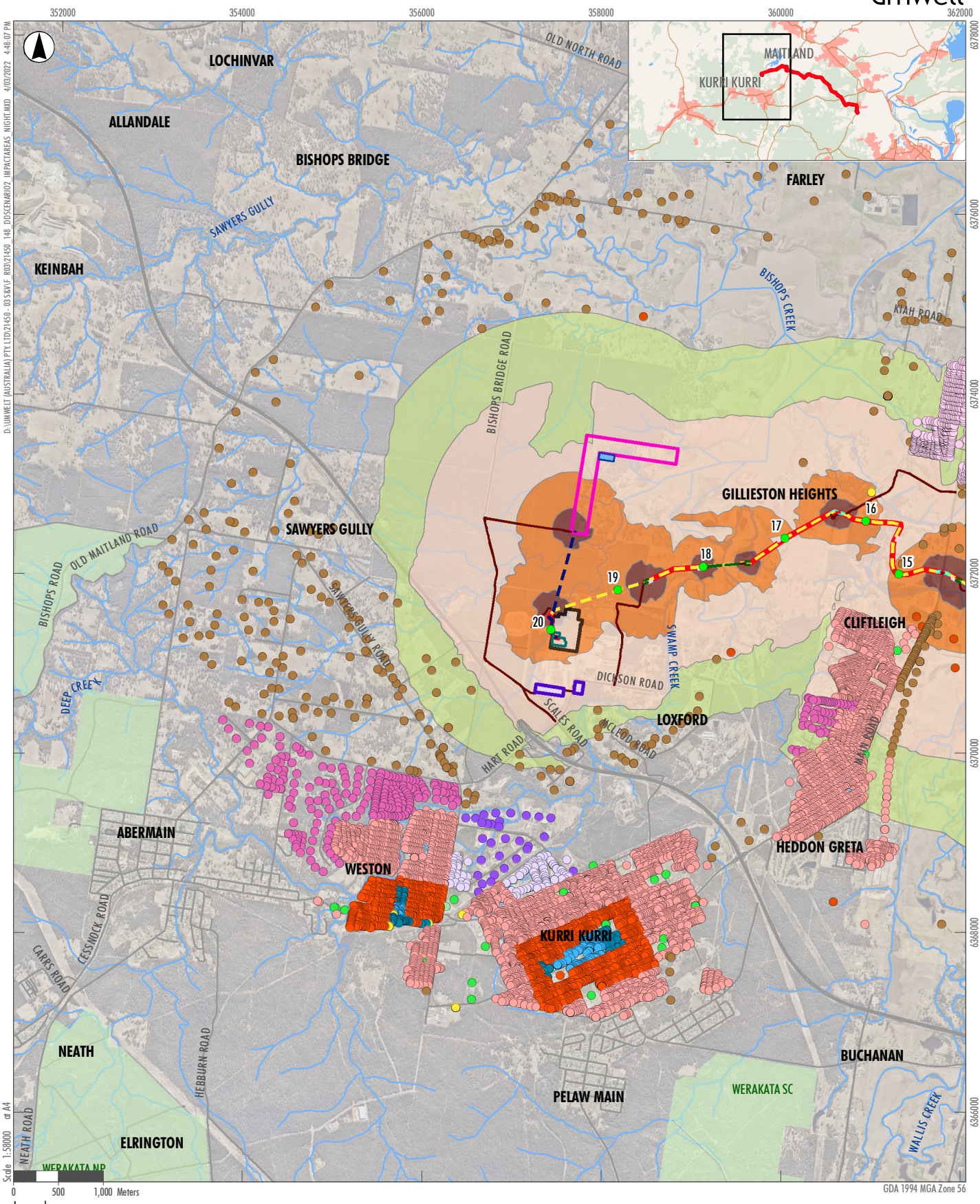
Receivers

- B1 Neighbourhood Centre
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- Primary Production
- RU2 Rural Landscape
- SP1 Special Activities
- SP2 Infrastructure

APPENDIX D1. 20

Scenario 2 Outside of Standard Hours Night

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- Access Tracks
- Roads
- Watercourses
- HDD Workspace
- Horizontal Bore Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Truck Turnarounds
- Storage Pipeline
- Turkey Nest Dam

