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RIX'S CREEK

RIX'S CREEK NORTH MINE

LANDFORM AMENDMENT, EXPLORATION AND BLASTING FREQUENCY MODIFICATION

STATEMENT OF ENVIRONMENTAL EFFECTS

June 2020

Bloomfield Collieries Pty Limited ◆ PO Box 4 ◆ East Maitland NSW 2323

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LANDFORM AMENDMENT, EXPLORATION AND BLASTING FREQUENCY MODIFICATION

STATEMENT OF ENVIRONMENTAL EFFECTS

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June 2020

For:

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EXECUTIVE SUMMARY

INTRODUCTION

Hansen Bailey has prepared this Statement of Environmental Effects on behalf of Bloomfield Collieries Pty Limited in support of a modification to the Project Approval 08_0102 for Rix's Creek North Mine.

Bloomfield Collieries Pty Limited owns and operates Rix's Creek Mine, located in the Hunter Valley of New South Wales. Rix's Creek Mine is located north-west of Singleton and both east and west of the New England Highway. Rix's Creek Mine is the collective name for Rix's Creek North and Rix's Creek South coal mines.

PA 08_0102 allows open cut coal mining and associated activities at Rix's Creek North in the Camberwell and Falbrook Pits and emplacement of overburden within each pit.

This Statement of Environmental Effects supports the modification application made under Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (MOD9).

MODIFICATION DESCRIPTION

MOD9 seeks to temporarily increase the approved height of the overburden emplacement within the Camberwell Pit by 25 metres to RL 175 metres. The elevation will then be reduced to a maximum of RL 165 metres following its reshaping by 2030. The Overburden Emplacement Area will be able to accommodate an additional 5.4 million bank cubic metres of overburden material. Following final reshaping, 1.5 million bank cubic metres will remain 15 metres above the currently approved maximum height. This landform change will also facilitate a minor change to the location of approximately 60.2 ha of trees over pasture from the top of the overburden emplacement area to the slope of the final void area. The total areas of trees over pasture and pasture land will not change.

MOD9 further seeks to increase the number of blast events allowed within Rix's Creek North from two per day to three per day.

MOD9 also seeks approval to undertake exploration activities in accordance with the *Mining Act 1992* within Bloomfield Collieries Pty Limited's mining tenements.

IMPACTS, MANAGEMENT AND MITIGATION

MOD9 will be entirely within the approved Camberwell Pit and existing mining tenements, and will utilise the existing infrastructure and operations fleet.

A risk assessment was conducted which identified the medium risk impacts to be air quality, noise and visual. Contemporary impact assessments were completed for these impacts and a summary of the results is presented below.

Air Quality and Greenhouse Gas

An Air Quality Impact Assessment was undertaken by Todoroski Air Sciences in accordance with the "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*" (NSW EPA, 2016).

The Air Quality Impact Assessment included dispersion modelling to predict particulate matter concentrations at private residences in the vicinity of Rix's Creek North. The predicted particulate matter concentrations were assessed against the criteria prescribed by NSW EPA (2016) and the *Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2014).

Dispersion modelling was undertaken to assess the air quality impacts of all operational activities including MOD9, including the use of existing and approved infrastructure. MOD9 is predicted to comply with all air quality criteria at private receptors not currently within an air quality acquisition zone (excluding receptor 175 which is in Rix's Creek North's noise acquisition zone).

The assessment of impacts on 25% of contiguous lots identified that two landholdings are predicted to exceed the acquisition criteria (N240 and N234-239) as stipulated in the *Voluntary Land Acquisition and Mitigation Policy*. This is as a result of the imposition of this new Policy, not changes to impacts. Exploration activities will not increase air quality impacts at Rix's Creek North.

Bloomfield Collieries Pty Limited will continue to manage air quality impacts per its approved *Air Quality Management Plan* (Bloomfield, 2019a) (AQMP) or most recent version, including watering roads, relocation or gradual shutdown of equipment in adverse conditions and progressive rehabilitation.

Greenhouse gas emissions were qualitatively assessed against the *Air Quality Impact Assessment Integra Open Cut Project* (Holmes Air Sciences, 2009) assessment. The key change under PA 08_0102 MOD9 that would influence a change in greenhouse gas emissions would be a nominal increase in the haul distance and dozer use associated with the increased height of the overburden emplacement area. This would generally be balanced by a minor decrease in haulage emissions with reduced annual mining rates for the period assessed in PA 08_0102 MOD9. Overall, the total greenhouse gas emissions would be less than for the approved operations.

Noise

An Acoustic Impact Assessment was undertaken by Global Acoustics in accordance with the *Noise Policy for Industry* (EPA, 2017) (NPfI). Noise modelling was undertaken to assess the potential acoustic impacts of all proposed operational activities against the project specific noise criteria in PA 08_0102 Tables 2, 3 and 7.

In 2021, when operations are occurring only in the Camberwell Pit, the model predicts that MOD9 is not expected to exceed the project specific criteria at any properties additional to those with existing acquisition rights.

In 2024, when operations occur within the Camberwell Pit and the Falbrook Pit, the modelling predicted that under 2024 evening scenario 1 (full operations in Falbrook Pit), MOD9 will exceed the project specific acquisition criteria at one receptor in addition to those with existing acquisition rights and exceed the mitigation criteria at four properties. However, modelling of a mitigated operating scenario (evening scenario 2) has identified that application of mitigation controls will ensure compliance with the approved noise criteria, resulting in no exceedances.

The modelling predicted that MOD9 will comply with the criteria for sleep disturbance.

The assessment of impacts on 25% of contiguous lots identified that no exceedances of *Voluntary Land Acquisition and Mitigation Policy* noise criteria are predicted to occur.

Bloomfield Collieries Pty Limited will continue to manage noise impacts per its approved *Noise Management Plan* (NMP) (Bloomfield, 2019b) or most recent version during periods of noise enhancing meteorological conditions, particularly during the evening period.

Visual

A Visual Impact Assessment was undertaken for this Modification. The visual impact of the increased height of the Overburden Emplacement Area was assessed from various view point locations in Camberwell Village, Middle Falbrook, the New England Highway and Bridgeman Road.

The visual effect and sensitivity of the landscape was determined by considering the existing landscape settings and how they are seen from the various viewing locations. In order to illustrate the views associated with MOD9, photomontages and visual cross sections were developed at primary viewing locations.

The existing visual landscape includes the Glennies Creek and Station Creek floodplains and basin, existing open cut mines and surrounding ridges. The approved active Camberwell Pit Overburden Emplacement Area is visually prominent from offsite areas to the west. The rehabilitated landform to the north of Camberwell Pit integrates with the existing landscape and provides screening from the active Overburden Emplacement Area to offsite areas to the north. A natural ridgeline along the east of the mine provides screening to receptors along Bridgeman Road and Rix's Creek South Mine dominates the visual landscape to the south of Rix's Creek North.

The Visual Impact Assessment concluded that during construction at the maximum height sought as part of MOD9, the amended Camberwell Pit Overburden Emplacement Area would have a moderate to low impact at the majority of locations; and continue to have a moderate to high impact from the New England Highway to 2030. Once the Overburden Emplacement Area has been reshaped and rehabilitation established, the visual impact from the New England Highway will reduce to moderate/low. The impact is low for the remaining viewpoints.

Bloomfield Collieries Pty Limited has existing tree planting on its property that abuts the Highway at the junction with McInerney Road to mitigate the visual impact from the New England Highway. Bloomfield will continue to monitor this planting and provide required planting as identified through monitoring.

Blasting

The proposed increase in the number of blast events per day will provide increased opportunity to blast during the most favourable weather conditions, which could ultimately reduce the overall magnitude of blast impacts relative to blasting when conditions are less optimal.

Blasting will continue to be managed in accordance with the approved *Blast Management Plan* (Bloomfield, 2019c) or latest version.

OTHER ENVIRONMENTAL ASPECTS

The increased Overburden Emplacement Area height proposed by MOD9 will occur entirely within the approved Camberwell Pit, within areas previously approved for disturbance. Approximately 13.5 hectares of existing exotic pasture rehabilitation will be disturbed and the topsoil retained for future rehabilitation.

MOD9 will neither result in any significant additional water catchment areas nor does it propose to change any of the water management activities outlined in the approved *Rix's Creek Mine Water Management Plan (*(Bloomfield, 2019d) (WMP) or latest version. The currently approved landform is generally flat, ponds water in some areas and seeps to the final void. Drainage from the revised landform will ensure that water is generally directed away from the void and back to the environment once the area is rehabilitated and stable.

There will be no additional disturbance to any native flora or fauna species, or any impacts to Aboriginal Heritage from the increase in the Overburden Emplacement Area.

For exploration activities, due diligence impact assessments for ecology and Aboriginal Heritage will be completed prior to any clearing for exploration activities, and the proposed drill holes will be re-located to minimise any impacts. Approvals under the *Mining Act 1992* will be sought for exploration activities, as required.

JUSTIFICATION

At the time of acquisition of the Integra Open Cut by Bloomfield in 2015, large areas of the Camberwell Pit Overburden Emplacement Area had already been formed to a maximum height of RL 150 m. The currently approved final landform includes a plateau approximately 900m long and 500 m wide at RL 150 m.

MOD6 of PA 08_0102 was granted on 23 August 2016. Under Schedule 3 Condition 50 of PA 08_0102 (as modified by MOD6), Bloomfield is required to create "*Final landforms designed to incorporate micro-relief and integrate with the surrounding natural landforms.*"

Bloomfield Collieries Pty Limited advises that at a meeting with Department of Planning Industry and Environment Resources Regulator on 2 November 2018 the integration of micro-relief into existing Overburden Emplacement Areas was discussed. The need for a modification to PA 08_0102 to raise the maximum height of the Overburden Emplacement Area and allow incorporation of micro-relief and provide a free draining landform was supported by the Resources Regulator.

The landform change will also facilitate the relocation of trees over pasture to the slope of the final void which will provide a better rehabilitation and final land use outcome. While the total areas of trees over pasture and pasture land do not change, the flatter pasture areas will be more accessible for ongoing management and grazing, while providing trees over pasture in steeper areas improves erosion control and a more sheltered habitat.

Bloomfield Collieries Pty Limited has assessed the number of days that blast events are impacted by environmental factors and identified that 64% of blast windows are impacted. This limits the ability to access coal and therefore the efficiency of Rix's Creek North. The addition of one additional blast event per day at Rix's Creek North will allow blasting events to be optimised to days when the environmental conditions are most favourable. The increase in the number of blast events per day will also allow Bloomfield Collieries Pty Limited to more efficiently manage their pit operations and will align blasting at Rix's Creek North with Rix's Creek South (commenced 24 February 2020).

Exploration activities will allow Bloomfield Collieries Pty Limited to better define the resource boundaries and gain additional coal quality information.

The activities presented in MOD9 will result in the alteration of three aspects of the approved activities, being the height of the Overburden Emplacement Area and associated relocation of trees over pasture, the number of blast events permissible per day and exploration activities, while key aspects of the Project remain unchanged. The development would remain substantially the same as that already approved and is within the scope of Section 4.55(2) of the *Environmental Planning and Assessment Act 1979*. The Overburden Emplacement Area is located within Coal Lease 357 and therefore MOD9 remains permissible with development consent pursuant to Clause 7(1)(b)(ii) of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*.

Rix's Creek North is located in an area with a long history of coal mining activities, and is surrounded by existing mines to the west and south as generally illustrated in **Figure 1**. MOD9 applies to an existing Overburden Emplacement Area contained entirely within an approved pit and an existing Coal Lease. Blasting will continue to occur within the approved pits in line with the approve *Blast Management Plan* (Bloomfield, 2019c) (or latest version). MOD9 is therefore consistent with the surrounding land use and the site is suitable for the proposed modification.

Bloomfield Collieries Pty Ltd has consulted with relevant regulatory and community stakeholders and have incorporated any issues or comments into this Statement of Environmental Effects.

The environmental impacts have been shown to be minimal, while MOD9 will provide improvements to the final landform integration and development of natural resources. It may therefore be concluded that MOD9 is in the public interest.

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1 INTRODUCTION

This section provides an overview of MOD9, introduces the proponent and outlines the purpose and structure of this Statement of Environmental Effects.

1.1 BACKGROUND

Bloomfield Collieries Pty Limited (Bloomfield) owns and operates Rix's Creek Mine (RCM) located in the Hunter Valley of New South Wales (NSW). RCM is a coal mining operation located approximately 5 km north of Singleton at its closest point and both east and west of the New England Highway (see **Figure 1**).

RCM is the collective name for Rix's Creek North (RCN) (originally Integra Open Cut) and Rix's Creek South (RCS) (the original Rix's Creek Mine).

RCN operates under Project Approval (PA) 08_0102 granted under the *Environmental Planning and Assessment Act 1979* (EP&A Act). PA 08_0102 has been modified on eight occasions. Under PA 08_0102, the Proponent can carry out open cut mining operations on site until 31 December 2035.

Bloomfield proposes to modify PA 08_0102 to facilitate overburden emplacement above the approved final landform height in a discrete area within the Camberwell Pit, increase the number of blast events per day to up to three, consistent with the RCS SSD 6300 (MOD9), undertake exploration activities, and to provide a more functional end land use.

1.2 THE PROPONENT

The contact details of the proponent are:

Bloomfield Collieries Pty Limited

Four Mile Creek Road
Ashtonfield NSW 2323
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info@bloomcoll.com.au
https://www.bloomcoll.com.au/about

1.3 DOCUMENT PURPOSE

This Statement of Environmental Effects (SEE) supports Bloomfield's application for MOD9 under Section 4.55(2) of the EP&A Act. This SEE provides a description of MOD9, assesses the potential environmental and social impacts, and proposes relevant mitigation.

1.4 DOCUMENT STRUCTURE

This document has been prepared generally in accordance with the draft '*Guideline 8: Modifying and Approved Project*' (DPIE, 2017)

Section 2 describes the existing environment in the locality of MOD9 and the approved mining operations at RCN;

Section 3 provides a description of MOD9 activities;

Section 4 includes a brief discussion on the applicable regulatory framework;

Section 5 outlines the stakeholder consultation conducted;

Section 6 presents an environmental risk assessment;

Section 7 provides a discussion on the environmental impacts from MOD9 and identifies any required additional mitigation requirements;

Section 8 provides an evaluation of merits; and

Section 9 and **Section 10** each define the abbreviations used throughout this SEE and a list of relevant reference materials.

HB RIXS CREEK 1915 F1 Regional Locality 31 01 2020

RIXS CREEK COAL MINE

Regional Locality

FIGURE 1

2 EXISTING ENVIRONMENT

This section provides a discussion on the existing approved RCN and RCN topography, natural features, land use and land ownership as relevant to MOD9.

2.1 APPROVED RCN

2.1.1 Existing Approvals

RCN has previously been known as Camberwell Coal Mine, Glennies Creek Open Cut Mine and Integra Open Cut Mine.

Camberwell Coal Mine was originally established under Development Consent DA 86/2889 granted on 18 March 1990. DA 86/2889 provided approval for open cut mining in the North Pit and South Pit as well as the construction and use of the Coal Handling and Preparation Plant (CHPP). Mining in the North Pit has been completed and the mining area was backfilled in 1999. Mining in the South Pit (as originally approved under DA 86/2889) has also been completed, although subsequent approvals have enabled further mining in this area.

Project Approval for the Glennies Creek Open Cut Mine (PA 06_0073) was granted on 2 December 2008. PA 06_0073 provided approval for further development of the Falbrook Pit (also known as the North Open Cut). PA 06_0073 operated concurrently with DA 86/2889.

2.1.2 Current Project Approval PA 08_0102

The current Project Approval (PA 08_0102) was granted on 26 November 2010. PA 08_0102 consolidated the previous approvals for Camberwell Coal Mine and Glennies Creek Open Cut Mine. **Figure 2** generally illustrates the approved activities.

PA 08_0102 has been modified on eight occasions and facilitates the following activities:

- Extraction of up to 1.5 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal from the Falbrook Pit;
- Extraction of up to 4.5 Mtpa of ROM coal concurrently from the Camberwell Pit;
- Open cut mining using shovel and excavator methods down to the base of the Hebden Seam;
- Extraction of additional ROM coal through highwall or auger mining methods;
- Extension of the South Pit (Camberwell Pit) further to the west of the mining extent approved under DA 86/2889;
- Emplacement of overburden within the Camberwell and Falbrook Pits;
- Construction of an overburden emplacement area (OEA) adjacent to the Falbrook Pit;
- Processing of ROM coal using the RCN CHPP;
- Transport of Coal from RCN to Rix's Creek South (RCS) for processing and rail transport (MOD5);

- Receival of coal for processing and rail transport from RCS (MOD5);
- Receival of up to 5 million bank cubic metres (Mbcm) per annum overburden and 0.5 Mbcm of dried tailings from RCS (MOD 7);
- Rail transportation of up to 7.3 Mtpa of product coal from the site; and
- Ancillary activities including construction and use of access road and site facilities area.

The current approval of the Camberwell Pit under PA 08_0102 facilitates the extraction of 30 Mt of ROM coal. Recovery of these coal resources involves the removal of approximately 195 Mbcm of overburden and interburden materials. Two options were approved for the Camberwell Pit, the 'Full Pit Extent' and the 'Part Pit Extent' as shown in **Figure 2**. The ability to mine the 'Full Pit Extent' is dependent on the purchase of the 'Dulwich' homestead. To date, this property has not been purchased. As such Bloomfield is currently progressing mining of the 'Part Pit Extent' option.

The Falbrook Pit is currently in care and maintenance; however, Bloomfield proposes to restart mining by 2024. Under PA 08_0102, operations are only permitted within Falbrook Pit between 7 am and 10 pm.

Blasting is currently restricted to:

a) "*1 blast a day in the northern mining area unless an additional blast is required following a blast misfire;*

b) *2 blasts a day in the existing Camberwell south pit, and 1 blast a day when mining moves from this pit into the western mining area unless an additional blast is required following a blast misfire; and*

c) *10 blasts a week on site, averaged over any 12 month period.*"

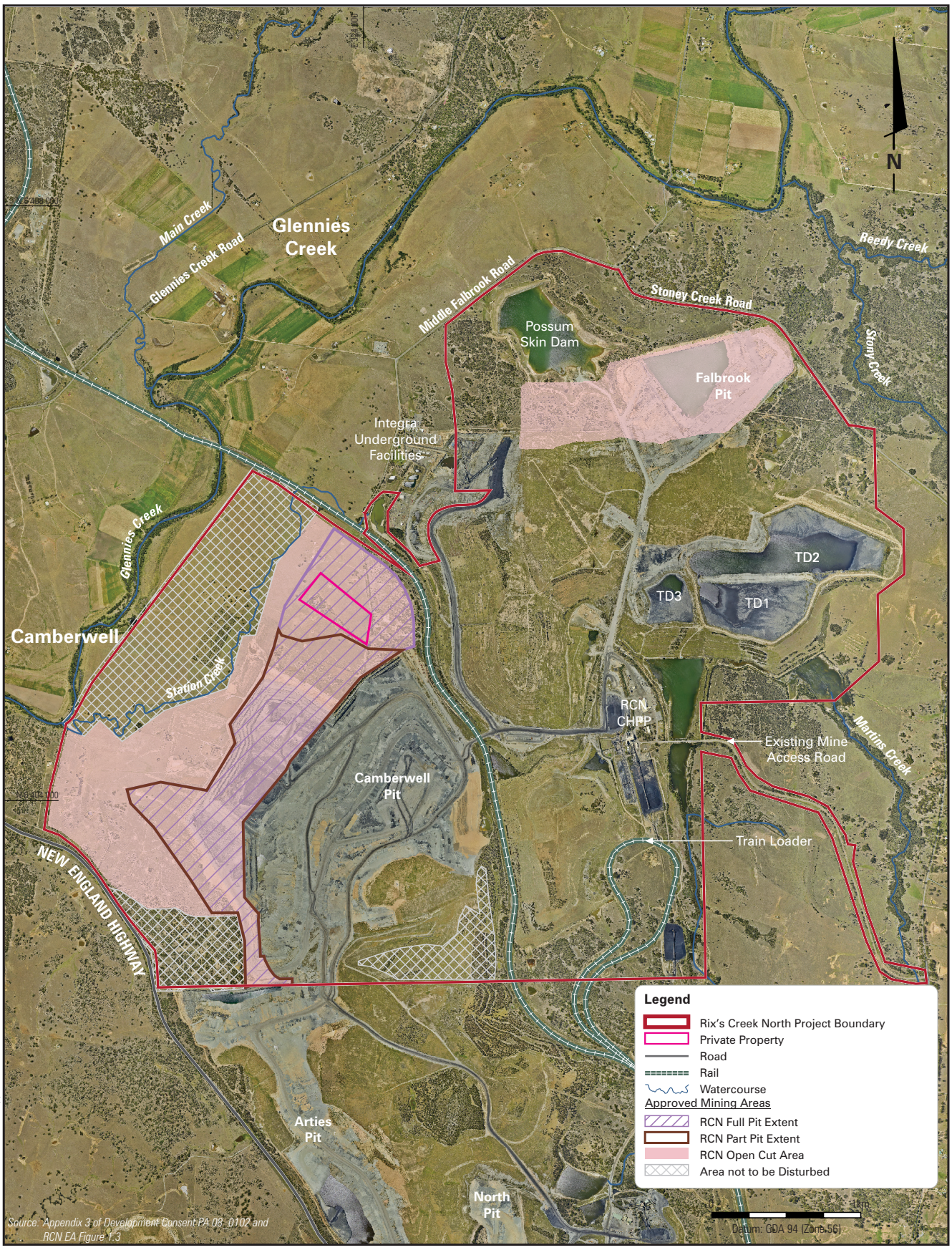
The 'northern mining area' is now referred to as Falbrook Pit and the 'western mining area' is the area now referred to as Camberwell Pit.

2.2 TOPOGRAPHY AND CATCHMENT

The existing topography consists of well rounded, undulating low hills and low gentle flat plains associated with the alluvial flats of Glennies Creek (URS, 2009).

In the RCN area, the eastern portion of the Falbrook Pit intercepts runoff from the Reedy Creek and Stony Creek catchment (**Figure 2**). Martins Creek is located to the south east of RCN Tailings Dam 2 (TD2). Station Creek is located less than 1 km to the west of the existing Camberwell Pit and flows to Glennies Creek. The majority of the catchment of Station Creek has been removed by the development of the RCN mine.

Glennies Creek is a regulated river system under the Hunter Regulated River Water Source and is a major tributary into the Hunter River. It is located approximately 1 km west of the Camberwell Pit (**Figure 2**). Glennies Creek is a sixth order stream with permanent, regulated flows from Glennies Creek Dam.



HB RIXS CREEK MOD9 1916 F2 Approved Rix's Creek Mine Plan 27 04 2020

RIXS CREEK COAL MINE

Conceptual Approved Rix's Creek North Mine

FIGURE 2

2.3 LAND OWNERSHIP AND USE

2.3.1 Land Ownership

Land ownership surrounding the Project Boundary is shown on **Figure 3**. The majority of land within the Project Boundary is owned by Bloomfield under the trading names Rix's Creek Pty Ltd, Four Mile Pty Ltd, Bloomfield Collieries Pty Ltd or Big Ben Holdings Pty Ltd. The exception to this includes:

- Parcels of Crown land and roads;
- A privately-owned property ID 177 (associated with the 'Full Pit Extent' option described in **Section 2.1.2**); and
- Glencore owned land in the north associated with the Integra Underground operation.

2.3.2 Coal Mining Operations and Industry

There are a number of operational coal mines within the vicinity (~10 km radius) of Rix's Creek Mine as shown on **Figure 1**. Operations within the immediate locality (~5 km) include:

- Integra Underground immediately north;
- Mt Owen Complex (MOC) (Glendell, Mt Owen and Ravensworth East) to the north-west;
- Ashton Mine (Ashton) to the west; and
- Ravensworth Open Cut Operations (Ravensworth) to the north-west.

The approved Ashton South East Open Cut (SEOC) has not yet commenced.

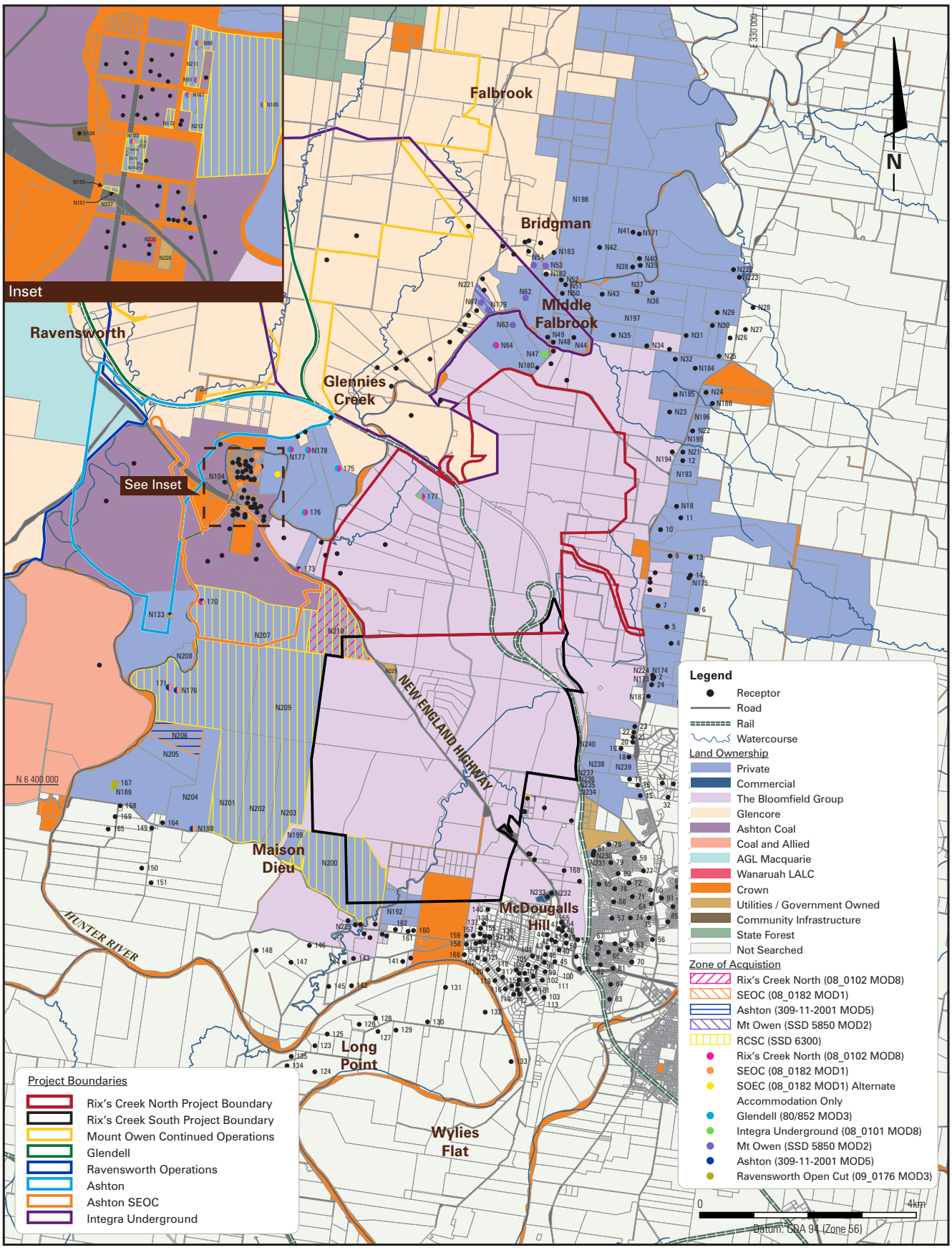
2.3.3 Private Residential and Industrial

Figure 3 illustrates the surrounding private land ownership. Privately-owned parcels of land are located immediately to the east, west and north of the Project Boundary. Camberwell Village is located to the west of RCN's Camberwell Pit. Singleton Heights and the centre of Singleton are located to the south east of RCN. Five private receptors remain within Camberwell Village. Three properties have mitigation rights for noise from RCN, and all have acquisition rights from other adjacent mining operations as indicated in **Figure 3**.

2.3.4 Road and Rail

The New England Highway travels in a north west to south east direction directly to the west of the RCN Project Boundary. It is the primary road corridor servicing the Hunter Valley. The New England Highway is currently protected by a buffer of 100 m in which no mining operations can take place (AECOM, 2015). Motorists travelling south on the New England Highway have views towards the MOD9 area as the road passes Camberwell Village.

The Main Northern Rail Line bisects the RCN Project Boundary travelling in a north west to south east direction. The RCN Rail Loop joins the Main Northern Rail Line. Middle Falbrook Road and Stoney Creek Road are located to the north of the RCN Project Boundary as shown on **Figure 2**.



HB RIXS CREEK MOD9 1916 F3 Land Ownership 24 04 2020 Rev S

RIXS CREEK COAL MINE

Land Ownership

FIGURE 3

3 MODIFICATION DESCRIPTION

This section describes in detail the modification sought to PA 08_0102 and the alternatives considered.

3.1 OVERVIEW

Bloomfield is seeking approval for a Modification to PA 08_0102 to temporarily increase the height of the approved OEA within the Camberwell Pit by 25 m to an elevation of approximately RL 175 m by the end of 2024. The elevation of the OEA will then be reduced to a maximum of RL 165 m following its reshaping by 2030 (i.e. 15 m above currently approved maximum RL).

The interactions of the amended landform with the approved conceptual mine plans for years 2021 and 2024 (the period in which the increase in landform height is proposed to be constructed) and a revised final landform are presented in **Figure 4**, **Figure 5** and **Figure 6** respectively.

PA 08_0102 facilitates approval for both a 'Part Pit Extent' and a 'Full Pit Extent' as described in **Section 2.1.2**. Bloomfield is currently mining to the approved 'Part Pit Extent' option. MOD9 does not seek to vary the approved mine plans for the 'Full Pit Extent' which may occur in the future depending on Bloomfield's ability to access the full extent of the approved coal extraction limit. The increase in OEA height would apply to both options.

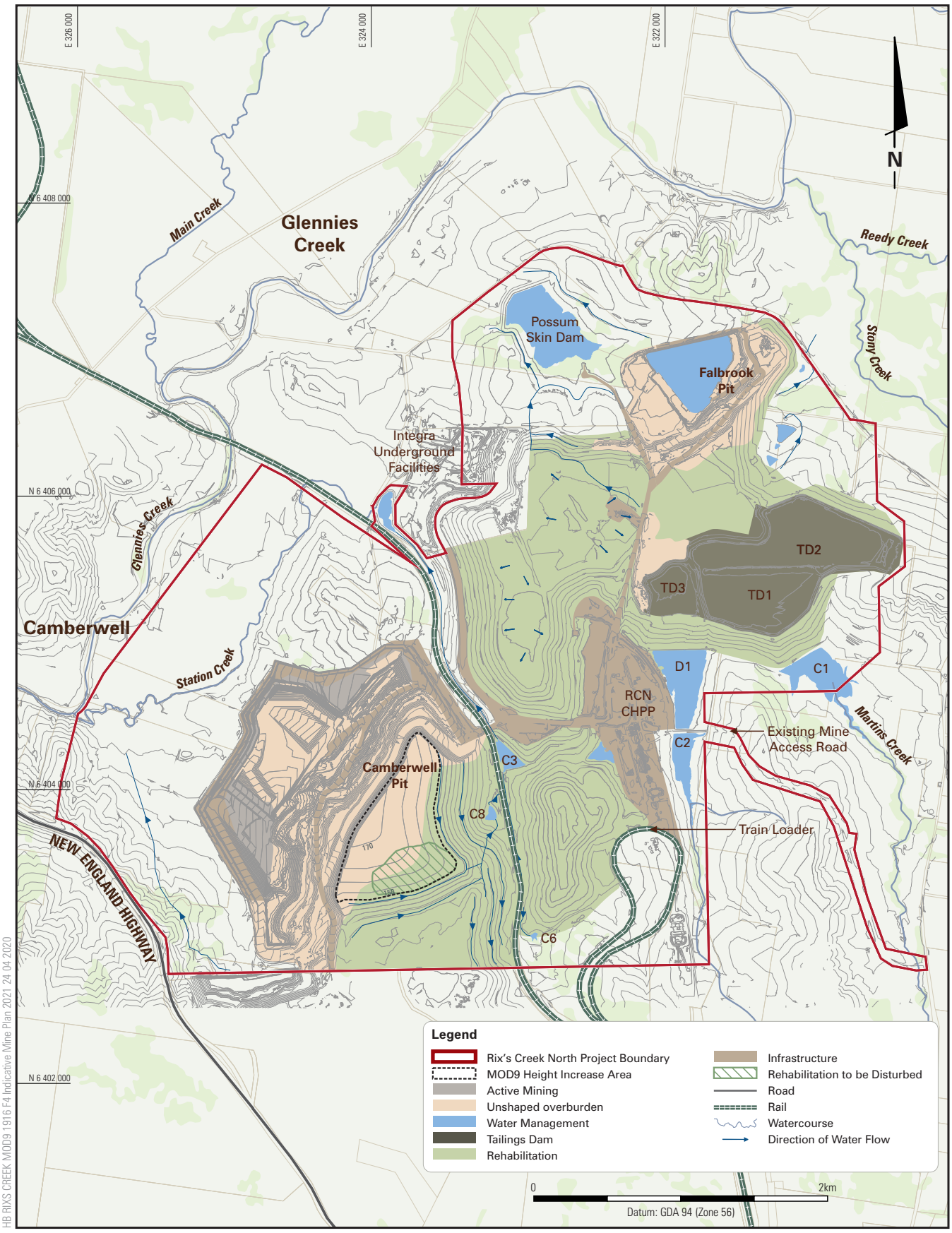
Bloomfield is also seeking to increase the number of blast events allowable per day in RCN from two to three. This will reduce impacts to surrounding receptors by conducting blasting when environmental conditions are most favourable, facilitate improved operational efficiency and align with the RCS approval.

MOD9 also seeks approval to undertake exploration activities in accordance with the *Mining Act 1992* (Mining Act) within Bloomfield's mining tenements.

The maximum mining rate would be up to 4.2 Mtpa for the duration of MOD9. In 2021, mining would occur only in the Camberwell Pit. In 2024, approximately 2.7 Mtpa would be extracted from the Camberwell Pit, with 1.5 Mtpa extracted from the Falbrook Pit. Schedule 2 Condition 10(a) limits operations in Falbrook Pit to 7am to 10pm.

The mobile fleet at RCN will be generally consistent with that modelled for the Integra EA and as utilised in noise and air quality modelling in **Section 7.1** and **Section 7.2**. MOD9 does not seek to change any other aspect of the approved RCN.

The following sections provide a detailed description of MOD9, the justification for MOD9 (**Section 3.2**) and the alternatives considered (**Section 3.7**).

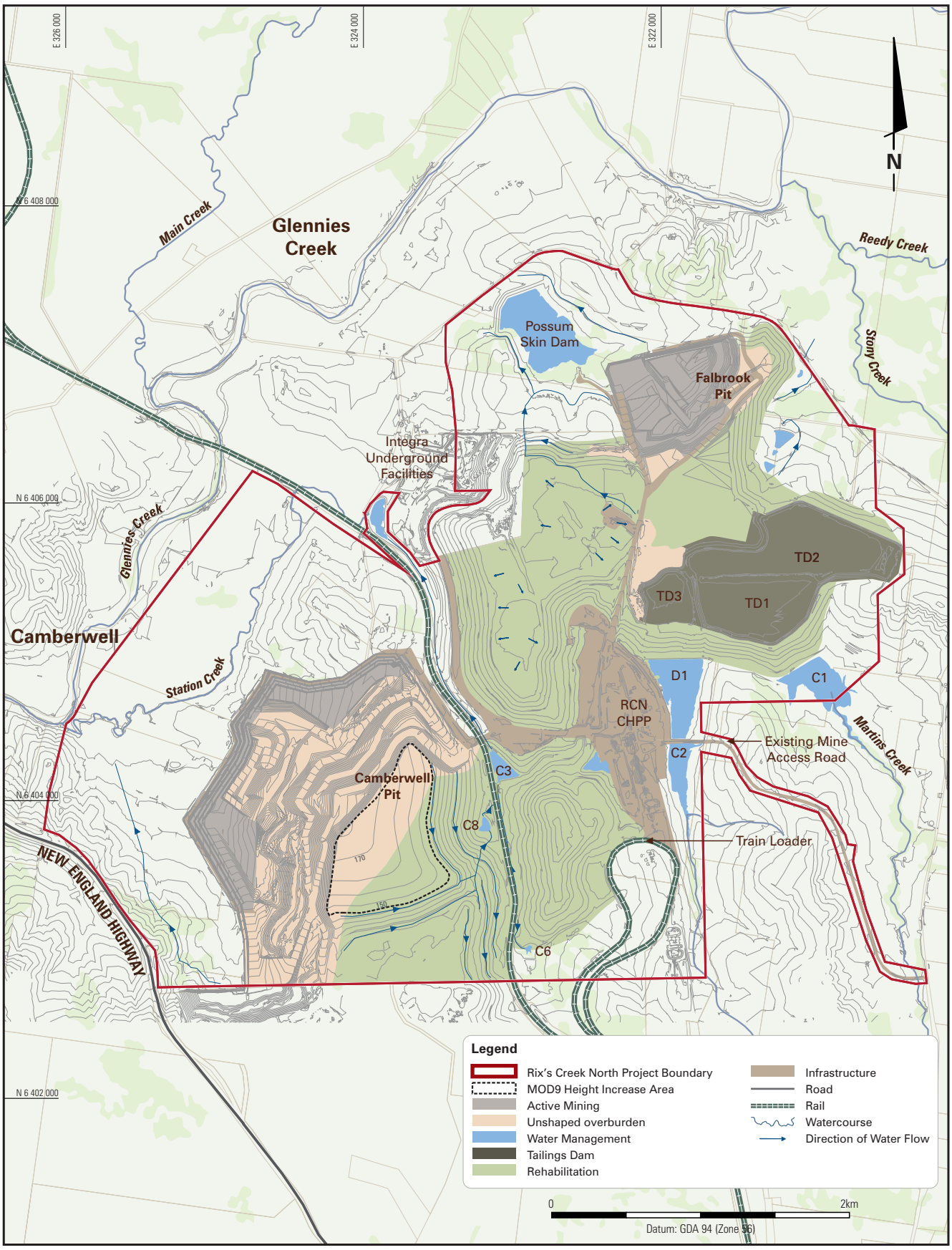


HB RIXS CREEK MOD9 1916 F4 Indicative Mine Plan 2021 24 04 2020

RIXS CREEK COAL MINE

Conceptual Mine Plan - 2021

FIGURE 4

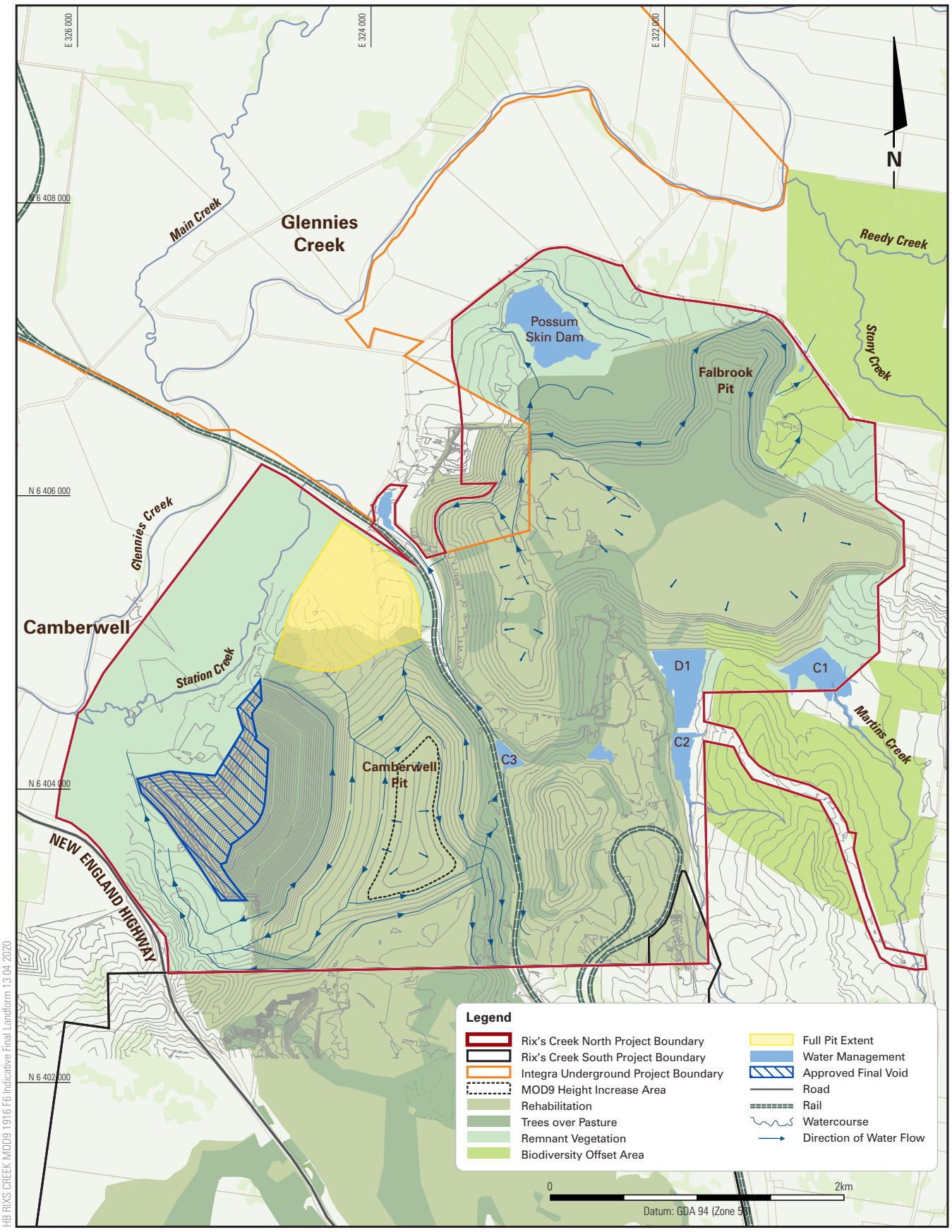


HB RIXS CREEK MOD9 1916 F5 Indicative Mine Plan 2024 24 04 2020

RIXS CREEK COAL MINE

Conceptual Mine Plan - 2024

FIGURE 5



RIXS CREEK COAL MINE

Conceptual Final Landform

FIGURE 6

3.2 MOD9 JUSTIFICATION

3.2.1 Amended Landform

At the time of acquisition of the Integra Open Cut by Bloomfield in 2015, large areas of the Camberwell Pit OEA had already been formed to a maximum height of RL 150 m. The currently approved final landform includes a plateau approximately 900 m long and 500 m wide at RL 150 m.

MOD6 of PA 08_0102 was granted on 23 August 2016, and revised conditions were issued. Under Schedule 3 Condition 50 of PA 08_0102 (as modified by MOD6), Bloomfield is required to create "*Final landforms designed to incorporate micro-relief and integrate with the surrounding natural landforms.*" A note to Table 15 of PA 08_0102 (as modified by MOD6) further states that:

> "*Note: The rehabilitation objectives detailed in Table 15 apply to the entire site, including all landforms constructed under either this consent or previous consents. However, they do not require any additional earthmoving works to be undertaken for landforms that have been approved and constructed under previous consents or prior to the approval of MOD 6.*"

The landform existing at the time of the MOD6 approval negated the possibility of micro-relief or integration with the surrounding landforms without a modification to PA 08_0102. Rehabilitation completed in this area has not been able to incorporate micro-relief, and rehabilitation efforts are hampered by the poor drainage from the flat plateau area.

On 2 November 2018 a meeting was held with the DPIE-Resources Regulator (RR) following questions regarding how RCN would integrate the micro-relief that was required under MOD6 of PA 08_0102. It was discussed with the RR that large areas of the Camberwell Pit OEA had already been emplaced to maximum height (RL 150 m) prior to the purchase by Bloomfield and that a modification would be required to increase the height of the current OEA to allow incorporation of micro-relief and to provide a free draining landform. RR were supportive of this approach which was proposed to provide a free draining safe and stable landform and provide micro-relief for improved visual aesthetics.

The proposed increase in landform height will facilitate the micro-relief required by MOD6, result in improved drainage and a more naturally shaped final landform (see **Section 7.3**). The micro-relief landform will more easily integrate with the surrounding landscape whilst at the same time providing a minor increase in dump capacity which will be of benefit to the efficient operation of the mine.

The landform change will also facilitate the relocation of an area of approved trees over pasture to the slope of the final void which will provide a better rehabilitation and final land use outcome. While the total areas of trees over pasture and pasture land do not change, the flatter pasture areas will be more accessible for ongoing management and grazing, while providing trees over pasture in steeper areas which improves erosion control and provides more sheltered habitat.

An area of 13.5 ha of previous rehabilitation will be disturbed. This area does not currently incorporate micro-relief. The approval of MOD9 will allow Bloomfield to improve rehabilitation outcomes by reshaping the additional material to include micro-relief. The final landform is indicatively shown in **Figure 6**, with specific detail on micro-relief to be included in a revised version of the Mining Operations Plan (MOP).

3.2.2 Blasting Frequency

Under PA 08_0102, RCN is restricted to one blast event per day in both the Camberwell and Falbrook Pits, between the hours of 9am to 5pm and not on weekends or public holidays. Bloomfield reviewed the impact that a restriction of one blast per day per pit has on mining operations during 2019. Actual blast windows are influenced by wind speed and direction, inversions and other environmental factors.

Bloomfield has undertaken an assessment of the number of blasting windows when its personnel are able to fire a blast against the *Blast Management Plan* (Bloomfield, 2019c) (BMP) or latest version, and has determined that for the total number of days the operation would be able to blast (approximately):

- Wind speed ruled out 11% of these days;
- Wind direction was not desirable for 50% of these days; and
- Inversions and other environmental factors prevented blasting on 19% of these days.

Taken in combination, Bloomfield advises that these factors ruled out approximately 64% of possible blasting windows, which equates to only two days a week and seven days a month being available for blasting. On occasions where conditions remain unsuitable for blasting, waits of up to 18 days can occur between blasting events. The time taken to load a blast, or delays in loading the blast may further reduce the number of blasts, for example blasting windows occurring on consecutive days leaves insufficient time to load the next blast.

Blasting is required before mining within an area can occur, so delays in blasting impact on operational efficiency. On occasion, this requires Bloomfield to blast under less optimal conditions.

Blasting complaints provide an indication of Bloomfield's ability to successfully minimise blast impacts. Bloomfield recommenced blasting in 2016. The number of complaints received in relation to blasting at RCN during 2019 totalled three which has decreased by 40% in 12 months. The three complaints were from a total of two complainants.

Bloomfield is requesting an increase to the number of blast events allowed in a day at RCN to three, in line with the RCS approval. No change to the approved maximum number of blast events per week under PA 08_0102 is requested. This change will allow Bloomfield to take advantage of blasting windows as they occur and optimise days when the environmental conditions are most favourable to improve the operational efficiency of the site. Bloomfield will continue to manage blasting as outlined in the BMP or most recent version to meet the relevant project approval criteria.

3.2.3 Exploration Activities

Bloomfield intends to undertake exploration activities within its mining authorities. This may include activities within the area marked as 'Area not to be Disturbed' on Figure 1.3 of the Integra EA as shown on **Figure 2**. Approval of MOD9 will provide the ability for to Bloomfield to undertake exploration activities in accordance with the Mining Act. No exploration activities will occur within the Biodiversity Offset Areas required under Schedule 3 Conditions 37 and 38 and illustrated in Appendix 8 of PA 08_0102.

3.3 OVERBURDEN EMPLACEMENT

PA 08_0102 facilitated the extension of the Camberwell Pit towards the north-west. The overburden removed by open cut mining is backfilled within the Camberwell Pit as mining progresses to the west. The Integra EA identified a maximum approved height of RL 150 m in the Camberwell Pit.

The proposed increase in the height of the approved Camberwell Pit OEA will enable the emplacement area to accommodate an additional 5.4 Mbcm of overburden material over a three-year period. Following final reshaping, 1.5 Mbcm will remain above the currently approved height of RL 150 m. The additional material above the currently approved height will cover an area of approximately 58 ha before being reduced to approximately 32 ha on final reshaping of the western side of the OEA.

Surrounding sites have maximum approved OEA heights of approximately RL 230 m at Mt Owen (Umwelt, 2015), RL 230 m at Ravensworth (Hansen Bailey, 2014) and RL 160 m at Glendell (Umwelt, 2018). The proposed modification at RL 175 m to the RCN OEA is generally consistent with adjacent sites.

The increase in OEA height proposed by MOD9 will occur entirely within the approved Camberwell Pit and within CL 357.

3.4 REHABILITATION

Approximately 13.5 ha of existing rehabilitation will be disturbed to enable the emplacement of material on the OEA (**Figure 4**). This area was rehabilitated in 2017 and is currently pasture sown with predominantly non-native grass species as discussed in **Section 7.4.3**.

Plate 1 illustrates the typical vegetation within this rehabilitated area as at December 2019 which will be re-disturbed and reshaped as part of MOD9.

Source: Bloomfield 2019

Plate 1
Indicative Rehabilitation Area to be Re-disturbed

Progressive rehabilitation of the revised landform will continue consistent with current practices. The final land use will remain generally consistent with that currently approved for RCN.

Under Schedule 3 Condition 52 of PA 08_0102, Bloomfield is required to develop a Rehabilitation Management Plan to the satisfaction of the Division of Resources and Geoscience (DRG). The MOP fulfils the purpose of the Rehabilitation Management Plan. The MOP describes the goals of rehabilitation, including providing grazing land and interconnected areas of trees over pasture and ensuring a final landform designed to "*integrate with surrounding natural landforms*". The revised final landform will achieve these goals.

Figure 6 illustrates the revised conceptual final landform, including areas of connecting trees over pasture.

3.5 WATER MANAGEMENT

The approved final landform includes a final void in the south-western extent of the Camberwell Pit. This void will be retained. Areas below the natural surface will drain to the void. The micro-relief provided in the proposed landform will allow runoff to be directed to surface dams and streams thereby minimising the seepage of rainfall into the overburden emplacement area and reducing the amount of water reporting to the mining void.

The design of the OEA will ensure that water runoff is directed away from the void as generally illustrated in **Figure 4** to **Figure 6** and discussed in **Section 7.4.6**.

MOD9 will not result in any changes to the final void catchment or the RCN water balance assessed in the Integra EA.

No changes to the approved water management system are proposed.

3.6 COMPARISON WITH APPROVED OPERATIONS

Appendix A provides a comparison of MOD9 with the approved activities under PA 08_0102. MOD3 (to extend timeframes for the long-term security of offsets) and MOD4 (change to offset strategy) have not been included as they have no material change to any aspect listed in the table. A further discussion of RCN's planning approvals platform is included in **Section 2.1.1**.

3.7 ALTERNATIVES CONSIDERED

3.7.1 Option 1 - 'Do Nothing' Scenario

It is not possible to establish micro-relief on the current landform without exceeding the current maximum height of RL 150 m of the Camberwell Pit OEA. At the time of acquisition of the Camberwell Pit approximately 13.5 ha of landform had been established with minimal drainage in the area. If MOD9 is not undertaken, this area at RL 150 m will increase to 32 ha as the maximum OEA capacity will be required. This will result in an extended flat area with a shape of approximately 500 m by 900 m with resultant drainage issues. It is also noted that this area would not be compliant with PA 08_0102 Condition 50 which requires the final landform to incorporate micro-relief.

Therefore, the 'Do Nothing' scenario is not desirable.

3.7.2 Option 2 – Emplacement of Overburden in the Falbrook Pit

PA 08_0102 allows for overburden emplacement in the Falbrook Pit up to a maximum elevation of RL 141 m. Mining in the Falbrook Pit was suspended in May 2014 when the former Integra Open Cut Mine was placed under care and maintenance. The Falbrook Pit has since been used as a water storage. The Falbrook Pit would need to be dewatered and the remaining coal mined before it can be used for emplacement of overburden extracted from the Camberwell Pit.

At present, there is no alternate water storage at RCN which has sufficient capacity to manage the volume of water in the Falbrook Pit.

Furthermore, use of the Falbrook Pit for emplacement of overburden from the Camberwell Pit would result in reduced emplacement capacity for future operations in the Falbrook Pit and sterilisation of the approved coal resource therein. For these reasons, this alternative is not desirable for the resolution of the minor dump capacity shortfall identified.

3.7.3 Option 3 – Emplace Additional Overburden Out of Pit

This option was not considered desirable due to:

- The additional disturbance that it would create;
- The limited areas close to the pit available for overburden emplacement.

For these reasons, this alternative is not desirable.

3.7.4 Option 4 – Emplace Additional overburden at Rix's Creek South

RCS will be utilising available emplacement areas for overburden from the RCS West Pit. This would not allow emplacement of additional RCN material in the short term.

3.7.5 Option 5 – MOD9

The alternative options (Options 1 to 4) do not address the desired outcome of establishing micro-relief on the existing RL 150 m OEA, improving operational efficiency through an increased number of blasting events, or allowing exploration activities. The preferred modification is that described in **Section 3.1** and justified in **Section 3.2**.

4 STATUTORY CONTEXT

This section briefly describes the provisions of legislation that are applicable to MOD9.

4.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

4.1.1 Objects of the EP&A Act

The objects of the EP&A Act are listed under Section 5 of the Act:

- *(a) "to encourage:*
  - *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
  - *(ii) the promotion and co-ordination of the orderly and economic use and development of land,*
  - *(iii) the protection, provision and co-ordination of communication and utility services,*
  - *(iv) the provision of land for public purposes,*
  - *(v) the provision and co-ordination of community services and facilities, and*
  - *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
  - *(vii) ecologically sustainable development, and*
  - *(viii) the provision and maintenance of affordable housing, and*
- *(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and*
- *(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

MOD9 will facilitate a minor increase in the height of the approved Camberwell Pit OEA and associated relocation of trees over pasture and improved operational efficiency. Compared to the approved final landform, the proposed final landform for RCN will result in a more naturally shaped landform that integrates with the surrounding landscape and has improved drainage. The other minor modification components of blast events and exploration will have minimal impact and will allow improved operational efficiency. Therefore, MOD9 will result in an improved environmental outcome and allow for the proper development of the mineral resource.

Given the highly modified nature of the existing landform, MOD9 is unlikely to have significant environmental impacts when compared to the current approved operations. MOD9 represents an improved environmental outcome and the proper development of natural resources and is therefore consistent with the objects of the EP&A Act.

4.1.2 Modification of Approvals

PA 08_0102 was granted under the former Part 3A of the EP&A Act. Under Part 3A, Section 75W enabled the modification of approved projects. However, Clause 3BA of Schedule 2 to the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (EP&A Savings Regulation) states that approved projects cannot be modified under Section 75W after 1 March 2018.

After 1 March 2018, Section 4.55 (formerly Section 96) of the EP&A Act applies to modification of project approvals. Section 4.55(2) of the EP&A Act states:

> *"A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
>
> *(a) It is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all)."*

Under Section 4.55(2) of the EP&A Act, the consent authority must be satisfied that the modified project would remain "*substantially the same development*" as the approved project. Clause 3BA(6) under Schedule 2 of the EP&A Savings Regulation states that when considering whether the modified project is *'substantially the same development'*, the modified project is to be compared to the approved project (as last modified under Section 75W). PA 08_0102 has been subject to eight modifications under Section 75W. Therefore, the appropriate comparison is between MOD9 and PA 08_0102 (as modified by MOD8).

MOD9 only seeks to alter the height of the OEA in a previously mined area, the number of blast events allowed per day, and the inclusion of exploration activities in accordance with the Mining Act. The following aspects of RCN will remain consistent with PA 08_0102:

- Mining footprint and methods;
- Maximum coal production rate;
- Duration of the project;
- Mine infrastructure;
- Methods and rates of coal processing and transportation; and
- Operating hours and size of the workforce.

Due to these key aspects of the project remaining unchanged, the modified project would be substantially the same as the approved project. Therefore, MOD9 is within the scope of Section 4.55(2).

4.1.3 Permissibility

The permissibility of developments in NSW is primarily governed by the EP&A Act and the Environmental Planning Instruments (EPIs) enacted pursuant to that Act. EPIs include Local Environmental Plans and State Environmental Planning Policies.

Clause 7(1)(b) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) states that mining is permissible with development consent where it is proposed to be carried out:

(i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or

(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,…"

MOD9 relates to the emplacement of overburden in the Camberwell Pit. This OEA is located within CL357. Therefore, pursuant to Clause 7(1)(b)(ii) of the Mining SEPP, MOD9 is permissible with development consent because it is on land that is the subject of a mining lease.

4.2 OTHER RELEVANT NSW LEGISLATION

4.2.1 Mining Act 1992

Section 6(6) of the Mining Act identifies certain 'designated ancillary mining activities' that require an authorisation, that is an exploration licence, an assessment lease or a mining lease, namely:

(a) the construction, maintenance or use of any reservoir, dam (including a tailings dam), drain or water race, other than any reservoir, dam, drain or water race principally used for purposes not connected with mining or any other activities regulated by or under an authorisation,

(b) opal puddling,

(c) the removal, stockpiling or depositing of overburden, ore or tailings to the extent that it is associated with mineral extraction or mineral beneficiation.

The emplacement of overburden in the Camberwell Pit constitutes a designated ancillary mining activity and therefore must be carried out in accordance with a mining lease. The proposed overburden emplacement will be undertaken within CL357.

4.2.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides for licensing of pollution by the NSW Environment Protection Authority (EPA) which administers the POEO Act. Section 48 of the POEO Act provides that an EPL is required in respect of premises at which any "… s*cheduled activity is carried on* …". Bloomfield holds EPL 3391 in respect to its currently approved mining operations for PA 08_0102 (as modified).

Should the Minister for Planning and Public Spaces consider it appropriate to grant approval for this Modification, a variation to the EPL 3391 will be sought under the POEO Act to revise the noise monitoring groups. This will reflect changed ownership in various areas as discussed in **Section 7.2**.

4.2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) was enacted on 23 November 2016 and superseded the *Threatened Species Conservation Act 1995*. Part 7 of the BC Act imposes a framework for the assessment of impacts to listed threatened species and ecological communities.

The increased height of the OEA applies only to land which is already disturbed and the re-disturbance of exotic pasture land and therefore does not have any impacts on species and ecological communities. Exploration activities will be conducted as described in **Section 7.4** as it relates to the BC Act.

4.2.4 National Parks and Wildlife Act 1974

Under Section 86 of the *National Parks and Wildlife Act 1974* (NPW Act), it is an offence to harm or desecrate an Aboriginal object unless the harm or desecration was authorised by an Aboriginal Heritage Impact Permit (AHIP) issued under Section 90.

MOD9 applies only to land which is already disturbed and therefore does not have any impacts on any Aboriginal objects.

4.2.5 Water Management Act 2000

The provisions of the *Water Management Act 2000* (WM Act) apply to water sources that are subject to a Water Sharing Plan (WSP). The following WSPs apply to the water sources in the vicinity of MOD9:

- *Water Sharing Plan for the Hunter Regulated River Water Source 2016;*
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009; and*
- *Water Sharing Plan for the North Coast Fractured and Porous Water Source 2009.*

Section 60A of the WM Act provides that a Water Access Licence (WAL) is required for the taking of water from a water source. MOD9 does not result in any taking of water additional to that already approved.

4.2.6 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

Clause 6 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) provides that development for the purposes of mineral exploration (i.e. prospecting) may be carried out without development consent. However, an environmental assessment of any proposed prospecting activity is required pursuant to Part 5 of the EPA Act unless the proposed prospecting has already been assessed and approved under the EPA Act.

Assessable prospecting operation means any exploration activity that is not exempt development within the meaning of Clause 10 of the Mining SEPP.

Clause 10 Exempt Development does not include exploration activities and as such, development consent is sought in MOD9.

4.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) outlines the role of the Commonwealth in the protection of the environment. The EPBC Act provides protection for listed Matters of National Environmental Significance (MNES) which include:

- World heritage properties;
- National heritage places;
- Wetlands of international importance;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park;
- Protection of the environment from nuclear actions (including uranium mining); and
- Protection of water resources.

A proponent must make a Referral under Section 68 of the EPBC Act if the proposed action has the potential to result in significant impacts to MNES.

MOD9 would result in a minor height increase to an existing approved OEA and an improvement in operational efficiency. MOD9 applies only to land which is already disturbed and the re-disturbance of exotic pasture land. As discussed in **Section 7.4**, there will be no impacts to listed threatened species and ecological communities, migratory species or water resources. Therefore, MOD9 is not likely to have a significant impact on MNES. Accordingly, a Referral under Section 68 of the EPBC Act is not required.

5 STAKEHOLDER ENGAGEMENT

Table 1 outlines the relevant level of consultation activities undertaken for MOD9. Outcomes from discussions have been incorporated into this SEE. **Section 7** includes consideration of issues raised in **Table 1**.

Various communication and engagement mechanisms will continue to be implemented to ensure the effective ongoing engagement with key stakeholders.

Key consultation avenues that are maintained by Rix's Creek Mine include:

- Consultation with the key regulators, local Council and the community;
- Updates to the Community Consultative Committee (CCC); and
- Provision of information on the Bloomfield public website.

Table 1
Stakeholder Engagement and Consultation

Stakeholder	Method of Consultation	Issues Raised	Section where Addressed
Community			
CCC	Meeting held 12 February 2020	• Query regarding number of existing blast complaints • Micro-relief	7.4.1 3.2.1
Near neighbours	Newsletter distributed to 110 Properties on 8 May 2020 21 emails sent to surrounding neighbours with attached copy of the Modification 9 Newsletter	• Nil	N/A
Residents within 3 km of blasting	Individual phone calls to 36 residents from 12 May to 28 May 2020	• Exploration within Biodiversity Offset Area • Location of proposed OEA height increase • Timing of recommencement of Falbrook Pit • Dust • Noise from increased dump height • Noise from Falbrook Pit	3.2.3 Figure 5 2.1.2 7.1.3 7.2.3 7.2.3

Stakeholder	Method of Consultation	Issues Raised	Section where Addressed
Broader community	Newsletter available on the Bloomfield public website. Copies provided to Singleton Council for public areas e.g. Library, Visitors' Centre. Placed on community noticeboard at Singleton Coles.	• Nil	N/A
Regulatory Stakeholders			
DPIE	Email correspondence 6 and 7 March 2019	• Increase of OEA by 15 to 20 m to allow incorporation of micro-relief requires a modification	This application
	Meeting at DPE offices held 29 January 2020	• Confirm rehabilitation to be disturbed is not CEEC/EEC • Apply landform trees over pasture to void slope • Discuss drainage and separation of clean water • Blast assessment • Qualitive assessment of greenhouse gas • Social assessment • Include photomontages for key visual impacts	7.4.2 7.4.2 7.4.6 7.4.1 7.4.7 7.4.8 7.3.5
DPIE – Resources Regulator	Meeting held at RCM 3 December 2018	• Incorporation of micro-relief into final landform	7.4.2

Stakeholder	Method of Consultation	Issues Raised	Section where Addressed
	Meeting held 3 March 2020	• Move landform trees over pasture to void slope • Include further detail on drainage and water infrastructure • Include additional detail on cattle trials with respect to erosion and pasture maintenance • Collection of topsoil from rehabilitation area to be disturbed • Chemical testing and visual assessment of areas where Mixed Waste Organic Outputs may have been used	7.4.2 7.4.6 7.4.2 7.4.5 7.4.5
EPA	Meeting offered via letter dated 10 February 2020 and no response	• Nil	N/A
Singleton Shire Council (SSC)	Meeting held 2 March 2020	• Closure outcomes • Overburden emplacement height in comparison to surrounding mine sites	7.4.2 7.3.2
	Meeting held 25 May 2020	• Air Quality assessment for additional blasting.	Appendix B

6 RISK ASSESSMENT

A risk assessment was completed to identify potential environmental and socio-economic issues associated with MOD9. The purpose of the risk assessment process was to prioritise the impact studies required for the SEE in consideration of the Project description in **Section 3**.

Each of the environmental issues was ranked as being of low, moderate, high or critical risk. **Table 2** summarises the risk ratings for the identified environmental risks. The risk rating allocated to an impact is dependent upon the probability of the impact occurring and the potential consequences should the impact materialise. The final risk ranking is based on the predicted residual impacts (i.e. assuming the implementation of appropriate management and mitigation measures).

Due to the nature of MOD9, no environmental aspects provided a critical or high risk. Noise, Air Quality and Visual impacts were determined to be medium risks, while other environmental issues were determined to be of low risk.

Table 2
Environmental Risk Rating

Risk Ranking	Area/s
High	None
Significant	None
Medium	Noise, Air Quality and Visual
Low	Blasting; Rehabilitation and Final Landform; Ecology; Soils and Land Capability; Water management; Aboriginal Heritage

7 IMPACTS, MANAGEMENT AND MITIGATION

The potential environmental impacts of MOD9 have been assessed as part of this SEE. The findings of this assessment as well as a description of the measures that will be implemented to manage and mitigate potential impacts are presented below.

7.1 AIR QUALITY

7.1.1 Background

An '*Air Quality Impact Assessment Rix's Creek North Modification 9*' (TAS, 2019) (AQIA) for MOD9 was completed by Todoroski Air Sciences. The full AQIA is presented in **Appendix B.**

7.1.2 Methodology

Guidelines and Policies

The AQIA was undertaken in accordance with the NSW Environment Protection Authority's (EPA) '*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW'* (EPA, 2106) (Approved Methods).

The AQIA focused on particulate matter (Total Suspended Particulates (TSP), Particulate Matter <10 µm (PM_{10}), Particulate Matter <2.5 µm ($PM_{2.5}$)) and deposited dust, as these are the key pollutants associated with mining development. The potential emissions due to MOD9 were assessed against the criteria in the Approved Methods and the *Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018) (VLAMP).

Air Quality Criteria

The relevant air quality criteria for concentrations of particulate matter are presented in the report in **Appendix B**. It is important to note that the NSW EPA criteria (in the Approved Methods) are applied to cumulative impacts (due to MOD9 and other sources), whereas the VLAMP criteria differentiates between incremental impacts (due to MOD9 alone) and cumulative impacts.

Modelling

The air dispersion modelling conducted for the AQIA utilised an advanced modelling system consisting of *The Air Pollution Model* (TAPM) and CALMET/CALPUFF models as described in the AQIA (**Appendix B**). Best practice dust controls were identified in accordance with *NSW Coal Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al, 2011). The proposed dust controls were incorporated into the dispersion model. A full description of the assumptions and modelling method is described in the AQIA (**Appendix B**).

7.1.3 Impact Assessment

Results

Appendix C provides a summary of the receptors for which modelling has predicted exceedances will occur.

No receptors (additional to those within an existing air quality acquisition zone) are predicted to exceed the cumulative $PM_{2.5}$ and PM_{10} criteria. This excludes receptor 175 which is in RCN's noise acquisition zone.

Section 6.3 of the AQIA provides a contemporaneous assessment of the cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts for receptors within an existing acquisition zone.

The contemporaneous assessment of the cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts identified that for the 2021 scenario, one additional day above the cumulative 24-hour average PM_{10} criteria is predicted to occur at N187. For the 2024 scenario, one additional day above the cumulative 24-hour average PM_{10} criteria is predicted to occur at seven receptors. Exceedances are predicted to occur on three additional days at N180 which is a community hall. These results are shown in **Appendix C**.

Figure 7 shows relevant acquisition criteria for the assessment of impacts on 25% of contiguous lots owned by the same landowner. Seven blocks belonging to two landowners were found to exceed the VLAMP criteria on this basis, as presented in **Appendix C**.

7.1.4 Mitigation and Management

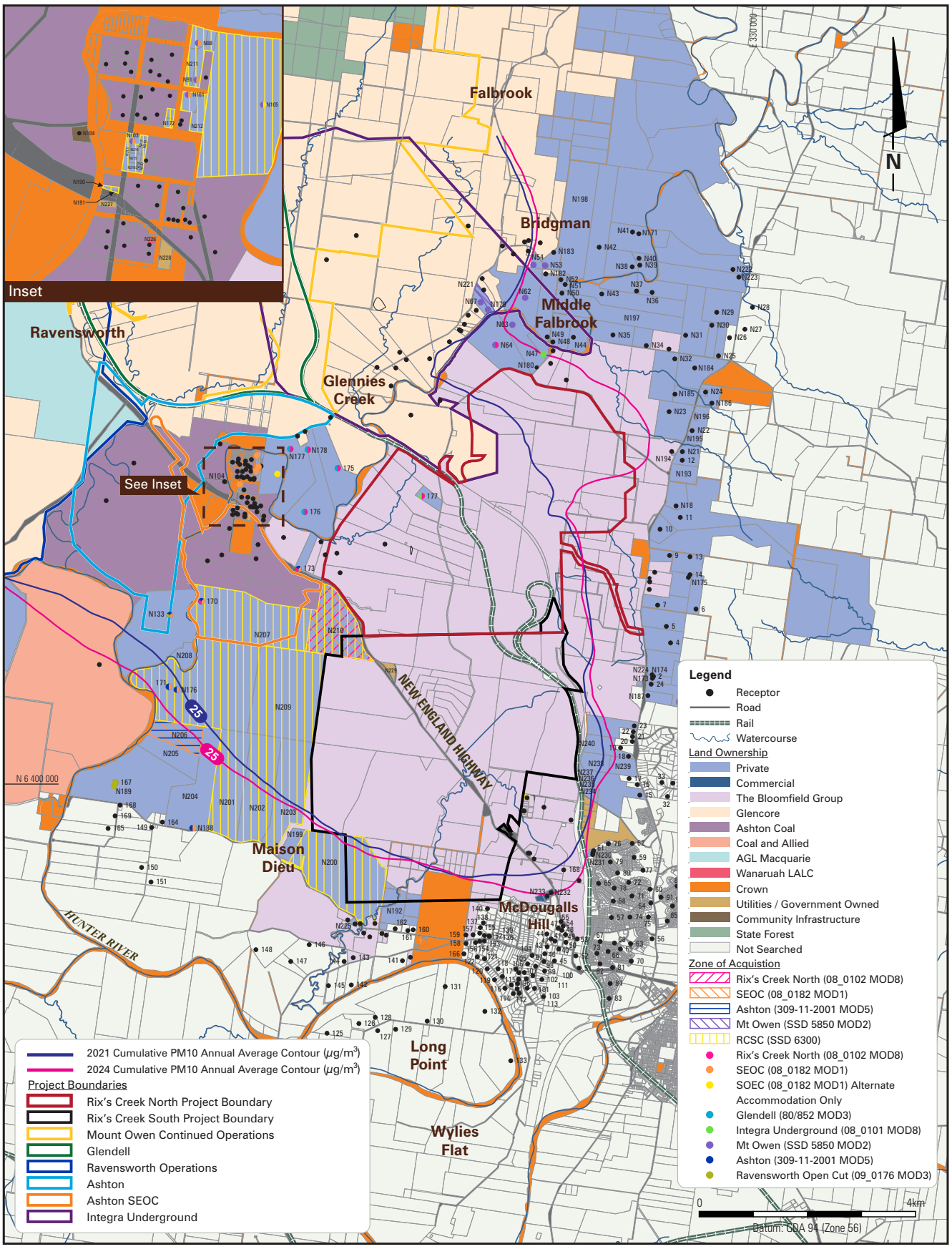
Bloomfield manages its operations in accordance with the approved AQMP or latest version. Mitigation and management measures outlined in this document will continue to be implemented for MOD9, specifically:

- Site inductions to ensure all employees and contractors are aware of dust impacts and management requirements;
- Implementation of existing reactive and proactive management systems;
- Watering of haul roads;
- Minimising speed of equipment during unfavourable conditions;
- Visual monitoring of dust levels and modifying or ceasing works when elevated dust levels are observed; and
- Relocation of overburden emplacement operations during unfavourable weather conditions.

The existing proactive system is primarily used as an alert of possible elevated dust levels allowing time to prepare and respond to any actual issues. The existing reactive system uses trigger levels applied to the real-time monitoring data to manage dust levels in real-time through scheduling of operations, modifying activity or temporarily ceasing operations.

These systems will be effective at minimising the potential for exceedances of the cumulative 24-hour average $PM_{2.5}$ and PM_{10} criteria.

It is considered that the continued implementation of the AQMP management measures would be suitable to manage potential air quality impacts from the Project.



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RIXS CREEK COAL MINE

THE Bloomfield GROUP · RIX'S CREEK · Hansen Bailey ENVIRONMENTAL CONSULTANTS

2021 and 2024 Air Quality Contours RCN and Other Sources

FIGURE 7

7.2 NOISE

7.2.1 Background

A '*Noise and Blasting Impact Assessment*' (Global Acoustics, 2019) (NBIA) for MOD9 was completed by Global Acoustics and is presented in **Appendix D**.

The NBIA assessed modelled noise levels against the intrusive, acquisition and mitigation criteria listed in PA 08_0102 Table 2: Noise Criteria, Table 3: Noise acquisition criteria and Table 7: Additional noise mitigation criteria. These criteria are presented in the **Appendix D**.

7.2.2 Methodology

Guidelines and Policies

The NBIA was undertaken in accordance with the following guidelines and policies:

- *Industrial Noise Policy* (EPA, 2000) (INP);
- *Noise Policy for Industry* (EPA, 2017) (NPfI);
- *Interim Construction Noise Guideline* (DECCW, 2009) (ICNG);
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) (VLAMP);
- *Road Noise Policy* (DECCW, 2011) (RNP);
- *Rail Infrastructure Noise Guideline* (EPA, 2013) (RING); and
- *Australian and New Zealand Environment and Conservation Council guideline Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (EPA, 1990) (ANZECC).

Intrusive Noise Criteria

The noise assessment conducted for the Integra EA divided the receptors into a number of Noise Assessment Groups (NAGs) with different impact criteria as shown on **Figure E1** in **Appendix E**. Condition 2 of Schedule 3 of PA 08_0102 lists intrusive noise criteria applicable for receptors on privately-owned land within each NAG. This table is reproduced in **Appendix E**.

Modelling

Noise modelling was undertaken to predict noise levels at private receptors during the period when the OEA will be modified. Day, evening and night-time periods were modelled for 2021 and 2024 as described in **Appendix D.**

The assumptions used in the noise model are discussed in detail in the NBIA (**Appendix D**).

The modelling considered three scenarios for the 2024 evening period, when Falbrook Pit is in operation:

- Evening Scenario 1: Unrestricted operations in Falbrook Pit;
- Evening Scenario 2: Mitigated operations assuming a partial shutdown of one excavator and associated truck fleet; or
- Evening Scenario 3: Complete shutdown of operations in Falbrook Pit.

7.2.3 Impact Assessment

Results

No predicted exceedances of the mitigation or acquisition criteria at private receptors are predicted in 2021.

For 2024, no exceedances at private receptors are predicted in the day or night periods. Schedule 2 Condition 10(a) limits operations in Falbrook Pit to 7am to 10pm.

During 2024 evening scenario 1 (full operations in Falbrook Pit), there is a potential for RCN to exceed the acquisition criteria stipulated in PA 08_0102 Table 3 at three receptors. Further, under Scenario 1, the model predicts an exceedance of the relevant mitigation criteria at an additional four properties owned by three landowners.

Bloomfield will continue to utilise on the ground noise management personnel to maintain noise compliance with the intrusive noise criteria modelled in Scenario 2 during operations in the Falbrook Pit (2024). As modelled for evening scenario 2, this approach will result in no exceedances of acquisition or mitigation criteria at any private receptor.

Figure 8 shows relevant amenity criteria for assessment of impacts on 25% of contiguous lots owned by the same landowner. No properties (additional to existing) were found to exceed the VLAMP criteria.

7.2.4 Mitigation and Management

Bloomfield manages its operations in accordance with the approved NMP or latest version. Mitigation and management measures outlined in the NMP will continue to be implemented for MOD9, specifically:

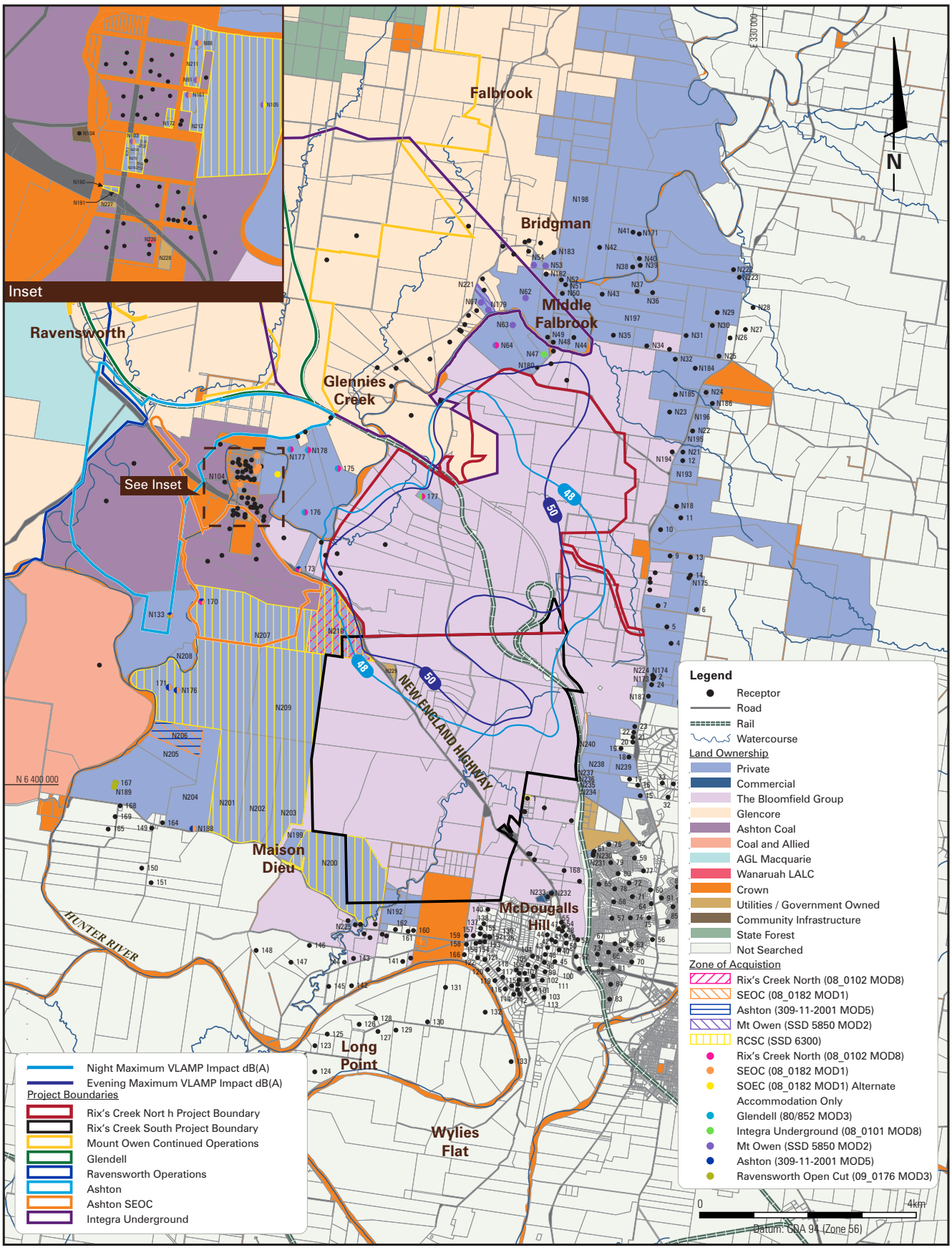
- Use of the proactive and reactive management systems;
- Mining schedules modified to reflect predicted weather conditions;
- Relocation of equipment to less exposed pit and OEA locations in adverse conditions;
- Progressive shutdown of operations in adverse conditions, especially in the Falbrook Pit;
- Internal attended monitoring to identify raised noise levels;
- Maintenance of noise attenuation on equipment;
- Replacement of track dozers with rubber tyred dozers when appropriate;

- Restriction of travelling dozers to first gear; and
- Restriction of haul truck speed.

As described in the NMP, Bloomfield has developed best practice noise management using meteorological and atmospheric predictive modelling known as EnvMet. EnvMet completes modelling by 6 am each morning, providing a forecast of noise enhancement for the next 24 hours. The daily prediction is discussed at the morning Production Meeting which allows operational changes for the day to be planned as required.

As described in the NMP, Bloomfield employs suitably trained personnel to conduct internal attended noise monitoring during the evening and night periods. Monitoring locations are determined using the daily predictions to allow monitoring to be focussed in high risk areas. The monitoring personnel provide real time feedback to the production team to allow modification to mining operations where required. Following any modification to operations, the location is re-monitored to ensure the changes have reduced noise levels. Further iterations of modification occur, as required.

To mitigate potential impacts from the Falbrook Pit in Scenario 2 in 2024, under meteorological enhancement conditions as described in Table 4.1 of the NBIA, Bloomfield will shut down one excavator and its associated fleet. Noise mitigation controls will typically only be required during periods of meteorological enhancement, and will be applied based on information obtained from the real-time monitoring system and application of the RCM Trigger Action Response Plan in accordance with the NMP.



HB RIXS CREEK 1916 F8 2021 and 2024 Noise Contours - Maximum Criteria for 25pc Assessment 30 03 2020

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2021 and 2024 Noise Contours Maximum Criteria for 25% Assessment

FIGURE 8

7.3 VISUAL

RCN is in an area largely surrounded by mining operations (**Figure 1**). RCS West Pit lies to the south with the MOC to the north, Ashton to the west and Ravensworth to the north west. The Camberwell Pit is adjacent to the floodplain associated with Glennies Creek and Station Creek.

To the south and east, topography limits the extent of the views towards Singleton, Singleton Heights, Obanvale and Wattle Ponds. From the north and northwest of the open cut area, the floodplain lies between Station Creek and Glennies Creek and the natural topography then rises reasonably steeply from approximately RL 60 m to RL 100 m.

Camberwell Village sits to the west of the OEA. A ridge runs north-south directly to the east of the village, providing some visual shielding, and another ridge runs north-south between Camberwell Village and RCN. While most of the receptors in the village are mine owned, there are some private landowners within Camberwell Village (**Figure 3**). These all have acquisition rights from RCS or another Mining Company.

