ATLAS-CAMPASPE MINERAL SANDS PROJECT

OPTIMISATION MODIFICATION

APPENDIX C

NOISE REVIEW

TRONOX

ACOUSTICS AND AIR

ATLAS-CAMPASPE MINERAL SANDS PROJECT OPTIMISATION MODIFICATION

NOISE REVIEW

REPORT NO. 11241-A
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TRONOX LIMITED

WILKINSON MURRAY

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TABLE OF CONTENTS

Page

GLOSSARY OF ACOUSTIC TERMS

1 INTRODUCTION 1

2 OVERVIEW OF THE MODIFICATION 3

3 NOISE CRITERIA 6

3.1 Operational Noise 6

3.2 Road Traffic Noise 10

3.3 Rail Traffic Noise 11

4 EXISTING NOISE ENVIRONMENT 13

4.1 Receiver Locations 13

4.2 Ambient Noise Monitoring 13

4.3 Compliance Noise Monitoring 14

4.4 Meteorology 14

4.5 Meteorological Conditions Used for Noise Assessment Purposes 17

5 EXISTING NOISE MANAGEMENT 19

6 OVERVIEW OF PREVIOUS ASSESSMENT 20

6.1 Atlas-Campaspe Mine Site 20

6.2 Ivanhoe Rail Facility 23

6.3 Road Traffic 23

6.4 Rail Traffic 24

7 ASSESSMENT OF MODIFIED POTENTIAL NOISE IMPACTS 25

7.1 Operational Noise Atlas-Campaspe Mine Site 25

7.2 Ivanhoe Rail Facility 28

7.3 Road Traffic Noise 29

7.4 Rail Traffic Noise 29

8 CONCLUSION 31

9 REFERENCES 32

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

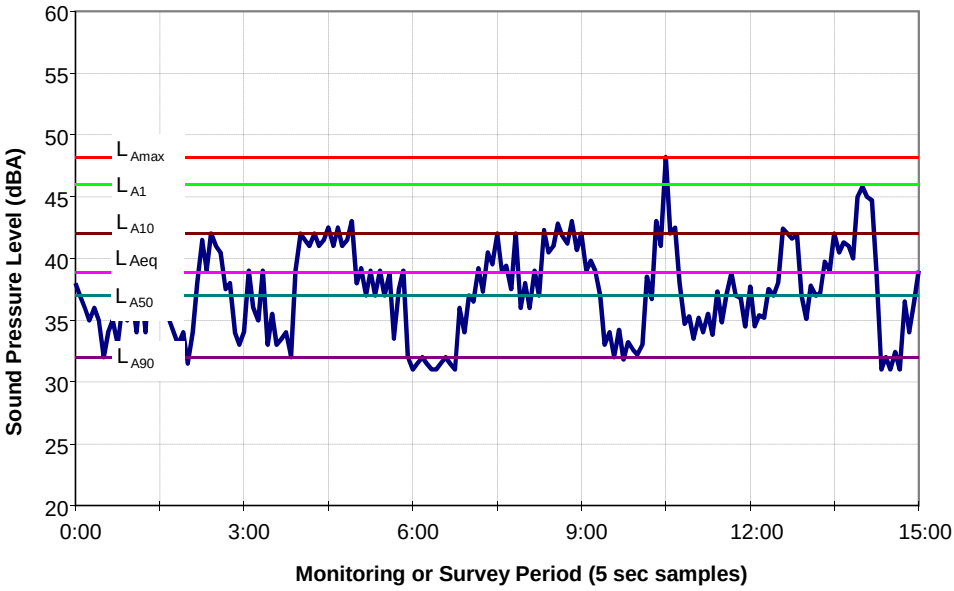
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

The Atlas-Campaspe Mineral Sands Project (the Project) is being developed by Tronox Mining Australia Limited (Tronox). Development Consent (SSD_5012) for the Project was issued under the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* in 2014.

The Project includes the development of a mineral sands mining operation (herein referred to as the Atlas-Campaspe Mine), together with the construction and operation of a rail loadout facility located near the township of Ivanhoe (herein referred to as the Ivanhoe Rail Facility).

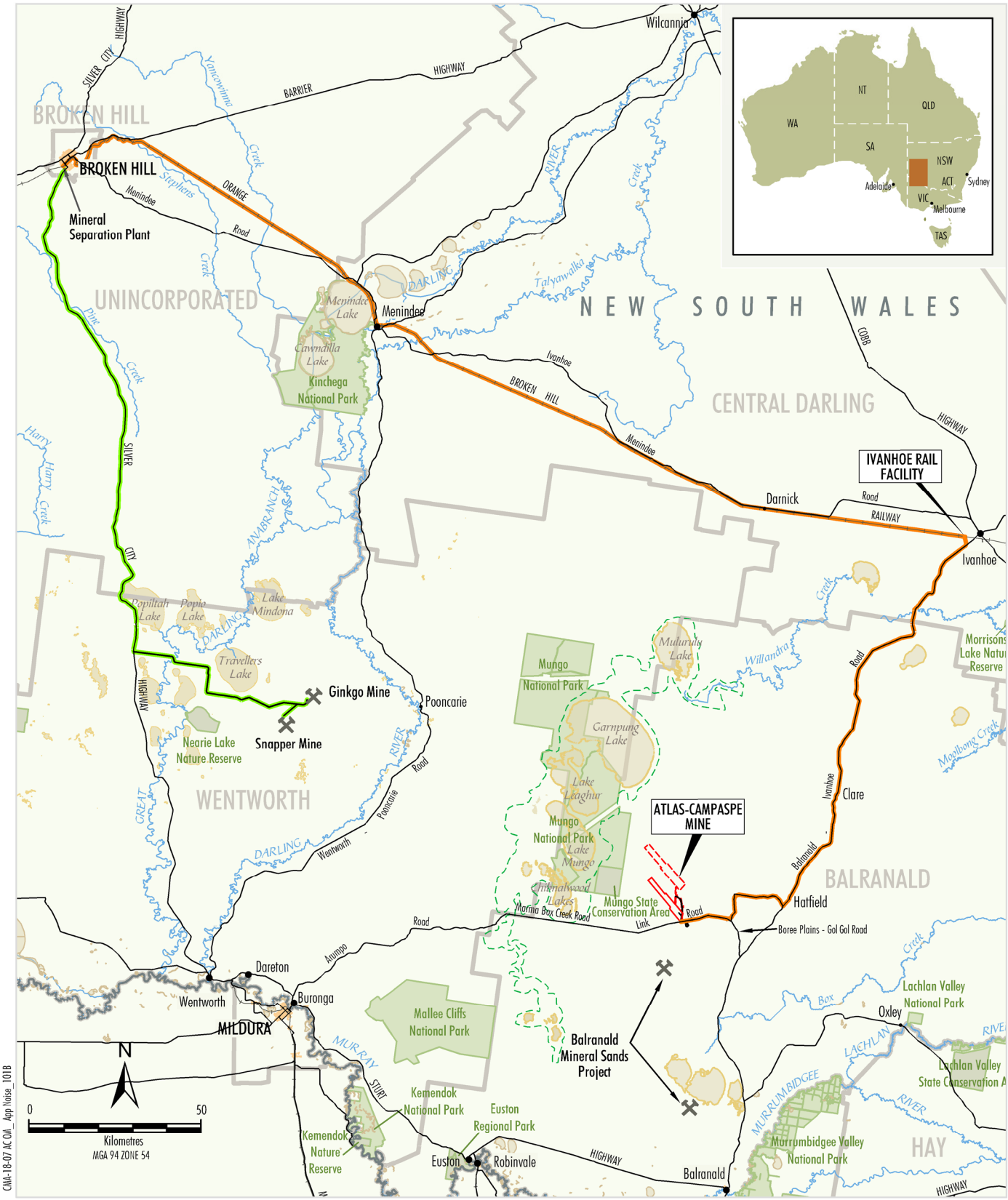
The Atlas-Campaspe Mine is located approximately 80 kilometres (km) north of Balranald, NSW and 270 km south-east of Broken Hill, NSW (Figure 1-1). The Ivanhoe Rail Facility is located approximately 135 km north-east of the Atlas-Campaspe Mine, and is approximately 4.5 km to the south-west of the township of Ivanhoe (Figure 1-1).

Product (mineral concentrates) generated as a result of operations at the Atlas-Campaspe Mine will be trucked to the Ivanhoe Rail Facility for transfer to train wagons, which will then be railed to the existing Broken Hill Mineral Separation Plant (the MSP) (Figure 1-1).

The Project will integrate with currently existing / approved Tronox operations in western NSW, including (Figure 1-1):

- the MSP – located in Broken Hill approximately 270 km north-west of the Atlas-Campaspe Mine;
- Snapper Mine – located approximately 105 km to the west of the Atlas-Campaspe Mine; and
- Ginkgo Mine – located approximately 100 km to the west of the Atlas-Campaspe Mine.

This Noise Review has been prepared to support the application to modify Development Consent (SSD_5012) for the Project.



CMA-18-07 AC OIA_ App Noise_101B

LEGEND

- National Park, Regional Park or State Conservation Area
- Willandra Lakes Region World Heritage Area
- Local Government Area Boundary
- Mining Lease Boundary (ML 1767)
- Mining Lease Application Boundary (MLA)
- Existing Mineral Concentrate Transport Route and MSP Process Waste Transport Route
- Approved Mineral Concentrate Transport Route*

Source: © NSW Department of Finance, Services & Innovation (2018); Cristal Mining Australia (2012)

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OPTIMISATION MODIFICATION

Regional Location

* MSP Process Waste Transport Route following cessation of operations at the Ginkgo and Snapper Mines.