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

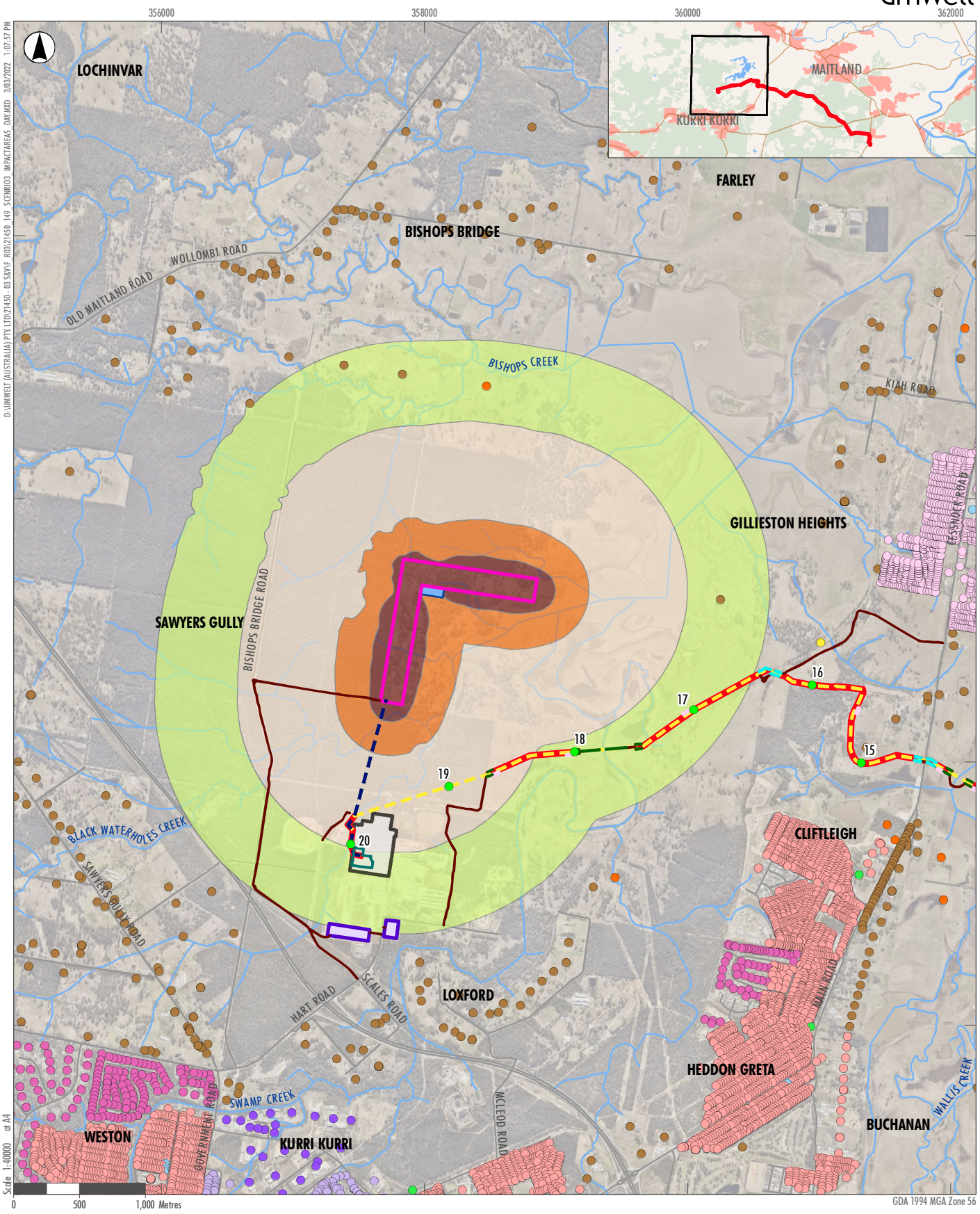
Receivers

- B1 Neighbourhood Centre
- B2 Local Centre
- B4 Mixed Use
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 21

Scenario 2
Outside of Standard Hours
Night

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020; 2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