Other private receptors to the west of RCN have views already impacted by the existing mine. These closest receptors have acquisition rights from RCN or another mining company as shown on **Figure 3**.

There are further private receptors to the east of RCN as shown on **Figure 3**. Views from these receptors are generally shielded by a ridge that runs north-south between RCN and Bridgeman Road.

Private properties to the north of RCN are generally shielded by existing topography or their views are already impacted by the existing mine. Two receptors closest to the mine have acquisition rights from RCN and another Mining Company as shown on **Figure 3**.

7.3.1 Existing Visual Character

To understand the visual impact that MOD9 may have on surrounding receptors, the baseline visual character of the existing environment is described. The visual character of the landscape includes:

- Glennies Creek and Station Creek Floodplain;
- Glennies Creek basin;
- Camberwell Village;
- Existing open cut mines; and
- Surrounding ridges.

The floodplains create a strong contrast and visual interest to surrounding landscapes. The greatest significance is the flatness and grass/crop cover that allows for long views from distant locations. The floodplains lead into the edges of the creek basin, which rises in places to the north-west and north of RCN approximately RL 60 m to the surrounding landscape.

Camberwell Village is to the west. While the village is elevated, a ridge on the eastern edge of the village provides some shielding for the majority of the village.

RCS lies directly south of RCN, and beyond are a series of ridges that rise to between 120 m and 168 m, and provide shielding towards Maison Dieu. The majority of the intervening land is grazing land, some of which is heavily wooded. Another ridge runs north-south adjacent to Bridgman Road and provides shielding to Singleton Heights, Wattle Ponds and Obanvale.

The visual environment includes the existing open cut mines of RCS, MOC, Ashton and Ravensworth as shown on **Figure 1**. The views to MOC, Ashton and Ravensworth are generally shielded by rehabilitated OEAs and topography. Views to the Camberwell pit OEA will have the Camberwell Open Cut pit in the foreground and current and rehabilitated OEAs at RCN and RCS as a backdrop.

7.3.2 Project Visual Character

The most significant visual factor associated with MOD9 will be the additional height of the overburden area. Until rehabilitation is established, the colour, form and height of the existing OEA creates a high contrast visual effect. The additional height will not significantly change the visual character of the current approved OEA. Night lighting may also continue to cause some visual impacts.

Surrounding sites have maximum approved OEA heights of approximately RL 230 m at Mt Owen (Umwelt, 2015), RL 230 m at Ravensworth (Hansen Bailey, 2014) and RL 160 m at Glendell (Umwelt, 2018). The proposed temporary modification at RL 175 m to the RCN OEA will not create a higher visual contrast compared with adjacent sites.

7.3.3 Viewing Locations

Viewing locations are those areas where people are likely to obtain a view of the OEA. These viewing locations have different significance based on numerous factors, collectively evaluated through land use and viewing distance to the OEA. Viewing locations include residences, roads, commercial and recreation areas as well as urban and other rural areas.

An initial desktop review and location visit identified five viewing points representative of different viewing locations for assessment which are summarised in **Table 3** and illustrated on **Figure 9** and **Figure 10**. These viewpoints are discussed further in **Section 7.3.5**.

Table 3
Viewing Points and Approximate Distance to OEA

View Point	Description	Approximate Distance to top of OEA (km)
VP1	Junction McInerney Road and New England Highway	3.3
VP2	Receptor N91	3.8
VP3	Adjacent to Receptor N62	5.5
VP4	Receptor N44	5.2
VP5	Receptor 10	4.3

Views from Singleton Heights and Maison Dieu were qualitatively assessed as discussed in **Section 7.3.5**.

7.3.4 Visual Impact

The visual impact is determined through defining the visual sensitivity of the viewing locations and how the visual effect of the OEA will interact with these.

Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a development. Visual sensitivity is a combination of the sensitivity of the land use and the visibility of the OEA as a measure of distance.

Land uses that rely on the scenic amenity values of the surrounding landscape as part of a leisure experience and over extended viewing periods, generally have a higher visual sensitivity (e.g. residential, tourist and/or recreation areas).

Visibility decreases with distance and the visual sensitivity reduces accordingly. Other factors affecting visual sensitivity of individual areas include:

- Screening effects of existing topography, infrastructure or vegetation. For example, receptors whose views are screened from the OEA by hills or trees will have a lower visual sensitivity than those with open views; and
- Orientation to the OEA. For example, receptors with strong visual orientation towards the OEA will have a higher visual sensitivity than those not orientated towards the OEA.

VP1 is from a main road, where the receptors have a temporary view of the OEA having already passed other mining operations along the New England Highway. This point could be considered to have a moderate land use sensitivity. The distance to the OEA of approximately 3.3 km creates a moderate visual sensitivity.

The remaining viewing points are indicative of private receptors, which could be considered to have a high land use sensitivity. The distance from the OEA to the receptors is approximately 3 to 6 km, providing a high to moderate visual sensitivity.

Visual Effect

Visual effect is a combination of the visual properties of the OEA (contrast and integration), and the proportion of the view occupied by the OEA. A newly created mine pit and OEA have a high visual contrast and low integration compared with expansion of an existing OEA, as is the case with MOD9. The proportion of the view can be a factor of distance as well as size of the OEA. The lower the proportion of the view that the OEA occupies, the lower will be the level of the visual effect.

Visual Impact

The visual impact level of the OEA is determined by considering together the visual sensitivity and visual effect. **Table 4** illustrates the interaction between the parameters of visual sensitivity and visual effect.

Table 4
Visual Impact

		Visibility Sensitivity		
		High	Moderate	Low
Visual Effect	High	High	High/Moderate	Moderate/Low
	Moderate	High/Moderate	Moderate	Moderate/Low
	Low	Moderate/Low	Moderate/Low	Low
	Very Low	Low	Very Low	Very Low

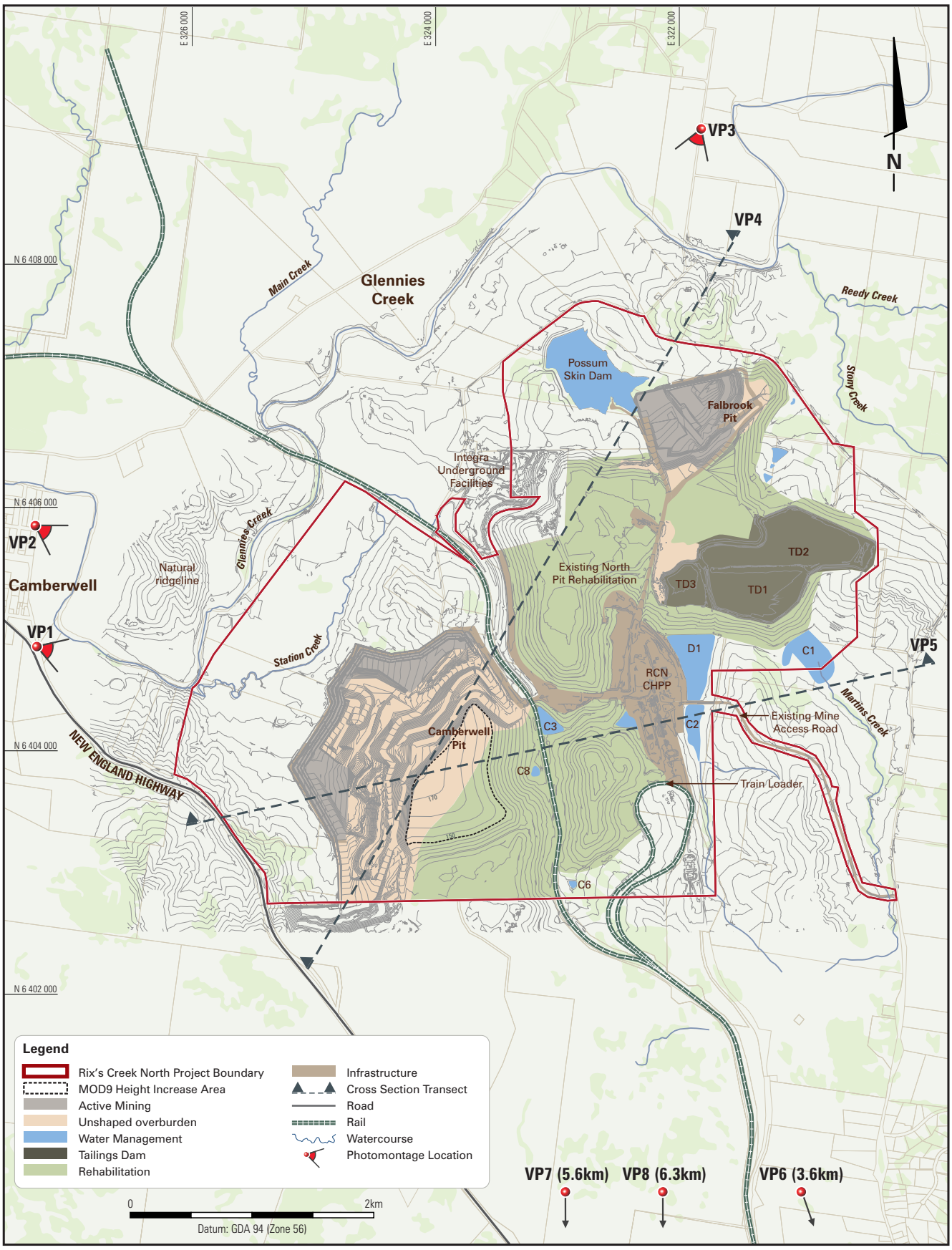
Source: Continuation of Bengalla Mine Project Visual Impact Assessment (JVP, 2013)

7.3.5 Impact Assessment

MOD9 would temporarily raise the height of the existing OEA by RL 25 m to 175 m, and permanently raise it by 15 m to approximately RL 165 m (approximately 9% height increase). The unrehabilitated surface of the existing OEA faces north through to west, and at RL 150 m masks the natural ridges to the east, which rise to approximately RL 140 m. The current OEA therefore creates an existing visual effect.

Photomontages were completed for VP1, VP2 and VP3 and visual cross sections were completed for VP4 and VP5 comparing the currently approved operations with the proposed view (**Figure 9** and **Figure 10**). A qualitative assessment of locations within Singleton Heights and McDougall's Hill was also completed.

The visual impacts of each of these locations was assessed using **Table 4** in consideration of the visual sensitivity and visual effect at each point. A summary of the impacts is provided in **Table 5**.



HB RIXS CREEK MOD9 1916 F9 Visual Viewpoint Locations - 2024 24 04 2020 Rev F

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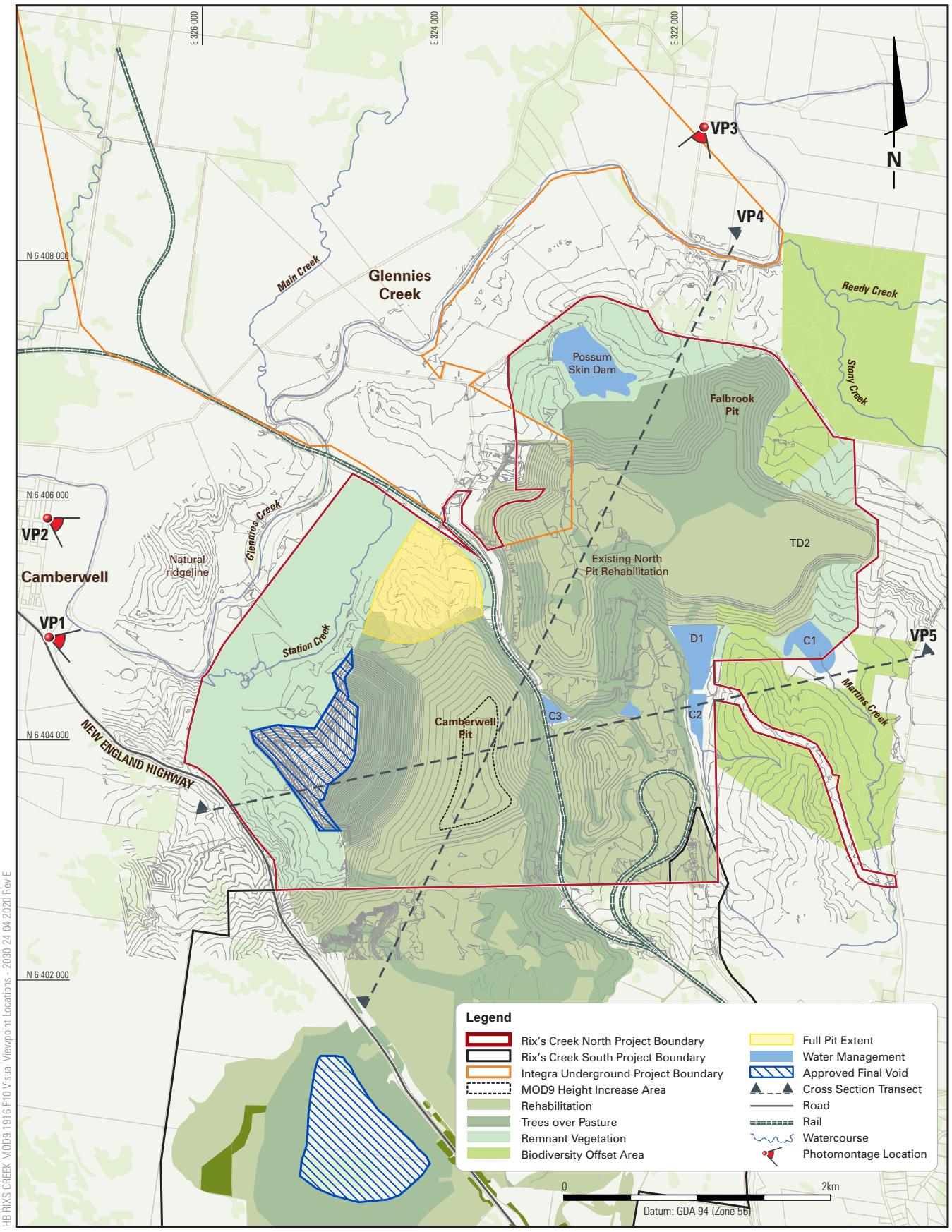
Visual Viewpoint Locations - 2024

FIGURE 9



HB RIXS CREEK MOD9 1916 F10 Visual Viewpoint Locations - 2030 24 04 2020 Rev E

RIXS CREEK COAL MINE

Visual Viewpoint Locations - Final Landform

FIGURE 10

7.3.5.1 *VP1*

VP1 is near the junction of the New England Highway and McInerney Road and looks east towards the OEA across the Glennies Creek floodplain. This is the point along the New England Highway where the current OEA is most noticeable to travellers heading east along the Highway, and will continue to be so until rehabilitation is completed. Views from VP1 will be short term and generally less than 30 seconds (Green Bean, 2008).

As discussed in Section 7.3.4, the visual sensitivity at this location is considered moderate. The existing visual effect is considered high due to the high contrast of the active OEA, giving a current visual impact of moderate to high. **Figure 11** shows the visual effect of the existing OEA from VP1. This point is around 3.3 km from the highest point of the amended OEA.

2024 Landform

By 2024, the amended landform will be at its highest point of RL 175 m. **Figure 11** illustrates the modified component due to MOD9, and a simulation of the visual effect of the landform. The visual impact will remain moderate to high (i.e. consistent with the existing visual impact).

Final Landform

Figure 11 shows that while the view is still unmitigated, the visual effect of the amended OEA will be lower once rehabilitation has been completed. The amended OEA gives a more rounded top to the existing flat plateau which will better integrate with the surrounding landforms. The visual impact at this time will be low.

7.3.5.2 *VP2*

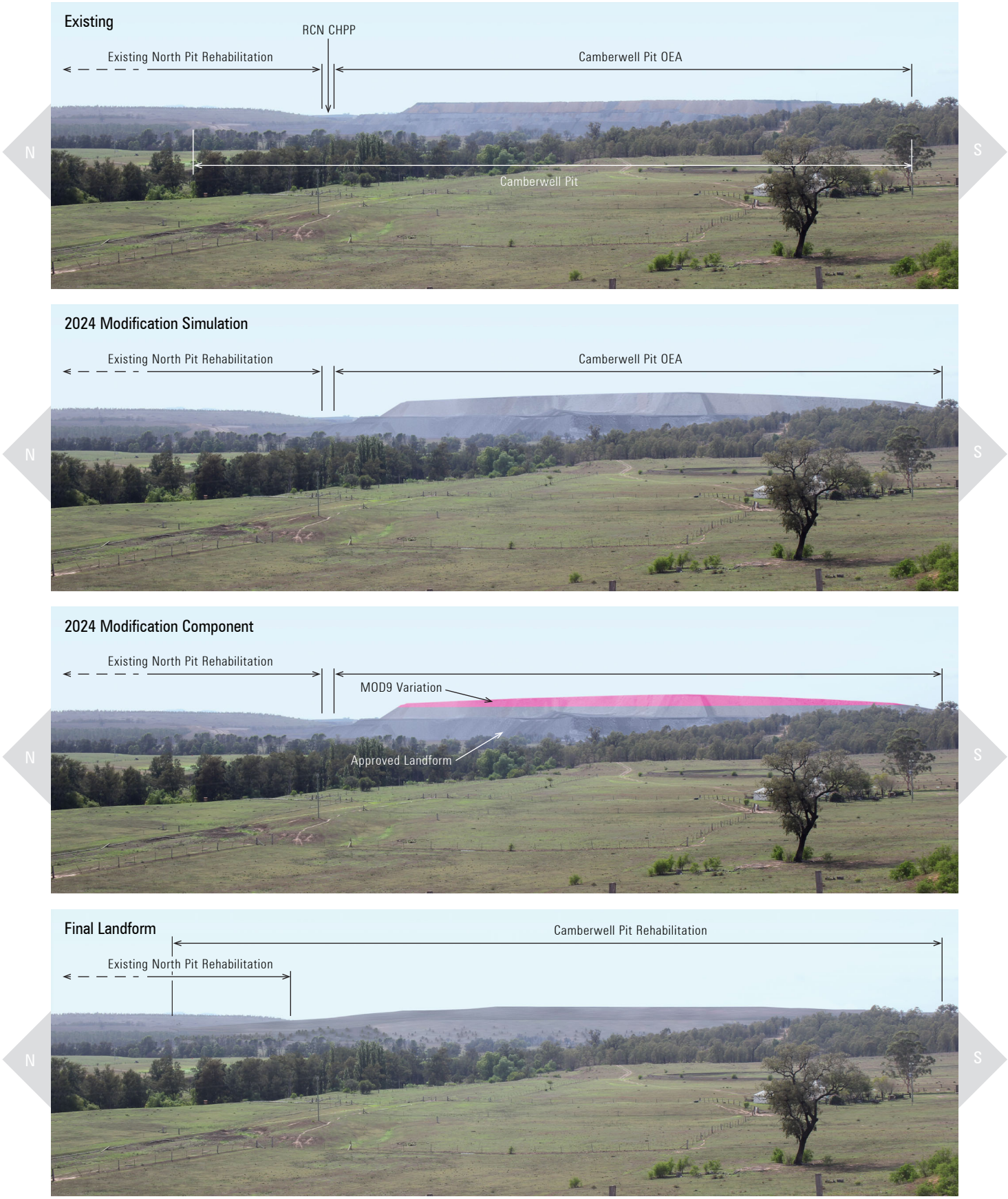
VP2 is within Camberwell Village, a small rural village characterised by larger blocks with individual dwellings and surrounded by grazing paddocks. As discussed in **Section 2.3.3** five private receptors remain within Camberwell Village. VP2 is from receptor N91, which is privately owned and has acquisition rights from SEOC, MOC and RCS. VP2 is approximately 3.8 km from the highest point of the amended OEA. As discussed in Section 7.3.4, the visual sensitivity at this location is considered high to moderate. While the location is generally shielded from views of the existing OEA by two low ridges running north to south between the viewing point and the OEA, a small portion of the OEA remains visible. The visual effect is considered low, giving a current visual impact of low.

2024 Landform

As shown on **Figure 12**, the view from VP2 is partly shielded by the RL 75 m ridge to the east of Camberwell Village. The amended OEA will be visible as it starts to rise above RL 150 m introducing a new visual effect. This effect of MOD9 will be moderate given the distance to the OEA (which is approximately 3.8 km) and unmitigated visual impact will be moderate.

Final Landform

The rehabilitated landform will still be visible from this view point, however the effect will be lower as rehabilitation progresses reducing the visual contrast and reducing the proportion of the OEA that is visible. The impact following rehabilitation will be low as in **Figure 12**.



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MOD 9 Visual Simulations
Viewpoint 1 - McInerney Road

FIGURE 11

RIXS CREEK COAL MINE

MOD 9 Visual Simulations
Viewpoint 2 - Dawson Street

FIGURE 12

7.5.3.3 *VP3*

VP3 represents rural properties with views to the south-west towards the mine site. It is set on the edge of a rise near Glennies Creek. The topography drops to the floodplain, with a rise between Possum Skin Dam and the OEA. **Figure 12** shows the existing view towards RCN. Existing rehabilitation in the north of the mine is visible beyond the tree line.

As discussed in **Section 7.3.4**, the existing visual sensitivity at this location is considered high to moderate. The existing visual effect is considered very low as the location is shielded from the existing OEA by RCN rehabilitation, giving a current visual impact of low.

2024 Landform

Views towards the OEA from this location are shielded by an intervening ridge approximately RL 135 m high and existing RCN rehabilitation. The top of the OEA will be visible, but the majority of the area remains shielded. The location is approximately 5.5 km from the top of the OEA, and the OEA will occupy a very small proportion of the total view which will reduce the visual effect (see modification component on **Figure 12**). The visual impact from this location will be moderate to low.

Final Landform

Once the OEA is rehabilitated, it will largely not be visible from this location due to the shielding of the intervening ridge and existing North Pit rehabilitation (see modification component and final landform on **Figure 12**). The visual impact at this time will be low.

7.5.3.4 *VP4*

VP4 is a rural property located on the Glennies Creek floodplain and has a view south to south-west towards RCN. To the south-west, a ridge rising to approximately RL 110 m runs roughly east to west between this location and the Falbrook Pit. This view point is approximately 5.2 km from the highest point of the amended OEA.

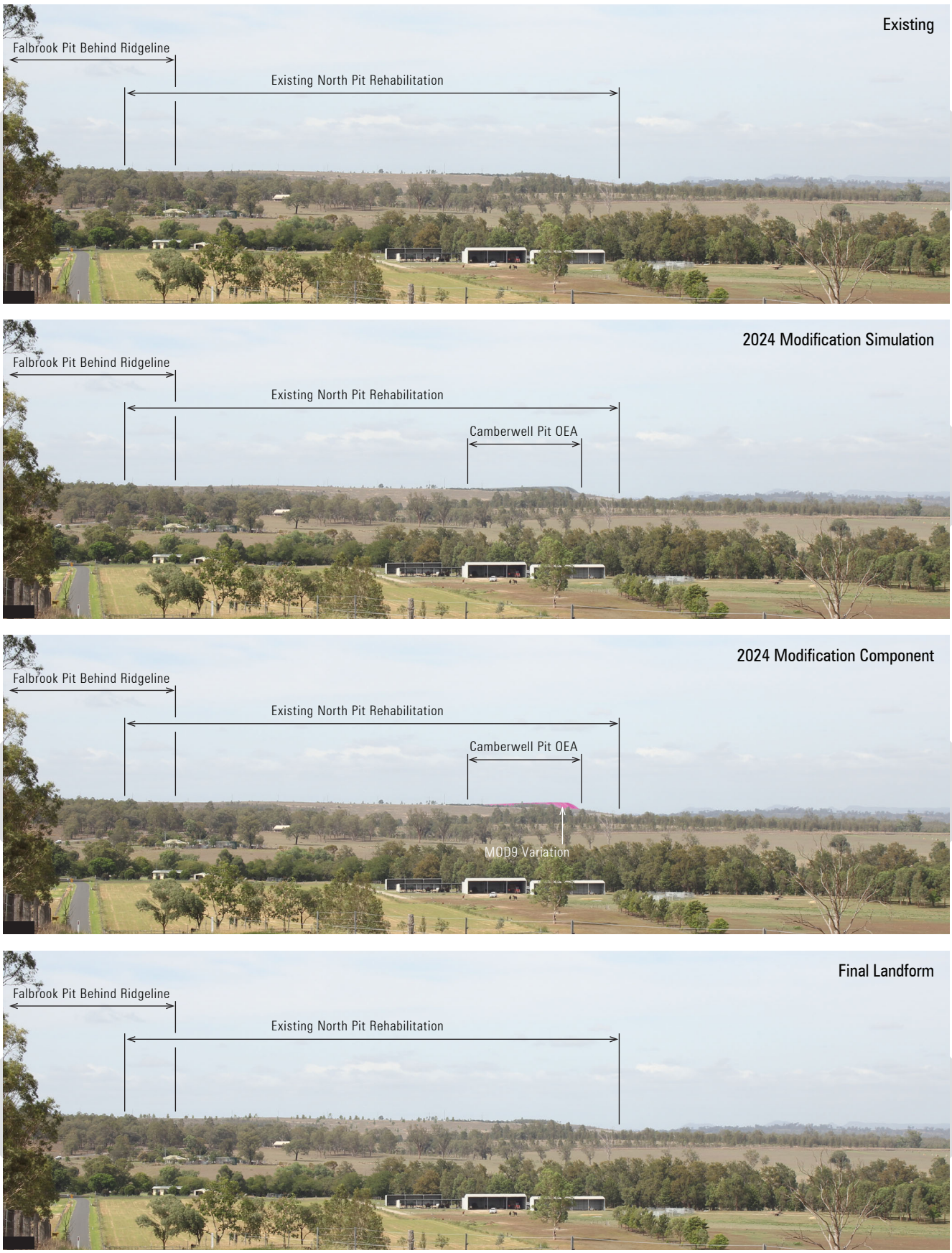
As discussed in **Section 7.3.4**, the visual sensitivity at this location is considered high to moderate. The current visual effect is considered very low as the location is shielded from the existing OEA by the ridge running south-west, giving a current visual impact of low.

2024 Landform

Figure 14 shows that the views of the modified OEA are shielded by the ridge between Glennies Creek and Middle Falbrook Road. The visual impact at this point will be not change from the existing impact of low.

Final Landform

The reshaping of the final landform will further reduce the height of the OEA (**Figure 14**), leaving the visual impact as low.



RIXS CREEK COAL MINE

MOD 9 Visual Simulations
Viewpoint 3 - Middle Falbrook Road

FIGURE 13

7.3.5.5 *VP5*

VP5 is a rural property along Bridgman Road, with views to the west towards the OEA. Properties along Bridgman Road are generally 'lifestyle' blocks subdivided from previous grazing land. Land to the east of Bridgman road is privately owned and to the west is owned by Bloomfield. **Plate 2** is the view near this location looking generally west towards the OEA amendment area. The receptor is approximately 4.3 km from the highest point of the amended OEA.

As discussed in Section 7.3.4, the visual sensitivity at this location is considered high to moderate. **Figure 15** shows that, while the location is shielded from the existing OEA by the ridge running between Bridgeman Road and the mine access road, a small proportion of the current OEA remains visible from this location giving a visual effect of low. The existing visual impact at this location is low to moderate.

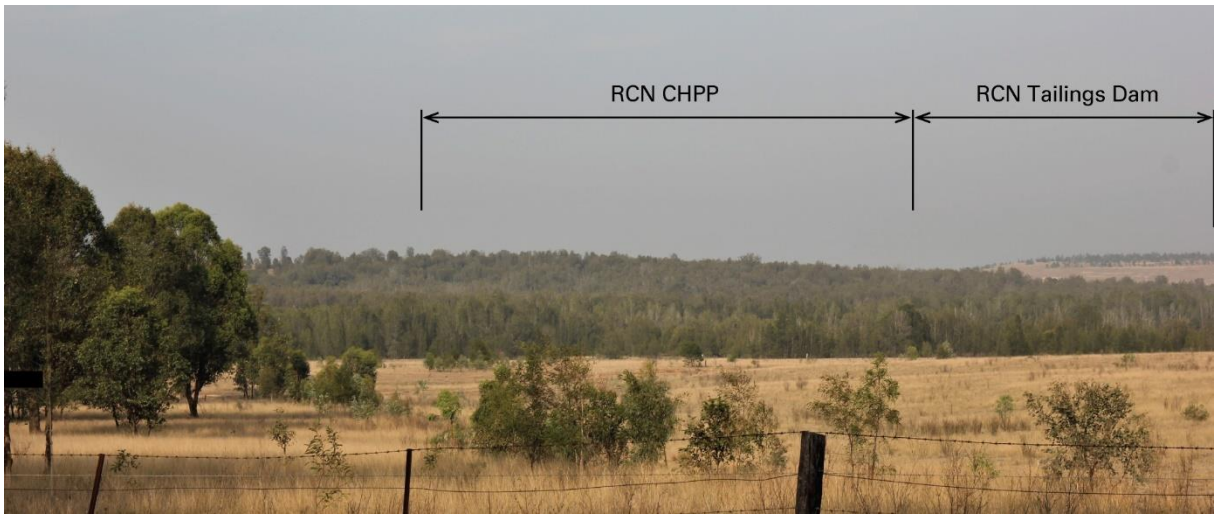


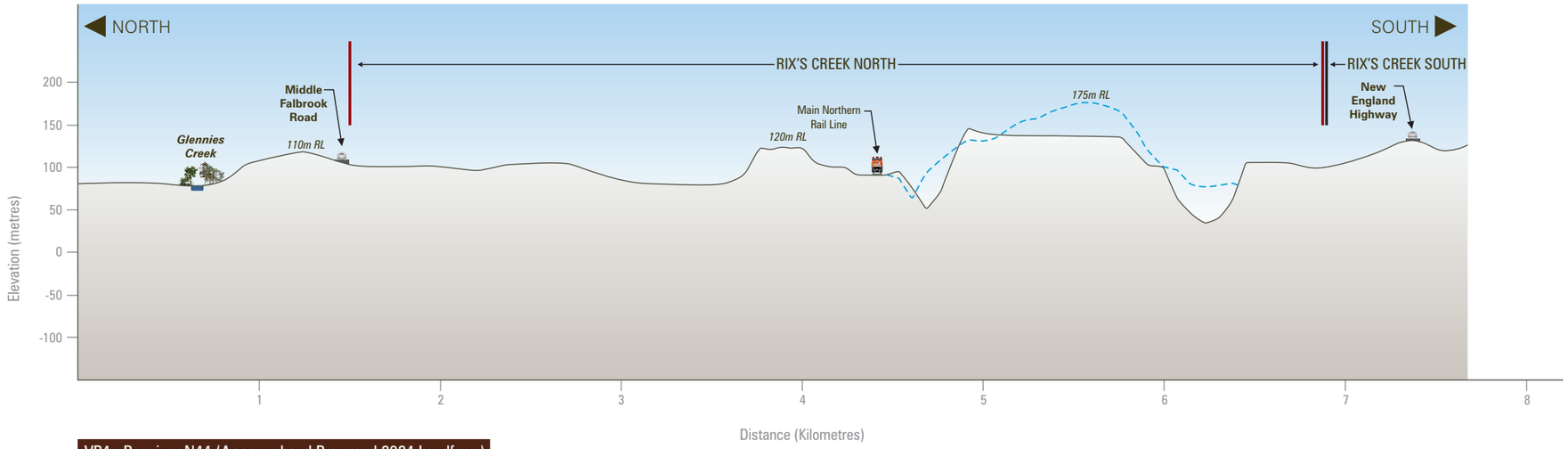
Plate 2
Visual Assessment Viewing Point 5

2024 Landform

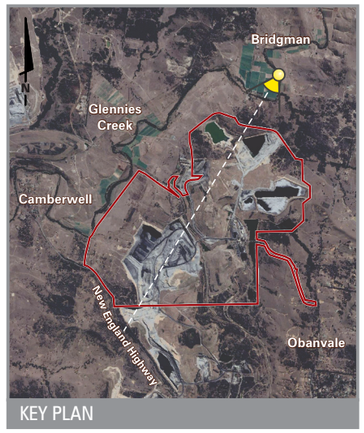
The amended OEA will be visible above the tree line shown in **Plate 2**, however the proportion of the total view occupied by the amended OEA will be small, reducing the visual effect. There is shielding from a natural ridgeline between Martins Creek and the mine access road. The visual impact at this time remains moderate to low.

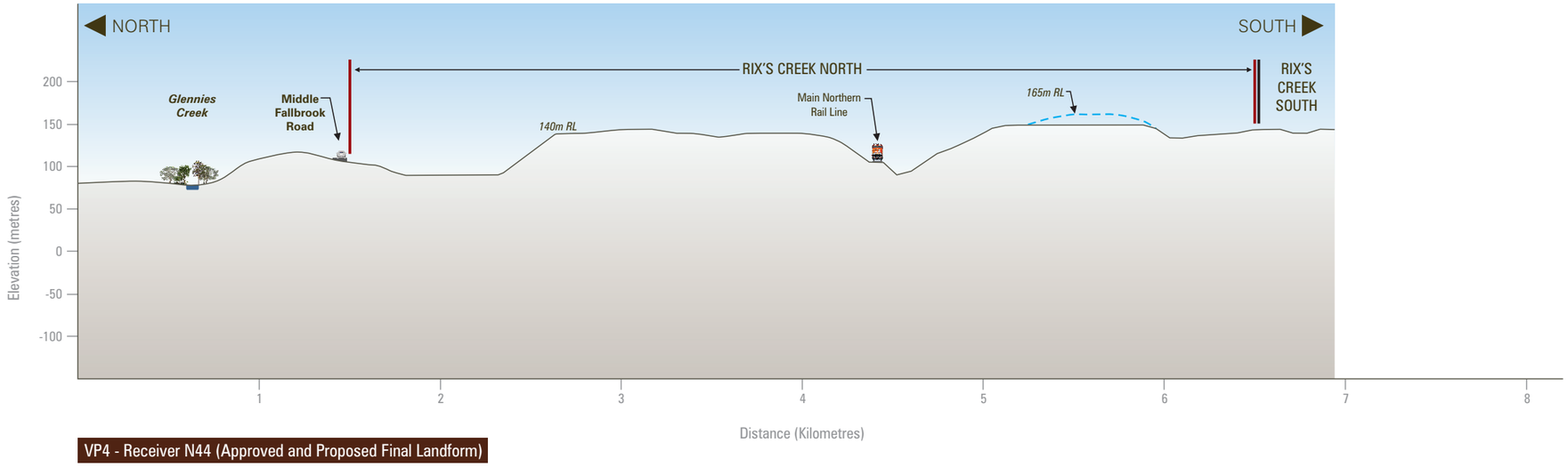
Final Landform

The final landform will still be visible (**Figure 15**), however the effect will be reduced to very low as the OEA is reshaped and rehabilitated, creating a more integrated landform and reducing the proportion of the total view occupied by the OEA. The visual impact will reduce to low following rehabilitation.

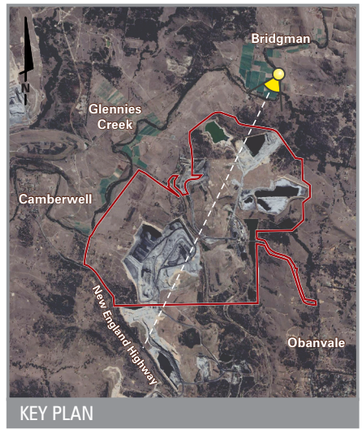


VP4 - Receiver N44 (Approved and Proposed 2024 Landform)





VP4 - Receiver N44 (Approved and Proposed Final Landform)



Legend

- Rix's Creek North Project Boundary
- Rix's Creek South Project Boundary
- Approved Landform (2024 Modified for Approved Final Landform)
- MOD9

Note: 2024 Approved Landform data has been extrapolated from Figure 3.6c Integra Open Cut Project (43177507.048.WOR, 17/06/2009)

HB RIXS CREEK MOD9 1916 F14 Visual Cross Section 4 - Receiver N44 24 04 2020

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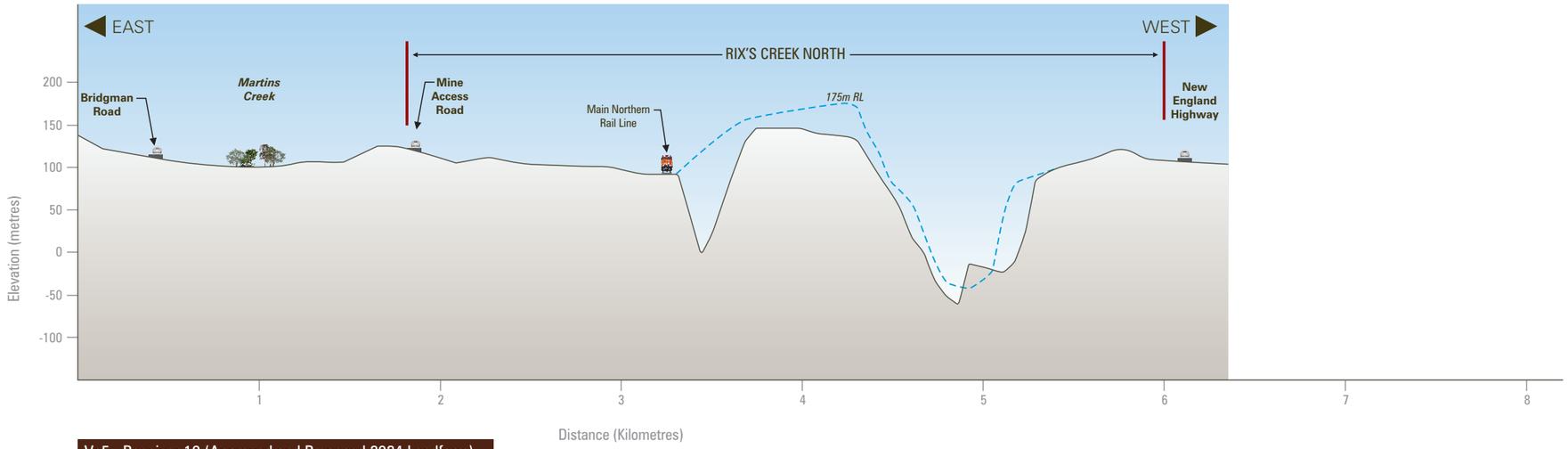
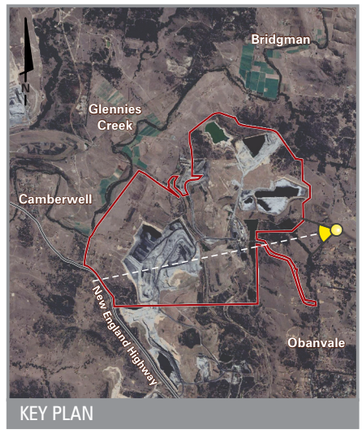
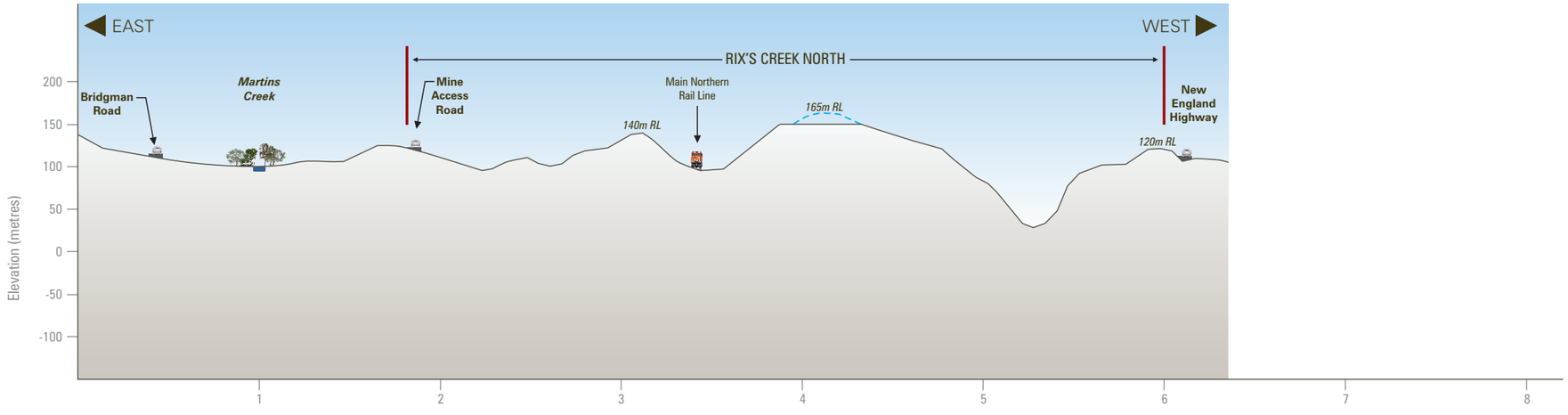
Visual Cross Section VP4 - Receiver N44

FIGURE 14

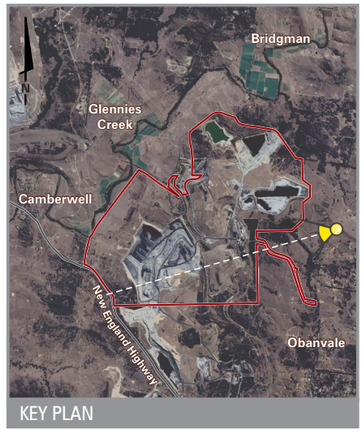


Vp5 - Receiver 10 (Approved and Proposed 2024 Landform)





VP5 - Receiver 10 (Approved and Proposed Final Landform)



Legend

- Rix's Creek North Project Boundary
- Rix's Creek South Project Boundary
- Approved Landform (2024 Modified for Approved Final Landform)
- MOD9

Note: 2024 Approved Landform data has been extrapolated from Figure 3.6c Integra Open Cut Project (43177507.048.WOR, 17/06/2009)

HB RIXS CREEK MOD9 1916 F15 Visual Cross Section 5 - Receiver 24 04 2020

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Visual Cross Section VP5 - Receiver 10

FIGURE 15

7.3.5.6 *Other locations*

Locations within Singleton Heights and McDougalls Hill were qualitatively assessed for visual impacts. The locations assessed were the northern end of McMahon Way (VP6) in the north of Singleton Heights and Enterprise Crescent (VP7); and Llanrian Drive (VP8) in McDougalls Hill. These locations are between 5.3 and 7.3 km from the proposed OEA modification, respectively (**Figure 9**).

VP6

McMahon Way is approximately 5.3 km from the proposed OEA. RCS is between the RCN OEA and Singleton Heights. Views to west and north west towards the OEA and RCS are shielded by a natural ridge line that runs north south. **Plate 3** is the view from this location and indicates the approximate locations of RCS and RCN.

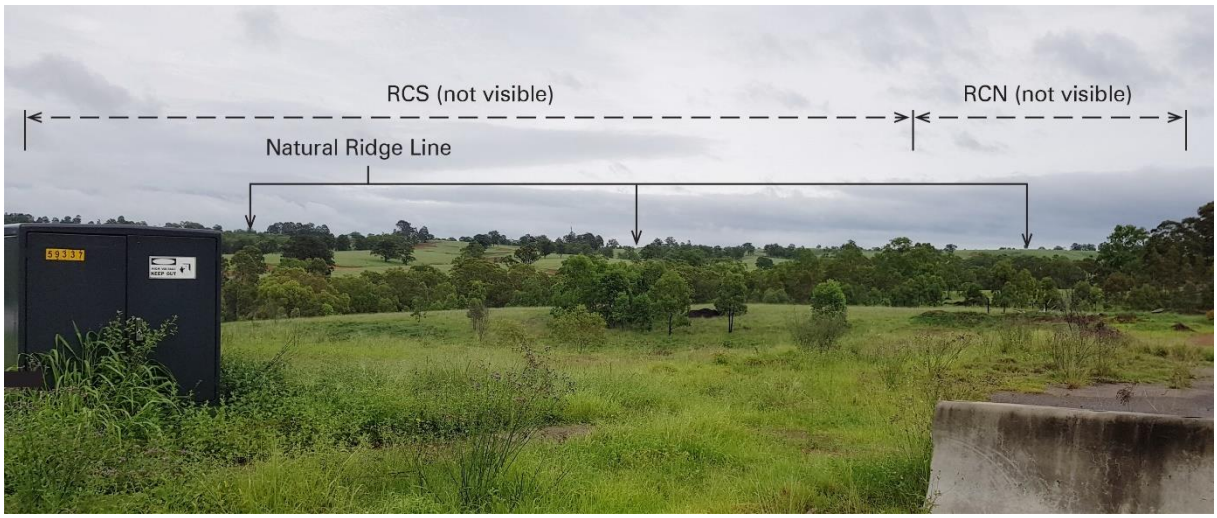

Plate 3
View Point 6

VP7

Enterprise Crescent is approximately 6.5 km from the proposed OEA and approximately 2 km from RCS, which is located between the OEA and McDougalls Hill. Views to the north towards the OEA and RCS are shielded by natural topography and vegetation. **Plate 4** shows the view from this location and indicates the approximate locations of RSC and RCN.

Plate 4
View Point 7

VP8

Llanrian Drive is approximately 7.3 km from the OEA. Views to the north and north west towards the OEA are shielded by natural topography and vegetation. RCS West Pit is visible from this location, as the location is 3 km from RCS. **Plate 5** shows the view from this location and indicates the approximate locations of RSC and RCN.

Plate 5
View Point 8

The visual impacts of the proposed OEA from these locations are considered nil and additional mitigation is not required as part of MOD9.

7.3.5.7 *Summary*

The assessed visual impacts of MOD9 are summarised in **Table 5**.

Table 5
Visual Impact Assessment

Existing			
Viewing Point	**Visual Sensitivity**	**Visual Effect**	**Visual Impact**
VP1	Moderate	High	High/Moderate
VP2	High/Moderate	Low	Low
VP3	High/Moderate	Very Low	Low
VP4	High/Moderate	Very Low	Low
VP5	High/Moderate	Low	Moderate/Low
2024			
Viewing Point	**Visual Sensitivity**	**Visual Effect**	**Visual Impact**
VP1	Moderate	High	High/Moderate
VP2	High/Moderate	Moderate	Moderate
VP3	High/Moderate	Low	Moderate/Low
VP4	High/Moderate	Very Low	Low
VP5	High/Moderate	Low	Moderate/Low
Final Landform			
Viewing Point	**Visual Sensitivity**	**Visual Effect**	**Visual Impact**
VP1	Moderate	Low	Low
VP2	High/Moderate	Very Low	Low
VP3	High/Moderate	Very Low	Low
VP4	High/Moderate	Very Low	Low
VP5	High/Moderate	Very Low	Low

7.3.6 Mitigation and Management

Bloomfield commits to continuing the mitigation measures in *Appendix 9: Statement of Commitments* which will be continued for MOD9 including:

- Constructing visual amenity bunds/screens or soil stockpiles to temporarily screen views;
- Reducing lighting impacts through arranging activities that may be visible to only occur during the day, where feasible;
- Positioning floodlights to minimise light pollution;
- Configuring haul routes and tipping areas where possible to minimise the potential impact associated with headlights and flashing lights; and

- Where reasonable, assist landowners to establish visual screens on their property through planting/landscape works, where such works would reduce the visual impact.

Bloomfield will continue to conduct progressive rehabilitation works in accordance with the MOP which will reduce the medium-term visual impact of the amended OEA. Where rehabilitation is delayed, temporary stabilisation will occur using sterile crop covers as described in the MOP.

In order to reduce the visual impact from the New England Highway, Bloomfield will maintain the planted tree screen on its property abutting the highway at the junction with McInerney Road.

7.4 OTHER ENVIRONMENTAL ASPECTS

7.4.1 Blasting

The NBIA includes a qualitative discussion on the impacts of increasing daily blast events.

MOD9 will increase blasts events at RCN from two to three per day, with the approved blast events per week remaining at ten. There would be no change to the magnitude of impacts, only the distribution of blast events within a weekly period. The change would provide increased opportunity to blast during the most favourable weather conditions, which could ultimately reduce the overall magnitude of blast impacts.

The proposed change would also provide consistency with RCS SSD 6300.

Bloomfield manages its operations in accordance with the approved RCM BMP or latest version. Bloomfield has blast design and management procedures in place that are consistent with industry best practice. Detailed design is undertaken for all blasts to ensure compliance with relevant project approval criteria.

7.4.2 Rehabilitation

The modified OEA will require disturbance of approximately 13.5 ha of existing rehabilitation from 2017. This rehabilitation is identified as pasture in the MOP, which also describes the seed mix for pasture rehabilitation as consisting of predominantly non-native species.

Rehabilitation in this area was completed in August and September 2017 and included rock and timber structures to provide animal habitat. These will be removed prior to the area being re-disturbed for future re- placement.

Monitoring completed in 2019 identified that vegetation cover was generally sparse with the species present being a combination of exotic grasses or weeds, including:

- *Chloris gayana;*
- *Plantago lanceolate;*
- *Setaria parviflora;*
- *Eragrostis curvula;*
- *Sida rhombifolia;*
- *Brassica* sp. *(*prob*. Hirschfeldia incana);*
- *Verbena bonariensis;*
- *Gomphocarpos fruticosus;*
- *Carthamus lanatus; and*
- *Malva parviflora.*

Cynodon dactylon (Couch grass) and one regenerating individual of *Acacia decora* was noted in the monitoring transect.

The revised OEA will be rehabilitated with pasture species consistent with the land use currently approved for RCN as described in the MOP.

The general objectives of rehabilitation as outlined in PA 08_0102 are to develop a safe and stable landform, incorporating micro-relief and integrating with surrounding natural landforms.

MOD9 proposes to alter the currently approved landform as presented in **Figure 2**. While the landform will temporarily increase to RL 175 m, the height of the final landform will be reduced to RL 165 m during rehabilitation activities. The revised landform will be rehabilitated to incorporate micro-relief as required by PA 08_0102 and should allow the revised final landform to better integrate with the surrounding landscape. The conceptual final landform is shown in **Figure 6.**

The remainder of the OEA will be reshaped to recreate a stable final landform as currently approved. The outward facing slopes and the inward facing slopes above RL 120 m of the rehabilitated OEA will be 10° or less to the natural surface. The slopes that lie below RL 120 m and face into the final void will be up to 18° in gradient. The areas of micro-relief slopes above RL 150 m will be designed to be between 2° and 6°. Rehabilitation is undertaken progressively, with overburden emplacements and backfilled pits shaped and rehabilitated once overburden emplacement is complete (Bloomfield, 2019e).

Bloomfield has revised the location of approximately 60.2 ha of trees over pasture corridor to the slope of the final void area. While the total areas of trees over pasture and pasture land do not change, the relocation of part of the trees over pasture areas from flatter to steeper areas will provide a better rehabilitation and final land use outcome. Flatter pasture areas are more accessible for ongoing management and grazing, while providing trees over pasture in steeper areas improves erosion control and a more sheltered habitat.

As outlined in Section 4.2 of the MOP, the land use goal is to provide grazing land where slopes are less than 10°, with areas of trees over pasture on steeper slopes, interconnected to form wildlife refuges and linkages across the site and with surrounding and regional biodiversity areas.

Bloomfield is currently undertaking grazing trials on the established rehabilitation areas as outlined in Section 8.2.1 of the MOP and Section 8.6 of the 2019 Annual Review (Bloomfield, 2020). This trial commenced in 2018 to monitor the productivity of rehabilitated pasture under grazing and is ongoing. Two rehabilitated pasture paddocks are monitored, with comparative monitoring undertaken in an adjoining natural pasture site.

During 2019, cattle were removed from the RCN pasture to prevent long term damage due to the ongoing drought conditions which have stressed the pasture. However, cattle continued to be grazed in the RCS West Pit Rehab south batter pasture, with the agistee increasing the stocking rate at times as part of the agistee's drought management strategy. The area was successfully grazed without detriment to the pasture through good grazing management. Preliminary inspections indicate that there has been no increase in erosion compared to ungrazed areas.

Rehabilitation will continue to be implemented as described in the revised MOP to meet the currently approved final land use. Bloomfield will continue to review rehabilitation design based on monitoring outcomes and current best practice, and any changes would be reflected in updated versions of the MOP.

7.4.3 Ecology

The modified OEA occurs entirely within previously disturbed land, which was approved for disturbance under DA 86_2889 for the Camberwell Coal Project. There will be no additional disturbance to any native flora or fauna species associated with the modified OEA, including any listed under the BC Act and/or EPBC Act. Ecological impacts will continue to be managed in accordance with the *Biodiversity Management Plan* (Bloomfield, 2017) or latest version and internal procedures including the *Rix's Creek North – Flora and Fauna Management Plan* and the *Permit to Disturb*. Approximately 13.5 ha of existing rehabilitation will be disturbed.

For exploration activities, where an ESF4 Form (or latest DRG process and version) is not required, the following internal process will be undertaken:

- As part of Bloomfield's existing internal 'Permit to Disturb' process, a Due Diligence inspection will be undertaken by relevantly qualified biodiversity specialists with the borehole locations adjusted to minimise any potential impacts identified by the assessments'
- Disturbance associated with exploration activities will be relocated to avoid impacts to Threatened species as identified by the relevantly qualified specialists. No mature trees will be removed;
- The exploration activities will be positioned to minimise disturbance caused in gaining access to the proposed locations through utilising previously cleared areas and existing tracks;
- Above ground drilling sumps will be utilised to minimise disturbance where possible. Any topsoil removed will be stockpiled during the initial preparation of the drill site and rehabilitated consistent with the current land use. Rehabilitation will be monitored over time and remedial action taken if required;
- On completion, any boreholes will be remediated in accordance with relevant regulatory Guideline; and

- If required by DRG, a revision to the approved MOP (or equivalent document) will be undertaken prior to undertaking the exploration activities.

7.4.4 Aboriginal Heritage

The modified OEA occurs entirely within previously disturbed land. There will be no additional disturbance to any Aboriginal Heritage associated with the modified OEA and impacts will continue to be managed in accordance with the *Rix's Creek North Heritage Management Plan* (Bloomfield, 2016) or latest version and internal procedures including the *Permit to Disturb.*

For exploration activities, where an ESF4 Form (or latest DRG process and version) is not required, the following internal process will be undertaken:

- As part of Bloomfield's existing internal 'Permit to Disturb' process, a Due Diligence inspection will be undertaken by relevantly qualified heritage specialists with the borehole locations adjusted to minimise impacts identified by the assessments;
- Disturbance associated with exploration activities will be relocated to avoid impacts to Aboriginal heritage as identified by the relevantly qualified specialists;
- If disturbance cannot be avoided to any Aboriginal heritage items, the existing 'Heritage Management Plan' will be updated and consultation occur in accordance with PA 08_0102;
- The exploration activities will be positioned to minimise disturbance caused in gaining access to the proposed locations through utilising previously cleared areas and existing tracks;
- On completion, any boreholes will be remediated in accordance with relevant regulatory Guidelines; and
- If required by DRG, a revision to the approved MOP (or equivalent document) will be undertaken prior to undertaking the exploration activities.

7.4.5 Soils and Land Capability

Topsoil from the 'Rehabilitation to be Disturbed' illustrated on **Figure 4** will be collected and stored for future use. The area to be disturbed will undergo a visual assessment and chemical testing to determine whether 'Mixed Waste Organic Outputs' were applied, and the topsoil will be managed appropriately if any contaminants are found, in consultation with relevant regulators.

7.4.6 Water Resources

MOD9 will not result in any significant additional catchment areas nor does it propose to change any of the water management objectives outlined in the approved *Rix's Creek Mine Water Management Plan (*(Bloomfield, 2019d) (WMP) or latest version. MOD9 will not result in an increase in water take from any regulated or unregulated water sources, and there will be no change to the currently approved water management system.

MOD9 will not result in any significant changes to the final void catchment or the RCN water balance assessed in the Integra EA.

Section 7.4.2 describes the slope gradients that are applied when rehabilitating OEAs to minimise erosion. Water runoff from rehabilitated areas is diverted via contour banks and catch drains to sediment dams or towards active mining areas where it will be captured in the mine water management system. Drainage from the currently approved OEA final landform is designed to avoid the final void as illustrated in Appendix 7 of PA 08_0102. Drainage from the revised landform will be designed to merge with the approved drainage as shown in **Figure 6**.

The sediment dams would either be removed to allow the free flow of water or cleaned of sediment and converted to clean water dams once the rehabilitation is relinquished (Bloomfield, 2019e).

Bloomfield will continue to manage water resources in accordance with the WMP and MOP or latest version. The rehabilitation of the OEA will be carried out in line with the requirements of PA 08_0102, including incorporating micro-relief and maximising surface water drainage to the natural environment.

7.4.7 Greenhouse Gas Emissions

The *Air Quality Impact Assessment Integra Open Cut Project* (Holmes Air Sciences, 2009) (2009 AQIA) provided a quantitative assessment of the greenhouse gas (GHG) emissions for RCN. The key changes proposed under MOD9 that would influence the amount of GHG emissions would be the proposed increase in height of the OEA and a slightly reduced ROM coal tonnage for the period being assessed.

The proposed increase in OEA height would see a nominal increase in the travel distance for overburden emplacement and minor increase in dozer use for reshaping which would increase diesel consumption. This increase is not expected to be significant compared to the existing approved haul distance.

The proposed ROM coal tonnage extracted for the period assessed in MOD9 would be approximately 0.8 Mtpa lower than that assessed in the 2009 AQIA which would result in a nominal decrease in haulage and associated diesel consumption and scope 1 emissions.

Overall, the GHG emissions for MOD9 would be less when compared to the approved operations. GHG emissions would continue to be managed as outlined in the approved AQMP.

7.4.8 Social and Economic

Social

Social impacts can arise from changes in a variety of factors including people's way of life, their access to facilities and services, changes to the surroundings, a sense of community and culture and how these could impact on their health and wellbeing.

MOD9 anticipates minor changes to an existing operation, namely an increase in the height of the OEA and approved number of blasting events. As discussed in **Section 2**, RCN has been in operation since 1990 and is located adjacent to a number of other coal mines.

MOD9 does not introduce any new activities that are not already common in the area. Amenity impacts are comparable to those approved (see **Sections 7.1**, **7.2** and **7.3**).

MOD9 will result in an overall improvement in environmental outcomes. The modified OEA will be an improved shape which will more easily integrate with the surrounding landscape thereby reducing the visual impact of the approved final landform. The associated relocation of the trees over pasture area will provide a better rehabilitation and final land use outcome.

Increasing the number of blast events per day, while maintaining the maximum number per week, will allow Bloomfield to take better advantage of optimum blasting conditions and reduce the requirement to blast during less optimal conditions which would reduce the overall impact of blasting.

Economic

There will be no change to the current operations, such as employee levels or mining rate, as a result of MOD9 and therefore no change to the existing economic benefits of RCN.

8 EVALUATION OF MERITS

The activities presented in MOD9 will result in the alteration of three aspects of the approved activities, while key aspects of the project remain unchanged. The development would remain substantially the same as that already approved and is within the scope of Section 4.55(2) of EP&A Act.

RCN is located in an area with a long history of coal mining activities, and is surrounded by existing mines to the west and south as illustrated in **Figure 1**. As discussed in **Section 3.3**, MOD9 applies to an existing OEA contained entirely within an approved pit and an existing Coal Lease. MOD9 is therefore consistent with the surrounding land use and the site is suitable for the proposed modification.

Bloomfield Collieries Pty Ltd have consulted with relevant regulatory and community stakeholders and have incorporated any issues or comments into this Statement of Environmental Effects as discussed in **Section 5**.

MOD9 is required to enable Bloomfield to meet the requirements of Schedule 3 Condition 50 of PA 08_0102 and improve the efficiency of its operations.

Assessments on air quality, acoustics and visual impacts were completed to identify any changes in impacts that MOD9 may have. These assessments concluded that MOD9:

- Dust emissions are predicted to have no impacts on receptors additional to those already within an acquisition zone. An assessment of impacts on 25% of contiguous lots owned by the same landowner identified seven blocks belonging to two landowners exceeded the VLAMP criteria (owing to new criteria, not operational activities);
- Noise emissions will be managed through progressive shut down of equipment in noise enhancing conditions. Use of noise mitigation controls will result in no exceedances of the existing noise criteria in PA 08_0102 and no additional impacts to private receptors.
- Visual impacts would continue to vary from High/Moderate (from the New England Highway) to Low (from residential receptors) during 2024 when the OEA would be at its highest. Reshaping of the OEA for rehabilitation would reduce these impacts to Moderate/Low from the Highway and Low for residential receptors.

The approval of MOD9 would provide for the micro-relief required by PA 08_0102 and result in improved drainage with a more naturally shaped final landform. The micro-relief landform will more easily integrate with the surrounding landscape, providing a better visual outcome. Improved operational efficiency will allow proper development of natural resources. The associated relocation of the trees over pasture area will provide a better rehabilitation and final land use outcome.

Increasing the number of blasts per day will allow the operation to optimise the days when the environmental conditions are most favourable for blasting while still maintaining the maximum number of blasts over the period of a week.

Exploration activities would occur in accordance with the Mining Act within Bloomfield's mining tenements.

Given that the environmental impacts have been shown to be minimal, it may be concluded that MOD9 is in the public interest.

* * *

For

HANSEN BAILEY

Kirstin Blaikie
Senior Environmental Scientist

Dianne Munro
Principal Environmental Scientist

9 ABBREVIATIONS

Abbreviation	Description
AIA	Acoustic Impact Assessment
AHIP	Aboriginal Heritage Impact Permit
AQIA	Air Quality Impact Assessment
ARTC	Australian Rail Track Corporation
Bloomfield	The Bloomfield Group
BC Act	*Biodiversity Conservation Act 2016*
CCC	Community Consultative Committee
CHPP	Coal Handling and Preparation Plant
DA	Development Application
DPIE	NSW Department of Planning, Industry and Environment
DRG	Department of Planning, Industry and Environment – Division of Resources and Geoscience
EPA Act	*Environmental Planning and Assessment Act 1979*
EPA Savings Regulation	*Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*
ha	hectare
Integra EA	'*Environmental Assessment: Integra Open Cut Project' (URS, 2009)*
ICNG	*Interim Construction Noise Guideline*
LGA	Local Government Area
Singleton LEP	*Singleton Local Environmental Plan 2013*
Mining Act	*Mining Act 1992*
Mining SEPP	*State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*
MOC	Mount Owen Complex
MOD1	*Integra Mine Complex Modification 1 Environmental Assessment (EMM Mitchell McLennan, 2011)*
MOD2	*Integra Mine Complex Modification 2 Environmental Assessment' (EMM Mitchell McLennan, 2012)*
MOD4	*Integra Mine Complex Modification 4 Environmental Assessment (EMM Mitchell McLennan, 2014)*
MOD5	*Environmental Assessment for Proposed Modifications to Rix's Creek DA 49/94 N90/00356 (Mod 7)' and 'Integra Open Cut Project 08_0102 (Mod 5) (Bloomfield, undated)*
MOD6	*PA 08_0101 and PA 08_0102 – Modifications to Integra Underground and Integra Open Cut Coal Project (Bloomfield 2016)*
MOD7	*Environmental Assessment for Proposed Modifications to Rix's Creek DA 49/94 N90/00356 (Mod 9) and Rix's Creek North Open Cut Project 08_0102 (Bloomfield, undated)*

Abbreviation	Description
MOD8	*Proposed Modification to Rix's Creek North Open Cut Project (Bloomfield, 2018) 08_0102*
MOD9	This modification
MOP	Mining Operations Plan
Mbcm	Million bank cubic metres
Mtpa	Million tonnes per annum
NPW Act	*National Parks and Wildlife Act 1974*
OEA	Overburden Emplacement Area
PA	Project Approval
POEO Act	*Protection of the Environment Operations Act 1997*
RCM	Rix's Creek Mine
RCN	Rix's Creek North
RCS	Rix's Creek South
RL	Reduced Level
RMS	Roads and Maritime Services
ROM	Run of Mine
SEE	Statement of Environmental Effects
SEOC	Ashton South East Open Cut
Singleton LEP	*Singleton Local Environment Plan 2013*
SSC	Singleton Shire Council
TD	Tailings Dam
VP	Viewing Point
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WSP	Water Sharing Plan
NMP	Noise Management Plan
AQMP	Air Quality Management Plan
WMP	Water Management Plan

10 REFERENCES

- AECOM (2015), *Rix's Creek Mine – Continuation of Mining Project Environmental Impact Statement*
- AECOM (2017), *Biodiversity Management Plan*
- Bloomfield (2017), *Biodiversity Management Plan*
- Bloomfield (2019a), *Air Quality Management Plan*
- Bloomfield (2019b), *Noise Management Plan*
- Bloomfield (2019c), *Blast Management Plan*
- Bloomfield (2019d), *Rix's Creek Mine Water Management Plan*
- Bloomfield (2019e), *Rix's Creek Mining Operations Plan*
- Bloomfield (2020), *Rix's Creek Mine 2019 Annual Review*
- Department of Environment, Climate Change and Water (2009), *Interim Construction Noise Guideline*
- Department of Environment, Climate Change and Water (2011), *Road Noise Policy*
- Donnelley et al. (2011), *NSW Coal Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*
- Environmental Protection Authority (1990), *Australian and New Zealand Environment and Conservation Council guideline Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*
- Environmental Protection Authority (2013), *Rail Infrastructure Noise Guideline*
- Environmental Protection Authority (2016), *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*
- Environmental Protection Authority (2017), *Noise Policy for Industry*
- Environmental Protection Authority (2000), *Industrial Noise Policy*
- Global Acoustics (2019), *Noise and Blasting Impact Assessment*
- Green Bean Design (2008), *Integra Open Cut Visual Impact Assessment*
- Hansen Bailey (2014), *Ravensworth Operations Final Landform Modification Environmental Assessment*
- Holmes Air Sciences (2009), *Air Quality Impact Assessment Integra Open Cut Project*
- JVP Visual Planning and Design (2013), *Continuation of Bengalla Mine Project visual impact assessment*
- NSW Government (2018), *Voluntary Land Acquisition and Mitigation Policy*

- Todoroski Air Sciences (2019), *Air Quality Impact Assessment Rix's Creek North Modification 9*
- Umwelt (2015), *Environmental Impact Statement Mount Owen Continued Operations Project*
- Umwelt (2018), *Modification 4 Statement of Environmental Effects Glendell Mine*
- Umwelt (2019), *Rix's Creek 2019 Rehabilitation Monitoring Report.*
- URS (2009), *Environmental Assessment: Integra Open Cut Project*
- URS (2010), *Submissions Report: Integra Open Cut Project*

Appendix A

MOD9 Comparison with Approved Operations

Table A1
MOD9 Comparison with Approved Operations

Aspect	Approved Development	MOD1	MOD2	MOD5	MOD6	MOD7	MOD8	MOD9
Project Boundary	As shown on **Figure 2**	No change	No change	No change	Minor change to cover edge of TD2.	No change	No change	No change
Surface disturbance	160 ha pit Remaining 124 ha in 'open cut' area to remain undisturbed (as shown on **Figure 2**)* Approximately 90 ha at Falbrook Pit.	Increase by 39 ha for North Open Cut (Falbrook Pit) OEA	No change	No change	No change	No change	Additional 7.2 ha which has been disturbed	No change
Project duration	31 December 2022	No change	No change	No change	31 December 2035	No change	No change	No change
Mining Method	Open cut mining (truck and excavator)	No change	No change	No change	No change	No change	No change	No change
Production Rate (ROM coal)	Up to 4.5 Mtpa from the Camberwell Pit Up to 1.5 Mtpa from the Falbrook Pit	No change	No change	No change Allowed coal from RCS to be transported to RCN CHPP and vice versa	No change	No change	No change	No change

Aspect	Approved Development	MOD1	MOD2	MOD5	MOD6	MOD7	MOD8	MOD9
Mine Plan	Two open cut mining areas (Camberwell Pit and Falbrook Pit) Highwall or auger mining where feasible in either pit	No change	No change	No change	No change	No change	Additional 7.2 ha which has been disturbed	No change
Overburden emplacement	OEA within Camberwell Pit to RL 150 m OEA adjacent to Falbrook Pit covering approximately 43 ha	Increase in Falbrook Pit OEA height from RL 135 m to RL 141 m AHD	No change	No change	Requirement to include micro-relief Schedule 3 (Condition 50)	RCS overburden to be emplaced on RCN OEAs	No change	Temporary height increase of the Camberwell Pit OEA by 25 m to RL 175 m with final landform reduced to RL 165 m
Blasting	Max one blast/day in the Falbrook Pit Max one blast/day in the Camberwell Pit Up to 10 total blasts per week (averaged over a year)	No change	No change	No change	No change	No change	No change	Increase in number of blast events to 3 events per day.
Surface Infrastructure	CHPP Training loading facility and rail loop Coal stockpiles Water management infrastructure	No change	Removal of condition that required construction of overland conveyor	No change	No change	No change	No change	No change

Aspect	Approved Development	MOD1	MOD2	MOD5	MOD6	MOD7	MOD8	MOD9
Water Management	Mine water dams (Possum Skin Dam, Vent Shaft Dam, Process Dams, D1, D3 and D4) Sediment dams Clean water dams Ability to transfer water to and from Integra Underground Mine	No change	No change	No change	No change	No change	No change	No change
Management of Reject Materials	Coarse reject material co-disposed with overburden in the Camberwell Pit Tailings are emplacement within tailings dams (TD1, TD2 and TD3)	No change	No change	No change	No change	RCS dried tailings refuse to be emplaced in RCN overburden areas	No change	No change
Coal Transportation	Rail transportation of product coal to Newcastle Transportation of up to 7.3 Mtpa of product coal	No change	No change	No change	No change	No change	No change	No change

Aspect	Approved Development	MOD1	MOD2	MOD5	MOD6	MOD7	MOD8	MOD9
Employment	Operational workforce of 250 personnel	No change	No change	No change	No change	No change	No change	No change
Operational Hours	24 hours a day, 7 days per week in the Camberwell Pit 7am to 10pm, 7 days per week in Falbrook Pit.	No change	No change	No change	No change	No change	No change	No change
Exploration Activities	Not described	No change	No change	No change	No change	Specific exploration drilling program approved	No change	Exploration activities added to approved activities

** Excludes additional approved activities described in the previous EAs listed in Appendix 2 of the Project Approval)*

Appendix B

Air Quality Impact Assessment
Rix's Creek North Modification 9

AIR QUALITY IMPACT ASSESSMENT

RIX'S CREEK NORTH MODIFICATION 9

Hansen Bailey

24 April 2020

Job Number 19050978

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Air Quality Impact Assessment
Rix's Creek North Modification 9

DOCUMENT CONTROL

Report Version	Date	Prepared by	Reviewed by
WORKING DRAFT	11/12/2019	P Henschke	A Todoroski
DRAFT - 001	20/12/2019	P Henschke	
DRAFT - 005	24/04/2019	P Henschke	

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1 INTRODUCTION

Todoroski Air Sciences has prepared this report for Hansen Bailey on behalf of The Bloomfield Group (Bloomfield). It provides a contemporary assessment of the potential air quality impacts associated with a proposed modification to increase the height of the Camberwell Pit Overburden Emplacement Area (OEA) at Rix's Creek North Mine (hereafter referred to as the Project).

1.1 Preamble

The project approval for the Integra Open Cut Project was granted on 25 November 2010 and was valid for the open cut until 31 December 2022. The potential air quality impacts were assessed in the *Air Quality Impact Assessment Integra Open Cut Project* (**Holmes Air Sciences, 2009**).

In December 2015 Glencore completed the purchase of 100% of the Integra Mining Operations. Bloomfield subsequently purchased from Glencore the previous Integra Open Cut Operations, Coal Handling Preparation Plant, Train Loading Infrastructure and Rail Loop.

Application was made in February 2016 to separate the underground and open cut approvals as well as extend the open cut approval to December 2035 with the approval being formally granted in August 2016.

Bloomfield operates the open cut operations as "Rix's Creek North" with control of the open cut mining, delivery of ROM coal from the Glencore owned Integra Underground Mine, coal preparation and train loading operations.

Along with renaming the mine, the operational areas have been renamed as well with the Western Mining Areas now being known as the Camberwell Pit and the North Pit referred to as the Falbrook Pit.

1.2 Modification description

Bloomfield is seeking approval for a modification to Project Approval (PA) PA 08_0102 (MOD9) under Section 4.55(2) of the *Environmental Planning & Assessment Act 1979* as follows:

- To increase the final landform height of the overburden emplacement within a discrete area of the Camberwell Pit at the Rix's Creek North Mine from a nominal approved height of 150 metres (m) to a final height of 165m RL. The landform will temporarily increase to 175m RL by 2023, reducing to 165m RL after reshaping into the final landform. This landform change will also require minor changes to the areas shown as trees over pasture in the final landform.
- The additional overburden emplacement proposed by MOD9 will occur entirely within the approved Camberwell Pit and no new surface disturbance will be required.
- The interactions of MOD9 with the approved conceptual mine plans for years 2021 and 2024 (the period in which the increase in landform height is proposed to be constructed) are presented in **Figure 1-1** and **Figure 1-2** respectively.

- Air dispersion modelling was performed to predict the potential impacts associated with the Modification. Whilst the effect of MOD 9 on dust levels would be minor, the modelling includes recent changes to neighbouring mines and assessment against the updated New South Wales (NSW) Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**) and *NSW Voluntary Land Acquisition and Mitigation Policy* (**NSW Government, 2018**) in order to contemporise the assessment of cumulative impacts for Rix's Creek North.
- Bloomfield is also seeking to increase the number of blasts allowed in Rix's Creek North from two to three per day. The approved number of blasts per week will remain at ten.
- Bloomfield seeks to undertake exploration and related activities in accordance with *Mining Act 1992* within its mining tenements.

No additional changes to approved activities are sought (i.e. all other aspects of Rix's Creek North Mine will remain generally consistent with those approved under PA 08_0102).

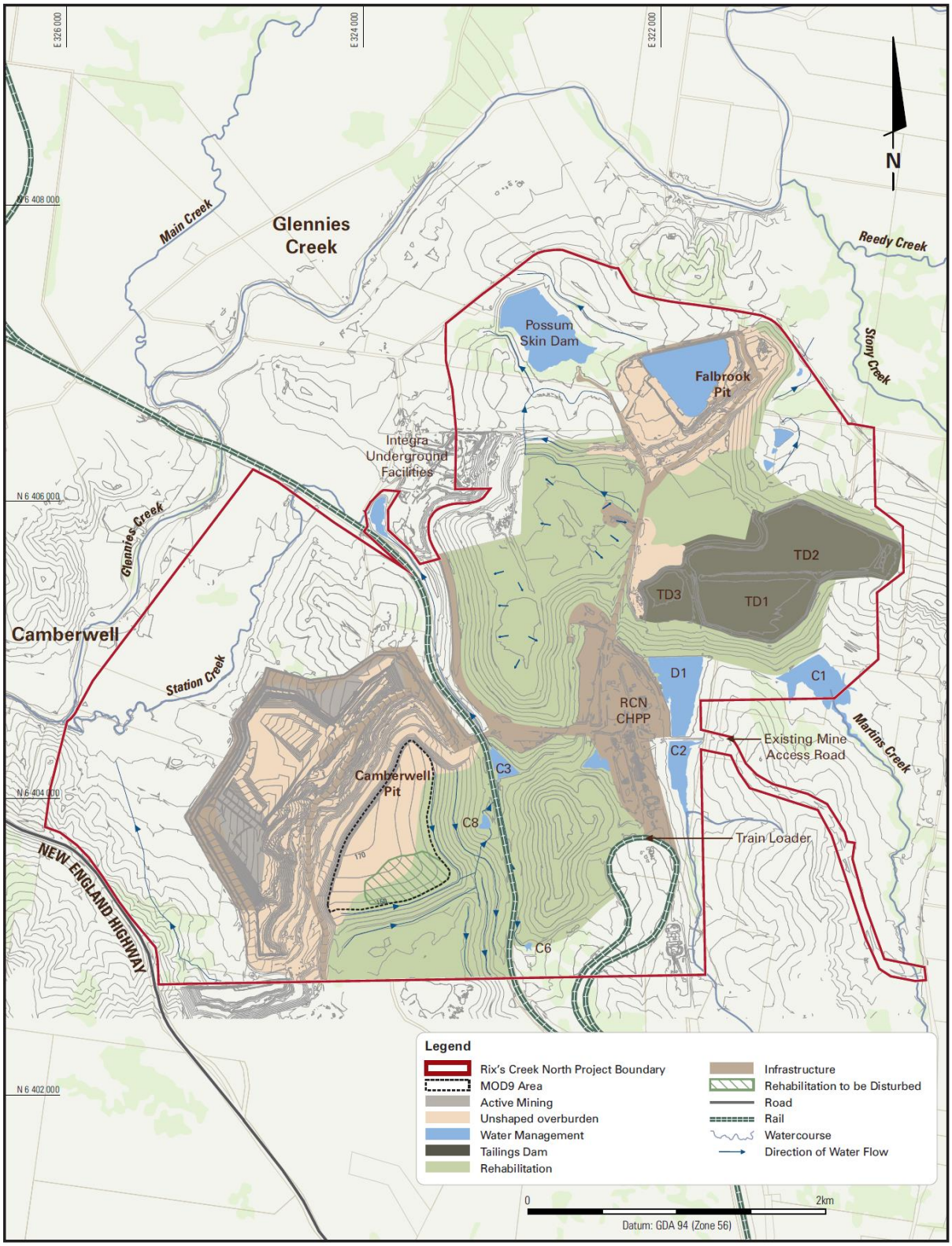

Figure 1-1: Conceptual Mine Plan - 2021

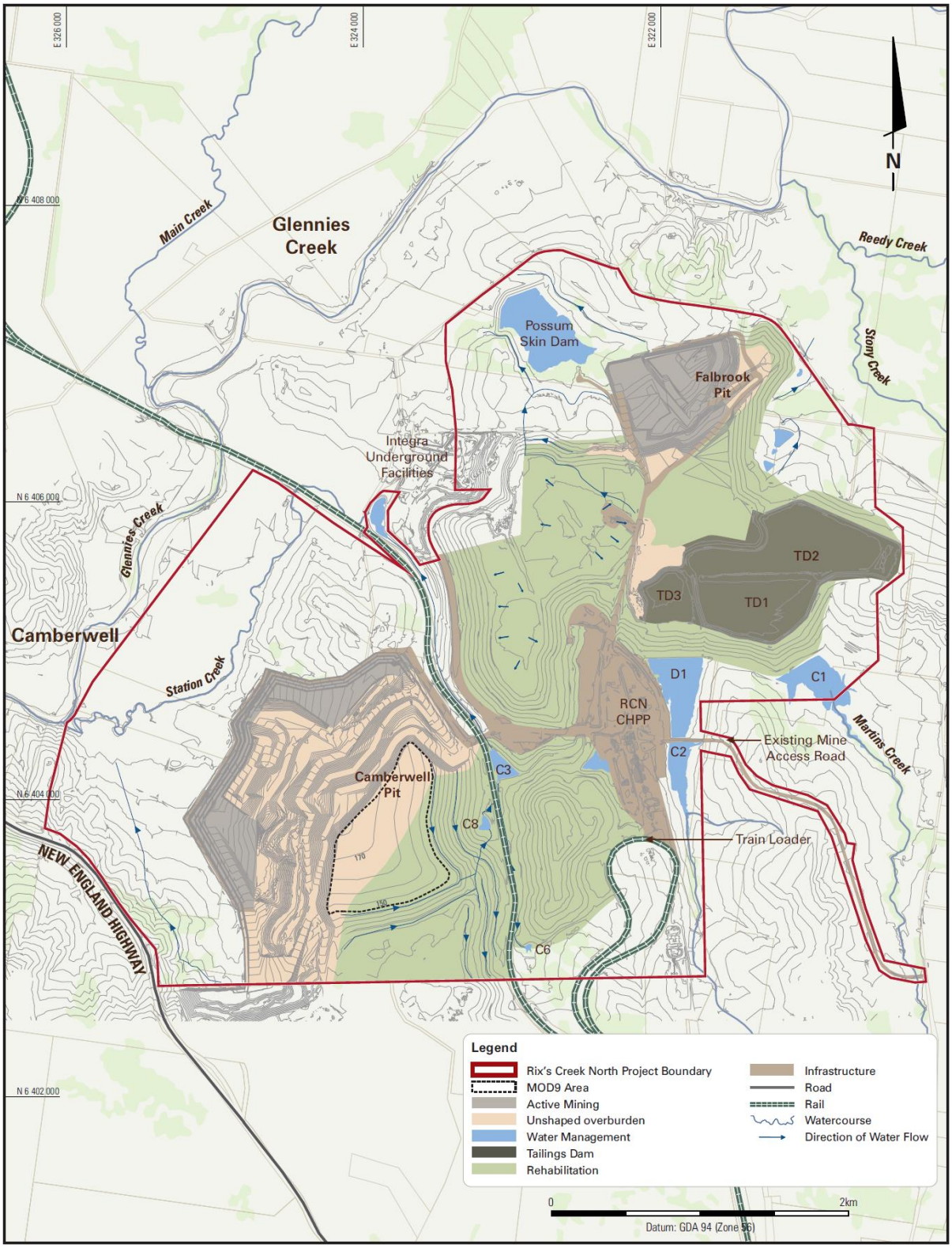

Figure 1-2: Conceptual Mine Plan - 2024

2 LOCAL SETTING

The Rix's Creek North (RCN) Mine is located in the Hunter Valley region of NSW, approximately 7 kilometres (km) northwest of Singleton and 4km east of Camberwell.

The area surrounding the Project is typically comprised of various open cut and underground coal mining operations, agricultural operations, industrial and commercial activities and a mix of rural residences and urban residential areas.

Figure 2-1 presents the location of the Project in relation to privately-owned, mine-owned and Zone-of-Acquisition (ZOA) receptors of relevance to this assessment. **Appendix A** provides a detailed list of all the receptor locations considered in this assessment.

