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Northern Coal Logistics Project
Air Quality Impact Assessment

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Northern Coal Logistics Project

Air Quality Impact Assessment

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Executive Summary

Introduction

SLR Consulting was commissioned by Northern Coal Services Pty Limited (Northern Coal Services) to conduct an Air Quality Impact Assessment (AQIA) for the Northern Coal Logistics Project located between Fassifern and Dora Creek on the western side of Lake Macquarie, New South Wales.

The Northern Coal Logistics Project (the Project) comprises of the operations at Newstan Colliery Surface Site, Hawkmount Quarry, Mandalong Mine - Cooranbong Entry Site (Cooranbong Entry Site) and the private haul roads. As part of the Project, various upgrades have been proposed to the operations at Newstan Colliery Surface Site. The aim of this AQIA was to assess the air quality impacts on surrounding sensitive receivers associated with the Project and the upgrades at Newstan Colliery Surface Site.

Methodology

This assessment has been completed in accordance with the "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DEC, 2005) (the Approved Methods) issued by the New South Wales Environment Protection Authority (NSW EPA). Air quality criteria specified by the NSW EPA were adopted as stipulated in the Approved Methods. In the absence of criteria applicable to PM_{2.5} in the Approved Methods, the NEPM advisory reporting standard (2003) was adopted.

Dispersion modelling was conducted for the identified sources at Newstan Colliery Surface Site, Hawkmount Quarry, Cooranbong Entry Site and the private haul roads for particulates (TSP, PM₁₀ and PM_{2.5}) and odour for ten scenarios:

- eight scenarios associated with the operations at the Newstan Colliery Surface Site; and
- two scenarios associated with the operations at the Cooranbong Entry Site.

In order to assess the background air quality of the region a number of industrial facilities with the potential to have a cumulative impact on the local airshed were identified. A dispersion modelling exercise was performed to determine suitable background levels of pollutants in order to assess the cumulative impacts.

Results

The dispersion modelling exercise for the Project indicates that:

- The annual average deposited dust concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average TSP concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average PM₁₀ concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average PM_{2.5} concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.

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- The 24-hour average PM₁₀ concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for the Cooranbong Entry Site. The 24-hour average PM₁₀ concentrations were likely to exceed the relevant criterion for three scenarios at the receptor 'NC6' surrounding the Newstan Colliery Surface Site. To achieve the relevant PM₁₀ criterion at all of the identified sensitive receptors surrounding the Newstan Colliery Surface Site, it was recommended that:
 - Train loading operations are automated once it is proposed to export 6 Mtpa from the Newstan Colliery Surface Site; and
 - Coal transfers between the CPP and the rail loop stockpile are automated once it is proposed to export 6 Mtpa AND train loading operations are automated once it is proposed to export 8 Mtpa from the Newstan Colliery Surface Site.
- The 24-hour average PM_{2.5} concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The 99th percentile odour concentrations were predicted to be below the relevant criterion at all the identified sensitive receptors during Project operations for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.

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APPENDICES

- Appendix A Detailed Emissions Inventory (CLP)
 Appendix B Contour Plots

ABBREVIATIONS

%	percent
°C	degrees Celsius
µg	Microgram
µg/m ³	microgram per cubic metre of air
µg/Nm ³	microgram per normalised cubic metre of air (273K, 101.3kPa)
µm	micrometre or micron
AGL	above ground level
AHD	Australian Height Datum
AP-42	US EPA Emission Factor Handbook
AQIA	air quality impact assessment
AWS	automatic weather station
Centennial Mandalong	Centennial Mandalong Pty Ltd
Centennial Newstan	Centennial Newstan Pty Ltd
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CSIRO	Australian Commonwealth Scientific and Industrial Research Organisation