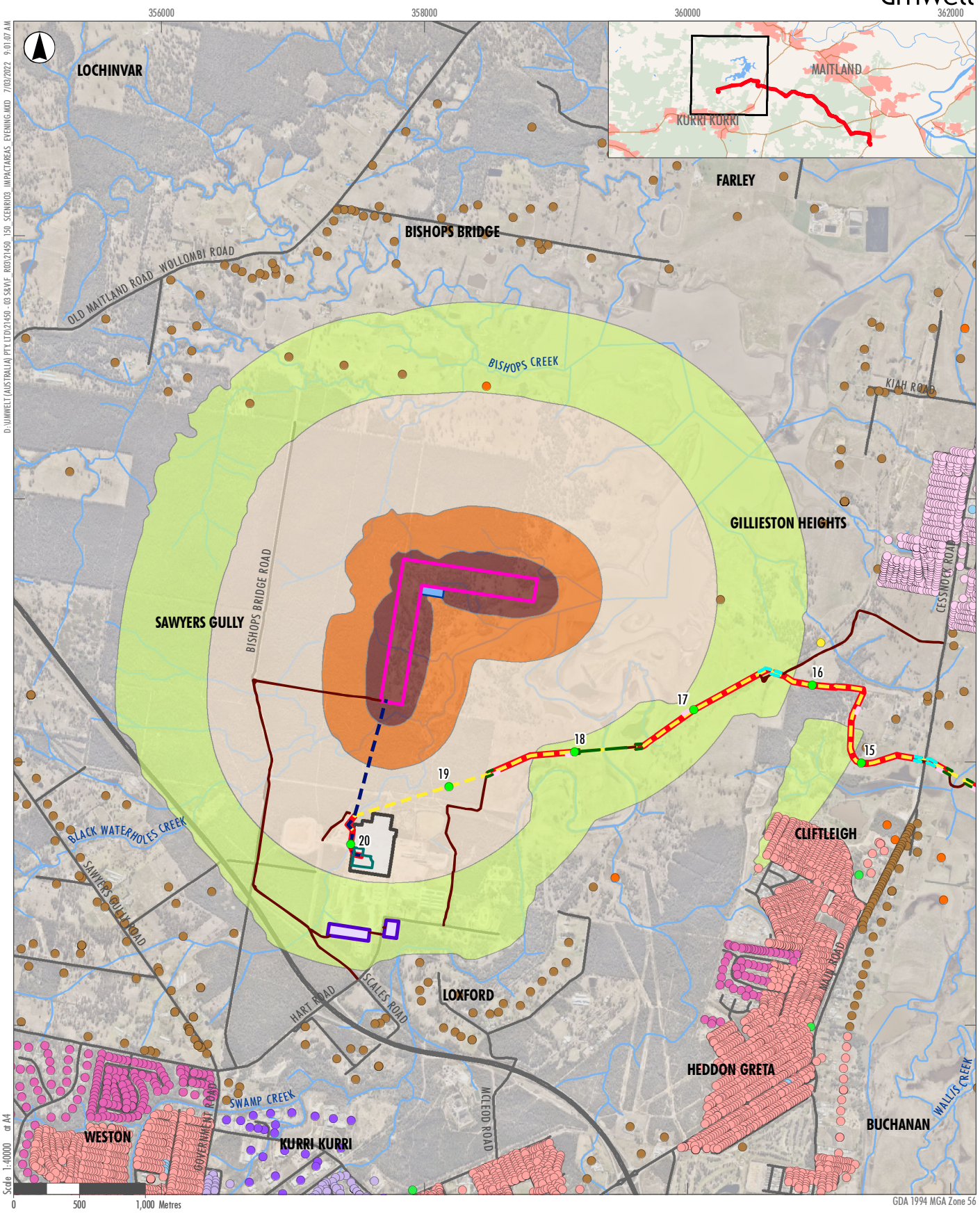
Receivers

- B1 Neighbourhood Centre
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 22

Scenario 3 Outside of Standard Hours Day

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Scale 1:40000 at A4

Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

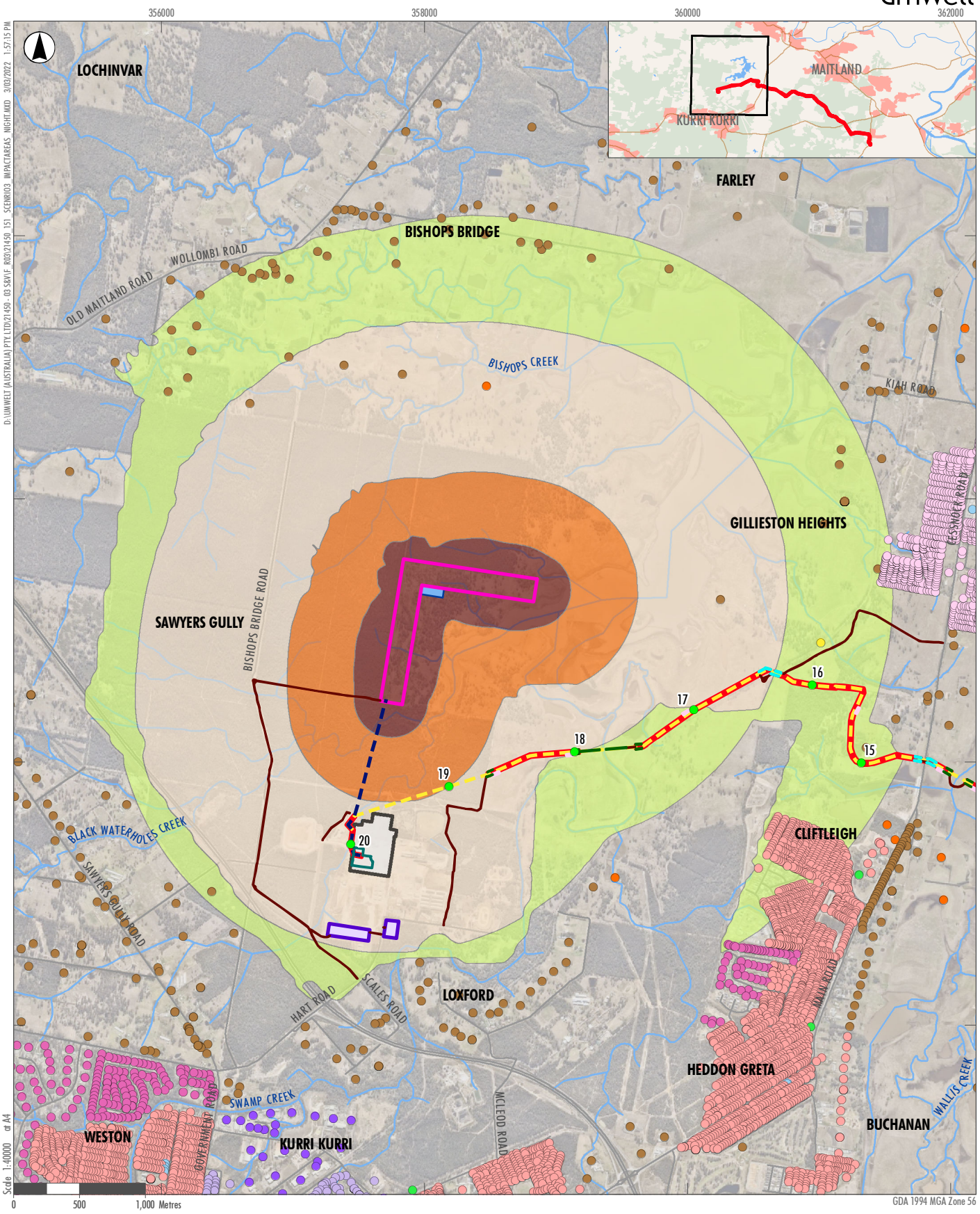
- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