Figure 1-1

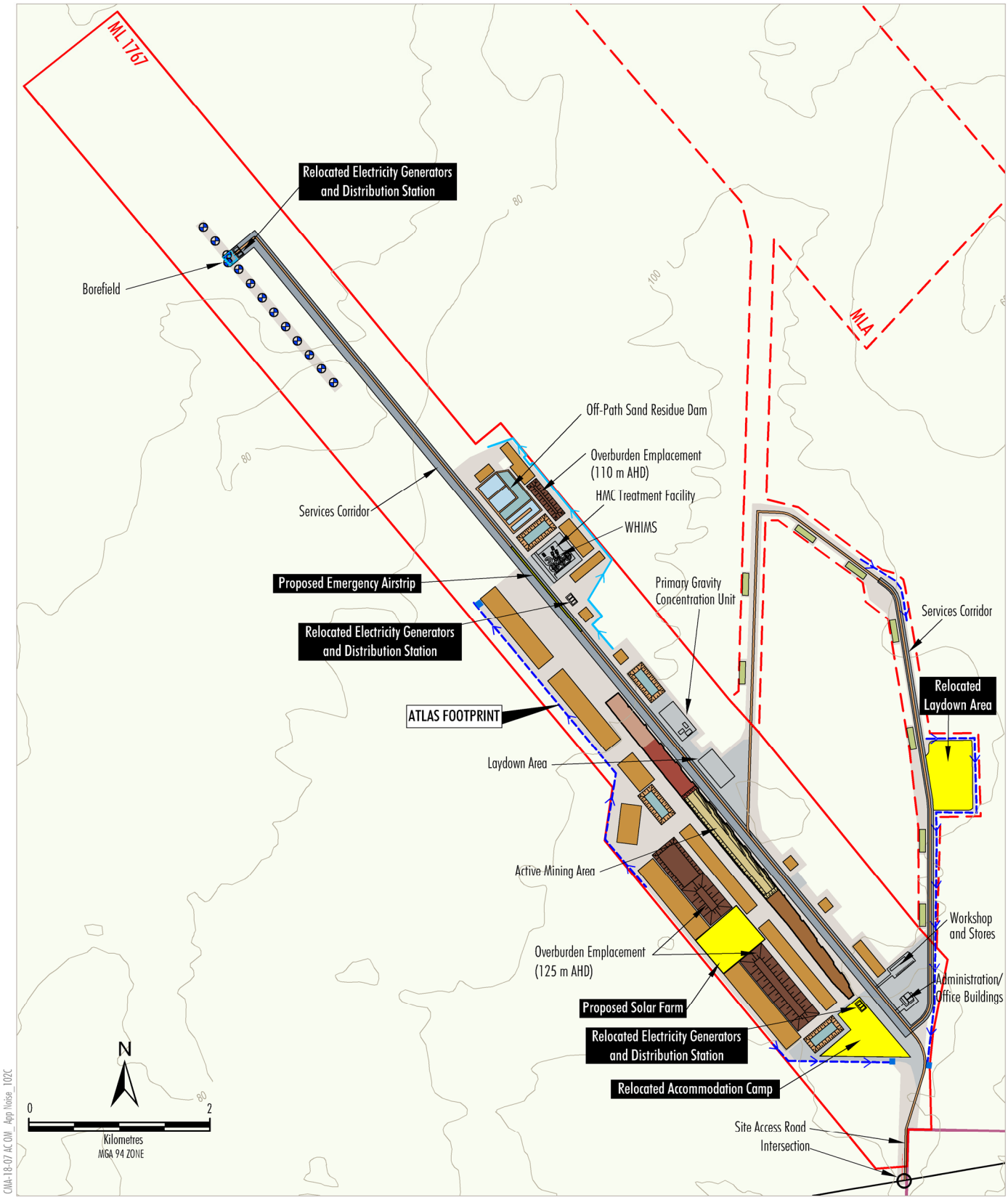
2 OVERVIEW OF THE MODIFICATION

Tronox proposes to modify Development Consent (SSD_5012) for the Project to allow for changes to optimise the Project (herein referred to the Optimisation Modification or Modification). The Modification would include:

- Increased mineral concentrate production from 546,000 tonnes per annum (tpa) to 665,000 tpa;
- Increased mineral concentrate transport from 450,000 tpa to 665,000 tpa;
- Increased mineral concentrate transport truck trips from 24 per day to 35 per day;
- Increased mineral concentrate transport train length (from 600 metres [m] to 920 m) and frequency (from six to eight train movements per week [i.e. four arrivals, four departures]);
- Increased MSP process waste disposal from 50,000 tpa to 65,000 tpa;
- The option to use an overland conveyor to transfer overburden in addition to haul trucks;
- The relocation of the Atlas-Campaspe Mine accommodation camp;
- The option to develop on-site solar power generation infrastructure at the Atlas-Campaspe Mine to supplement diesel generator sets (Figure 2-1);
- Development of an emergency airstrip at the Atlas-Campaspe Mine (Figure 2-1);
- Construction and operation of a telecommunications tower at the Atlas-Campaspe Mine;
- An extension to the Ivanhoe Rail Facility hardstand area (Figure 2-2);
- An extension of the Ivanhoe Rail Facility rail siding and addition of a passing siding (Figure 2-2);
- A revised alignment of the Ivanhoe Rail Facility access road and access road intersection (Figure 2-2);
- A groundwater supply bore for the Ivanhoe Rail Facility (Figure 2-2); and
- The use of local roads other than the road haulage route by Project-related light vehicles to access site (Figure 1-1).

The Modification would <u>not</u> change the following components of the Project:

- Mine path or mine life;
- Mining method;
- Mineral concentration methods;
- Overburden and ore extraction rate;
- Sand residue, coarse reject and process waste placement management;
- Annual maximum water supply/demand;
- Rehabilitation works;
- Biodiversity offset area; or
- Workforce.



Source: © NSW Department of Finance, Services & Innovation (2018); Cristal Mining Australia (2012) and Tronox (2019)

LEGEND

- Mining Lease Boundary (ML)
- Mining Lease Application Boundary (MLA)
- Exploration Licence Boundary (EL)
- Up-catchment Diversions
- Collection Drains
- Bore
- Approximate Extent of Surface Development - Year 2
- Fixed Infrastructure Areas
- Soil Stockpile
- Process Water Storage
- Overburden Emplacement
- Stage 1 Rehabilitation - Stabilised Landform with Seed/Cover Crop Application

Active Mining Area

- Vegetation Clearance/Soil Stripping
- Overburden Removal
- Ore Zone/Extraction Area
- Overburden Replacement/Process Waste Emplacement/Soil Replacement
- Sediment Basin

ACMSP Modification

- Modification Surface Development Area

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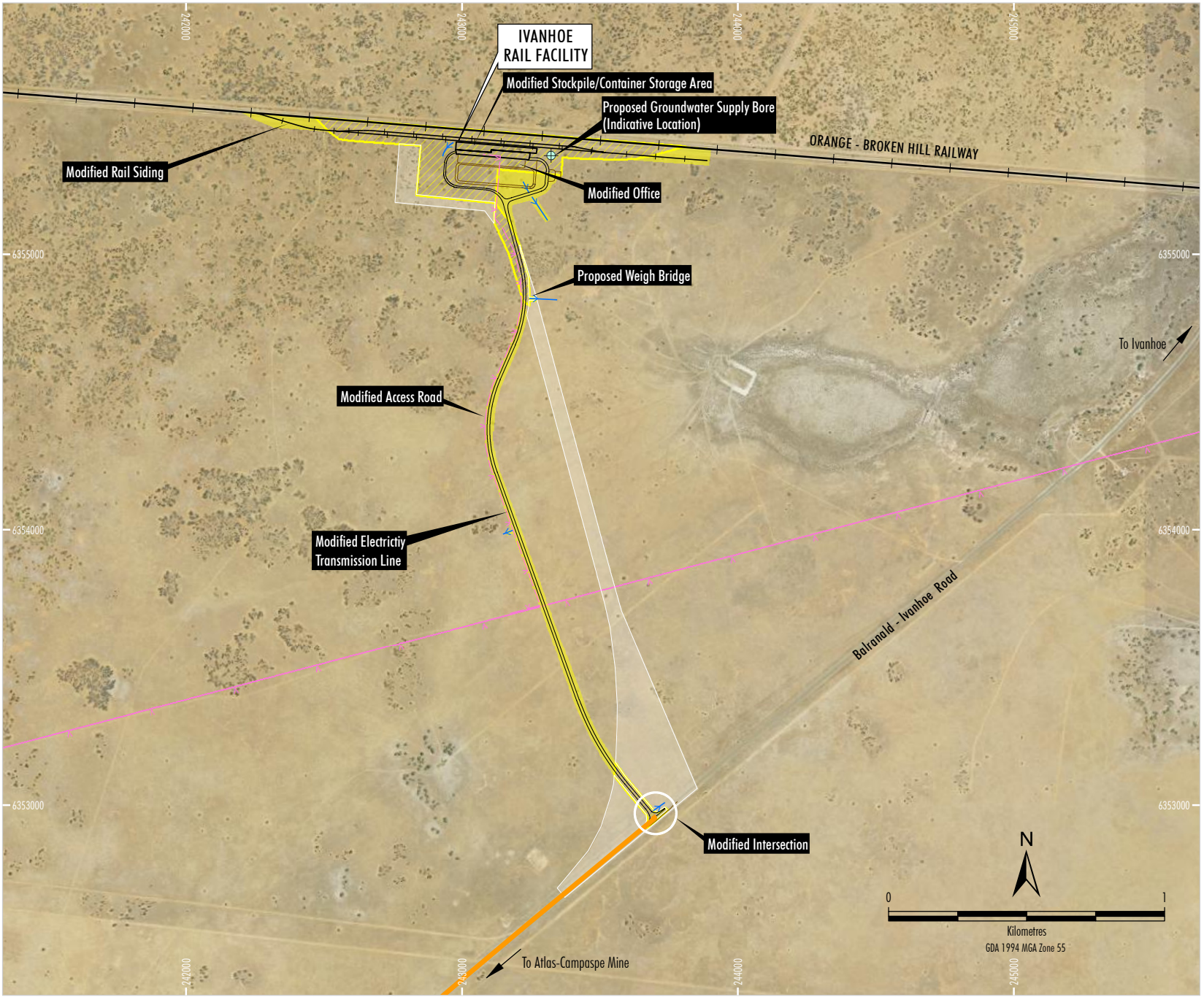
OPTIMISATION MODIFICATION