DECC	Former NSW Department of Environment and Climate Change (see OEH and EPA)
DECCW	Former NSW Department of Environment, Climate Change and Water (see OEH and EPA)
DDG	dust deposition gauge
DP&I	Department of Planning and Infrastructure
DGRs	Director General's Requirements
EETM	Emission Estimation Technique Manual
EF	Emission Factor
EIS	Environmental Impact Statement
EHS	Environmental Health and Safety
EPA	Environment Protection Authority
EPS	Ering Power Station
FEL	front-end loader
g	Gram
g/m ² /month	grams per square metre per month
HVAS	High Volume Air Sampler
ha	hectare
J	joule
K	degrees Kelvin
kg	kilogram
kg/hr	kilogram per hour
km	kilometre
km E	kilometres east
km N	kilometres north
L	litre
m	metre
M	million
m/s	metre per second
m ²	square metre
m ³	cubic metre
min	minute
mm	millimetre
Mt	million tonnes
Mtpa	million tonnes per annum
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NPI	National Pollutant Inventory (Australia)
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
Pa	Pascal
PM	Particulate Matter
PM ₁₀	particular matter with an equivalent aerodynamic diameter of 10 microns or less
PM _{2.5}	particular matter with an equivalent aerodynamic diameter of 2.5 microns or less
ppb	parts per billion (10 ⁹)
ppm	parts per million (10 ⁶)
ROM	run of mine
SI	Système International
SO ₂	sulfur dioxide
t	tonne
TEOM	tapered element oscillating microbalance
tpa	tonnes per annum
TSP	total suspended particulate matter
US EPA	United States Environmental Protection Agency

UTM	Universal Transverse Mercator
VOC	volatile organic compound
W	watt
WGS	World Geodetic System

GLOSSARY

air dispersion model	A computer-based software program which provides a mathematical prediction of how pollutants from a source will be distributed in the surrounding area under specific conditions of wind, temperature, humidity and other environmental factors
airshed	The geographical area associated with a given air supply
algorithms	A step-by-step problem-solving procedure, especially an established, recursive computational procedure for solving a problem in a finite number of steps
ambient	Pertaining to the surrounding environment or prevailing conditions
anemometer	An instrument for measuring wind force and velocity
atmosphere	A gaseous mass surrounding the planet Earth that is retained by Earth's gravity. It is divided into five layers. Most of the weather and clouds are found in the first layer
atmospheric stability	The tendency of the atmosphere to resist or enhance vertical motion
atmospheric pressure	The force per unit area exerted against a surface by the weight of air above that surface in the Earth's atmosphere
background	The existing air quality in the Project area excluding the impacts from the proposed development
baseline monitoring program	A monitoring program designed to measure the ambient concentration levels which currently exist prior to the proposed development
CALMET	A meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain
CALPOST	A post-processor used to process CALPUFF files, producing tabulations that summarize results of the simulation for user-selected averaging periods
CALPUFF	A transport and dispersion model that advects "puffs" of material emitted from modelled sources, simulating dispersion and transformation processes
climatological	The science dealing with climate and climatic phenomena
combustion	The process of thermal oxidation. A chemical change, especially oxidation, accompanied by the production of heat and light
commissioning	A systematic process of ensuring that a new facility performs according to the documented design intent and the owner's operational needs, and that specified system documentation and training are provided to the facility staff
crushers	A machine designed to reduce large rocks into smaller rocks, gravel, or rock dust
decommissioning	Planned shut-down or removal of a building, equipment, plant, etc., from operation or usage
dust deposition	Settling of particulate matter out of the air through gravitational effects (dry deposition) and scavenging by rain and snow (wet deposition)
dispersion	The spreading and dilution of substances emitted in a medium (e.g. air or water) through turbulence and mixing effects
diurnal	Relating to or occurring in a 24-hour period; daily
downwash	The grounding of an air pollution plume as it flows over nearby buildings or other structures due to turbulent eddies being formed in the downwind side of the building, resulting in elevated ground level concentrations.
downwind	The direction in which the wind is blowing