Receivers

- B1 Neighbourhood Centre
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 23

Scenario 3
Outside of Standard Hours
Evening



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

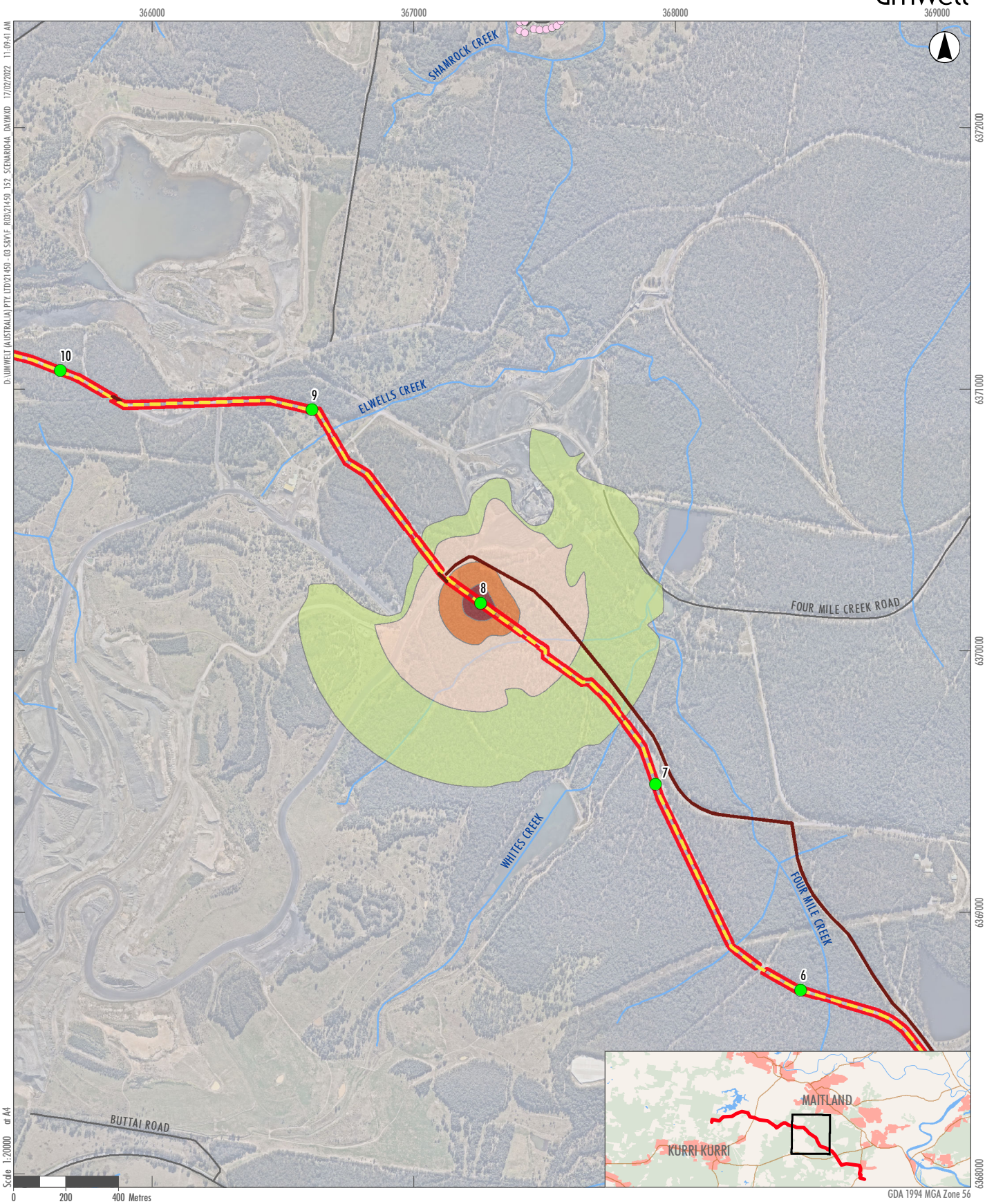
Receivers

- B1 Neighbourhood Centre
- E2 Environmental Conservation
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RU2 Rural Landscape
- SP2 Infrastructure