Modified Atlas-Campaspe Mine General Arrangement - Year 2

Figure 2-1



LEGEND

- Approved Surface Development Area Required
- Additional Surface Development Area
- Approved Surface Development Area not Required
- Approved Mineral Concentrate Transport Route*
- Existing Electricity Transmission Line

* MSP Process Waste Transport Route following cessation of operations at the Ginkgo and Snapper Mines

Source: Cristal Mining Australia (2012); Tronox (2019)
Orthophoto: © NSW Department of Finance, Services & Innovation (2017)

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OPTIMISATION MODIFICATION

Modified Ivanhoe Rail Facility
General Arrangement

Figure 2-2

CMA-18-07 AC OM_ App Noise_201B

3 NOISE CRITERIA

3.1 Operational Noise

The applicable operational noise criteria for the Project is stipulated in Condition 16, Schedule 3 of Development Consent (SSD_5012) and are reproduced in Table 3-1.

Table 3-1 Development Consent (SSD_5012) Operational Noise Criteria

Location	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,1min}$
All privately-owned land	35	35	35	45
Mungo National Park & Mungo State Conservation Area	50	50	50	-

The applicable operational noise criteria for the Project (Table 3-1) were based on rating background levels (RBL) of 30 dBA for the day, evening and night periods (i.e. the minimum RBLs assumed for assessment purposes in accordance with the procedures documented in the Industrial Noise Policy [INP] [Environmental Protection Authority, 2000]), based on the background noise survey conducted by Wilkinson Murray (2012) for the approved Project (Section 4.2).

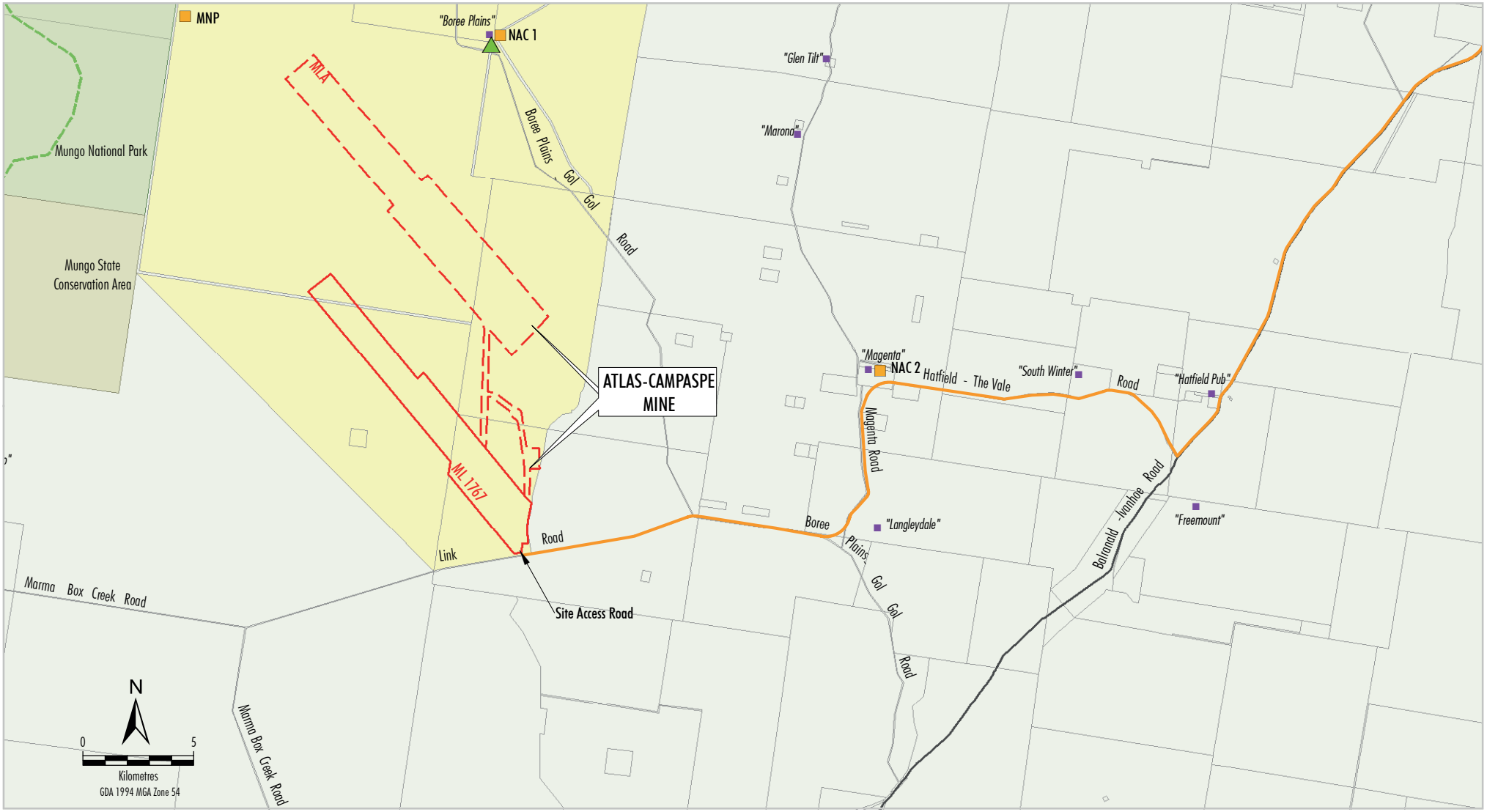
In accordance with Condition 16, Schedule 3 of Development Consent (SSD_5012), the criteria in Table 3-1 do not apply under the following meteorological conditions:

- Periods of rain or hail;
- Average wind speed exceeding 5 metres per second (m/s);
- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Temperature inversions greater the 3 degrees Celsius (°C) / 100 m.

Also in accordance with Condition 16, Schedule 3 of Development Consent (SSD_5012), these criteria do not apply where Tronox has an agreement with the owner/s or leaseholders of the residence to generate higher noise levels, and Tronox has advised the Department of Planning and Environment in writing of the terms of this agreement.

Tronox holds Environment Protection Licence (EPL) 21007 issued under the NSW *Protection of the Environment Operations Act 1997* for the Project. Condition L3.1 details the criteria applicable to noise generated by the operations measured at each monitoring point established under EPL 21007. The EPL 21007 operational noise criteria are shown in Table 3-2.

The monitoring locations are as identified in the Noise Management Plan (Cristal Mining Australia [CMA], 2018) prepared in accordance with Condition 18, Schedule 3 of Development Consent (SSD_5012) and are shown on Figure 3-1.



OMA-18-07 AC OM_ App Noise_202B

LEGEND

- Mining Lease Boundary (ML 1767)
- Mining Lease Application Boundary (MLA)
- Willandra Lakes Region World Heritage Area
- National Park
- State Conservation Area
- Tronox Owned Land
- Private Landholder
- Dwelling
- Approved Mineral Concentrate Transport Route
- Automatic Weather Station
- Noise Monitoring Location

Source:© NSW Department of Finance, Services & Innovation (2017); Cristal Mining Australia (2012)

TRONOX

OPTIMISATION MODIFICATION

Atlas-Campaspe Mine
- Noise Monitoring Sites

Figure 3-1

Table 3-2 EPL 21007 Operational Noise Criteria

Location	Noise Level (Day, Evening and Night) $L_{Aeq,15min}$ dBA
Mungo National Park (MNP)	50
NAC1 "Boree Plains"	35
NAC2 "Magenta"	35

dBA = A-weighted decibel

The Noise Management Plan (CMA, 2018) also includes monitoring locations representative of privately-owned receivers most likely to be affected by noise generated by the Ivanhoe Rail Facility (NI1, NI2 and NI3). NI1, NI2 and NI3 and are shown in Figure 3-2. NI1 is representative of Ivanhoe Township, NI2 represents residences on the Cobb Highway and NI3 represents the Warakirri Correctional Centre.

The EPL 21007 operational noise criteria are consistent with Development Consent (SSD_5012).

Noise Policy for Industry Project Trigger Levels

The *Noise Policy for Industry* (NPfI) (Environment Protection Authority [EPA], 2017) outlines a process for determining Project Noise Trigger Levels for assessing potential operational noise impacts, and supersedes the INP (EPA, 2000).

The Project Noise Trigger Levels for the Project determined in accordance with the NPfI are outlined in Table 3-3.