emission factor	A measure of the amount of a specific pollutant or material emitted by a specific process, fuel, equipment, or source based on activity data such as the quantity of fuel burnt, hours of operation or quantity of raw material consumed.
emissions inventory	A database that lists, by source, the amount of air pollutants discharged into the atmosphere from a facility over a set period of time (e.g. per annum, per hour)
erodible	A term used to describe a soil that is vulnerable to erosion by the agents of wind, water, ice
evapotranspiration	The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces
epidemiological	The branch of medicine that deals with the study of the causes, distribution, and control of disease in populations
fossil fuel	A natural fuel such as coal, diesel or gas, formed in the geological past from the remains of living organisms
fugitive emissions	Pollutants which escape from an industrial process due to leakage, materials handling, transfer, or storage
guideline	A general rule, principle, or piece of advice. A statement or other indication of policy or procedure by which to determine a course of action.
materiality threshold	Represents the amount of insignificant emissions allowed which do not need to be quantified and accounted for.
meteorological	The science that deals with the phenomena of the atmosphere, especially weather and weather conditions
mixing height	The height to which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly homogeneous air mass
modelling domain	The area over which the model is making predictions
particulate	Of, relating to, or formed of minute separate particles. A minute separate particle, as of a granular substance or powder
plume	A space in air, water, or soil containing pollutants released from a point source
point source	A pollution source that is fixed and/or uniquely identifiable, such as a stack, chimney, outlet pipe or vent
pollutant	A substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource
prognostic	A prediction of the value of variables for some time in the future on the basis of the values at the current or previous times
qualitative assessment	An assessment of impacts based on a subjective, non-statistical oriented analysis
quantitative assessment	An assessment of impacts based on estimates of emission rates and air dispersion modelling techniques to provide estimate values of ground level pollutant concentrations.
receptor	Coordinate locations specified in an air dispersion model where ground level pollutant concentrations are calculated by the model
sensitive receptor	Locations such as residential dwellings, hospitals, churches, schools, recreation areas etc where people (particularly the young and elderly) may often be present, or locations with sensitive vegetation and crops.
spatial variation	Pertaining to variations across an area
standard	The prescribed level of a pollutant in the outside air that should not be exceeded during a specific time period to protect public health

standard deviation of wind direction	A measure of the variation in wind direction
synoptic meteorological data	A surface weather observation, made at periodic times (usually at 3-hourly and 6-hourly intervals), of sky cover, state of the sky, cloud height, atmospheric pressure reduced to sea level, temperature, dew point, wind speed and direction, amount of precipitation, hydrometeors and lithometeors, and special phenomena that prevail at the time of the observation or have been observed since the previous specified observation
temporal variation	Pertaining to variations with time
topography	Detailed mapping or charting of the features of a relatively small area, district, or locality
volatile organic compounds	All organic compounds (substances made up of predominantly carbon and hydrogen) with boiling temperatures in the range of 50-260°C, excluding pesticides. This means that they are likely to be present as a vapour or gas in normal ambient temperatures.
wind direction	The direction from which the wind is blowing
wind erosion	Detachment and transportation of loose topsoil or sand due to action by the wind
wind rose	A meteorological diagram depicting the distribution of wind direction and speed at a location over a period of time

1 INTRODUCTION

SLR Consulting has been commissioned by Centennial Northern Coal Services Pty Ltd (Northern Coal Services) to conduct an Air Quality Impact Assessment (AQIA) for the Northern Coal Logistics Project (the Project) located between Fassifern and Dora Creek on the western side of Lake Macquarie, New South Wales.

The Project comprises of the operations at Newstan Colliery Surface Site, Hawkmount Quarry, Mandalong Mine - Cooranbong Entry Site (Cooranbong Entry Site) and the private haul roads linking the Newstan Colliery Surface Site, Awaba Colliery Surface Site, Eraring Power Station and the Cooranbong Entry Site.

This AQIA assesses the incremental and cumulative impacts from the Project. The aim of this AQIA is to assess the air quality impacts on surrounding sensitive receptors associated with the Project.