APPENDIX D1. 24

Scenario 3
Outside of Standard Hours
Night

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

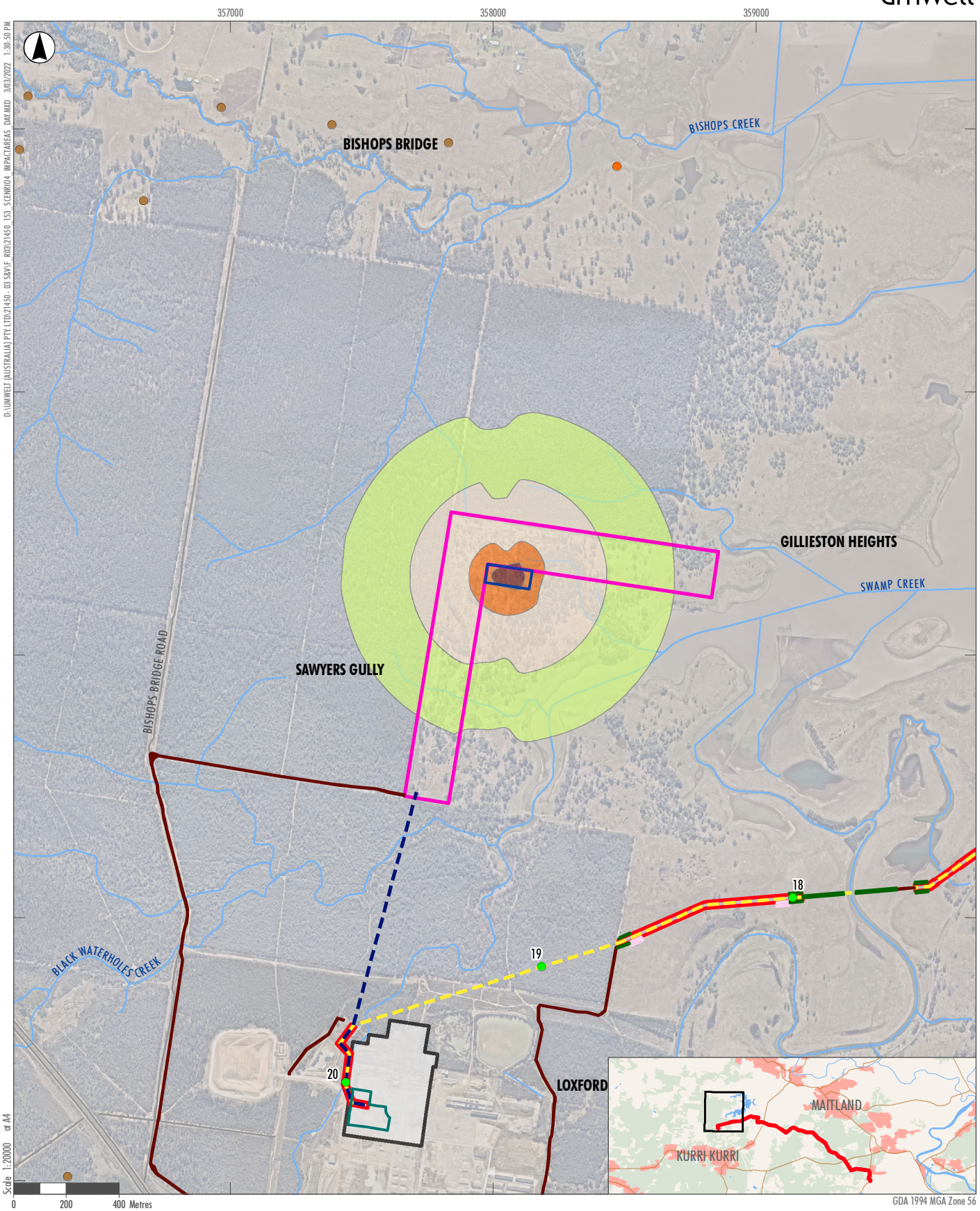
Receivers

- R1 General Residential

APPENDIX D1. 25

Scenario 4 Outside of Standard Hours Day

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

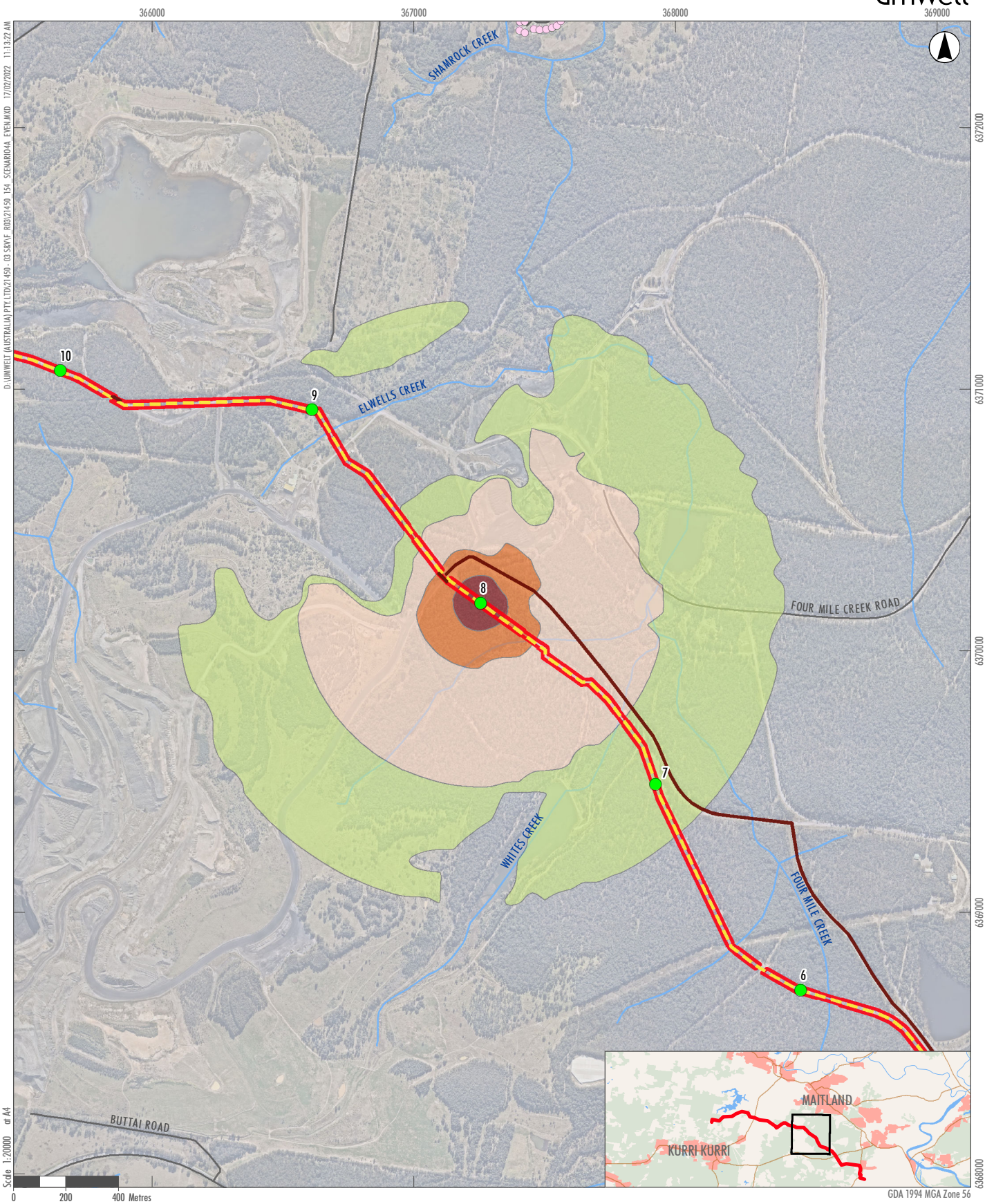