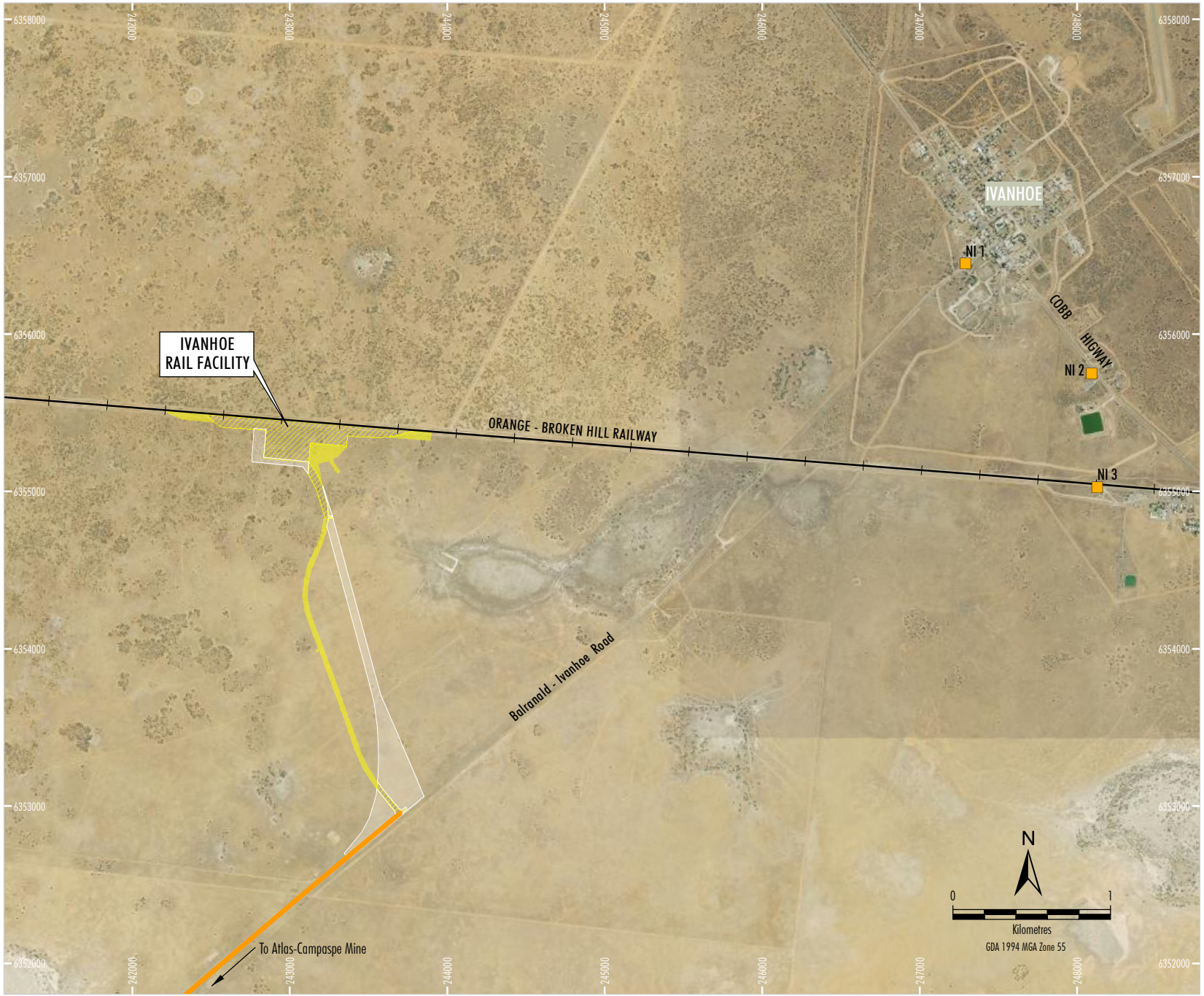
Table 3-3 NPfI Project Noise Trigger Levels

Location	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	L_{AFmax}
All privately-owned land	40	35	35	52

The Project Noise Trigger Levels outlined in Table 3-3 are based on the following:

- RBLs of 35 dBA, 30 dBA, and 30 dBA (i.e. the minimum assumed RBLs in accordance with the NPfI) for the day, evening and night periods respectively, based on the background noise survey conducted by Wilkinson Murray (2012) for the approved Project (Section 4.2).
- The surrounding receivers are situated in an area which would be classified as "Rural" under the NPfI, and the relevant recommended $L_{Aeq,Period}$ amenity noise levels are 50 dBA, 45 dBA and 40 dBA for daytime, evening and night time periods, respectively.

The existing Development Consent and EPL 21007 noise criteria (Tables 3-1 and 3-2) are more stringent than the NPfI Project Noise Trigger Levels outlined in Table 3-3. The potential noise impacts of the Modification have been assessed against the NPfI criteria in Section 7.



LEGEND

- Approved Surface Development Area Required
- Additional Surface Development Area
- Approved Surface Development Area not Required
- Approved Mineral Concentrate Transport Route*
- Noise Monitoring Location

* MSP Process Waste Transport Route following cessation of operations at the Ginkgo and Snapper Mines

Source: Cristal Mining Australia (2012); Tronox (2019)
Orthophoto: © NSW Department of Finance, Services & Innovation (2017)

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OPTIMISATION MODIFICATION

Modified Ivanhoe Rail Facility - Noise Monitoring Sites

Figure 3-2

CMA-18-07 AC OM_ App Noise_203B

3.2 Road Traffic Noise

Development Consent (SSD_5012) does not stipulate any quantitative criteria in regard to noise from road or rail traffic. Condition 17, Schedule 3 of Development Consent (SSD_5012) does however include operating conditions to manage and minimise road or rail traffic emissions as follows:

The Applicant shall:

(a) implement all reasonable and feasible measures to minimise the construction, operational, road and rail noise of the development;

…

(d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in the ARTC's EPL.

Criteria for assessment of noise from traffic on public roads are set out in the NSW *Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011). These criteria are shown in Table 3-4.

Table 3-4 Criteria for Traffic Noise – Residences

Type of Development	Noise Level Criterion	
	Day (7am-10pm)	**Night (10pm-7am)**
Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hour}$ 60 dBA	$L_{Aeq,9hour}$ 55 dBA
Existing residences affected by **additional traffic** on existing local roads generated by land use developments.	$L_{Aeq,1hour}$ 55 dBA	$L_{Aeq,1hour}$ 50 dBA

The RNP states:

> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*

The RNP defines daytime as 7.00am to 10.00pm and night time as 10.00pm to 7.00am.

Noise monitoring location NAC2 ("Magenta"), as shown on Figure 3-1, is representative of the privately-owned receiver most likely to be affected by noise generated by Project road traffic on the road haulage route.

3.3 Rail Traffic Noise

Criteria for assessment of noise from rail traffic operating on the Orange-Broken Hill Railway are documented in the Australian Rail Track Corporation's (ARTC) (operator of the Orange-Broken Hill Railway) EPL 3142. Condition L6 of EPL 3142 does not nominate specific environmental noise limits but notes that:

> *It is an objective of this Licence to progressively reduce noise levels to the goals of 65 dB(A)Leq, (day time from 7am – 10pm), 60 dB(A)Leq, (night time from 10pm – 7am) and 85dB(A) (24 hr) max pass-by noise, at one metre from the façade of affected residential properties through the implementation of the Pollution Reduction Programs.*

In addition, the EPA's *Environmental Assessment Requirements for Rail Traffic – Generating Developments* (Office of Environment and Heritage, 2012) provides rail noise assessment criteria which are presented in Table 3-5.

Table 3-5 EPA Rail Noise Assessment Criteria

Descriptor	Rail Traffic Noise Goal
$L_{Aeq,24hour}$	60 dBA
Maximum Pass-by L_{Amax} (95th percentile)	85 dBA

Note: 95th percentile equates to the 5% exceedance value.

The EPA's rail noise assessment criteria are similar to the ARTC's EPL 3142 noise goals, however, the EPA assessment criteria have an averaging period of 24 hours, rather than daytime (15 hours) and night time (9 hours) as for the ARTC's EPL 3142 noise goals. The EPA rail noise assessment requirements also provide:

> *Where the cumulative noise level exceeds the noise assessment trigger levels, and project-related noise increases are predicted, all feasible and reasonable noise mitigation measures should be implemented. As a general principle, where the reduction of existing noise levels can be achieved through feasible and reasonable measures, a reduction in noise levels to meet the noise assessment trigger levels is the primary objective. In all cases where the LAeq noise level increases are more than 2dB(A), strong justification should be provided as to why it is not feasible or reasonable to reduce the increase.*

In addition, the EPA's *Environmental Assessment Requirements for Rail Traffic – Generating Developments* also provide guidance in relation to the geographical extent of rail noise assessment which should be undertaken for a rail traffic generating development (such as the Project):

> *Ideally, the geographical extent of the rail noise assessment should be to where project/related rail noise increases are less than 0.5dB. This roughly equates to where project/related rail traffic represents less than 10% of total line/corridor rail traffic.*

The EPA's *Rail Infrastructure Noise Guideline* (EPA, 2013) provides the following criteria for rail traffic generating developments:

Rail traffic generating developments

- $L_{Aeq,9hour}$ = 55 dBA;
- $L_{Aeq,15hour}$ = 60 dBA; and
- L_{Amax} (95th percentile) = 80 dBA.

4 EXISTING NOISE ENVIRONMENT

4.1 Receiver Locations

The potentially sensitive receiver locations in vicinity of the Project areas are shown on Figure 3-1 and Figure 3-2.

The Boree Plains residence (Tronox owned) is the closest residence to the Atlas-Campaspe Mine footprint and is located approximately 7 km away from the Campaspe deposit and approximately 18 km away from the Atlas deposit (where Project activities are occurring) (Figure 3-1). Other rural residences (e.g. Marona, Glen Tilt, Magenta and Langleydale) are located at least 14 km away from the Atlas-Campaspe Mine footprint (Figure 3-1).