The NSW Office of Environment and Heritage (OEH) [formerly NSW Department of Environment, Climate Change and Water (DECCW)] have issued 'Action for Air' (DECCW 2009) as a key strategy for implementing the State Plan's cleaner air goals. Originally published in 1998, the 'Action for Air' is the NSW government's 25-year plan for managing air quality in Sydney, the Illawarra and the Lower Hunter regions. The 'Action for Air' outlines the key objectives and actions in order to achieve the wider air quality goals. This assessment aims to assess the air quality impacts against the wider air quality goals set out in the 'Action for Air'.

The New South Wales Environment Protection Authority (NSW EPA) "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DEC, 2005) (the Approved Methods) outline the requirements for conducting an AQIA (and the Sections of this report where the requirements are met), as follows:

- Description of local topographic features and sensitive receptor locations (**Section 3.1** and **Section 3.2** respectively).
- Establishment of air quality assessment criteria (**Section 4**).
- Analysis of climate and dispersion meteorology for the region (**Sections 6.2**).
- Description of existing air quality environment (**Section 7**).
- Compilation of a comprehensive emissions inventory for the existing and proposed activities (**Section 5**).
- Completion of atmospheric dispersion modelling and analysis of results (**Section 6**).
- Preparation of an air quality impact assessment report comprising the above.

The scope for this AQIA has been designed to address the Director General's Requirements (DGR's) with regard to the assessment of air quality impacts. A summary of the DGR's is provided in **Section 2.2**.

2 PROJECT OVERVIEW

The Project is part of a long term strategy developed by Centennial for its future operations in the Newcastle Coalfield to provide the infrastructure and flexibility required to meet future opportunities in both the domestic and export coal markets. The other parts of the long term strategy include the Newstan Extension of Mining Project and Mandalong Southern Extension Project (refer **Figure 5**).

The Project comprises both a continuation of existing operations and an upgrade to the surface coal handling and processing infrastructure at the Newstan Colliery Surface Site and Cooranbong Entry Site, along with the existing private haul roads and rail loading infrastructure. These facilities are integral to the on-going handling, processing and transport of coal from the underground workings of Newstan Colliery and Mandalong Mine (including the proposed Newstan Colliery Extension of Mining Project and Mandalong Southern Extension Project) into domestic and export markets.

The project Application Area comprises:

Newstan Colliery Surface Site - Newstan Colliery Surface Site comprises coal handling and processing infrastructure, the Southern Reject Emplacement Area (SREA), Northern Reject Emplacement Area (NREA), water management infrastructure and rail loading infrastructure. The exceptions are the mine ventilation shafts and ventilation fans, which form part of the Newstan Extension of Mining Project (see **Section 2.4.1**).

The Project proposes to extend and redevelop the Newstan Colliery Surface Site to accommodate new coal handling and processing infrastructure.

Cooranbong Entry Site - Cooranbong Entry Site comprises a coal handling plant (CHP), coal stockpiles, workshop building and water management infrastructure. The exceptions are the mine ventilation shaft, ventilation fan and the Borehole Dam, which form part of the Mandalong Southern Extension Project (see **Section 2.4.4**).

Private Haul Roads - The Cooranbong Private Haul Road owned by Centennial Mandalong links the Newstan Colliery Surface Site and the Cooranbong Entry Site via the Newstan-Eraring Private Haul Road. The Newstan-Eraring Private Haul Road links the Newstan Colliery Surface Site to the Eraring Power Station and is owned by Eraring Energy. The Awaba Private Haul Road links the Awaba Colliery Surface Site to the Newstan-Eraring Private Haul Road and is owned by Centennial Newstan Pty Limited.

Hawkmount Quarry – Hawkmount Quarry is an abandoned gravel quarry (Crown land under permissive occupancy held by Lake Macquarie City Council). Hawkmount Quarry has not been used for extraction purposes for several years but is proposed to be used as coarse rejects emplacement area for the Northern Coal Logistics Project.

2.1 Project Location

The Project Application Area is located between Fassifern and Dora Creek on the western side of Lake Macquarie, New South Wales.

The existing Newstan Colliery Surface Site is located approximately 19 kilometres (km) southwest of Newcastle, within the Newcastle Coalfield of NSW.