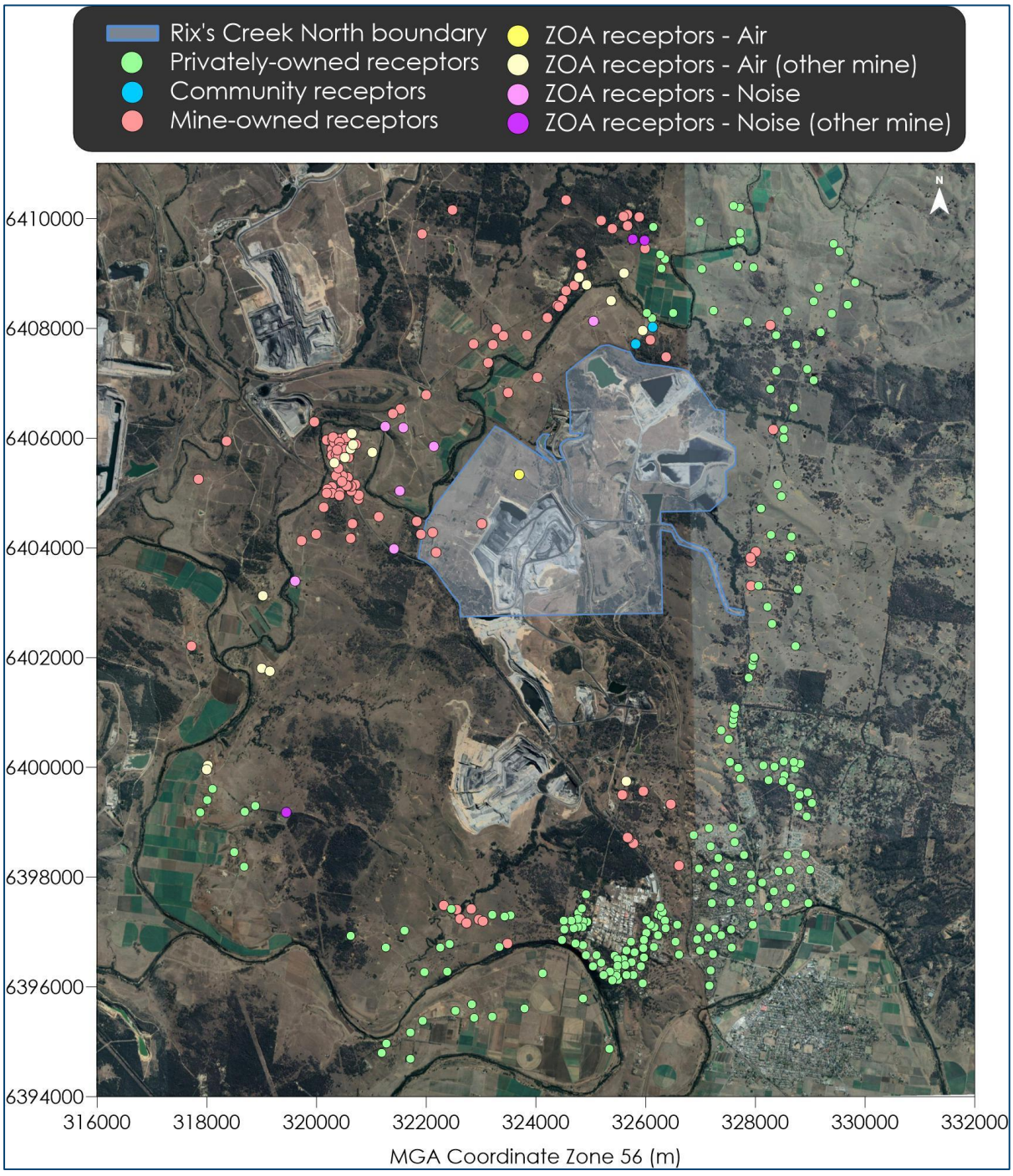

Figure 2-1: Project setting

3 AIR QUALITY ASSESSMENT CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the applicable air quality criteria for the Project.

3.1 NSW EPA impact assessment criteria

Table 3-1 summarises the air quality criteria that are relevant to this assessment as outlined in the NSW Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**).

The air quality criteria for total impact relate to the total dust burden in the air and not just the dust from the Project. Consideration of background dust levels needs to be made when using these criteria to assess potential impacts.

Table 3-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging period	Impact	Criterion
Total Suspended Particles (TSP)	Annual	Total	90µg/m^3
Particulate matter ≤10µm (PM_{10})	Annual	Total	25µg/m^3
	24 hour	Total	50µg/m^3
Particulate matter ≤2.5µm ($PM_{2.5}$)	Annual	Total	8µg/m^3
	24 hour	Total	25µg/m^3
Deposited dust	Annual	Incremental	2g/m^2/month
		Total	4g/m^2/month

Source: NSW EPA, 2017.

µg/m^3 = micrograms per cubic metre.

g/m^2/month = grams per square metre per month.

3.2 NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP)

Part of the NSW VLAMP dated September 2018 describes the NSW Government's policy for voluntary mitigation and land acquisition to address particulate matter impacts from state significant mining, petroleum and extractive industry developments.

Voluntary mitigation rights may apply per the VLAMP where, even with best practice management, the development contributes to exceedances of the criteria in **Table 3-2** at any residence on privately-owned land or workplace[1].

Table 3-2: Particulate matter mitigation criteria

Pollutant	Averaging period	Mitigation criterion		Impact type
$PM_{2.5}$	Annual	8µg/m^3*		Human health
$PM_{2.5}$	24 hour	25µg/m^3**		Human health
PM_{10}	Annual	25µg/m^3*		Human health
PM_{10}	24 hour	50µg/m^3**		Human health
TSP	Annual	90µg/m^3*		Amenity
Deposited dust	Annual	2g/m^2/month**	4g/m^2/month*	Amenity

Source: NSW Government (2018).

*Cumulative impact (i.e. increase in concentration due to the development plus background concentrations due to all other sources).

[1] Where any exceedance would be unreasonably detrimental to workers' health or carrying out of the business. A workplace does not include broad-acre agricultural land, heavy, hazardous or offensive industry or businesses intentionally located close to mining operations.

**Incremental impact (i.e. increase in concentrations due to the development alone), with zero allowable exceedances of the criteria over the life of the development.

Voluntary acquisition rights may apply per the VLAMP where, even with best practice management, the development contributes to exceedances of the criteria in **Table 3-3** at any residence on privately-owned land, workplace[2] or on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls (vacant land).

Table 3-3: Particulate matter acquisition criteria

Pollutant	Averaging period	Acquisition criterion		Impact type
$PM_{2.5}$	Annual	8µg/m³*		Human health
$PM_{2.5}$	24-hour	25µg/m³**		Human health
PM_{10}	Annual	25µg/m³*		Human health
PM_{10}	24-hour	50µg/m³**		Human health
TSP	Annual	90µg/m³*		Amenity
Deposited dust	Annual	2g/m²/month**	4g/m²/month*	Amenity

Source: NSW Government (2018).

*Cumulative impact (i.e. increase in concentration due to the development plus background concentrations due to all other sources).

**Incremental impact (i.e. increase in concentrations due to the development alone), with up to five allowable exceedances of the criteria over the life of the development.

[2] Where any exceedance would be unreasonably detrimental to workers health or carrying out of the business. A workplace does not include broad-acre agricultural land, heavy, hazardous or offensive industry or businesses intentionally located close to mining operations.

4 EXISTING ENVIRONMENT

This section provides a summary of the local climate and ambient air quality in the area surrounding the Project.

4.1 Local climate

Long term climatic data collected at the closest Bureau of Meteorology (BoM) weather station at Jerrys Plains Post Office (Station Number 061086) were analysed to characterise the local climate in the proximity of the Project. The Jerrys Plains Post Office is located approximately 20km west of the Project.

Table 4-1 and **Figure 4-1** show climatic parameters which have been collected from Jerrys Plains Post Office over a 45 to 128 year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 31.8 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 3.8ºC. Rainfall peaks during the summer months, and relative humidity levels exhibit variability over the day and seasonal fluctuations. Wind speeds vary across the seasons with higher averages evident during the warmer months.

Table 4-1: Monthly climate statistics summary – Jerrys Plains Post Office

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (ºC)	31.8	30.9	28.9	25.3	21.3	18.0	17.4	19.4	22.9	26.3	29.1	31.2	25.2
Mean min. temp. (ºC)	17.2	17.1	15.0	11.0	7.4	5.3	3.8	4.4	7.0	10.3	13.2	15.7	10.6
Rainfall													
Rainfall (mm)	77.1	73.1	59.7	44.0	40.7	48.1	43.4	36.1	41.7	51.9	61.9	67.5	644.5
No. of rain days	6.4	6.0	5.8	4.9	4.9	5.5	5.2	5.2	5.2	5.8	6.3	6.3	67.5
9am conditions													
Mean temp. (ºC)	23.4	22.7	21.2	18.0	13.6	10.6	9.4	11.4	15.3	19.0	21.1	23.0	17.4
Mean R.H. (%)	67	72	72	72	77	80	78	71	65	59	60	61	70
Mean W.S. (km/h)	9.6	9.0	8.8	8.6	9.0	9.4	10.6	11.0	11.7	10.9	10.5	9.9	9.9
3pm conditions													
Mean temp. (ºC)	29.8	28.9	27.2	24.1	20.1	17.1	16.4	18.2	21.2	24.2	26.9	29.0	23.6
Mean R.H. (%)	47	50	49	49	52	54	51	45	43	42	42	42	47
Mean W.S. (km/h)	13.2	13.0	12.4	11.3	11.0	11.5	13.0	14.3	14.7	14.1	14.2	14.2	13.1

Source: BoM (2019).

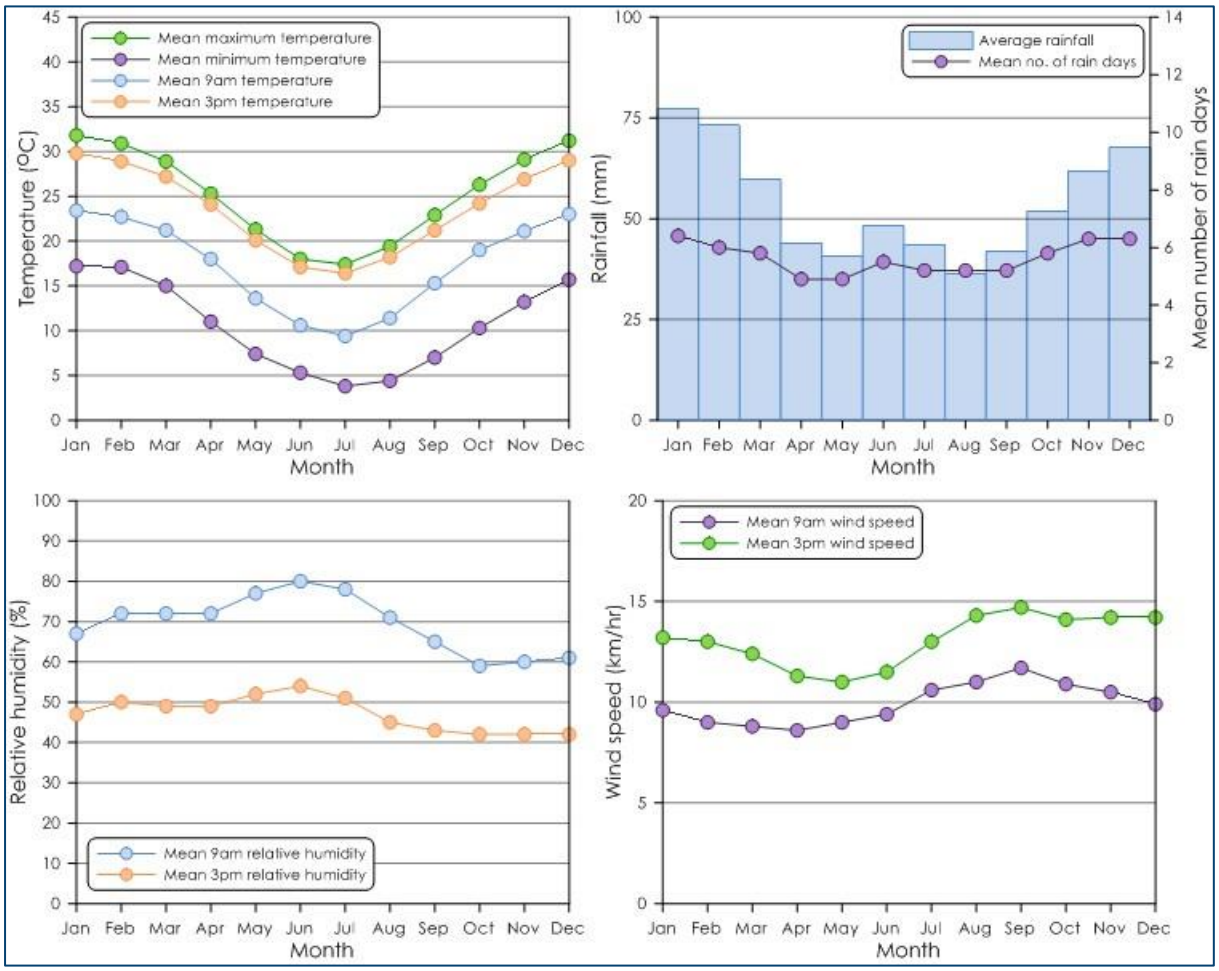

Figure 4-1: Monthly climate statistics summary – Jerrys Plains Post Office

4.2 Local meteorological conditions

Annual and seasonal windroses have been prepared from the available data collected at the RCN weather station for the 2018 period, and are presented in **Figure 4-2**.

Analysis of the windroses show that on an annual basis the predominant wind flows at the RCN weather station are along the north-northwest to east-southeast/ southeast axis, which is typical of the Hunter Valley conditions. Very few winds originate from the northeast and southwest quadrants.

The summer winds are predominately from the southeast and east-southeast. The autumn and spring wind distribution is similar to the annual distribution with winds from the southeast, east-southeast, and west-northwest. During winter, winds are primarily from the west-northwest.

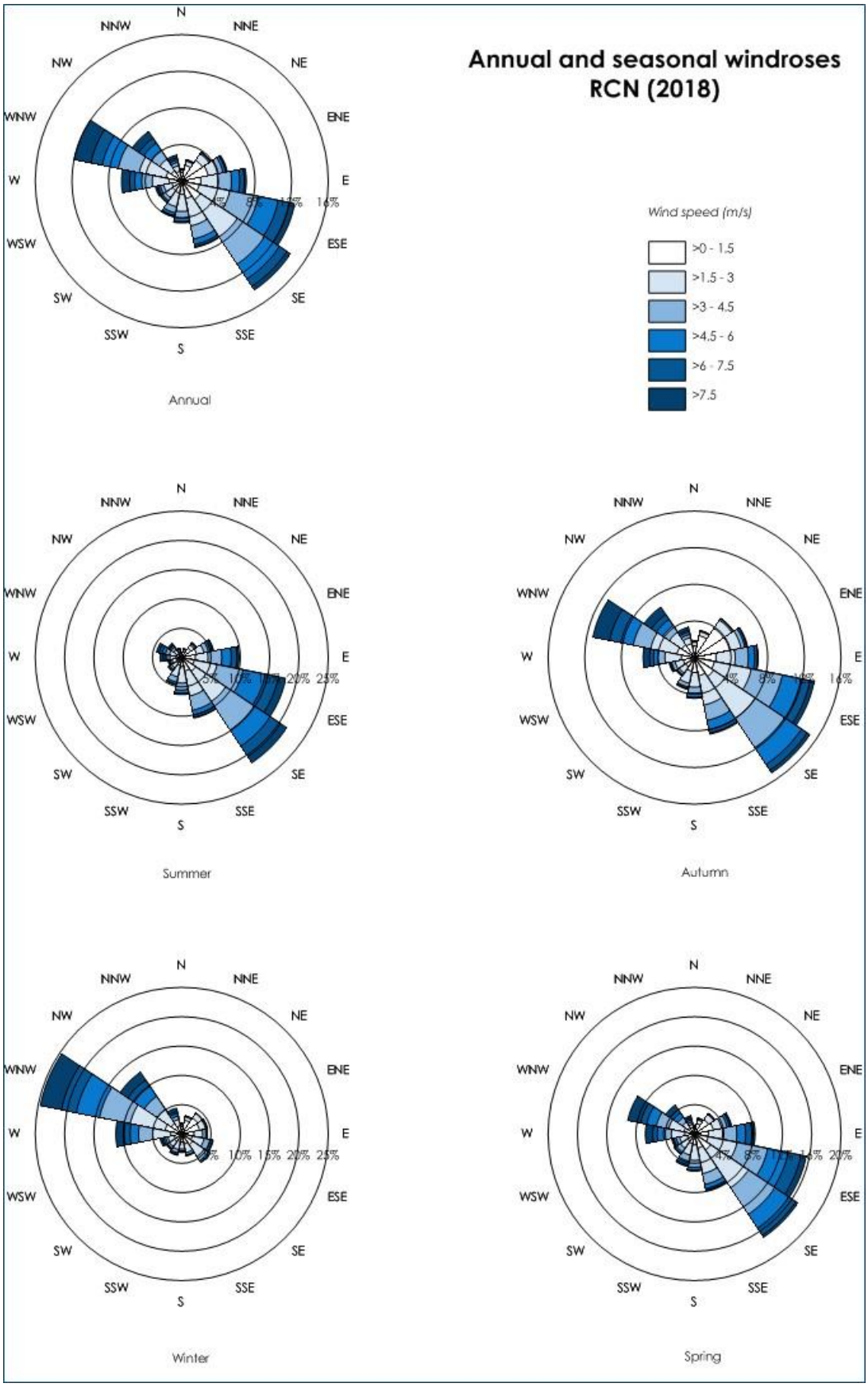

Figure 4-2: Annual and seasonal windroses for RCN (2018)

4.3 Local air quality monitoring

The main sources of particulate matter in the area surrounding the Project include mining, agriculture, commercial and industrial (including power generation) activities, urban activity and emissions from local anthropogenic activities such as motor vehicle exhaust and domestic wood heaters.

This section reviews the available ambient air quality monitoring data sourced from the RCN and surrounding mining operations' air quality monitoring networks (including RCS and Mount Owen Complex [MTO]) along with the NSW Department of Planning, Industry and Environment (DPIE) Upper Hunter Air Quality Monitoring Network (UHAQMN).

The historical ambient air quality monitoring data reviewed in this assessment is similar with the data reviewed in the *Air Quality and Greenhouse Gas Assessment Rix's Creek South Continuation of Mining Project* (Rix's Creek South Assessment) (**Todoroski Air Sciences, 2015**) to provide consistency with this assessment.

Figure 4-3 shows the approximate location of each of the historical monitoring stations with reference to the Project. It is noted that the air quality monitoring network for RCN and RCS has since been updated. The updated air quality monitoring network is presented in the *Air Quality & Greenhouse Gas Management Plan – Rix's Creek Mine* (**RCM, 2019**).

The type of air quality monitors used to measure ambient PM_{10}, $PM_{2.5}$ and TSP include Tapered Element Oscillating Microbalances (TEOMs), Beta Attenuation Monitors (BAMs) and High Volume Air Samplers (HVAS).

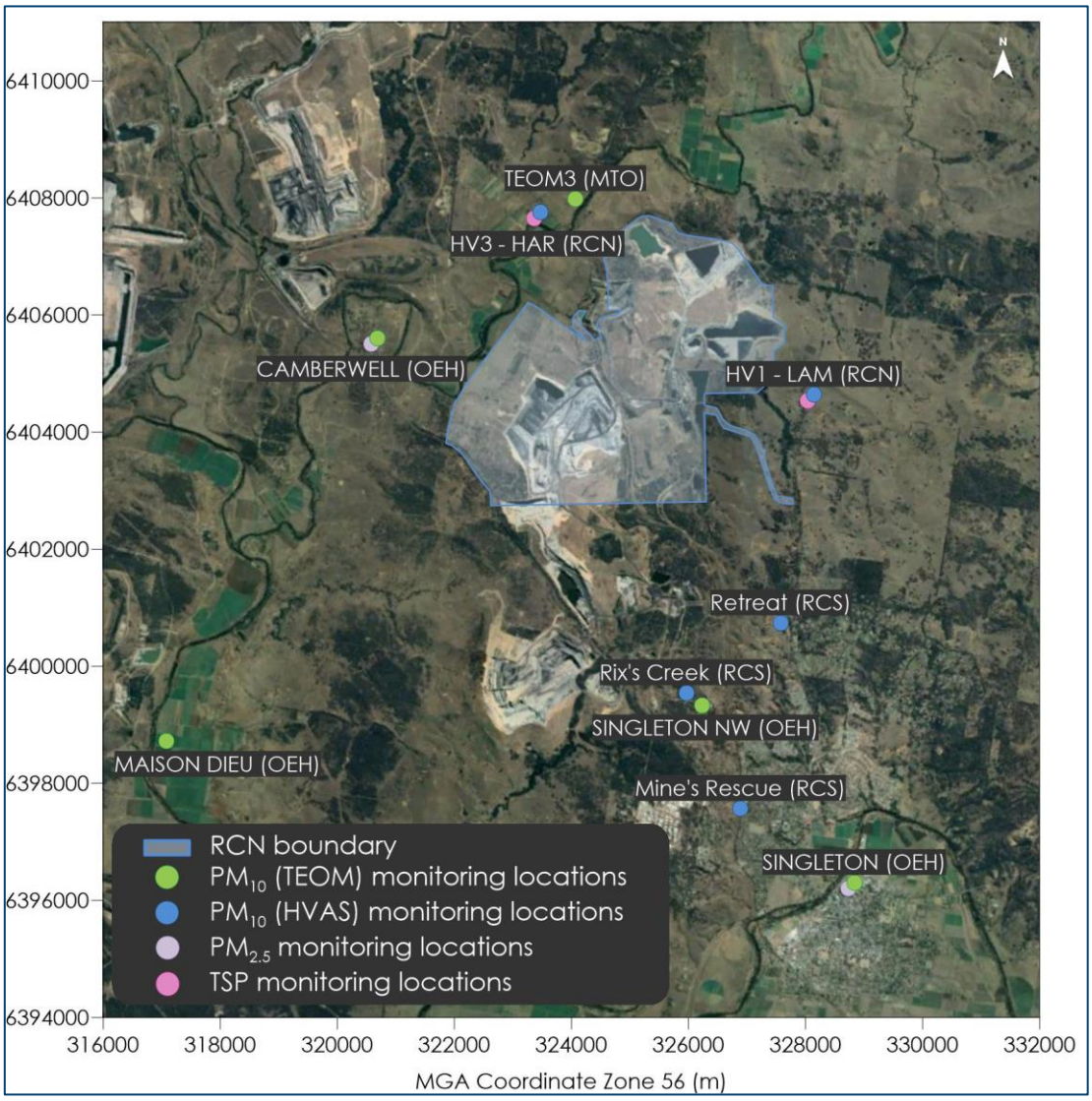

Figure 4-3: Historical ambient monitoring locations

4.3.1 PM_{10} monitoring

A summary of the available data from the HVAS PM_{10} monitoring stations is presented in **Table 4-2**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 4-4**.

A review of **Table 4-2** indicates that the annual average PM_{10} concentrations for the monitoring stations were below the relevant criterion of 25µg/m^3 with the exception of Rix's Creek in 2012 and 2013, and Retreat in 2013. The maximum 24-hour average PM_{10} concentrations recorded at the monitoring stations exceeded the relevant criterion of 50µg/m^3 on a number of occasions during the review period.

It can be seen from **Figure 4-4** that PM_{10} concentrations in 2012 and 2013 show higher readings in the spring and summer months with the warmer weather elevating the potential for drier ground and the occurrence of windblown dust, bushfires and plant pollen. This trend is not as apparent in 2014 and 2015.

Table 4-2: Summary of ambient HVAS PM_{10} levels (µg/m³)

Location	2012	2013	2014	2015
	Annual average			
Rix's Creek	**25.2**	**29.5**	**26.8**	22.3
Mines Rescue	19.6	20.5	20.5	18.4
Retreat	22.8	**25.5**	22.2	17.1
HV1- LAM	19.7	21.2	18.3	19.2
HV3 – HAR	24.0	20.6	15.2	15.3
	Maximum 24-hour average			
Rix's Creek	**94**	**129**	**91**	**79**
Mines Rescue	**61**	**53**	50	42
Retreat	**68**	**84**	**58**	46
HV1- LAM	**61**	**73**	**51**	40
HV3 – HAR	**81**	**56**	**51**	38

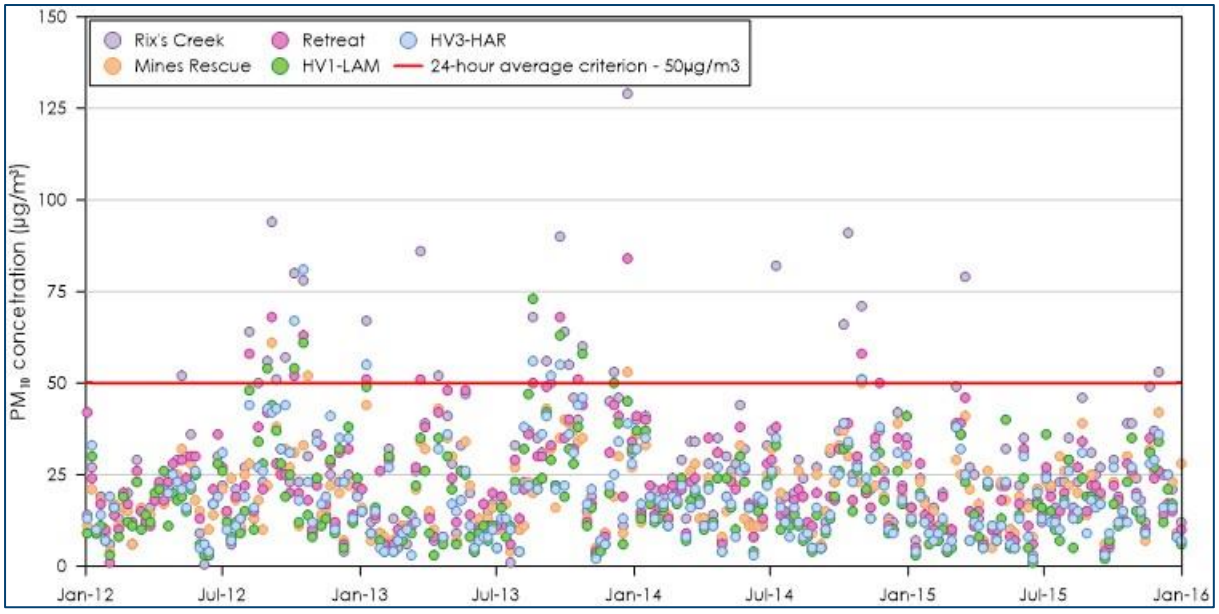

Figure 4-4: 24-hour average PM_{10} concentrations

The available PM_{10} monitoring data from the UHAQMN monitoring stations have also been reviewed and are summarised in **Table 4-3**. Recorded 24-hour average PM_{10} concentrations are presented graphically in **Figure 4-5**.

A review of **Table 4-3** indicates that the annual average PM_{10} concentrations for the Singleton monitor were below the criterion of 25µg/m³, the other monitors recorded levels above this in 2012, 2013 and 2018 with the Camberwell monitor additionally recording a level above in 2017. The maximum 24-hour average PM_{10} concentrations recorded at these stations exceeded the relevant criterion of 50µg/m³ on a number of occasions.

Table 4-3: Summary of ambient PM_{10} levels from UHAQMN (µg/m³)

Location	2012	2013	2014	2015	2016	2017	2018
	Annual average						
Singleton	22.3	23.3	21.0	19.3	19.3	20.8	24.0
Maison Dieu	**25.8**	**25.8**	22.7	20.4	20.4	23.1	**27.9**
Camberwell	**26.4**	**27.8**	24.6	22.0	24.5	**27.4**	**31.1**
Singleton NW	**25.9**	**25.9**	22.7	20.9	21.9	22.7	**26.9**
	Maximum 24-hour average						
Singleton	**63.6**	**62.7**	**54.5**	**85.3**	**60.8**	**57.0**	**198.0**
Maison Dieu	**87.7**	**84.2**	**63.7**	**77.3**	**47.7**	**78.9**	**191.6**
Camberwell	**81.6**	**104.8**	**79.7**	**86.7**	**65.7**	**101.5**	**243.9**
Singleton NW	**85.2**	**91.7**	**64.7**	**84.0**	**60.5**	**67.9**	**200.3**

Figure 4-5 shows a seasonal trend with PM_{10} concentrations nominally higher in the spring and summer months. The potential cause of the elevated PM_{10} levels typically coincide with regional dust events and bushfires which affect a wide area, for example as indicated by all air quality monitoring stations in the surrounding region also recording elevated levels on such days. At other times, potential sources including local agriculture, open cut mining activity and localised fires may have contributed to the periods of elevated PM_{10} levels.

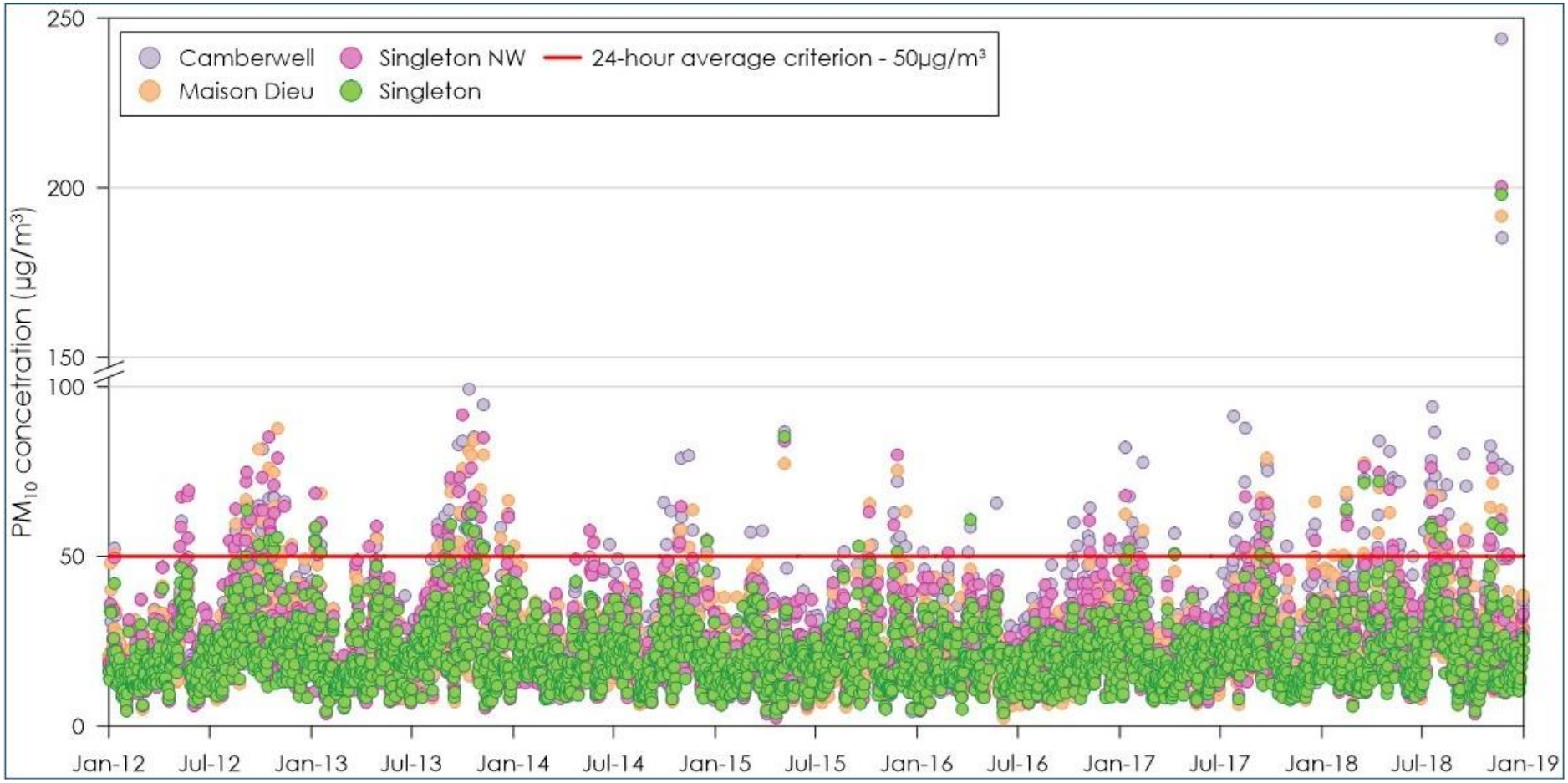

Figure 4-5: 24-hour average PM_{10} concentrations at UHAQMN monitoring stations

4.3.2 $PM_{2.5}$ monitoring

A summary of the available $PM_{2.5}$ monitoring data from the UHAQMN Singleton and Camberwell monitoring stations is presented in **Table 4-4**. The 24-hour average $PM_{2.5}$ concentrations are presented graphically in **Figure 4-6**.

Table 4-4 demonstrates that the annual average $PM_{2.5}$ concentrations for the Singleton and Camberwell monitoring stations were above the relevant criterion of 8µg/m³ in 2013, 2017 and 2018. The maximum 24-hour average $PM_{2.5}$ concentrations recorded at the Singleton and Camberwell monitoring stations exceeded the relevant criterion of 25µg/m³ on occasions.

Table 4-4: Summary of ambient $PM_{2.5}$ levels (µg/m³)

Location	2012	2013	2014	2015	2016	2017	2018
	Annual average						
Singleton	8.0	7.9	7.8	7.6	7.9	**8.2**	**8.1**
Camberwell	7.5	**8.2**	7.8	7.2	7.5	7.4	**8.4**
	Maximum 24-hour average						
Singleton	19.5	22.6	**28.5**	24.9	**27.7**	**29.6**	19.2
Camberwell	19.6	**29.5**	**31.6**	23.9	21.1	24.7	22.6

The 24-hour average $PM_{2.5}$ concentrations are presented graphically in **Figure 4-6**. A slight seasonal trend in 24-hour average $PM_{2.5}$ concentrations for the monitoring stations can be seen in **Figure 4-6** with elevated levels occurring in the cooler months. This is the opposite of the seasonal trend for PM_{10} concentrations which has elevated levels during the warmer months. Ambient $PM_{2.5}$ levels are likely to be governed by many non-mining background sources such as wood heaters and motor vehicles.

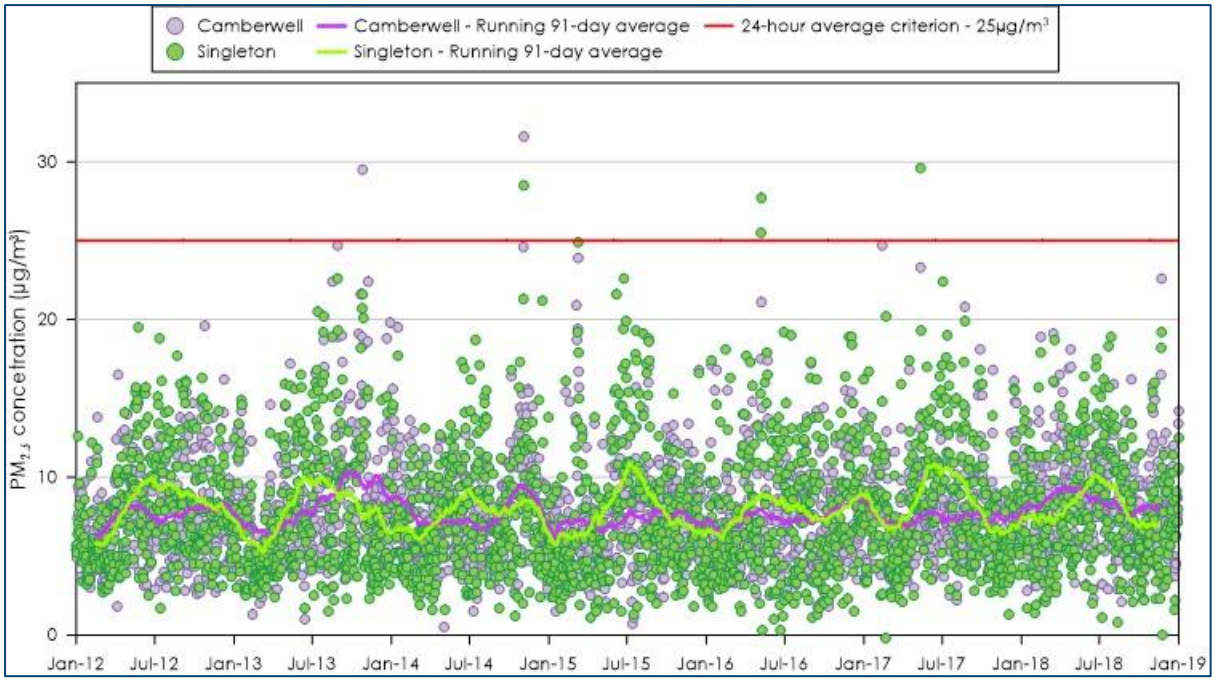

Figure 4-6: 24-hour average $PM_{2.5}$ concentrations

4.3.3 TSP monitoring

A summary of the results collected between 2012 and 2015 is shown in **Table 4-5**. Recorded 24-hour average TSP concentrations are presented in **Figure 4-7**.

The monitoring data presented in **Table 4-5** indicate that the annual average TSP concentrations at the monitors were below the annual average criterion of 90µg/m³.

Figure 4-7 shows that the recorded 24-hour average TSP concentrations follow a generally similar trend to the PM_{10} monitoring with levels nominally higher during warmer months.

Table 4-5: Summary of annual average TSP levels from HVAS monitoring (µg/m³)

Location	2012	2013	2014	2015
	Annual average			
Rix's Creek	65.2	76.7	68.1	61.3
Mines Rescue	50.1	56.4	52.4	51.2
Retreat	65.8	86.0	72.5	59.7
HV1-LAM	43.4	49.9	45.2	43.3
HV3-HAR	66.4	65.4	57.1	43.3

- Insufficient data to calculated annual average

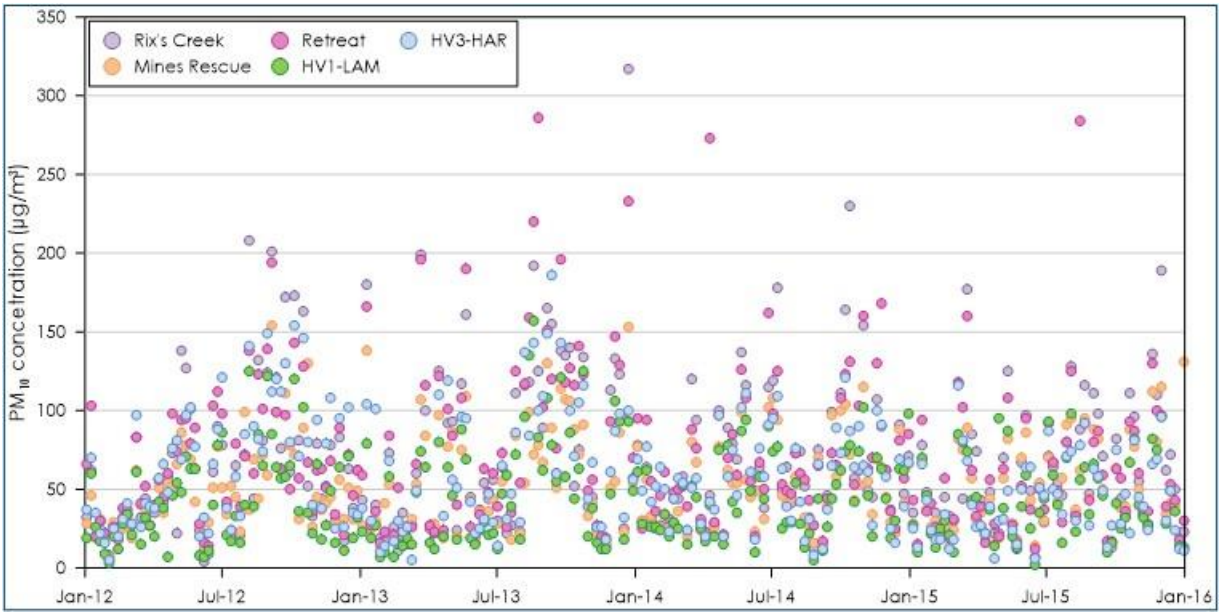

Figure 4-7: HVAS 24-hour average TSP concentrations

5 DISPERSION MODELLING APPROACH

For this assessment the CALPUFF modelling suite is applied to dispersion modelling. CALPUFF is an air dispersion model approved by the NSW EPA for use in air quality impact assessments. CALMET is the meteorological modelling component for the CALPUFF dispersion model.

The model setup used is in general accordance with methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC**, **2011**).

The air dispersion model was setup using the same methodology and modelled meteorological year applied to the *Air Quality and Greenhouse Gas Assessment Rix's Creek South Continuation of Mining Project* (Rix's Creek South Assessment) (**Todoroski Air Sciences, 2015**). This approach was selected to provide consistency with the recently approved assessment for the neighbouring RCS mine. Full details regarding the model setup can be found in the Rix's Creek South Assessment, see; https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6300%2120191023T032428.362%20GMT .

Since the writing of the Rix's Creek South Assessment some of the nearby mining operations have sought modifications to their approved operations and other approved operations have yet to commence. The changes to the nearby mining operations have been factored into this assessment.

5.1 Meteorological modelling

The meteorological modelling methodology applied a 'hybrid' approach which includes a combination of prognostic model data from The Air Pollution Model (TAPM) with surface observations.

TAPM was applied to generate prognostic upper air data for use in CALMET. The centre of analysis for the TAPM modelling used is 32deg31min south and 151deg7min east. The TAPM simulation involved an outer grid of 30km, with three nested grids of 10km, 3km and 1km with 35 vertical grid levels.

The CALMET modelling used a nested approach where the wind field from the coarser grid outer domain is used as the initial (or starting) field for the finer grid inner domains. The CALMET initial domain was run on a 150 x 150km grid with a 3km grid resolution and refined for a second domain on a 50 x 50km grid with a 1.0km grid resolution and further refined for a final domain on a 22 x 22km grid with a 0.22km grid resolution.

The available meteorological data for January 2012 to December 2012 from nine nearby meteorological monitoring sites were included in the simulation. The 2012 calendar period is considered a representative period for use in air dispersion modelling based on an analysis of five contiguous years of data. This period is also the same modelling period used in the Rix's Creek South Assessment and would provide consistency with this assessment. **Table 5-1** outlines the parameters used from each station.

Table 5-1: Surface observation stations used in modelling

Weather Stations	Parameters						
	WS	WD	CH	CC	T	RH	SLP
Rix's Creek Weather Station		✓			✓		
Cessnock Airport Automatic Weather Station (BoM) (Station No. 061260)	✓	✓			✓	✓	✓
Merriwa (Roscommon) Weather Station (BoM) (Station No, 061287)	✓	✓	✓	✓	✓	✓	✓
Murrurundi Gap Automatic Weather Station (BoM) (Station No. 061392)	✓	✓	✓	✓	✓	✓	✓
Camberwell Automatic Weather Station	✓	✓			✓		
Paterson (Tocal) Automatic Weather Station (BoM) (Station No. 061250)	✓	✓			✓	✓	
Scone Airport Automatic Weather Station (BoM) (Station No. 061363)	✓	✓			✓	✓	✓
Williamtown RAAF (BoM) (Station No. 061078)	✓	✓	✓	✓	✓	✓	✓
Nullo Mountain Automatic Weather Station (BoM) (Station No. 062100)	✓	✓			✓	✓	

WS = wind speed, WD= wind direction, CH = cloud height, CC = cloud cover, T = temperature, RH = relative humidity and SLP = station level pressure.

5.2 Meteorological modelling evaluation

The outputs of the CALMET modelling are evaluated using visual analysis of the wind fields and extracted data and also through statistical evaluation.

Figure 5-1 presents a visualisation of the wind field generated by CALMET for a single hour of the modelling period. The wind fields follow the terrain well and indicate the simulation produces realistic fine scale flow fields (such as terrain forced flows) in surrounding areas.

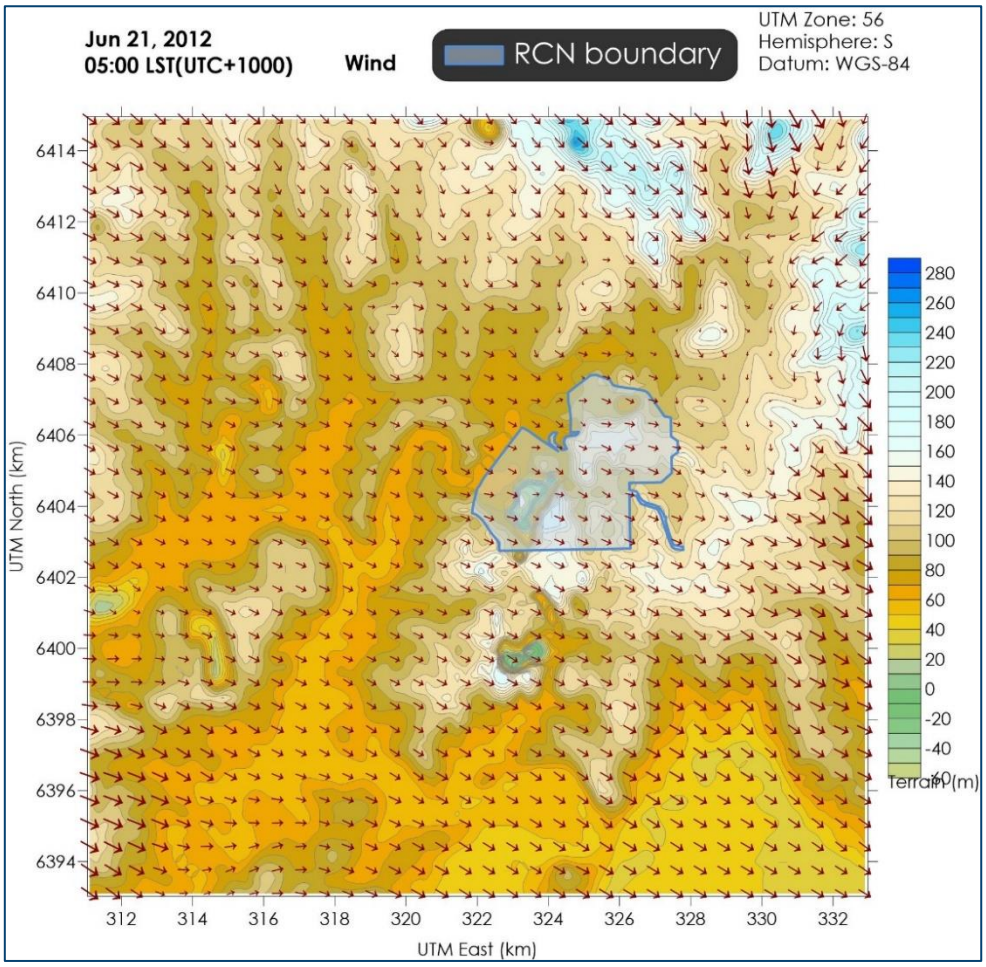

Figure 5-1: Example of the wind field for one of the 8,760 hours of the year that are modelled

CALMET generated meteorological data were extracted at a location within the CALMET domain (see **Figure 5-1**) and are graphically represented in **Figure 5-2** and **Figure 5-3**.

Figure 5-2 presents annual and seasonal windroses extracted at a location within the CALMET domain. The wind distribution patterns are generated in CALMET based on the available measurements and the expected terrain effects on the prevailing winds, and reflect the expected wind distribution patterns of the area. This is evident as the general wind directions and the relative distribution of winds in the windroses based on the CALMET data are similar to the windroses generated with the measured data, as presented in **Figure 4-2**. **Figure 5-3** includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and shows trends considered to be representative of the area.

Figure 5-2: Windroses from CALMET extract Cell ref 5048 (2012)

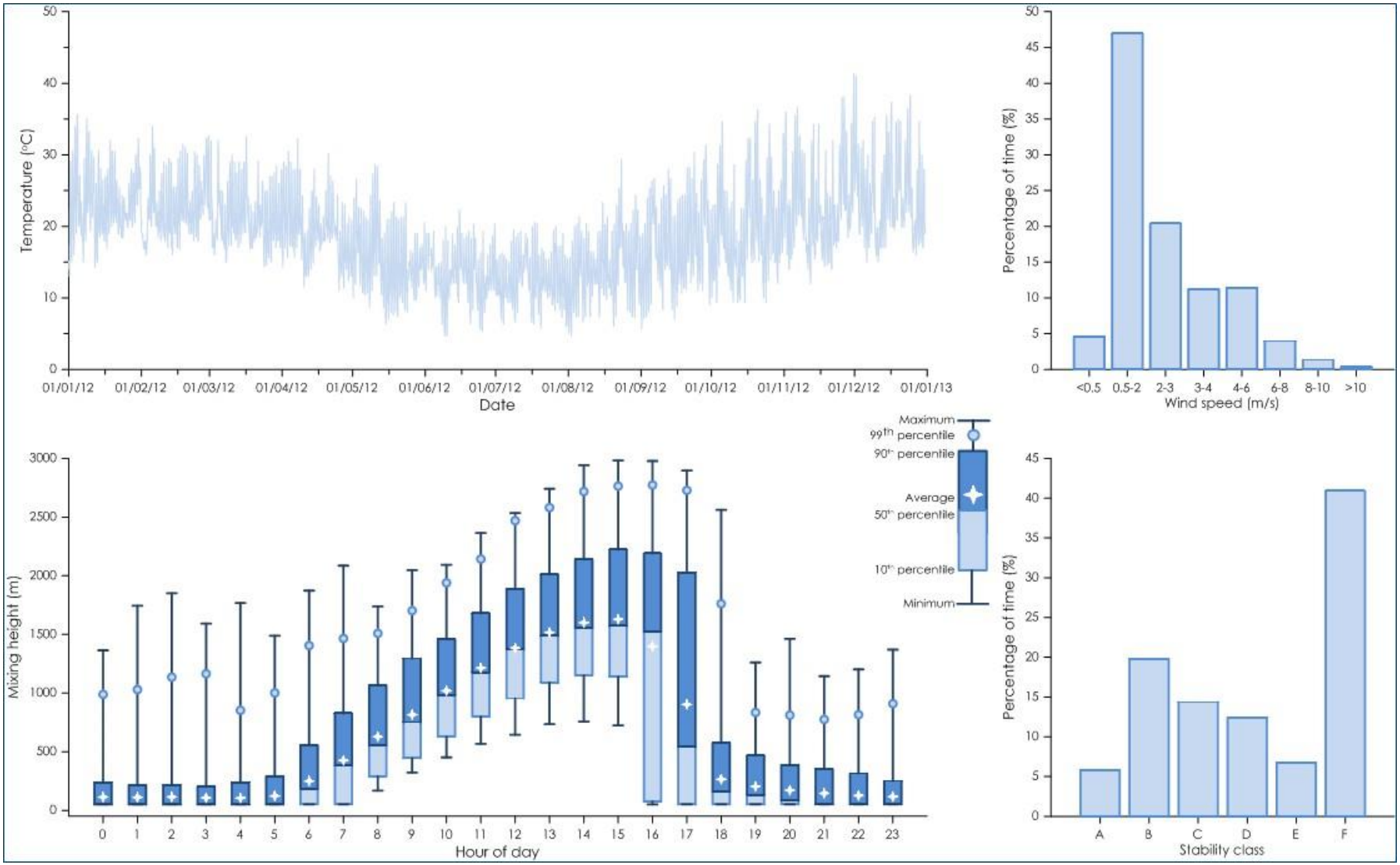

Figure 5-3: Meteorological analysis of CALMET extract Cell ref 5048 (2012)

5.3 Dispersion modelling

CALPUFF modelling is based on the distribution of particles for each particle size category derived from the applied emission factor equations. Emissions from each activity were represented by a series of volume sources and were included in the CALPUFF model via an hourly varying emission file. Meteorological conditions associated with dust generation (such as wind speed) and levels of dust generating activity were considered in calculating the hourly varying emission rate for each source.

It should be noted that as a conservative measure, the effect of the precipitation rate (rainfall) in removing dust emissions from the atmosphere has not been considered in this assessment.

5.4 Modelling Scenarios

This assessment considers two indicative mine plan years (scenarios) to represent different stages of the Project.

Year 2021 - The Camberwell Pit waste emplacement area has reached a height of 170 metres RL, and is progressing in a westerly direction. All operations are contained within Camberwell Pit and haulage of coal from the Integra Underground stockpile area to the RCN Coal Handling Preparation Plant (CHPP) is in progress (Bloomfield has a contract with Glencore, who manage Integra Underground, to haul and process coal to/at the RCN CHPP).

Year 2024 - The Camberwell Pit waste emplacement area continues to be utilised at the proposed temporary height of 175 metres RL, and has progressed in a westerly direction. Falbrook Pit is proposed to be operational at this stage, and open cut mining is modelled concurrently in both the Camberwell Pit and Falbrook Pit areas. In accordance with PA 08_0102, Falbrook Pit only operates between 7 am and 10 pm. Haulage of coal from the Integra Underground stockpile area to the RCN CHPP continues.

Indicative plans for each of the respective scenarios are presented in **Figure 5-4** and **Figure 5-5**.

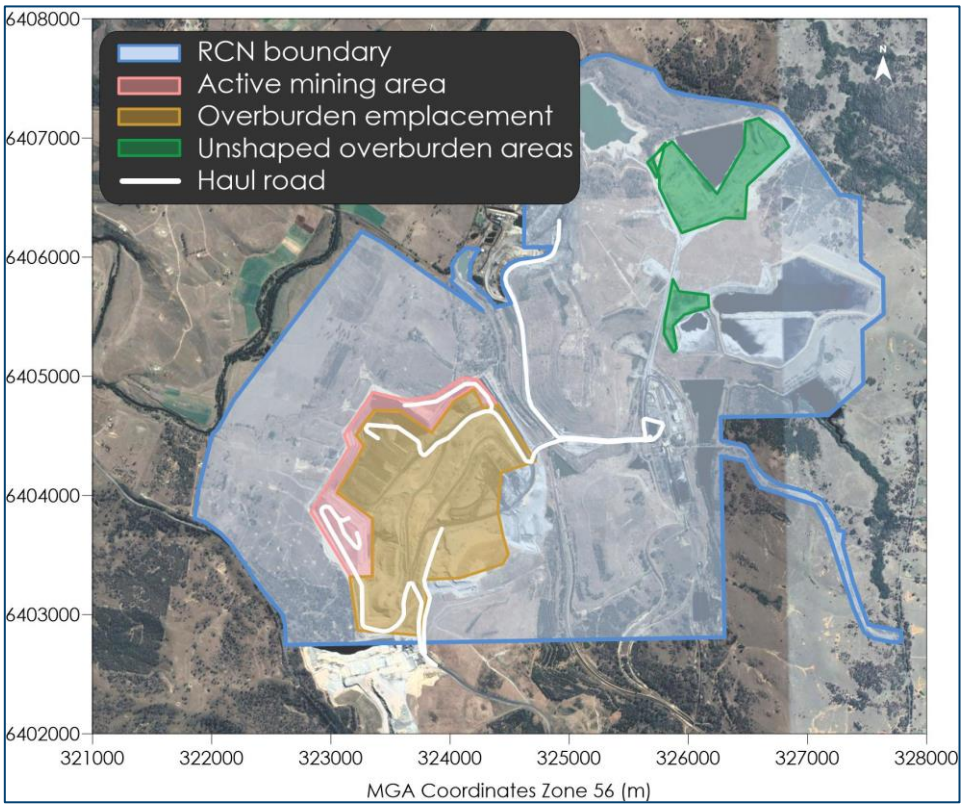

Figure 5-4: Modelling scenario – Year 2021

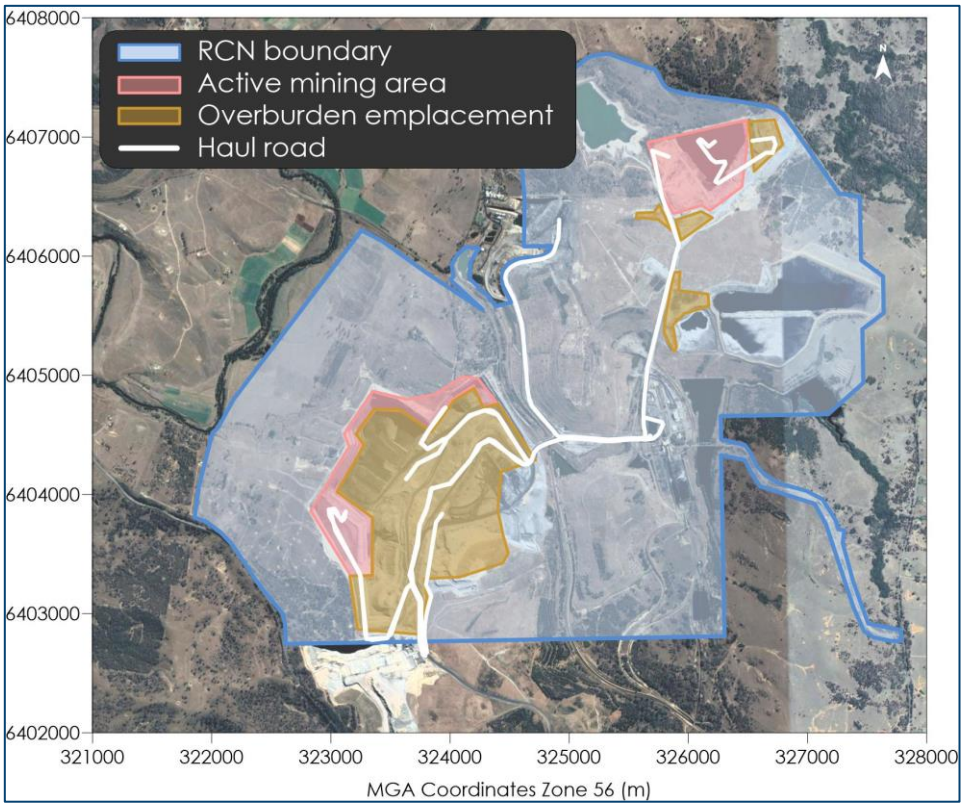

Figure 5-5: Modelling scenario – Year 2024

5.5 Emission estimation

For each scenario of the Project, emissions have been estimated by analysing the dust generating activities and utilising suitable emission factors.

The emission factors were sourced from both locally developed and United States Environmental Protection Agency (US EPA) developed documentation. Total TSP emissions from all significant activities for the Project are presented in **Table 5-2**. Full emission inventories for TSP, PM_{10} and $PM_{2.5}$ and associated calculations are presented in **Appendix B**.

Table 5-2: Summary of estimated TSP emission rate for the Project (kg/year)

	Activity	Year 2021	Year 2024
Camberwell Pit	OB - Drilling	13,384	13,384
	OB - Blasting	45,760	45,760
	OB - Loading OB to haul truck	63,345	40,367
	OB - Hauling OB to Emplacement area	720,722	381,007
	OB - Emplacing OB at emplacement area	63,345	40,367
	OB - Dozers on OB	117,147	117,147
	OB - Dozers on rehab	33,471	33,471
	CL - Dozers ripping/pushing/clean-up	139,479	139,479
	CL - Loading ROM coal to haul truck	283,724	182,394
	CL - Hauling to ROM hopper at RCS	67,933	46,290
	WE - Overburden emplacement areas	144,190	151,986
	WE - Open pit	22,680	41,855
Fallbrook Pit	OB - Drilling	-	106
	OB - Blasting	-	13,420
	OB - Loading OB to haul truck	-	21,939
	OB - Hauling OB to Emplacement area	-	128,001
	OB - Emplacing OB at emplacement area	-	21,939
	OB - Dozers on OB	-	58,574
	OB - Dozers on rehab	-	33,471
	CL - Dozers ripping/pushing/clean-up	-	68,197
	CL - Loading ROM coal to haul truck	-	101,330
	CL - Hauling to ROM hopper at RCS	-	47,292
	WE - Overburden emplacement areas	-	19,254
	WE - Open pit	-	40,235
	WE – Unshaped overburden areas	57,360	-
Underground	CL - Loading Underground ROM coal to haul truck	188,474	172,261
	CHPP - Hauling Underground ROM to ROM hopper	41,967	38,789
	CHPP - Unloading ROM to hopper	94,237	86,130
	CHPP - Rehandle ROM at hopper	9,424	8,613
	CHPP - Loading Product coal to stockpile	285	265
	CHPP - Loading Product coal to train	285	265
	CHPP - Loading rejects	112	98
	CHPP - Hauling rejects	14,484	11,041
	CHPP - Unloading rejects	112	98
	WE - ROM stockpiles	876	876
	WE - Product stockpiles	3,504	3,504
	Grading roads	47,445	47,445
	Diesel exhaust	21,221	23,093
	Total emissions	**2,173,746**	**2,179,742**

RCS – Rix's Creek South

Bloomfield is also seeking to increase the number of blasts in Rix's Creek North from two to three per day, however the approved number of blasts per week will remain at ten. The change in the approved blasts per day would provide increased opportunity to blast during the most favourable weather conditions, which could ultimately reduce the overall magnitude of dust impacts from blasting. This can be seen as a positive measure to assist with the overall management of blasting impacts and therefore the potential dust impacts associated with increasing the number of approved blasts per day is not expected to affect the overall modelling predictions for the approved number of blasts per week.

Proposed exploration and related activities would occur within Bloomfield's mining leases. The dust emissions from these activities are not expected to be significant and may arise from drilling activities, vehicle movements and exhaust emissions from vehicles and plant. The potential impact due to these activities is difficult to accurately quantify on any given day due to their temporary and sporadic nature. Relative to the approved dust generating activities, the impacts are unlikely to be discernible. Regardless, appropriate operational and physical dust mitigation measures as outlined in the approved *Air Quality & Greenhouse Gas Management Plan – Rix's Creek Mine* (**RCM, 2019**) will be implemented for the exploration activities to ensure any dust emissions are managed appropriately.

5.6 Other mining operations

Emission estimates from other nearby approved mining operations were derived from information provided in the air quality assessments available in the public domain at the time of modelling. These estimates are likely to be conservative, as in many cases, mines do not continually operate at the maximum extraction rates assessed in their respective environmental assessments.

Table 5-3 summarises the emissions adopted in this assessment for each of the nearby mining operations.

Since the writing of the Rix's Creek South Assessment (**Todoroski Air Sciences, 2015**), the Mt Owen, Ravensworth East and Glendell mining operations have been modified. The Ashton South East Open Cut (SEOC) is yet to commence operations and as such has been assumed to be operational only in the 2024 scenario. The Integra Underground operation is a separate entity to RCN. Emissions associated with the ventilation shaft and stockpile wind erosion are associated with the Integra Underground, however surface activity, including ROM transport and processing at the CHPP has been included in the modelling for the RCN operations (refer to **Table 5-2**).

Table 5-3: Estimated emissions from nearby mining operations (kg/year)

Mining operation	Year 2021	Year 2024
Rix's Creek South	1,569,129 [1]	2,456,291 [2]
Mt Owen [3]	5,639,369	4,981,288
Ravensworth East [3]	1,219,624	630,617
Glendell [4]	2,146,320	2,199,076
Ravensworth Operations [5]	11,629,549	11,558,274
Ashton SEOC [6]	-	1,646,927
Integra Underground [7]	42,048	42,048

[1] Todoroski Air Sciences (2015), [2] Todoroski Air Sciences (2018), [3] Jacobs (2018), [4] Jacobs (2019), [5] PAEHolmes (2010), [6] PAEHolmes (2009), [7] ERM (2009)

5.7 Accounting for background dust levels

To account for the contribution from other non-mining sources of particulate matter in the wider area an allowance has been added to the modelling predictions to fully address the total potential cumulative impact.

The contribution to the prevailing background dust levels of other non-modelled dust sources was estimated by modelling the past (known) mining activities (including Rix's Creek South, Ravensworth, Hunter Valley Operations, Mount Owen, Glendell and Ravensworth East coal mines) for January 2012 to December 2012 and comparing the model predictions with the actual measured data from the corresponding monitoring stations. The average difference between the measured and predicted $PM_{2.5}$, PM_{10}, TSP and deposited dust levels from each of the monitoring points was considered to be the contribution from other non-modelled dust sources, and was added to the future predicted values to account for the background dust levels (not already in the model and due to the numerous non-modelled dust sources).

Using the approach described above, the estimated annual average contribution from other non-modelled dust sources in the surrounding area was found to be:

- $PM_{2.5}$ – 5.2µg/m^3;
- PM_{10} – 11.5µg/m^3;
- TSP – 44.1µg/m^3; and,
- Deposited dust – 1.8g/m^2/month.

The background dust levels applied are the same as those used for the Rix's Creek South Assessment (**Todoroski Air Sciences, 2015**).

It is important that the above values are not confused with measured background levels, background levels excluding only the Project, or the change in existing levels as a result of the Project. The values above are not background levels in that sense but are the residual amount of the background dust that is not accounted for directly in the air dispersion modelling.

6 DISPERSION MODELLING RESULTS

The dispersion modelling predictions for each of the assessed scenarios are presented in this section. The results presented include those for the operation in isolation (incremental impact) and the operation with other sources and background levels (total (cumulative) impact).

Each of the privately-owned, community, mine-owned and ZOA receptors of relevance to this study detailed in **Appendix A**, were assessed individually as discrete receptors. The predicted results are presented in tabular form for each of the assessed years in **Appendix C**. Associated isopleth diagrams of the dispersion modelling results are presented in **Appendix D**.

6.1 Summary of modelling results

Table 6-1 summarises the privately-owned and community receptor locations where impacts are predicted to exceed relevant assessment criteria.

The results in **Table 6-1** indicate that no exceedances of the relevant criteria are predicted to arise for the assessed dust metrics at the privately-owned receptors for the 2021 scenario.

There is one community receptor, Receptor N180, that is predicted to exceed the relevant criteria for cumulative annual average $PM_{2.5}$ and PM_{10} for the 2024 scenario. It is understood that Receptor N180 is a community hall and not a place of residence. All other privately-owned receptors are predicted to experience levels below the relevant criteria for the assessed dust metrics.

Table 6-1: Summary of modelling predictions where predicted levels exceed assessment criteria at any privately-owned receptor

Pollutant		Period	Criteria	Receptor ID (level of impact - µg/m³)	
				Year 2021	Year 2024
$PM_{2.5}$ (µg/m³)	Project in isolation (Incremental)	24-hr ave.	25*	-	-
		Ann. ave.	-	-	-
PM_{10} (µg/m³)		24-hr ave.	50*	-	-
		Ann. ave.	-	-	-
TSP (µg/m³)		Ann. ave.	-	-	-
DD (g/m²/mth)		Ann. ave.	2	-	-
$PM_{2.5}$ (µg/m³)	Total impact (Cumulative)	Ann. ave.	8	-	N180 (8)**
PM_{10} (µg/m³)		Ann. ave.	25	-	N180 (29)**
TSP (µg/m³)		Ann. ave.	90	-	-
DD (g/m²/mth)		Ann. ave.	4	-	-

* Note that cumulative 24-hr average criteria also apply. ** Community hall / not a place of residence.
DD =Dust Deposition.

The modelling predictions for the ZOA receptors indicate that up to 16 ZOA receptors are predicted to exceed the relevant criteria for the assessed dust metrics in 2021 and up to 19 ZOA receptors in 2024.

Table 6-2 and **Table 6-3** summarise the predicted levels that exceed the assessment criteria at the ZOA receptors for 2021 and 2024, respectively.

These receptors are already identified in the acquisition zone of mine operations and are impacted regardless of the MOD9. Of the impacted ZOA receptors, there are seven ZOA receptors (Receptors 170, 173, 175, 176, N64, N177 and N178) which are afforded acquisition rights due to noise impacts under PA 08_0102.

A number of assessed mine-owned receptors are predicted to experience levels above the relevant criteria for the assessed dust metrics as expected due to their proximity to modelled sources.

We note that in some cases, due to the conservative nature of the modelling assumptions applied for the other mine(s), the levels predicted at the receptor locations are likely to be higher than the levels for the same receptors shown in the more refined site-specific assessments made for the other mines.

Further detail regarding the modelling results for the mine-owned receptors and ZOA receptors are presented in **Appendix C**.

Table 6-2: Summary of modelling predictions for ZOA receptors where predicted levels exceed assessment criteria – 2021

Receptor ID	Project impact		Total impact		
	24-hr ave. PM_{10} (µg/m³)	No. days >50µg/m³	Ann. ave. $PM_{2.5}$ (µg/m³)	Ann. ave. PM_{10} (µg/m³)	Ann. ave. TSP (µg/m³)
1*	-	-	-	33	-
170*^+	-	-	-	31	-
173^+	60	1	10	40	99
175^	87	14	11	45	122
176^+	87	35	11	47	135
177^#	102	30	11	45	133
N103*+	-	-	9	34	-
N105*+	54	2	9	36	99
N133+	-	-	-	30	-
N161*+	-	-	9	36	94
N172*+	-	-	9	36	94
N177^	61	3	10	44	108
N178^+	65	5	10	44	110
N179+	-	-	-	27	-
N67+	-	-	-	28	-
N88*+	51	1	9	36	94
N91*+	-	-	9	35	93

ZOA - * RCS for air; ^ RCN for noise; # RCN for air, + Other mine for air;

Table 6-3: Summary of modelling predictions for ZOA receptors where predicted levels exceed assessment criteria – 2024

Receptor ID	Project impact		Total impact			
	24-hr ave. PM_{10} (µg/m³)	No. days >50µg/m³	Ann. ave. $PM_{2.5}$ (µg/m³)	Ann. ave. PM_{10} (µg/m³)	Ann. ave. TSP (µg/m³)	Ann. ave. DD (g/m²/mon.)
1*	-	-	-	31	-	-
170*^+	-	-	9	36	-	-
171*+	-	-	-	27	-	-
173^+	-	-	14	77	167	5
175^	59	2	10	42	108	-
176^+	56	6	11	46	119	-
177^#	78	12	10	41	117	-
N103*+	-	-	10	44	102	-
N105*+	-	-	9	38	95	-
N133+	-	-	8	35	-	-
N161*+	-	-	10	41	98	-
N172*+	-	-	10	43	101	-
N176*+	-	-	-	28	-	-
N177^	-	-	10	43	101	-
N178^+	-	-	10	42	101	-
N179+	-	-	-	28	-	-
N64^+	-	-	-	26	-	-

Receptor ID	Project impact		Total impact			
	24-hr ave. PM_{10} (µg/m³)	No. days >50µg/m³	Ann. ave. $PM_{2.5}$ (µg/m³)	Ann. ave. PM_{10} (µg/m³)	Ann. ave. TSP (µg/m³)	Ann. ave. DD (g/m²/mon.)
N67+	-	-	-	29	-	-
N88*+	-	-	10	42	98	-
N91*+	-	-	9	40	95	-

ZOA - * RCS for air; ^ RCN for noise; # RCN for air, + Other mine for air;

6.2 Assessment of 24-hour average $PM_{2.5}$ and PM_{10} concentrations for privately owned and community receptors

The results for incremental (operation in isolation) 24-hour average $PM_{2.5}$ and PM_{10} concentrations indicate there are no predicted exceedances of the relevant criteria at the privately-owned receptors for the assessed scenarios.

It is important to note that when assessing impacts per the maximum 24-hour average $PM_{2.5}$ and PM_{10} criteria, the predictions show the highest predicted 24-hour average concentrations modelled at each point within the modelling domain for the worst day (a 24-hour period).

When assessing the total (cumulative) 24-hour average impacts based on model predictions an assessment of cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts was undertaken in accordance with Section 11.2 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA**, **2017**). The "Level 2 assessment - Contemporaneous impact and background approach" was applied to assess potential impacts. In simple terms, the contemporaneous assessment involves matching one year of ambient air quality monitoring data with meteorological data representing the same period.

The analysis has focused on the following assessment locations, which represent the closest and most likely impacted receptor locations surrounding the Project:

- Receptors N180 (community hall), and N181 (Rural Fire Service [RFS] building), which are representative of receptors to the north (highlighted in an orange box in **Figure 6-1**); and,
- Receptors N23, N18, Receptor 9 and N187, which are representative of receptors to the east and southeast (highlighted in a pink box in **Figure 6-1**).

For the receptors to the north, data from the Mt Owen Complex TEOM3 (**Xstrata Coal, 2012**) monitor have been adopted and for the receptors to the east and southeast, data from the RCN HV1 monitor have been adopted for the assessment of PM_{10} cumulative impacts.

The Camberwell DPIE monitoring station has been adopted for the assessment of $PM_{2.5}$ cumulative impacts, as it is considered representative of background levels experienced at the assessed receptors.

Where data are unavailable in the monitoring datasets for the contemporaneous period, the 70th percentile of the monitoring dataset has been applied to substitute for these gaps. This approach provides a reasonable indication of the potential background level on any day where data are unavailable, e.g. between HVAS run days.

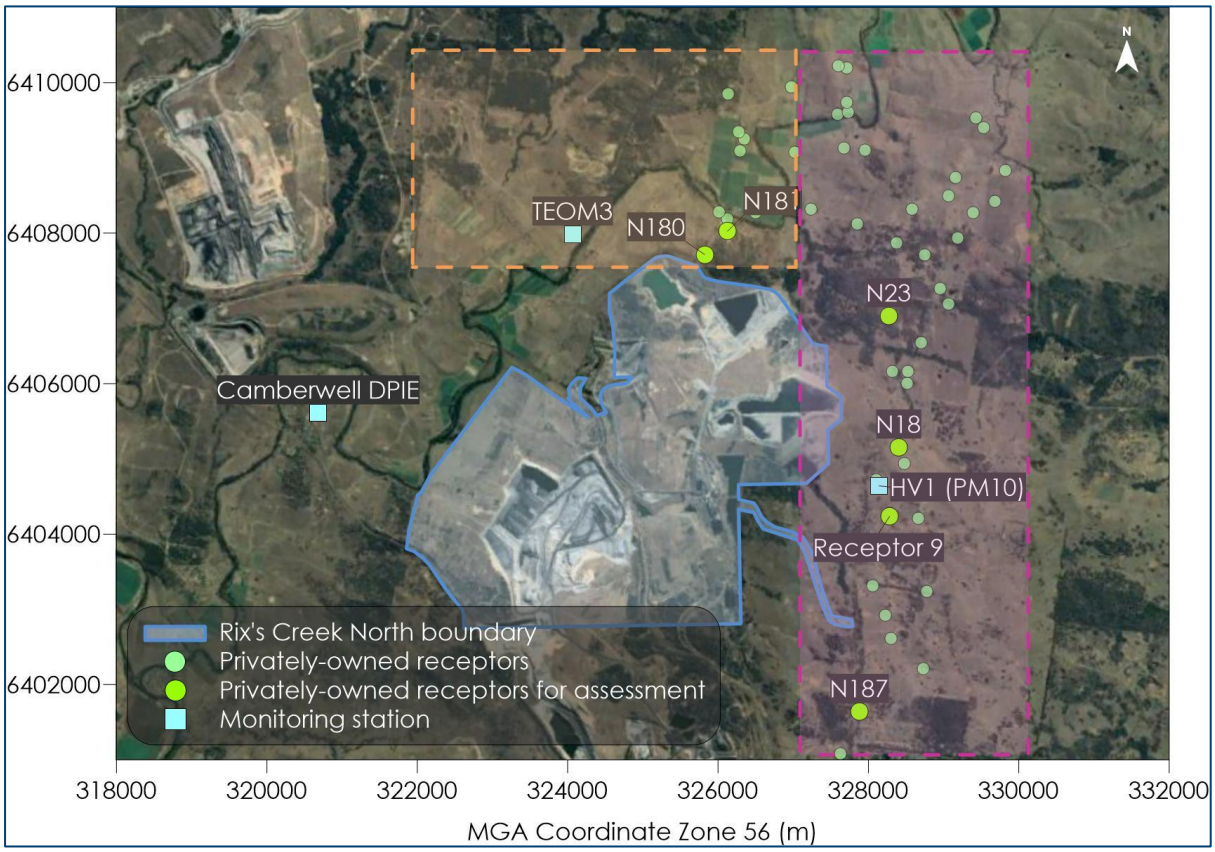

Figure 6-1: Locations considered as part of the contemporaneous cumulative impact assessment

Table 6-4 provides a summary of the contemporaneous assessment at each assessed receptor location. The results in **Table 6-4** indicate that for the assessed receptors, no exceedances of the cumulative 24-hour average $PM_{2.5}$ criteria are predicted due to the Project.

For the 2020 scenario, one additional day above the cumulative 24-hour average PM_{10} criteria is predicted to occur at N187. For the 2023 scenario, it is predicted between 1 to 3 additional days above the cumulative 24-hour average PM_{10} criteria would occur. See **Section 7** for confirmation of mitigation measures to confirm how these potential impacts will be managed and will not occur.

Detailed tables of the full assessment results are provided in **Appendix E**.

Table 6-4: NSW EPA contemporaneous assessment - maximum number of additional days in a year above 24-hour average criterion depending on background level at monitoring sites

Receptor ID	$PM_{2.5}$ analysis		PM_{10} analysis	
	2020	2023	2020	2023
N180 [(1)]	0	0	0	3
N181[(2)]	0	0	0	1
N23	0	0	0	0
N18	0	0	0	1
Receptor 9	0	0	0	0
N187	0	0	1	1

(1) Community hall / not a place of residence

(2) Rural Fire Service Shed / not a place of residence

Further analysis of the predicted cumulative $PM_{2.5}$ and PM_{10} concentrations at Receptor N180 and N187 is presented in **Figure 6-2** to **Figure 6-3**.

The figures show time series predictions of the 24-hour average $PM_{2.5}$ and PM_{10} concentrations as a result of the Project. The blue bars represent the adopted ambient background level for that receptor (**Figure 6-2** to **Figure 6-3**), the orange bars represent the predicted incremental contribution due to the Project (i.e. the whole mine site) at that receptor and the yellow bars indicate the relative reduction to existing background levels that are predicted to occur. The top of the orange (or bottom of the yellow) bar indicates the predicted future cumulative level associated with the Project and background combined.

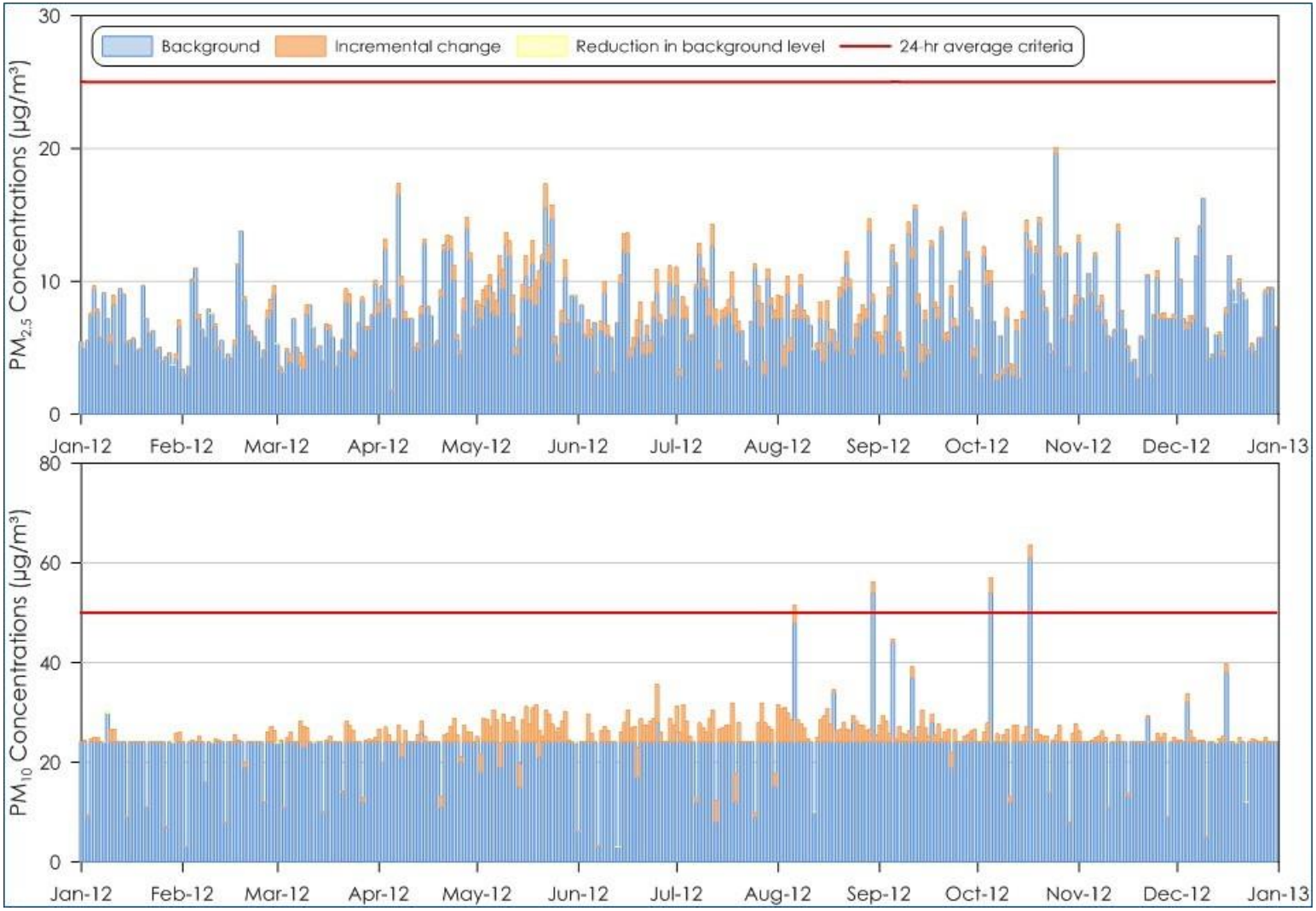

Figure 6-2: Predicted 24-hour average $PM_{2.5}$ and PM_{10} concentrations for sensitive receptor location N187 during 2021

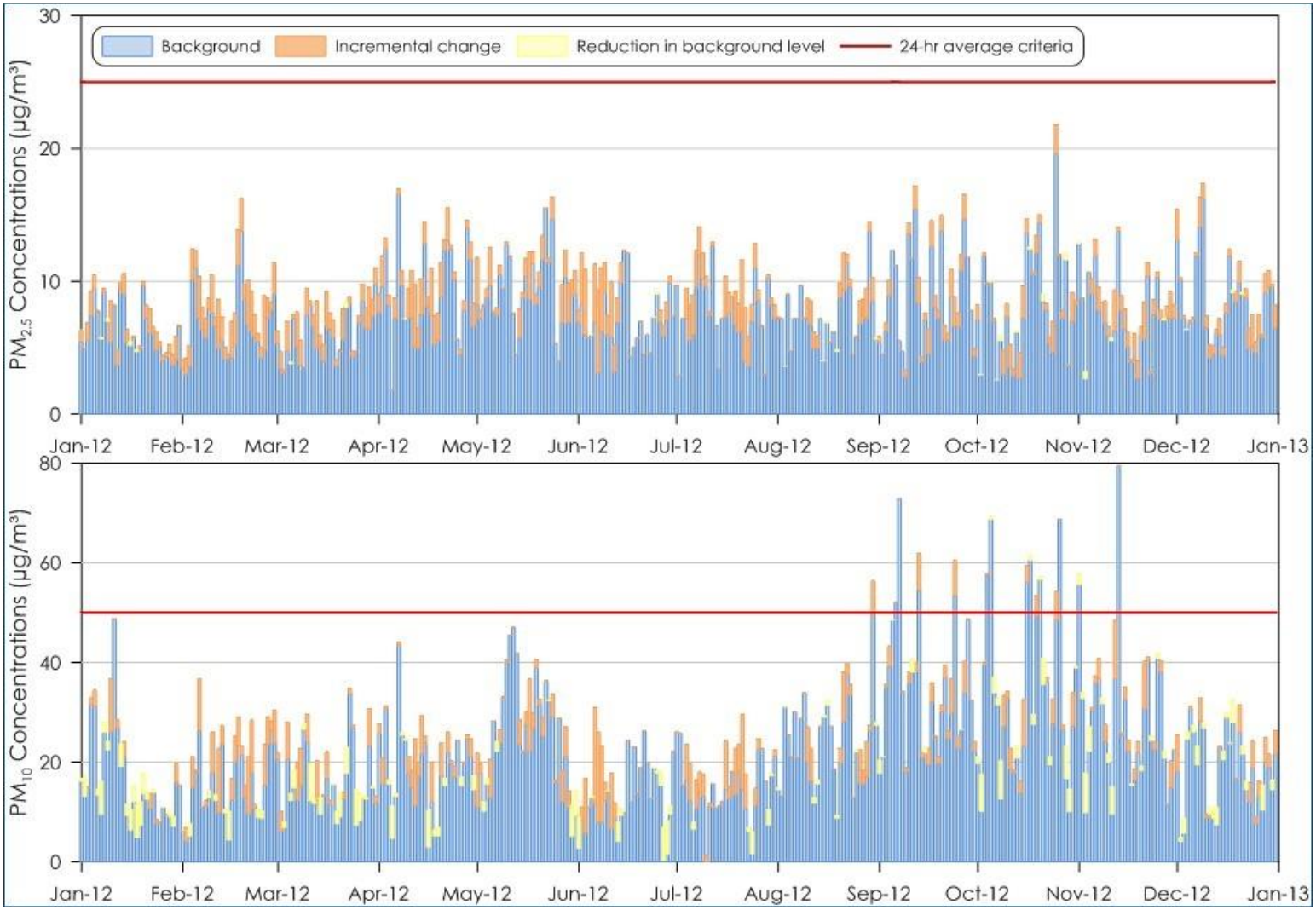

Figure 6-3: Predicted 24-hour average $PM_{2.5}$ and PM_{10} concentrations for sensitive receptor location N180 during 2024

6.3 Assessment of 24-hour average $PM_{2.5}$ and PM_{10} concentrations for ZOA Receptors

A "Level 2 assessment - Contemporaneous impact and background approach" was also applied to assess potential impacts at the ZOA receptors. The analysis has focused on the ZOA receptors in **Figure 6-4**, which represent the closest and most likely impacted ZOA receptor locations surrounding the Project.