The closest residential receivers to the mineral concentrate transport route in the Project area were identified as follows (and are shown on Figure 3-1):

- South Winter – approximately 1 km from Hatfield-The Vale Road;
- Magenta – approximately 0.8 km from Magenta Road;
- Langleydale – approximately 1.3 km from Magenta Road;
- Kilfera – approximately 1.5 km from Balranald-Ivanhoe Road; and
- Hatfield Pub – approximately 49 m from Balranald-Ivanhoe Road.

The township of Ivanhoe is representative of the closest residential area to the Ivanhoe Rail Facility. The Ivanhoe Rail Facility is located approximately 4.5 km from Ivanhoe (Figure 3-2).

4.2 Ambient Noise Monitoring

Monitoring to characterise the noise environment of the area surrounding the Project was carried out by Wilkinson Murray (2012) for the Project. The survey results are shown in Table 4-1.

Table 4-1 Background Noise Survey Results

Location	Site	Monitoring Period	RBL (dBA)		
			Day	Evening	Night
Boree Plains (NAC1)	Atlas-Campaspe Mine	15/11/2011 to 30/11/2011	28	27	24
Min Min		15/11/2011 to 26/11/2011	25	25	25
32 Mitchell Street, Ivanhoe (NI1)	Ivanhoe	12/04/2012 to 19/04/2012	28	29	25

dBA = A-weighted decibel

4.3 Compliance Noise Monitoring

Compliance noise monitoring in accordance with the Noise Management Plan (CMA, 2018) was carried out by GHD on behalf of Tronox on 14 May 2018. The results are shown in Table 4-2. No mechanically-generated noise was audible from the Atlas-Campaspe Mine throughout the measurement period and the measured levels are well below the Project-specific noise limits as required under Development Consent (SSD_5012) and EPL 21007 conditions.

Table 4-2 Compliance Survey Ambient Noise Monitoring Results

Location	Time	Measured Noise Levels dBA		Estimated Project Contribution dBA
		$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{Aeq,15min}$
NAC2	1022-1037	24	18	Inaudible
NAC2	1040-1055	24	18	Inaudible
NAC1	1146-1200	28	19	Inaudible
NAC1	1207-1222	27	19	Inaudible
MNP	1326-1340	23	19	Inaudible
MNP	1345-1359	24	18	Inaudible

4.4 Meteorology

4.4.1 General

At relatively large distances from a source the resultant noise levels from a noise source will be influenced by meteorological conditions, specifically:

- wind; and
- temperature gradients.

Wind can increase noise at a receiver when it blows from the direction of the noise source at relatively low wind speeds (below 3 m/s). An increase in wind strength greater than 3 m/s generally results in a corresponding increase in wind noise at the receiver which masks noise from the source under investigation.

Temperature inversions (positive temperature gradients) can increase noise levels at surrounding receivers by the reflection of sound waves from warmer upper layers of air. Temperature inversions occur predominantly at night.

In assessing noise impacts, the criteria are expected to apply under weather conditions that are likely to occur at a particular site for a significant period of time.

The NPfI describes two approaches for assessing these effects; the simple and the more detailed approach.

The simple approach forgoes a detailed analysis of meteorological data and simply applies given default meteorological parameters to predict noise levels. This approach assumes that meteorological effects are present for a significant amount of time, avoiding the need to quantify these effects in detail. It is conservative, in that it is likely to predict the upper range of increases in noise levels due to meteorological conditions.

The more detailed approach involves an analysis of meteorological data to determine whether inversions and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or where preferred, measured values maybe used instead.

Tronox has installed an automatic weather station (AWS) at the Atlas-Campaspe Mine (Figure 3-1). In the absence of data from the AWS, the following summary of the synthetic site-specific meteorological data for both the Atlas-Campaspe Mine and the Ivanhoe Rail Facility are as presented in the Katestone Environmental Pty Ltd (2012) *Air Quality and Greenhouse Gas Assessment* prepared for the Project.

4.4.2 Wind

Figure 4-1 and Figure 4-2 show seasonal wind roses for the Atlas-Campaspe Mine and the Ivanhoe Rail Facility, respectively. For both sites the highest frequencies of winds generally occur from the south and southwest.

Figure 4-1 Seasonal Wind Roses for the Atlas-Campaspe Mine (Katestone, 2012)

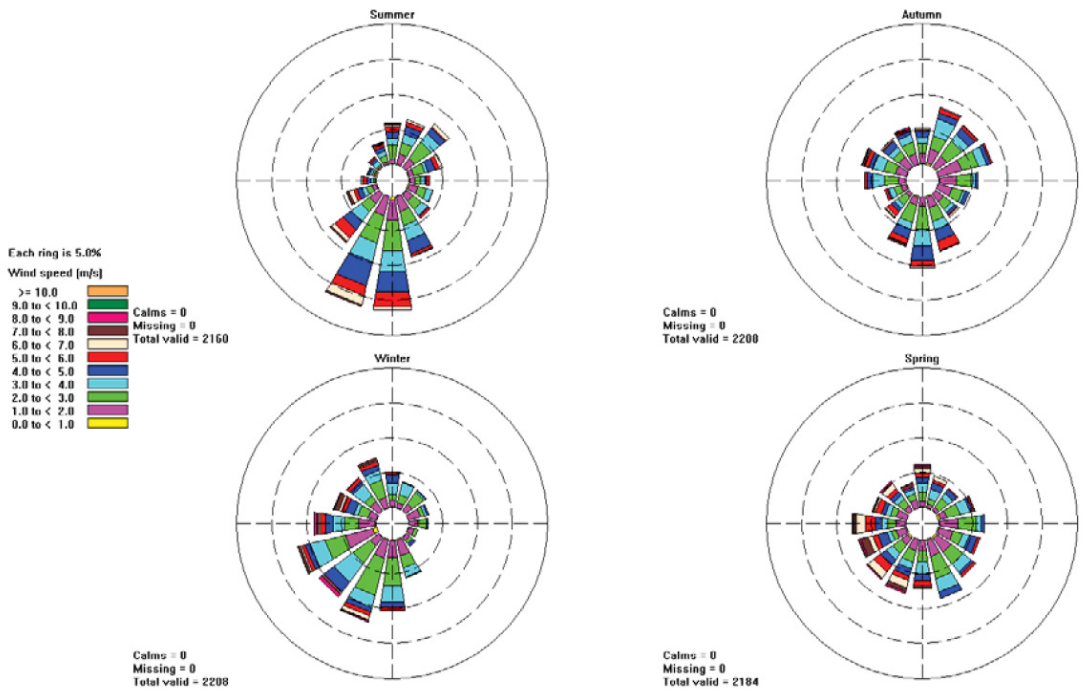

Figure 4-2 Seasonal Wind Roses for the Ivanhoe Rail Facility (Katestone, 2012)

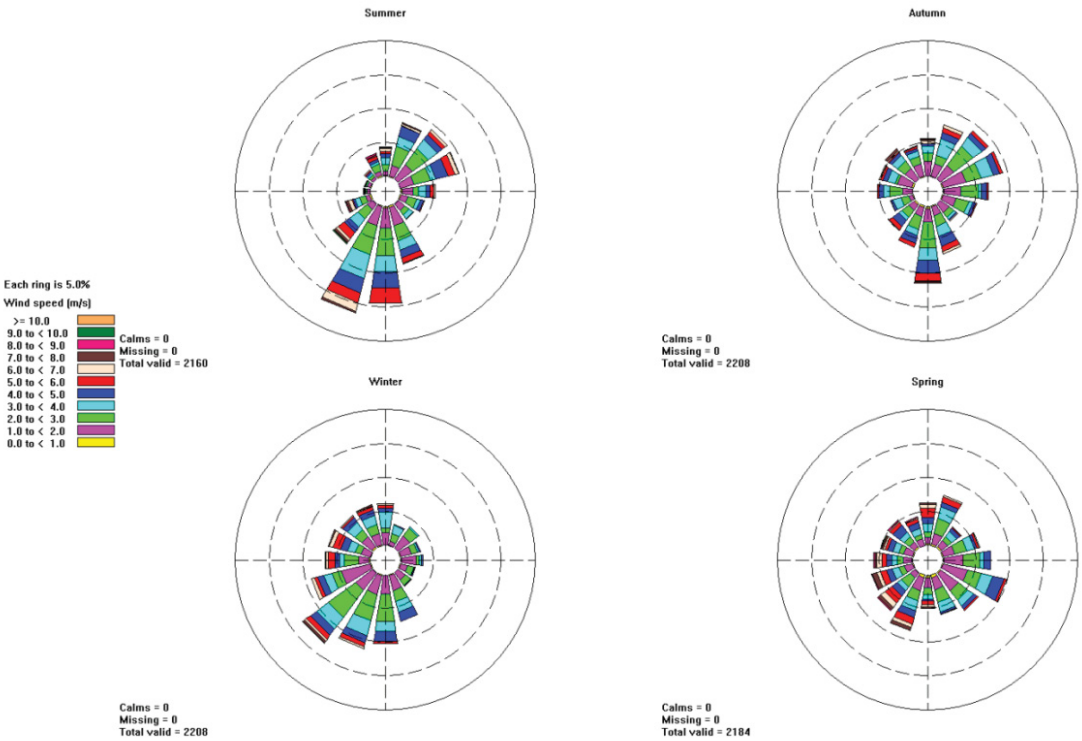

Figure 4-1 and Figure 4-2 indicate that the winds at the Atlas-Campaspe Mine and Ivanhoe Rail Facility are similar and can be considered predominantly moderate. These figures also show that approximately 50 percent (%) of winds are between 2 and 4 m/s, with little seasonal variation.