The existing Cooranbong Entry Site is located approximately 30 kilometres (km) southwest of Newcastle.

The private haul roads link the Newstan Colliery Surface Site, Awaba Colliery Surface Site, Eraring Power Station, Hawkmount Quarry and Cooranbong Entry Site.

The regional location of the Project application area is shown in **Figure 1**.

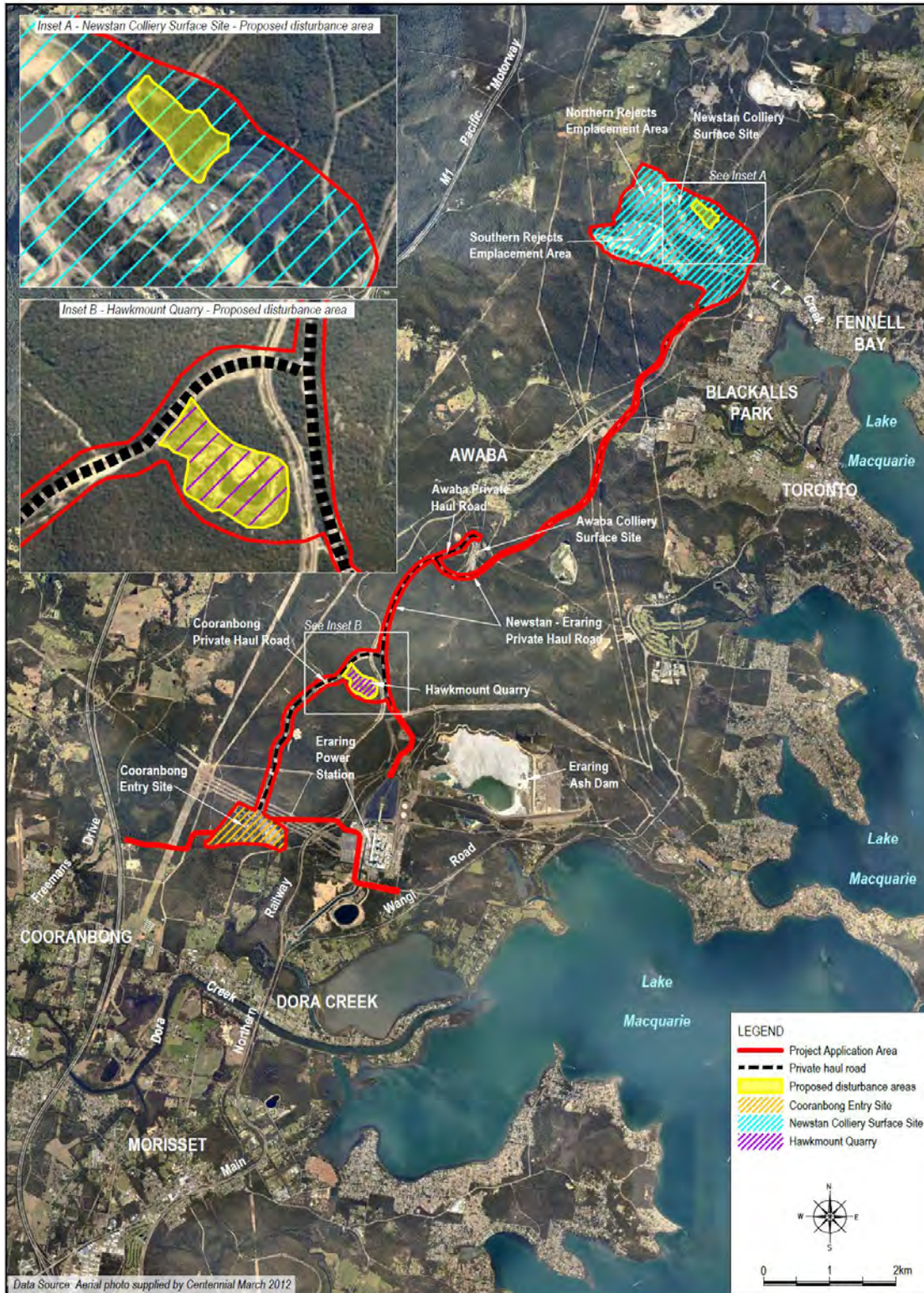
Figure 1 Regional Setting of the Project



Source: Centennial 2012

The local setting of the Project Application Area is shown in **Figure 2**.