Receivers

- E2 Environmental Conservation
- RU2 Rural Landscape

APPENDIX D1. 26

Scenario 4
Outside of Standard Hours
Day

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

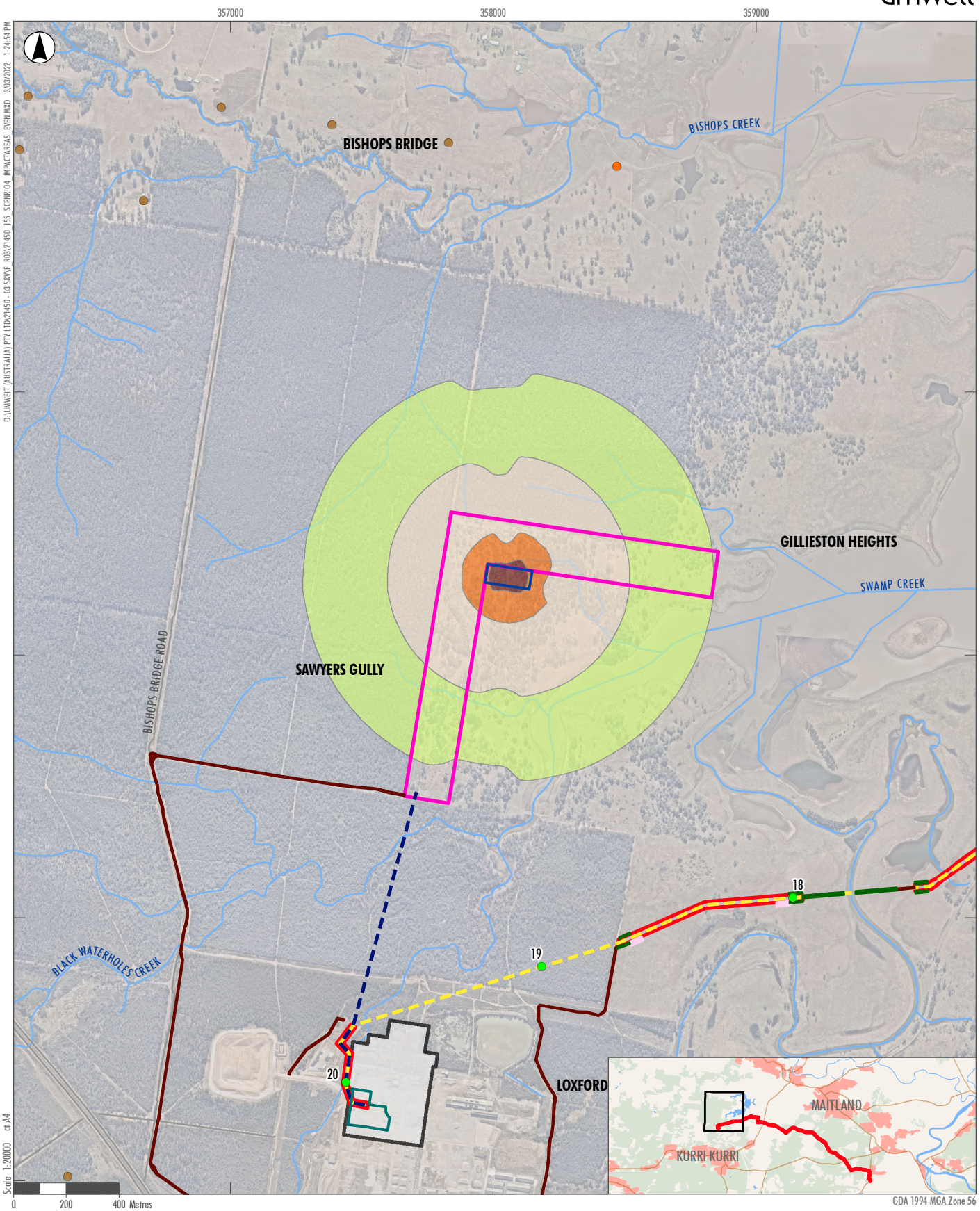
Receivers

- R1 General Residential

APPENDIX D1. 27

Scenario 4
Outside of Standard Hours
Evening