4.4.3 Temperature Inversion

Pasquill-Gifford stability conditions indicate the potential for temperature inversions. There are seven stability classes referred to as A to G. The predicted frequencies of occurrence of stability class are shown in Table 4-3 and Table 4-4 for the Atlas-Campaspe Mine and for the Ivanhoe Rail Facility, respectively.

Pasquill-Gifford stability conditions A to D indicate lapse conditions (negative temperature gradient). Pasquill-Gifford stability conditions E to G indicate temperature inversion conditions, E indicating a temperature gradient of between -0.5 and 1.5 ^{o}C / 100 m, F indicating a temperature gradient of between 1.5 and 4°C / 100 m and G indicating a temperature gradient greater than 4°C / 100 m.

Table 4-3 Distribution of Atmospheric Stability Categories for the Atlas-Campaspe Mine

Stability	Percentage Occurrence
A	1.3
B	7.9
C	18.2
D	28.9
E	11.3
F/G	32.4

Table 4-4 Distribution of Atmospheric Stability Categories for the Ivanhoe Rail Facility

Stability	Percentage Occurrence
A	1.5
B	8.6
C	19.1
D	26.8
E	9.4
F/G	34.6

Stability Classes F and G apply normally at night when winds are light, and the sky is clear. Class E describe intermediate conditions between those described above.

There is a high percentage of D, E, F and G class conditions for both areas (Table 4-3 and Table 4-4), reflecting a prevalence of stable meteorological conditions.

4.5 Meteorological Conditions Used for Noise Assessment Purposes

For the detailed noise assessment carried out for the Project, Wilkinson Murray (2012) used the following INP (EPA, 2000) default meteorological parameters to predict noise levels at each receiver. The Project area is located in an arid/semi-arid area that has annual average rainfall of less than 500 millimetres. For such conditions, the INP recommends the following default meteorological conditions that enhance noise levels:

- Strong (G-class stability category) inversions:

  8°C / 100 m inversion strength and source-to-receiver drainage flow wind of 1 m/s.

- Gradient wind:

  Source-to-receiver gradient wind of 3 m/s.

Comparison of the synthesised wind and temperature inversion conditions with the INP default conditions indicates that the INP default meteorological conditions provide a maximum-case scenario in terms of enhancement of operational noise due to meteorological factors.

The NPfI recommends different default meteorological conditions that enhance noise levels under the conditions experienced at the Project:

- 4°C / 100 m inversion strength and source-to-receiver drainage flow wind of 2 m/s.

The default meteorological parameters adopted by Wilkinson Murray (2012) in accordance with the INP are considered to be conservative in the context of the NPfI default meteorological conditions.

5 EXISTING NOISE MANAGEMENT

Noise management at the Project is undertaken in accordance with the Noise Management Plan (CMA, 2018). The Noise Management Plan (CMA, 2018) was prepared in accordance with Condition 18, Schedule 3 of Development Consent (SSD_5012) and includes the following noise management measures for the Project:

- Development and implementation of an equipment maintenance schedule to maintain equipment noise emission levels and reduce the likelihood of tonal noise impacts;
- Development and implementation of a noise awareness program to educate employees on the effects of noise and quiet work practices;
- Drivers will be made aware of the potential for noise impact through site-specific inductions and staff education programs to reinforce quiet driving styles/attitudes;
- An awareness of industry developments will be maintained in relation to noise mitigation engineering for individual plant items in order to assess inherent cost and practicability;
- The number of vehicle trips to and from the Atlas-Campaspe Mine will be optimised by ensuring that transport trucks are loaded to their operating capacity;
- All loose and rattling truck body parts will be fixed or tightened to minimise noise emissions from 'body rumble' (i.e. when loose panels vibrate when a truck hits a bump, causing noise to emanate from the panel);
- The use of locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with ARTC's EPL 3142; and
- Implementation of operational changes to minimise noise impacts during periods of adverse meteorological conditions in accordance with Condition 17(c), Schedule 3 of Development Consent (SSD_5012).

Tronox has advised that no noise-related complaints have been received to date.

6 OVERVIEW OF PREVIOUS ASSESSMENT

Wilkinson Murray (2012) prepared a Noise Assessment for Project in accordance with the *Industrial Noise Policy* (EPA 2000) and considered the noise impacts associated with the Atlas-Campaspe Mine, Ivanhoe Rail Facility and mineral concentrate transport between the Atlas-Campaspe Mine and the MSP.

6.1 Atlas-Campaspe Mine Site

Operational noise emissions at the Atlas-Campaspe Mine were modelled for two scenarios, namely (Wilkinson Murray, 2012):

- An initial construction scenario (Year 1) where infrastructure will be built, dry mining unit (DMU) assembled, etc. The construction activities will be largely concentrated at the south-eastern end of the Atlas footprint. The mobile fleet will include construction specific items.
- A typical maximum-case operational scenario when all plant is working concurrently during Year 16 with operations 24 hours a day. The major items of mobile fleet will be consistent throughout the life of the Project. As such, Year 16 of operations was chosen for modelling due to its proximity to the nearest residential receiver (Boree Plains).

A schedule of major operational and construction mobile and fixed equipment for the Atlas-Campaspe Mine relevant to Year 1 (i.e. the plant with potential to contribute to noise levels at the receiver locations) and the modelled sound power level (SWL) associated with each item was prepared and is reproduced in Table 6-1.

The predicted Year 1 noise levels for the Atlas-Campaspe Mine (including maximum case Year 1 under meteorological gradient wind of 3 m/s and night time noise contours for 8°C / 100 m inversion strength and 1 m/s wind) complied with Project-specific noise criteria of 35 dBA for all modelled receivers.

Table 6-1 Approved Equipment and Sound Power Levels– Year 1

Equipment	Construction No. of Units	L_{Aeq} SWL (dBA)	Source
Backhoe (CAT 330B)	1	102	WM Measurements
Bobcat	1	97	WM Measurements
Bus (Toyota Coaster)	2	109	WM Measurements
Road Roller/Compactor (CAT 825G)	2	109	WM Measurements
Scraper (Water Cart) (CAT 740)	1	115	WM Measurements
Grader (CAT 16G)	2	108	WM Measurements
Front End Loader (IT62G)	1	113	WM Measurements
Crane (GROVE RT650E/ LIEBHERR LTM 1100)	4	105	WM Measurements
Mobile Fuel Tank (MACK)	1	109	WM Measurements

Equipment	Construction No. of Units	L_{Aeq} SWL (dBA)	Source
1,000 kVA Generators	4	98	WM Measurements
Scraper / Laser Bucket (Case STX 535/ New Holland t9060)	9	115	WM Measurements
Dozer (CAT D11)	3	116	WM Measurements
Excavator (EX 1900/PC1800)	3	114	WM Measurements
Haul Truck (CAT 777D)	12	115	WM Measurements
Water Truck (CAT 773)	2	115	WM Measurements
Service Truck (MACK)	1	109	WM Measurements
Maintenance Truck (Isuzu)	1	109	WM Measurements
Lighting Tower (ALL Light)	8	103	WM Measurements
Garbage Truck	1	109	WM Measurements
Electric Pump	4	103	WM Measurements
Sewage Treatment Plant	1	97	WM Measurements
Accommodation Block	1	102	WM Measurements
Total		130	

Source: Wilkinson Murray (2012)
WM Measurements = Wilkinson Murray Measurements
kVA = kilovolt-ampere

For the Year 16 operational noise scenario, a schedule was prepared of the indicative major operational mobile and fixed equipment for the Atlas-Campaspe Mine relevant to mining operations (i.e. the plant with potential to contribute to noise levels at the receiver locations) and the modelled SWL associated with each item. The plant and equipment schedule is reproduced in Table 6-2.

Based on the Year 16 modelling, noise levels associated with the Atlas-Campaspe Mine (including those under maximum-case meteorological gradient wind of 3 m/s and also night time 8°C / 100m inversion strength and 1 m/s wind) were predicted to readily comply with Project-specific noise criteria of 35 dBA for all modelled receivers for the life of the Atlas-Campaspe Mine.

Table 6-2 Approved Equipment and Sound Power Levels – Years 2-20

Equipment	No. of Units	L_{Aeq} SWL (dBA)	Source
Dozer (CAT D11)	4	116	WM Measurements
Excavator (EX1900/PC1700)	4	114	WM Measurements
Scraper (Water Cart) (CAT740)	1	115	WM Measurements
Front End Loader (CAT990)	3	113	WM Measurements
Front End Loader (CAT IT62G)	1	113	WM Measurements
Grader (CAT 16G)	2	108	WM Measurements
Road Roller/Compactor (CAT 825G)	1	109	WM Measurements
Front End Loader (CAT980H)	2	111	WM Measurements
Water Truck (CAT 773)	2	115	WM Measurements

Equipment	No. of Units	L_{Aeq} SWL (dBA)	Source
1,000 kVA generators	4	98	WM Measurements
Haul Truck (CAT 777D)	12	115	WM Measurements
Scraper (Laser Bucket) (Case STX535/New Holland t9060)	9	115	WM Measurements
DMUs	2	112	Holmes Air Sciences (2007)
Primary Gravity Concentration Unit	1	103	Holmes Air Sciences (2007)
Electric Pumps	16	103	Holmes Air Sciences (2007)
Truck (Kenworth T650)	2	109	WM Measurements
Bobcat	1	97	WM Measurements
Bus (Toyota Coaster)	2	109	WM Measurements
Crane (GROVE RT650E/ LIEBHERR LTM 1100)	1	105	WM Measurements
Mobile Fuel Tank (MACK)	1	109	WM Measurements
Service Truck (MACK)	1	109	WM Measurements
Maintenance Truck (Isuzu)	1	109	WM Measurements
Lighting Tower (ALL Light)	8	103	WM Measurements
Garbage Truck (International 8 m^3)	1	109	WM Measurements
Sewerage Treatment plant	1	97	WM Measurements
Accommodation Block	1	102	WM Measurements
Total		131	

Source: Wilkinson Murray (2012)
WM Measurements = Wilkinson Murray Measurements
kVA = kilovolt-ampere

Noise levels at the boundary of the Mungo National Park, the Mungo State Conservation Area and the Willandra Lakes Region World Heritage Area were also predicted to readily comply with the relevant amenity criteria of 50 dBA for an "area specifically reserved for passive recreation" during maximum case operations. Noise levels would be less than 20 dBA and would likely be inaudible in most instances (Wilkinson Murray, 2012).