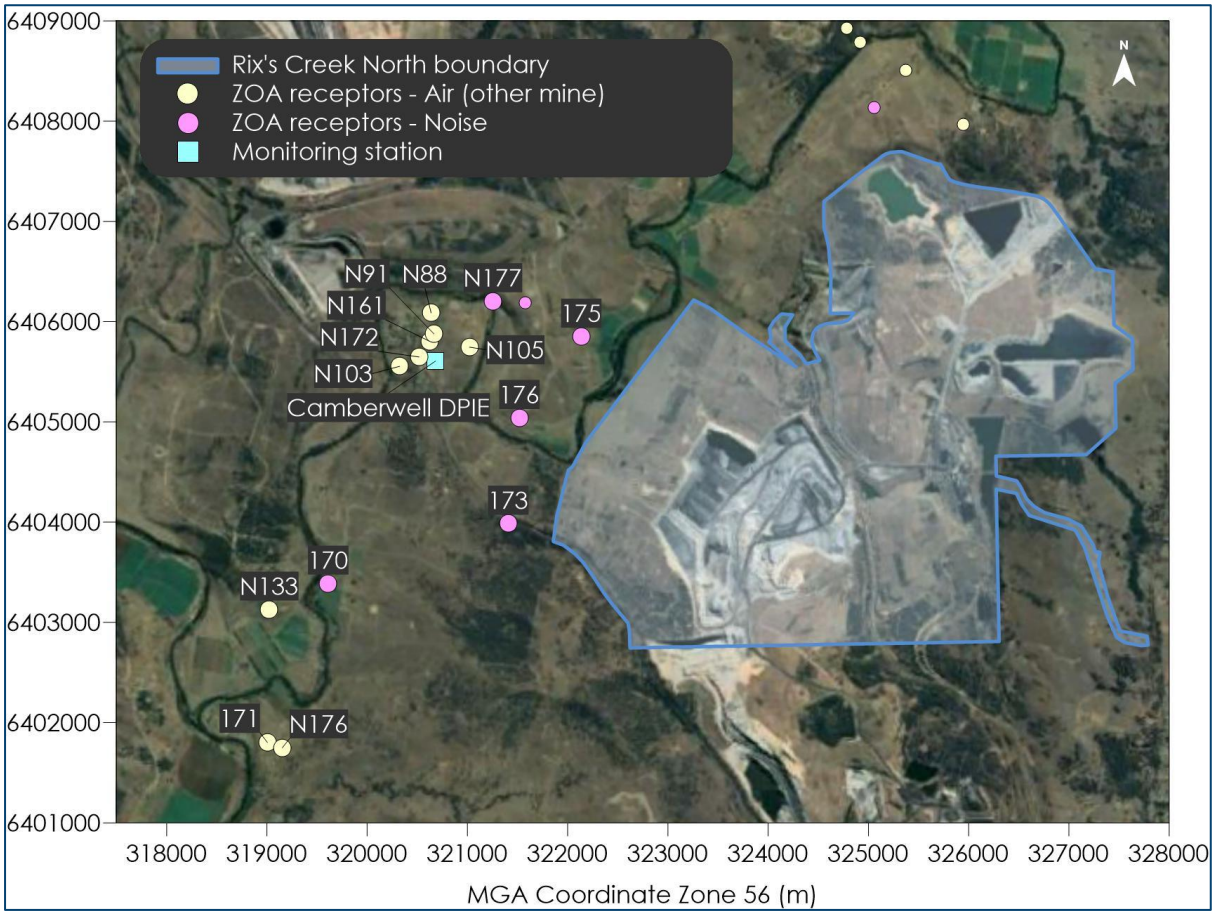

Figure 6-4: Locations considered as part of the contemporaneous cumulative impact assessment

The Camberwell DPIE monitoring station has been adopted for the assessment of $PM_{2.5}$ and PM_{10} cumulative impacts, as it is considered representative of background levels experienced at the assessed receptors. Where data were unavailable in the monitoring dataset for the contemporaneous period, the 70th percentile of the monitoring dataset has been applied to substitute for these gaps.

Table 6-5 provides a summary of the contemporaneous assessment at each assessed receptor location. The results in **Table 6-5** indicate that for the assessed ZOA receptors, no exceedances of the cumulative 24-hour average $PM_{2.5}$ criteria are predicted due to the Project.

For the 2021 scenario, four ZOA receptors, Receptors 173, 175 176 and 177, are predicted to experience more than 10 additional days above the cumulative 24-hour average PM_{10} criteria, two receptors (N105 and N88) are predicted to experience more than five additional days and other receptors are predicted to experience less than five additional days.

For the 2024 scenario, Receptor 177 is predicted to experience more than five additional days above the cumulative 24-hour average PM_{10} criteria with all other receptors predicted to experience less than five additional days.

These receptors are also predicted to exceed annual average PM_{10} as described in **Section 6.1**.

Table 6-5: NSW EPA contemporaneous assessment for ZOA receptors - maximum number of additional days in a year above 24-hour average criterion depending on background level at monitoring sites

Receptor ID	$PM_{2.5}$ analysis		PM_{10} analysis	
	2021	2024	2021	2024
170*^+	0	0	2	2
171*+	0	0	2	0
173^+	0	0	18	5
175^	0	0	17	2
176^+	0	0	63	5
177^#	0	0	39	6
N103*+	0	0	4	2
N105*+	0	0	6	2
N133+	0	0	2	2
N161*+	0	0	4	2
N172*+	0	0	5	2
N176*+	0	0	2	1
N177^	0	0	5	2
N88*+	0	0	6	2
N91*+	0	0	5	2

ZOA - * RCS for air; ^ RCN for noise; # RCN for air, + Other mine for air

6.4 Dust impacts on privately-owned land

As required by the VLAMP, the potential impacts due to the Project, extending over more than 25% of any privately-owned land, have been evaluated using the predicted pollutant dispersion contours.

The cumulative PM_{10} annual average impact due to the Project and other sources was used to represent the most impacting parameter. The contour presented in **Figure 6-5** defines the maximum extent of the cumulative PM_{10} annual average level for all years assessed of the Project.

The contour plot indicates that two landholdings are predicted to exceed the relevant acquisition criteria (N240 and N34-239).

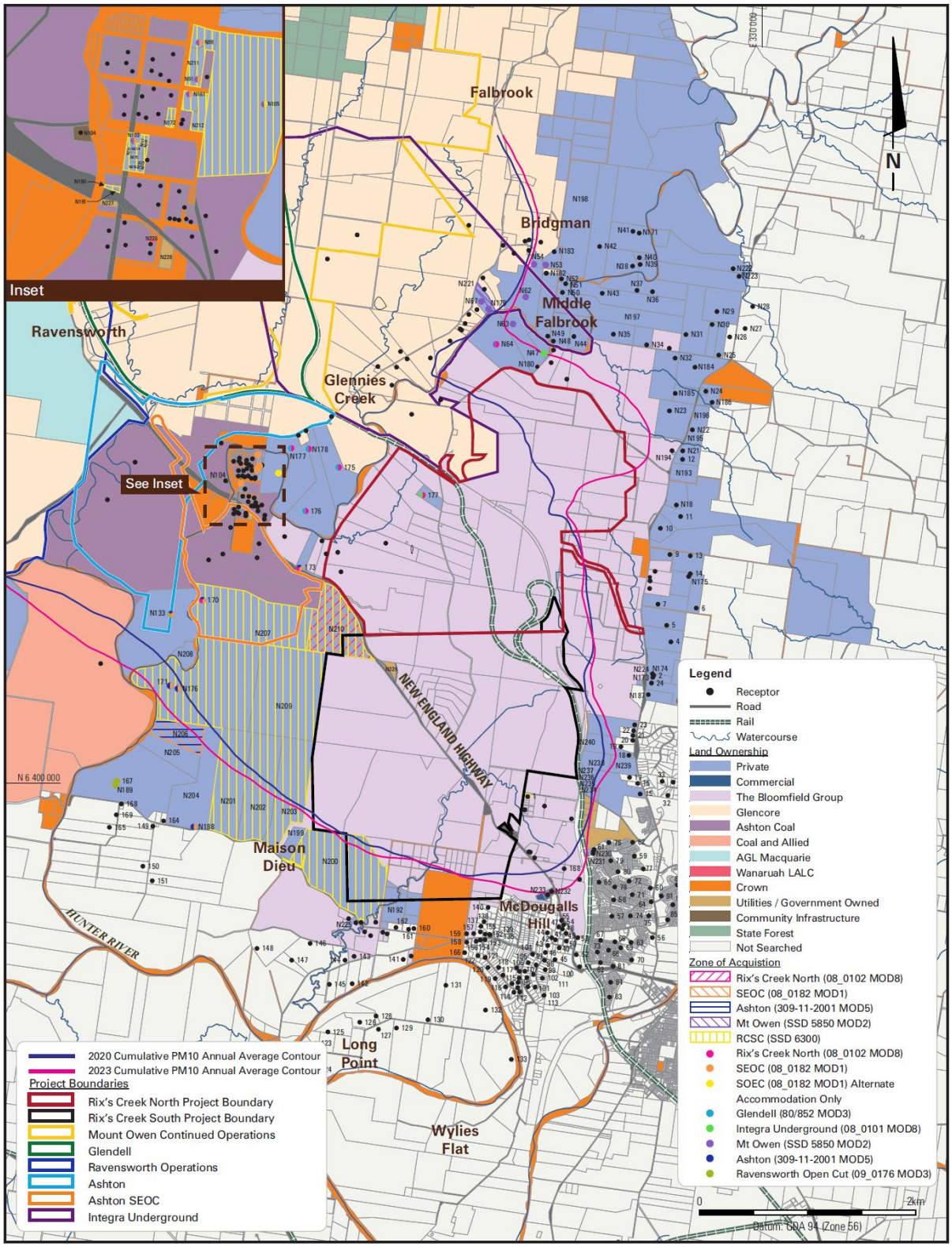

Figure 6-5: Cumulative PM_{10} annual average contours

7 DUST MITIGATION AND MANAGEMENT

The existing operations at RCN implement dust mitigation measures, including proactive and reactive management in accordance with the existing Air Quality Management Plan (AQMP) and the existing Blast Management Plan (BMP).

The dust mitigation measures implemented by the Project are commensurate with those outlined in the NSW EPA document, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*, prepared by Katestone Environmental (**Katestone Environmental, 2010**).

In addition to the dust mitigation measures, proactive and reactive operational dust mitigation strategies and management measures are implemented to minimise the potential for dust impacts during exploration activities and mining operations in the surrounding environment.

The air quality assessment for the Project predicts that there would be potential for exceedances of 24-hour average PM_{10} air quality criteria at some of the nearest surrounding privately-owned receptors due to the Project and background sources (including other mining operations). These exceedances would not be significant and are relatively infrequent (between one and up to three additional days).

Given this situation, the proactive and reactive operational dust mitigation strategies and management measures would be effective at minimising the potential for these exceedances to occur and would also assist with managing short-term visible or other such events.

The proactive system is primarily used as an alert of possible elevated dust levels allowing time to prepare and respond to any actual issues. The reactive system uses trigger levels applied to the real-time monitoring data to manage dust levels in real-time through scheduling of operations, modifying activity and temporarily ceasing operations.

The BMP outlines a range of management measures including (but not limited to) preventive measures, consideration of current weather conditions and predictive forecast models to minimise potential dust and fume impacts from blasting.

It is considered that the continued implementation of the AQMP and BMP management measures (as updated in the current plan revisions), including real-time controls with implementation of the best practice mitigation measures, would be suitable to manage potential air quality impacts from the Project.

8 GREENHOUSE GAS ASSESSMENT

The assessment aims to qualitatively estimate the predicted change in greenhouse gases associated with the Project, relative to the approved operations which were assessed in the *Air Quality Impact Assessment Integra Open Cut Project* (**Holmes Air Sciences, 2009**) and subsequent modifications.

The key changes proposed by MOD9 which can influence the amount of greenhouse gas emissions generated are identified as diesel use associated with the proposed increase of the final landform height of the Camberwell Pit overburden emplacement by an additional 15m and greenhouse gas emissions associated with the reduced ROM tonnage extracted for the period of the MOD9 assessment.

The change in final landform height would see a nominal increase in the travel distance for overburden to the emplacement area and dozer usage required in the shaping of the overburden emplacement area, requiring more diesel to be consumed. The increase in haul distance and dozer usage is not expected to be a significant increase when compared to the existing approved operations. In addition, the greenhouse gas assessment in the *Air Quality Impact Assessment Integra Open Cut Project* (**Holmes Air Sciences, 2009**) was based on a larger fleet than that proposed for the Project and any additional diesel requirements for MOD9 would already be accounted for in the approved mining operations.

The maximum tonnage of ROM coal proposed for MOD9 is 4.2 Mtpa, which is 16% lower than the maximum tonnage of coal (5Mtpa) assessed in the *Air Quality Impact Assessment Integra Open Cut Project* (**Holmes Air Sciences, 2009**) (refer to Table 27). The proposed reduction in ROM coal extracted would also result in a reduction in the diesel required for transport.

On the basis of the estimated Scope 1 greenhouse gas emissions for the approved operations, the proposed reduction in the amount of ROM coal extracted is equivalent to a reduction of 36,400 tonnes per year of CO_2-e compared to the approved project.

Scope 2 and 3 emissions will consequentially be less than those assessed for the approved operations.

Overall, the additional hauling associated with the increase in height for the overburden emplacement and dozer requirements would be offset by the reduced ROM extraction and therefore the greenhouse gas emissions for the Project would be less than that of the approved operations.

9 SUMMARY AND CONCLUSIONS

This study has examined the air quality impacts and greenhouse gas emissions which may arise from the site including the proposed additional overburden emplacement at RCN, and the effect of recent and proposed changes in nearby other mining operations.

The assessment finds that one privately-owned receptor (Receptor N180) would be impacted by the Project in the 2024 scenario. Receptor N180 is a community hall. The assessment also found that impacts would occur at a number of mine-owned receptors and already impacted receptors in current zones of acquisition.

Up to 16 ZOA receptors are predicted to exceed the relevant criteria for the assessed dust metrics in 2021 and up to 19 ZOA receptors in 2024. These receptors are already identified in the acquisition zone of mine operations and are impacted regardless of the Project. Of the impacted ZOA receptors, there are seven ZOA receptors (Receptors 170, 173, 175, 176, N64, N177 and N178) which are afforded acquisition rights under PA 08_0102 due to noise impacts and would additionally be impacted above the VLAMP acquisition criteria for air quality.

The modelling predictions in **Figure 6-5** indicate the privately-owned vacant blocks N234-N240 owned by two landowners would experience dust impacts on more than 25% of the land.

The change in the approved number of blast events per day would provide increased opportunity to blast during the most favourable weather conditions and is not expected to influence the overall dust impacts from blasting.

The greenhouse gas assessment indicates that relative to the estimated greenhouse gas emissions for the approved operations, MOD9 is likely to generate less emissions than already approved.

Overall, the assessment shows that the Project would not significantly alter the air quality impacts in the surrounding area.

10 REFERENCES

Bureau of Meteorology (2019)

Climate Averages Australia, Bureau of Meteorology website. August 2019. <http://www.bom.gov.au/climate/averages>

ERM (2009)

"Integra Underground Coal Project Air Quality Assessment", prepared for Integra Coal Operations Pty Ltd by ERM, June 2009.

Holmes Air Sciences (2009)

"Air Quality Impact Assessment Integra Open Cut Project", prepared for URS Australia Pty Ltd on behalf of Integra Coal by Holmes Air Sciences, June 2009.

Jacobs (2018)

"Mount Owen Continued Operations Modification 2 Air Quality Impact Assessment", prepared for Mt Owen Pty Limited by Jacobs, July 2018.

Jacobs (2019)

"Glendell Mine Modification 4 Air Quality Impact Assessment", prepared for Mt Owen Pty Ltd by Jacobs, May 2019.

Katestone Environmental Pty Ltd (2010)

"NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining", Katestone Environmental Pty Ltd prepared for DECCW, 2010.

National Pollutant Inventory (2012)

"Emission Estimation Technique Manual for Mining Version 3.1", National Pollutant Inventory, January 2012.

New South Wales Environment Protection Authority (2014)

"NSW Coal Mining Benchmarking Study Best-practice measures for reducing non-road diesel exhaust emissions", December 2014.

New South Wales Environment Protection Authority (2017)

"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", January 2017.

New South Wales Government (2018)

"Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments", NSW Government, September 2018.

PAEHolmes (2009)

"Air Quality Impact Assessment Ashton South East Open Cut Mine", prepared for Wells Environmental Services for Ashton Coal Operations by PAEHolmes, October 2009.

PAEHolmes (2010)

"Air Quality Impact Assessment Ravensworth Operations Project", prepared for Umwelt (Australia) Pty Limited by PAEHolmes, January 2010.

RCM (2019)

"Air Quality & Greenhouse Gas Management Plan – Rix's Creek Mine", Rix's Creek Mine, July 2019

Todoroski Air Sciences (2015)

"Air Quality and Greenhouse Gas Assessment Rix's Creek South Continuation of Mining Project", prepared for Rix's Creek Mine by Todoroski Air Sciences, August 2015.

Todoroski Air Sciences (2018)

"Rix's Creek South Continuation Project – Trade-off Scenarios for the Independent Planning Commission of NSW", prepared for the Bloomfield Group by Todoroski Air Sciences, November 2011.

TRC Environmental Corporation (2011)

"Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'", Prepared for the NSW Office of Environment and Heritage by TRC Environmental Corporation.

United States Environmental Protection Agency (1985 and updates)

"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

Xstrata Coal (2012)

"Mt Owen Complex Annual Environmental Management Report, 1 January 2012 – 31 December 2012", prepared by Xstrata Coal Mount Owen Complex, March 2013.

Appendix A

Receptor locations

Table A-1: Receptor locations

Receptor ID	x	y	Owner status	Receptor ID	x	y	Owner status
1	325644	6399747	ZOA – Air (other mine)	177	323690	6405337	ZOA – Air
2	327976	6401989	Private	N103	320324	6405556	ZOA – Air (other mine)
3	328732	6402211	Private	N105	321021	6405747	ZOA – Air (other mine)
4	328302	6402615	Private	N133	319024	6403130	ZOA – Air (other mine)
5	328222	6402921	Private	N161	320623	6405805	ZOA – Air (other mine)
6	328773	6403242	Private	N171	327714	6410196	Private
7	328060	6403313	Private	N172	320519	6405648	ZOA – Air (other mine)
8	327912	6403817	Mine	N173	327965	6401960	Private
9	328282	6404237	Private	N174	327984	6401996	Private
10	328107	6404722	Private	N175	328630	6403829	Private
11	328480	6404941	Private	N176	319154	6401750	ZOA – Noise (other mine)
12	328518	6406000	Private	N177	321255	6406207	ZOA – Noise
13	328662	6404211	Private	N178	321580	6406192	ZOA – Noise
14	328661	6403877	Private	N179	324919	6408789	Private
15	327732	6399796	Private	N18	328404	6405153	Private
16	327685	6399992	Private	N180	325821	6407717	Community
17	327534	6400104	Private	N181	326125	6408026	Community
18	327521	6400513	Private	N183	326135	6409850	Private
19	327374	6400674	Private	N184	328747	6407708	Private
20	327592	6400791	Private	N185	328382	6407222	Private
21	327596	6400878	Private	N186	329067	6407057	Private
22	327612	6400970	Private	N187	327882	6401640	Private
23	327628	6401078	Private	N188	319446	6399186	ZOA – Noise (other mine)
24	327942	6401851	Private	N189	317993	6399960	ZOA – Air (other mine)
25	328931	6399102	Private	N20	328323	6406162	Mine
26	328789	6399293	Private	N21	328521	6406159	Private
27	328522	6400109	Private	N22	328701	6406549	Private
28	328803	6399500	Private	N222	329426	6409536	Private
29	328951	6399546	Private	N223	329531	6409402	Private
30	329025	6399354	Private	N23	328273	6406899	Private
31	328530	6399855	Private	N24	328949	6407263	Private
32	328245	6399771	Private	N25	329190	6407935	Private
33	328140	6400031	Private	N26	329392	6408270	Private
34	328343	6400014	Private	N27	329678	6408425	Private
35	328657	6399634	Private	N28	329819	6408833	Private
36	328721	6399984	Private	N29	329155	6408739	Private
37	328500	6399744	Private	N30	329066	6408500	Private
38	328821	6400065	Private	N31	328580	6408315	Private
39	328702	6400101	Private	N32	328378	6407875	Private
40	326227	6396946	Private	N34	327852	6408124	Private
41	326160	6397091	Private	N35	327234	6408320	Private

Receptor ID	x	y	Owner status	Receptor ID	x	y	Owner status
42	326090	6397129	Private	N36	327959	6409108	Private
43	326015	6396985	Private	N37	327672	6409133	Private
44	326009	6397223	Private	N38	327589	6409583	Private
45	326150	6396727	Private	N39	327731	6409613	Private
46	325971	6396857	Private	N40	327715	6409738	Private
47	326220	6397330	Private	N41	327596	6410229	Private
48	326290	6397292	Private	N42	326977	6409946	Private
49	326355	6397211	Private	N43	327025	6409079	Private
50	326360	6397068	Private	N44	326501	6408277	Private
51	326607	6396595	Private	N47	325946	6407965	ZOA – Air (other mine)
52	326547	6396819	Private	N48	326121	6408190	Private
53	326573	6397130	Private	N49	326016	6408285	Private
54	326309	6397372	Private	N50	326289	6409093	Private
55	326269	6397452	Private	N51	326349	6409257	Private
56	327957	6397132	Private	N52	326270	6409347	Private
57	327207	6397529	Private	N53	325976	6409608	ZOA – Noise (other mine)
58	327238	6397833	Private	N54	325761	6409621	ZOA – Noise (other mine)
59	327624	6398641	Private	N62	325608	6409009	ZOA – Air (other mine)
60	327919	6398052	Private	N63	325370	6408508	ZOA – Air (other mine)
61	326876	6398765	Private	N64	325055	6408133	ZOA - Noise
62	327589	6398900	Private	N67	324784	6408927	ZOA – Air (other mine)
63	327561	6397043	Private	N88	320638	6406088	ZOA – Air (other mine)
64	327937	6397797	Private	N91	320667	6405878	ZOA – Air (other mine)
65	326968	6398160	Private	M1	323010	6404446	Mine
66	327144	6396899	Private	M2	322178	6403916	Mine
67	326997	6397083	Private	M3	320658	6404437	Mine
68	327262	6397056	Private	M4	319988	6404246	Mine
69	327371	6396943	Private	M5	319723	6404137	Mine
70	327573	6396718	Private	M6	322321	6397484	Mine
71	327586	6397927	Private	M7	322552	6397416	Mine
72	327523	6398180	Private	M8	322617	6397241	Mine
73	326937	6396865	Private	M9	322824	6397417	Mine
74	327550	6397535	Private	M10	322729	6397168	Mine
75	327891	6397537	Private	M11	322954	6397232	Mine
76	327151	6398894	Private	M12	323035	6397202	Mine
77	327791	6398406	Private	M13	323482	6396792	Mine
78	327258	6398071	Private	M14	326608	6398212	Mine
79	327187	6398558	Private	M15	325771	6398612	Mine
80	327321	6398354	Private	M16	325692	6398717	Mine
81	327227	6396603	Private	M17	326455	6399334	Mine
82	326992	6396668	Private	M18	325593	6399501	Mine
83	327165	6396029	Private	M19	325955	6399570	Mine

Receptor ID	x	y	Owner status	Receptor ID	x	y	Owner status
84	327183	6396306	Private	M20	327921	6403311	Mine
85	328241	6397462	Private	M21	327916	6403747	Mine
86	328643	6397802	Private	M22	328007	6403925	Mine
87	328546	6397528	Private	M23	324552	6408686	Mine
88	328999	6398136	Private	M24	320256	6405017	Mine
89	328422	6398107	Private	M25	320414	6404954	Mine
90	328337	6397742	Private	M26	320758	6404893	Mine
91	328124	6397905	Private	M27	323491	6406834	Mine
92	328913	6398413	Private	172	321904	6404248	Mine
93	328971	6397533	Private	174	321134	6404567	Mine
94	328580	6398401	Private	N100	320279	6405792	Mine
95	328628	6398125	Private	N101	320187	6405962	Mine
96	325467	6396301	Private	N102	320276	6405691	Mine
97	325957	6396711	Private	N107	321825	6404486	Mine
98	325800	6396627	Private	N108	322119	6404278	Mine
99	325969	6396537	Private	N113	320766	6404964	Mine
100	325749	6396453	Private	N114	320637	6405043	Mine
101	325781	6396216	Private	N115	320607	6405137	Mine
102	325917	6396380	Private	N116	320597	6405199	Mine
103	325945	6396064	Private	N117	320569	6405285	Mine
104	325736	6396824	Private	N118	320470	6405312	Mine
105	325653	6396669	Private	N119	320357	6405316	Mine
106	325437	6396572	Private	N120	320519	6405140	Mine
107	325592	6396509	Private	N121	320417	6405003	Mine
108	325490	6396507	Private	N122	320279	6405118	Mine
109	325629	6396394	Private	N123	320196	6405075	Mine
110	325483	6396385	Private	N124	320284	6404999	Mine
111	325647	6396221	Private	N125	320414	6404955	Mine
112	325498	6396125	Private	N126	320188	6404991	Mine
113	325461	6396206	Private	N127	320132	6404735	Mine
114	325387	6396119	Private	N129	320623	6404174	Mine
115	325352	6396278	Private	N134	318359	6405949	Mine
116	325234	6396219	Private	N135	317847	6405252	Mine
117	325184	6396438	Private	N136	317720	6402213	Mine
118	325104	6396577	Private	N140	325571	6399502	Mine
119	325041	6396375	Private	N141	325665	6398724	Mine
120	324907	6396579	Private	N155	320710	6405153	Mine
121	324854	6396765	Private	N156	320631	6405122	Mine
122	324721	6396796	Private	N157	320568	6405131	Mine
123	321710	6395169	Private	N158	320545	6405137	Mine
124	321707	6394687	Private	N159	320458	6405213	Mine
125	321936	6395384	Private	N160	320399	6405451	Mine

Receptor ID	x	y	Owner status	Receptor ID	x	y	Owner status
126	322527	6395565	Private	N162	320458	6405694	Mine
127	322876	6395434	Private	N163	320353	6405694	Mine
128	322832	6395679	Private	N164	320717	6405892	Mine
129	323209	6395456	Private	N165	320515	6405871	Mine
130	323794	6395609	Private	N166	320470	6405903	Mine
131	324125	6396249	Private	N167	320428	6405985	Mine
132	324862	6395790	Private	N168	320288	6405965	Mine
133	325339	6394874	Private	N169	320320	6405921	Mine
134	321192	6394797	Private	N182	325988	6409453	Mine
135	321270	6394970	Private	N33	328271	6408060	Mine
136	324944	6397183	Private	N45	326371	6407486	Mine
137	324778	6397345	Private	N46	326080	6407792	Mine
138	324833	6397429	Private	N55	325887	6410028	Mine
139	324936	6397191	Private	N56	325666	6409875	Mine
140	324910	6397692	Private	N57	325672	6410068	Mine
141	323334	6396730	Private	N58	325596	6410046	Mine
142	322385	6396279	Private	N59	325188	6409968	Mine
143	322423	6396785	Private	N60	324551	6410338	Mine
144	322254	6396714	Private	N61	325389	6409820	Mine
145	321965	6396265	Private	N65	324814	6409366	Mine
146	321606	6397025	Private	N66	324841	6409154	Mine
147	321265	6396714	Private	N68	324703	6408777	Mine
148	320621	6396932	Private	N70	324484	6408519	Mine
149	318687	6399196	Private	N71	324391	6408417	Mine
150	318503	6398457	Private	N72	324416	6408395	Mine
151	318677	6398187	Private	N73	324204	6408194	Mine
152	324855	6397195	Private	N74	322480	6410162	Mine
153	324853	6397094	Private	N75	321928	6409716	Mine
154	324764	6397088	Private	N76	323837	6407878	Mine
155	324765	6397237	Private	N77	324031	6407105	Mine
156	324686	6397065	Private	N79	323405	6407862	Mine
157	324643	6397208	Private	N80	323284	6407999	Mine
158	324511	6397046	Private	N81	323212	6407709	Mine
159	324511	6397206	Private	N82	323125	6407375	Mine
160	323531	6397301	Private	N83	322862	6407720	Mine
161	323433	6397286	Private	N84	322003	6406792	Mine
162	323200	6397319	Private	N85	321533	6406528	Mine
163	322455	6397410	Private	N86	321390	6406444	Mine
164	318885	6399294	Private	N89	319956	6406300	Mine
165	317882	6399179	Private	N90	320537	6406013	Mine
166	324474	6396855	Private	N92	320297	6406023	Mine
167	318017	6400033	ZOA – Air (other mine)	N93	320423	6405924	Mine

Receptor ID	x	y	Owner status	Receptor ID	x	y	Owner status
168	318103	6399610	Private	N94	320434	6405829	Mine
169	318012	6399409	Private	N95	320526	6405794	Mine
170	319612	6403390	ZOA – Noise	N96	320588	6405664	Mine
171	319005	6401802	ZOA – Air (other mine)	N97	320581	6405643	Mine
173	321408	6403987	ZOA – Noise	N98	320393	6405674	Mine
175	322136	6405853	ZOA – Noise	N99	320372	6405789	Mine
176	321519	6405042	ZOA – Noise				

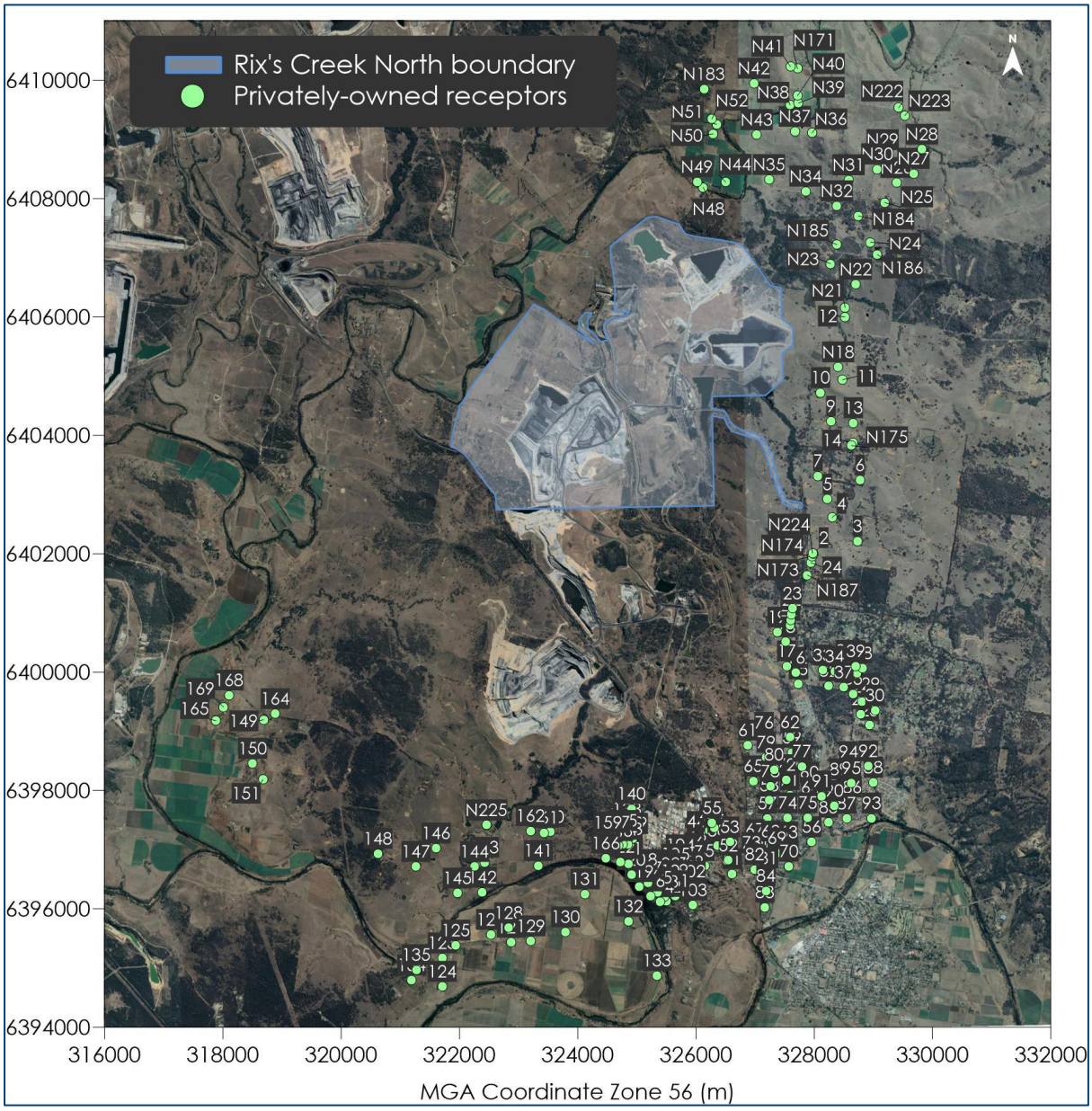

Figure A-1: Privately-owned receptors

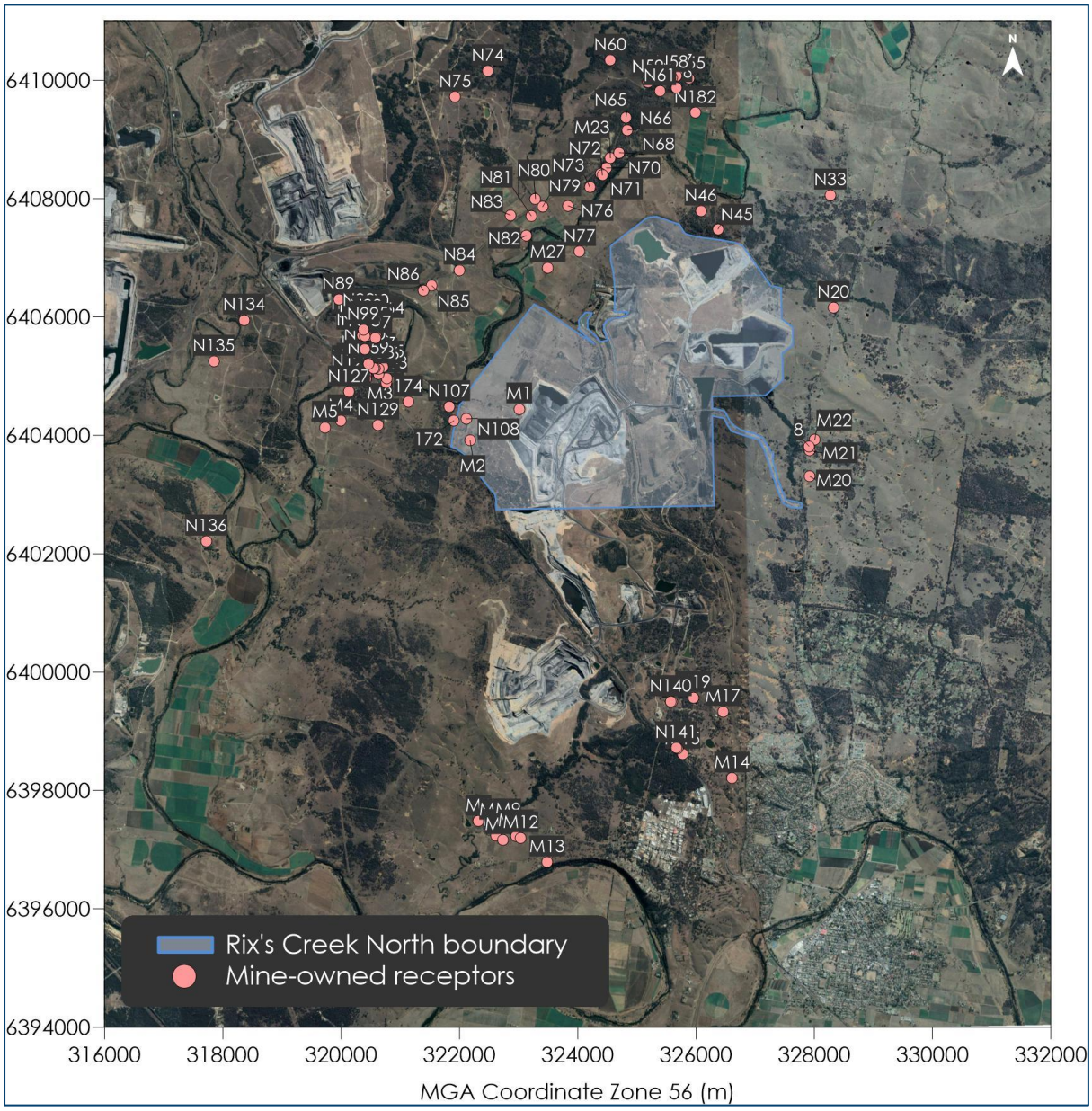

Figure A-2: Mine-owned receptors

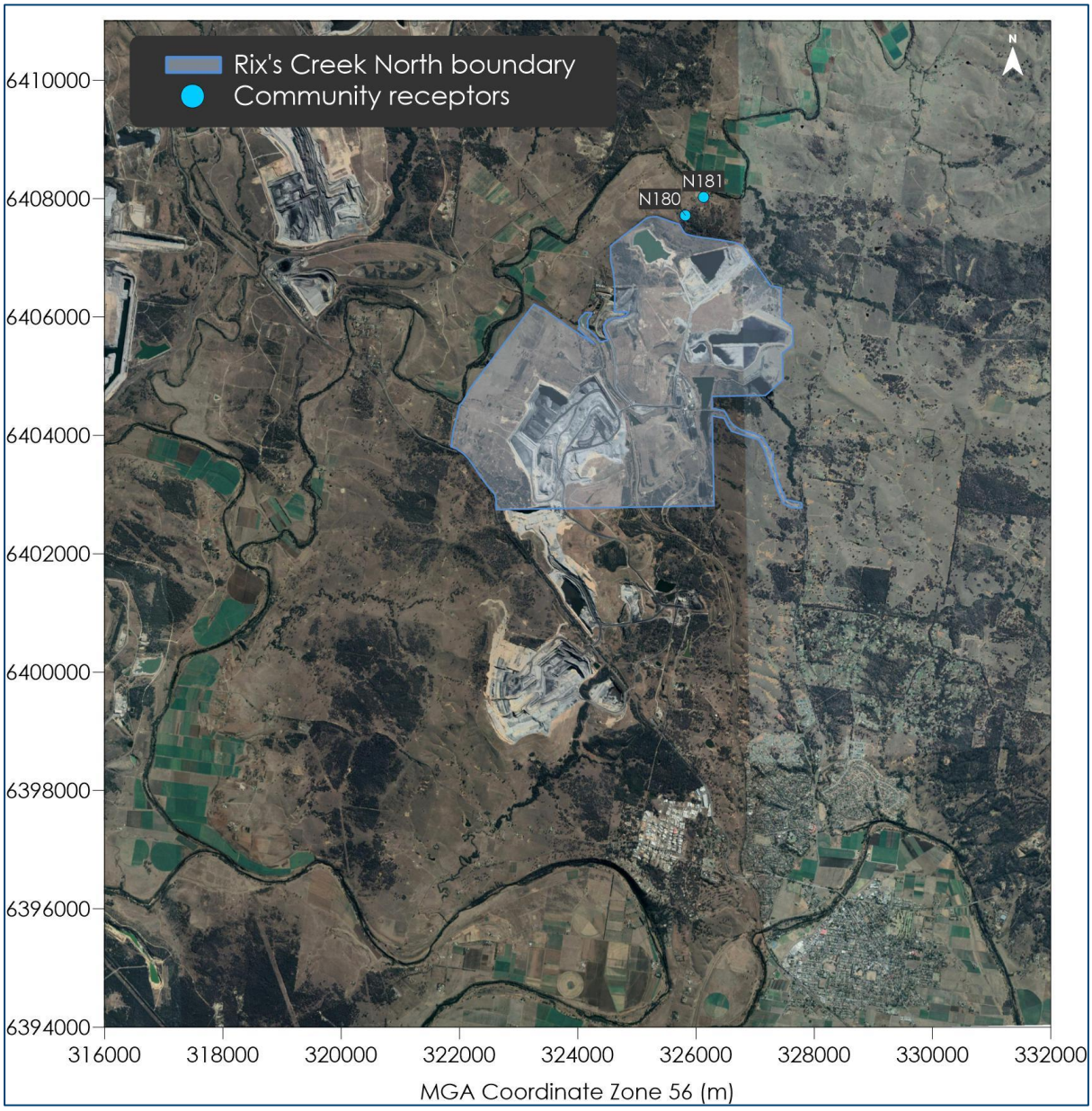

Figure A-3: Community receptors

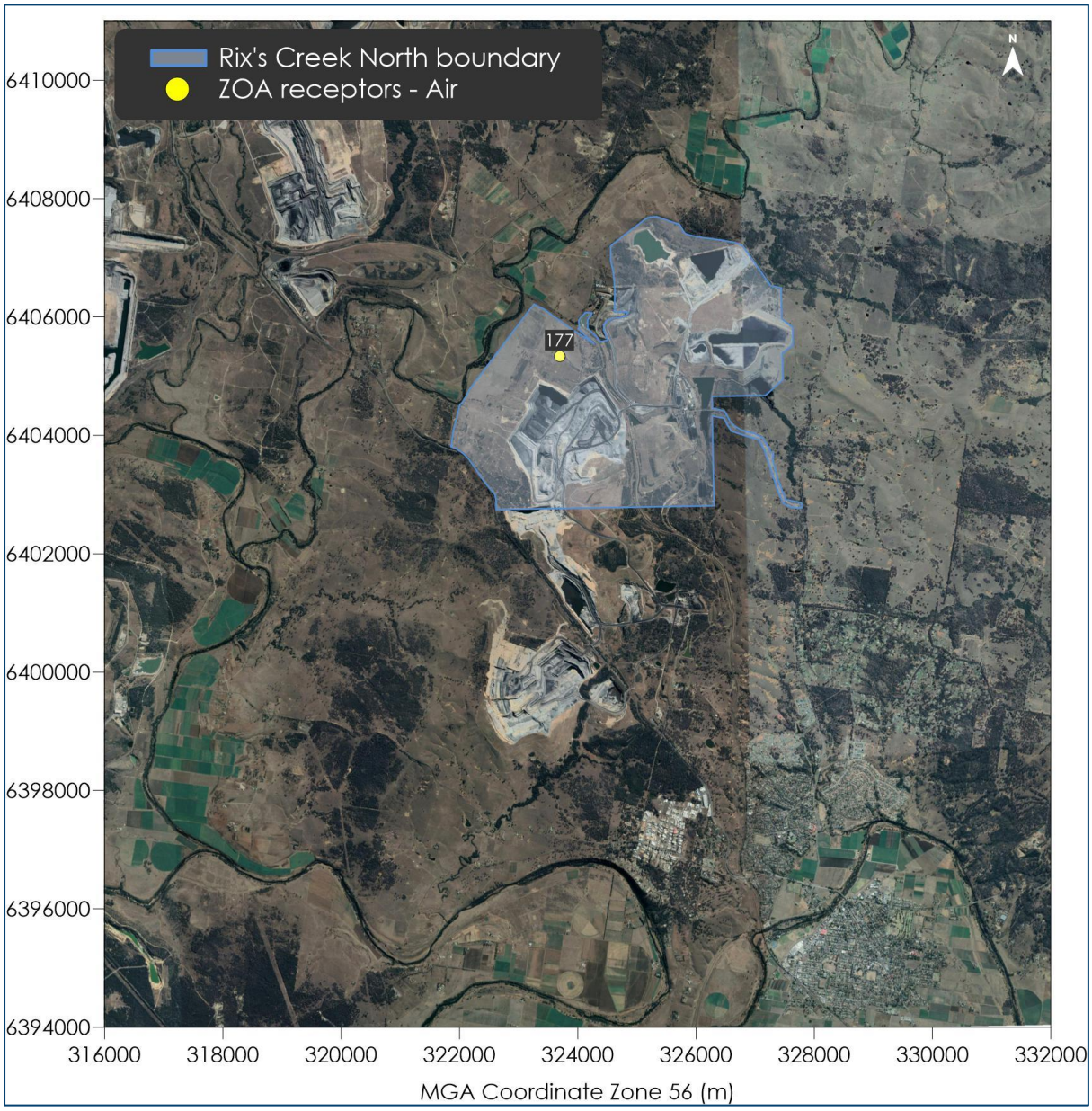

Figure A-4: ZOA receptors - Air

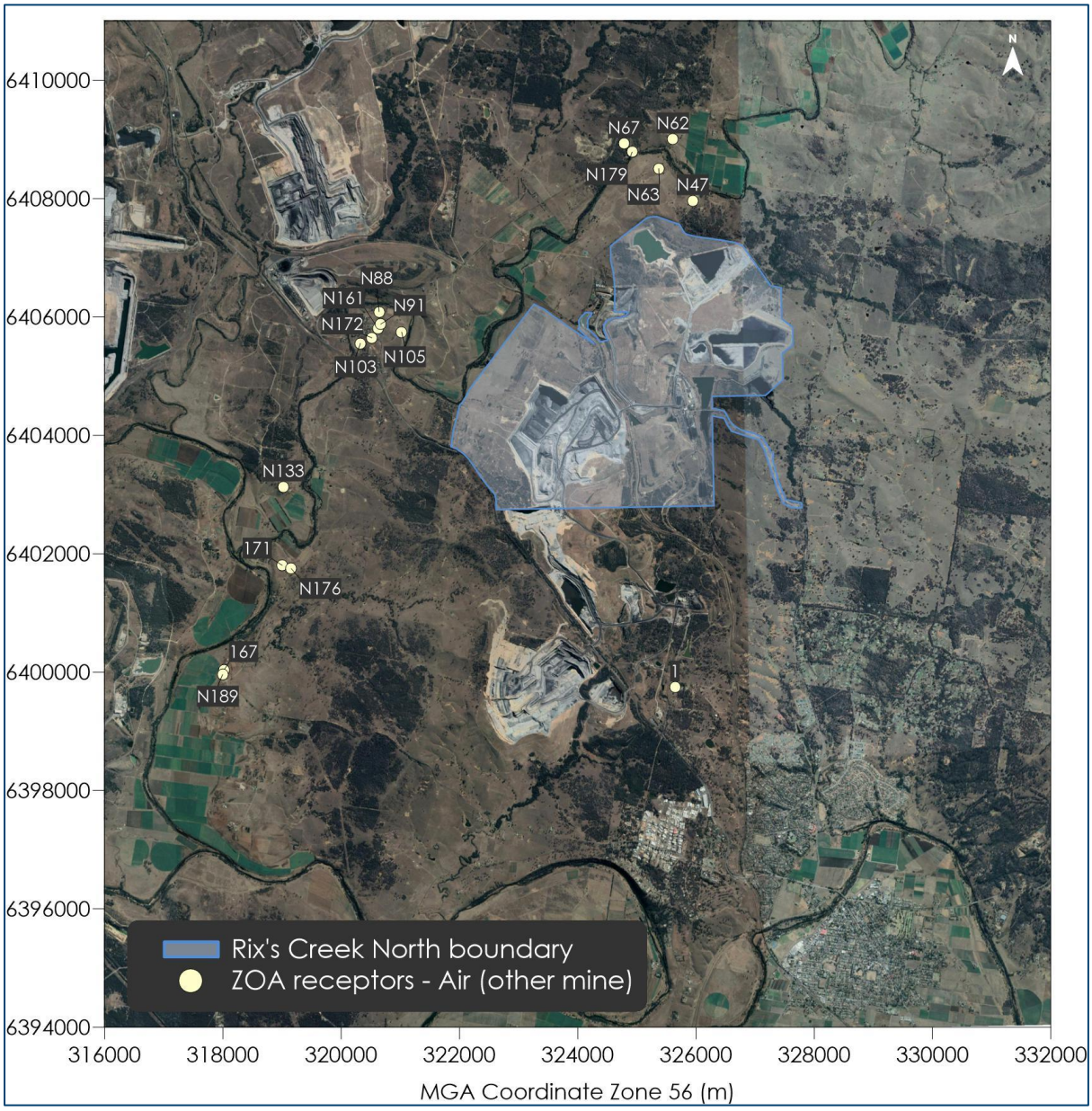

Figure A-5: ZOA receptors – Air (other mine)

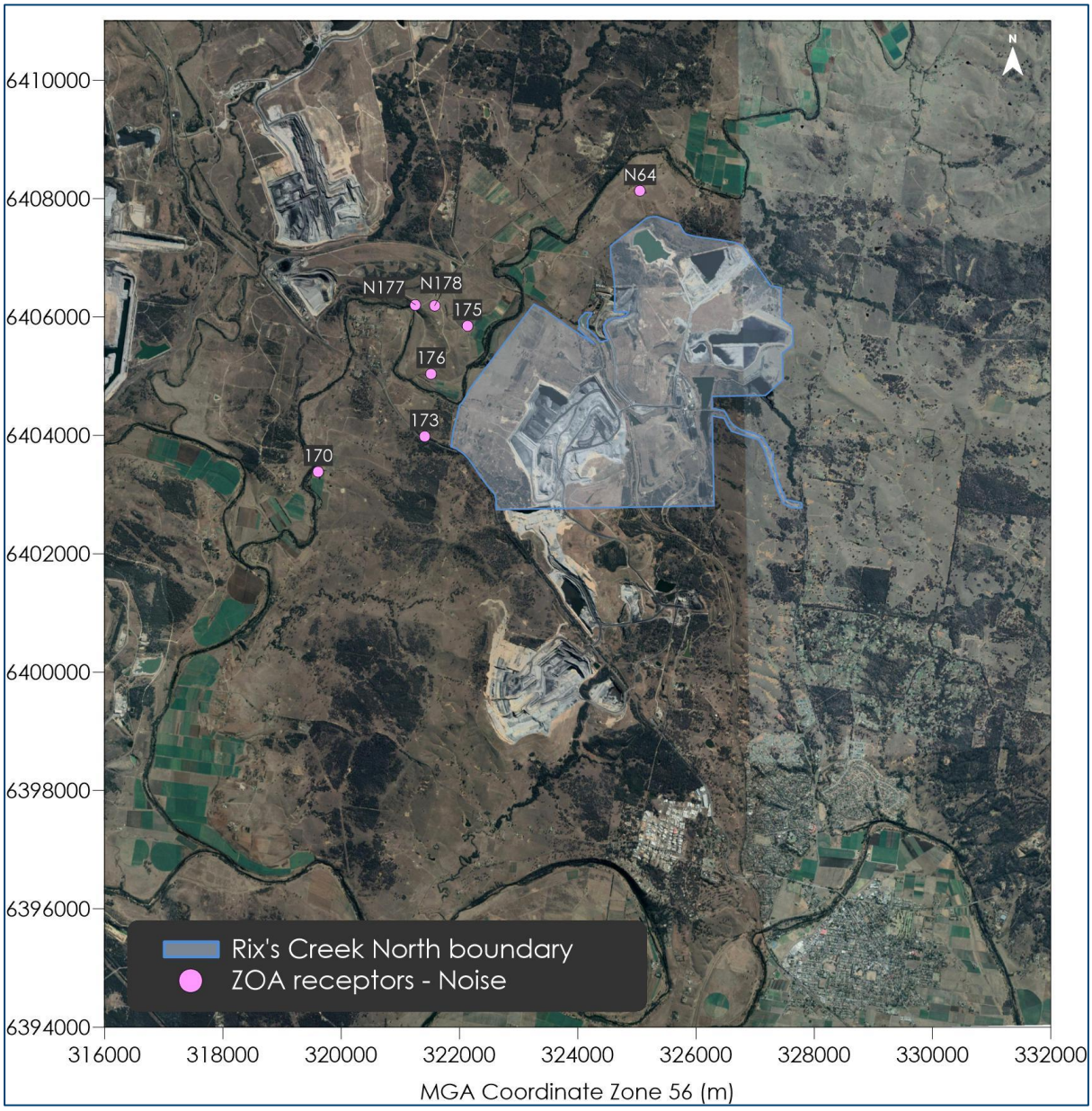

Figure A-6: ZOA receptors – Noise

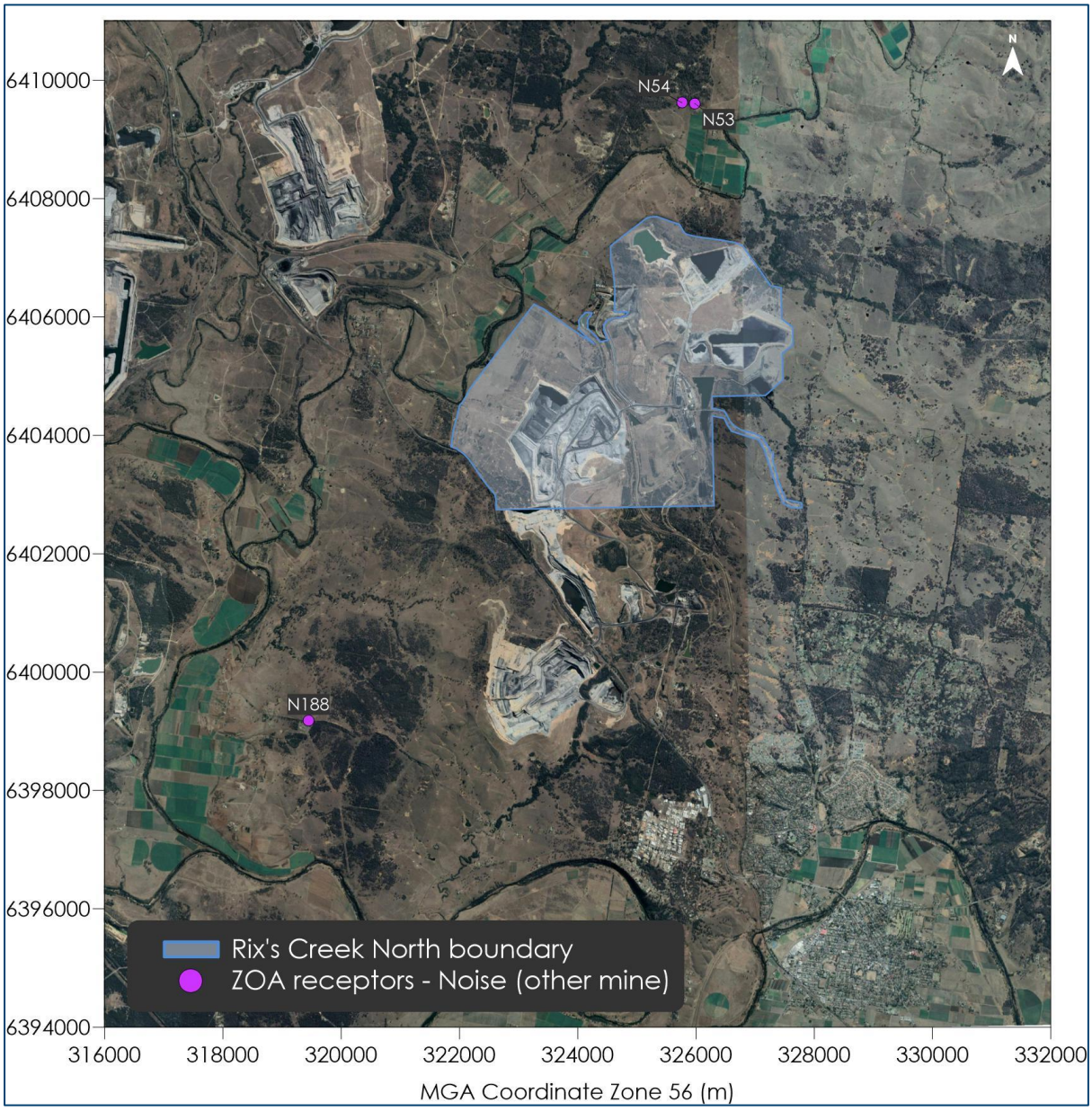

Figure A-7: ZOA receptors – Noise (other mine)

Appendix B

Emission Calculation

Emission Calculation

The mining schedule and mine plan designs provided by the Proponent have been combined with emissions factor equations that relate to the quantity of dust emitted from particular activities based on intensity, the prevailing meteorological conditions, and composition of the material being handled.

Emission factors and associated controls have been sourced from the United States Environmental Protection Agency (US EPA) AP42 Emission Factors (**US EPA, 1985 and Updates**), the National Pollutant Inventory (NPI) document *Emission Estimation Technique Manual for Mining, Version 3.1* (**NPI, 2012**) and the New South Wales Environmental Protection Authority document, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*, prepared by Katestone Environmental (**Katestone Environmental, 2010**).

The emission factor equations used for each dust generating activity are outlined in **Table C-1** below. Detailed emission inventories for each scenario are presented in **Table C-2** to **Table C-4**.

Control factors include the following:

- Hauling on unpaved surfaces – 85% control for watering of trafficked areas.
- Drilling – 70% control for dust suppression.
- Unloading Run-of-mine (ROM) to hopper at the Coal Handling Preparation Plant (CHPP) – 50% control for use of fogging sprays.
- Wind erosion from ROM and product stockpiles – 50% for watering.

Air emissions associated with the operation of the diesel powered equipment have been estimated based on the number of equipment, power rating, hours of operation and emission factors sourced from the NSW EPA document *NSW Coal Mining Benchmarking Study Best-practice measures for reducing non-road diesel exhaust emissions* (**NSW EPA, 2014**).

Table B-1: Emission factor equations

Activity	Emission factor equation		
	TSP	PM_{10}	$PM_{2.5}$
Drilling	$EF = 0.59\ kg/hole$	$0.52 \times TSP$	$0.03 \times TSP$
Blasting	$EF = 0.00022 \times A^{15}\ kg/hole$	$0.52 \times TSP$	$0.03 \times TSP$
Loading / emplacing overburden & loading product coal to stockpile & loading product coal to train	$EF = 0.74 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right)\ kg/tonne$	$EF = 0.35 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right)\ kg/tonne$	$EF = 0.053 \times 0.0016 \times \left(\frac{U}{2.2}^{1.3} / \frac{M^{1.4}}{2}\right)\ kg/tonne$
Hauling on unsealed surfaces	$EF = \left(\frac{0.4536}{1.6093}\right) \times 4.9 \times (s/12)^{0.7} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 1.5 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$	$EF = \left(\frac{0.4536}{1.6093}\right) \times 0.15 \times (s/12)^{0.9} \times (1.1023 \times M/3)^{0.45}\ kg/VKT$
Dozers on overburden	$EF = 2.6 \times \frac{s^{1.2}}{M^{1.3}}\ kg/hour$	$EF = 0.45 \times \frac{s^{1.5}}{M^{1.4}} \times 0.75\ kg/hour$	$EF = 0.45 \times \frac{s^{1.5}}{M^{1.4}} \times 0.105\ kg/hour$
Dozers on coal	$EF = 35.6 \times \frac{s^{1.2}}{M^{1.4}}\ kg/hour$	$EF = 8.44 \times \frac{s^{1.5}}{M^{1.4}} \times 0.75\ kg/hour$	$EF = 8.44 \times \frac{s^{1.5}}{M^{1.4}} \times 0.022\ kg/hour$
Loading / emplacing coal	$EF = \frac{0.58}{M^{1.2}}\ kg/tonne$	$EF = \frac{0.0596}{M^{0.9}} \times 0.75\ kg/tonne$	$EF = \frac{0.0596}{M^{0.9}} \times 0.019\ kg/tonne$
Wind erosion on exposed areas & conveyors	$EF = 850\ kg/ha/year$	$0.5 \times TSP$	$0.075 \times TSP$
Grading roads	$EF = 0.0034 \times sp^{2.5}\ kg/VKT$	$EF = 0.0056 \times sp^{2.0} \times 0.6\ kg/VKT$	$EF = 0.0056 \times sp^{2.0} \times 0.031\ kg/VKT$

EF = emission factor, A = area of blast (m^2), U = wind speed (m/s), M = moisture content (%), s = silt content (%), VKT = vehicle kilometres travelled (km), sp = speed of grader (km/h), kg = kilogram, ha = hectares, w = weight (tonnes).

Table B-2: Emission inventory – 2020

	Activity	TSP emission	PM10 emission	PM25 emission	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4 - TSP / PM10 / PM2.5	Units	Variable 5	Units	Variable 6	Units
	OB - Dozers stripping topsoil	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Loading topsoil to haul truck	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling topsoil to Emplacement area	-	-	-	-	t/yr	0.0000	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	-	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing topsoil at emplacement area	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Drilling	13,384	6,960	402	75,616	holes/year	0.59	0.31	0.02	kg/hole											70	% Control
	OB - Blasting	45,760	23,795	1,373	208	blasts/year	220	114.4	6.6	kg/blast	10,000	Area of blast m²										
	OB - Loading OB to haul truck	63,345	29,961	4,537	46,776,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling OB to Emplacement area	720,722	155,196	15,520	46,776,000	t/yr	0.103	0.0221	0.0022	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.1	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing OB at emplacement area	63,345	29,961	4,537	46,776,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Dozers on OB	117,147	28,309	12,300	7,000	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Dozers on rehab	33,471	8,088	3,514	2,000	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	CL - Dozers ripping/pushing/clean-up	139,479	33,600	3,069	5,833	hr/yr	23.9	5.8	0.5	kg/h	5	S.C. (%)	6	M.C. (%)								
	CL - Loading ROM coal to haul truck	283,724	37,430	5,391	4,200,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CL - Hauling to ROM hopper at RCS	67,933	14,628	1,463	4,200,000	t/yr	0.108	0.0232	0.0023	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.4	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	WE - Overburden emplacement areas	144,190	72,095	10,814	164.6	ha	876	438.00	65.700	kg/ha/year												
Camberwell	WE - Open pit	22,680	11,340	1,701	25.9	ha	876	438.00	65.700	kg/ha/year												
	OB - Dozers stripping topsoil	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Loading topsoil to haul truck	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling topsoil to Emplacement area	-	-	-	-	t/yr	0.000	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	-	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing topsoil at emplacement area	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Drilling	-	-	-	-	holes/year	0.59	0.31	0.02	kg/hole											70	% Control
	OB - Blasting	-	-	-	-	blasts/year	220	114.4	6.6	kg/blast	10,000	Area of blast m²										
	OB - Loading OB to haul truck	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling OB to Emplacement area	-	-	-	-	t/yr	0.000	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	-	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing OB at emplacement area	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Dozers on OB	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Dozers on rehab	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	CL - Dozers ripping/pushing/clean-up	-	-	-	-	hr/yr	23.9	5.8	0.5	kg/h	5	S.C. (%)	6	M.C. (%)								
	CL - Loading ROM coal to haul truck	-	-	-	-	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CL - Hauling to ROM hopper at RCS	-	-	-	-	t/yr	-	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	-	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	WE - Overburden emplacement areas	-	-	-	-	ha	876	438.00	65.700	kg/ha/year												
Falbrook	WE - Open pit	-	-	-	-	ha	876	438.00	65.700	kg/ha/year												
	WE - Unshaped overburden	57,360	28,680	4,302	65.5	ha	876	438.00	65.700	kg/ha/year												
	CL - Loading Underground ROM coal to haul tru	188,474	24,864	3,581	2,790,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CHPP - Hauling Underground ROM to ROM hop	41,967	9,037	904	2,790,000	t/yr	0.100	0.0216	0.0022	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.0	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	CHPP - Unloading ROM to hopper	94,237	12,432	1,790	2,790,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)									50	% Control
	CHPP - Rehandle ROM at hopper	9,424	1,243	179	279,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)									50	% Control
	CHPP - Loading Product coal to stockpile	285	135	20	2,000,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	CHPP - Loading Product coal to train	285	135	20	2,000,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	CHPP - Loading rejects	112	53	8	790,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	CHPP - Hauling rejects	14,484	3,119	312	790,000	t/yr	0.122	0.0263	0.0026	kg/t	177	tonnes/load	229	Vehicle gross (t)	7.3	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	CHPP - Unloading rejects	112	53	8	790,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	WE - ROM stockpiles	876	438	66	2.0	ha	876	438.00	65.700	kg/ha/year											50	% Control
Underground	WE - Product stockpiles	3,504	1,752	263	8.0	ha	876	438.00	65.700	kg/ha/year											50	% Control
	Grading roads	47,445	16,577	1,471	77,088	km	0.62	0.22	0.02	kg/VKT	8	speed of graders in km/h										
	Diesel	21,221	21,221	20,584																		
	Total emissions (kg/yr)	**2,173,746**	**549,881**	**98,129**																		

Table B-3: Emission inventory – 2023

	ACTIVITY	TSP emission (kg/year)	PM10 emission (kg/y)	PM25 emission (kg/y)	Intensity	Units	Emission Factor - TSP	Emission Factor - PM10	Emission Factor - PM25	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4 - TSP / PM10 / PM2.5	Units	Variable 5	Units	Variable 6	Units
Camberwell	OB - Dozers stripping topsoil	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Loading topsoil to haul truck	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling topsoil to Emplacement area	-	-	-	-	t/yr	0.000	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	0.0	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing topsoil at emplacement area	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Drilling	13,384	6,960	402	75,616	holes/year	0.59	0.31	0.02	kg/hole											70	% Control
	OB - Blasting	45,760	23,795	1,373	208	blasts/year	220	114.4	6.6	kg/blast	10,000	Area of blast m²										
	OB - Loading OB to haul truck	40,367	19,092	2,891	29,808,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling OB to Emplacement area	381,007	82,307	8,231	29,808,000	t/yr	0.085	0.0184	0.0018	kg/t	177	tonnes/load	229	Vehicle gross (t)	5.0	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing OB at emplacement area	40,367	19,092	2,891	29,808,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Dozers on OB	117,147	28,309	12,300	7,000	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Dozers on rehab	33,471	8,088	3,514	2,000	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	CL - Dozers ripping/pushing/clean-up	139,479	33,600	3,069	5,833	hr/yr	23.9	5.8	0.5	kg/h	5	S.C. (%)	6	M.C. (%)								
	CL - Loading ROM coal to haul truck	182,394	24,062	3,465	2,700,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CL - Hauling to ROM hopper at RCS	46,290	10,000	1,000	2,700,000	t/yr	0.114	0.0247	0.0025	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.8	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	WE - Overburden emplacement areas	151,986	75,993	11,399	173.5	ha	876	438.00	65.700	kg/ha/year												
	WE - Open pit	41,855	20,928	3,139	47.8	ha	876	438.00	65.700	kg/ha/year												
	OB - Dozers stripping topsoil	-	-	-	-	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Loading topsoil to haul truck	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling topsoil to Emplacement area	-	-	-	-	t/yr	0.000	0.0000	0.0000	kg/t	177	tonnes/load	229	Vehicle gross (t)	0.0	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing topsoil at emplacement area	-	-	-	-	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Drilling	106	55	3	600	holes/year	0.59	0.31	0.02	kg/hole											70	% Control
	OB - Blasting	13,420	6,978	403	61	blasts/year	220	114.4	6.6	kg/blast	10,000	Area of blast m²										
	OB - Loading OB to haul truck	21,939	10,376	1,571	16,200,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Hauling OB to Emplacement area	128,001	27,651	2,765	16,200,000	t/yr	0.053	0.0114	0.0011	kg/t	177	tonnes/load	229	Vehicle gross (t)	3.1	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	OB - Emplacing OB at emplacement area	21,939	10,376	1,571	16,200,000	t/yr	0.001	0.00064	0.00010	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	2	M.C. (%)								
	OB - Dozers on OB	58,574	14,155	6,150	3,500	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	OB - Dozers on rehab	33,471	8,088	3,514	2,000	hr/yr	16.7	4.0	1.8	kg/h	10	S.C. (%)	2	M.C. (%)								
	CL - Dozers ripping/pushing/clean-up	68,197	16,428	1,500	2,852	hr/yr	23.9	5.8	0.5	kg/h	5	S.C. (%)	6	M.C. (%)								
	CL - Loading ROM coal to haul truck	101,330	13,368	1,925	1,500,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CL - Hauling to ROM hopper at RCS	47,292	10,216	1,022	1,500,000	t/yr	0.210	0.0454	0.0045	kg/t	177	tonnes/load	229	Vehicle gross (t)	12.4	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	WE - Overburden emplacement areas	19,254	9,627	1,444	22.0	ha	876	438.00	65.700	kg/ha/year												
Falbrook	WE - Open pit	40,235	20,117	3,018	45.9	ha	876	438.00	65.700	kg/ha/year												
Underground	CL - Loading Underground ROM coal to haul tr	172,261	22,725	3,273	2,550,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)										
	CL - Hauling Underground ROM to ROM hoppe	38,789	8,379	838	2,550,000	t/yr	0.101	0.0219	0.0022	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.0	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	CHPP - Unloading ROM to hopper	86,130	11,363	1,636	2,550,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)									50	% Control
	CHPP - Rehandle ROM at hopper	8,613	1,136	164	255,000	t/yr	0.068	0.009	0.001	kg/t	6	M.C. (%)									50	% Control
	CHPP - Loading Product coal to stockpile	265	125	19	1,860,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	0	M.C. (%)								
	CHPP - Loading Product coal to train	265	125	19	1,860,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	0	M.C. (%)								
	CHPP - Loading rejects	98	46	7	690,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	CHPP - Hauling rejects	11,041	2,385	239	690,000	t/yr	0.107	0.0230	0.0023	kg/t	177	tonnes/load	229	Vehicle gross (t)	6.3	km/return trip	3.0 / 0.6 / 0.1	kg/VKT	2.1	S.C. (%)	85	% Control
	CHPP - Unloading rejects	98	46	7	690,000	t/yr	0.00014	0.00007	0.00001	kg/t	1.14	Ave(WS/2.2)^1.3 [m/s]	10	M.C. (%)								
	WE - ROM stockpiles	876	438	66	2.0	ha	876	438.00	65.700	kg/ha/year											50	% Control
	WE - Product stockpiles	3,504	1,752	263	8.0	ha	876	438.00	65.700	kg/ha/year											50	% Control
	Grading roads	47,445	16,577	1,471	77,088	km	0.62	0.22	0.02	kg/VKT	8	speed of graders in km/h										
	Diesel	23,093	23,093	22,400																		
	Total TSP emissions (kg/yr)	**2,179,742**	**587,857**	**108,963**																		

Appendix C

Modelling Predictions

Table C-1: Modelling predictions for 2020

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
1	2	0	10	1	3	0.0	8	33	80	2.7
2	3	1	15	4	9	0.4	7	21	61	2.4
3	2	1	11	3	7	0.3	6	19	57	2.3
4	2	1	11	3	8	0.3	6	19	59	2.3
5	2	1	12	3	8	0.3	6	19	59	2.3
6	2	0	9	2	5	0.2	6	18	56	2.2
7	2	1	12	3	7	0.3	6	19	59	2.3
8	3	1	12	3	6	0.2	6	19	58	2.2
9	2	0	11	2	4	0.2	6	18	55	2.1
10	2	0	11	2	4	0.1	6	18	55	2.1
11	2	0	9	1	3	0.1	6	17	54	2.0
12	1	0	6	1	2	0.1	6	17	53	2.0
13	2	0	9	1	4	0.1	6	17	54	2.1
14	2	0	8	2	4	0.2	6	18	55	2.1
15	3	0	13	2	4	0.1	7	21	61	2.3
16	3	0	13	2	5	0.1	7	22	61	2.3
17	3	0	14	2	5	0.1	7	22	62	2.3
18	3	1	14	3	6	0.2	7	22	62	2.3
19	3	1	15	3	7	0.2	7	23	63	2.3
20	3	1	15	3	7	0.2	7	22	62	2.3
21	3	1	15	3	7	0.2	7	22	62	2.3
22	3	1	16	3	7	0.3	7	22	62	2.3
23	3	1	16	3	8	0.3	7	21	62	2.3
24	3	1	15	4	9	0.4	7	21	61	2.4
25	2	0	9	1	3	0.1	6	19	56	2.2
26	2	0	10	2	4	0.1	6	19	57	2.2
27	2	0	12	2	5	0.2	6	20	58	2.2
28	2	0	10	2	4	0.1	6	19	57	2.2
29	2	0	10	2	4	0.1	6	19	56	2.2
30	2	0	9	2	4	0.1	6	18	56	2.2
31	2	0	12	2	5	0.1	6	20	58	2.2
32	2	0	12	2	4	0.1	7	20	59	2.2
33	2	0	12	2	5	0.1	7	20	59	2.3
34	2	0	12	2	5	0.2	7	20	59	2.2
35	2	0	11	2	4	0.1	6	20	57	2.2
36	2	0	11	2	5	0.2	6	19	57	2.2
37	2	0	11	2	4	0.1	6	20	58	2.2
38	2	0	11	2	5	0.2	6	19	57	2.2
39	2	0	12	2	5	0.2	6	19	58	2.2
40	1	0	4	0	1	0.0	6	17	53	2.0
41	1	0	4	0	1	0.0	6	18	53	2.0
42	1	0	4	0	1	0.0	6	18	54	2.0
43	1	0	4	0	1	0.0	6	17	53	2.0
44	1	0	4	0	1	0.0	6	18	54	2.1

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
45	1	0	3	0	1	0.0	6	16	52	2.0
46	1	0	3	0	1	0.0	6	17	52	2.0
47	1	0	4	0	1	0.0	6	19	55	2.1
48	1	0	4	0	1	0.0	6	18	55	2.1
49	1	0	4	0	1	0.0	6	18	54	2.1
50	1	0	4	0	1	0.0	6	18	53	2.1
51	1	0	3	0	1	0.0	6	16	51	2.0
52	1	0	3	0	1	0.0	6	17	52	2.0
53	1	0	4	0	1	0.0	6	18	54	2.1
54	1	0	4	0	1	0.0	6	19	55	2.1
55	1	0	4	0	1	0.0	6	19	56	2.2
56	1	0	3	0	1	0.0	6	17	52	2.2
57	1	0	4	1	1	0.0	6	18	55	2.4
58	1	0	5	1	1	0.0	6	19	56	2.4
59	1	0	7	1	2	0.1	6	20	58	2.4
60	1	0	5	1	2	0.0	6	18	55	2.4
61	1	0	7	1	2	0.0	7	23	63	2.4
62	2	0	8	1	2	0.1	7	21	59	2.4
63	1	0	3	0	1	0.0	6	17	52	2.2
64	1	0	4	1	1	0.0	6	18	54	2.3
65	1	0	6	1	1	0.0	7	21	59	2.5
66	1	0	3	0	1	0.0	6	17	52	2.1
67	1	0	4	0	1	0.0	6	17	53	2.2
68	1	0	4	0	1	0.0	6	17	53	2.2
69	1	0	3	0	1	0.0	6	17	52	2.2
70	1	0	3	0	1	0.0	6	16	51	2.1
71	1	0	5	1	1	0.0	6	19	56	2.4
72	1	0	5	1	2	0.0	6	19	57	2.4
73	1	0	3	0	1	0.0	6	17	52	2.1
74	1	0	4	1	1	0.0	6	18	54	2.3
75	1	0	4	1	1	0.0	6	18	53	2.3
76	2	0	8	1	2	0.0	7	22	62	2.4
77	1	0	6	1	2	0.0	6	19	57	2.4
78	1	0	5	1	1	0.0	6	20	57	2.5
79	1	0	7	1	2	0.0	7	21	60	2.5
80	1	0	6	1	2	0.0	6	20	58	2.5
81	1	0	3	0	1	0.0	6	16	51	2.1
82	1	0	3	0	1	0.0	6	16	51	2.1
83	1	0	2	0	1	0.0	6	15	50	2.0
84	1	0	3	0	1	0.0	6	16	50	2.0
85	1	0	4	1	1	0.0	6	17	53	2.2
86	1	0	5	1	2	0.0	6	18	53	2.2
87	1	0	4	1	1	0.0	6	17	53	2.2
88	1	0	6	1	2	0.1	6	18	54	2.2
89	1	0	6	1	2	0.0	6	18	55	2.3

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
90	1	0	4	1	1	0.0	6	18	54	2.3
91	1	0	4	1	1	0.0	6	18	54	2.3
92	1	0	7	1	2	0.1	6	18	55	2.2
93	1	0	5	1	1	0.0	6	17	52	2.2
94	1	0	7	1	2	0.1	6	19	55	2.3
95	1	0	6	1	2	0.1	6	18	54	2.3
96	1	0	3	0	1	0.0	6	15	50	1.9
97	1	0	3	0	1	0.0	6	16	51	2.0
98	1	0	3	0	1	0.0	6	16	51	1.9
99	1	0	3	0	1	0.0	6	16	51	1.9
100	1	0	3	0	1	0.0	6	16	50	1.9
101	1	0	3	0	1	0.0	6	15	50	1.9
102	1	0	3	0	1	0.0	6	16	50	1.9
103	1	0	3	0	1	0.0	6	15	49	1.9
104	1	0	3	0	1	0.0	6	17	52	2.0
105	1	0	3	0	1	0.0	6	16	51	1.9
106	1	0	3	0	1	0.0	6	16	50	1.9
107	1	0	3	0	1	0.0	6	16	50	1.9
108	1	0	3	0	1	0.0	6	16	50	1.9
109	1	0	3	0	1	0.0	6	15	50	1.9
110	1	0	3	0	1	0.0	6	15	50	1.9
111	1	0	3	0	1	0.0	6	15	49	1.9
112	1	0	2	0	0	0.0	6	15	49	1.9
113	1	0	3	0	1	0.0	6	15	49	1.9
114	1	0	2	0	0	0.0	6	15	49	1.9
115	1	0	3	0	1	0.0	6	15	49	1.9
116	1	0	2	0	0	0.0	6	15	49	1.9
117	1	0	3	0	1	0.0	6	15	50	1.9
118	1	0	3	0	1	0.0	6	16	50	1.9
119	1	0	2	0	1	0.0	6	15	49	1.9
120	1	0	2	0	1	0.0	6	15	50	1.9
121	1	0	3	0	1	0.0	6	16	50	1.9
122	1	0	2	0	1	0.0	6	16	50	1.9
123	0	0	2	0	0	0.0	5	13	46	1.8
124	0	0	1	0	0	0.0	5	13	46	1.8
125	0	0	2	0	0	0.0	5	13	46	1.8
126	0	0	2	0	0	0.0	5	13	47	1.8
127	0	0	1	0	0	0.0	5	13	47	1.8
128	0	0	1	0	0	0.0	5	13	47	1.8
129	0	0	1	0	0	0.0	5	13	47	1.8
130	0	0	1	0	0	0.0	6	14	47	1.8
131	0	0	2	0	0	0.0	6	14	48	1.9
132	0	0	2	0	0	0.0	6	14	48	1.9
133	0	0	1	0	0	0.0	5	13	47	1.8
134	0	0	2	0	0	0.0	5	13	46	1.8