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

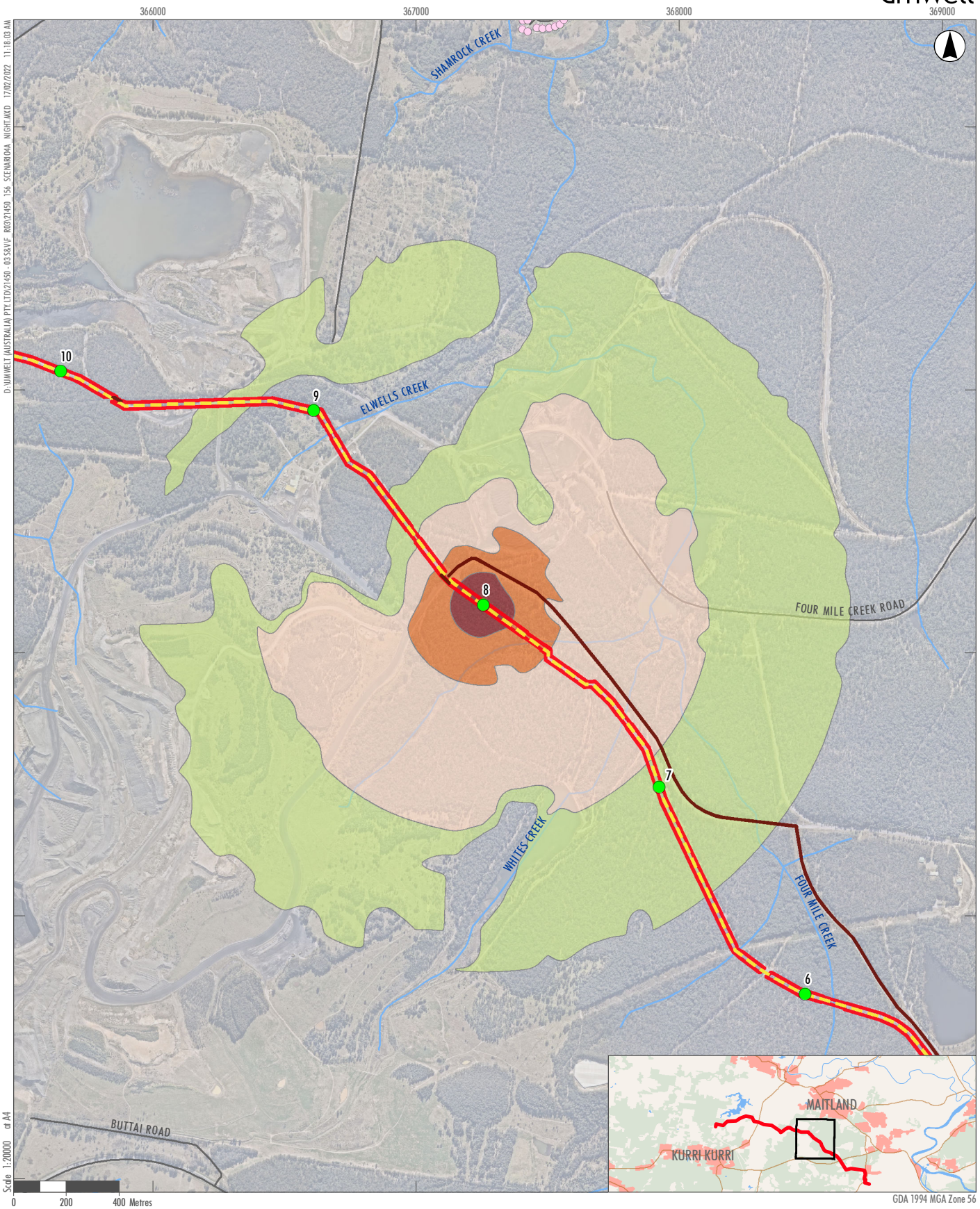
Receivers

- E2 Environmental Conservation
- RU2 Rural Landscape

APPENDIX D1. 28

Scenario 4
Outside of Standard Hours
Evening

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- HDD Workspace
- Kilometre Point
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