Modelling of L_{Amax} noise levels at nearby receivers was undertaken for typical instantaneous noise sources, such as reversing alarms. This analysis concluded that predicted noise levels would comply comfortably with the 45 dBA $L_{A1,1\ min}$ criterion applicable to assessment of potential sleep disturbance at all privately-owned receivers.

Consideration was given to the potential cumulative impacts associated with the construction and operation of the Iluka Resources Limited Balranald Mineral Sands Project (SSD-5285). Based upon the Project Scoping Report for the Balranald Mineral Sands Project (Iluka Resources Limited, 2012), mining of the West Balranald and Nepean deposits would be undertaken in series. Whilst mining is being undertaken at the Atlas deposit, operations at the Balranald Mineral Sands Project would be focussed on the West Balranald deposit (approximately 45 km south of the Atlas deposit). By the time operations at the Balranald Mineral Sands Project progress to the Nepean deposit (northern-most deposit) Project mining operations would be focussed at the Campaspe deposit.

The Balranald Mineral Sands Project would be operating at its northern-most extent during Year 11 of operations at the Atlas-Campaspe Mine. This would result in a distance between the operational ore extraction areas of the Atlas-Campaspe Mine and the Balranald Mineral Sands Project (Nepean deposit) of approximately 21 km.

Modelling demonstrated that the maximum-case operational noise contour of 35 dBA resulting from the Atlas-Campaspe Mine would extend no further than approximately 4.5 km south from the Atlas-Campaspe Mine active mining area.

Accordingly, it was concluded that no cumulative noise impact would occur from the coincident construction or operation of the Project and the Balranald Mineral Sands Project (Wilkinson Murray, 2012).

6.2 Ivanhoe Rail Facility

Table 6-3 outlines the indicative equipment schedule and associated SWLs adopted for modelling and assessment of Ivanhoe Rail Facility.

Table 6-3 Sound Power Levels and Proposed Equipment – Ivanhoe Rail Facility

Equipment	No. of Units	L_{Aeq} SWL (dBA)	Source
Front End Loader (Cat 988)	1	114	WM Measurements
Truck (Kenworth T650)	1	109	WM Measurements
Forklift (Hyster 12 to 16 tonne)	1	106	WM Measurements
Locomotive (81 class Locomotive)	2	109	WM Measurements
Total		117	

Under the maximum-case meteorological gradient wind of 3 m/s scenario and night time 8°C / 100 m inversion strength and 1 m/s wind assessment scenario, the predicted 35 dBA operational noise contour was established not to extend as far as the Ivanhoe township. As such, it was concluded that operational noise would achieve Project-specific noise limits at all modelled receivers.

Modelling of L_{Amax} noise levels at nearby receivers was undertaken for typical instantaneous noise sources, such as reversing alarms. This analysis concluded that predicted noise levels would comply comfortably with the 45 dBA $L_{A1,1\ min}$ criterion applicable to assessment of potential sleep disturbance at all privately-owned receivers.

6.3 Road Traffic

The Road Transport Assessment (GTA, 2012) projected the future traffic volumes on roads in the Project region for Year 1 and Year 20[1] of operations. Traffic noise levels at the closest residential receiver (Magenta residence which is approximately 0.8 km from Magenta Road [Figure 3-1]) were predicted by Wilkinson Murray (2012) based on the estimated traffic scenarios presented in the Road Transport Assessment (GTA, 2012). The predicted traffic noise levels at the Magenta residence were found to be well within both day and night time road traffic noise criteria. Accordingly, the criteria would be met at all other receivers along the road.

[1] Year 20 projections include a conservative estimate of traffic generated by the Balranald Mineral Sands Project.

Balranald-Ivanhoe Road represents the greatest potential cumulative impact of light vehicle traffic from the Project and the Balranald Mineral Sands Project. An assessment of road traffic-related noise was undertaken to determine the anticipated noise levels as a result of potential cumulative increased traffic volumes (particularly light vehicle movements) as presented in the Road Transport Assessment (GTA, 2012). The noise levels were evaluated for compliance with the relevant road noise criteria by Wilkinson Murray (2012) and it was concluded that the relative increase in traffic noise level resulting from the Project-related traffic movements on the Balranald-Ivanhoe Road is likely to be less than 2dB. The RNP states that *an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*

6.4 Rail Traffic

Mineral concentrates and MSP process waste will be railed between the Ivanhoe Rail Facility and the MSP via the Orange-Broken Hill Railway. The Project will result in a maximum of two train passbys in any one 24-hour period and the following scenarios could occur:

- Scenario 1 – two train passbys occurring during the daytime (between 7.00am and 10.00pm); or
- Scenario 2 – one passby occurring during the day (between 7.00am and 10.00 pm) and one at night (between 10.00pm and 7.00am); or
- Scenario 3 – two passbys occurring at night (between 10.00pm and 7.00am).

The existing and proposed noise levels at different setback distances from the Orange-Broken Hill Railway were calculated. Prediction of the existing and future proposed offset distances from the Orange-Broken Hill Railway in order to meet the relevant criteria concluded:

- The maximum increase in distance from the railway line at which the ARTC EPL criteria are met including the Project rail movements, compared with the existing/approved rail movements, would be 3 m for daytime operations and 5 m for night time operations. It is anticipated that this increase in distance would not result in any additional exceedances of the daytime criterion, however, would result in an additional exceedance of night time criterion at two additional residential receivers along the Orange-Broken Hill Railway.
- The maximum increase in distance from the railway line at which the EPA criteria are met including the Project rail movements, compared with the existing/approved rail movements, would be 2 m for 24-hour operations. This increase in distance would not result in any additional exceedances of criterion at residential receivers along the Orange-Broken Hill Railway.
- There would be no change to the maximum passby noise as a result of the Project rail movements.

The predicted noise levels indicated that for the Orange-Broken Hill Railway west of the Ivanhoe Rail Facility the peak noise increase associated with the Project was predicted to be approximately 0.7 dBA. Given that the peak Project related noise increase is anticipated to be less than 2 dBA, an assessment of 'reasonable and feasible' noise mitigation measures was not considered necessary.

7 ASSESSMENT OF MODIFIED POTENTIAL NOISE IMPACTS

7.1 Operational Noise Atlas-Campaspe Mine Site

7.1.1 Methodology

Prediction of operational noise levels at the identified receiver locations for the detailed noise assessment was carried out using the Environmental Noise Model (ENM). Factors that are addressed in the modeling are:

- equipment sound level emissions and location;
- screening effects from buildings (if relevant);
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

The Wilkinson Murray (2012) modelling assumed all plant and equipment to be operating concurrently and as such, the predicted results are considered to be conservative.

To assess any potential changes in the previously predicted noise levels (and associated potential noise impact) (Section 6.1), a screening assessment has been conducted based upon changes to the plant and equipment schedules for Year 1 (construction) and Year 2 onwards. The total SWLs of the overall approved mining fleets for each previously assessed stage have been compared with the total SWLs of the modified mining fleets. Where no change in the overall SWLs would occur as a result of the Modification, further modelling of noise emissions is not required.

7.1.2 Operational Noise – Year 1

Table 7-1 shows the indicative modified major operational and construction mobile and fixed equipment for the Atlas-Campaspe Mine in Year 1 (i.e. the plant with potential to contribute to noise levels at the receiver locations) and the modelled SWL associated with each item.

No changes are proposed to either the approved major operational and construction mobile and fixed equipment during the Year 1 stage as a result of the Modification. Given the above, the modified Project operational noise levels during Year 1 would be unchanged from the predicted noise levels in Wilkinson Murray (2012) for the approved Project.

The modified Year 1 noise levels from the Atlas-Campaspe Mine would therefore comply with Project-specific noise criteria of 35 dBA for all modelled receivers under neutral and adverse meteorological conditions.

As described in Section 3.1, the existing Development Consent and EPL 21007 noise criteria (Tables 3-1 and 3-2) are more stringent than the NPfI Project Noise Trigger Levels outlined in Table 3-3. Given the above, the modified Year 1 noise levels from the Atlas-Campaspe Mine are therefore expected to comply with relevant NPfI Project Noise Trigger Levels.