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
135	0	0	2	0	0	0.0	5	13	46	1.8
136	1	0	3	0	1	0.0	6	17	52	1.9
137	1	0	3	0	1	0.0	6	17	53	1.9
138	1	0	3	0	1	0.0	6	18	54	1.9
139	1	0	3	0	1	0.0	6	17	52	1.9
140	1	0	4	0	1	0.0	6	19	56	2.0
141	0	0	2	0	0	0.0	6	15	49	1.9
142	0	0	2	0	0	0.0	6	14	47	1.8
143	1	0	2	0	0	0.0	6	14	48	1.8
144	1	0	2	0	0	0.0	6	14	48	1.8
145	0	0	2	0	0	0.0	6	14	47	1.8
146	1	0	3	0	0	0.0	6	14	48	1.8
147	1	0	3	0	0	0.0	6	14	47	1.8
148	1	0	3	0	0	0.0	6	14	47	1.8
149	1	0	3	0	0	0.0	6	15	49	1.9
150	0	0	2	0	0	0.0	6	14	48	1.8
151	0	0	2	0	0	0.0	6	14	47	1.8
152	1	0	3	0	1	0.0	6	17	52	1.9
153	1	0	3	0	1	0.0	6	17	52	1.9
154	1	0	3	0	1	0.0	6	17	51	1.9
155	1	0	3	0	1	0.0	6	17	52	1.9
156	1	0	3	0	1	0.0	6	16	51	1.9
157	1	0	3	0	1	0.0	6	17	52	1.9
158	1	0	3	0	1	0.0	6	16	51	1.9
159	1	0	3	0	1	0.0	6	17	52	1.9
160	0	0	2	0	1	0.0	6	16	51	1.9
161	1	0	2	0	1	0.0	6	16	51	1.9
162	1	0	3	0	0	0.0	6	16	50	1.9
163	1	0	3	0	0	0.0	6	15	49	1.9
164	1	0	3	0	0	0.0	6	15	50	1.9
165	1	0	3	0	0	0.0	6	14	48	1.8
166	0	0	2	0	1	0.0	6	16	50	1.9
167	1	0	3	0	0	0.0	6	16	50	1.9
168	1	0	3	0	0	0.0	6	15	49	1.9
169	1	0	3	0	0	0.0	6	15	49	1.8
170	2	0	11	1	3	0.1	8	**31**	74	2.5
171	1	0	7	1	1	0.0	7	24	63	2.1
173	11	2	60	10	27	0.6	**10**	**40**	**99**	2.9
175	16	3	87	18	56	1.2	**11**	**45**	**122**	3.4
176	15	4	87	23	72	1.6	**11**	**47**	**135**	3.8
177	20	4	102	23	73	1.6	**11**	**45**	**133**	3.7
N103	6	2	35	9	26	0.6	**9**	**34**	89	2.8
N105	10	2	54	13	37	0.9	**9**	**36**	**99**	3.0
N133	2	0	10	1	2	0.0	8	**30**	72	2.4
N161	8	2	48	11	31	0.7	**9**	**36**	**94**	2.9

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N171	0	0	2	0	0	0.0	6	17	53	2.2
N172	8	2	44	11	31	0.7	**9**	**36**	**94**	2.9
N173	3	1	15	4	9	0.4	7	21	61	2.4
N174	3	1	15	4	9	0.4	7	21	61	2.4
N175	2	0	8	2	4	0.2	6	18	55	2.1
N176	2	0	8	1	1	0.0	7	25	64	2.1
N177	11	2	61	12	34	0.7	**10**	**44**	**108**	3.0
N178	12	2	65	13	36	0.8	**10**	**44**	**110**	3.1
N179	1	0	5	1	1	0.0	7	**27**	68	2.2
N18	2	0	9	1	3	0.1	6	17	54	2.0
N180	2	0	12	1	2	0.0	7	21	60	2.1
N181	2	0	8	1	1	0.0	6	21	58	2.1
N183	1	0	2	0	1	0.0	7	22	61	2.4
N184	1	0	4	0	1	0.0	6	17	52	2.0
N185	1	0	4	0	1	0.0	6	17	53	2.0
N186	1	0	4	0	1	0.0	6	16	52	2.0
N187	3	1	15	4	9	0.3	7	21	61	2.3
N188	1	0	3	0	0	0.0	6	16	50	1.9
N189	1	0	3	0	0	0.0	6	15	50	1.9
N20	1	0	7	1	2	0.1	6	17	53	2.0
N21	1	0	6	1	2	0.1	6	17	53	2.0
N22	1	0	6	1	1	0.0	6	17	52	2.0
N222	1	0	3	0	0	0.0	6	15	50	2.0
N223	1	0	2	0	0	0.0	6	15	49	2.0
N23	1	0	6	1	1	0.0	6	17	53	2.0
N24	1	0	4	0	1	0.0	6	16	52	2.0
N25	1	0	3	0	1	0.0	6	16	52	2.0
N26	1	0	3	0	0	0.0	6	16	51	2.0
N27	0	0	2	0	0	0.0	6	15	50	2.0
N28	0	0	2	0	0	0.0	6	15	50	2.0
N29	1	0	3	0	0	0.0	6	16	51	2.0
N30	1	0	3	0	0	0.0	6	16	52	2.0
N31	1	0	4	0	1	0.0	6	17	53	2.0
N32	1	0	4	0	1	0.0	6	17	53	2.0
N34	1	0	5	0	1	0.0	6	18	54	2.0
N35	1	0	5	0	1	0.0	6	19	55	2.1
N36	1	0	4	0	0	0.0	6	17	54	2.1
N37	1	0	4	0	1	0.0	6	18	55	2.1
N38	1	0	3	0	0	0.0	6	18	55	2.2
N39	1	0	3	0	0	0.0	6	17	54	2.2
N40	1	0	3	0	0	0.0	6	17	54	2.2
N41	1	0	2	0	0	0.0	6	17	53	2.2
N42	1	0	3	0	0	0.0	6	19	56	2.4
N43	1	0	3	0	1	0.0	6	19	56	2.2
N44	1	0	6	0	1	0.0	6	20	58	2.1

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N47	2	0	9	1	2	0.0	7	21	59	2.1
N48	1	0	7	1	1	0.0	6	21	59	2.1
N49	1	0	7	1	1	0.0	7	21	59	2.1
N50	1	0	4	0	1	0.0	6	21	60	2.2
N51	1	0	3	0	1	0.0	6	21	59	2.3
N52	1	0	3	0	1	0.0	6	21	60	2.3
N53	1	0	3	0	1	0.0	7	23	62	2.3
N54	1	0	3	0	1	0.0	7	24	65	2.3
N62	1	0	4	0	1	0.0	7	23	63	2.2
N63	1	0	5	1	1	0.0	7	23	62	2.1
N64	2	0	8	1	2	0.0	7	23	62	2.1
N67	1	0	5	1	1	0.0	8	**28**	70	2.2
N88	9	2	51	11	29	0.6	**9**	**36**	**94**	2.8
N91	8	2	48	11	30	0.7	**9**	**35**	**93**	2.9
M1	44	15	278	90	372	8.6	**21**	**113**	**432**	**10.7**
M2	23	4	131	22	73	1.7	**11**	**50**	**141**	3.9
M3	7	1	40	8	22	0.5	**9**	**37**	**91**	2.8
M4	4	1	21	4	9	0.2	**8**	**33**	80	2.6
M5	3	1	16	3	6	0.1	**8**	**32**	77	2.6
M6	1	0	3	0	0	0.0	6	15	49	1.9
M7	1	0	3	0	0	0.0	6	15	50	1.9
M8	1	0	3	0	0	0.0	6	15	49	1.9
M9	1	0	3	0	0	0.0	6	16	50	1.9
M10	1	0	3	0	0	0.0	6	15	49	1.9
M11	1	0	3	0	0	0.0	6	15	50	1.9
M12	1	0	2	0	0	0.0	6	15	50	1.9
M13	0	0	2	0	0	0.0	6	15	49	1.9
M14	1	0	6	1	1	0.0	7	23	62	2.4
M15	1	0	6	1	1	0.0	7	**27**	69	2.4
M16	1	0	6	1	2	0.0	7	**28**	71	2.5
M17	2	0	10	1	3	0.0	7	**27**	69	2.5
M18	2	0	9	1	2	0.0	8	**32**	78	2.6
M19	2	0	9	1	3	0.0	8	**30**	75	2.6
M20	2	1	13	3	8	0.3	7	20	59	2.3
M21	3	1	12	3	7	0.3	6	19	58	2.2
M22	3	0	12	2	6	0.2	6	19	57	2.2
M23	1	0	6	1	2	0.0	7	**28**	70	2.2
M24	5	1	31	8	21	0.5	**9**	**35**	88	2.8
M25	6	2	37	9	25	0.6	**9**	**36**	**92**	2.9
M26	8	2	48	12	33	0.8	**9**	**38**	**100**	3.1
M27	7	2	32	8	24	0.5	**8**	**31**	85	2.7
172	21	4	123	24	75	1.7	**11**	**50**	**142**	3.9
174	10	2	56	13	37	0.9	**9**	**39**	**102**	3.1
N100	6	2	35	9	24	0.6	**8**	**33**	86	2.8
N101	6	1	34	8	22	0.5	**8**	**32**	84	2.7

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N102	6	2	34	9	24	0.6	**8**	**33**	87	2.8
N107	16	4	92	22	70	1.6	**11**	**46**	**133**	3.8
N108	23	5	138	29	96	2.2	**12**	**54**	**161**	**4.4**
N113	8	2	48	12	35	0.8	**9**	**39**	**101**	3.1
N114	8	2	46	12	33	0.8	**9**	**39**	**100**	3.0
N115	8	2	44	12	33	0.8	**9**	**39**	**100**	3.0
N116	8	2	44	12	34	0.8	**9**	**39**	**100**	3.0
N117	8	2	43	12	33	0.8	**9**	**38**	**99**	3.0
N118	7	2	40	11	30	0.7	**9**	**37**	**96**	3.0
N119	7	2	36	10	27	0.7	**9**	**35**	**92**	2.9
N120	7	2	41	11	30	0.7	**9**	**38**	**97**	3.0
N121	6	2	37	9	26	0.6	**9**	**36**	**92**	2.9
N122	6	2	32	8	23	0.6	**9**	**35**	89	2.9
N123	5	1	29	8	21	0.5	**9**	**34**	87	2.8
N124	6	1	32	8	22	0.5	**9**	**35**	89	2.8
N125	6	2	37	9	25	0.6	**9**	**36**	**92**	2.9
N126	5	1	28	7	20	0.5	**9**	**34**	86	2.8
N127	5	1	27	6	16	0.4	**9**	**34**	85	2.8
N129	6	1	34	6	15	0.3	**9**	**36**	86	2.7
N134	3	1	14	4	9	0.2	**8**	**34**	82	2.8
N135	2	0	10	2	5	0.1	**9**	**36**	85	2.9
N136	1	0	5	0	1	0.0	7	21	59	2.0
N140	2	0	9	1	2	0.0	8	**32**	79	2.7
N141	1	0	6	1	2	0.0	7	**28**	71	2.5
N155	8	2	47	13	37	0.9	**10**	**39**	**102**	3.1
N156	8	2	45	12	34	0.8	**9**	**39**	**101**	3.1
N157	8	2	43	11	32	0.8	**9**	**38**	**98**	3.0
N158	8	2	42	11	31	0.7	**9**	**38**	**98**	3.0
N159	7	2	39	10	29	0.7	**9**	**37**	**95**	3.0
N160	7	2	37	10	28	0.7	**9**	**36**	**93**	2.9
N162	7	2	41	10	29	0.7	**9**	**35**	**92**	2.9
N163	7	2	37	9	26	0.6	**9**	**34**	89	2.8
N164	9	2	49	11	31	0.7	**9**	**35**	**93**	2.9
N165	8	2	44	10	28	0.7	**9**	**34**	**90**	2.8
N166	7	2	42	10	27	0.6	**9**	**34**	89	2.8
N167	7	2	43	9	26	0.6	**9**	**33**	88	2.8
N168	7	2	38	9	24	0.6	**8**	**32**	86	2.7
N169	7	2	38	9	24	0.6	**8**	**33**	86	2.7
N182	1	0	3	0	1	0.0	7	22	62	2.3
N33	1	0	4	0	1	0.0	6	17	53	2.0
N45	2	0	9	1	2	0.0	6	20	58	2.0
N46	2	0	10	1	2	0.0	7	21	59	2.1
N55	1	0	2	0	1	0.0	7	24	64	2.4
N56	1	0	3	0	1	0.0	7	**25**	66	2.3
N57	1	0	3	0	1	0.0	7	**25**	67	2.3

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N58	1	0	3	0	1	0.0	7	26	68	2.3
N59	1	0	3	0	1	0.0	8	30	74	2.3
N60	1	0	3	0	1	0.0	9	38	88	2.6
N61	1	0	3	0	1	0.0	7	27	70	2.3
N65	1	0	4	1	1	0.0	8	31	75	2.2
N66	1	0	5	1	1	0.0	8	29	72	2.2
N68	1	0	6	1	2	0.0	7	28	70	2.2
N70	2	0	7	1	2	0.0	7	27	68	2.1
N71	2	0	8	1	3	0.0	7	26	67	2.1
N72	2	0	8	1	3	0.0	7	26	66	2.1
N73	2	0	10	2	4	0.1	7	25	66	2.1
N74	2	0	10	1	2	0.0	10	43	92	2.5
N75	2	0	11	1	3	0.1	9	39	85	2.4
N76	3	1	14	3	7	0.1	7	26	67	2.2
N77	6	1	30	7	21	0.5	8	28	79	2.5
N79	3	1	15	3	8	0.2	7	26	68	2.2
N80	3	1	16	3	7	0.1	7	26	67	2.2
N81	4	1	17	4	10	0.2	7	26	70	2.3
N82	4	1	21	5	14	0.3	8	28	74	2.4
N83	4	1	19	4	10	0.2	7	26	70	2.3
N84	7	2	36	8	22	0.4	9	38	95	3.0
N85	10	2	53	10	27	0.6	10	46	110	3.1
N86	10	2	55	10	29	0.6	10	47	111	3.1
N89	7	1	39	8	21	0.5	9	39	94	2.7
N90	8	2	46	10	28	0.6	9	34	91	2.8
N92	7	2	40	9	24	0.6	9	33	87	2.7
N93	7	2	41	9	26	0.6	9	33	88	2.8
N94	7	2	41	10	27	0.6	9	34	89	2.8
N95	8	2	44	10	29	0.7	9	35	92	2.8
N96	8	2	47	11	32	0.8	9	36	96	2.9
N97	8	2	46	11	32	0.8	9	37	96	2.9
N98	7	2	38	10	27	0.7	9	34	90	2.8
N99	7	2	38	9	26	0.6	9	34	89	2.8

Table C-1: Modelling predictions for 2023

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
1	2	0	8	1	2	0.0	8	31	77	2.7
2	2	1	11	3	7	0.3	7	21	60	2.3
3	2	1	8	2	5	0.2	6	19	57	2.2
4	2	1	9	3	6	0.2	7	20	58	2.2
5	2	1	9	3	6	0.2	7	19	58	2.2
6	2	0	7	2	5	0.2	6	18	56	2.1
7	2	1	9	3	7	0.2	7	19	58	2.2
8	2	1	10	3	6	0.2	7	19	58	2.2
9	3	1	10	2	5	0.2	6	19	57	2.1
10	3	1	12	3	6	0.2	7	19	57	2.2
11	3	1	12	3	7	0.2	7	19	57	2.2
12	4	1	18	5	11	0.3	7	21	62	2.2
13	2	1	8	2	5	0.2	6	18	56	2.1
14	2	1	7	2	5	0.2	6	18	56	2.1
15	2	0	9	1	3	0.1	7	22	62	2.4
16	2	0	9	2	3	0.1	7	23	63	2.4
17	2	0	9	2	4	0.1	7	23	64	2.4
18	2	0	10	2	5	0.1	7	23	64	2.4
19	2	0	10	2	5	0.2	7	24	65	2.4
20	2	1	10	2	5	0.2	7	23	63	2.4
21	2	1	10	2	5	0.2	7	23	63	2.4
22	2	1	10	3	6	0.2	7	22	62	2.4
23	2	1	11	3	6	0.2	7	22	62	2.3
24	2	1	11	3	7	0.3	7	21	61	2.3
25	1	0	7	1	2	0.1	6	19	57	2.3
26	2	0	7	1	3	0.1	6	20	58	2.3
27	2	0	8	2	4	0.1	7	21	59	2.3
28	2	0	7	1	3	0.1	6	20	58	2.3
29	2	0	7	1	3	0.1	6	20	57	2.2
30	2	0	7	1	3	0.1	6	19	57	2.2
31	2	0	8	2	3	0.1	7	21	59	2.3
32	2	0	8	2	3	0.1	7	21	60	2.3
33	2	0	9	2	4	0.1	7	21	60	2.3
34	2	0	9	2	4	0.1	7	21	60	2.3
35	2	0	8	1	3	0.1	7	20	59	2.3
36	2	0	8	2	4	0.1	7	20	58	2.3
37	2	0	8	2	3	0.1	7	21	59	2.3
38	2	0	8	2	4	0.1	6	20	58	2.3
39	2	0	8	2	4	0.1	7	20	58	2.3
40	1	0	3	0	1	0.0	6	18	55	2.2
41	1	0	3	0	1	0.0	6	19	56	2.2
42	1	0	3	0	1	0.0	6	19	56	2.2
43	1	0	3	0	1	0.0	6	18	55	2.1
44	1	0	3	0	1	0.0	6	20	57	2.2

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
45	1	0	3	0	1	0.0	6	17	53	2.1
46	1	0	3	0	1	0.0	6	18	54	2.1
47	1	0	3	0	1	0.0	6	20	58	2.3
48	1	0	3	0	1	0.0	6	20	58	2.3
49	1	0	3	0	1	0.0	6	20	57	2.3
50	1	0	3	0	1	0.0	6	19	56	2.2
51	1	0	2	0	1	0.0	6	17	53	2.1
52	1	0	3	0	1	0.0	6	18	54	2.2
53	1	0	3	0	1	0.0	6	19	56	2.3
54	1	0	3	0	1	0.0	6	21	59	2.3
55	1	0	3	0	1	0.0	7	21	60	2.4
56	1	0	3	0	1	0.0	6	18	54	2.4
57	1	0	4	0	1	0.0	6	20	58	2.7
58	1	0	4	1	1	0.0	7	21	59	2.8
59	1	0	5	1	2	0.0	6	21	59	2.5
60	1	0	4	1	1	0.0	6	19	56	2.5
61	1	0	5	1	2	0.0	7	24	64	2.6
62	1	0	6	1	2	0.0	7	21	59	2.4
63	1	0	3	0	1	0.0	6	18	54	2.4
64	1	0	3	0	1	0.0	6	19	56	2.5
65	1	0	4	1	1	0.0	7	23	62	2.8
66	1	0	3	0	1	0.0	6	18	54	2.4
67	1	0	3	0	1	0.0	6	19	55	2.4
68	1	0	3	0	1	0.0	6	18	55	2.5
69	1	0	3	0	1	0.0	6	18	54	2.4
70	1	0	2	0	1	0.0	6	17	53	2.3
71	1	0	4	1	1	0.0	6	20	58	2.7
72	1	0	4	1	1	0.0	6	20	58	2.7
73	1	0	3	0	1	0.0	6	18	54	2.3
74	1	0	3	0	1	0.0	6	19	56	2.6
75	1	0	3	0	1	0.0	6	19	55	2.5
76	1	0	6	1	2	0.0	7	23	62	2.5
77	1	0	4	1	1	0.0	6	20	58	2.5
78	1	0	4	1	1	0.0	7	21	60	2.8
79	1	0	5	1	1	0.0	7	22	61	2.6
80	1	0	5	1	1	0.0	7	21	60	2.7
81	1	0	2	0	1	0.0	6	17	53	2.2
82	1	0	2	0	1	0.0	6	17	53	2.2
83	0	0	2	0	0	0.0	6	16	51	2.0
84	1	0	2	0	1	0.0	6	16	52	2.1
85	1	0	3	0	1	0.0	6	18	54	2.4
86	1	0	4	1	1	0.0	6	18	54	2.3
87	1	0	3	1	1	0.0	6	18	54	2.3
88	1	0	4	1	1	0.0	6	18	54	2.3
89	1	0	4	1	1	0.0	6	19	55	2.4

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
90	1	0	3	1	1	0.0	6	18	55	2.4
91	1	0	3	1	1	0.0	6	19	55	2.5
92	1	0	5	1	2	0.0	6	18	55	2.3
93	1	0	3	1	1	0.0	6	17	53	2.2
94	1	0	5	1	2	0.0	6	19	56	2.3
95	1	0	4	1	1	0.0	6	19	55	2.3
96	0	0	2	0	0	0.0	6	16	51	1.9
97	1	0	3	0	1	0.0	6	17	53	2.0
98	1	0	2	0	0	0.0	6	17	52	2.0
99	1	0	2	0	0	0.0	6	17	52	2.0
100	1	0	2	0	0	0.0	6	16	51	2.0
101	1	0	2	0	0	0.0	6	16	51	1.9
102	1	0	2	0	0	0.0	6	16	51	2.0
103	0	0	2	0	0	0.0	6	16	50	1.9
104	1	0	3	0	1	0.0	6	17	53	2.0
105	1	0	2	0	0	0.0	6	17	52	2.0
106	1	0	2	0	0	0.0	6	16	52	1.9
107	1	0	2	0	0	0.0	6	16	51	2.0
108	1	0	2	0	0	0.0	6	16	51	1.9
109	1	0	2	0	0	0.0	6	16	51	1.9
110	1	0	2	0	0	0.0	6	16	51	1.9
111	0	0	2	0	0	0.0	6	16	50	1.9
112	0	0	2	0	0	0.0	6	16	50	1.9
113	0	0	2	0	0	0.0	6	16	50	1.9
114	0	0	2	0	0	0.0	6	16	50	1.9
115	0	0	2	0	0	0.0	6	16	50	1.9
116	0	0	2	0	0	0.0	6	16	50	1.9
117	0	0	2	0	0	0.0	6	16	51	1.9
118	0	0	2	0	0	0.0	6	16	51	1.9
119	0	0	2	0	0	0.0	6	16	50	1.9
120	0	0	2	0	0	0.0	6	16	50	1.9
121	0	0	2	0	0	0.0	6	16	51	1.9
122	0	0	2	0	0	0.0	6	16	51	1.9
123	0	0	1	0	0	0.0	5	13	46	1.8
124	0	0	1	0	0	0.0	5	13	46	1.8
125	0	0	1	0	0	0.0	5	13	46	1.8
126	0	0	1	0	0	0.0	5	13	47	1.8
127	0	0	1	0	0	0.0	5	13	47	1.8
128	0	0	1	0	0	0.0	6	14	47	1.8
129	0	0	1	0	0	0.0	6	14	47	1.8
130	0	0	1	0	0	0.0	6	14	48	1.8
131	0	0	1	0	0	0.0	6	15	49	1.9
132	0	0	1	0	0	0.0	6	14	48	1.9
133	0	0	1	0	0	0.0	6	14	47	1.8
134	0	0	1	0	0	0.0	5	13	46	1.8

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
135	0	0	1	0	0	0.0	5	13	46	1.8
136	1	0	2	0	1	0.0	6	18	54	2.0
137	1	0	2	0	1	0.0	6	18	54	2.0
138	1	0	2	0	1	0.0	6	19	55	2.0
139	1	0	2	0	1	0.0	6	18	54	2.0
140	1	0	3	0	1	0.0	6	20	58	2.1
141	0	0	2	0	0	0.0	6	15	49	1.9
142	0	0	2	0	0	0.0	6	14	48	1.8
143	0	0	2	0	0	0.0	6	15	48	1.8
144	0	0	2	0	0	0.0	6	14	48	1.8
145	0	0	2	0	0	0.0	6	14	47	1.8
146	1	0	2	0	0	0.0	6	14	48	1.8
147	0	0	2	0	0	0.0	6	14	48	1.8
148	0	0	2	0	0	0.0	6	14	48	1.8
149	1	0	2	0	0	0.0	6	16	50	1.9
150	0	0	2	0	0	0.0	6	14	48	1.8
151	0	0	2	0	0	0.0	6	14	48	1.8
152	1	0	2	0	1	0.0	6	18	54	2.0
153	1	0	2	0	1	0.0	6	17	53	1.9
154	1	0	2	0	0	0.0	6	17	53	1.9
155	1	0	2	0	1	0.0	6	18	54	2.0
156	1	0	2	0	0	0.0	6	17	52	1.9
157	1	0	2	0	1	0.0	6	18	53	1.9
158	0	0	2	0	0	0.0	6	17	52	1.9
159	0	0	2	0	0	0.0	6	17	53	1.9
160	0	0	2	0	0	0.0	6	17	51	1.9
161	0	0	2	0	0	0.0	6	16	51	1.9
162	1	0	2	0	0	0.0	6	16	51	1.9
163	1	0	2	0	0	0.0	6	15	50	1.9
164	1	0	3	0	0	0.0	6	16	51	1.9
165	0	0	2	0	0	0.0	6	15	49	1.8
166	0	0	2	0	0	0.0	6	16	51	1.9
167	1	0	3	0	0	0.0	6	16	51	1.9
168	1	0	2	0	0	0.0	6	16	50	1.9
169	1	0	2	0	0	0.0	6	15	49	1.9
170	2	0	8	1	2	0.0	**9**	**36**	83	2.6
171	1	0	5	0	1	0.0	7	**27**	68	2.2
173	8	2	44	8	21	0.5	**14**	**77**	**167**	**4.6**
175	12	3	59	13	39	0.8	**10**	**42**	**108**	3.0
176	11	3	56	15	46	1.0	**11**	**46**	**119**	3.3
177	17	4	78	18	56	1.2	**10**	**41**	**117**	3.4
N103	5	1	24	7	18	0.4	**10**	**44**	**102**	2.9
N105	7	2	34	8	24	0.5	**9**	**38**	**95**	2.9
N133	2	0	8	1	2	0.0	**8**	**35**	81	2.5
N161	6	1	31	8	20	0.5	**10**	**41**	**98**	2.9

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N171	1	0	3	0	1	0.0	6	17	53	2.2
N172	6	1	29	8	20	0.5	**10**	**43**	**101**	2.9
N173	2	1	11	3	7	0.3	7	21	61	2.3
N174	2	1	11	3	7	0.3	7	21	60	2.3
N175	2	1	7	2	5	0.2	6	18	56	2.1
N176	1	0	6	0	1	0.0	7	**28**	70	2.3
N177	8	2	39	8	23	0.5	**10**	**43**	**101**	2.8
N178	9	2	43	9	25	0.5	**10**	**42**	**101**	2.8
N179	3	1	14	3	7	0.1	8	**28**	72	2.2
N18	3	1	16	4	8	0.3	7	20	59	2.2
N180	9	2	42	9	27	0.6	**8**	**29**	84	2.6
N181	4	1	16	3	7	0.1	7	22	64	2.1
N183	1	0	4	0	1	0.0	7	22	62	2.4
N184	1	0	6	1	2	0.0	6	17	53	2.0
N185	3	0	13	2	4	0.1	6	18	56	2.0
N186	2	0	8	1	2	0.1	6	17	53	2.0
N187	2	1	11	3	7	0.3	7	21	61	2.3
N188	1	0	3	0	0	0.0	6	17	52	1.9
N189	1	0	3	0	0	0.0	6	16	51	1.9
N20	5	1	21	5	13	0.4	7	22	64	2.3
N21	4	1	16	4	10	0.3	7	20	61	2.2
N22	3	1	14	3	6	0.1	6	18	57	2.1
N222	1	0	4	0	0	0.0	6	15	49	2.0
N223	1	0	4	0	0	0.0	6	15	49	2.0
N23	5	1	19	3	7	0.2	7	19	59	2.1
N24	2	0	7	1	2	0.0	6	17	53	2.0
N25	1	0	4	1	1	0.0	6	16	52	2.0
N26	1	0	4	0	1	0.0	6	16	51	2.0
N27	1	0	3	0	1	0.0	6	15	51	2.0
N28	1	0	3	0	1	0.0	6	15	50	2.0
N29	1	0	6	0	1	0.0	6	16	51	2.0
N30	1	0	6	0	1	0.0	6	16	52	2.0
N31	2	0	8	1	1	0.0	6	17	53	2.0
N32	2	0	8	1	2	0.0	6	17	54	2.0
N34	2	0	11	1	2	0.0	6	18	56	2.0
N35	3	0	12	1	2	0.0	6	19	57	2.1
N36	1	0	6	0	1	0.0	6	17	54	2.1
N37	1	0	6	0	1	0.0	6	18	55	2.1
N38	1	0	5	0	1	0.0	6	18	55	2.2
N39	1	0	5	0	1	0.0	6	17	54	2.2
N40	1	0	4	0	1	0.0	6	17	54	2.2
N41	1	0	3	0	1	0.0	6	17	53	2.2
N42	1	0	3	0	1	0.0	6	19	57	2.3
N43	1	0	6	1	1	0.0	6	19	57	2.2
N44	3	0	11	2	4	0.1	7	21	60	2.1

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N47	5	1	21	4	10	0.2	7	24	67	2.2
N48	3	1	14	2	6	0.1	7	22	63	2.1
N49	3	1	13	2	6	0.1	7	22	63	2.1
N50	2	0	7	1	2	0.0	7	21	60	2.2
N51	2	0	6	1	2	0.0	7	21	60	2.2
N52	1	0	6	1	2	0.0	7	21	60	2.3
N53	1	0	5	1	1	0.0	7	23	63	2.3
N54	1	0	7	1	2	0.0	7	24	66	2.3
N62	2	0	10	1	3	0.1	7	24	65	2.2
N63	3	1	14	3	7	0.1	7	24	67	2.2
N64	5	1	23	6	16	0.3	8	**26**	74	2.4
N67	3	1	12	2	6	0.1	8	**29**	74	2.2
N88	6	1	32	7	19	0.4	**10**	**42**	**98**	2.9
N91	6	1	31	7	20	0.5	**9**	**40**	**95**	2.8
M1	27	9	161	54	219	4.8	**16**	**79**	**283**	**7.0**
M2	18	3	99	18	57	1.3	**12**	**58**	**146**	**4.1**
M3	5	1	29	6	16	0.4	**67**	**514**	**1230**	**32.0**
M4	3	1	16	3	7	0.2	**11**	**57**	**126**	3.6
M5	3	0	12	2	5	0.1	**14**	**78**	**174**	**5.4**
M6	1	0	3	0	0	0.0	6	15	50	1.9
M7	1	0	2	0	0	0.0	6	16	50	1.9
M8	1	0	2	0	0	0.0	6	15	50	1.9
M9	1	0	2	0	0	0.0	6	16	50	1.9
M10	1	0	2	0	0	0.0	6	15	49	1.9
M11	1	0	2	0	0	0.0	6	16	50	1.9
M12	0	0	2	0	0	0.0	6	16	50	1.9
M13	0	0	2	0	0	0.0	6	15	50	1.9
M14	1	0	5	1	1	0.0	7	25	66	2.7
M15	1	0	5	1	1	0.0	8	**30**	76	2.7
M16	1	0	5	1	1	0.0	8	**31**	78	2.7
M17	2	0	7	1	2	0.0	7	**27**	69	2.5
M18	2	0	7	1	2	0.0	**8**	**33**	81	2.9
M19	2	0	7	1	2	0.0	8	**30**	74	2.6
M20	2	1	10	3	7	0.3	7	20	59	2.2
M21	2	1	10	3	6	0.2	7	19	58	2.2
M22	3	1	10	3	6	0.2	7	19	58	2.2
M23	4	1	19	3	9	0.2	8	**29**	75	2.3
M24	4	1	22	6	15	0.4	**14**	**81**	**177**	**4.2**
M25	5	1	26	7	18	0.4	**15**	**87**	**188**	**4.3**
M26	6	2	33	9	24	0.6	**12**	**61**	**136**	3.5
M27	7	2	30	9	26	0.6	**9**	**32**	86	2.7
172	16	3	87	18	57	1.3	**12**	**59**	**146**	**4.0**
174	7	2	39	9	27	0.6	**12**	**58**	**134**	4.0
N100	5	1	23	6	16	0.4	**9**	**40**	**95**	2.8
N101	4	1	23	6	15	0.4	**9**	**40**	**94**	2.8

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N102	4	1	23	6	17	0.4	**10**	**41**	**97**	2.8
N107	11	3	64	16	51	1.2	**11**	**49**	**129**	3.7
N108	17	4	98	23	75	1.8	**12**	**57**	**154**	**4.3**
N113	6	2	33	9	25	0.6	**12**	**56**	**126**	3.3
N114	6	2	32	9	23	0.6	**12**	**61**	**134**	3.4
N115	6	2	30	8	23	0.5	**12**	**57**	**126**	3.2
N116	6	2	31	8	23	0.5	**11**	**54**	**122**	3.2
N117	6	2	31	8	23	0.5	**11**	**52**	**117**	3.1
N118	5	1	28	8	21	0.5	**11**	**52**	**117**	3.1
N119	5	1	25	7	19	0.5	**11**	**52**	**117**	3.1
N120	6	2	28	8	21	0.5	**12**	**59**	**130**	3.3
N121	5	1	26	7	18	0.4	**14**	**77**	**167**	3.9
N122	4	1	22	6	16	0.4	**13**	**65**	**144**	3.6
N123	4	1	20	6	15	0.4	**13**	**71**	**157**	3.8
N124	4	1	23	6	16	0.4	**15**	**84**	**183**	**4.3**
N125	5	1	26	7	18	0.4	**15**	**87**	**188**	**4.3**
N126	4	1	20	5	14	0.4	**16**	**91**	**199**	**4.7**
N127	4	1	19	5	12	0.3	**19**	**118**	**255**	**5.9**
N129	5	1	25	5	11	0.3	**22**	**140**	**316**	**8.0**
N134	2	1	10	3	6	0.2	**10**	**44**	**98**	3.0
N135	2	0	8	2	4	0.1	**10**	**44**	**98**	3.1
N136	1	0	4	0	1	0.0	7	24	63	2.1
N140	2	0	7	1	2	0.0	**8**	**34**	81	2.9
N141	1	0	5	1	1	0.0	8	**31**	78	2.7
N155	6	2	33	9	25	0.6	**11**	**52**	**119**	3.2
N156	6	2	31	9	24	0.6	**12**	**57**	**127**	3.3
N157	6	2	29	8	22	0.5	**12**	**58**	**129**	3.3
N158	6	2	29	8	22	0.5	**12**	**58**	**129**	3.3
N159	5	1	27	8	20	0.5	**12**	**56**	**125**	3.2
N160	5	1	26	7	19	0.5	**10**	**47**	**108**	3.0
N162	5	1	27	7	19	0.5	**10**	**42**	**99**	2.9
N163	5	1	25	7	18	0.4	**10**	**42**	**98**	2.8
N164	6	1	31	7	20	0.5	**9**	**39**	**95**	2.8
N165	5	1	28	7	18	0.4	**9**	**40**	**96**	2.8
N166	5	1	28	7	18	0.4	**9**	**40**	**95**	2.8
N167	5	1	28	6	17	0.4	**9**	**40**	**95**	2.8
N168	5	1	25	6	16	0.4	**9**	**40**	**95**	2.8
N169	5	1	25	6	16	0.4	**9**	**40**	**94**	2.8
N182	2	0	6	1	2	0.0	7	23	63	2.3
N33	2	0	9	1	2	0.0	6	17	54	2.0
N45	16	3	60	13	37	0.7	**10**	**32**	**93**	2.7
N46	7	1	30	5	14	0.3	8	25	71	2.3
N55	1	0	5	0	1	0.0	7	24	66	2.3
N56	1	0	6	1	1	0.0	7	**26**	68	2.3
N57	1	0	6	1	1	0.0	7	**26**	69	2.3

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD (g/m²/mth)
	Project alone						Total impact			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	25	-	50	-	-	2	8	25	90	4
N58	1	0	6	1	1	0.0	7	27	70	2.3
N59	2	0	7	1	1	0.0	8	31	77	2.3
N60	2	0	8	1	1	0.0	9	41	94	2.6
N61	2	0	7	1	2	0.0	7	28	72	2.3
N65	2	0	11	1	3	0.1	8	31	77	2.2
N66	2	0	11	2	4	0.1	8	30	75	2.2
N68	3	1	16	3	8	0.1	8	29	74	2.3
N70	5	1	23	4	12	0.2	8	29	75	2.3
N71	5	1	24	5	14	0.3	8	29	76	2.3
N72	5	1	24	5	14	0.3	8	28	76	2.3
N73	5	1	23	6	17	0.3	8	29	77	2.4
N74	2	0	9	1	3	0.1	8	34	78	2.3
N75	2	0	11	2	5	0.1	8	29	71	2.2
N76	5	2	24	7	20	0.4	8	29	79	2.5
N77	7	2	33	9	29	0.7	8	30	86	2.7
N79	4	1	20	6	17	0.4	8	28	75	2.4
N80	4	1	19	5	14	0.3	8	27	73	2.4
N81	4	1	19	6	16	0.4	8	28	75	2.5
N82	5	1	21	7	18	0.4	8	29	78	2.5
N83	4	1	18	5	14	0.3	8	27	73	2.5
N84	6	1	29	7	18	0.4	9	37	90	2.8
N85	8	2	37	7	20	0.4	10	44	101	2.8
N86	8	2	38	8	20	0.4	10	44	102	2.8
N89	5	1	25	6	14	0.3	11	54	118	3.2
N90	6	1	30	7	18	0.4	10	41	96	2.8
N92	5	1	26	6	16	0.4	10	41	97	2.9
N93	5	1	27	6	17	0.4	9	40	95	2.8
N94	5	1	27	7	18	0.4	10	41	96	2.8
N95	6	1	29	7	19	0.4	10	41	97	2.8
N96	6	2	30	8	21	0.5	10	43	101	2.9
N97	6	2	30	8	21	0.5	10	43	102	2.9
N98	5	1	26	7	18	0.4	10	42	99	2.8
N99	5	1	25	7	17	0.4	10	41	96	2.8

Appendix D

Isopleth Diagrams

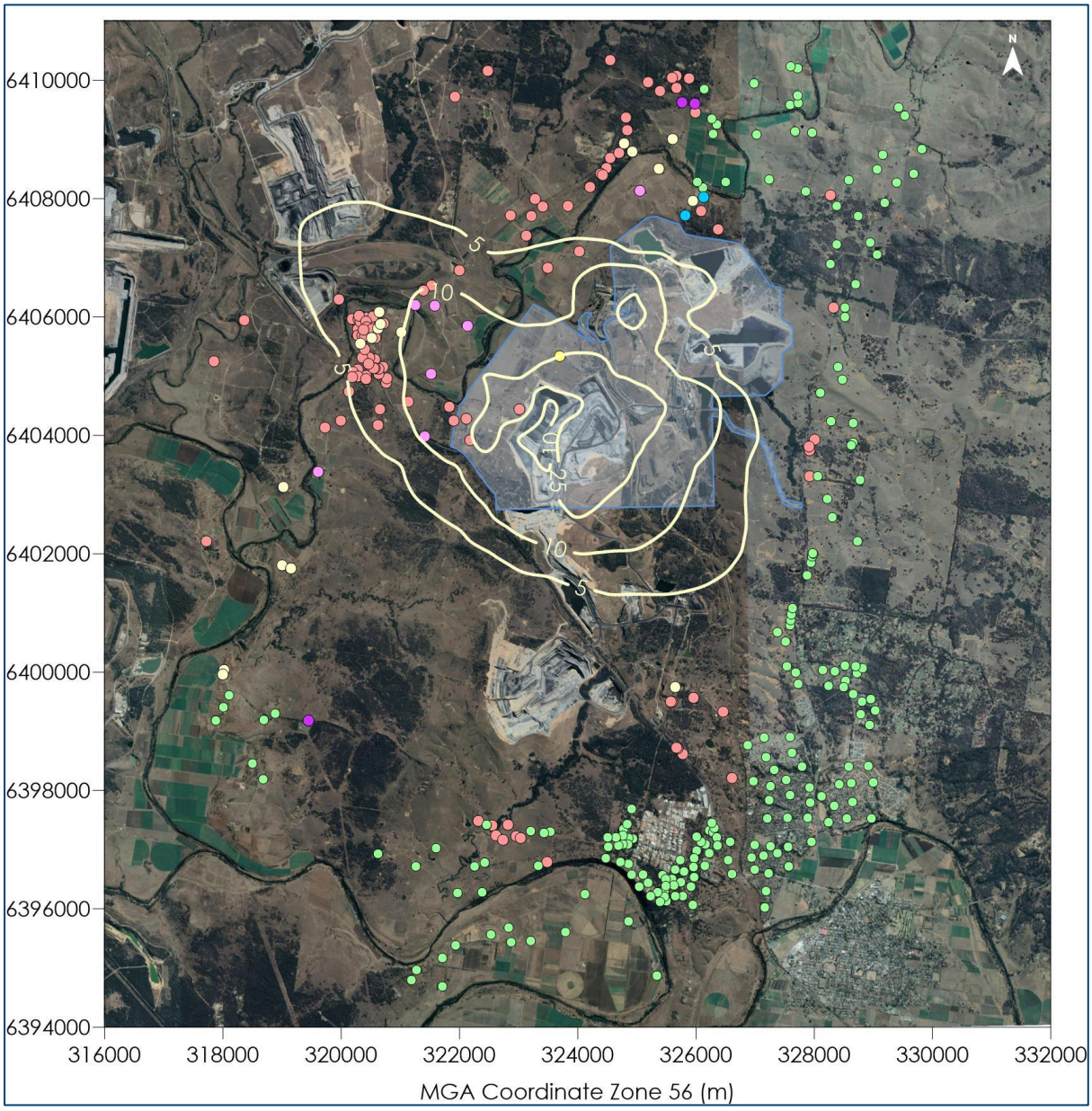

Figure D-1: Predicted maximum 24-hour average $PM_{2.5}$ concentrations due to emissions from the Project in 2021 (µg/m³)

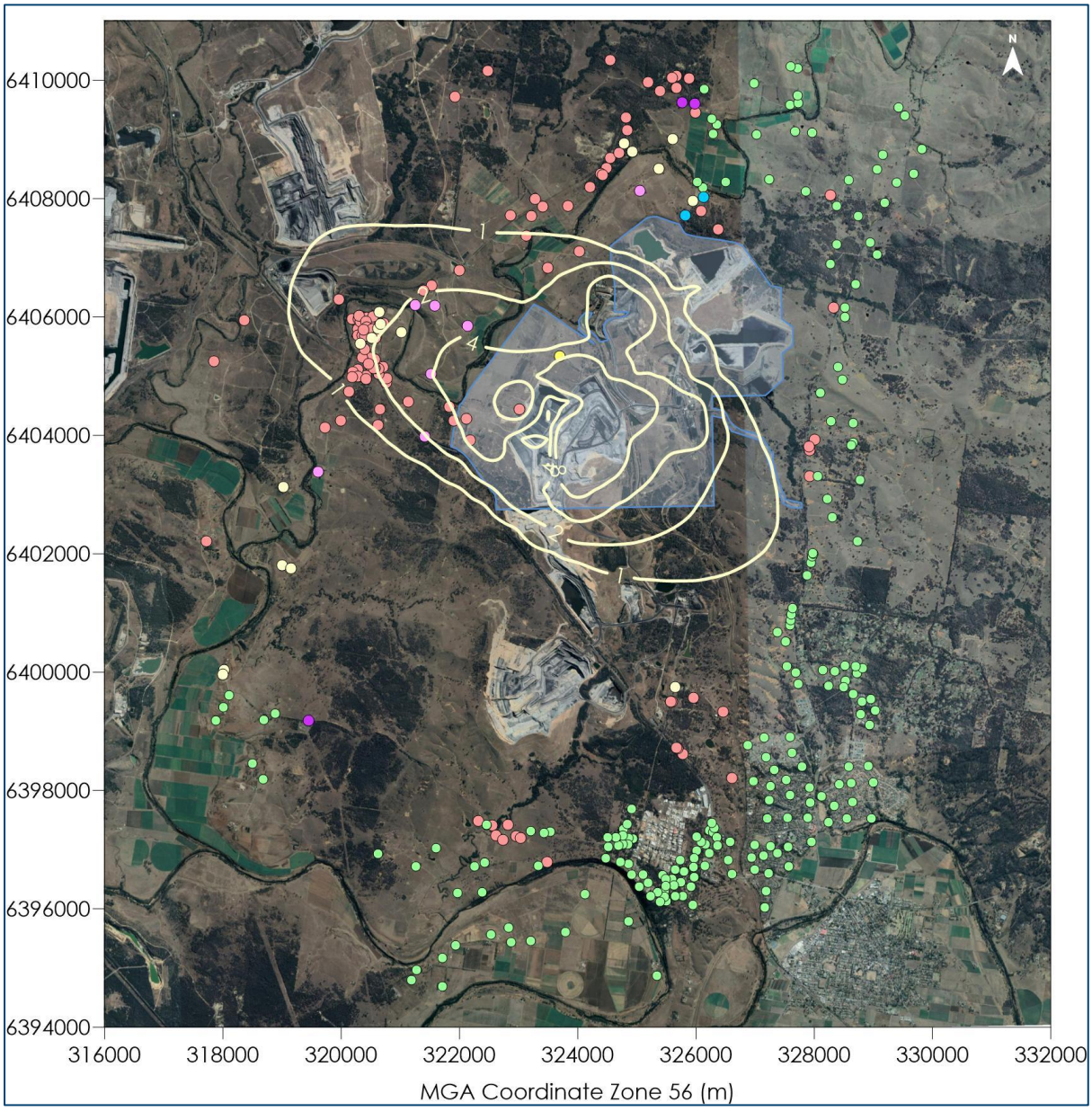

Figure D-2: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Project in 2021 (µg/m³)

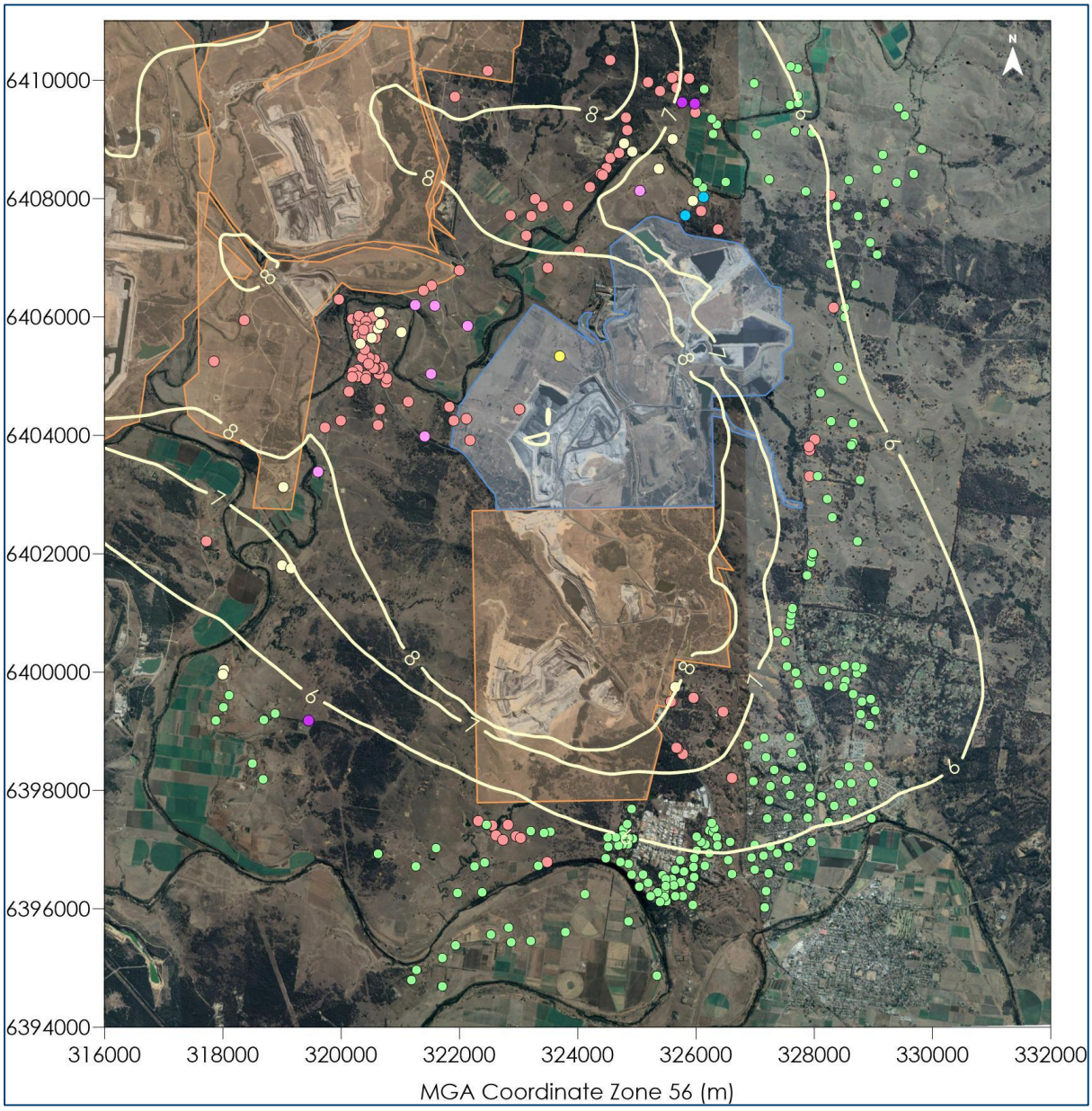

Figure D-3: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Project and other sources in 2021 (µg/m³)

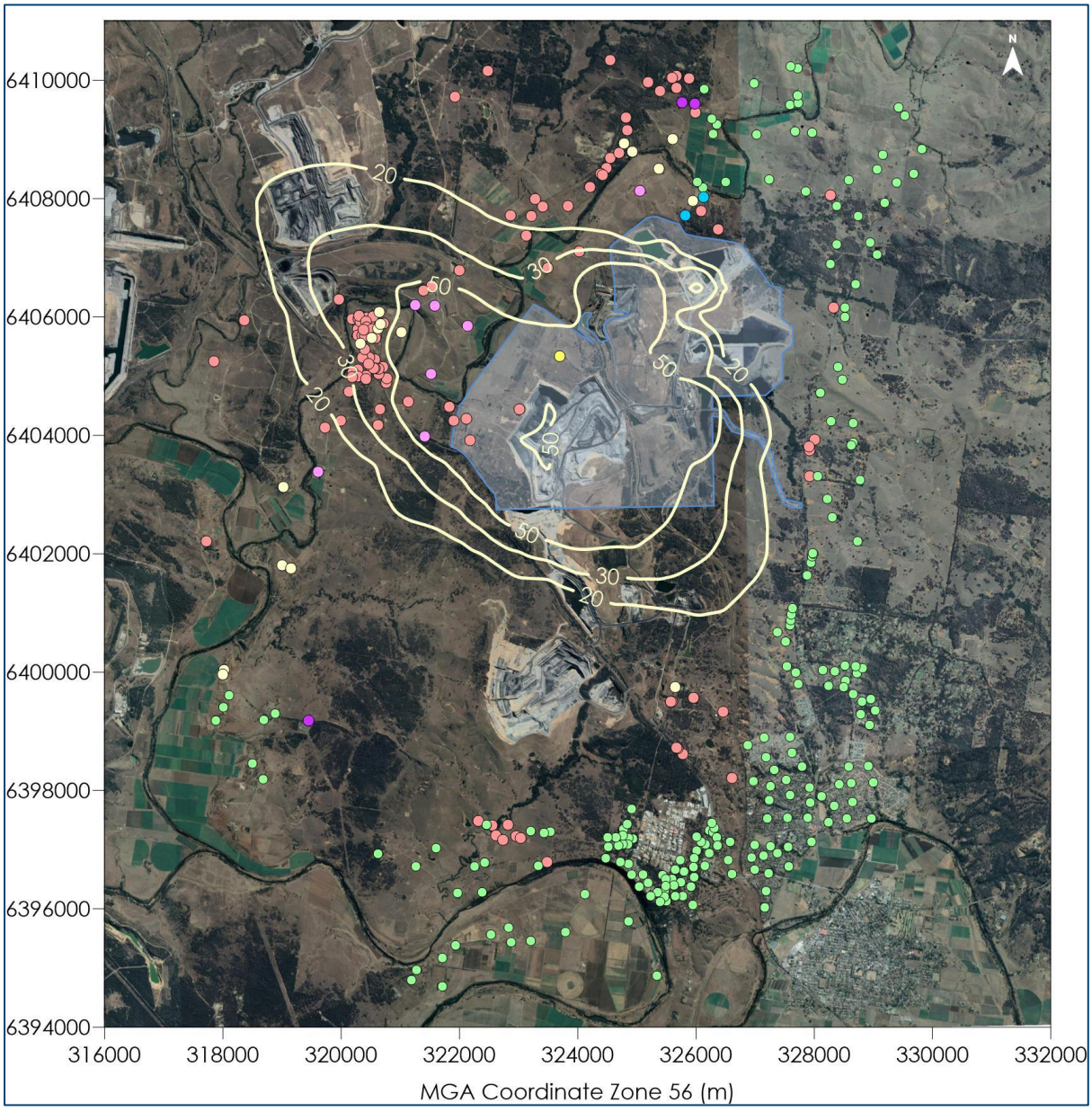

Figure D-4: Predicted maximum 24-hour average PM_{10} concentrations due to emissions from the Project in 2021 (µg/m³)

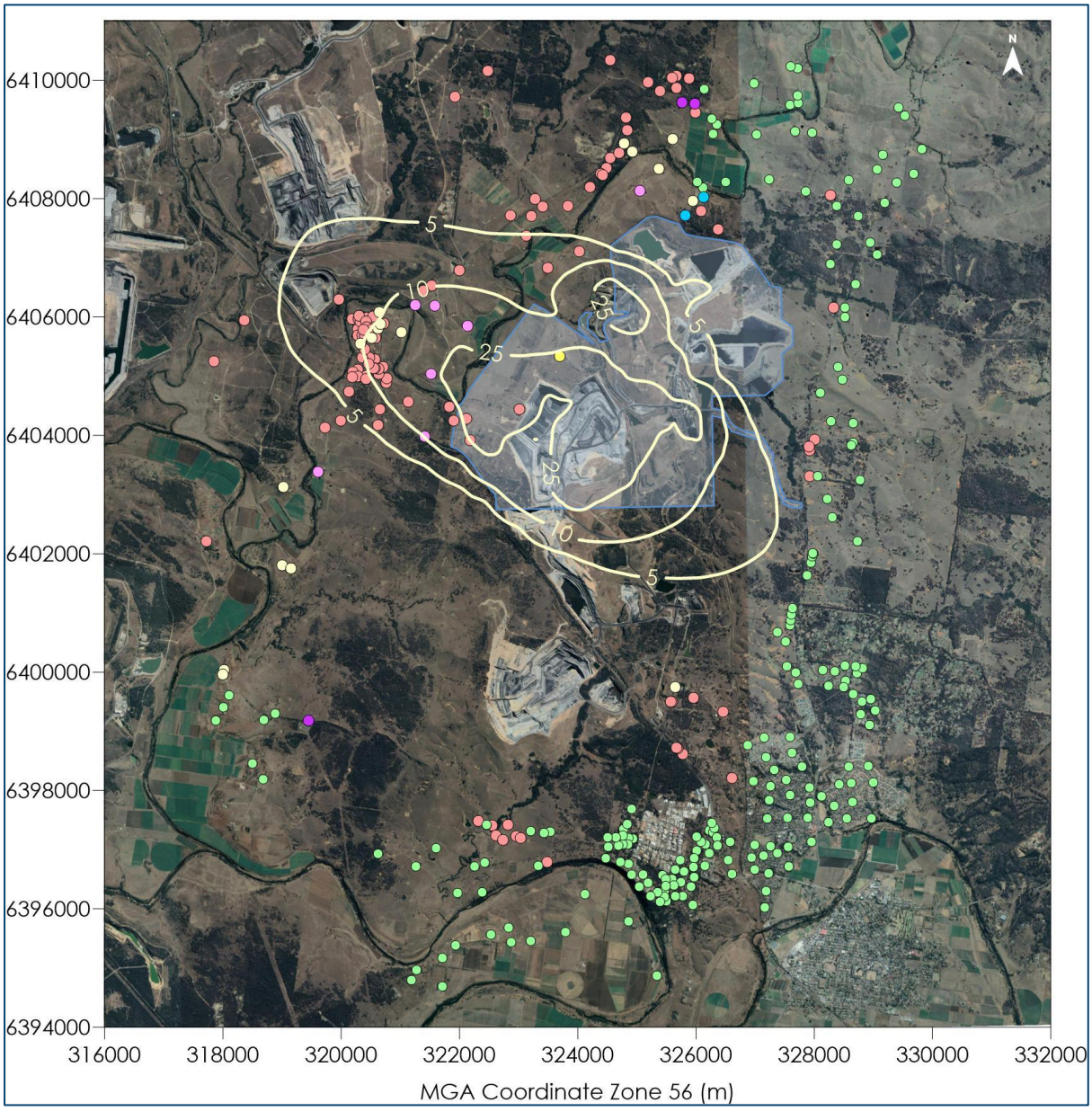

Figure D-5: Predicted annual average PM_{10} concentrations due to emissions from the Project in 2021 (µg/m³)

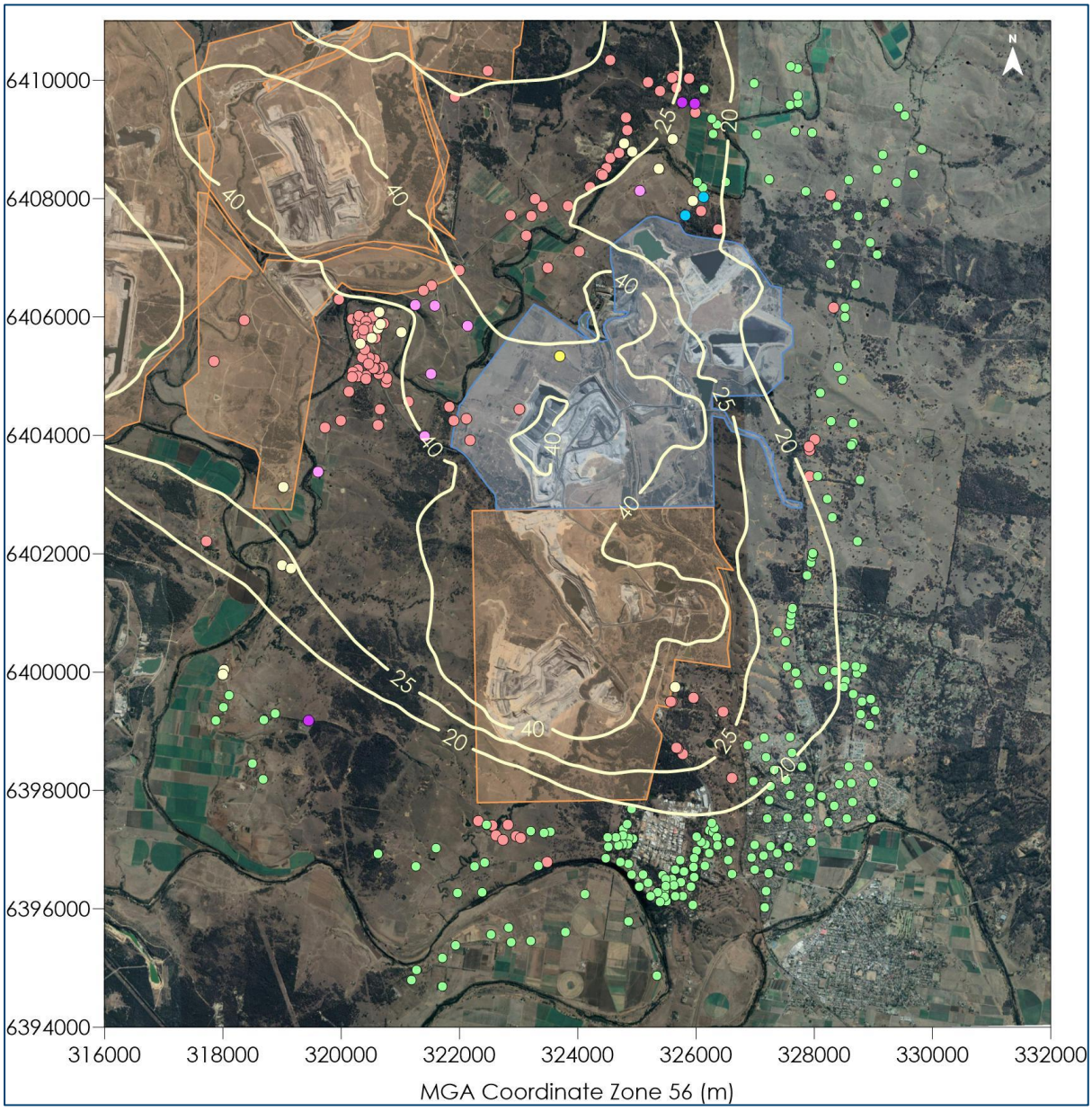

Figure D-6: Predicted annual average PM_{10} concentrations due to emissions from the Project and other sources in 2021 (µg/m³)

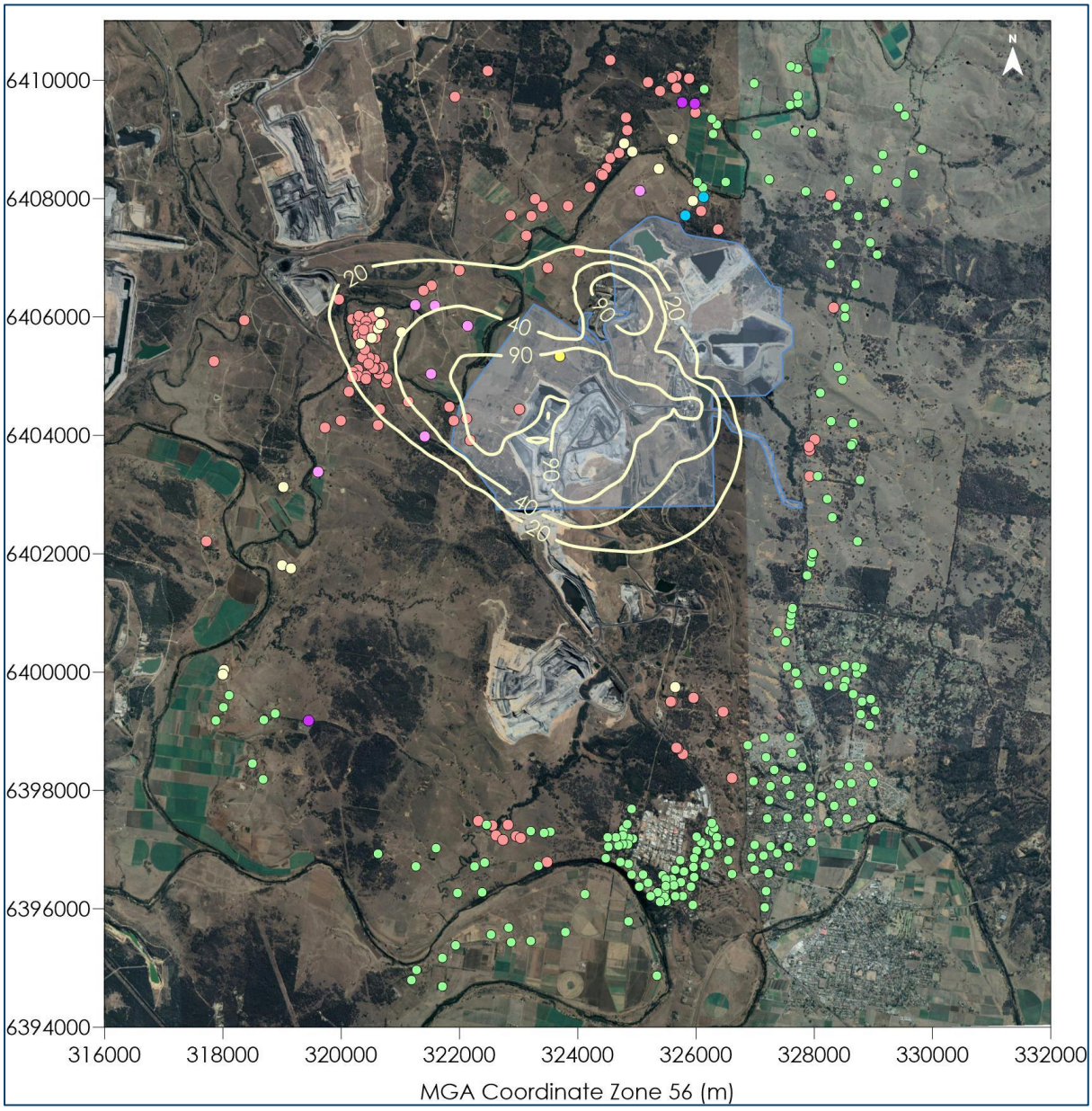

Figure D-7: Predicted annual average TSP concentrations due to emissions from the Project in 2021 (µg/m³)

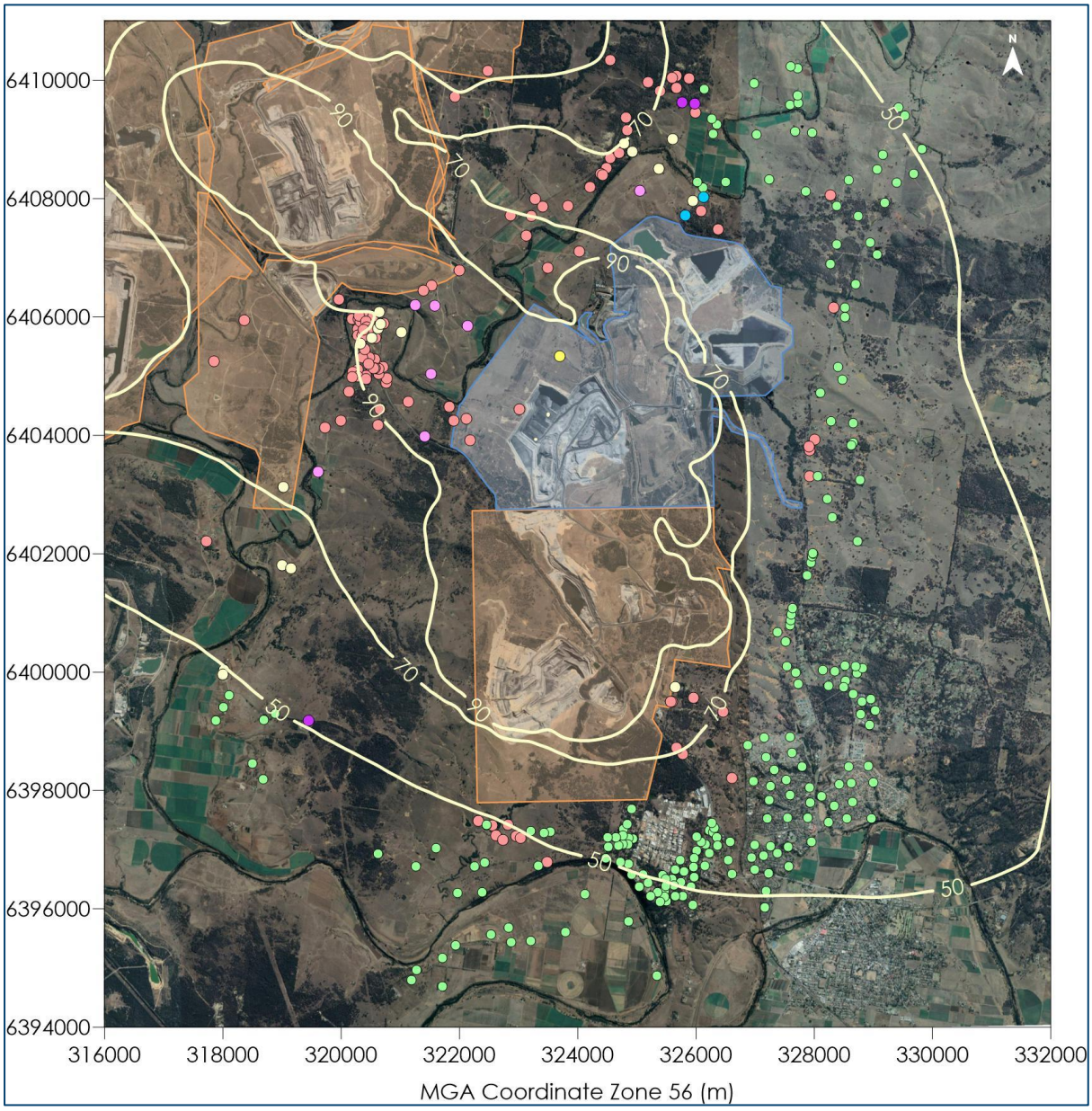

Figure D-8: Predicted annual average TSP concentrations due to emissions from the Project and other sources in 2021 (µg/m³)

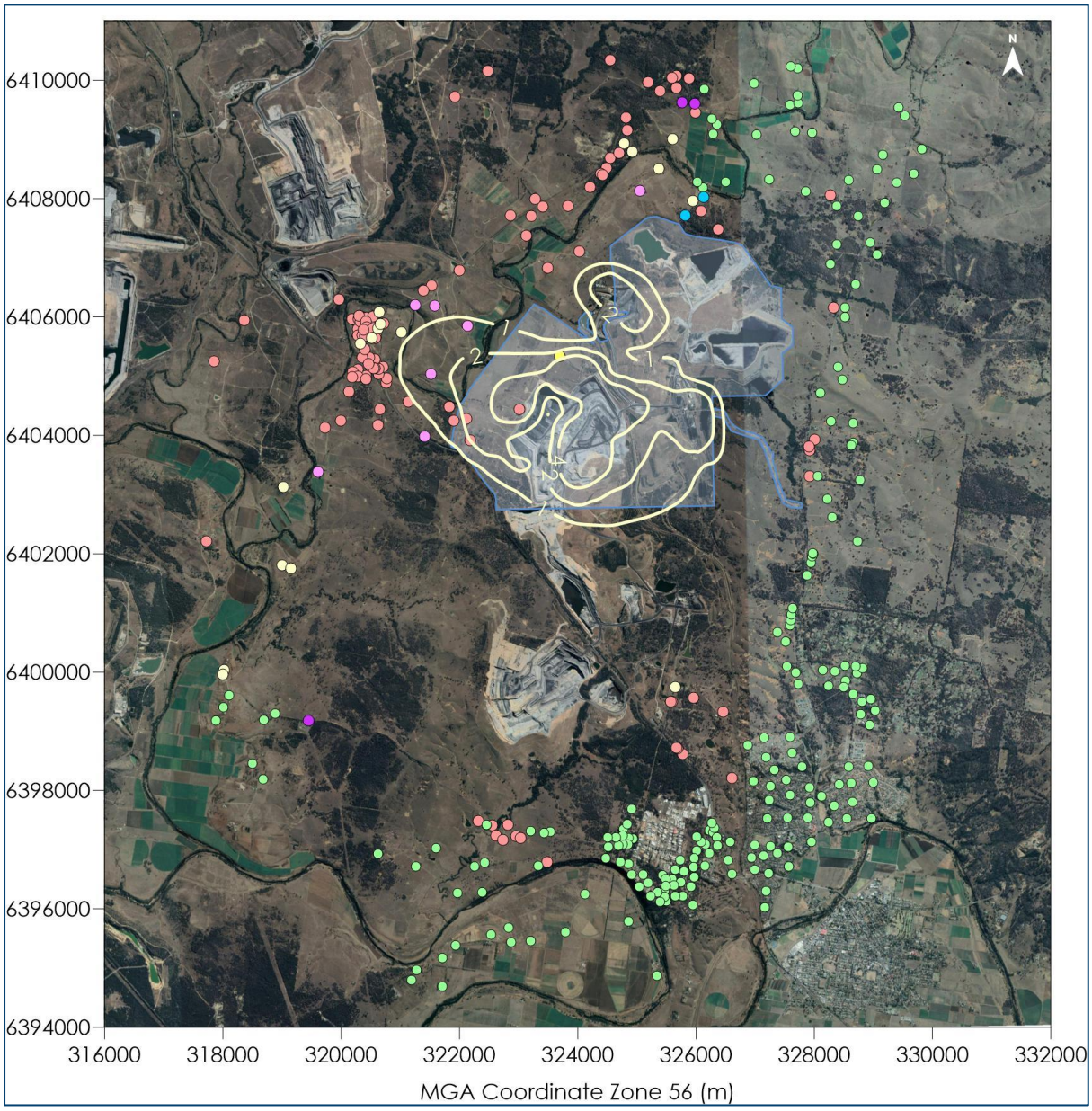

Figure D-9: Predicted annual average dust deposition levels due to emissions from the Project in 2021 (g/m²/month)

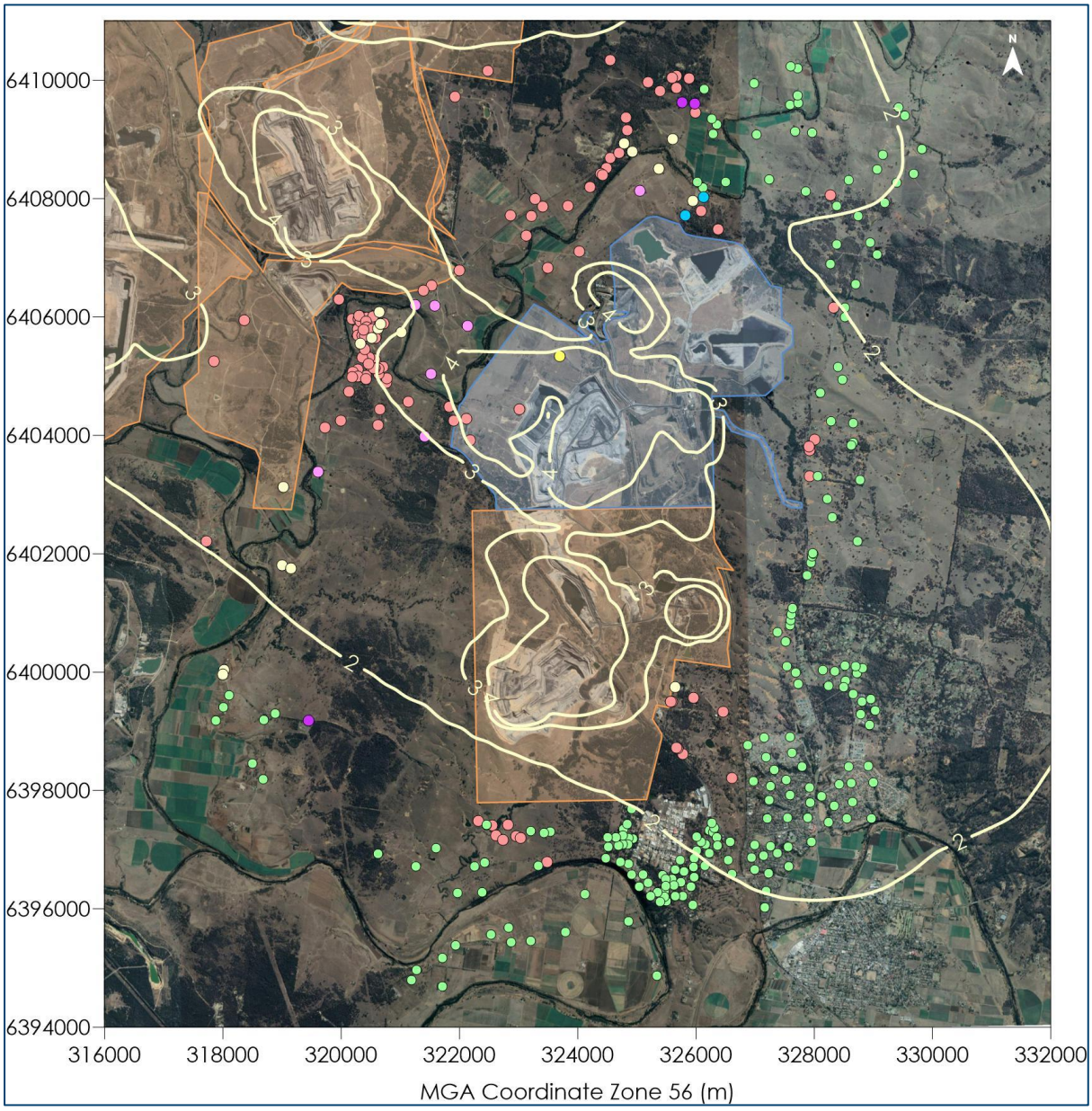

Figure D-10: Predicted annual average dust deposition levels due to emissions from the Project and other sources in 2021 (g/m²/month)

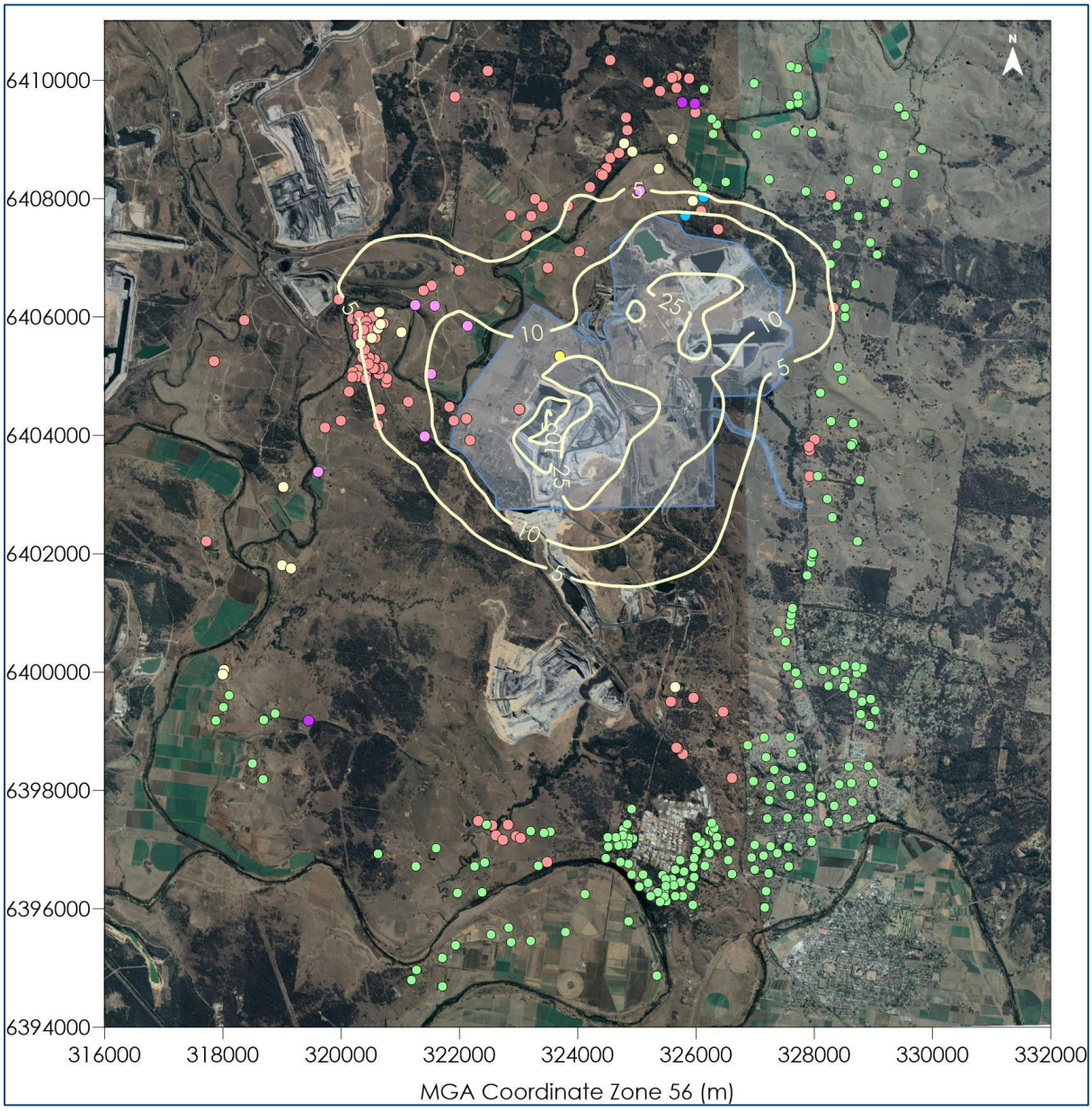

Figure D-11: Predicted maximum 24-hour average $PM_{2.5}$ concentrations due to emissions from the Project in 2024 (µg/m³)