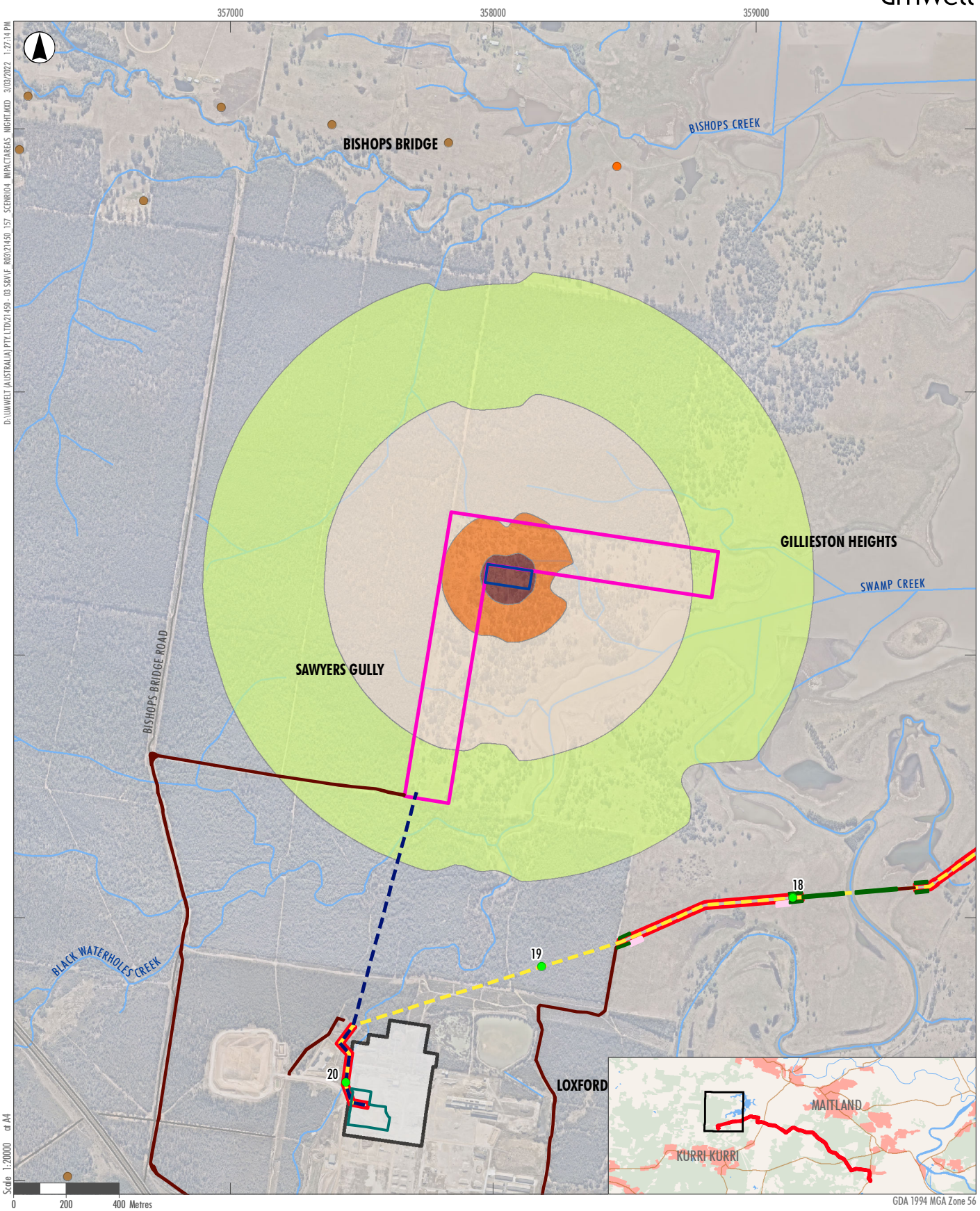
Receivers

- R1 General Residential

APPENDIX D1. 29

Scenario 4
Outside of Standard Hours
Night

Image Source: Neamap (August 2021) Data source: NSW LPI (2020;2021)



Legend

- Transmission Pipeline Construction Footprint
- Transmission Pipeline Alignment
- Interconnect Pipeline
- Kilometre Point
- HDD Workspace
- Compressor and Delivery Station
- HPP Proposal Site
- Pipe Laydown Areas
- Storage Pipeline
- Turkey Nest Dam
- Access Tracks
- Roads
- Watercourses

Noise Impact Areas

- Category 1 - Noticeable
- Category 2 - Clearly Audible
- Category 3 - Moderately Intrusive
- Category 4 - Highly Intrusive

Receivers

- E2 Environmental Conservation
- RU2 Rural Landscape

APPENDIX D1. 30

Scenario 4 Outside of Standard Hours Night

Image Source: Nearmap (August 2021) Data source: NSW LPI (2020;2021)

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Consultants

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