Table 7-1 Modified Equipment and Sound Power Levels – Year 1

Equipment	Construction No. of Units	L_{Aeq} SWL (dBA)	Source
Backhoe (CAT 330B)	1	102	WM Measurements
Bobcat	1	97	WM Measurements
Bus (Toyota Coaster)	2	109	WM Measurements
Road Roller/Compactor (CAT 825G)	2	109	WM Measurements
Scraper (Water Cart) (CAT 740)	1	115	WM Measurements
Grader (CAT 16G)	2	108	WM Measurements
Front End Loader (IT62G)	1	113	WM Measurements
Crane (GROVE RT650E/ LIEBHERR LTM 1100)	4	105	WM Measurements
Mobile Fuel Tank (MACK)	1	109	WM Measurements
1,000 kVA Generators	4	98	WM Measurements
Scraper / Laser Bucket (Case STX 535/New Holland t9060)	9	115	WM Measurements
Dozer (CAT D11)	3	116	WM Measurements
Excavator (EX 1900/PC1800)	3	114	WM Measurements
Haul Truck (CAT 777D)	12	115	WM Measurements
Water Truck (CAT 773)	2	115	WM Measurements
Service Truck (MACK)	1	109	WM Measurements
Maintenance Truck (Isuzu)	1	109	WM Measurements
Lighting Tower (ALL Light)	8	103	WM Measurements
Garbage Truck	1	109	WM Measurements
Electric Pump	4	103	WM Measurements
Sewage Treatment Plant	1	97	WM Measurements
Accommodation Block	1	102	WM Measurements
Total		130	

WM Measurements = Wilkinson Murray Measurements
kVA = kilovolt-ampere

7.1.3 Operational Noise – Year 2 Onwards

Table 7-2 shows the indicative modified major operational mobile and fixed equipment for the Atlas-Campaspe Mine for Year 2 onwards (i.e. the plant with potential to contribute to noise levels at the receiver locations) and the modelled SWL associated with each item.

The changes to the mining equipment fleet proposed as a result of the Modification would involve inclusion of alternative models of excavator, front end loader, grader and haul trucks. The SWLs of these alternative models would not be higher than the levels previously nominated by Wilkinson Murray (2012) for the approved Project, nor would there be any resulting change in the overall SWL of the total fleet.

Table 7-2 Optimisation Modification Sound Power Levels and Proposed Equipment – Year 2 Onwards

Equipment	No. of Units	L_{Aeq} SWL (dBA)	Source
Dozer (CAT D11)	4	116	WM Measurements
Excavator (EX1900/PC1700/**Cat6040**)	4	114	WM Measurements
Scraper (Water Cart) (CAT740)	1	115	WM Measurements
Front End Loader (CAT990/**980**)	3	113	WM Measurements
Front End Loader (CAT IT62G)	1	113	WM Measurements
Grader (CAT 16G, **24H**)	2	108	WM Measurements
Road Roller/Compactor (CAT 825G)	1	109	WM Measurements
Front End Loader (CAT980H)	2	111	WM Measurements
Water Truck (CAT 773)	2	115	WM Measurements
1,000 kVA generators	4	98	WM Measurements
Haul Truck (CAT 777D/**785/793**)	12	115	WM Measurements
Scraper (Laser Bucket) (Case STX535/New Holland t9060)	9	115	WM Measurements
DMUs	2	112	Holmes Air Sciences (2007)
Primary Gravity Concentration Unit	1	103	Holmes Air Sciences (2007)
Electric Pumps	16	103	Holmes Air Sciences (2007)
Truck (Kenworth T650)	2	109	WM Measurements
Bobcat	1	97	WM Measurements
Bus (Toyota Coaster)	2	109	WM Measurements
Crane (GROVE RT650E/ LIEBHERR LTM 1100)	1	105	WM Measurements
Mobile Fuel Tank (MACK)	1	109	WM Measurements
Service Truck (MACK)	1	109	WM Measurements
Maintenance Truck (Isuzu)	1	109	WM Measurements
Lighting Tower (ALL Light)	8	103	WM Measurements
Garbage Truck (International 8 m^3)	1	109	WM Measurements
Sewerage Treatment plant	1	97	WM Measurements
Accommodation Block	1	102	WM Measurements
Total		131	

The Modification includes the possible addition of conveyors to transfer some or all of the overburden rather than the currently approved haul trucks. The SWL of a typical conveyor system has previously been measured at 100 dBA/100 m, which is significantly lower than that generated by haul or product trucks. This introduction of conveyors would reduce noise emissions generated by Atlas-Campaspe Mine operations.

With no change expected in the overall SWL associated with mining operations from Year 2 onwards, there would be no change in operational noise predicted noise levels in Wilkinson Murray (2012) for the approved Project.

The Modification would therefore not change the operational noise propagated to the surrounding environment from Year 2 onwards and noise levels at the surrounding receiver locations considered would be below 35 dBA under neutral and adverse meteorological conditions.

As described in Section 3.1, the existing Development Consent and EPL 21007 noise criteria (Tables 3-1 and 3-2) are more stringent than the NPfI Project Noise Trigger Levels outlined in Table 3-3. Given the above, the modified noise levels from the Atlas-Campaspe Mine for Year 2 onwards are therefore expected to comply with relevant NPfI Project Noise Trigger Levels.

7.2 Ivanhoe Rail Facility

Table 7-3 outlines the modified Ivanhoe Rail Facility equipment (i.e. the plant with potential to contribute to noise levels at the receiver locations) and the SWL.

Table 7-3 Optimisation Modification Sound Power Levels & Proposed Equipment – Ivanhoe Rail Facility

Equipment	No. of Units	L_{Aeq} SWL (dBA)	Source
Front End Loader (Cat 988)	1	114	WM Measurements
Truck (Kenworth T650)	1	109	WM Measurements
Forklift (Hyster 12 to 16 tonne)	1	106	WM Measurements
Reach Stacker Kalmar DRT450 2014 MODEL	1	110	Kalmar measured data
Water cart 16,000L	1	115	WM Measurements
Locomotive (81 class Locomotive)	2	109	WM Measurements
Total		120	

With the addition of a Reach Stacker and water cart, the overall SWL associated with the Ivanhoe Rail Facility operations would increase by a maximum 3 dBA, assuming concurrent operation of all sources.

The Modification would therefore not significantly change the operational noise propagated to the surrounding environment and noise levels at the surrounding receiver locations considered would be below 35 dBA under neutral and adverse meteorological conditions.

Computer modelling of the modified Ivanhoe Rail Facility, based on the model developed by Wilkinson Murray (2012), confirmed that noise levels at the surrounding receiver locations considered would be below 35 dBA (generally below 30 dBA) under neutral and adverse meteorology.

7.3 Road Traffic Noise

The Modification includes an increase in the mineral concentrate transport truck trips from 24 per day to 35 per day. This proposed increase represents a potential 1.6 dBA increase in noise level over the daytime and night time periods (assuming equivalent distribution of vehicles over daytime and night time periods).

On this basis the predicted noise levels at the residential receivers previously assessed by Wilkinson Murray (2012) are presented in Table 7-4.

Table 7-4 Calculated Traffic Noise Levels – Optimised Modification

Location	Predicted Noise Level dBA	Criterion Day / Night dBA	Complies
Magenta	Peak 1 hour $L_{Aeq,1hour}$ 38	55 / 50	Yes
Hatfield – The Vale Road	Peak 1 hour $L_{Aeq,1hour}$ 38	55 / 50	Yes
Balranald / Ivanhoe Road (Kilfera)	$L_{Aeq,15hour}$ / $L_{Aeq,9hour}$ (Day / Night) <25 / <25	60 / 55	Yes
Hatfield Pub	$L_{Aeq,15hour}$ / $L_{Aeq,9hour}$ (Day / Night) 45 / 46	60 / 55	Yes
Balranald-Ivanhoe Road – South of the proposed Balranald Mineral Sands Project Location J	$L_{Aeq,15hour}$ / $L_{Aeq,9hour}$ (Day / Night) 57 / 53	60 / 55	Yes

Noise generated by increased traffic associated with the modified Project complies with the relevant assessment criteria at all receiver locations.

7.4 Rail Traffic Noise

Under the Modification, mineral concentrate transport train length would increase from 600 m to 920 m and train frequency would increase from six to eight train movements per week (i.e. four arrivals, four departures). The hardstand area and rail siding would be extended to accommodate the increase train length. There is also a revised alignment of the Ivanhoe Rail Facility access road and access road intersection (Figure 3-2).

The proposed increase in train frequency is not expected to result in any change to the number of train movements per day. Train movements would occur over additional days per week. Accordingly, the approved rail noise impacts as previously assessed in Wilkinson Murray (2012) would remain unchanged as follows:

- No additional exceedance of the ARTC EPL daytime criterion, however an additional exceedance of night time criterion at two additional residential receivers along the Orange-Broken Hill Railway locations within 5 m of the railway line.
- The EPA criteria would be met with no additional exceedances of the criterion at residential receivers along the Orange-Broken Hill Railway.
- There would be no change to the maximum passby noise as a result of the optimised Project rail movements.

8 CONCLUSION

This Noise Review has reviewed the aspects of the Modification that have the potential to generate noise to the surrounding environment. These operations have been reviewed in relation to the Noise Assessment (Wilkinson Murray, 2012) previously prepared for the Project.

This review concludes that the proposed modifications at the Atlas-Campaspe Mine are not expected to cause any significant increase in operational noise levels at the nearest surrounding receivers. All operational noise criteria (including NPfI Project Noise Trigger Levels) are predicted to be achieved.

Noise emissions due to proposed modifications at the Ivanhoe Rail Facility would not result in any significant increase in noise levels at surrounding receivers. All operational noise criteria (including NPfI Project Noise Trigger Levels) are predicted to be achieved.

Road traffic noise resulting from the modified Project would meet the relevant regulatory limits at receivers located in proximity to the transport routes.

Noise generated as a result of Project rail movements would not increase as a result of the proposed modifications to Project rail operations. In summary, the Noise Review found that the Modification is unlikely to significantly alter the outcomes of the Noise Assessment (Wilkinson Murray, 2012) for the approved Project.

9 REFERENCES

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