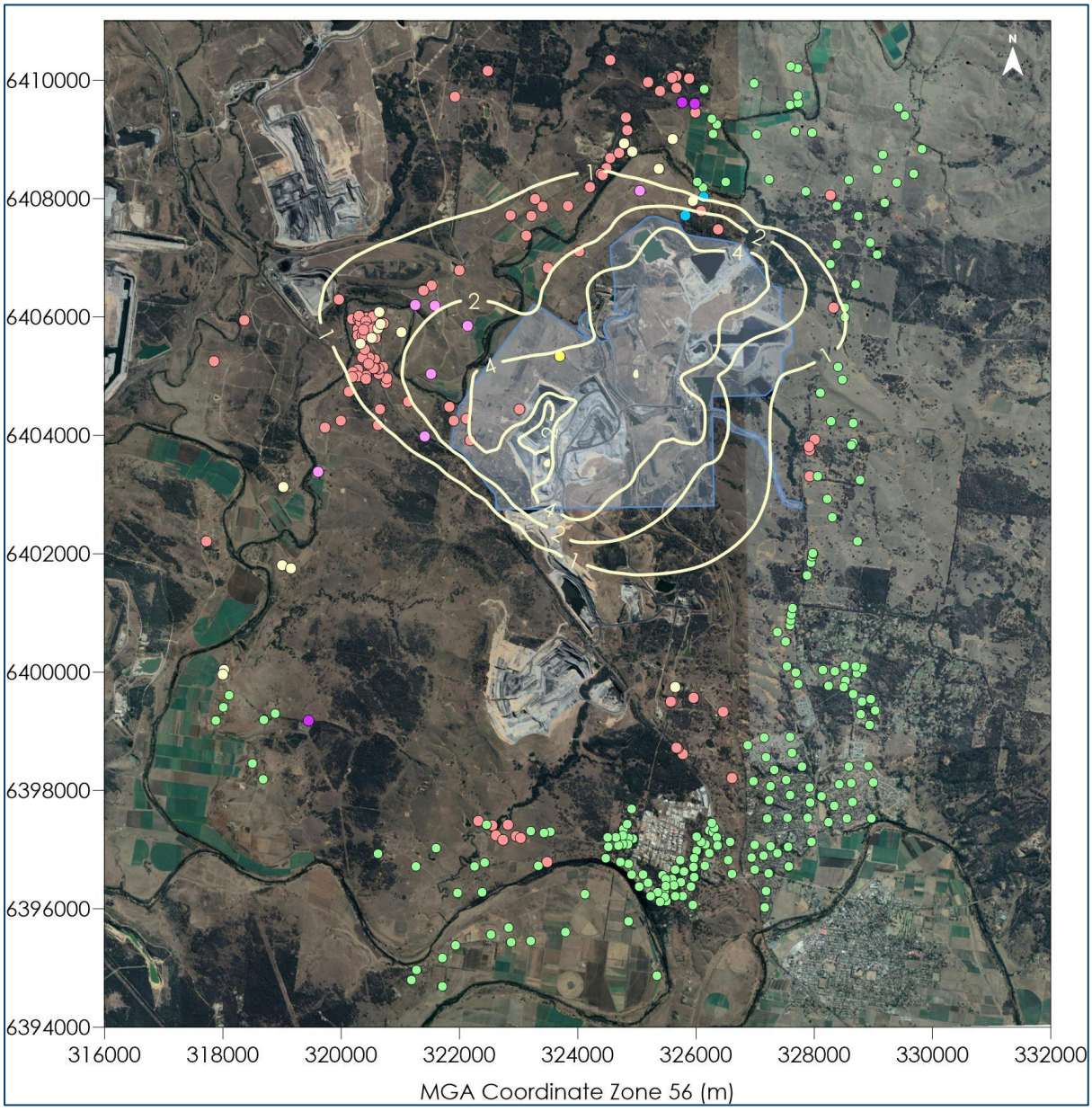

Figure D-12: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Project in 2024 (µg/m³)

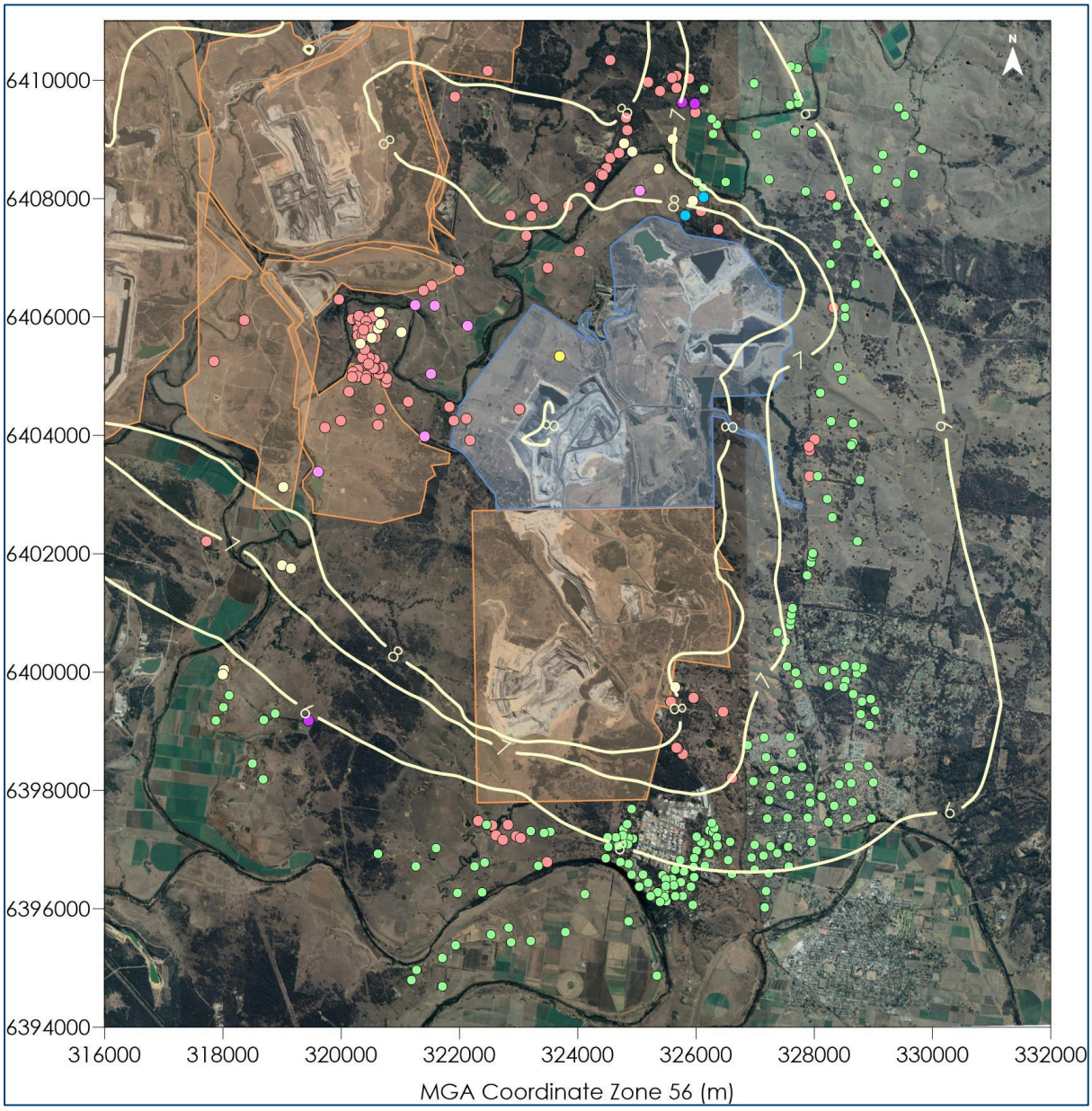

Figure D-13: Predicted annual average $PM_{2.5}$ concentrations due to emissions from the Project and other sources in 2024 (µg/m³)

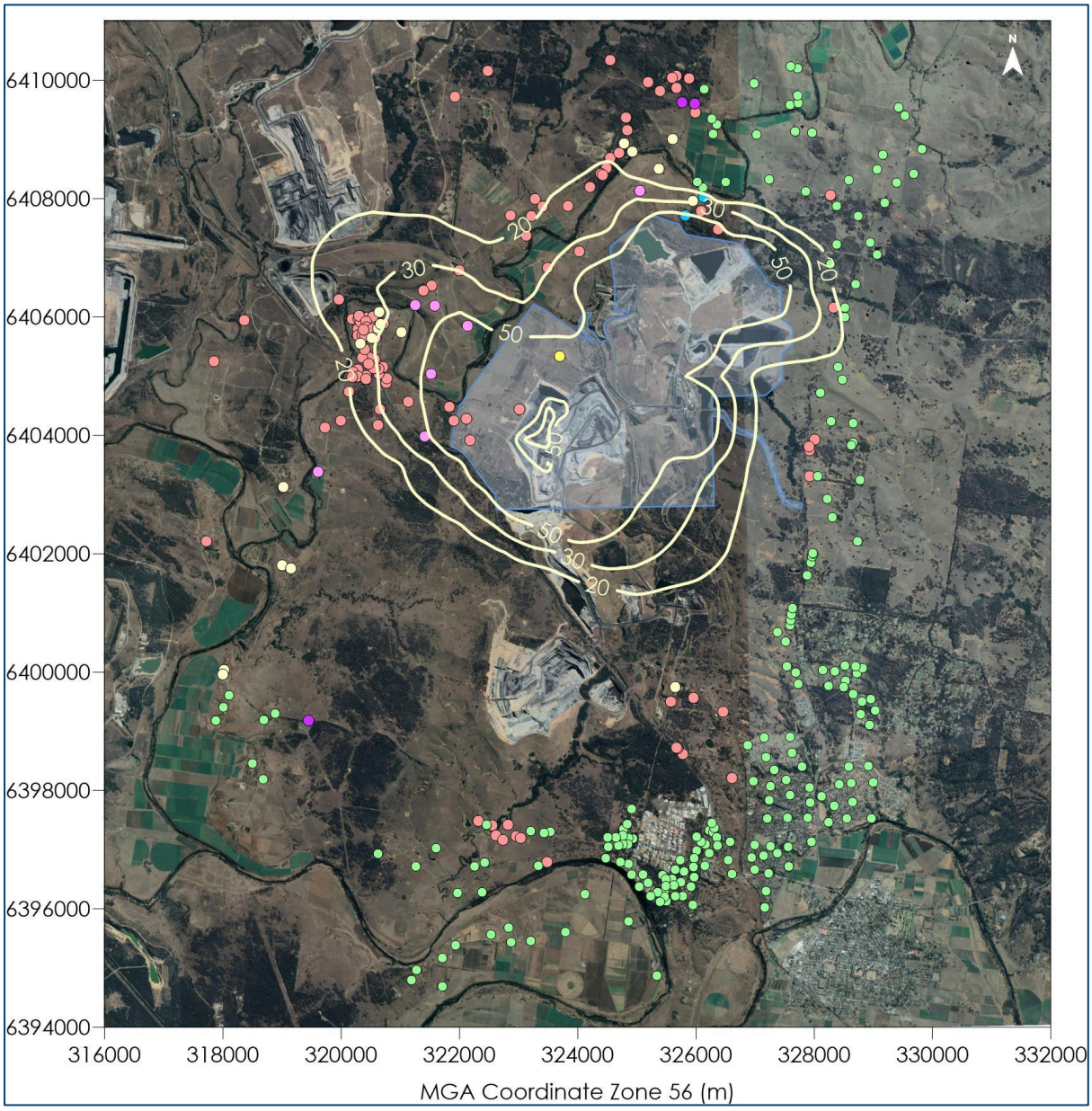

Figure D-14: Predicted maximum 24-hour average PM_{10} concentrations due to emissions from the Project in 2024 (µg/m³)

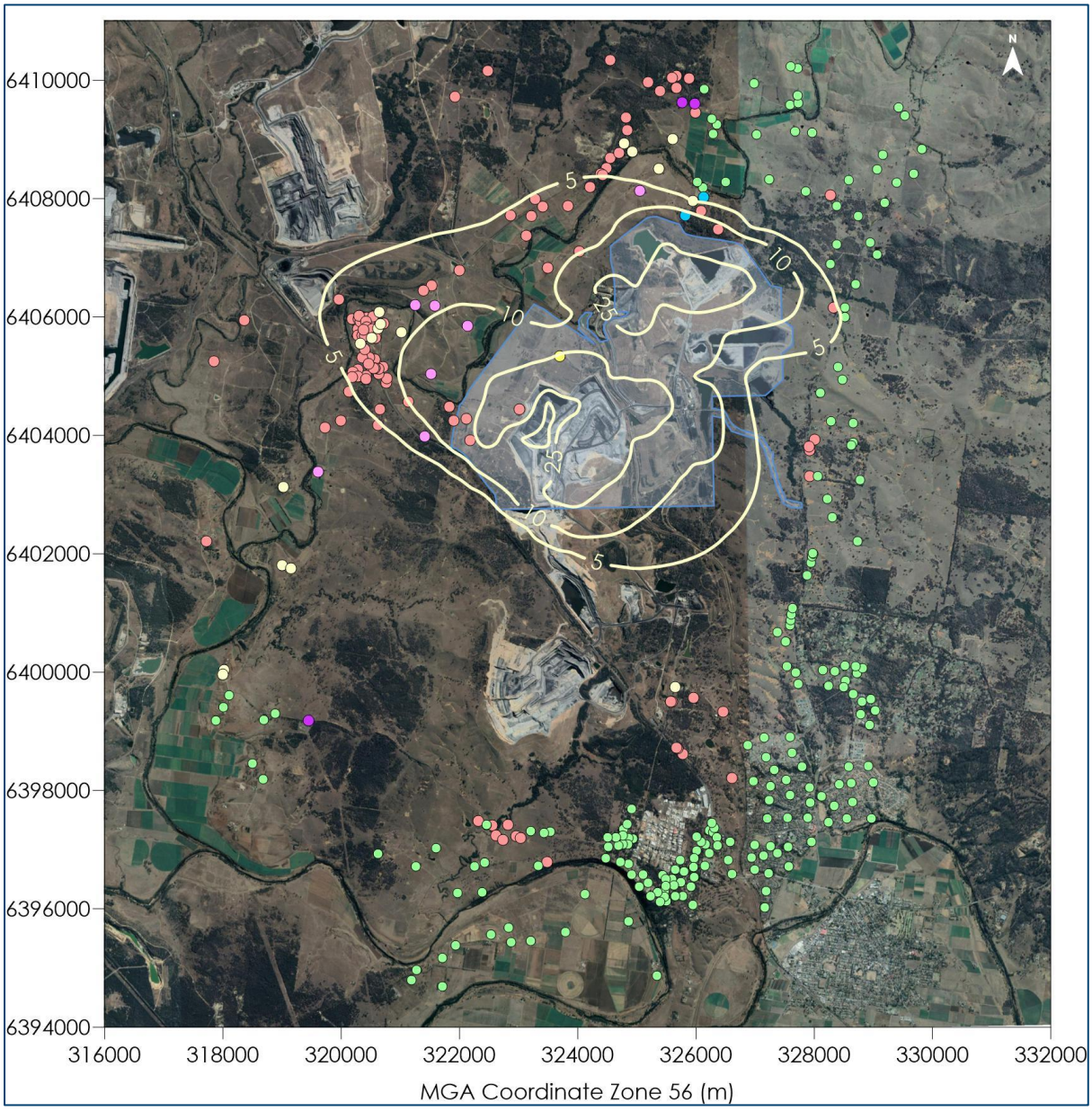

Figure D-15: Predicted annual average PM_{10} concentrations due to emissions from the Project in 2024 (µg/m³)

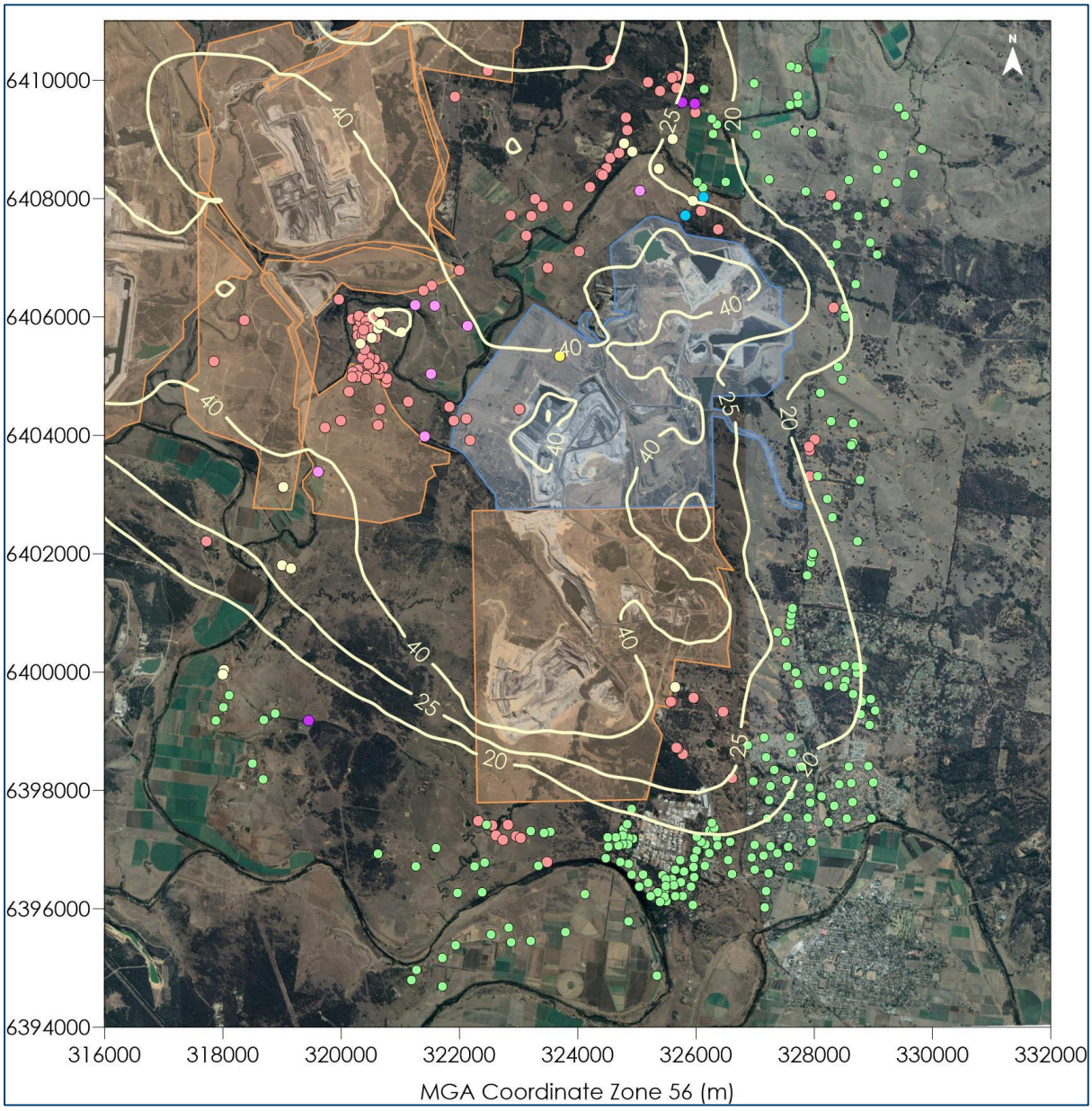

Figure D-16: Predicted annual average PM_{10} concentrations due to emissions from the Project and other sources in 2024 (µg/m³)

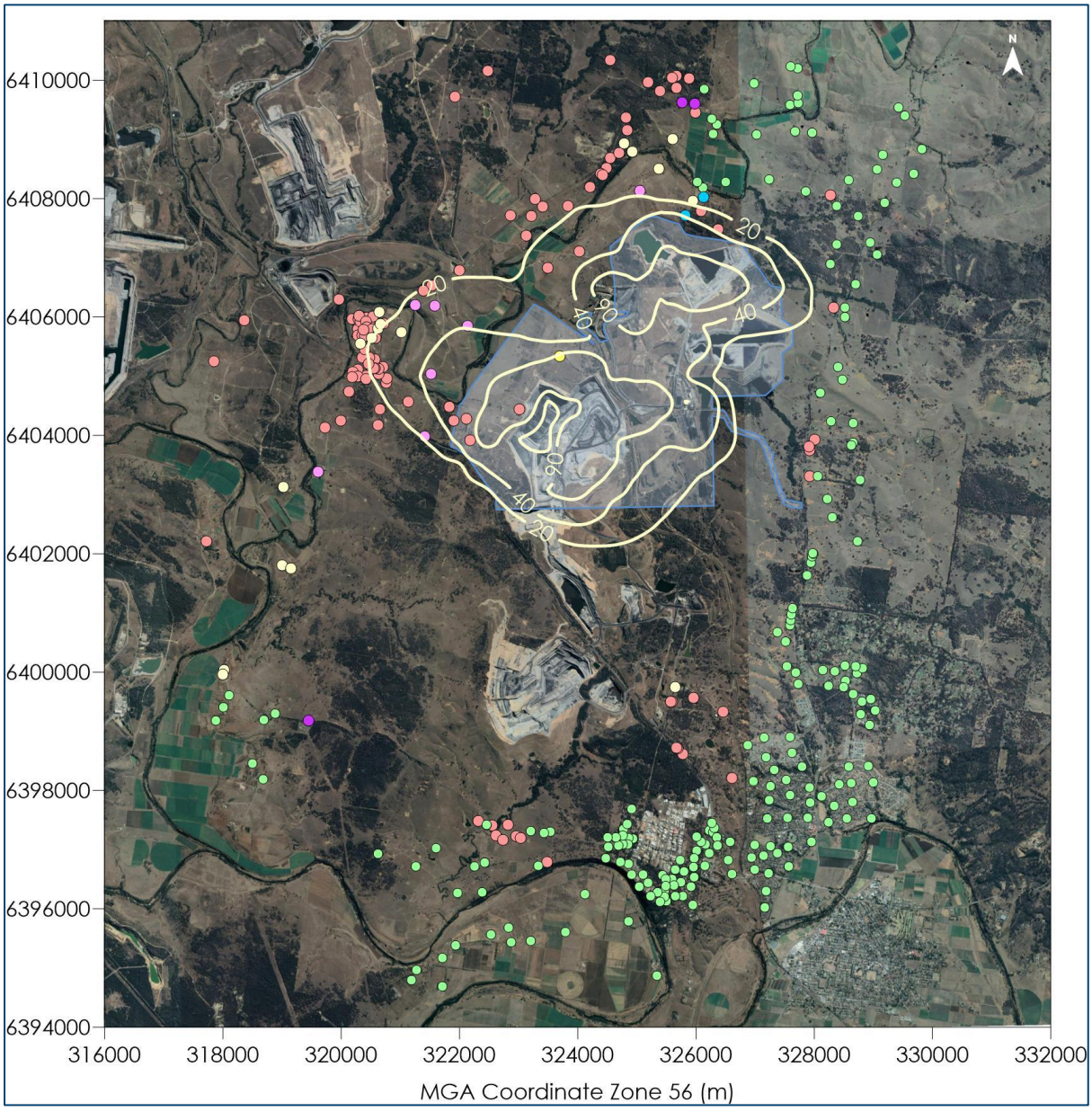

Figure D-17: Predicted annual average TSP concentrations due to emissions from the Project in 2024 (µg/m³)

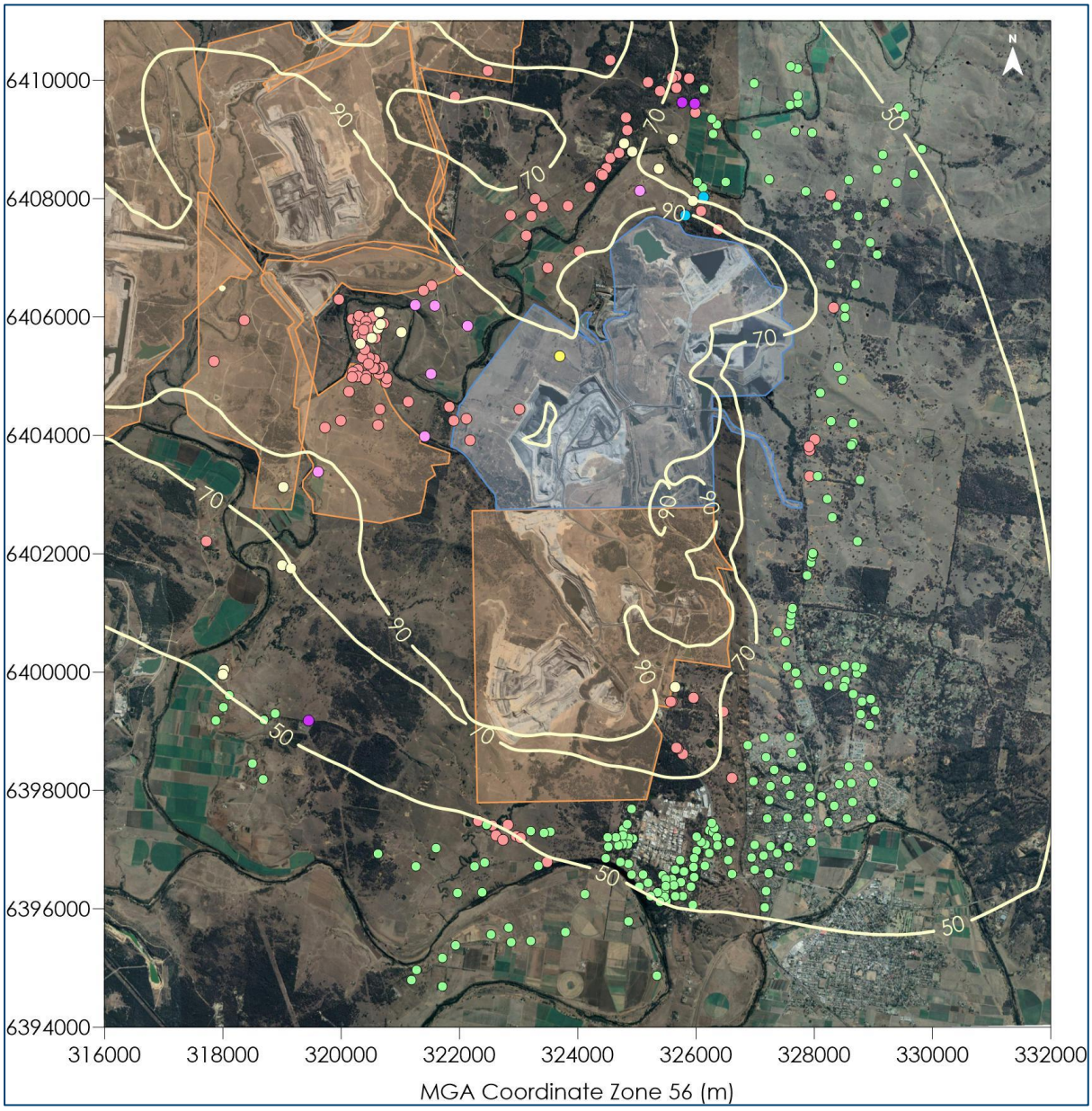

Figure D-18: Predicted annual average TSP concentrations due to emissions from the Project and other sources in 2024 (µg/m³)

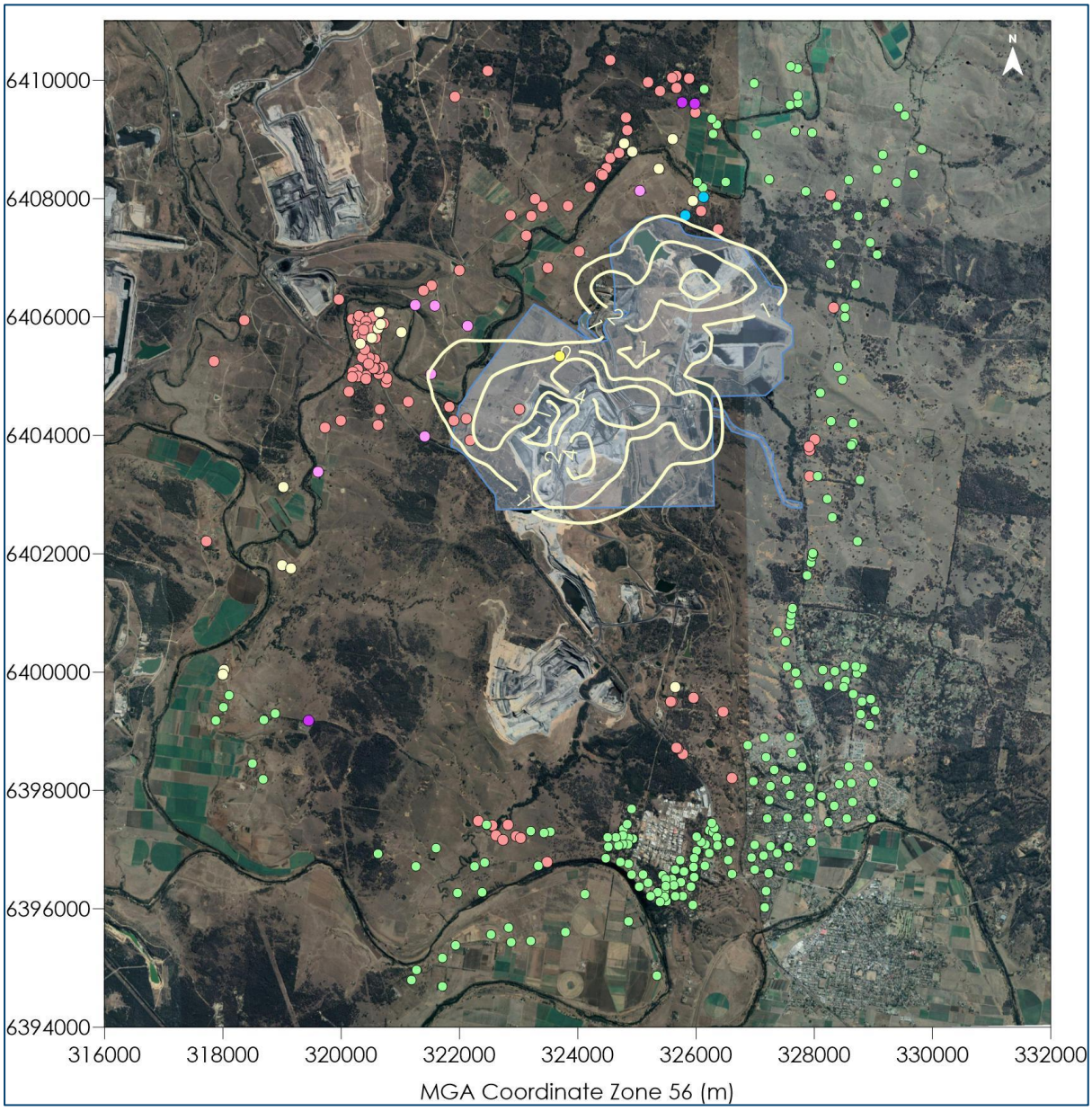

Figure D-19: Predicted annual average dust deposition levels due to emissions from the Project in 2024 (g/m²/month)

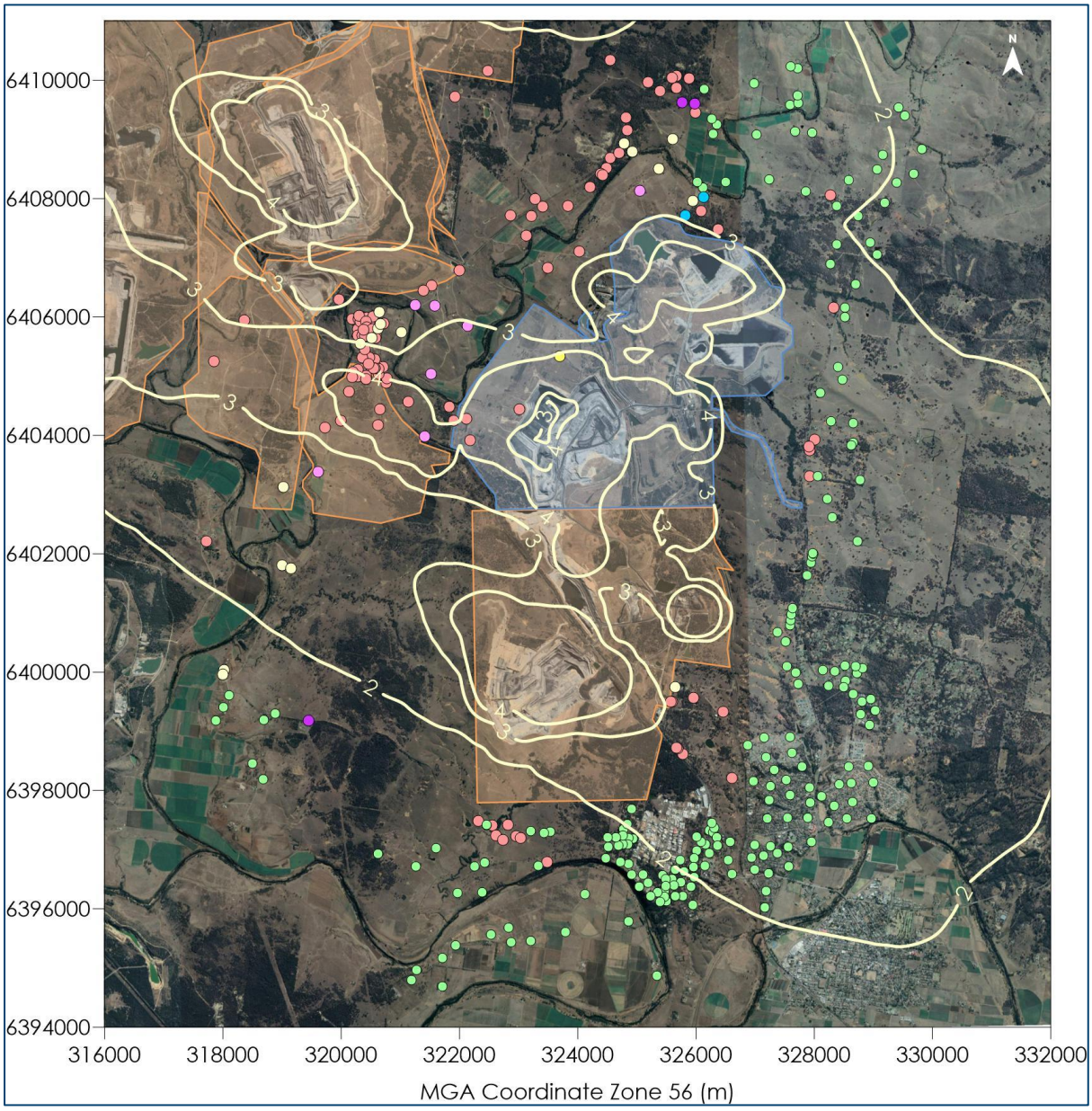

Figure D-20: Predicted annual average dust deposition levels due to emissions from the Project and other sources in 2024 (g/m²/month)

Appendix E

Further Detail Regarding 24-hour $PM_{2.5}$ and PM_{10} Analysis

Table E-1: 2020 ($PM_{2.5}$ 24-hr average concentration) – Receptor 9

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.2	19.8	30/07/2012	8.2	1.3	9.5
7/04/2012	16.5	0.3	16.8	28/02/2012	7.8	0.9	8.7
9/12/2012	16.2	0.0	16.2	20/07/2012	6.2	0.8	7.0
22/05/2012	15.5	0.1	15.6	9/04/2012	7.2	0.8	8.0
12/09/2012	15.4	0.1	15.5	1/08/2012	7.2	0.7	7.9
24/05/2012	14.7	0.4	15.1	31/07/2012	7.2	0.7	7.9
27/09/2012	14.7	0.0	14.7	28/05/2012	10.3	0.7	11.0
20/10/2012	14.4	0.1	14.5	14/09/2012	3.9	0.7	4.6
8/12/2012	14.1	0.1	14.2	30/08/2012	8.5	0.7	9.2
28/04/2012	14	0.0	14.0	5/05/2012	9.7	0.6	10.3

Table E-2: 2020 ($PM_{2.5}$ 24-hr average concentration) – N18

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	-0.1	19.5	30/07/2012	8.2	1.1	9.3
7/04/2012	16.5	0.0	16.5	31/07/2012	7.2	0.5	7.7
9/12/2012	16.2	0.0	16.2	9/04/2012	7.2	0.5	7.7
22/05/2012	15.5	-0.3	15.2	12/10/2012	2.9	0.5	3.4
12/09/2012	15.4	0.0	15.4	28/02/2012	7.8	0.4	8.2
24/05/2012	14.7	0.0	14.7	5/05/2012	9.7	0.4	10.1
27/09/2012	14.7	-0.2	14.5	5/12/2012	6.9	0.4	7.3
20/10/2012	14.4	0.0	14.4	20/07/2012	6.2	0.4	6.6
8/12/2012	14.1	0.0	14.1	13/04/2012	4.9	0.4	5.3
28/04/2012	14	-0.3	13.7	21/09/2012	5.6	0.4	6.0

Table E-3: 2020 ($PM_{2.5}$ 24-hr average concentration) – N180

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	-1.0	18.6	27/10/2012	7.2	0.6	7.8
7/04/2012	16.5	-0.1	16.4	5/05/2012	9.7	0.5	10.2
9/12/2012	16.2	-1.2	15.0	26/11/2012	7.2	0.3	7.5
22/05/2012	15.5	0.0	15.5	10/08/2012	7.2	0.2	7.4
12/09/2012	15.4	-1.1	14.3	28/02/2012	7.8	0.2	8.0
24/05/2012	14.7	-0.4	14.3	11/07/2012	7.4	0.2	7.6
27/09/2012	14.7	-0.4	14.3	3/10/2012	11.9	0.1	12.0
20/10/2012	14.4	-0.7	13.7	27/02/2012	7.2	0.1	7.3
8/12/2012	14.1	-1.1	13.0	2/11/2012	8.7	0.1	8.8
28/04/2012	14	-0.2	13.8	4/10/2012	9.8	0.1	9.9

Table E-4: 2020 ($PM_{2.5}$ 24-hr average concentration) – N181

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	-0.4	19.2	5/05/2012	9.7	0.5	10.2
7/04/2012	16.5	-0.1	16.4	27/10/2012	7.2	0.5	7.7
9/12/2012	16.2	-0.4	15.8	2/11/2012	8.7	0.3	9.0
22/05/2012	15.5	0.0	15.5	10/08/2012	7.2	0.2	7.4
12/09/2012	15.4	-0.5	14.9	26/11/2012	7.2	0.2	7.4
24/05/2012	14.7	-0.2	14.5	11/07/2012	7.4	0.1	7.5
27/09/2012	14.7	-0.2	14.5	28/02/2012	7.8	0.1	7.9
20/10/2012	14.4	-0.2	14.2	11/08/2012	6.7	0.1	6.8
8/12/2012	14.1	-0.7	13.4	25/12/2012	4.6	0.1	4.7
28/04/2012	14	0.0	14.0	2/05/2012	7.2	0.1	7.3

Table E-5: 2020 ($PM_{2.5}$ 24-hr average concentration) – N187

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.4	20.0	18/07/2012	8.8	1.9	10.7
7/04/2012	16.5	0.8	17.3	19/05/2012	8.2	1.8	10.0
9/12/2012	16.2	0.1	16.3	22/05/2012	15.5	1.8	17.3
22/05/2012	15.5	1.8	17.3	25/06/2012	9.1	1.8	10.9
12/09/2012	15.4	0.4	15.8	18/05/2012	11.3	1.8	13.1
24/05/2012	14.7	1.0	15.7	27/07/2012	6.6	1.7	8.3
27/09/2012	14.7	0.5	15.2	1/08/2012	7.2	1.7	8.9
20/10/2012	14.4	0.4	14.8	12/07/2012	12.6	1.7	14.3
8/12/2012	14.1	0.1	14.2	2/08/2012	7.2	1.7	8.9
28/04/2012	14	0.8	14.8	3/07/2012	7.2	1.6	8.8

Table E-6: 2020 ($PM_{2.5}$ 24-hr average concentration) – N20

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	-0.4	19.2	11/08/2012	6.7	0.4	7.1
7/04/2012	16.5	-0.5	16.0	10/04/2012	7.2	0.3	7.5
9/12/2012	16.2	0.0	16.2	9/04/2012	7.2	0.3	7.5
22/05/2012	15.5	-1.2	14.3	2/11/2012	8.7	0.2	8.9
12/09/2012	15.4	-0.2	15.2	27/10/2012	7.2	0.2	7.4
24/05/2012	14.7	-0.6	14.1	7/06/2012	3.1	0.2	3.3
27/09/2012	14.7	-0.5	14.2	12/01/2012	3.7	0.1	3.8
20/10/2012	14.4	-0.2	14.2	21/09/2012	5.6	0.1	5.7
8/12/2012	14.1	0.0	14.1	13/04/2012	4.9	0.1	5.0
28/04/2012	14	-0.6	13.4	12/02/2012	4.9	0.1	5.0

Table E-7: 2020 ($PM_{2.5}$ 24-hr average concentration) – N23

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	-0.3	19.3	11/08/2012	6.7	0.4	7.1
7/04/2012	16.5	-0.6	15.9	10/04/2012	7.2	0.3	7.5
9/12/2012	16.2	0.0	16.2	2/11/2012	8.7	0.3	9.0
22/05/2012	15.5	-0.8	14.7	12/01/2012	3.7	0.2	3.9
12/09/2012	15.4	-0.3	15.1	7/06/2012	3.1	0.2	3.3
24/05/2012	14.7	-0.6	14.1	27/10/2012	7.2	0.2	7.4
27/09/2012	14.7	-0.1	14.6	30/01/2012	4.1	0.1	4.2
20/10/2012	14.4	-0.3	14.1	26/02/2012	4.8	0.0	4.8
8/12/2012	14.1	0.0	14.1	19/02/2012	13.8	0.0	13.8
28/04/2012	14	-0.2	13.8	2/01/2012	4.9	0.0	4.9

Table E-8: 2023 ($PM_{2.5}$ 24-hr average concentration) – Receptor 9

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.5	20.1	30/07/2012	8.2	1.7	9.9
7/04/2012	16.5	0.6	17.1	18/05/2012	11.3	1.5	12.8
9/12/2012	16.2	0.1	16.3	8/05/2012	10.5	1.5	12.0
22/05/2012	15.5	1.0	16.5	29/06/2012	9.9	1.4	11.3
12/09/2012	15.4	0.8	16.2	26/07/2012	8.5	1.4	9.9
24/05/2012	14.7	1.2	15.9	12/07/2012	12.6	1.4	14.0
27/09/2012	14.7	0.8	15.5	1/08/2012	7.2	1.4	8.6
20/10/2012	14.4	0.4	14.8	22/08/2012	11.4	1.3	12.7
8/12/2012	14.1	0.1	14.2	28/05/2012	10.3	1.3	11.6
28/04/2012	14	1.1	15.1	28/02/2012	7.8	1.3	9.1

Table E-9: 2023 ($PM_{2.5}$ 24-hr average concentration) – N18

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.8	20.4	30/06/2012	7.4	2.9	10.3
7/04/2012	16.5	0.8	17.3	22/05/2012	15.5	2.6	18.1
9/12/2012	16.2	0.1	16.3	15/06/2012	12.3	2.3	14.6
22/05/2012	15.5	2.6	18.1	18/05/2012	11.3	2.2	13.5
12/09/2012	15.4	1.2	16.6	14/08/2012	7.2	2.1	9.3
24/05/2012	14.7	1.5	16.2	20/06/2012	7	2.1	9.1
27/09/2012	14.7	1.2	15.9	2/09/2012	4.5	2.0	6.5
20/10/2012	14.4	0.5	14.9	1/08/2012	7.2	2.0	9.2
8/12/2012	14.1	0.1	14.2	17/07/2012	7.6	2.0	9.6
28/04/2012	14	1.9	15.9	28/05/2012	10.3	2.0	12.3

Table E-10: 2023 ($PM_{2.5}$ 24-hr average concentration) – N180

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	2.2	21.8	7/06/2012	3.1	6.3	9.4
7/04/2012	16.5	0.5	17.0	21/07/2012	6.3	5.3	11.6
9/12/2012	16.2	1.1	17.3	3/06/2012	6	4.9	10.9
22/05/2012	15.5	0.0	15.5	12/04/2012	5	4.7	9.7
12/09/2012	15.4	1.8	17.2	8/06/2012	6.3	4.7	11.0
24/05/2012	14.7	1.7	16.4	6/06/2012	6.9	4.4	11.3
27/09/2012	14.7	1.8	16.5	11/06/2012	5.8	4.1	9.9
20/10/2012	14.4	0.6	15.0	26/02/2012	4.8	4.1	8.9
8/12/2012	14.1	2.2	16.3	2/06/2012	8.2	4.0	12.2
28/04/2012	14	0.6	14.6	22/07/2012	4	4.0	8.0

Table E-11: 2023 ($PM_{2.5}$ 24-hr average concentration) – N181

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.5	20.1	7/06/2012	3.1	2.3	5.4
7/04/2012	16.5	0.2	16.7	6/06/2012	6.9	2.0	8.9
9/12/2012	16.2	-0.1	16.1	12/04/2012	5	1.9	6.9
22/05/2012	15.5	0.0	15.5	8/06/2012	6.3	1.9	8.2
12/09/2012	15.4	0.2	15.6	12/02/2012	4.9	1.7	6.6
24/05/2012	14.7	0.8	15.5	3/06/2012	6	1.7	7.7
27/09/2012	14.7	0.8	15.5	21/07/2012	6.3	1.6	7.9
20/10/2012	14.4	0.1	14.5	11/06/2012	5.8	1.6	7.4
8/12/2012	14.1	0.1	14.2	21/02/2012	6.7	1.6	8.3
28/04/2012	14	0.4	14.4	17/05/2012	8.6	1.5	10.1

Table E-12: 2023 ($PM_{2.5}$ 24-hr average concentration) – N187

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.3	19.9	18/05/2012	11.3	1.4	12.7
7/04/2012	16.5	0.5	17.0	8/05/2012	10.5	1.3	11.8
9/12/2012	16.2	0.1	16.3	12/07/2012	12.6	1.3	13.9
22/05/2012	15.5	1.3	16.8	19/05/2012	8.2	1.3	9.5
12/09/2012	15.4	0.4	15.8	18/07/2012	8.8	1.3	10.1
24/05/2012	14.7	1.0	15.7	22/05/2012	15.5	1.3	16.8
27/09/2012	14.7	0.5	15.2	14/09/2012	3.9	1.2	5.1
20/10/2012	14.4	0.4	14.8	2/08/2012	7.2	1.2	8.4
8/12/2012	14.1	0.1	14.2	1/08/2012	7.2	1.2	8.4
28/04/2012	14	0.8	14.8	9/05/2012	9.4	1.2	10.6

Table E-13: 2023 ($PM_{2.5}$ 24-hr average concentration) – N20

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	1.0	20.6	22/05/2012	15.5	3.2	18.7
7/04/2012	16.5	1.3	17.8	1/08/2012	7.2	2.8	10.0
9/12/2012	16.2	0.1	16.3	18/07/2012	8.8	2.8	11.6
22/05/2012	15.5	3.2	18.7	25/06/2012	9.1	2.8	11.9
12/09/2012	15.4	1.0	16.4	2/08/2012	7.2	2.8	10.0
24/05/2012	14.7	1.7	16.4	30/06/2012	7.4	2.7	10.1
27/09/2012	14.7	0.9	15.6	29/06/2012	9.9	2.6	12.5
20/10/2012	14.4	0.6	15.0	20/06/2012	7	2.5	9.5
8/12/2012	14.1	0.1	14.2	30/07/2012	8.2	2.5	10.7
28/04/2012	14	1.6	15.6	14/08/2012	7.2	2.5	9.7

Table E-14: 2023 ($PM_{2.5}$ 24-hr average concentration) – N23

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
25/10/2012	19.6	0.4	20.0	30/07/2012	8.2	2.9	11.1
7/04/2012	16.5	1.0	17.5	9/04/2012	7.2	2.4	9.6
9/12/2012	16.2	0.1	16.3	7/05/2012	7.4	1.9	9.3
22/05/2012	15.5	1.1	16.6	20/07/2012	6.2	1.8	8.0
12/09/2012	15.4	0.7	16.1	30/09/2012	4.3	1.8	6.1
24/05/2012	14.7	1.3	16.0	10/07/2012	9.5	1.7	11.2
27/09/2012	14.7	0.3	15.0	31/07/2012	7.2	1.6	8.8
20/10/2012	14.4	0.5	14.9	28/02/2012	7.8	1.6	9.4
8/12/2012	14.1	0.1	14.2	29/06/2012	9.9	1.5	11.4
28/04/2012	14	0.6	14.6	29/05/2012	6.9	1.5	8.4

Table E-15: 2020 (PM_{10} 24-hr average concentration) – Receptor 9

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	0.3	**61.3**				
30/08/2012	**54.0**	2.3	**56.3**				
5/10/2012	**54.0**	0.6	**54.6**				
6/08/2012	48.0	0.6	48.6	30/07/2012	24.0	4.5	28.5
5/09/2012	44.0	-0.2	43.8	28/02/2012	24.0	2.9	26.9
16/12/2012	38.0	1.3	39.3	9/04/2012	24.0	2.7	26.7
11/09/2012	37.0	-0.2	36.8	20/07/2012	24.0	2.6	26.6
18/08/2012	34.0	0.8	34.8	31/07/2012	15.0	2.3	17.3
4/12/2012	32.0	1.6	33.6	9/08/2012	24.0	2.3	26.3
9/01/2012	30.0	-0.2	29.8	1/08/2012	24.0	2.3	26.3
22/11/2012	29.0	0.4	29.4	30/08/2012	**54.0**	2.3	**56.3**
25/06/2012	28.0	1.0	29.0	14/09/2012	24.0	2.2	26.2
24/08/2012	28.0	0.7	28.7	7/10/2012	24.0	2.1	26.1

Table E-16: 2020 (PM_{10} 24-hr average concentration) – N18

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	-0.3	**60.7**				
30/08/2012	**54.0**	0.9	**54.9**				
5/10/2012	**54.0**	-0.4	**53.6**				
6/08/2012	48.0	0.5	48.5	30/07/2012	24.0	3.7	27.7
5/09/2012	44.0	-2.3	41.7	5/12/2012	24.0	1.5	25.5
16/12/2012	38.0	0.7	38.7	31/07/2012	15.0	1.5	16.5
11/09/2012	37.0	-1.1	35.9	9/04/2012	24.0	1.4	25.4
18/08/2012	34.0	0.2	34.2	12/10/2012	24.0	1.3	25.3
4/12/2012	32.0	1.0	33.0	16/11/2012	13.0	1.1	14.1
9/01/2012	30.0	-1.4	28.6	24/09/2012	24.0	1.1	25.1
22/11/2012	29.0	0.3	29.3	5/05/2012	24.0	1.1	25.1
25/06/2012	28.0	-1.1	26.9	4/12/2012	32.0	1.0	33.0
24/08/2012	28.0	0.2	28.2	21/09/2012	24.0	1.0	25.0

Table E-17: 2020 (PM_{10} 24-hr average concentration) – N180

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
13/11/2012	**79.5**	-2.5	**77.0**				
7/09/2012	**72.9**	0.0	**72.9**				
5/10/2012	**69.4**	-0.7	**68.7**				
26/10/2012	**68.7**	-1.0	**67.7**				
17/10/2012	**61.5**	-1.0	**60.5**				
1/11/2012	**57.8**	-3.2	**54.6**				
4/10/2012	**57.5**	0.3	**57.8**				
20/10/2012	**57.1**	-6.0	**51.1**				
16/10/2012	**56.1**	-2.4	**53.7**				
13/09/2012	**54.6**	-4.5	**50.1**				
24/09/2012	**53.4**	-8.4	45.0				
6/09/2012	**52.1**	0.0	**52.1**				
30/08/2012	49.6	-3.9	45.7	27/10/2012	26.5	1.4	27.9
19/10/2012	49.4	-5.3	44.1	26/11/2012	38.1	0.9	39.0
11/01/2012	48.8	0.0	48.8	4/10/2012	**57.5**	0.3	**57.8**
28/09/2012	48.6	0.0	48.6	3/10/2012	39.5	0.2	39.7
5/09/2012	48.5	0.0	48.5	25/05/2012	16.0	0.1	16.1
25/10/2012	48.5	-8.4	40.1	4/06/2012	10.8	0.0	10.8
12/05/2012	47.0	0.0	47.0	18/07/2012	18.1	0.0	18.1
11/05/2012	45.4	0.0	45.4	9/05/2012	32.8	0.0	32.8
7/04/2012	43.4	-1.9	41.5	5/08/2012	21.0	0.0	21.0
13/05/2012	41.8	0.0	41.8	11/05/2012	45.4	0.0	45.4

Table E-18: 2020 (PM_{10} 24-hr average concentration) – N181

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
13/11/2012	**79.5**	-0.7	**78.8**				
7/09/2012	**72.9**	0.0	**72.9**				
5/10/2012	**69.4**	-0.1	**69.3**				
26/10/2012	**68.7**	-0.7	**68.0**				
17/10/2012	**61.5**	-0.3	**61.2**				
1/11/2012	**57.8**	-0.7	**57.1**				
4/10/2012	**57.5**	0.1	**57.6**				
20/10/2012	**57.1**	-2.0	**55.1**				
16/10/2012	**56.1**	-1.1	**55.0**				
13/09/2012	**54.6**	-2.8	**51.8**				
24/09/2012	**53.4**	-6.0	47.4				
6/09/2012	**52.1**	0.0	**52.1**				
30/08/2012	49.6	-2.8	46.8	27/10/2012	26.5	1.5	28.0
19/10/2012	49.4	-2.8	46.6	2/11/2012	34.0	0.9	34.9
11/01/2012	48.8	0.0	48.8	26/11/2012	38.1	0.2	38.3
28/09/2012	48.6	0.0	48.6	5/05/2012	12.8	0.1	12.9
5/09/2012	48.5	0.0	48.5	5/06/2012	13.2	0.1	13.3
25/10/2012	48.5	-3.7	44.8	25/05/2012	16.0	0.1	16.1
12/05/2012	47.0	0.0	47.0	4/10/2012	**57.5**	0.1	**57.6**
11/05/2012	45.4	0.0	45.4	4/06/2012	10.8	0.0	10.8
7/04/2012	43.4	-1.2	42.2	9/05/2012	32.8	0.0	32.8
13/05/2012	41.8	0.0	41.8	18/07/2012	18.1	0.0	18.1

Table E-19: 2020 (PM_{10} 24-hr average concentration) – N187

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	61.0	2.5	63.5				
30/08/2012	54.0	2.3	56.3				
5/10/2012	54.0	3.0	57.0				
6/08/2012	48.0	3.3	51.3	18/07/2012	24.0	7.9	31.9
5/09/2012	44.0	0.6	44.6	27/07/2012	24.0	7.9	31.9
16/12/2012	38.0	1.6	39.6	25/06/2012	28.0	7.6	35.6
11/09/2012	37.0	2.1	39.1	1/08/2012	24.0	7.6	31.6
18/08/2012	34.0	0.6	34.6	3/07/2012	24.0	7.6	31.6
4/12/2012	32.0	1.6	33.6	19/05/2012	24.0	7.5	31.5
9/01/2012	30.0	-0.2	29.8	16/05/2012	24.0	7.1	31.1
22/11/2012	29.0	0.3	29.3	3/08/2012	24.0	7.0	31.0
25/06/2012	28.0	7.6	35.6	18/05/2012	24.0	6.8	30.8
24/08/2012	28.0	1.4	29.4	16/08/2012	24.0	6.8	30.8

Table E-20: 2020 (PM_{10} 24-hr average concentration) – N20

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	61.0	-2.3	58.7				
30/08/2012	54.0	-2.8	51.2				
5/10/2012	54.0	-4.1	49.9				
6/08/2012	48.0	-3.5	44.5	10/04/2012	24.0	1.2	25.2
5/09/2012	44.0	-4.9	39.1	11/08/2012	24.0	0.7	24.7
16/12/2012	38.0	-1.2	36.8	27/10/2012	24.0	0.5	24.5
11/09/2012	37.0	-4.5	32.5	12/01/2012	24.0	0.4	24.4
18/08/2012	34.0	-1.4	32.6	7/06/2012	3.0	0.3	3.3
4/12/2012	32.0	-2.0	30.0	2/11/2012	24.0	0.3	24.3
9/01/2012	30.0	-2.2	27.8	19/02/2012	24.0	0.1	24.1
22/11/2012	29.0	0.1	29.1	23/02/2012	24.0	0.1	24.1
25/06/2012	28.0	-9.6	18.4	2/01/2012	24.0	0.1	24.1
24/08/2012	28.0	-2.4	25.6	22/11/2012	29.0	0.1	29.1

Table E-21: 2020 (PM_{10} 24-hr average concentration) – N23

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	-5.0	**56.0**				
30/08/2012	**54.0**	-5.1	48.9				
5/10/2012	**54.0**	-2.1	**51.9**				
6/08/2012	48.0	-1.8	46.2	10/04/2012	24.0	1.3	25.3
5/09/2012	44.0	-0.9	43.1	12/01/2012	24.0	0.7	24.7
16/12/2012	38.0	-2.4	35.6	11/08/2012	24.0	0.5	24.5
11/09/2012	37.0	-1.6	35.4	2/11/2012	24.0	0.5	24.5
18/08/2012	34.0	-0.1	33.9	7/06/2012	3.0	0.3	3.3
4/12/2012	32.0	-3.4	28.6	30/01/2012	24.0	0.2	24.2
9/01/2012	30.0	-1.1	28.9	27/10/2012	24.0	0.2	24.2
22/11/2012	29.0	-0.5	28.5	23/02/2012	24.0	0.1	24.1
25/06/2012	28.0	-9.1	18.9	2/01/2012	24.0	0.1	24.1
24/08/2012	28.0	-0.2	27.8	15/03/2012	10.0	0.0	10.0

Table E-22: 2023 (PM_{10} 24-hr average concentration) – Receptor 9

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	61.0	0.7	61.7				
30/08/2012	54.0	1.0	55.0				
5/10/2012	54.0	0.9	54.9				
6/08/2012	48.0	0.2	48.2	18/05/2012	24.0	4.3	28.3
5/09/2012	44.0	3.5	47.5	8/05/2012	19.0	4.1	23.1
16/12/2012	38.0	1.1	39.1	22/08/2012	24.0	4.1	28.1
11/09/2012	37.0	2.0	39.0	2/09/2012	24.0	4.0	28.0
18/08/2012	34.0	0.8	34.8	20/06/2012	24.0	3.9	27.9
4/12/2012	32.0	1.8	33.8	30/06/2012	24.0	3.9	27.9
9/01/2012	30.0	0.8	30.8	15/06/2012	24.0	3.9	27.9
22/11/2012	29.0	0.3	29.3	28/04/2012	24.0	3.8	27.8
25/06/2012	28.0	2.3	30.3	2/08/2012	24.0	3.8	27.8
24/08/2012	28.0	0.8	28.8	30/07/2012	24.0	3.7	27.7

Table E-23: 2023 (PM_{10} 24-hr average concentration) – N18

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	1.9	**62.9**				
30/08/2012	**54.0**	1.6	**55.6**				
5/10/2012	**54.0**	3.8	**57.8**				
6/08/2012	48.0	1.9	49.9	30/06/2012	24.0	11.2	35.2
5/09/2012	44.0	7.4	**51.4**	22/05/2012	24.0	9.8	33.8
16/12/2012	38.0	1.7	39.7	11/05/2012	24.0	8.7	32.7
11/09/2012	37.0	5.3	42.3	15/06/2012	24.0	8.6	32.6
18/08/2012	34.0	2.7	36.7	2/09/2012	24.0	8.4	32.4
4/12/2012	32.0	2.2	34.2	14/08/2012	24.0	8.3	32.3
9/01/2012	30.0	1.7	31.7	18/05/2012	24.0	8.2	32.2
22/11/2012	29.0	0.4	29.4	3/10/2012	24.0	7.7	31.7
25/06/2012	28.0	6.6	34.6	20/06/2012	24.0	7.6	31.6
24/08/2012	28.0	2.9	30.9	5/09/2012	44.0	7.4	51.4

Table E-24: 2023 (PM_{10} 24-hr average concentration) – N180

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
13/11/2012	**79.5**	0.0	**79.5**				
7/09/2012	**72.9**	0.0	**72.9**				
5/10/2012	**69.4**	-0.7	**68.7**				
26/10/2012	**68.7**	0.0	**68.7**				
17/10/2012	**61.5**	-0.9	**60.6**				
1/11/2012	**57.8**	-2.1	**55.7**				
4/10/2012	**57.5**	0.3	**57.8**				
20/10/2012	**57.1**	-0.5	**56.6**				
16/10/2012	**56.1**	3.3	**59.4**				
13/09/2012	**54.6**	7.2	**61.8**				
24/09/2012	**53.4**	7.0	**60.4**				
6/09/2012	**52.1**	0.0	**52.1**				
30/08/2012	49.6	6.7	**56.3**	6/06/2012	11.5	19.4	30.9
19/10/2012	49.4	3.9	**53.3**	7/06/2012	7.9	18.0	25.9
11/01/2012	48.8	0.0	48.8	8/06/2012	8.0	15.2	23.2
28/09/2012	48.6	0.0	48.6	21/07/2012	14.6	15.0	29.6
5/09/2012	48.5	0.0	48.5	17/05/2012	22.2	14.4	36.6
25/10/2012	48.5	5.7	**54.2**	12/04/2012	11.2	13.5	24.7
12/05/2012	47.0	0.0	47.0	12/02/2012	9.9	12.7	22.6
11/05/2012	45.4	0.0	45.4	12/11/2012	36.7	11.7	48.4
7/04/2012	43.4	0.7	44.1	21/02/2012	9.6	11.5	21.1
13/05/2012	41.8	0.0	41.8	3/06/2012	5.6	11.2	16.8
25/11/2012	41.8	-1.0	40.8	11/06/2012	6.6	11.2	17.8
11/09/2012	40.7	-2.6	38.1	1/05/2012	11.0	10.8	21.8
21/10/2012	40.7	-5.2	35.5	10/01/2012	26.0	10.7	36.7
22/11/2012	40.3	0.8	41.1	22/02/2012	17.7	10.6	28.3
10/05/2012	40.0	0.5	40.5	6/02/2012	26.4	10.3	36.7

Table E-25: 2023 (PM_{10} 24-hr average concentration) – N181

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
13/11/2012	**79.5**	0.0	**79.5**				
7/09/2012	**72.9**	0.0	**72.9**				
5/10/2012	**69.4**	-0.1	**69.3**				
26/10/2012	**68.7**	-0.1	**68.6**				
17/10/2012	**61.5**	-0.3	**61.2**				
1/11/2012	**57.8**	-0.7	**57.1**				
4/10/2012	**57.5**	0.1	**57.6**				
20/10/2012	**57.1**	-0.8	**56.3**				
16/10/2012	**56.1**	0.5	**56.6**				
13/09/2012	**54.6**	1.2	**55.8**				
24/09/2012	**53.4**	1.0	**54.4**				
6/09/2012	**52.1**	0.0	**52.1**				
30/08/2012	49.6	1.7	**51.3**	8/06/2012	8.0	3.8	11.8
19/10/2012	49.4	0.3	49.7	5/05/2012	12.8	3.2	16.0
11/01/2012	48.8	0.0	48.8	12/02/2012	9.9	3.2	13.1
28/09/2012	48.6	0.0	48.6	17/05/2012	22.2	2.8	25.0
5/09/2012	48.5	0.0	48.5	12/04/2012	11.2	2.6	13.8
25/10/2012	48.5	-0.3	48.2	7/06/2012	7.9	2.4	10.3
12/05/2012	47.0	0.0	47.0	21/02/2012	9.6	2.2	11.8
11/05/2012	45.4	0.0	45.4	6/06/2012	11.5	2.0	13.5
7/04/2012	43.4	-0.1	43.3	2/03/2012	6.0	1.9	7.9
13/05/2012	41.8	0.0	41.8	21/08/2012	28.2	1.9	30.1

Table E-26: 2023 (PM_{10} 24-hr average concentration) – N187

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	1.4	**62.4**				
30/08/2012	**54.0**	1.5	**55.5**				
5/10/2012	**54.0**	0.7	**54.7**				
6/08/2012	48.0	3.0	**51.0**	14/09/2012	24.0	5.2	29.2
5/09/2012	44.0	-0.4	43.6	28/05/2012	24.0	4.4	28.4
16/12/2012	38.0	0.9	38.9	18/05/2012	24.0	4.1	28.1
11/09/2012	37.0	0.4	37.4	16/05/2012	24.0	4.1	28.1
18/08/2012	34.0	0.2	34.2	1/08/2012	24.0	4.0	28.0
4/12/2012	32.0	0.7	32.7	27/07/2012	24.0	3.9	27.9
9/01/2012	30.0	0.0	30.0	4/05/2012	24.0	3.9	27.9
22/11/2012	29.0	0.2	29.2	19/05/2012	24.0	3.7	27.7
25/06/2012	28.0	2.9	30.9	18/07/2012	24.0	3.6	27.6
24/08/2012	28.0	0.3	28.3	19/07/2012	12.0	3.6	15.6

Table E-27: 2023 (PM_{10} 24-hr average concentration) – N20

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	3.3	**64.3**				
30/08/2012	**54.0**	4.2	**58.2**				
5/10/2012	**54.0**	3.5	**57.5**				
6/08/2012	48.0	4.0	**52.0**	22/05/2012	24.0	8.9	32.9
5/09/2012	44.0	4.4	48.4	18/07/2012	24.0	8.4	32.4
16/12/2012	38.0	1.5	39.5	30/06/2012	24.0	8.4	32.4
11/09/2012	37.0	4.1	41.1	25/06/2012	28.0	8.2	36.2
18/08/2012	34.0	1.2	35.2	1/08/2012	24.0	8.1	32.1
4/12/2012	32.0	3.0	35.0	14/08/2012	24.0	7.3	31.3
9/01/2012	30.0	1.9	31.9	20/06/2012	24.0	7.0	31.0
22/11/2012	29.0	0.5	29.5	2/08/2012	24.0	7.0	31.0
25/06/2012	28.0	8.2	36.2	2/09/2012	24.0	6.7	30.7
24/08/2012	28.0	2.3	30.3	9/04/2012	24.0	6.6	30.6

Table E-28: 2023 (PM_{10} 24-hr average concentration) – N23

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
17/10/2012	**61.0**	2.9	**63.9**				
30/08/2012	**54.0**	2.8	**56.8**				
5/10/2012	**54.0**	0.5	**54.5**				
6/08/2012	48.0	0.5	48.5	9/04/2012	24.0	6.7	30.7
5/09/2012	44.0	0.3	44.3	30/07/2012	24.0	5.8	29.8
16/12/2012	38.0	1.6	39.6	20/07/2012	24.0	4.3	28.3
11/09/2012	37.0	-0.2	36.8	28/02/2012	24.0	3.7	27.7
18/08/2012	34.0	0.1	34.1	21/09/2012	24.0	3.6	27.6
4/12/2012	32.0	2.2	34.2	30/09/2012	24.0	3.6	27.6
9/01/2012	30.0	0.7	30.7	7/05/2012	24.0	3.0	27.0
22/11/2012	29.0	0.5	29.5	17/10/2012	**61.0**	2.9	**63.9**
25/06/2012	28.0	0.4	28.4	24/03/2012	24.0	2.8	26.8
24/08/2012	28.0	0.1	28.1	1/08/2012	24.0	2.8	26.8

Appendix C

Predicted Air Quality Exceedances

Table C4
Predicted Air Quality Exceedances

ID	Receptor Name	$PM_{2.5}$		PM_{10}		TSP	Depositional Dust	
		24-hour	Annual	24-hour	Annual	Annual	Annual	
		Project Alone (25ug/m^3) Days per year above criteria	Project and other sources (8 ug/m^3)	Project Alone (50ug/m^3) Days per year above criteria	Project and other sources (25 ug/m^3)	Project and other sources (90 ug/m^3)	Project Alone (2g/m^2/ month)	Project and other sources (4g/m^2/ month)
1*	C. & S. Eveleigh & Jarramarkyl Pty Ltd				33 (2021)			
170^#	W.G. Bowman		9 (2024)		36 (2024)			
171^#	A.S. Bowman				27 (2024)			
173^	T. Burgess		14 (2024)		77 (2024)	167 (2024)		
175^	B. & R. Richards		11 (2021)		45 (2021)	122 (2021)		
176^	B. & R. Richards		11 (2021 & 2024)		47 (2021)	135 (2021)		
177^	R. & D. Hall		11 (2021)		45 (2021)	133 (2021)		
N103*	S. Turner		10 (2024)		44 (2024)	102 (2024)		
N105*	J. & J. McInerney		9 (2021 & 2024)		38 (2024)	99 (2021)		
N133#	A.S. Bowman				35 (2024)			
N161*	V. Lopes		10 (2024)		41 (2024)	98 (2024)		
N172*	J.L. Vollebregt & T.L. Clarke		10 (2024)		43 (2024)	101 (2024)		

ID	Receptor Name	$PM_{2.5}$		PM_{10}		TSP	Depositional Dust	
		24-hour	Annual	24-hour	Annual	Annual	Annual	
		Project Alone (25ug/m^3) Days per year above criteria	Project and other sources (8 ug/m^3)	Project Alone (50ug/m^3) Days per year above criteria	Project and other sources (25 ug/m^3)	Project and other sources (90 ug/m^3)	Project Alone (2g/m^2/ month)	Project and other sources (4g/m^2/ month)
N176#	A.S. Bowman				28 (2024)			
N177^	B. & R. Richards		10 (2021 & 2024)		44 (2021)	108 (2021)		
N178^	B. & R. Richards		10 (2021 & 2024)		44 (2021)	110 (2021)		
N179#	G.M. Watson				28 (2024)			
N180	Community Hall				29 (2024)			
N64#	W. & A. Gardner				26 (2024)			
N67#	G.M. Watson				29 (2024)			
N88*	M. & T. Dejong		10 (2024)		42 (2024)	98 (2024)		
N91*	T. & D. Olofsson		9 (2021 & 2024)		40 (2024)	95 (2024)		
25% Contiguous Properties								
N234 to N239	N.R. and J.M. Long	N/A	N/A	N/A	2024 (65%)	N/A	N/A	N/A
N240	N.A. Long	N/A	N/A	N/A	2024 (100%)	N/A	N/A	N/A

^ receptor entitled to acquisition by RCN
** receptor entitled to acquisition by RCS*
 # receptor entitled to acquisition by another mining company

Appendix D

Rix's Creek North Open Cut Modification 9
Noise and Blasting Impact Assessment

Rix's Creek Mine

Rix's Creek North Open Cut Modification 9

Noise and Blasting Impact Assessment

Prepared for

Hansen Bailey Pty Ltd

Global Acoustics

Noise and Vibration Analysis and Solutions

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Rix's Creek North Open Cut Project

Project Approval 08_0102 MOD9
Noise and Blasting Impact Assessment

Reference: 19166_R01.docx
Report date: 16 April 2020

Prepared for
Hansen Bailey Pty Ltd
PO Box 473
Singleton NSW 2330

Prepared by
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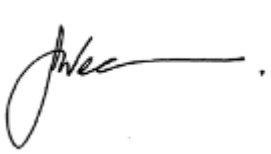


Prepared:	Jeremy Welbourne Acoustics Consultant	QA Review:	Tony Welbourne Director

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Contents

Appendices

1 INTRODUCTION

Global Acoustics Pty Ltd has been commissioned by Hansen Bailey Pty Ltd to undertake a Noise and Blasting Impact Assessment (NBIA) on behalf of The Bloomfield Group for the Rix's Creek North Open Cut Project.

The Bloomfield Group (Bloomfield) operates the Rix's Creek Open Cut Mine (RCM), which is the combined operation of the Rix's Creek North Open Cut (RCN) and the Rix's Creek South Open Cut (RCS). The RCM is located approximately 5 kilometres north of Singleton, NSW.

In December 2015 Bloomfield completed the purchase of the adjoining Integra Open Cut Mine, including the Coal Preparation Plant (CHPP) and Rail Loading facility, which was part of the former Integra Complex. The Integra Complex was originally referred to as the Camberwell Coal Mine, which operated under PA 86/2889. That consent was incorporated into the Project Approval (PA) dated 26th November 2010 covering PA 08_0101 for the Integra Underground project and PA 08_0102 for the Integra Open Cut project. On the 23rd August 2016, the underground and open cut consents were separated with Bloomfield Collieries retaining PA 08_0102 (which incorporates the open cut mining activities originally approved under DA86/2889). This is now referred to as the Rix's Creek North Open Cut project.

Bloomfield is seeking approval for a modification to PA 08_0102 (MOD9) under Section 4.55(2) of the Environmental Planning & Assessment Act 1979 as follows:

- To increase the final landform height of the overburden emplacement within a discrete area of the Camberwell Pit at RCN from a nominal approved height of 150 to 165 metres RL. The landform will temporarily increase to 175m RL by 2024, reducing to 165m RL after reshaping into the final landform. This landform change will also require minor changes to the areas shown as trees over pasture (woodland) to pasture in the final landform.

  The additional overburden emplacement proposed by MOD9 will occur entirely within the approved Camberwell Pit and no new surface disturbance will be required.

  The interactions of MOD9 with the approved conceptual mine plans for years 2021 and 2024 (covering the period in which the increase in landform height is proposed to be constructed) are presented in Figure 2 and Figure 3 respectively.

- Bloomfield is also seeking to increase the number of blasts allowed in RCN from two to three per day. The approved number of blasts per week will remain at ten. No additional changes to approved activities are sought (i.e. all other aspects of Rix's Creek North Mine will remain generally consistent with that approved under PA 08_0102).

- Bloomfield seeks to undertake exploration and related activities in accordance with Mining Act 1992 within its mining tenements.

This NBIA has been prepared by Global Acoustics Pty Ltd, and is to form part of a Statement of Environmental Effects (SEE) being prepared by Hansen Bailey Pty Ltd (Hansen Bailey) for PA 08_0102 MOD9.

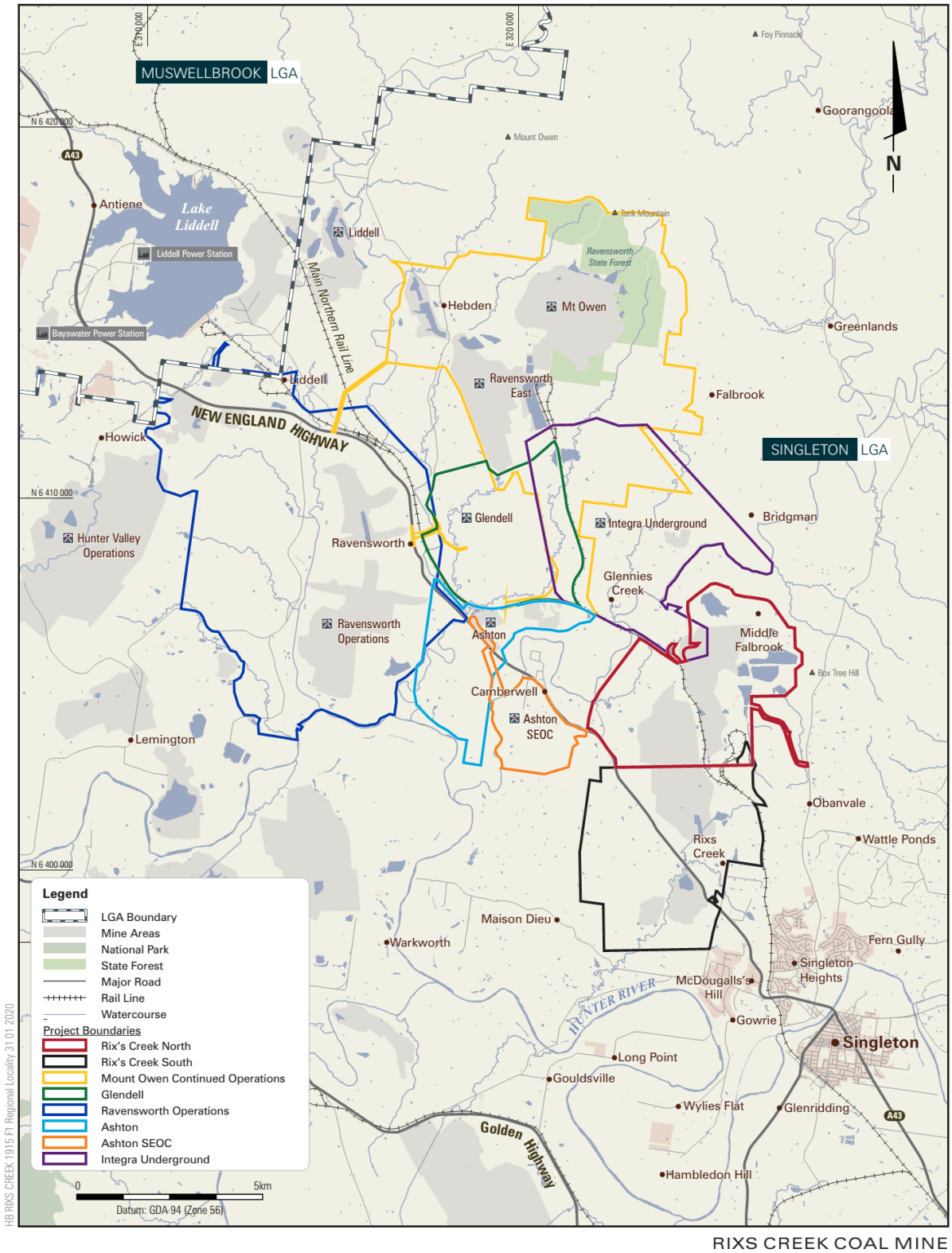


Figure 1: Regional Context

1.1 Terminology & Abbreviations

Some definitions of acoustic terminology which may be used in this document are as follows:

- L_A, the A-weighted root mean squared (RMS) noise level at any instant;
- L_{A1}, the noise level which is exceeded for 1 per cent of the time;
- $L_{A1,1minute}$, corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms, this represents the maximum measured level, and is often used to assess sleep disturbance;
- L_{A10}, the noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels;
- L_{A90}, the level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes;
- L_{Aeq}, the average noise energy during a measurement period;
- dB(A), noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise;
- dB(C), noise level measurement units are decibels (dB). The "C" weighting scale is used as a measure of human response to high noise levels. It includes more of the low frequency range of sounds. It is often used to assess low frequency noise impact;
- sound power level (L_W denotes linear, L_{WA} denotes A-weighted), 10 times the logarithm of energy radiated from a source (as noise) divided by a reference power, the reference power being 1 picowatt;
- sound pressure level (Lp), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals;
- sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second.;
- Hertz (Hz), cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together;
- ABL, the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period;
- RBL, the background noise level for a period (day, evening or night) determined from ABL data.

Definitions of acronyms which may be used in this document are as follows:

- RCM, Rix's Creek Mine, which is the combined operation of RCS and RCN;
- RCN, Rix's Creek North;
- RCS, Rix's Creek South;
- CHPP, Coal Handling and Preparation Plant, which consists of the open cut infrastructure area;
- CPP, Coal Processing Plant, sometimes referred to as the washery building. Located within the CHPP;
- DPIE, Department of Planning, Industry and Environment;
- EIS, Environmental Impact Statement;
- ENM, Environmental Noise Model;
- EPA, Environment Protection Authority;
- ICNG, Interim Construction Noise Guideline;
- INP, Industrial Noise Policy;
- NBIA, Noise and Blasting Impact Assessment;
- NMP, Noise Management Plan;
- NPfI, Noise Policy for Industry;
- RING, Rail Infrastructure Noise Guideline;
- RNP, Road Noise Policy;
- ROM, Run of Mine;
- MOP, Mining Operations Plan
- SEE, Statement of Environmental Effects; and
- VLAMP, Voluntary Land Acquisition and Mitigation Policy.

2 NOISE IMPACT ASSESSMENT OVERVIEW

2.1 Policy and Guidelines

Technical policy and guidelines relevant to assessment of industrial and transport noise in NSW include:

- Industrial Noise Policy (INP) (EPA, 2000);
- Noise Policy for Industry (NPfI) (EPA, 2017);
- Interim Construction Noise Guideline (ICNG) (DECCW[1], 2009);
- Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP) (NSW Government, 2018);
- Road Noise Policy (RNP) (DECCW, 2011);
- Rail Infrastructure Noise Guideline (RING) (EPA, 2013); and
- Australian and New Zealand Environment and Conservation Council guideline Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC) (EPA, 1990).

2.2 Assessment Approach

PA 08_0102 MOD9 will occur entirely within the approved Camberwell Pit and no new surface disturbance will be required. The modified development is considered 'substantially the same development' as that currently approved. The primary objective of this NBIA is to evaluate whether RCN can continue to operate in accordance with approved noise and blasting criteria prescribed in PA 08_0102.

The most recent NBIA undertaken for the RCN mine (formerly Integra Open Cut) was the Integra Open Cut Project, Operational Noise and Blasting Assessment (Heggies, 2009) (the IOC NBIA). The IOC NBIA primary inclusions were the Open Cut Extension mining area (now referred to as the Camberwell Pit), the North Open Cut mining area (now referred to as Falbrook Pit), the CHPP, and rail loading infrastructure.

This NBIA has been prepared using generally the same assessment approach as the IOC NBIA, which was assessed in accordance with the INP. The INP and NPfI are considered relatively equivalent as they apply to this assessment. Primary differences between the INP and NPfI, as applicable to this assessment, pertain to setting of assessment noise levels and consideration of residual noise impacts. However, these differences are not relevant to this assessment as approved noise and blasting criteria

[1] Now the Environment Protection Authority.

prescribed in PA 08_0102 are being used for assessment of impact.

Modifying factors have been assessed in accordance with Fact Sheet C of the NPfI. Section 3.2 provides further detail regarding modifying factors.

2.3 Operational Noise

Two operational stages of mining were modelled representing the updated progression of mining operations during the period when the Camberwell Pit waste emplacement area landform will be modified. Each stage modelled represents realistic worst case operating conditions for that period of operations. The stages nominally relate to years 2021 and 2024. The two stages represent:

- 2021: The Camberwell Pit waste emplacement area has reached the proposed height of 170 metres RL, and is progressing in a westerly direction. No operations are proposed for Falbrook Pit at this stage, so all open cut noise sources are contained within Camberwell Pit. Haulage of coal from the Integra Underground stockpile area to the RCN CHPP is in progress (Bloomfield has a contract with Glencore, who manage Integra Underground, to haul and process coal to/at the RCN CHPP); and

- 2024: The Camberwell Pit waste emplacement area continues to be utilised at the proposed temporary height of 175 metres RL, and has progressed in a westerly direction. Falbrook Pit is proposed to be operational at this stage, and open cut mining is modelled concurrently in both the Camberwell Pit and Falbrook Pit areas. In accordance with PA 08_0102, Falbrook Pit is restricted to operating during the day and evening periods only. Falbrook Pit was not included in modelled night period scenarios. Haulage of coal from the Integra Underground stockpile area to the RCN CHPP continues.

Further detail regarding assessed mining scenarios is included in Section 5.1.2 of this report.

Operational intrusive noise, cumulative noise, modifying factor adjustments, and potential sleep disturbance impact associated with each mining stage is assessed. Section 5.1.1 provides further detail regarding operating scenarios.

An assessment area was defined that encompasses all known private residential receptors that may be noise impacted by MOD9.

Figure 2 and Figure 3 present conceptual mine plans for the two stages assessed.

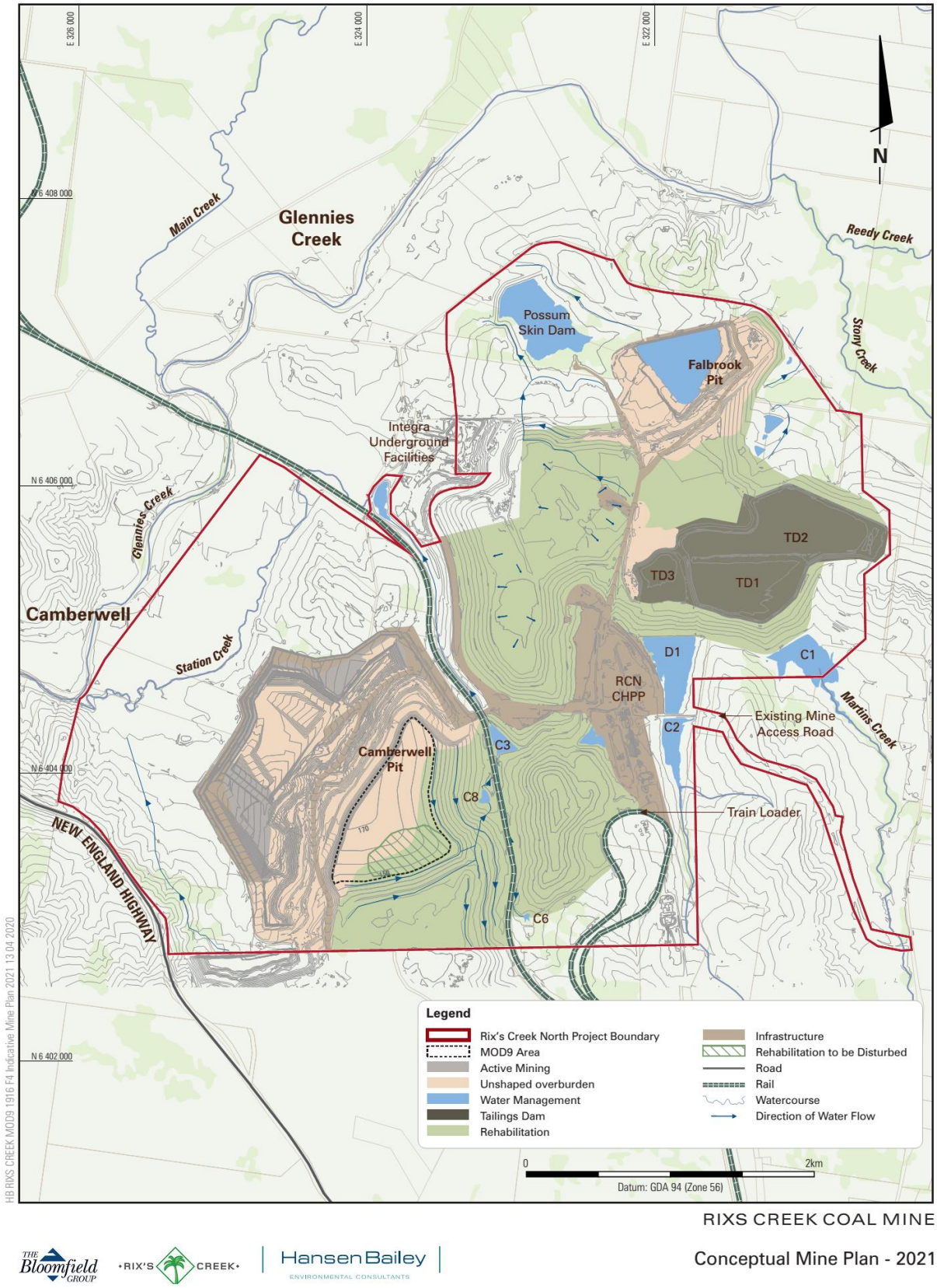


Figure 2 - 2021 Conceptual Mine Plan

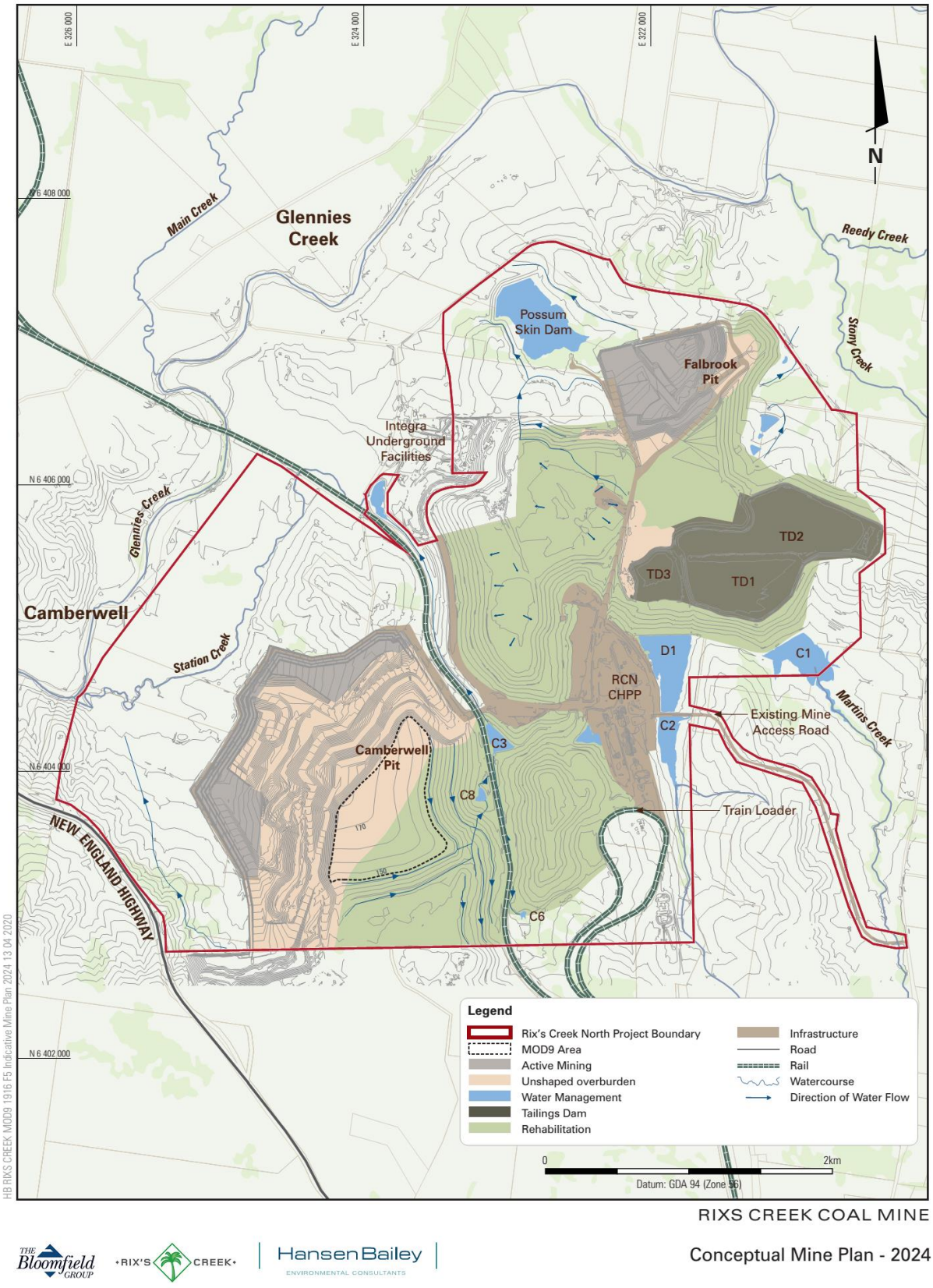


Figure 3 - 2024 Conceptual Mine Plan

2.4 Construction Noise

No significant construction tasks are proposed. As such, it is considered highly unlikely that construction noise from any minor onsite construction activities would be audible over and above the noise generated by the open cut mining operation; therefore construction noise has not been quantitatively assessed. Noise associated with minor construction activities will be managed to comply with project approval criteria and will therefore be treated as an operational noise source for compliance purposes. Construction noise is not discussed further in this report.

2.5 Road Traffic Noise

There is no change to road traffic volumes associated with PA 08_0102 MOD9; therefore, no change in road traffic noise impact relative to the Approved Development should occur.

2.6 Rail Noise

There is no change to rail volumes associated with PA 08_0102 MOD9; therefore, no change in rail noise impact relative to the Approved Development should occur.

2.7 Noise Modelling Methodology

Noise levels were predicted using RTA Technology's Environmental Noise Model (ENM), a computer based environmental noise model, to determine the acoustic impact of operational activities. ENM is approved by the DPIE and EPA as suitable for prediction of industrial noise involving large propagation distances and is currently the industry standard for NBIA of this nature. The model takes into account geometric spreading, atmospheric absorption, and, barrier and ground attenuation.

In accordance with Section 2.2 of the NPfI, all model predictions in this NIA are rounded to the nearest integer.

2.8 Land Ownership and Receptors

All known private residential receptors that may be noise impacted by PA 08_0102 MOD9 were assessed. Figure 4 illustrates land ownership and receptor locations. Details of assessed receptors are included in Appendix D.

As the assessment area has been extended relative to that previously assessed for the IOC NBIA, there is overlap between the two receptor sets used for the IOC NBIA and the RCS Continuation of Mining Project Noise Impact Assessment (Global Acoustics, 2015) (the RCS NIA). To maintain continuity with the IOC NBIA, the original identifiers have been retained, except where the receptors overlapped (i.e. each site had a different identifier), in which case the RCS identifiers prevailed. Where the IOC identifier has been retained, the letter "N" has been included in the identifier.

2.9 Noise Contours

Noise contours were produced for assessment areas containing private residences to provide a visual representation of the model results. It should be noted that noise contours are based on interpolation of results determined for individual points, and as such are indicative, and are included for presentation purposes only.

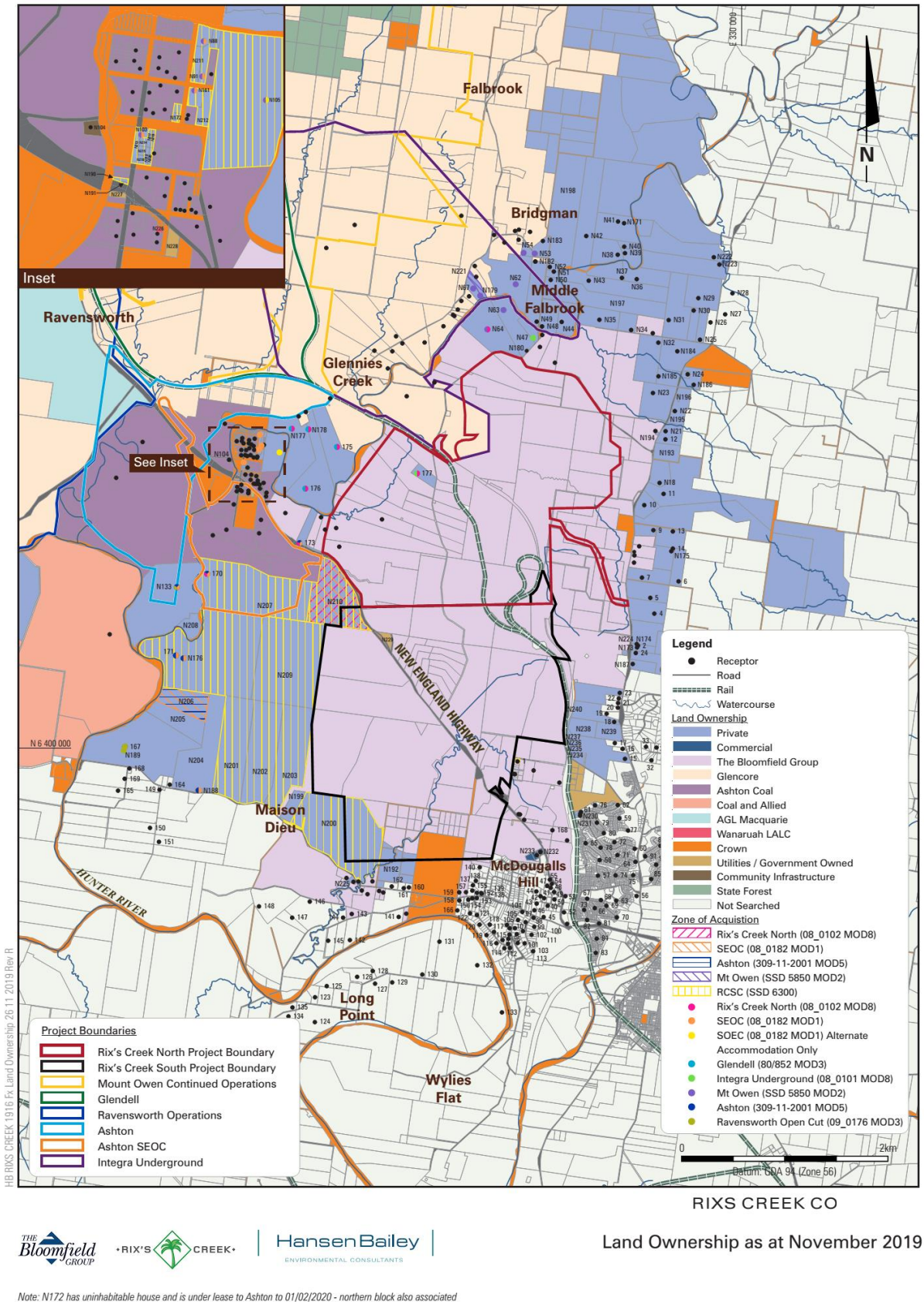


Figure 4 - Land Ownership

3 NOISE CRITERIA

Bloomfield is committed to managing noise emission from RCN to maintain compliance with approved criteria. Therefore, noise criteria set out in PA 08_0102 Modification 8 have been adopted for assessment of noise impact in this NBIA.

3.1 Existing Consent (PA 08_0102)

Schedule 3, Conditions 1 to 10 of PA 08_0102 outline environmental performance conditions pertaining to noise. These are reproduced in the following sections.

3.1.1 Acquisition upon Request

Table 1 within Condition 1 of Schedule 3 of PA 08_0102 lists private receptors entitled to acquisition upon written request from the owner of the land.

Residential Receiver No.	*Acquisition Basis*
11 – F Ferraro	Noise
64 – W & A Gardner	Noise
87 – B & R Richards	Noise
106 – B & R Richards	Noise
111 – T Burgess	Noise
153 – R & D Hall	Noise and Air Quality
351 – WG Bowman	Noise
352 – AS Bowman	Noise

3.1.2 Intrusive Noise Criteria

Table 2 within Condition 2 of Schedule 3 of PA 08_0102 lists noise criteria applicable for residences on privately-owned land. This table is reproduced below.

Location		*Day*	*Evening*	*Night*	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
NAG 1	All privately-owned land	38	38	36	46
NAG 2	All privately-owned land	39	39	37	47
NAG 3	All privately-owned land	40	40	39	49
NAG 4	99, 100	39	39	39	47
	88, 91, 95	40	40	40	47
	105, 161	41	41	41	47
	All other privately-owned land	42	42	37	47
NAG 5	104	35	35	35	52
	139	36	36	36	52
	103	37	37	37	52
	121	40	40	40	52
	118, 154	43	43	43	52
	Deleted	45	45	45	52
	Deleted	47	47	47	52
	All other privately-owned land	50	46	42	52
NAG 6	137	35	35	35	48
	133	37	37	37	48

	132	38	38	38	48
	All other privately-owned land	41	41	38	48
NAG 7	All privately-owned land	45	42	39	49
NAG 8	142	35	35	35	45
	All other privately-owned land	42	42	35	45
NAG 9	146, 148, 149	35	35	35	48
	143, 144, 145, 147, 150, 151, 152	36	36	36	48
	2	37	37	37	48
	3, 4	39	39	39	48
	All other privately-owned land	40	40	38	48
NAG 10	5	40	40	40	47
	6, 11	41	41	41	47
	8	42	42	42	47
	All other privately-owned land	39	39	37	47
NAG 11	18	35	35	35	49
	20, 21	37	37	36	49
	19	37	37	37	49
	17	38	38	38	49
	7	39	39	39	49
	12, 15	40	40	40	49
	14, 16	42	42	42	49
	All other privately-owned land	41	41	39	49
NAG 12	52, 55	35	35	35	45
	51, 56	37	37	37	45
	53, 57	38	38	38	45
	50, 54	39	39	39	45
	62	40	40	40	45
	All other privately-owned land	38	38	35	45
NAG A	24, 25, 26, 27, 28, 29, 30, 36, 37, 38, 39, 40, 41	35	35	35	46
	31	36	36	35	46
	42, 43	36	36	36	46
	32	37	37	35	46
	22, 23	37	37	37	46
	34	39	39	36	46
	35	39	39	35	46
	All other privately-owned land	39	39	36	46
NAG B	All privately-owned land	37	37	35	45
NAG C	47	39	39	39	45
	63	40	40	40	45
	All other privately-owned land	37	37	35	45
NAG D	44, 48	36	36	36	48
	49	39	39	39	48
	All other privately-owned land	40	40	38	48
NAG F	65, 66	39	39	39	50
	67	40	40	40	50
	68	42	42	42	50
	All other privately-owned land	40	40	40	50

NAG G	All privately-owned land	41	41	39	50
All other privately-owned land		35	35	35	45

Appendix 5 of PA 08_0102 sets out the meteorological conditions for which these criteria apply, and the requirements for evaluating compliance with these criteria. In accordance with Appendix 5, noise criteria are to apply under all meteorological conditions except the following:

- during periods of rain or hail;
- average wind speed at microphone height exceeds 5 m/s;
- wind speeds greater than 3 m/s at 10 m above ground level; or
- temperature inversion conditions greater than 3ºC/100m.

Condition 9(e) states:

> *The Proponent must minimise the noise impacts of the project during meteorological conditions under which data is to be excluded for the purposes of assessing compliance with these conditions.*

The assessment area includes three non-residential receptors:

1. St Clements Anglican church, Camberwell (N104);
2. Glennies Creek Community Hall (N180); and
3. Glennies Creek Rural Fire Service (N181).

N180 is treated as an active recreation area for the purpose of allocating recommended amenity criteria in this NBIA. N181 is considered a commercial premises. N104 is a place of worship that is not currently in use. Recommended amenity noise levels for these receptors are listed in Table 3.1. Project specific amenity levels are set 5 dB lower than recommended amenity levels. Noise criteria for recreation areas, places of worship and commercial premises are only applicable when in use.

Table 3.1 RECOMMENDED AMENITY NOISE LEVELS - $L_{Aeq,period}$ dB

Receptor Category	Day	Evening	Night
Active recreation area (external)	55	55	55
Commercial premises	65	65	65
Place of worship (internal)	40	40	40
Place of worship (external) [1]	50	50	50

Notes:
1. *10 dB adjustment applied to obtain equivalent external amenity noise level.*

An adjustment of 10 dB has been applied to internal amenity noise levels for a place of worship to obtain an equivalent external value. This adjustment is consistent with standard practice, and in keeping with Section 2.6 of the NPfI that recommends that in cases where gaining internal access for monitoring is difficult, then external noise levels 10 dB above the internal levels apply.

Intrusive and amenity noise levels each use the L_{Aeq} descriptor; however, intrusive noise levels are averaged over a 15-minute duration whilst amenity noise levels are averaged over an assessment period (day, evening or night). The NPfI provides a method to standardise the time periods, which involves applying an adjustment factor of plus 3 dB to $L_{Aeq,period}$ noise levels to obtain equivalent $L_{Aeq,15minute}$ noise levels. Project amenity noise criteria for the three non-residential receptors are $L_{Aeq,15minute}$ 53 dB for N180, $L_{Aeq,15minute}$ 63 dB for N181, and $L_{Aeq,15minute}$ 48 dB for N104.

3.1.3 Maximum Noise Event Criteria

Maximum noise event criteria, used to assess sleep disturbance impacts, are prescribed in Table 2 within Condition 2 of Schedule 3 of PA 08_0102. That table is reproduced above.

3.1.4 Noise Mitigation Criteria

Condition 6 of Schedule 3 of PA 08_0102 outlines requirements for additional mitigation measures. Condition 6 states:

> *Upon receiving a written request from the owner of any residence:*
>
> *(a) on the land listed in Table 1 for which the acquisition basis is noise; or*
>
> *(b) on land listed in Table 6; or*
>
> *(c) on privately-owned land where subsequent noise monitoring shows the noise generated by the project is greater than or equal to the criteria in Table 7, the Proponent must implement additional noise mitigation measures (such as double -glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner.*

Table 6 within Condition 6 (reproduced below) lists land where additional noise mitigation measures are available on request.

Table 6: Land where additional noise mitigation measures are available on request

5 – D P Cox	6 – W G Cox
8 – DK Geelan	16 – A Lambkin
14 – M Hoggan	31 – C Craven
20 – Mr Garvie	48 - G Cheetham
32 – M Langdon	50 – D & M Bridge
47 – B & R Cherry	54 – G Holmes
53 – K & J Badior	63 – J & M Moore
62 – D Moran	95 – J & T Clarke
91 – T & D Olofsson	161 – V Lopes
105 – J & G McInerney	363 – D & L Bynon

Note: To interpret the locations referred to in Table 6, see the applicable figures in Appendix 4.

Table 7 within Condition 6 (reproduced below) lists noise mitigation criteria for each noise assessment group assessed for the IOC NBIA for which landowners become entitled to additional noise mitigation measures on request.

Table 7: Additional noise mitigation criteria dB(A)

Location	Day	Evening	Night
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
All privately-owned land in NAG 1	41	41	39
All privately-owned land in NAG 2	42	42	40
All privately-owned land in NAG 3	43	43	42
All privately-owned land in NAG 4	45	45	40
All privately-owned land in NAG 5	53	49	45
All privately-owned land in NAG 6	44	44	41
All privately-owned land in NAG 7	48	45	42
All privately-owned land in NAG 8	45	45	38
All privately-owned land in NAG 9	43	43	41
All privately-owned land in NAG 10	42	42	40
All privately-owned land in NAG 11	44	44	42
All privately-owned land in NAG 12	41	41	38
All privately-owned land in NAG A	42	42	39
All privately-owned land in NAG B	40	40	38
All privately-owned land in NAG C	40	40	38
All privately-owned land in NAG D	43	43	41
All privately-owned land in NAG F	43	43	43
All privately-owned land in NAG G	44	44	42
All other privately-owned land	38	38	38

3.1.5 Noise Acquisition Criteria

Condition 3 of Schedule 3 of PA 08_0102 outlines noise acquisition criteria. Condition 3 states:

> *If noise generated by the project exceeds the criteria in Table 3 at any residence on privately owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the owner, the Proponent must acquire the land in accordance with the procedures in conditions 7 and 8 of Schedule 4.*

Table 3 within Condition 3 (reproduced below) lists noise acquisition criteria for each noise assessment group assessed for the IOC NBIA for which landowners become entitled to acquisition on request.

It should be noted that Condition 3 of PA 08_0102 includes a requirement that noise acquisition criteria not be exceeded on more than 25 percent of any privately owned land. It is understood an independent environmental audit in 2011 concluded that this requirement is not practical to determine and has no relevance to resident amenity. The audit recommended the 25 percent area conditions be removed from the project approval. Global Acoustics concurs with the audit conclusion, and also recommends the 25 percent area conditions be removed from the project approval on the basis that it is not feasible to assess the percentage of noise affected land for an operating mine. However, it is feasible to predict an estimated percentage of noise affected area for a proposed operating configuration using predicted noise contours. Therefore, a private land area assessment based on the proposed stage plans for 2021 and 2024 is included in Section 5.3 of this report

Table 3: Noise acquisition criteria dB(A)

Location	Day	Evening	Night
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
All privately-owned land in NAG 1	44	44	42
All privately-owned land in NAG 2	45	45	43
All privately-owned land in NAG 3	46	46	45
All privately-owned land in NAG 4	48	48	43
All privately-owned land in NAG 5	56	52	48
All privately-owned land in NAG 6	47	47	44
All privately-owned land in NAG 7	51	48	45
All privately-owned land in NAG 8	48	48	41
All privately-owned land in NAG 9	46	46	44
All privately-owned land in NAG 10	45	45	43
All privately-owned land in NAG 11	47	47	45
All privately-owned land in NAG 12	44	44	41
All privately-owned land in NAG A	45	45	42
All privately-owned land in NAG B	43	43	41
All privately-owned land in NAG C	43	43	41
All privately-owned land in NAG D	46	46	44
All privately-owned land in NAG F	46	46	46
All privately-owned land in NAG G	47	47	45
All other privately-owned land	41	41	41

3.1.6 Cumulative Noise Criteria

Condition 4 of Schedule 3 of PA 08_0102 outlines cumulative noise criteria. Condition 4 states:

> *The Proponent must implement all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines in the vicinity does not exceed the criteria in Table 4 at any residence on privately-owned land or on more than 25 percent of any privately owned land (except for the residential receivers in Table 1 for which the acquisition basis is noise). The Proponent must share the costs associated with implementing these measures on as equitable basis as possible with the relevant mines.*

Table 4 within Condition 4 (reproduced below) lists cumulative noise criteria for each noise assessment group assessed for the IOC NBIA for which landowners become entitled to acquisition on request.

Table 4: Cumulative noise criteria dB(A) $L_{Aeq\ (period)}$

Location	Day	Evening	Night
NAGs 4, 5, 8 and 9	55	45	40
All other privately-owned land	50	45	40

3.2 Voluntary Land Acquisition and Mitigation Policy

In September 2018, the NSW government published the Voluntary Land Acquisition and Mitigation Policy (the VLAMP) for State Significant Mining, Petroleum and Extractive Industry Developments (NSW Government, 2018). This document describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise impacts from state significant mining, petroleum and extractive industry developments.

3.2.1 Mitigation and Acquisition Criteria

The VLAMP provides the following guidance on the applicability of noise mitigation and acquisition criteria:

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- *operational noise impacts of a development on privately owned land; and*
- *rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the RING);*

But not:

- *construction noise impacts, as these impacts are shorter term and can be controlled;*
- *noise impacts on the public road or rail network; or*
- *modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts.*

3.2.2 Voluntary Mitigation Rights

The VLAMP states:

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine site:

- *the noise generated by the development would meet the requirements in Table 1 (see following page), such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or*
- *the development would increase the total industrial noise level at any residence on privately owned land by more than 1 dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3 dB(A) at any residence on privately owned land.*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

It is noted that PA 08_0102 includes noise mitigation criteria (refer to Section 3.1.4 of this report), which are used for assessment of mitigation rights in this assessment in lieu of establishing new criteria in accordance with the VLAMP.

3.2.3 Voluntary Land Acquisition Rights

The VLAMP states:

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- *the noise generated by the development would be characterised as significant, according to Table 1 (see following page), at any residence on privately owned land; or*
- *the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls [2]; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

Table 1 of the VLAMP outlines a procedure for characterising noise impact and provides examples of potential receptor-based treatments that could be used to mitigate residual noise impact; this table is reproduced below.

[2] *Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.*

Table 1 – Characterisation of noise impacts and potential treatments[16]

If the predicted noise level minus the project noise trigger level[17] is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernable by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dB(A)	• ≤ recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ≤1dB	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	≤ recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

Figure 5 - Table 1 of the VLAMP (NSW Government, 2018)

3.3 Corrections for Annoying Noise Characteristics (Modifying Factors)

Fact Sheet C of the NPfI outlines procedures for assessing modifying correction factors. These correction factors, also referred to as modifying factor penalties, are applied to predicted/measured noise levels at the receptor before comparison with relevant noise trigger levels/criteria, to account for the additional annoyance caused by these noise characteristics.

Modifying factors, as they are applicable to industrial noise, are described in more detail below.

3.3.1 Tonal and Intermittent Noise

As defined in the NPfI:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Intermittent noise is noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.*

Open cut mines are not generally tonal or intermittent in nature as per the intent of the NPfI. Whilst individual noise sources, such as machine drives, alarms and hydraulic systems may exhibit tonal characteristics, these sources operate concurrently with the open cut mine, and the resulting combined sound power spectrum is not tonal in nature. RCN operates 24 hours per day, and therefore does not exhibit intermittent noise characteristics. No further assessment of these characteristics has been made.

3.3.2 Low Frequency Noise

As defined in the NPfI:

> *Low frequency noise is noise with an unbalanced spectrum and containing major components within the low-frequency range (10 – 160 Hz) of the frequency spectrum.*

The NPfI contains the current method of assessing low frequency noise, which is a 2-step process as detailed below:

> *Measure/assess source contribution C- and A-weighted L_{eq},T levels over the same time period. Correction to be applied where the C minus A level is 15 dB or more and:*
>
> • *where any of the one-third octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period; and*
>
> • *where any of the one-third octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI are reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.
- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

Section 5.5 includes assessment of potential low frequency noise impact.

4 NOISE MODEL PARAMETERS

4.1 Meteorology

Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions – that is, no wind or temperature gradient. Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receiver due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed with height.

Noise levels are increased when the wind blows from source to receiver or under temperature inversion conditions (both of which are sometimes referred to as 'noise enhancing weather conditions'), and decreased when the wind blows from receiver to the source or under temperature lapse conditions.

Sixteen years of meteorological data (2003 to 2018) from the RCN weather station were analysed to determine noise enhancing meteorological conditions in accordance with the NPfI. Sigma-theta data was analysed, in accordance with procedures in Fact Sheet D of the NPfI to determine the appropriate stability class for each weather record.

Wind effects need to be assessed when wind is considered to be a feature of the area. Wind is considered a feature of the area when source-to-receiver wind speeds (at 10m height) of 3 m/s or less occur for more than 30 percent of the time in any time period, in any season. The wind data analysis determined that no wind directions are considered prevailing during the day; therefore, neutral atmospheric conditions were assessed for that period. For the evening period, east-south-east and south-east winds are considered prevailing. For the night period, east-south-east, south-east and south-south-east winds are considered prevailing.

Temperature inversions need to be assessed when there is more than a 30 percent occurrence during winter nights (June, July, August). The time period used for this assessment is 18:00 to 07:00 as per NPfI guidelines. Data analysis determined that inversions do not occur more than 30 percent of the time during winter nights. However, inversions are a known feature of the Hunter Valley and were therefore assessed. A vertical temperature gradient of four degrees Celsius per 100 metres was used for modelling stability class F, which is consistent with the upper end of the range specified in Table D2 of the NPfI.

Table 4.1 lists noise enhancing meteorological conditions included in this assessment. Neutral atmospheric conditions were also assessed for each time period.

Table 4.1 MODELLED METEOROLOGICAL CONDITIONS

Temperature OC	Humidity %	Wind Speed m/s	Wind Direction	VTG O/100m
		Night Period		
10	80	0	-	-0.5
10	80	0	-	4
10	80	3	ESE	-0.5

Table 4.1 MODELLED METEOROLOGICAL CONDITIONS

Temperature OC	Humidity %	Wind Speed m/s	Wind Direction	VTG O/100m
10	80	3	SE	-0.5
10	80	3	SSE	-0.5
Evening Period				
10	80	0	-	-0.5
10	80	0	-	4
10	80	3	ESE	-0.5
10	80	3	SE	-0.5
Day Period				
10	80	0	-	-0.5

4.2 Indicative Mining Fleet

Table 4.2 and Table 4.3 list indicative open cut mining and CHPP equipment types and quantities. The actual quantity of equipment in service at any time will be dependent on off-site performance, which will be monitored via the real-time monitoring system and attended management monitoring. Monitoring will allow the appropriate level of noise mitigation controls to be applied to maintain compliance with approved criteria (refer to Section 7 of this report for detail regarding noise management). Modelled plant locations and pit shell topography figures are included in Appendix B.

Table 4.2: OPEN CUT EQUIPMENT INCLUDED IN MODELS

Description	2021	2024
Liebherr R9800 excavator	1	1
Caterpillar 6060 excavator	1	0
Hitachi EX3600 excavator	1	3
Caterpillar 793 rear dump truck	6	5
Caterpillar 789 rear dump truck	17	23
Caterpillar 785 water truck	0	1
Caterpillar 777 water truck	2	2
Caterpillar 773 service truck	1	1
Caterpillar 16 grader	1	2
Caterpillar 24 grader	1	1
Caterpillar 994 front end loader	2	2
Caterpillar D10 tracked dozer	1	5
Caterpillar D11 tracked dozer	4	2
Caterpillar 854 rubber tyre dozer	0	0
D50K blast hole drill	1	2
D75K blast hole drill	1	1

Notes:

1. *Table shows representative typical equipment to allow for assessment.*

Table 4.3: CHPP PLANT ITEMS INCLUDED IN MODELS (both stages)

Description	Quantity
Washery building (CPP)	1
Rail load out bin	1
Locomotives set of 4 (idle)	1
ROM bin	1
Reject bin	1
ROM primary crusher	1
Secondary sizing station	1
Stacker	1
Reclaimer	1
Conveyors (metres)	1775
Conveyor drives	4
Stockpile dozer	1

Throughout the life of the mine, equipment type and quantities may be varied in response to changes in technology, and to address technical issues such as geotechnical and geological variables, coal marketing quality requirements etc., however appropriate noise controls and noise management strategies can be implemented to maintain compliance with approved criteria.

4.3 Equipment Sound Power

Sound powers for open cut equipment used in modelling, provided in Table 4.4 are based on in-service levels of plant operating at the RCM. Sound powers for the CPP and train load out bin were sourced from the IOC NBIA, which states they were sourced from an on-site sound power survey. Sound powers for other CHPP plant were sourced from the Global Acoustics technical library for equivalent plant items.

Mining equipment and associated sound power levels shown in this NBIA are representative of a typical mining equipment fleet as proposed to be used for RCN. These sound powers represent current or anticipated fleet average levels. It is normal for plant items within an equipment category to vary, with some having sound power either higher or lower than the fleet average.

Dozers operating in exposed locations, such as overburden emplacement areas, can be restricted to 1st gear during periods of noise enhancing meteorological conditions as a mitigation control. As model predictions are based on noise enhancing meteorological conditions, dozers were modelled in 1st gear; however, this restriction would not be required during all weather conditions, and this mitigation control should be implemented as required to assist with managing noise levels within approved noise criteria.

Haul truck sound powers were incorporated into strings created for each route. This method distributes the acoustic energy of vehicles along the length of each haul route. Routes comprise a string of segments of fixed length, each having a sound power determined by the following:

- sound power for type of trucks on route. Trucks travelling down ramps greater than 5% grade were allocated a reduced sound power;
- number of each truck type on route in a 15-minute period, based on loading unit load capacity;
- speed of loaded truck on segment grade toward dump/ROM; and
- speed of empty truck on segment grade from dump/ROM.

Truck speeds are relative to grade in direction of travel and were allocated in accordance with truck speed data collected from mine sites in the Hunter Valley. Speed determines the duration required to traverse each segment, an important variable when calculating L_{Aeq} for a specific time period. Graders and water carts were allocated sound powers in a similar manner. Haul truck and watercart sound powers shown in Table 4.4 are uphill loaded, full power levels.

Table 4.4: SOUND POWER DATA

	Representative Sound Power, $L_{eq,15minute}$	
Equipment Category	**Linear (dB)**	**A-weighted (dB(A))**
Liebherr R9800 excavator	127	117
Caterpillar 6060 excavator	127	118
Hitachi EX3600 excavator	127	118
Caterpillar 793 rear dump truck	126	118
Caterpillar 789 rear dump truck	123	116
Caterpillar 785 water truck	127	117
Caterpillar 777 water truck	123	118
Caterpillar 773 service truck	125	115
Caterpillar 16G/H grader	115	112
Caterpillar 24H grader	122	115
Caterpillar 994F front end loader (or equivalent)	121	116
Caterpillar 992K front end loader (or equivalent)	118	110
Caterpillar D10 tracked dozer	124	117
Caterpillar D11 tracked dozer	124	119
Caterpillar 854 rubber tyre dozer	122	115
D50K blast hole drill	124	114
D75K blast hole drill	121	113
Coal Processing Plant (CPP)	131	112 [2]
Stockpile dozer	124	117
Locomotives on rail loop (idle)	121	105
Rail load out bin	116	114 [2]
ROM bin	121	113
Reject bin	112	98
ROM primary crusher	120	109
Secondary sizing station	119	113

	Representative Sound Power, $L_{eq,15minute}$	
Equipment Category	**Linear (dB)**	**A-weighted (dB(A))**
Stacker	112	106
Reclaimer	117	107
Conveyor drives	99	95

Notes:

1. *Table shows representative typical sound powers to allow for assessment; and*
2. *Sourced from the IOC NBIA.*

5 NOISE IMPACT ASSESSMENT

5.1 Operational Noise Assessment

The following sections outline noise mitigation controls implemented at RCM, mining scenarios considered, and operational noise predictions.

5.1.1 Noise Mitigation Controls

Long term noise mitigation controls currently implemented at the RCM and proposed to be incorporated into the proposed mine plan progression include:

1. pit design is optimised to provide alternate waste emplacement and hauling options that allow lower elevation and more shielded haulage and dumping during noise enhancing weather conditions when practical;

2. mining production schedules are modified to include allowances for reduced production resulting from modified fleet configurations during noise enhancing weather conditions; and

3. major plant and equipment are noise attenuated.

A series of noise management strategies will be progressively implemented as required to maintain compliance with approved noise criteria. These include:

1. ancillary equipment such as rehabilitation dozers, drill preparation dozers and road/pit maintenance equipment operating in exposed areas will be relocated or shutdown;

2. exposed waste emplacement area dozers will be either replaced with rubber tyre dozers, restricted to first gear operation, relocated to lower dump areas, or shutdown;

3. any other dozers operating in exposed areas will be either replaced with rubber tyre dozers, where functional, restricted to first gear operation, relocated, or shutdown;

4. haulage to exposed waste emplacement areas will be relocated to use more shielded haul roads and emplacement areas deeper in the pit;

5. blast hole drills may be shut down;

6. exploration drilling works and associated activities will be modified or shutdown as required;

7. excavators and associated equipment, including haul trucks, will be progressively shutdown or relocated to more shielded pit areas;

8. CHPP operations will be modified or shut down where required; and

9. coal product stockpile dozers will be operated in first gear or relocated to the other side of the stockpile.

Throughout the life of the mine, alternative noise controls and management strategies may be implemented to ensure ongoing compliance with approved noise criteria.

In accordance with the RCM Noise Management Plan (NMP), proactive noise management will continue to be used in the first instance via review of predictive weather forecasts combined with short term mine schedules to implement noise controls in advance of noise issues arising. In the event that higher than anticipated noise levels occur, reactive noise measures will continue to be applied to maintain compliance. Decision making will be informed by data from the real time monitoring system and attended noise management monitoring. Further detail regarding the RCN noise management system is included in Section 7 of this NBIA.

PA 08_0102 includes a condition (condition 9e) that the applicant must minimise the noise impacts of the development during meteorological conditions for which noise criteria in the consent do not apply (refer to Section 3.1.2 for more detail). Noise controls and management strategies that are implemented to ensure compliance during meteorological conditions for which approved noise criteria are applicable would continue to be implemented when meteorological conditions exceed the applicable range.

5.1.2 Mining Scenarios

Section 2.3 provides an overview of the two operational mining stages that were modelled. These represent the updated progression of mining operations during the period when the Camberwell Pit waste emplacement area landform will be modified. The stages nominally relate to years 2021 and 2024. For each stage an initial operating configuration was assessed representing a realistic worst-case operating scenario for that period of operations. For 2024, two additional reduced equipment configurations were assessed for the evening period. Modelled scenarios for each stage are described below.

Exploration drilling works were not included in modelled scenarios. Experience with these works on other projects indicates noise impact from exploration drilling is unlikely when a separation distance of more than 1,000 metres exists between the work site and the nearest private receptor. It is recommended that in cases where exploration drilling is required within 1,000 metres of a private residence, a risk assessment be completed that includes an evaluation of potential noise impact. When required, suitable noise mitigation such as acoustic barriers should be installed to minimise noise propagation during noise enhancing weather conditions. Exploration activities will only occur during the day period.

Figures illustrating modelled equipment layouts are include in Appendix B.

Year 2021 Mining Scenario

The 2021 modelled operational stage plan includes mining in Camberwell Pit only. Three excavators are operating, with waste haulage to two separate emplacement areas, and coal haulage from Camberwell Pit to the RCS CHPP. The Camberwell Pit waste emplacement area has reached the proposed height for this stage of 170 metres RL, and is progressing in a westerly direction. Haulage of coal from the Integra Underground stockpile area to the RCN CHPP is in progress. Reject from the RCN CHPP is hauled to Camberwell Pit. The operating configurations assessed are the same for the

day, evening and night periods.

Year 2024 Mining Scenario

The 2024 modelled operational stage plan includes mining in both Camberwell Pit and Falbrook Pit. In accordance with PA 08_0102, Falbrook Pit is restricted to operating during the day and evening periods only; Falbrook Pit was therefore not included in night period scenarios. Two excavators are operating in Camberwell Pit, with waste haulage to two separate emplacement areas. The Camberwell Pit waste emplacement area has reached the proposed temporary height for this stage of 175 metres RL, and is progressing in a westerly direction. The EX3600 excavator operating in Camberwell Pit is proposed to alternate between waste and coal loading. Of these, waste haulage to the highest emplacement area has been assessed as it representative of the worst-case option due to the height and more exposed nature of the haul. Two excavators are operating in Falbrook Pit, with waste haulage to an emplacement area in the north-east end of the pit, and coal haulage to the RCS CHPP. Haulage of coal from the Integra Underground stockpile area to the RCN CHPP is in progress. Reject from the RCN CHPP is hauled to Camberwell Pit. The initial operating configurations assessed are the same for the day and evening periods. The night period scenario excludes all operations in Falbrook Pit, but includes coal haulage from Integra Underground to the RCN CHPP.

Additional modelling identified that operating Falbrook Pit in the evening period during noise enhancing meteorological conditions will likely require management strategies to be implemented to maintain compliance with approved criteria. Two additional operating scenarios were modelled for Falbrook Pit during the evening period to quantify predicted reductions in noise levels due to progressive implementation of fleet shut downs. The three scenarios considered are as follows.

> **Evening Scenario 1** – This is the initial, unrestricted operational scenario for Falbrook Pit. This is a worst case scenario considering full production and exposed operations;
>
> **Evening Scenario 2** – This is a first stage mitigated operating scenario for Falbrook Pit, representing a partial shutdown of operations. This scenario assumes one excavator and associated fleet is shut down, and the other excavator and associated fleet continues to operate. In this case, the waste excavator and fleet were shut down, as that action provides the greatest benefit. Operations in Camberwell Pit remain unmodified and coal haulage from Integra Underground to the RCN CHPP continues; and
>
> **Evening Scenario 3** - This is a second stage mitigated operating scenario for Falbrook Pit, representing complete shutdown of operations in Falbrook Pit. All equipment in Falbrook Pit is shut down. Operations in Camberwell Pit remain unmodified and coal haulage from Integra Underground to the RCN CHPP continues.

These scenarios are only applicable to the 2024 stage, as Falbrook Pit is not included in the 2021 stage plans. These scenarios are presented to demonstrate predicted compliance with approved noise criteria can be achieved. The actual mitigation controls applied will be dependent on the degree of noise mitigation required and the operating configurations in effect at the time. An overview of proactive and reactive noise management measures is provided in Section 7 of this NIA.

5.1.3 Operational Noise Predictions

Table 5.2 presents noise enhancing meteorological conditions predictions for each stage (2021 and 2024). For 2024, results are included for each of the three evening scenarios described in Section 5.1.2 above. Results are presented for all receptors with a prediction that exceeds $L_{Aeq,15minute}$ 35 dB in any time period, for either stage. Predictions for the complete receptor set, for both neutral atmospheric conditions and noise enhancing meteorological conditions are presented in Appendix A.

Intrusive noise, mitigation and acquisition criteria from PA 08_0102 for each receptor are listed, and evaluation of impact is made against those criteria. No assessment of residual noise impact in accordance with the VLAMP is included, as mitigation and acquisition criteria have already been established for RCN and are listed in PA 08_0102. Further, as Bloomfield has indicated they will manage noise emission to maintain compliance with approved intrusive noise criteria, there should be no reason for any additional receptors to be entitled to mitigation or acquisition on request status.

Exceedances of criteria are highlighted according to the colouring scheme indicated in Table 5.1.

Table 5.1: EXCEEDANCE SIGNIFICANCE LEVELS

Colour	Significance
Orange	Values highlighted orange exceed the acquisition criterion
Yellow	Values highlighted yellow exceed the mitigation criterion, but not the acquisition criterion
Green	Values highlighted green exceed the intrusive noise criterion, but not mitigation or acquisition criteria

A number of receptors have acquisition on request status with either RCN, RCS, or another neighbouring mine. These are indicated by a symbol adjacent to the receptor identifier, with the relevant mining operation listed in the table notes. Receptors N104 and N180 are community buildings and N181 is commercial; therefore mitigation and acquisition criteria are not applicable.

Table 5.2: OPERATIONAL NOISE PREDICTIONS – $L_{Aeq,15minute}$ dB

Receptor ID	Intrusive Noise Criteria			Mitigation Criteria			Acquisition Criteria			Year 2021			Year 2024				
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve 1	Eve 2	Eve 3	Night
N34	39	39	36	42	42	39	45	45	42	21	30	35	36	36	32	30	34
N35	39	39	35	42	42	39	45	45	42	21	31	34	37	42	35	31	33
N36	35	35	35	42	42	39	45	45	42	21	28	34	30	36	32	28	33
N38	35	35	35	42	42	39	45	45	42	21	29	33	30	36	33	28	33
N42	36	36	36	42	42	39	45	45	42	22	31	33	30	38	35	31	34
N43	36	36	36	42	42	39	45	45	42	22	31	34	34	40	35	30	34
N44	36	36	36	43	43	41	46	46	44	23	28	32	37	46	34	27	31
N47*□	39	39	39	NA	NA	NA	43	43	41	29	32	36	35	45	41	32	35
N48*	36	36	36	NA	NA	NA	46	46	44	25	29	33	32	47	36	28	33
N49	39	39	39	43	43	41	46	46	44	25	29	32	31	46	38	28	32
N50*	39	39	39	NA	NA	NA	44	44	41	25	33	37	36	42	38	32	36
N51	37	37	37	41	41	38	44	44	41	25	32	36	34	41	38	32	36
N52	35	35	35	41	41	38	44	44	41	23	28	30	34	39	33	27	29
N53*□	38	38	38	NA	NA	NA	44	44	41	25	34	37	34	41	38	34	36
N54*□	39	39	39	NA	NA	NA	44	44	41	25	35	37	33	41	39	35	37
N62*+	40	40	40	NA	NA	NA	44	44	41	27	37	39	34	44	41	37	38
N63*+	40	40	40	NA	NA	NA	43	43	41	26	36	38	32	45	42	35	37
N64^+	NA	NA	NA	NA	NA	NA	NA	NA	NA	27	39	41	35	46	44	39	41
N67+	40	40	40	43	43	43	46	46	46	30	39	40	35	44	42	38	40
N88#+	40	40	40	45	45	40	48	48	43	27	38	38	27	40	40	38	38
N91*#+	40	40	40	NA	NA	NA	48	48	43	28	39	39	29	40	40	38	38
N103#+	37	37	37	53	49	45	56	52	48	24	36	36	24	37	37	35	35

Receptor ID	Intrusive Noise Criteria			Mitigation Criteria			Acquisition Criteria			Year 2021			Year 2024				
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve 1	Eve 2	Eve 3	Night
N104◊	48	48	48	NA	NA	NA	NA	NA	NA	23	37	37	24	37	37	35	35
N105*#+	41	41	41	NA	NA	NA	48	48	43	28	40	40	28	40	40	39	39
N133□	37	37	37	44	44	41	47	47	44	26	37	37	26	37	37	36	36
N161*#+	41	41	41	NA	NA	NA	48	48	43	30	39	39	30	40	39	38	38
N172#+	42	42	37	45	45	40	48	48	43	29	38	38	29	39	39	37	37
N173	39	39	39	43	43	41	46	46	44	29	29	39	30	30	30	29	37
N174	39	39	39	43	43	41	46	46	44	29	29	38	31	31	30	29	37
N175	40	40	40	44	44	42	47	47	45	27	27	38	31	31	30	28	38
N176#	38	38	38	44	44	41	47	47	44	21	35	35	20	36	35	34	34
N177^	NA	NA	NA	NA	NA	NA	NA	NA	NA	32	40	40	33	41	41	38	38
N178^	NA	NA	NA	NA	NA	NA	NA	NA	NA	32	41	41	34	43	42	40	40
N179+	40	40	40	43	43	43	46	46	46	30	39	40	34	45	43	39	40
N180◊	53	53	53	NA	NA	NA	NA	NA	NA	32	38	42	41	51	47	38	42
N181◊	63	63	63	NA	NA	NA	NA	NA	NA	25	27	31	33	45	34	27	31
N183	38	38	38	41	41	38	44	44	41	22	32	34	30	39	36	30	33
N187	39	39	39	43	43	41	46	46	44	26	26	36	27	27	27	23	33
1●	36	36	36	53	49	45	56	52	48	32	32	41	33	33	33	22	34
2	39	39	39	43	43	41	46	46	44	29	29	38	31	31	30	29	37
4*	40	40	40	NA	NA	NA	45	45	43	29	29	39	32	32	32	29	38
5*	41	41	41	NA	NA	NA	45	45	43	29	29	39	31	31	31	28	38
6	39	39	39	44	44	42	47	47	45	29	29	38	32	32	31	29	37
7*	42	42	42	NA	NA	NA	45	45	43	30	30	40	32	32	31	29	40
9*	42	42	42	NA	NA	NA	47	47	45	30	30	39	33	33	33	30	40

Receptor ID	Intrusive Noise Criteria			Mitigation Criteria			Acquisition Criteria			Year 2021			Year 2024				
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve 1	Eve 2	Eve 3	Night
10*	42	42	42	NA	NA	NA	47	47	45	33	33	41	35	35	35	32	40
11	38	38	38	44	44	42	47	47	45	24	24	37	29	29	27	24	38
12	37	37	37	44	44	42	47	47	45	21	21	35	32	32	26	21	36
13	40	40	40	44	44	42	47	47	45	29	29	38	32	32	32	30	38
14	40	40	40	44	44	42	47	47	45	28	28	38	31	31	31	28	38
23	36	36	36	43	43	41	46	46	44	25	25	36	25	25	25	21	33
24	39	39	39	43	43	41	46	46	44	29	29	38	30	30	30	28	37
170^□#	NA	NA	NA	NA	NA	NA	NA	NA	NA	26	39	39	26	39	39	37	37
173^+	NA	NA	NA	NA	NA	NA	NA	NA	NA	38	47	47	38	48	48	47	47
175^□	NA	NA	NA	NA	NA	NA	NA	NA	NA	37	47	47	37	48	47	47	47
176^□	NA	NA	NA	NA	NA	NA	NA	NA	NA	37	47	47	37	47	47	46	46
177^□	NA	NA	NA	NA	NA	NA	NA	NA	NA	44	50	51	44	52	52	50	51

Notes:

1. *Values highlighted green exceed the intrusive noise criterion, but not mitigation or acquisition criteria;*
2. *Values highlighted yellow exceed the mitigation criterion, but not the acquisition criterion;*
3. *Values highlighted orange exceed the acquisition criterion;*
4. ^ *indicates receptor entitled to acquisition on request with RCN. Mitigation and acquisition criteria are not applicable;*
5. * *indicates receptor entitled to noise mitigation on request with RCN. Mitigation criteria are not applicable;*
6. # *indicates receptor entitled to acquisition on request for air impacts with RCS;*
7. ♦ *indicates receptor entitled to acquisition on request for noise impacts with RCS;*
8. ◊ *indicates receptor is a community or commercial building. Mitigation and acquisition criteria are not applicable;*
9. □ *indicates receptor entitled to acquisition on request for noise impacts with another mine; and*
10. + *indicates receptor entitled to acquisition on request for air impacts with another mine.*

The 2021 stage has two predicted exceedances of intrusive noise criteria. These are as follows.

1. A minor 1 dB exceedance is predicted for Receptor N172 during the night period. N172, which is located in Camberwell, was not assessed in the IOC NBIA and therefore is not listed in PA 08_0102. Criteria have been allocated based on "All other privately-owned land" criteria for NAG 4 listed in the project approval. However, it should be noted that the night criterion is 4 dB lower than for Receptor N161, which is located less than 200 metres away, also in Camberwell. It is recommended N172 be added to PA 08_0102 with the same criteria as N161. In this case, the model prediction would be 3 dB lower than the night period criterion, and there would be no predicted exceedance. It is noted that this building is derelict, uninhabited, and the property is entitled to acquisition on request in accordance with the RCS project approval (SSD 6300); and

2. A 5 dB exceedance is predicted for Receptor 1, which is located very close to RCS on Rix's Lane. The predicted level is primarily due to RCN coal trucks operating within the RCS lease area, and dumping at the RCS ROM. Bloomfield has approval to haul coal from either RCN or RCS mines in either direction to the CHPP at the other site. Bloomfield has indicated the maximum number of trucks using the RCS coal haul road and dumping at the RCS ROM from both sites will not exceed the maximum number of movements assessed for the RCS Continuation Project. Therefore, there would be no increase in noise emission due to operating RCN trucks in the RCS lease area relative to that previously assessed. On this basis, any RCN truck movements within the RCS project boundary are considered part of RCS noise emission, and should be evaluated for compliance with the development consent for SSD 6300. Receptor 1 has acquisition on request status with RCS.

The 2024 stage has nineteen receptors with predicted exceedances of intrusive noise criteria when full operations are in effect in Falbrook Pit (day and evening periods only), primarily for receptors located to the north of Falbrook Pit. These exceedances are predicted predominantly for the evening period during periods of noise enhancing meteorological conditions. However, seven of these properties have existing entitlement to acquisition upon request.

During neutral atmospheric conditions, or periods of non-enhancing meteorological conditions, only one minor exceedance of 1 dB is predicted (Receptor N44), indicating the site should typically be able to operate at full production in both Camberwell and Falbrook Pits whilst maintaining compliance with PA 08_0102 when noise enhancing meteorological conditions are not present. When noise enhancing meteorological conditions are present, evening scenario 2 (partial shutdown of Falbrook Pit) indicates some minor exceedances of intrusive noise criteria may still result, but mitigation and acquisition criteria would not be exceeded. With a complete shutdown of Falbrook Pit (evening scenario 3), full compliance is predicted for all receptors. These results indicate that operations in Falbrook Pit will require monitoring and implementation of mitigation controls to maintain compliance when noise enhancing meteorological conditions are present.

Noise mitigation controls should typically only be required during periods of meteorological enhancement, and will be applied based on information obtained from attended noise management monitoring and any real time monitoring system if required, and application of the Trigger Action

Response Plan (TARP) detailed in the RCM NMP. Section 6 of the RCM NMP outlines noise management procedures and protocols.

5.2 Indicative Noise Contours

Figure 6 and Figure 7 present indicative $L_{Aeq,15minute}$ noise contours for each of the modelled stages. Noise contours are the maximum envelope of the day, evening and night periods with feasible and reasonable noise mitigation controls applied (evening scenario 3). A complete set of noise contour figures is included in Appendix C.

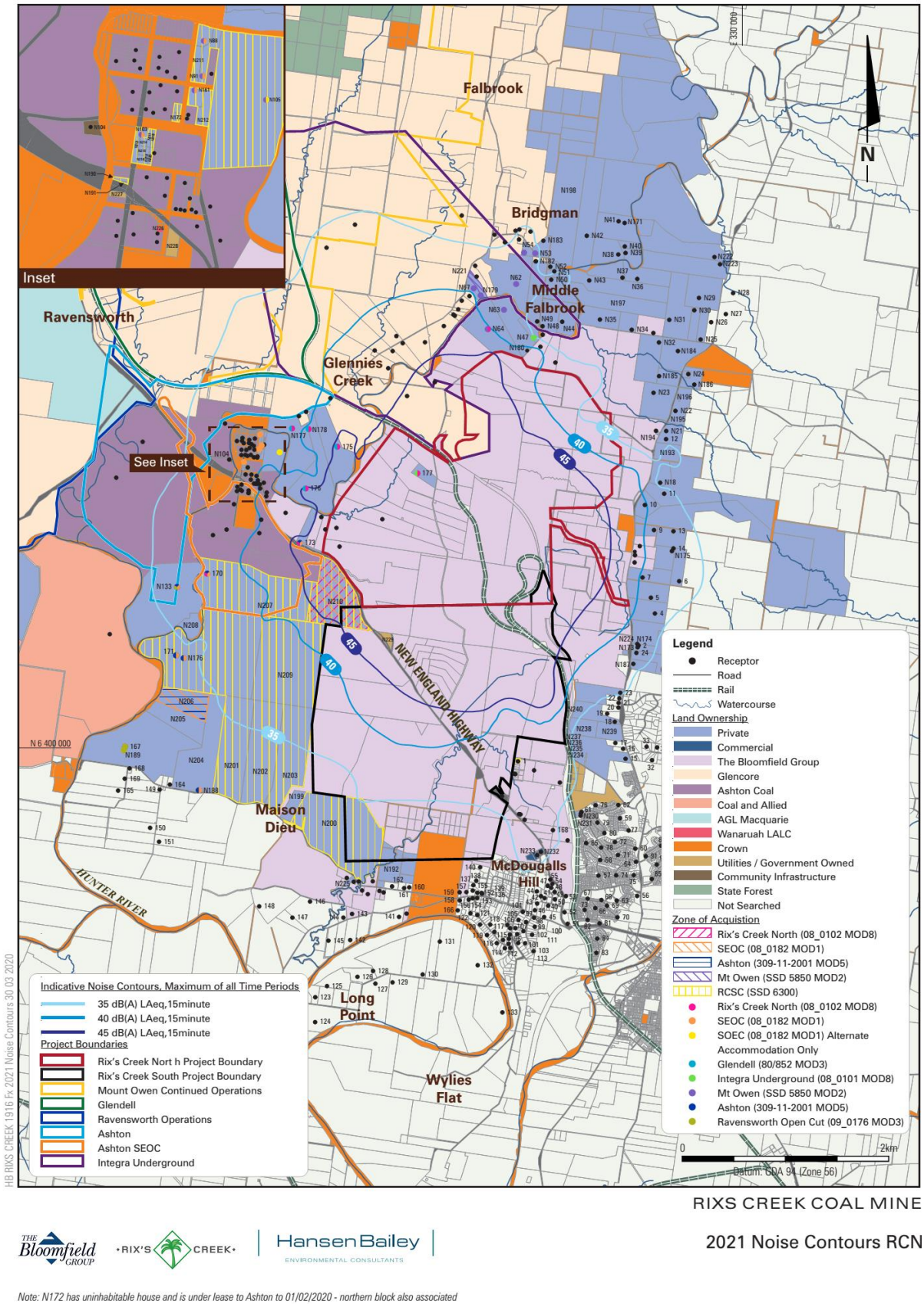


Figure 6 - Indicative Noise Contours – Maximum Envelope of All Time Periods – 2021

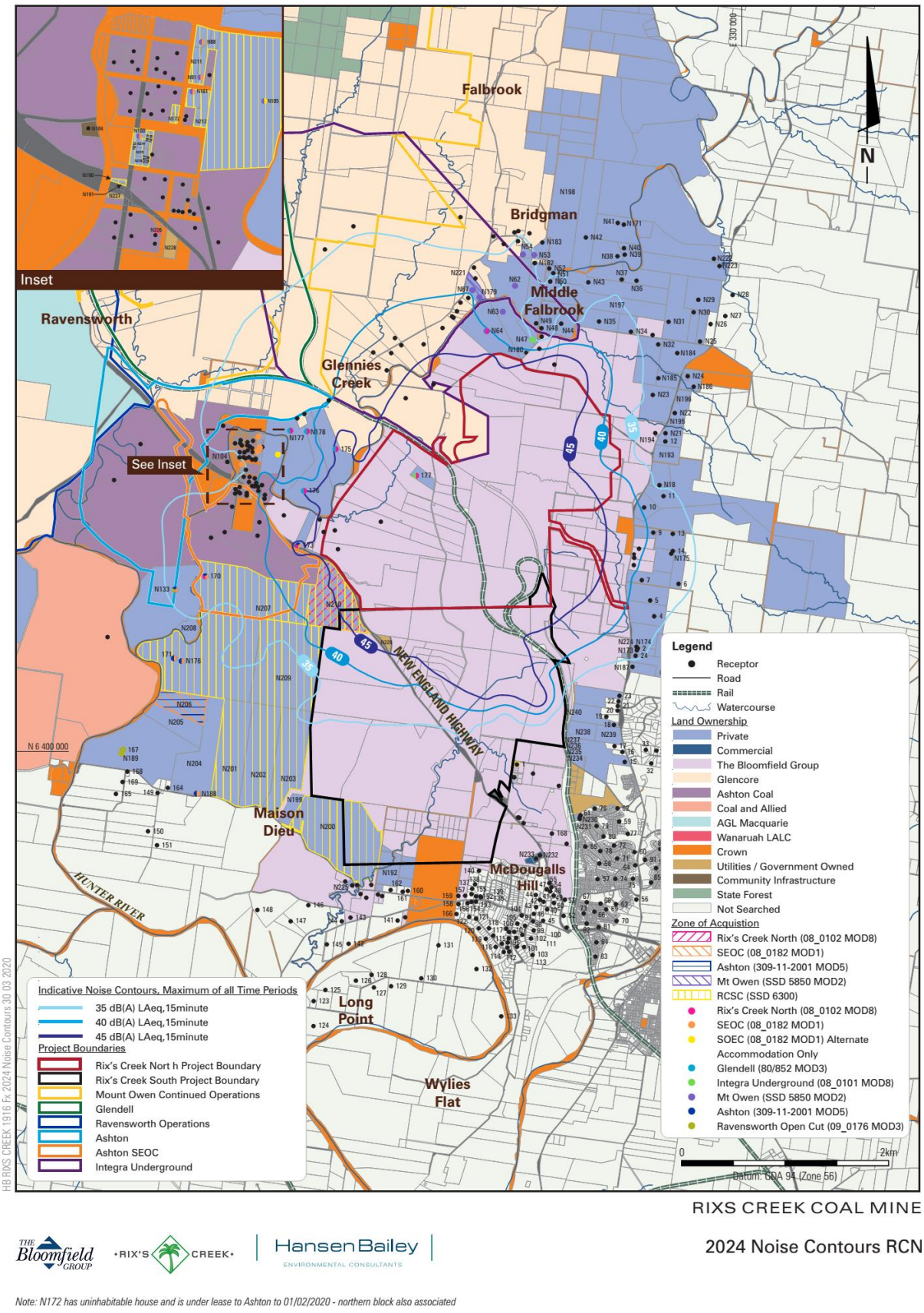


Figure 7 - Indicative Noise Contours – Maximum Envelope of All Time Periods - 2024

5.3 Private Land Area Assessment

In accordance with PA 08_0102, intrusive noise, mitigation and acquisition criteria should not be exceeded over more than 25 percent of any privately-owned land, with or without a residence. As discussed in Section 3.1.5 ,it is recommended the 25 percent area conditions be removed from the project approval on the basis that it is not feasible to assess the percentage of noise affected land for an operating mine.

The VLAMP includes an assessment requirement for privately owned land (refer to Section 3.2.3 for more detail), stating that voluntary land acquisition rights may apply where, even with the implementation of best practice management, the noise generated by the development would contribute to exceedances of the acceptable noise amenity levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land. This requirement is to be assessed where there is an existing dwelling or where a dwelling could be built under existing planning controls. Acceptable noise amenity levels plus 5 dB for the day, evening and night periods for receptors in a rural land environment are $L_{Aeq,period}$ 55, 50 and 45 dB respectively.

Noise contours were generated over contiguous private lot areas, from which the maximum envelope of predicted noise emission was determined. This was used to evaluate the maximum extent of noise impact for each time period and allow evaluation of impact over private land areas. Properties already subject to acquisition on request in accordance with PA 08_0102 were excluded.

The outcome of this assessment was that no private landholdings have more than 25 percent of the area predicted to exceed acceptable noise amenity levels plus 5 dB in any time period, for either of the two stages assessed. Therefore, no additional properties would be entitled to voluntary land acquisition rights due to predicted impact over the land area.

5.4 Maximum Noise Level Assessment

Potential sleep disturbance impact was assessed by predicting levels from plant items known to generate noise levels that at times stand out above the general mining continuum. Shovel and excavator bucket noise, first pass loads into empty truck trays, rear dump truck exhaust and dozer track noise are recognised as sources which can generate high, short term noise levels that may cause sleep disturbance.

The following sources were modelled to assess sleep disturbance:

- Impact noise generated by excavator buckets impacting truck bodies or hard ground material, or rocks impacting the bottom of empty haul truck trays was modelled at each dig location. A sound power of L_{max}/L_{Amax} 131/125 dB was modelled for each impact event;
- Dozer track slap was modelled at each dozer operating location. A sound power of L_{max}/L_{Amax} 130/125 dB representing dozer operation in 2nd gear reverse was modelled; and
- Haul truck exhaust surges were modelled by assessing a maximum sound power event of L_{max}/L_{Amax} 131/120 dB at each overburden emplacement area, and, at exposed sections along haul routes. This sound power is an addition of 5 dB to the full rated power, uphill loaded

sound power spectrum in engine and exhaust frequencies (31.5 to 500 Hz).

Assessment of sleep disturbance involved modelling each of these sources, and then combining the highest prediction with results for the remainder of operational plant to obtain an estimate of possible short-term maximum noise emissions.

Sleep disturbance model predictions are less than relevant $L_{A1,1minute}$ criteria prescribed in PA 08_0102 for all receptors. As such, there is no sleep disturbance impact predicted.

5.5 Low Frequency Noise Assessment

RCN will be operated with an attenuated mining fleet, and all major fixed plant infrastructure, including the CPP includes cladding in accordance with industry best practice.

To evaluate low frequency noise modifying factor adjustment applicability, each stage plan was modelled in ENM using one-third octave sound power inputs in order to obtain one-third octave model predictions. Predicted one-third octave L_{Aeq} spectra for each of the prevailing meteorological conditions were evaluated directly against NPfI low frequency noise thresholds.

All results were below NPfI thresholds, meaning low frequency noise modifying factor adjustment applicability is not predicted.

5.6 Cumulative Noise Assessment

Other industrial noise sources around RCM with potential to cause cumulative noise impact to receptors within the assessment area include:

- Integra Underground;
- Ravensworth Surface Operations mine (RSO);
- Ashton South East Open Cut (SEOC) mine;
- Glendell; and
- Mount Owen Complex.

Of these mines, RSO, Ashton SEOC, Glendell and Mount Owen are geographically located at sufficient distance from RCM, and directionally such that when weather conditions favour enhancement of noise from RCM, the same weather conditions would mitigate noise from mines located in the opposite direction (at receptors between); therefore, cumulative noise impact with these mines is not considered likely. The usual situation in Camberwell for example is that noise will be received primarily from mines to the north when noise enhancement is from that direction, with relatively low-level contributions from the south that do not cause a significant cumulative increase, if any. Conversely, when enhancement is from the south, noise will be received primarily from RCM, with relatively low levels from mines to the north. The end result is mining noise is typically audible in Camberwell, but cumulative levels remain below acceptable noise amenity levels. A similar situation occurs for other

receptor areas that are located between RCM and other neighbouring mines.

The combined operation of RCN and RCS has potential to cumulatively generate higher levels than either site operating independently. Cumulative noise from these combined operations was quantitatively assessed in the RCS NIA, using predictions from that NIA for RCS contributions, and predictions from the IOC NBIA for RCN contributions. As this NBIA demonstrates that RCN can operate in accordance with approved criteria, which were established using predictions from the IOC NBIA, the quantitative assessment included in the RCS NIA is still considered valid. That is, noise emission from RCN will not increase above approved noise limits as a result of MOD9, as the site will be managed to comply with approved intrusive noise criteria. The key outcome of the RCS NIA was that compliance with acceptable noise amenity criteria was predicted for all receptors that did not have acquisition rights in accordance with PA 08_0102, except Receptor 174 which is now mine owned.

Integra Underground was included in IOC NBIA predictions, and was therefore considered in the RCS NIA cumulative noise assessment. Provided Integra Underground and RCN continue to operate within respective approved noise impact assessment criteria, no exceedance of acceptable noise amenity levels should occur.

The proposed mine plan changes associated with MOD9 are minor, and noise emission should not increase as a result of the modification, as noise emission will be managed to comply with approved intrusive noise criteria. Compliance with cumulative noise criteria prescribed in PA 08_0102 should continue.

6 BLASTING ASSESSMENT

Blasting at the RCM is undertaken in accordance with the approved Rix's Creek Mine Blast Management Plan (BMP). The BMP details management and mitigation measures associated with blasting, and describes procedures for evaluating and monitoring blast impacts

Bloomfield has contemporary blast design and management procedures in place that are consistent with industry best practice. Detailed design is undertaken for all blasts to ensure compliance with relevant project approval criteria. Initiation of blasts is made by both electronic and non-electric (Nonel) products. The initiation timing and direction of each blast is considered on its individual merits to ensure minimised impact to neighbouring residences and infrastructure.

No change is proposed to current blast practices at RCM as a result of MOD9 other than seeking to increase the number of blasts allowed in RCN from two to three per day. The approved number of blasts per week will remain at ten. There would be no change to the magnitude of impacts associated with this change, only the distribution of these within a weekly period. The change would provide increased opportunity to blast during the most favourable weather conditions, which could ultimately reduce the overall magnitude of blast impacts relative to blasting when conditions are at the upper end of the range of acceptable weather limits.

In addition to providing potential for reduced magnitude of blast impacts, the proposed change to blasting frequency will provide consistency with other contemporary project approvals for mines in NSW, including SSD_6300 for Rix's Creek South issued in 2019.

Mining areas requiring blasting in Camberwell and Falbrook Pits are unchanged relative to those previously approved, and blasting has been undertaken successfully in these mining areas in the past. Continued implementation of design, management and monitoring protocols outlined in the BMP should ensure ongoing compliance with approved blasting criteria.

7 NOISE MANAGEMENT

Procedures for management and monitoring noise are outlined in the Rix's Creek Mine Noise Management Plan (NMP). RCM operates a comprehensive noise management system on site that uses a combination of predictive meteorological forecasting, real-time noise monitoring, and attended noise management monitoring to guide the day-to-day planning of exploration activities and mining operations, and the implementation of both proactive and reactive noise mitigation measures.

Section 5.1.1 of this NBIA details noise controls and management strategies that RCM will implement over the life of the operations to ensure compliance with approved noise criteria is maintained. The NMP will be updated to reflect any changes to consent conditions resulting from this application, and will include updated management measures if required to ensure all commitments are implemented, and monitoring is undertaken as required to maintain compliance with approved noise criteria. Throughout the life of the mine, alternative noise controls and management strategies may be implemented to ensure ongoing compliance with approved noise criteria.

7.1 Proactive Management

The RCM NMP outlines preventative measures used to reduce the risk of generating elevated noise levels. Key measures are summarised in the following points.

- RCM has developed a predictive noise model for the mine that is updated daily. Meteorological data from the Hunter Valley Meteorological Sounding Group Joint Venture (HVMSGJV) and meteorological forecasts for the RCM site are used to develop half hourly predictions of noise enhancement conditions;

- Predictions from the daily predictive model are used for daily operational planning, including exploration, to minimise the likelihood of exceedance of compliance noise limits. Daily operational and exploration planning includes the following.

    - Identification of likelihood of noise non-compliance;

    - Identification of equipment operating locations posing risk. In the case of high risk, the proposed operating configuration can be modified ahead of time to reduce the risk to low or moderate. If initial risk is low or moderate, performance is monitored by attended monitoring personnel, and operations modified if required;

    - Development of a daily plan for prioritising machine shut down sequences if noise enhancement is indicated, and allocation of alternative (shielded) production areas within the daily mine plan; and

    - Development of a plan prioritising modifications to the operation such as decreasing the speed of haul trucks, aligning haul routes to maximise the available topographical shielding provided by the pit shell, restricting dozers to first gear, relocating or shutting down non-attenuated equipment including exploration drills, and operating rubber tyred equipment near the surface in place of tracked equipment.

- Competent site personnel undertake attended noise monitoring during the night period, with priority given to receptor areas in the direction of predicted enhancement to ensure off-site mining operational noise impacts do not exceed approved noise limit levels at surrounding receptors. Real-time feedback is provided to the shift supervisor and operations are modified if required; and

- RCM undertakes regular sound power screening to assist in managing equipment sound power levels, and identify plant items requiring maintenance to noise attenuation packages. RCM will continue regular inspection and maintenance of noise attenuation packages. The sound power levels of any new equipment purchased for the site will continue to be managed to ensure sound power levels are generally consistent with the existing fleet.

7.2 Reactive Management

The RCM NMP outlines corrective measures used to address situations when elevated noise levels occur. Key measures are summarised in the following points.

- In the event that a community complaint is received, attended monitoring is instigated and an investigation is undertaken to determine the cause and validity of the complaint. Operations are modified if required to ensure compliance with approved noise criteria;

- A TARP is utilised to manage noise and ensure noise emission remains in compliance with approved criteria. The TARP includes actions and responses to be undertaken in response to noise complaints and noise levels measured during attended management monitoring that exceed trigger levels. The TARP, which is documented in Section 6.2.2 of the RCM NMP, includes a hierarchy of noise mitigation controls to be applied, monitoring procedures, and documentation requirements; and

- If noisy plant is identified during sound power screening, necessary remedial action is undertaken as required.

RCM has been operating with this management system in place since August 2014. RCM proposes to continue implementing this approach to managing noise, and seek to refine and calibrate the predictive noise model on an ongoing basis.

8 CONCLUSION

This noise and blasting impact assessment demonstrates that RCN should be able to continue to operate in accordance with approved noise and blasting criteria set out in PA 08_0102, provided adequate noise mitigation controls are implemented in Falbrook Pit during periods of noise enhancing meteorological conditions, particularly during the evening period.

During neutral atmospheric conditions, or periods of non-enhancing meteorological conditions, the site should typically be able to operate at the production rate assessed herein in both Camberwell and Falbrook Pits whilst maintaining compliance with PA 08_0102.

Noise mitigation controls should typically only be required during periods of meteorological enhancement, and it is recommended these be applied based on information obtained from the real-time monitoring system and application of the RCM Trigger Action Response Plan. Section 7 outlines RCM noise management procedures and protocols.

Continued implementation of blast design, management and monitoring protocols outlined in the RCM BMP should ensure ongoing compliance with approved blasting criteria. The proposed increase in blasting frequency from 2 to 3 per day will provide consistency with other contemporary project approvals for mines in NSW, including SSD_6300 for Rix's Creek South issued in 2019.

Other than an increase in blasting frequency, the only elements proposed to be modified through this application are the height of the waste emplacement area in Camberwell Pit, and the addition of exploration and related activities. No exceedances of relevant noise criteria at private receptors are predicted due to the operations in Camberwell Pit. This indicates that modifying the emplacement area landform height should not change site noise emissions relative to the case where the height is not modified. That is, any predicted noise issues would likely result with or without the modified emplacement area height increase. Exploration drilling should not cause noise impact provided a risk assessment is completed when works are to occur within 1,000 metres of a private residence, including an evaluation of potential noise impact.

It is recommended that RCM should continue to manage noise emission to maintain compliance in the same manner as it currently employs.

Global Acoustics Pty Ltd

9 REFERENCES

NSW Environment Protection Authority, 2000. *NSW Industrial Noise Policy*. Sydney: NSW Environment Protection Authority.

NSW Environment Protection Authority, 2017. *NSW Noise Policy for Industry*. Sydney: NSW Environment Protection Authority.

Department of Environment, Climate Change and Water, 2011. *NSW Road Noise Policy*. Sydney: NSW Environment Protection Authority.

Department of Environment and Climate Change, 2009. *Interim Construction Noise Guideline*. Sydney: NSW Environment Protection Authority.

NSW Environment Protection Authority, 2013. *Rail Infrastructure Noise Guideline*. Sydney: NSW Environment Protection Authority.

NSW Government, 2018. *Draft Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments.*

Global Acoustics, 2015. *Rix's Creek Coal Mine Continuation of Mining Project Environmental Noise Assessment.*

Heggies, 2009. I*ntegra Open Cut Operational Noise and Blasting Assessment.*

Appendix

A OPERATIONAL NOISE RESULTS

Table A.1 presents operational noise predictions for all assessed receptors for each stage (2021 and 2024). Predictions are presented for both neutral atmospheric conditions and noise enhancing meteorological conditions in the following format.

Neutral atmosphere prediction/noise enhancing meteorological conditions prediction

Results for three operating scenarios are presented for the evening period in 2024. Refer to Section 5.1.2 for detail regarding modelled scenarios.

Table A.1: OPERATIONAL NOISE PREDICTIONS- $L_{Aeq,15minute}$ dB

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
N18	35	35	35	22/22	22/22	22/34	27/27	27/27	25/25	21/21	21/34
N21	37	37	36	21/21	21/21	21/35	33/33	33/33	26/26	21/21	21/35
N22	37	37	37	22/22	22/22	22/33	31/31	31/31	28/28	22/22	22/34
N23	37	37	37	24/24	24/24	24/31	33/33	33/33	29/29	23/23	23/30
N24	35	35	35	19/19	19/19	19/29	29/29	29/29	25/25	19/19	19/30
N25	35	35	35	20/20	20/21	20/31	30/30	30/30	25/25	19/20	19/31
N26	35	35	35	19/19	19/20	19/31	30/30	30/30	25/25	19/20	19/30
N27	35	35	35	19/19	19/20	19/31	31/31	31/31	25/25	19/19	19/31
N28	35	35	35	18/18	18/19	18/30	27/27	27/27	23/23	17/18	17/30
N29	35	35	35	21/21	21/24	21/31	28/28	28/29	25/26	20/22	20/31
N30	35	35	35	20/20	20/23	20/32	32/32	32/32	26/27	20/22	20/32
N31	36	36	35	21/21	21/25	21/33	35/35	35/35	27/28	20/24	20/32
N32	37	37	35	21/21	21/24	21/33	34/34	34/34	27/27	20/22	20/32
N34	39	39	36	21/21	21/30	21/35	36/36	36/36	29/32	21/30	21/34
N35	39	39	35	21/21	21/31	21/34	37/37	37/42	29/35	21/31	21/33
N36	35	35	35	21/21	21/28	21/34	30/30	30/36	27/32	20/28	20/33
N37	35	35	35	19/19	19/22	19/26	27/27	27/32	24/27	19/23	19/27
N38	35	35	35	21/21	21/29	21/33	30/30	30/36	26/33	21/28	21/33
N39	35	35	35	21/21	21/25	21/29	28/28	28/35	26/31	21/25	21/29
N40	35	35	35	18/18	18/26	18/28	27/27	27/35	24/30	18/26	18/28
N41	35	35	35	13/13	13/17	13/22	20/20	20/27	17/21	13/14	13/21
N42	36	36	36	22/22	22/31	22/33	30/30	30/38	26/35	22/31	22/34

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
N43	36	36	36	22/22	22/31	22/34	34/34	34/40	27/35	22/30	22/34
N44	36	36	36	23/23	23/28	23/32	37/37	37/46	28/34	23/27	23/31
N47	39	39	39	29/29	29/32	29/36	35/35	35/45	34/41	29/32	29/35
N48	36	36	36	25/25	25/29	25/33	32/32	32/47	29/36	24/28	24/33
N49	39	39	39	25/25	25/29	25/32	31/31	31/46	30/38	25/28	25/32
N50	39	39	39	25/25	25/33	25/37	36/36	36/42	30/38	25/32	25/36
N51	37	37	37	25/25	25/32	25/36	34/34	34/41	29/38	25/32	25/36
N52	35	35	35	23/23	23/28	23/30	34/34	34/39	28/33	23/27	23/29
N53	38	38	38	25/25	25/34	25/37	34/34	34/41	29/38	25/34	25/36
N54	39	39	39	25/25	25/35	25/37	33/33	33/41	31/39	25/35	25/37
N62	40	40	40	27/27	27/37	27/39	34/34	34/44	33/41	27/37	27/38
N63	40	40	40	26/26	26/36	26/38	32/32	32/45	31/42	26/35	26/37
N64	NA	NA	NA	27/27	27/39	27/41	35/35	35/46	32/44	27/39	27/41
N67	40	40	40	30/30	30/39	30/40	35/35	35/44	34/42	30/38	30/40
N88	40	40	40	27/27	27/38	27/38	27/27	27/40	27/40	25/38	25/38
N91	40	40	40	28/28	28/39	28/39	29/29	29/40	28/40	27/38	27/38
N103	37	37	37	24/24	24/36	24/36	24/24	24/37	24/37	23/35	23/35
N104	48	48	48	23/23	23/37	23/37	24/24	24/37	24/37	22/35	22/35
N105	41	41	41	28/28	28/40	28/40	28/28	28/40	28/40	26/39	26/39
N133	37	37	37	26/26	26/37	26/37	26/26	26/37	26/37	25/36	25/36
N161	41	41	41	30/30	30/39	30/39	30/30	30/40	30/39	28/38	28/38
N171	35	35	35	15/15	15/21	15/24	22/22	22/32	19/27	15/20	15/24
N172	42	42	37	29/29	29/38	29/38	29/29	29/39	29/39	27/37	27/37

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
N173	39	39	39	29/29	29/29	29/39	30/30	30/30	30/30	29/29	29/37
N174	39	39	39	29/29	29/29	29/38	31/31	31/31	30/30	29/29	29/37
N175	40	40	40	27/27	27/27	27/38	31/31	31/31	30/30	28/28	28/38
N176	38	38	38	21/21	21/35	21/35	20/20	20/36	20/35	19/34	19/34
N177	NA	NA	NA	32/32	32/40	32/40	33/33	33/41	32/41	31/38	31/38
N178	NA	NA	NA	32/32	32/41	32/41	34/34	34/43	33/42	32/40	32/40
N179	40	40	40	30/30	30/39	30/40	34/34	34/45	33/43	30/39	30/40
N180	53	53	53	32/32	32/38	32/42	41/41	41/51	39/47	32/38	32/42
N181	63	63	63	25/25	25/27	25/31	33/33	33/45	30/34	25/27	25/31
N183	38	38	38	22/22	22/32	22/34	30/30	30/39	27/36	21/30	21/33
N184	37	37	35	20/20	20/21	20/32	33/33	33/33	26/26	20/20	20/31
N185	35	35	35	21/21	21/22	21/30	33/33	33/33	27/27	21/21	21/29
N186	35	35	35	20/20	20/20	20/29	29/29	29/29	25/25	20/20	20/29
N187	39	39	39	26/26	26/26	26/36	27/27	27/27	27/27	23/23	23/33
N188	41	41	38	20/20	20/31	20/32	20/20	20/31	20/31	17/28	17/31
N189	41	41	38	16/16	16/31	16/31	17/17	17/32	17/31	15/30	15/30
N222	35	35	35	13/13	13/16	13/23	18/18	18/19	17/19	12/15	12/23
N223	35	35	35	13/13	13/14	13/22	18/18	18/18	17/17	13/14	13/22
1	36	36	36	32/32	32/32	32/41	33/33	33/33	33/33	22/22	22/34
2	39	39	39	29/29	29/29	29/38	31/31	31/31	30/30	29/29	29/37
3	40	40	40	23/23	23/23	23/32	25/25	25/25	25/25	23/23	23/31
4	40	40	40	29/29	29/29	29/39	32/32	32/32	32/32	29/29	29/38
5	41	41	41	29/29	29/29	29/39	31/31	31/31	31/31	28/28	28/38

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
6	39	39	39	29/29	29/29	29/38	32/32	32/32	31/31	29/29	29/37
7	42	42	42	30/30	30/30	30/40	32/32	32/32	31/31	29/29	29/40
9	42	42	42	30/30	30/30	30/39	33/33	33/33	33/33	30/30	30/40
10	42	42	42	33/33	33/33	33/41	35/35	35/35	35/35	32/32	32/40
11	38	38	38	24/24	24/24	24/37	29/29	29/29	27/27	24/24	24/38
12	37	37	37	21/21	21/21	21/35	32/32	32/32	26/26	21/21	21/36
13	40	40	40	29/29	29/29	29/38	32/32	32/32	32/32	30/30	30/38
14	40	40	40	28/28	28/28	28/38	31/31	31/31	31/31	28/28	28/38
15	36	36	36	22/22	22/22	22/33	23/23	23/23	23/23	18/18	18/30
16	36	36	36	22/22	22/22	22/32	23/23	23/23	23/23	18/18	18/28
17	36	36	36	22/22	22/22	22/33	23/23	23/23	23/23	18/18	18/29
18	36	36	36	24/24	24/24	24/34	25/25	25/25	25/25	20/20	20/32
19	36	36	36	24/24	24/24	24/35	25/25	25/25	24/24	20/20	20/32
20	35	35	35	23/23	23/23	23/35	24/24	24/24	24/24	19/19	19/32
21	36	36	36	23/23	23/23	23/35	24/24	24/24	24/24	20/20	20/32
22	35	35	35	24/24	24/24	24/35	25/25	25/25	25/25	20/20	20/33
23	36	36	36	25/25	25/25	25/36	25/25	25/25	25/25	21/21	21/33
24	39	39	39	29/29	29/29	29/38	30/30	30/30	30/30	28/28	28/37
25	36	36	36	16/16	16/16	16/24	17/17	17/17	16/16	13/13	13/23
26	36	36	36	19/19	19/19	19/27	19/19	19/19	19/19	15/15	15/25
27	36	36	36	23/23	23/23	23/33	24/24	24/24	24/24	20/20	20/30
28	36	36	36	18/18	18/18	18/26	18/18	18/18	18/18	15/15	15/25
29	36	36	36	18/18	18/18	18/25	18/18	18/18	18/18	15/15	15/25

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
30	36	36	36	17/17	17/17	17/25	17/17	17/17	17/17	14/14	14/23
31	36	36	36	22/22	22/22	22/33	23/23	23/23	23/23	19/19	19/29
32	36	36	36	21/21	21/21	21/32	21/21	21/21	21/21	17/17	17/30
33	36	36	36	21/21	21/21	21/33	22/22	22/22	22/22	18/18	18/30
34	36	36	36	23/23	23/23	23/33	24/24	24/24	24/24	20/20	20/30
35	36	36	36	21/21	21/21	21/30	22/22	22/22	22/22	17/17	17/25
36	36	36	36	20/20	20/20	20/27	21/21	21/21	20/20	17/17	17/25
37	36	36	36	22/22	22/22	22/32	23/23	23/23	23/23	19/19	19/29
38	36	36	36	21/21	21/21	21/31	21/21	21/21	21/21	18/18	18/29
39	36	36	36	22/22	22/22	22/30	23/23	23/23	22/22	19/19	19/29
40	35	35	35	14/14	14/14	14/26	13/13	13/13	13/13	9/9	9/20
41	35	35	35	16/16	16/16	16/26	15/15	15/15	15/15	11/11	11/21
42	35	35	35	17/17	17/17	17/25	17/17	17/17	17/17	12/12	12/21
43	35	35	35	18/18	18/18	18/27	18/18	18/18	18/18	13/13	13/21
44	35	35	35	21/21	21/21	21/32	22/22	22/22	22/22	17/17	17/27
45	35	35	35	15/15	15/15	15/26	15/15	15/15	14/14	10/10	10/21
46	35	35	35	18/18	18/18	18/26	18/18	18/18	18/18	13/13	13/21
47	35	35	35	22/22	22/22	22/30	22/22	22/22	22/22	17/17	17/24
48	35	35	35	18/18	18/18	18/26	18/18	18/18	18/18	14/14	14/22
49	35	35	35	14/14	14/14	14/23	13/13	13/13	13/13	9/9	9/21
50	35	35	35	13/13	13/13	13/26	12/12	12/12	12/12	9/9	9/21
51	35	35	35	13/13	13/13	13/25	13/13	13/13	13/13	9/9	9/20
52	35	35	35	13/13	13/13	13/25	13/13	13/13	13/13	9/9	9/21

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
53	35	35	35	13/13	13/13	13/20	12/12	12/12	12/12	9/9	9/18
54	35	35	35	23/23	23/23	23/33	24/24	24/24	24/24	19/19	19/29
55	35	35	35	23/23	23/23	23/34	24/24	24/24	24/24	19/19	19/29
56	35	35	35	15/15	15/15	15/25	15/15	15/15	15/15	11/11	11/22
57	35	35	35	17/17	17/17	17/28	18/18	18/18	18/18	12/12	12/24
58	35	35	35	18/18	18/18	18/27	18/18	18/18	18/18	14/14	14/25
59	35	35	35	20/20	20/20	20/31	20/20	20/20	20/20	15/15	15/28
60	35	35	35	16/16	16/16	16/22	17/17	17/17	16/16	11/11	11/20
61	35	35	35	20/20	20/20	20/31	21/21	21/21	21/21	16/16	16/28
62	35	35	35	19/19	19/19	19/30	19/19	19/19	19/19	15/15	15/27
63	35	35	35	15/15	15/15	15/25	15/15	15/15	15/15	10/10	10/21
64	35	35	35	17/17	17/17	17/25	17/17	17/17	17/17	12/12	12/23
65	35	35	35	18/18	18/18	18/30	19/19	19/19	19/19	14/14	14/27
66	35	35	35	14/14	14/14	14/26	14/14	14/14	14/14	10/10	10/23
67	35	35	35	15/15	15/15	15/26	15/15	15/15	15/15	10/10	10/24
68	35	35	35	15/15	15/15	15/25	15/15	15/15	15/15	10/10	10/21
69	35	35	35	15/15	15/15	15/26	15/15	15/15	15/15	9/9	9/22
70	35	35	35	15/15	15/15	15/26	15/15	15/15	15/15	10/10	10/24
71	35	35	35	19/19	19/19	19/29	19/19	19/19	19/19	14/14	14/26
72	35	35	35	18/18	18/18	18/30	19/19	19/19	19/19	14/14	14/27
73	35	35	35	14/14	14/14	14/26	14/14	14/14	14/14	10/10	10/23
74	35	35	35	16/16	16/16	16/27	17/17	17/17	17/17	11/11	11/22
75	35	35	35	16/16	16/16	16/26	17/17	17/17	17/17	12/12	12/25

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
76	35	35	35	21/21	21/21	21/31	21/21	21/21	21/21	16/16	16/28
77	35	35	35	19/19	19/19	19/28	19/19	19/19	19/19	14/14	14/27
78	35	35	35	18/18	18/18	18/30	19/19	19/19	19/19	13/13	13/27
79	35	35	35	20/20	20/20	20/31	21/21	21/21	21/21	15/15	15/27
80	35	35	35	18/18	18/18	18/24	19/19	19/19	19/19	13/13	13/19
81	35	35	35	13/13	13/13	13/26	14/14	14/14	13/13	9/9	9/22
82	35	35	35	13/13	13/13	13/25	13/13	13/13	13/13	9/9	9/21
83	35	35	35	13/13	13/13	13/25	13/13	13/13	13/13	9/9	9/22
84	35	35	35	14/14	14/14	14/25	14/14	14/14	14/14	10/10	10/22
85	35	35	35	17/17	17/17	17/28	17/17	17/17	17/17	12/12	12/25
86	35	35	35	16/16	16/16	16/22	16/16	16/16	16/16	12/12	12/20
87	35	35	35	16/16	16/16	16/28	16/16	16/16	16/16	12/12	12/25
88	35	35	35	16/16	16/16	16/24	16/16	16/16	16/16	12/12	12/22
89	35	35	35	17/17	17/17	17/29	18/18	18/18	18/18	13/13	13/27
90	35	35	35	16/16	16/16	16/29	17/17	17/17	17/17	12/12	12/26
91	35	35	35	17/17	17/17	17/27	18/18	18/18	18/18	12/12	12/26
92	35	35	35	16/16	16/16	16/23	17/17	17/17	17/17	13/13	13/21
93	35	35	35	15/15	15/15	15/27	16/16	16/16	15/15	11/11	11/25
94	35	35	35	7/7	7/7	7/10	7/7	7/7	7/7	4/4	4/6
95	35	35	35	17/17	17/17	17/29	18/18	18/18	18/18	14/14	14/27
96	35	35	35	21/21	21/21	21/32	22/22	22/22	22/22	17/17	17/27
97	35	35	35	19/19	19/19	19/26	19/19	19/19	19/19	14/14	14/22
98	35	35	35	16/16	16/16	16/24	15/15	15/15	15/15	11/11	11/20

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
99	35	35	35	16/16	16/16	16/25	16/16	16/16	16/16	11/11	11/20
100	35	35	35	18/18	18/18	18/26	18/18	18/18	18/18	14/14	14/22
101	35	35	35	19/19	19/19	19/27	20/20	20/20	20/20	15/15	15/24
102	35	35	35	16/16	16/16	16/26	16/16	16/16	16/16	12/12	12/22
103	35	35	35	19/19	19/19	19/27	19/19	19/19	19/19	15/15	15/24
104	35	35	35	22/22	22/22	22/33	23/23	23/23	23/23	18/18	18/28
105	35	35	35	21/21	21/21	21/29	21/21	21/21	21/21	16/16	16/25
106	35	35	35	22/22	22/22	22/33	23/23	23/23	23/23	18/18	18/27
107	35	35	35	21/21	21/21	21/27	21/21	21/21	21/21	17/17	17/22
108	35	35	35	21/21	21/21	21/32	22/22	22/22	22/22	18/18	18/26
109	35	35	35	20/20	20/20	20/26	21/21	21/21	21/21	16/16	16/22
110	35	35	35	21/21	21/21	21/32	22/22	22/22	22/22	17/17	17/26
111	35	35	35	21/21	21/21	21/29	21/21	21/21	21/21	17/17	17/26
112	35	35	35	22/22	22/22	22/32	23/23	23/23	23/23	18/18	18/29
113	35	35	35	22/22	22/22	22/32	23/23	23/23	23/23	18/18	18/27
114	35	35	35	22/22	22/22	22/32	23/23	23/23	22/22	18/18	18/29
115	35	35	35	22/22	22/22	22/32	23/23	23/23	23/23	18/18	18/29
116	35	35	35	21/21	21/21	21/32	22/22	22/22	22/22	17/17	17/29
117	35	35	35	22/22	22/22	22/33	22/22	22/22	22/22	17/17	17/29
118	35	35	35	20/20	20/20	20/27	21/21	21/21	21/21	16/16	16/23
119	35	35	35	22/22	22/22	22/33	22/22	22/22	22/22	18/18	18/29
120	35	35	35	21/21	21/21	21/28	21/21	21/21	21/21	17/17	17/25
121	35	35	35	18/18	18/18	18/27	19/19	19/19	19/19	15/15	15/23

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
122	35	35	35	19/19	19/19	19/27	19/19	19/19	19/19	15/15	15/23
123	35	35	35	14/14	14/16	14/27	14/14	14/17	14/17	10/10	10/24
124	35	35	35	14/14	14/16	14/27	14/14	14/17	14/17	10/10	10/24
125	35	35	35	14/14	14/17	14/27	15/15	15/18	15/18	11/11	11/24
126	35	35	35	15/15	15/16	15/28	16/16	16/16	16/16	11/11	11/24
127	35	35	35	15/15	15/15	15/27	16/16	16/16	16/16	11/11	11/23
128	35	35	35	15/15	15/15	15/28	16/16	16/16	16/16	12/12	12/24
129	35	35	35	15/15	15/15	15/27	17/17	17/17	16/16	13/13	13/24
130	35	35	35	16/16	16/16	16/27	17/17	17/17	17/17	14/14	14/23
131	35	35	35	15/15	15/15	15/25	16/16	16/16	15/15	12/12	12/19
132	35	35	35	15/15	15/15	15/25	15/15	15/15	15/15	12/12	12/21
133	35	35	35	12/12	12/12	12/24	12/12	12/12	12/12	9/9	9/21
134	35	35	35	14/14	14/17	14/27	14/14	14/17	14/17	11/11	11/24
135	35	35	35	14/14	14/17	14/27	14/14	14/17	14/17	10/10	10/24
136	35	35	35	23/23	23/23	23/34	24/24	24/24	24/24	19/19	19/30
137	35	35	35	24/24	24/24	24/34	25/25	25/25	24/24	20/20	20/31
138	35	35	35	24/24	24/24	24/34	24/24	24/24	24/24	20/20	20/30
139	35	35	35	23/23	23/23	23/34	24/24	24/24	24/24	19/19	19/30
140	35	35	35	22/22	22/22	22/31	22/22	22/22	22/22	17/17	17/28
141	35	35	35	20/20	20/21	20/30	21/21	21/22	21/22	15/15	15/27
142	35	35	35	17/17	17/19	17/29	17/17	17/20	17/20	12/12	12/25
143	35	35	35	15/15	15/19	15/29	15/15	15/20	15/20	11/11	11/26
144	35	35	35	15/15	15/19	15/29	15/15	15/20	15/20	11/11	11/26

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
145	35	35	35	15/15	15/19	15/28	15/15	15/19	15/19	11/11	11/25
146	35	35	35	14/14	14/21	14/29	14/14	14/21	14/21	11/12	11/26
147	35	35	35	14/14	14/20	14/28	15/15	15/21	14/21	12/12	12/25
148	35	35	35	16/16	16/23	16/28	17/17	17/24	17/23	15/18	15/25
149	35	35	35	18/18	18/30	18/30	20/20	20/30	19/30	17/28	17/30
150	35	35	35	15/15	15/25	15/27	16/16	16/25	15/25	13/22	13/24
151	35	35	35	17/17	17/23	17/26	17/17	17/24	17/24	15/20	15/23
152	35	35	35	23/23	23/23	23/34	24/24	24/24	24/24	19/19	19/31
153	35	35	35	19/19	19/19	19/26	20/20	20/20	20/20	16/16	16/22
154	35	35	35	19/19	19/19	19/27	19/19	19/19	19/19	15/15	15/22
155	35	35	35	23/23	23/23	23/34	24/24	24/24	24/24	19/19	19/31
156	35	35	35	18/18	18/18	18/27	18/18	18/18	18/18	14/14	14/19
157	35	35	35	19/19	19/19	19/27	19/19	19/19	19/19	15/15	15/19
158	35	35	35	17/17	17/17	17/26	17/17	17/17	17/17	14/14	14/19
159	35	35	35	18/18	18/18	18/27	17/17	17/17	17/17	14/14	14/17
160	35	35	35	21/21	21/23	21/31	22/22	22/23	22/23	16/16	16/28
161	35	35	35	21/21	21/23	21/31	22/22	22/23	22/23	16/16	16/28
162	35	35	35	20/20	20/23	20/31	20/20	20/23	20/23	13/13	13/27
163	35	35	35	15/15	15/20	15/29	16/16	16/21	16/21	11/11	11/26
164	35	35	35	18/18	18/30	18/31	19/19	19/31	18/31	16/29	16/30
165	35	35	35	16/16	16/23	16/24	18/18	18/24	18/24	16/21	16/22
166	35	35	35	21/21	21/21	21/28	22/22	22/22	22/22	18/18	18/24
167	41	41	38	17/17	17/30	17/30	18/18	18/30	18/30	16/29	16/29

Receptor ID	Intrusive Noise Criteria			2021			2024				
	Day	Evening	Night	Day	Evening	Night	Day	Evening 1	Evening 2	Evening 3	Night
168	35	35	35	17/17	17/30	17/31	17/17	17/31	17/31	15/29	15/30
169	35	35	35	17/17	17/30	17/30	18/18	18/31	18/31	15/29	15/30
170	NA	NA	NA	26/26	26/39	26/39	26/26	26/39	25/39	25/37	25/37
171	35	35	35	21/21	21/35	21/35	21/21	21/35	20/35	19/34	19/34
173	NA	NA	NA	38/38	38/47	38/47	38/38	38/48	38/48	36/47	36/47
175	NA	NA	NA	37/37	37/47	37/47	37/37	37/48	37/47	35/47	35/47
176	NA	NA	NA	37/37	37/47	37/47	37/37	37/47	37/47	34/46	34/46
177	NA	NA	NA	44/44	44/50	44/51	44/44	44/52	44/52	43/50	43/51

Notes:

1. *"NA" denotes criteria not applicable as property subject to acquisition on request.*

APPENDIX

B MODELLED SOURCE LOCATIONS

The mining stage plans modelled included open cut mining equipment, CHPP infrastructure and underground coal haulage from Integra Underground Mine to the RCN CHPP.

Figure 8 and Figure 9 show indicative pit shell topography, modelled source locations and haul road alignments for the 2021 and 2024 stage plans respectively.

Figure 10 shows the modelled CHPP source arrangement.

Indicative open cut equipment locations are shown using identification tags located at the modelled location. Table 9.1 relates identification tags to equipment type.

Table 9.1: OPEN CUT EQUIPMENT INCLUDED IN MODELS

Identification Tag	Description
9800	Liebherr R9800 excavator
6060	Caterpillar 6060 excavator
3600	Hitachi EX3600 excavator
994	Caterpillar 994F front end loader
992	Caterpillar 992K front end loader
D10	Caterpillar D10 tracked dozer
D11	Caterpillar D11 tracked dozer
D50K	D50K blast hole drill
D75K	D75K blast hole drill

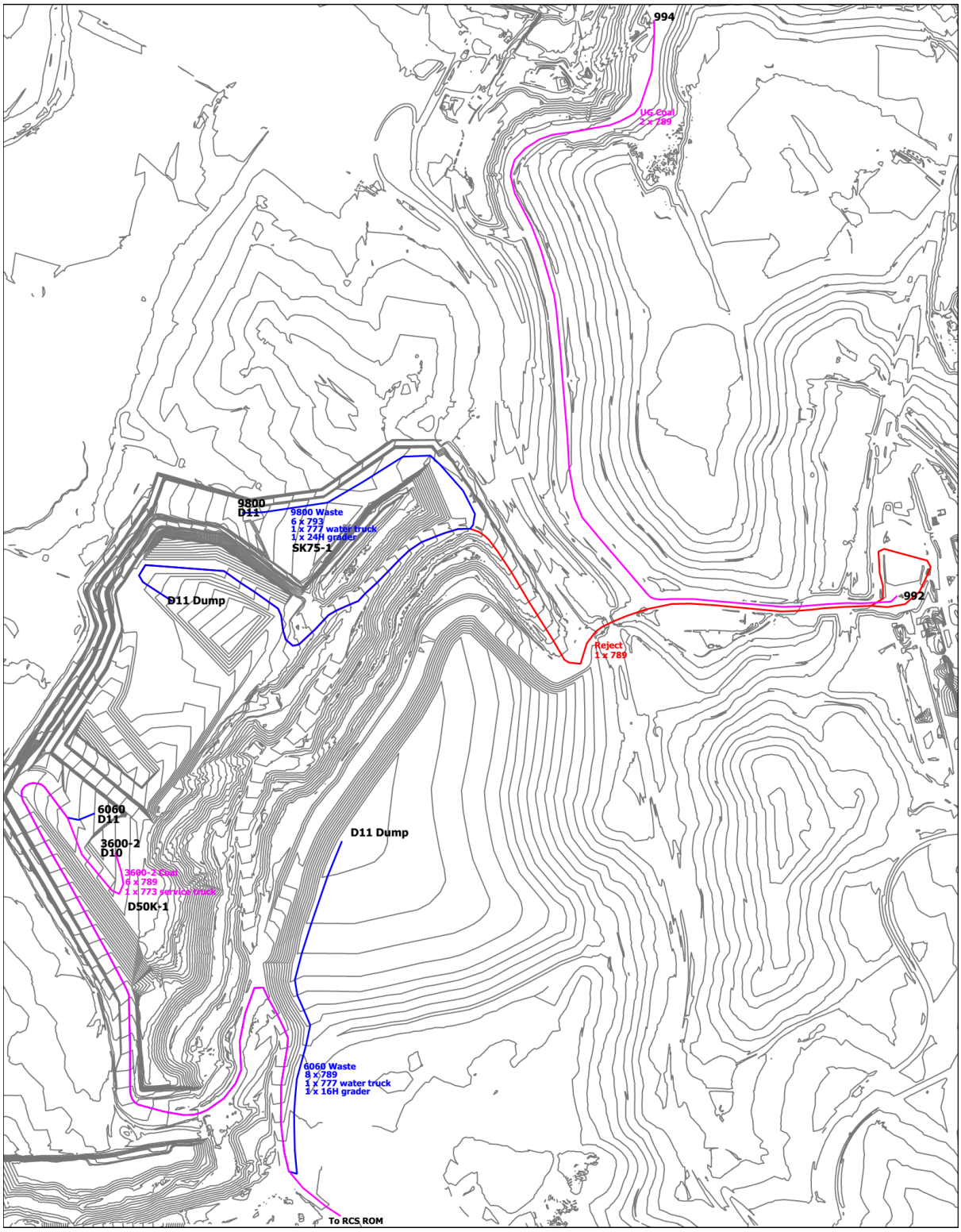


Figure 8 - 2021 Modelled Source Locations

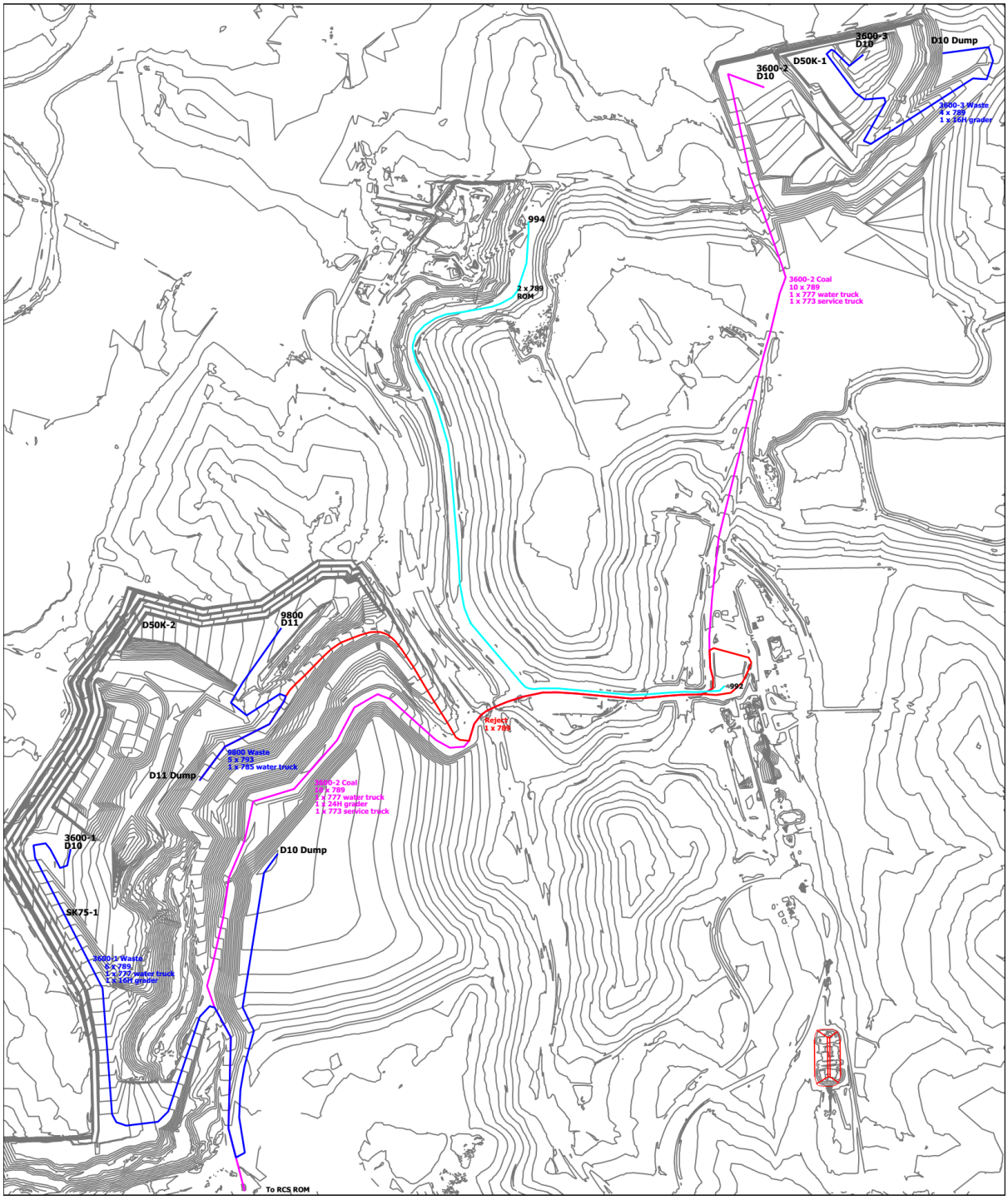


Figure 9 - 2024 Modelled Source Locations

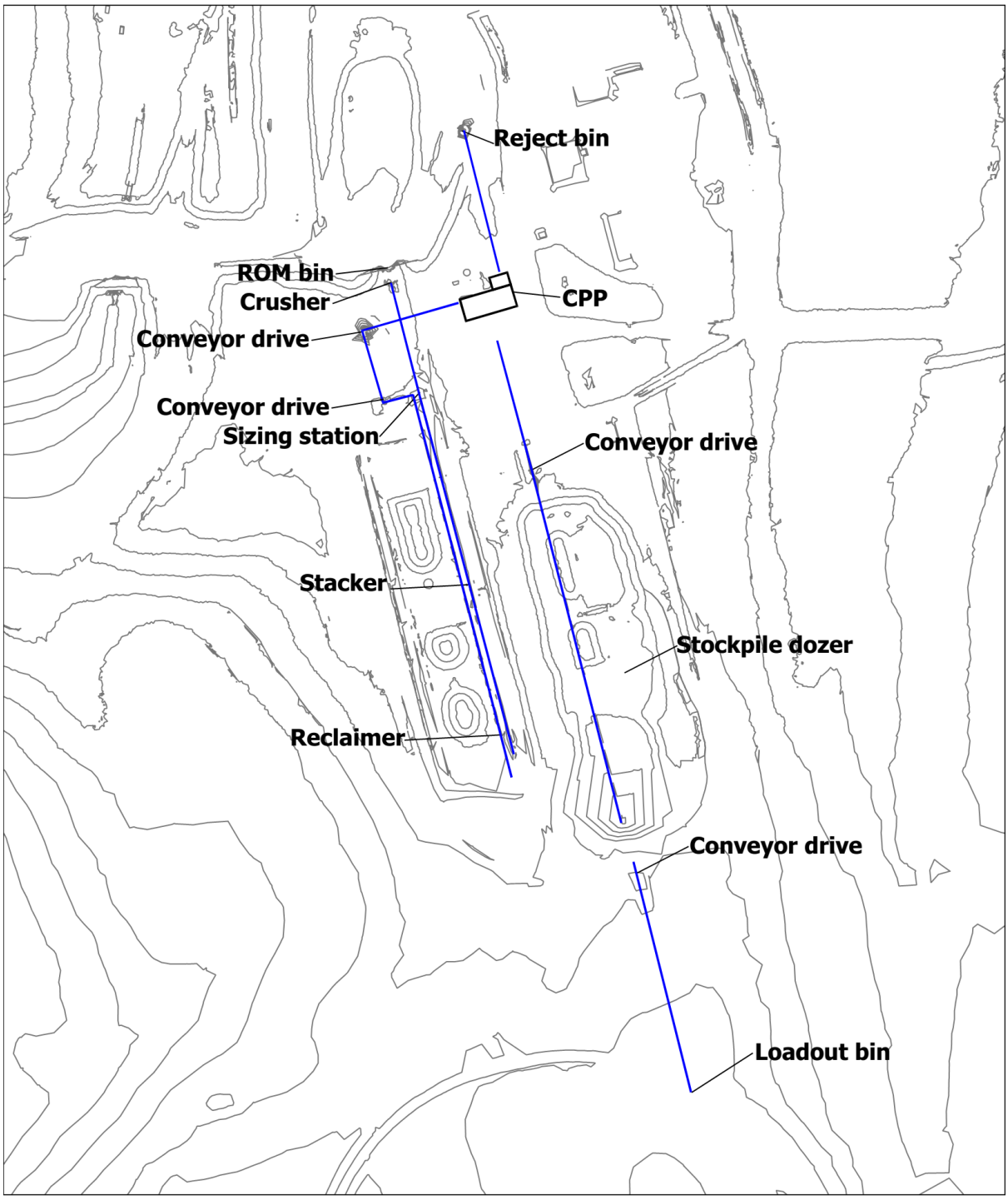
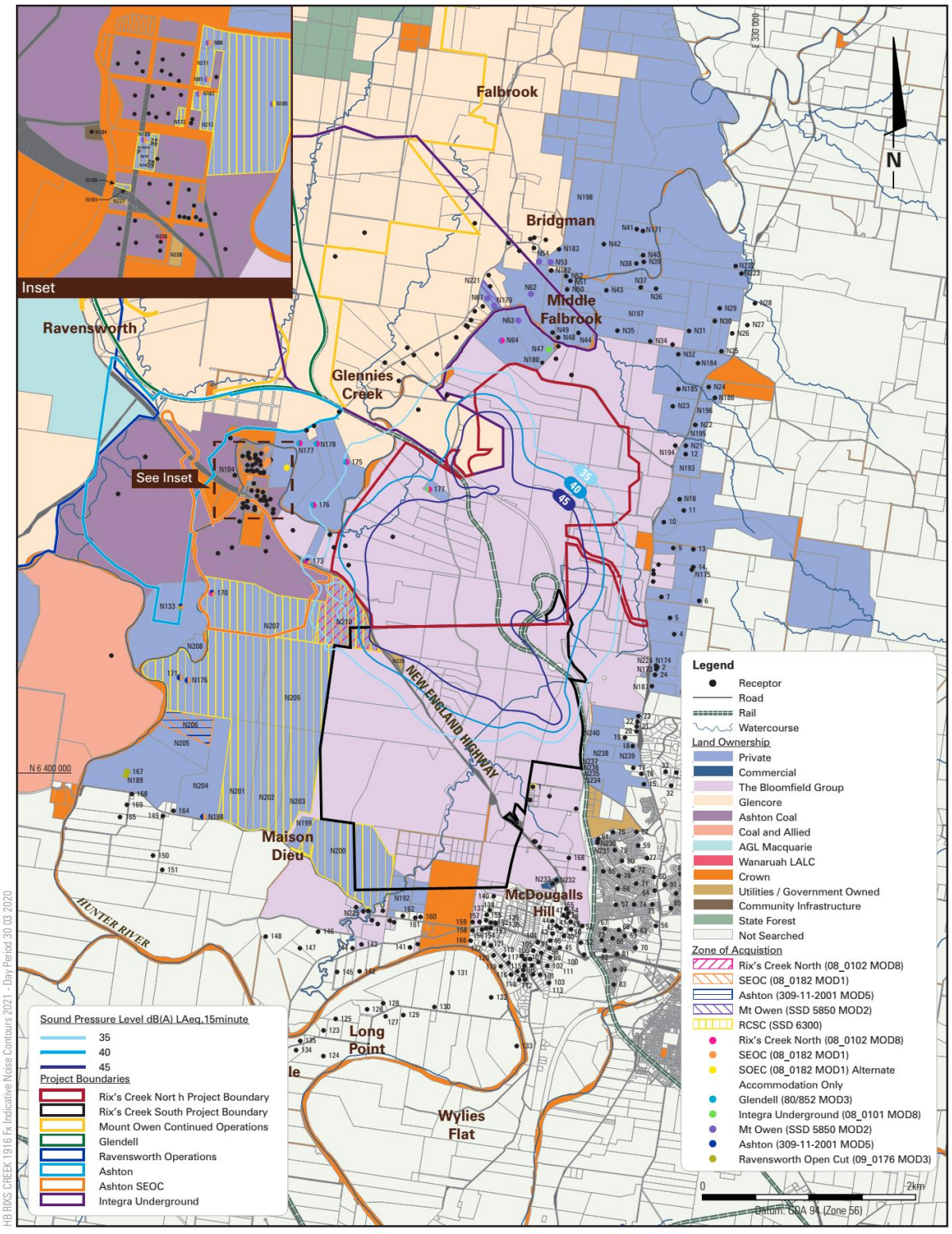


Figure 10 - CHPP Source Locations

APPENDIX

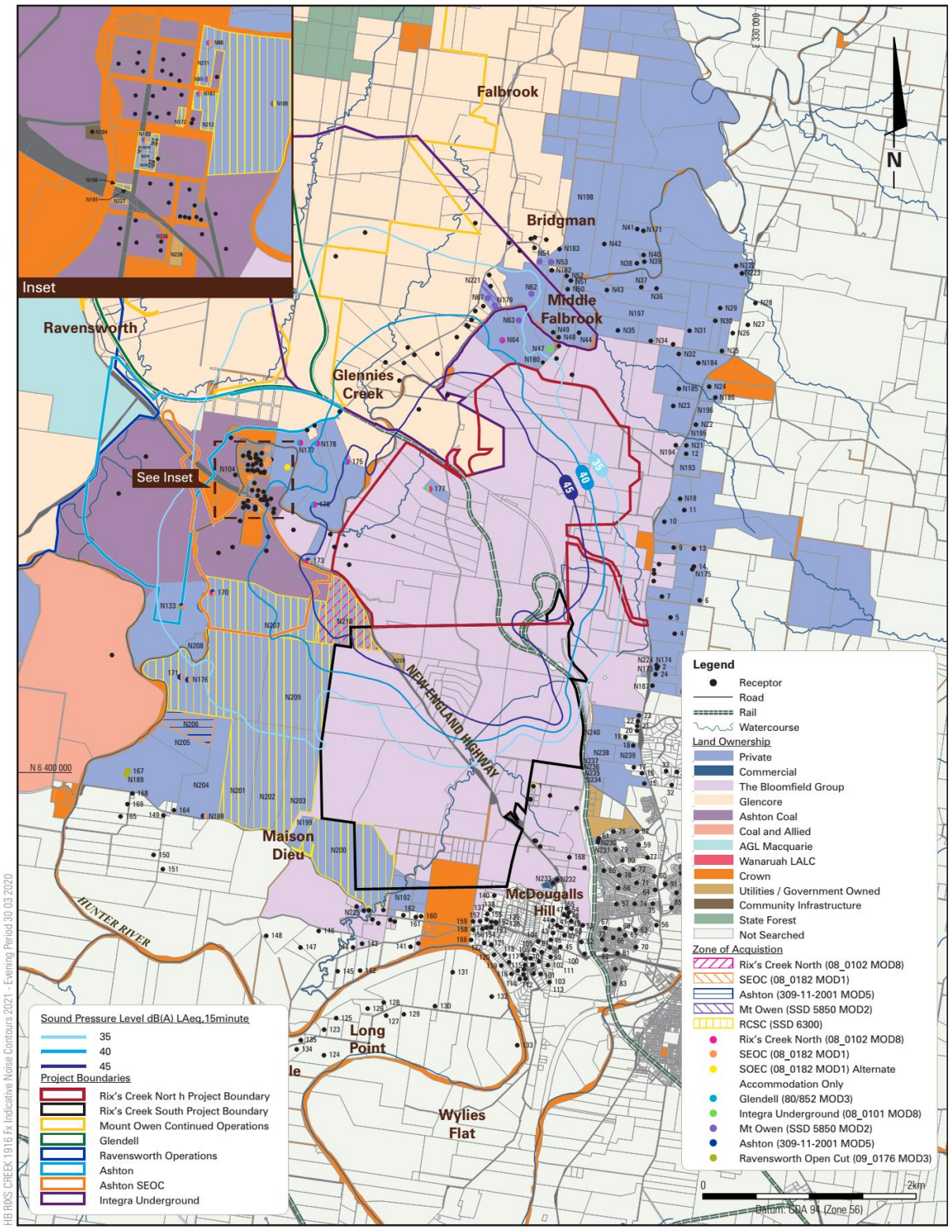
C NOISE CONTOUR FIGURES



RIXS CREEK COAL MINE

Indicative Noise Contours, 2021, Day Period

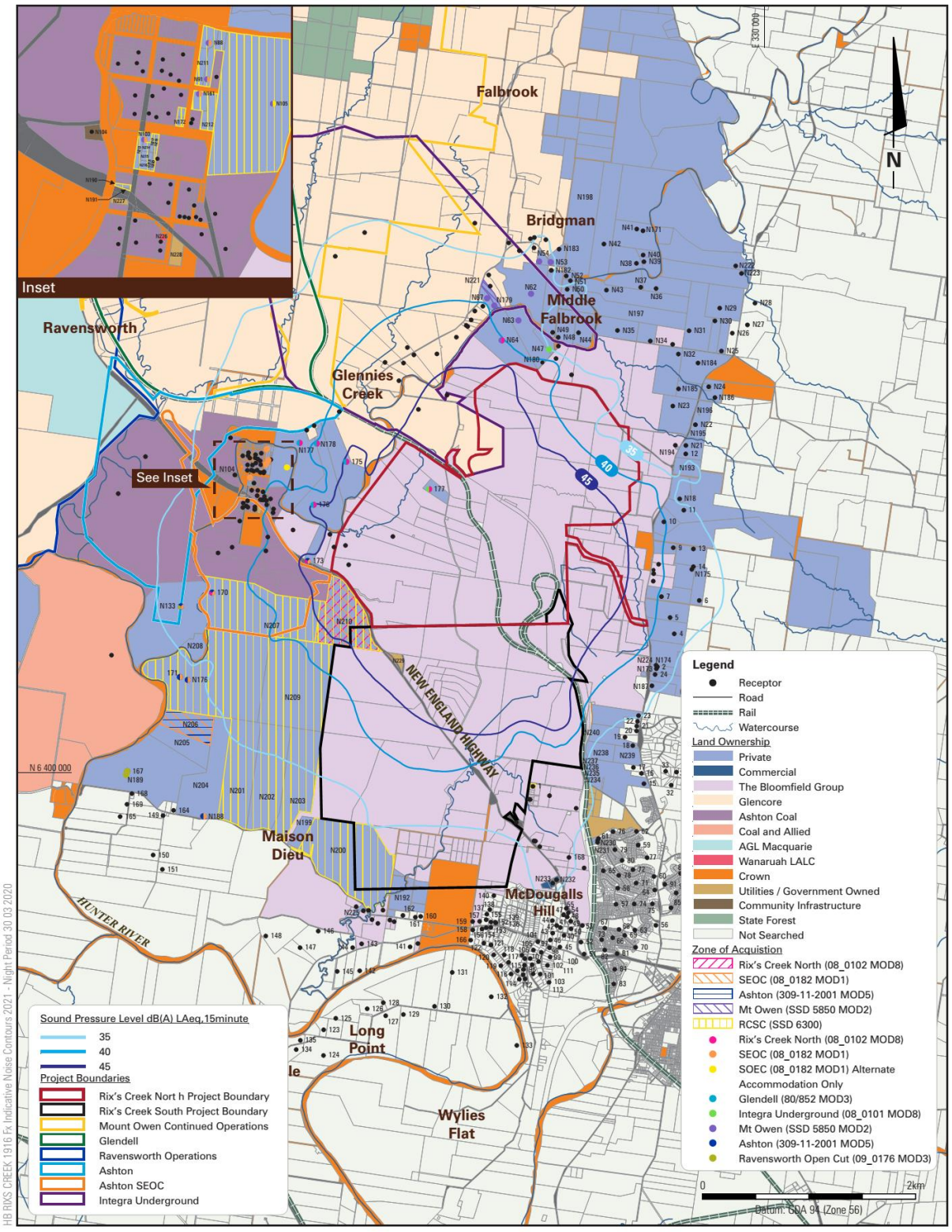
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2021, Evening Period

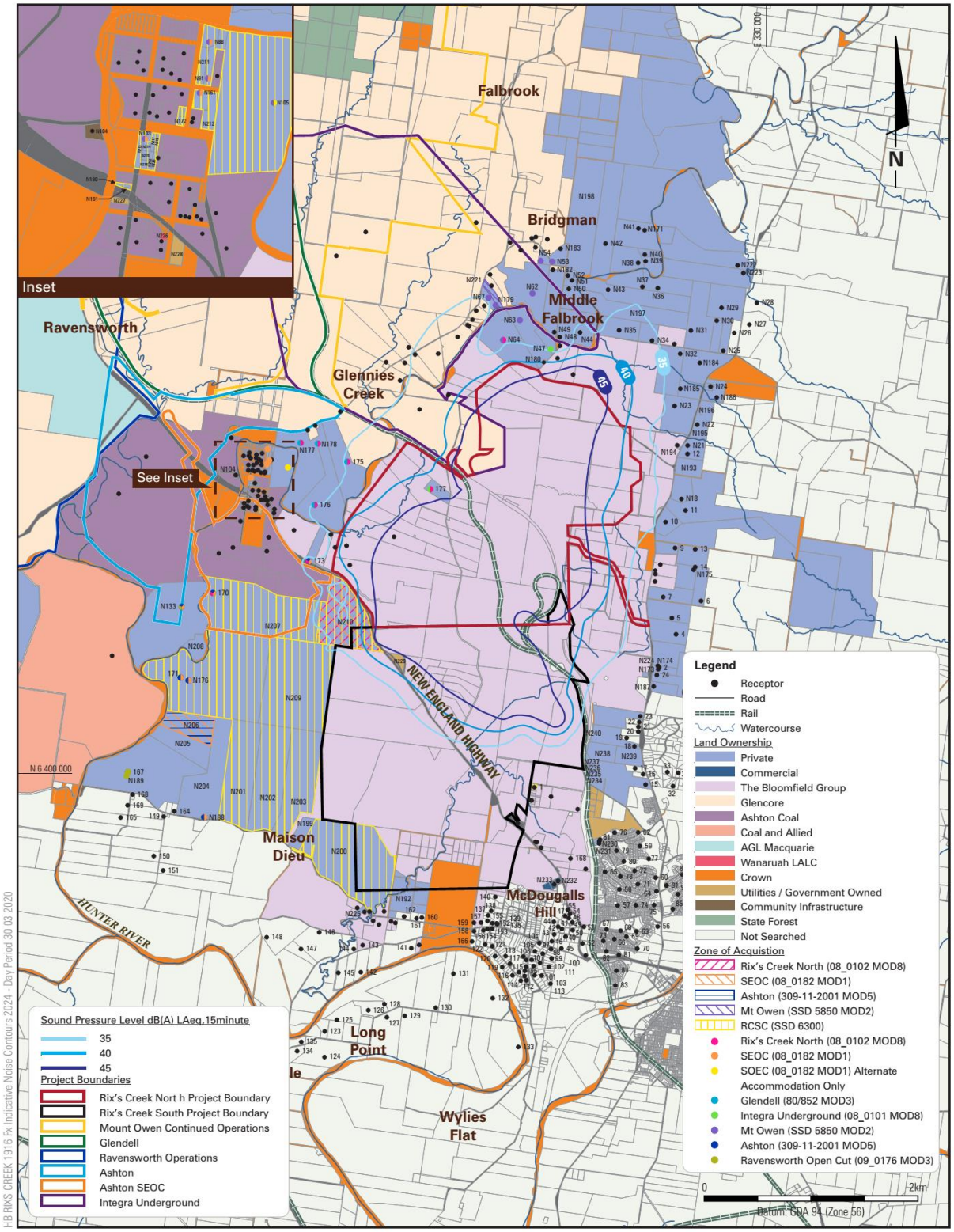
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2021, Night Period

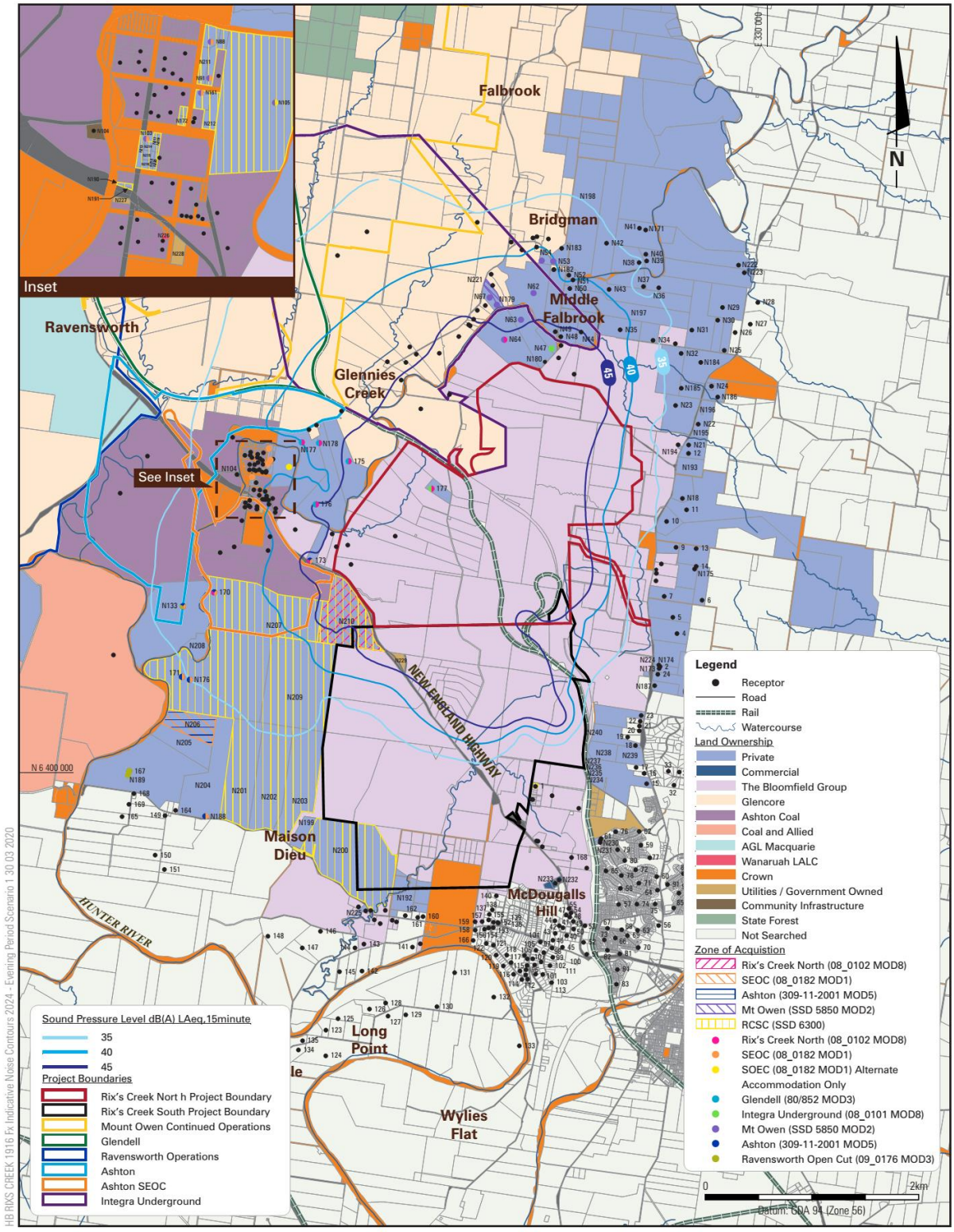
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2024, Day Period

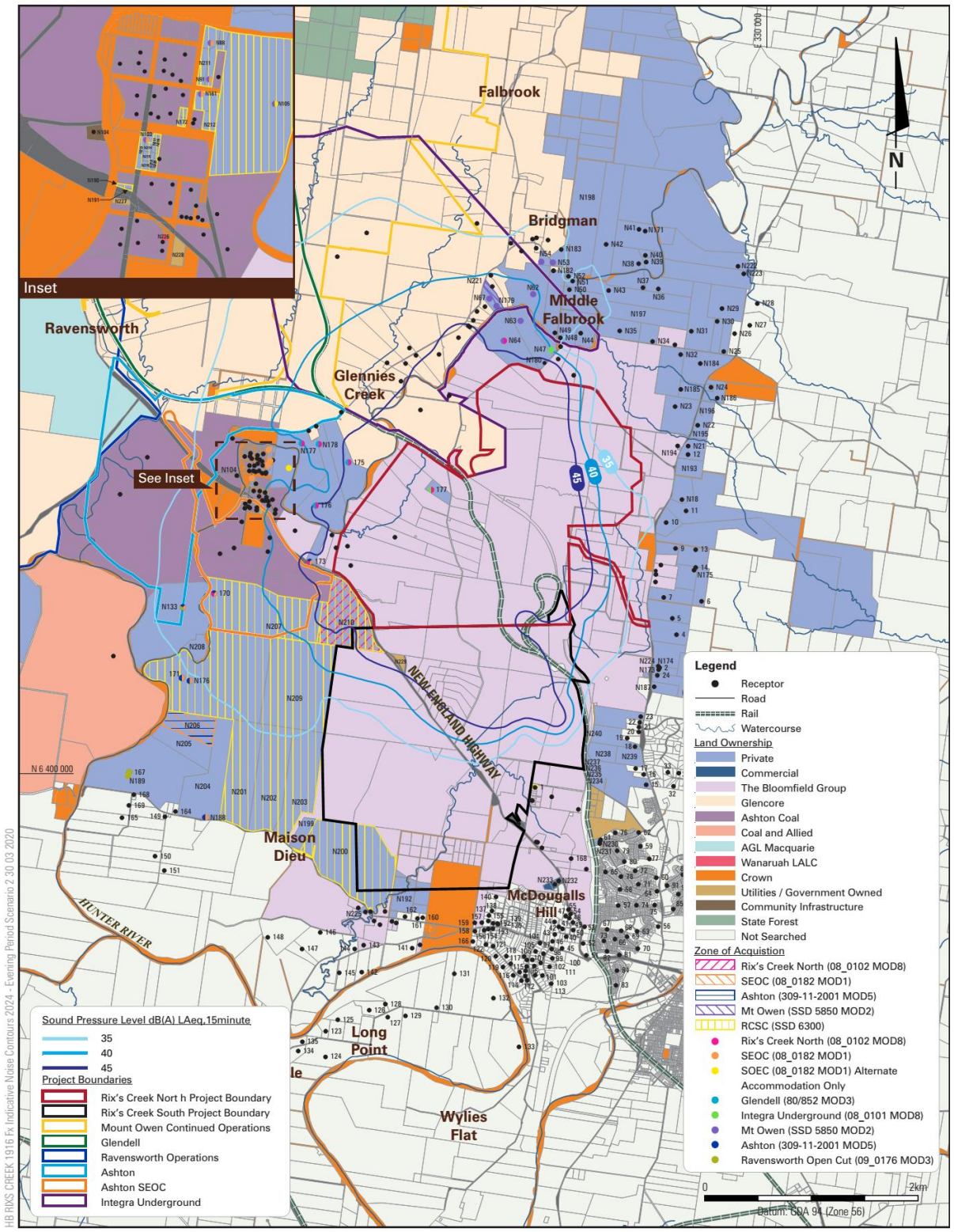
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2024, Evening Period, Scenario 1

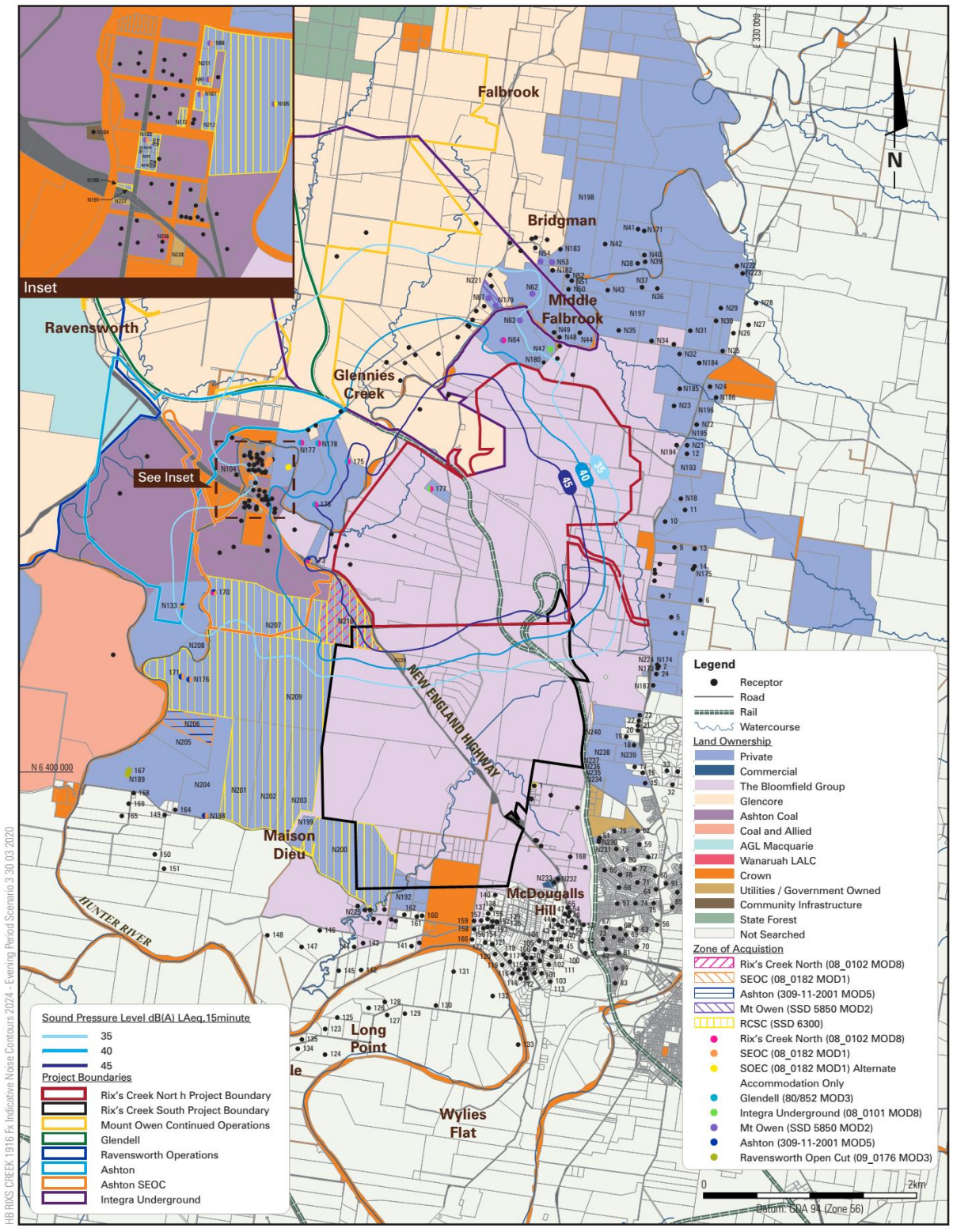
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2024
Evening Period, Scenario 2

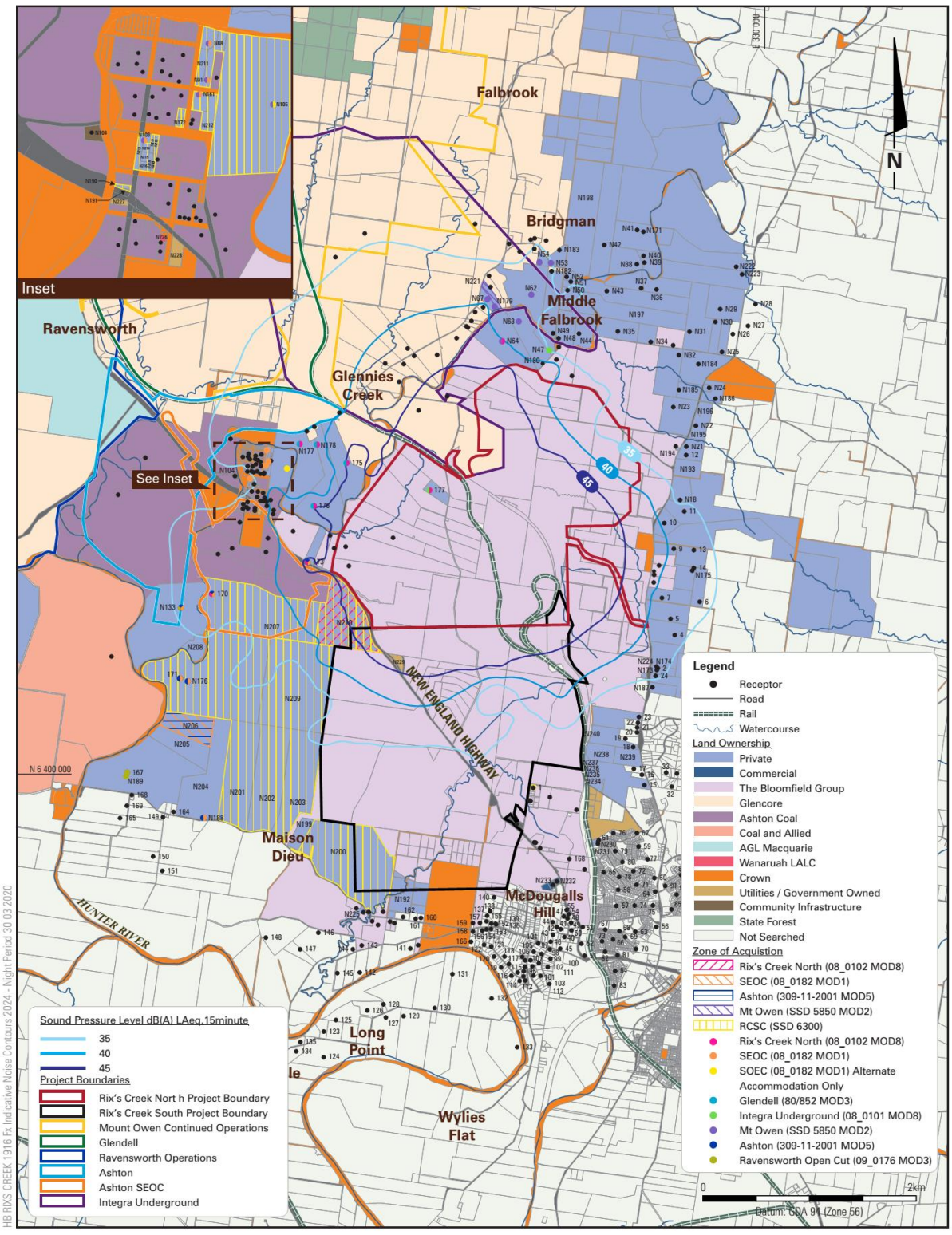
Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2024, Evening Period, Scenario 3

Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated



RIXS CREEK COAL MINE

Indicative Noise Contours, 2024, Night Period

Note: N172 has uninhabitable house and is under lease to Ashton to 01/02/2020 - northern block also associated

APPENDIX

D MODELLED RECEPTOR LOCATIONS

Table D.1: MODELLED RECEPTOR LOCATIONS

ID	Surname	Lot	DP	Easting	Northing
N18	W&G Cooper	Lot 5	DP1057222	328404	6405153
N21	S Andrews	Lot 3	DP603548	328521	6406158
N22	S Andrews	Lot 1	DP624862	328701	6406549
N23	R&K Bell	Lot 122	DP1067863	328273	6406899
N24	G Lambkin	Lot 1	DP775509	328949	6407262
N25	J&C Whitney	Lot 382	DP856227	329190	6407934
N26	B&R Frazer	Lot 381	DP856227	329392	6408269
N27	D Hamilton	Lot 1	DP1164492	329678	6408425
N28	D Hamilton	Lot 101	DP1124459	329819	6408832
N29	D Cope	Lot 385	DP856227	329155	6408739
N30	A Cox	Lot 383	DP856227	329066	6408499
N31	D Kacunic & C Jensen	Lot 384	DP856227	328580	6408315
N32	Owner to be confirmed	Lot 124	DP1067863	328378	6407875
N34	T&G Breen	Lot 1	DP609159	327852	6408123
N35	R&W Gardner	Lot 20	DP602363	327234	6408320
N36	D Baker	Lot 51	DP587711	327959	6409108
N37	Helen Leila May Castledine	Lot 52	DP587711	327672	6409133
N38	M&R Porter	Lot 1	DP787186	327589	6409582
N39	E&J Upward	Lot 2	DP787186	327731	6409613
N40	E&J Upward	Lot 3	DP787186	327715	6409738
N41	HM Upward & Sons	Lot 99	DP752499	327596	6410228
N42	JA Welsh	Lot 1	DP79387	326977	6409946
N43	Deidre Margaret Kay	Lot 4	DP1065800	327025	6409078
N44	G&K Cheetham	Lot 66	DP752499	326501	6408277
N47	B&R Cherry	Lot 2	DP600327	325946	6407965
N48	G&K Cheetham	Lot 65	DP752499	326121	6408190
N49	G&K Cheetham	Lot 622	DP1097524	326016	6408284
N50	D&M Bridge	Lot 64	DP752499	326289	6409093
N51	M&S Boyce	Lot 1	DP810452	326349	6409257
N52	B&j Moran	Lot 2	DP810452	326270	6409346
N53	K&J Badior	Lot 560	DP1104561	325976	6409608
N54	G Holmes	Lot 2	DP626880	325761	6409620
N62	D Moran	Lot 8	DP851867	325608	6409009
N63	J&M Moore	Lot 1	DP600327	325370	6408508
N64	W&A Gardner	Lot 79	DP1161577	325055	6408133
N67	GM Watson	Lot 4	DP851867	324784	6408927
N88	M&T Dejong	Lot 103	DP852484	320638	6406088

ID	Surname	Lot	DP	Easting	Northing
N91	T&D Olofsson	Lot 102	DP852484	320667	6405878
N103	S Turner	Lot 4	DP758214	320324	6405555
N104	Church	unknown	unknown	320048	6405603
N105	J&G McInerney	Lot 3	DP1088108	321021	6405746
N133	A Bowman	Lot 70	DP1107703	319024	6403130
N139	M Eveleigh,K Penfold & R Eveleigh	Lot 1	DP1137660	325618	6399743
N161	V Lopes	Lot 105	DP855187	320623	6405804
N171	unknown	Lot 99	DP752499	327714	6410196
N172	JL Vollebregt & TL Clarke	Lot 1	DP758214	320519	6405648
N173	L Cox	Lot 1	DP302625	327965	6401960
N174	L Cox	Lot 1	DP302625	327984	6401995
N175	W.C & C.D Garland	Lot 92	DP752455	328630	6403828
N176	AS Bowman	Lot 75	DP1124347	319154	6401750
N177	B&R Richards	Lot 10	DP1169092	321255	6406206
N178	B&R Richards - 2nd house on Lot 11 DP 1169092	Lot 11	DP1169092	321580	6406192
N179	G.M. Watson	Lot 4	DP851867	324919	6408788
N180	Community Hall	Lot 11	DP1100029	325821	6407717
N181	Glennies Creek RFB	Lot 173	DP727751	326125	6408026
N183	DN & LA Bynon	Lot 510	DP1033291	326135	6409849
N184	Unknown	Lot 120	DP1067863	328747	6407708
N185	Unknown	Lot 121	DP1067863	328382	6407221
N186	Unknown	Lot 2	DP775509	329067	6407056
N187	unknown	Lot 12	DP603197	327882	6401639
N188	E.S. Bowman	Lot 1	DP1133341	319446	6399185
N189	BE & TA Moxey	Lot 104	DP817010	317993	6399960
N222	unknown	unknown	unknown	329426	6409535
N223	unknown	unknown	unknown	329531	6409402
1	C Eveleigh, S Eveleigh (1/2) & Jarramarkyl Pty Ltd (1/2)	Lot 1	DP1137660	325644	6399746
2	Leonard Cox	Lot 1	DP302625	327976	6401989
3	unknown	Lot 101	DP752455	328732	6402211
4	Darren Philip Cox	Lot 1332	DP813851	328302	6402615
5	WG Cox	Lot 1331	DP813851	328222	6402921
6	NJ Smith	Lot 94	DP752455	328773	6403241
7	OK Geelan	Lot 93	DP752455	328060	6403313
9	M Hoggan	Lot 911	DP794486	328282	6404236
10	A Lambkin	Lot 6	DP1174101	328107	6404721
11	W Cooper	Lot 2	DP1057222	328480	6404940

ID	Surname	Lot	DP	Easting	Northing
12	unknown	Lot 3	DP603548	328518	6405999
13	G&J Barnett	Lot 130	DP752455	328662	6404211
14	W Garland	unknown	unknown	328661	6403877
15	Inverleigh Pty Ltd	Lot 33	DP634692	327732	6399795
16	unknown	Lot 22	DP616036	327685	6399991
17	unknown	Lot 1	DP606098	327534	6400103
18	M J Burrell	Lot 3	DP621647	327521	6400512
19	unknown	Lot 2	DP621647	327374	6400673
20	unknown	Lot 1	DP614836	327592	6400790
21	unknown	Lot 61	DP830270	327596	6400878
22	unknown	Lot 62	DP830270	327612	6400969
23	R F Bourke	Lot 63	DP830270	327628	6401078
24	Christopher Ross Whiting	Lot 11	DP603197	327942	6401850
25	unknown	Lot 218	DP1120621	328931	6399102
26	unknown	Lot 225	P1120621	328789	6399292
27	unknown	Lot 5	DP846673	328522	6400109
28	unknown	Lot 213	DP1064364	328803	6399500
29	unknown	Lot 204	DP1064365	328951	6399545
30	unknown	Lot 210	DP1064364	329025	6399354
31	unknown	Lot 213	DP867908	328530	6399855
32	unknown	Lot 2171	DP1155954	328245	6399770
33	unknown	Lot 220	DP867908	328140	6400031
34	unknown	Lot 223	DP867908	328343	6400014
35	unknown	Lot 201	DP1064364	328657	6399633
36	unknown	Lot 4	DP877394	328721	6399983
37	unknown	Lot 1	DP625695	328500	6399744
38	unknown	Lot 2	DP877394	328821	6400065
39	unknown	Lot 1	DP877394	328702	6400101
40	unknown	Lot 108	DP806302	326227	6396945
41	unknown	Lot 1	DP1075001	326160	6397090
42	unknown	Lot 2	DP1075000	326090	6397129
43	unknown	Lot 631	DP876854	326015	6396985
44	unknown	Lot 633	DP876854	326009	6397222
45	unknown	Lot 1	DP196793	326150	6396726
46	unknown	Lot 62	DP867561	325971	6396856
47	unknown	Lot 123	DP858085	326220	6397330
48	unknown	Lot 117	DP844703	326290	6397292
49	unknown	Lot 113	DP844703	326355	6397211
50	unknown	Lot 103	DP806302	326360	6397067

ID	Surname	Lot	DP	Easting	Northing
51	unknown	Lot 1	DP1001760	326607	6396594
52	unknown	Lot 1	DP118590	326547	6396819
53	unknown	Lot 2	DP1063069	326573	6397129
54	unknown	Lot 3	DP549294	326309	6397371
55	unknown	Lot 61	DP813433	326269	6397452
56	unknown	Lot 4	DP823120	327957	6397132
57	unknown	Lot 110	DP253252	327207	6397529
58	unknown	Lot 568	DP261925	327238	6397832
59	unknown	Lot 1672	DP1035063	327624	6398640
60	unknown	Lot 807	DP262536	327919	6398052
61	unknown	Lot 3	DP827621	326876	6398764
62	unknown	Lot 1752	DP1074871	327589	6398900
63	unknown	Lot 118	DP1019125	327561	6397042
64	unknown	Lot 3	DP785364	327937	6397796
65	unknown	Lot 971	DP263524	326968	6398160
66	unknown	Lot 10	DP238094	327144	6396898
67	unknown	Lot 8	DP235799	326997	6397083
68	unknown	Lot 46	DP239655	327262	6397056
69	unknown	Lot 54	DP239655	327371	6396942
70	unknown	Lot 2	DP244540	327573	6396718
71	unknown	Lot 869	DP262536	327586	6397927
72	unknown	Lot 1094	DP707427	327523	6398179
73	unknown	Lot 7	DP227763	326937	6396864
74	unknown	Lot 192	DP259149	327550	6397535
75	unknown	Lot 175	DP259149	327891	6397537
76	unknown	Lot 1649	DP1065611	327151	6398893
77	unknown	Lot 1686	DP1048786	327791	6398406
78	unknown	Lot 933	DP263524	327258	6398070
79	unknown	Lot 507	DP837313	327187	6398558
80	unknown	Lot 607	DP839458	327321	6398353
81	unknown	Lot 1	DP30367	327227	6396602
82	unknown	Lot 15	DP30367	326992	6396668
83	unknown	Lot 391	DP261199	327165	6396029
84	unknown	Lot 391	DP260388	327183	6396306
85	unknown	Lot 1	DP717790	328241	6397461
86	unknown	Lot 64	DP264243	328643	6397801
87	unknown	Lot 50	DP264242	328546	6397528
88	unknown	Lot 607	DP1059747	328999	6398135
89	unknown	Lot 16	DP1107543	328422	6398106

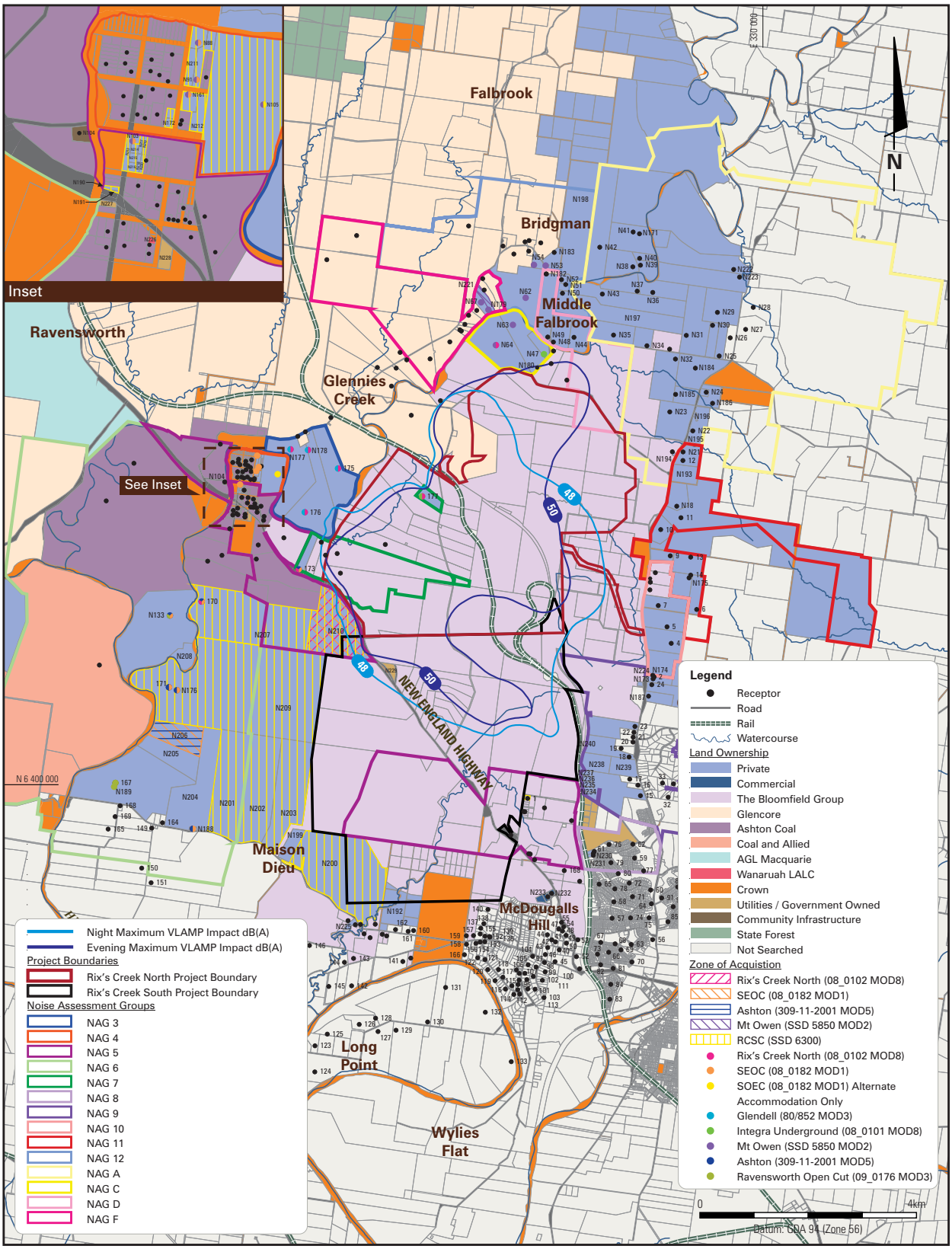
ID	Surname	Lot	DP	Easting	Northing
90	unknown	Lot 15	DP717790	328337	6397742
91	unknown	Lot 202	DP864381	328124	6397905
92	unknown	unknown	SP87916	328913	6398413
93	unknown	Lot 265	DP831355	328971	6397532
94	unknown	unknown	SP81310	328580	6398401
95	unknown	Lot 19	DP851164	328628	6398125
96	unknown	Lot 4	DP776074	325467	6396301
97	unknown	Lot 100	P1096347	325957	6396711
98	unknown	Lot 19	DP731963	325800	6396627
99	unknown	Lot 4	DP731963	325969	6396536
100	unknown	Lot 17	DP731963	325749	6396452
101	unknown	Lot 14	DP731963	325781	6396216
102	unknown	Lot 8	DP731963	325917	6396379
103	unknown	Lot 112	DP831513	325945	6396063
104	unknown	Lot 22	DP262702	325736	6396824
105	unknown	Lot 25	DP262702	325653	6396669
106	unknown	Lot 1	DP709363	325437	6396572
107	unknown	Lot 28	DP262702	325592	6396508
108	unknown	Lot 9	DP559438	325490	6396507
109	unknown	Lot 302	DP813086	325629	6396393
110	unknown	Lot 3	DP709363	325483	6396384
111	unknown	Lot 33	DP262702	325647	6396221
112	unknown	Lot 5	DP864039	325498	6396125
113	unknown	Lot 12	DP603197	325461	6396205
114	unknown	Lot 7	DP864039	325387	6396118
115	unknown	Lot 3	DP864039	325352	6396277
116	unknown	Lot 10	DP864038	325234	6396218
117	unknown	Lot 212	DP105064	325184	6396437
118	unknown	Lot 209	DP105064	325104	6396577
119	unknown	Lot 205	DP1050604	325041	6396374
120	unknown	Lot 302	DP1069985	324907	6396578
121	unknown	Lot 309	DP1069985	324854	6396765
122	unknown	Lot 307	DP1069985	324721	6396795
123	unknown	Lot 11	DP732038	321710	6395169
124	unknown	Lot 201	DP777038	321707	6394687
125	unknown	Lot 16	DP736075	321936	6395384
126	unknown	Lot 17	DP736075	322527	6395565
127	unknown	Lot 21	DP828765	322876	6395433
128	unknown	Lot 20	DP736075	322832	6395678

ID	Surname	Lot	DP	Easting	Northing
129	unknown	Lot 22	DP828765	323209	6395456
130	unknown	Lot 19	DP736075	323794	6395608
131	unknown	Lot 8	DP37628	324125	6396248
132	unknown	Lot A	DP153004	324862	6395789
133	unknown	Lot 1	DP37628	325339	6394874
134	unknown	Lot 20	DP621875	321192	6394797
135	unknown	Lot 19	DP621875	321270	6394970
136	unknown	unknown	unknown	324944	6397182
137	unknown	Lot 54	DP1006564	324778	6397344
138	unknown	Lot 552	DP1178084	324833	6397429
139	unknown	unknown	unknown	324936	6397191
140	unknown	Lot 11	DP1065512	324910	6397691
141	unknown	Lot 11	DP877362	323334	6396729
142	unknown	Lot 43	DP752442	322385	6396278
143	unknown	Lot 1	DP261349	322423	6396784
144	unknown	Lot 2	DP261349	322254	6396714
145	unknown	Lot 45	DP752442	321965	6396265
146	unknown	Lot 3	DP261349	321606	6397025
147	unknown	Lot 51	DP1121395	321265	6396714
148	unknown	Lot 4	DP261349	320621	6396931
149	unknown	unknown	unknown	318687	6399196
150	unknown	Lot 11	DP3005	318503	6398456
151	unknown	Lot 1	DP937751	318677	6398187
152	unknown	Lot 522	DP1166274	324855	6397195
153	unknown	Lot 57	DP864138	324853	6397094
154	unknown	Lot 58	DP864138	324764	6397088
155	unknown	Lot 521	DP1166274	324765	6397237
156	unknown	Lot 14	DP1065512	324686	6397065
157	unknown	Lot 1	DP626145	324643	6397208
158	unknown	Lot 1	DP708053	324511	6397046
159	unknown	Lot 2	DP626145	324511	6397205
160	unknown	Lot 1003	DP811415	323531	6397300
161	unknown	Lot 1002	DP811415	323433	6397286
162	unknown	Lot 1001	DP811415	323200	6397319
163	unknown	Lot 102	DP777898	322455	6397410
164	unknown	Lot 101	DP817010	318885	6399294
165	unknown	Lot 3	DP3005	317882	6399178
166	unknown	Lot 12	DP708053	324474	6396855
167	BE & TA Moxey	Lot 104	DP817010	318017	6400033

ID	Surname	Lot	DP	Easting	Northing
168	unknown	Lot 16	DP3005	318103	6399609
169	unknown	Lot 2	DP658467	318012	6399408
170	WG Bowman	Lot 2	DP1111313	319612	6403390
171	AS Bowman	Lot 75	DP1124347	319005	6401802
173	Burgess	Lot 30	DP1018512	321408	6403987
175	B&R Richards	Lot 1	DP745211	322136	6405852
176	B&R Richards	Lot 11	DP1169092	321519	6405042
177	R&D Hall	Lot 8	DP246434	323690	6405337

Appendix E

Noise Assessment Groups



HB RIXS CREEK 1916 Fx RCN Noise Assessment Gorups 24 04 2019

RIXS CREEK COAL MINE

RCN Noise Assessment Groups

FIGURE E1

Table E1
Noise Criteria dB(A)

Location		Day	Evening	Night	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
~~NAG 1~~	~~All privately-owned land~~	~~38~~	~~38~~	~~36~~	~~46~~
~~NAG 2~~	~~All privately-owned land~~	~~39~~	~~39~~	~~37~~	~~47~~
NAG 3	All privately-owned land	40	40	39	49
NAG 4	99, 100	39	39	39	47
	88, 91, 95	40	40	40	47
	105, 161	41	41	41	47
	All other privately-owned land	42	42	37	47
NAG 5	104	35	35	35	52
	139	36	36	36	52
	103	37	37	37	52
	121	40	40	40	52
	~~118, 154~~	~~43~~	~~43~~	~~43~~	~~52~~
	~~Deleted~~	~~45~~	~~45~~	~~45~~	~~52~~
	~~Deleted~~	~~47~~	~~47~~	~~47~~	~~52~~
	All other privately-owned land	50	46	42	52
NAG 6	137	35	35	35	48
	133	37	37	37	48
	132	38	38	38	48
	All other privately-owned land	41	41	38	48
NAG 7	All privately-owned land	45	42	39	49
NAG 8	142	35	35	35	45
	All other privately-owned land	42	42	35	45
NAG 9	146, 148, 149	35	35	35	48
	143, 144, 145, 147, 150, 151, 152	36	36	36	48
	2	37	37	37	48
	3, 4	39	39	39	48
	All other privately-owned land	40	40	38	48
NAG 10	5	40	40	40	47
	6, ~~11~~	41	41	41	47
	8	42	42	42	47
	All other privately-owned land	39	39	37	47
NAG 11	18	35	35	35	49
	20, 21	37	37	36	49

Location		Day	Evening	Night	
		$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
	19	37	37	37	49
	17	38	38	38	49
	7	39	39	39	49
	12, 15	40	40	40	49
	14, 16	42	42	42	49
	All other privately-owned land	41	41	39	49
NAG 12	52, ~~55~~	35	35	35	45
	51, ~~56~~	37	37	37	45
	53, ~~57~~	38	38	38	45
	50, 54	39	39	39	45
	62	40	40	40	45
	All other privately-owned land	38	38	35	45
NAG A	24, 25, 26, 27, 28, 29, 30, 36, 37, 38, 39, 40, 41	35	35	35	46
	31	36	36	35	46
	42, 43	36	36	36	46
	32	37	37	35	46
	22, 23	37	37	37	46
	34	39	39	36	46
	35	39	39	35	46
	All other privately-owned land	39	39	36	46
~~NAG B~~	~~All privately-owned land~~	~~37~~	~~37~~	~~35~~	~~45~~
NAG C	47	39	39	39	45
	63	40	40	40	45
	All other privately-owned land	37	37	35	45
NAG D	44, 48	36	36	36	48
	49	39	39	39	48
	All other privately-owned land	40	40	38	48
NAG F	~~65, 66~~	~~39~~	~~39~~	~~39~~	~~50~~
	67	40	40	40	50
	~~68~~	~~42~~	~~42~~	~~42~~	~~50~~
	All other privately-owned land	40	40	40	50
~~NAG G~~	~~All privately-owned land~~	~~41~~	~~41~~	~~39~~	~~50~~
	All other privately-owned land	35	35	35	45

~~Strikethrough~~ text indicates the properties are now mine-owned