Figure 2 Local Setting of the Project



Data Source: Aerial photo supplied by Centennial March 2012
 G:\Drafting\CCC13-012\Figures\Final\CAD\SEPTEMBER 2013 FIGURES\CAD\FgX_CCC13-012_Pro App Area_V4.dwg

Source: Centennial 2012

2.2 Director General's Requirements

The Director General of the Department of Planning and Infrastructure (DP&I) issued the Director General's Requirements (DGRs) for the Project on 20 March 2012, with revised DGRs issued on 7 August 2013. **Table 1** below identifies the DGRs relevant to this AQIA and where they have been addressed.

Table 1 Director General's Requirements – Northern Coal Logistics Project (Application number SSD - 5145)

Key Issue	Assessment Requirement	Addressed in Section
Air Quality	Construction and operational impacts, with a particular focus on dust emissions including PM _{2.5} and PM ₁₀ emissions	Section 2.4.1, Section 8.5 and Section 8.3 and Section 8.4
	Reasonable and feasible mitigation measures to minimise dust emissions, including evidence that there are no such measures available other than those proposed; and	Section 8.9
	Monitoring and management measures, in particular real-time air quality monitoring.	Section 8.9.3

Issued: 7 August 2013; Department of Planning & Infrastructure, NSW Government, File Reference: SSD - 5145.

The DGR's also require that the assessment be performed in accordance with relevant policies, guidelines and plans including:

- Protection of Environment Operations (Clean Air) Regulation 2002;
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2005); and,
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (2006).

This assessment addresses the key issues raised within the DGR's and is performed in accordance with the relevant policies and guidelines.

2.3 Process Description

In summary (and of relevance to this AQIA) the Project proposes to:

- Re-develop and upgrade the existing coal preparation and handling infrastructure at the Newstan Colliery Surface Site to enable continued utilisation for the receipt, handling and processing of up to 8 million tonnes per annum (Mtpa) run-of-mine (ROM) coal from the Newstan Colliery (up to 4.5 Mtpa), the Awaba Colliery (up to 0.88 Mtpa) and Mandalong Mine (up to 6 Mtpa);
- Continue to utilise the existing coal handling infrastructure at the Cooranbong Entry Site to enable the receipt, handling and processing of up to 6 Mtpa of ROM coal from Mandalong Mine;
- Increase the volume of coal transported from the Cooranbong Entry Site to Newstan Colliery Surface Site, via truck using existing private haul roads, from 4 Mtpa to up to 6 Mtpa;
- Increase the volume of coal transported from the Cooranbong Entry Site to Eraring Power Station, using the existing dedicated overland conveyor, from 4 Mtpa to up to 6 Mtpa;
- Increase the volume of coal transported from the Newstan Colliery Surface Site to Eraring Power Station, via truck using existing private haul roads, from 2 Mtpa to up to 4.5 Mtpa;

- Increase the volume of coal transported from the Newstan Colliery Surface Site rail loading facilities by train to the Port of Newcastle, Port Kembla or Vales Point Power Station for export from 3 Mtpa to up to 8 Mtpa;
- Continue to transport up to 0.5 Mtpa of middlings by truck via private haul roads from Newstan Colliery Surface Site to Cooranbong Entry Site for subsequent supply to the Eraring Power Station via a dedicated overland conveyor;
- Continue to transport up to 0.88 Mtpa of material (including coal and stone from construction activities undertaken as part of the Newstan Colliery Extension of Mining Project) by truck via private haul roads from the Awaba Colliery Surface Site to the reject emplacement areas at the Newstan Colliery Surface Site;
- Transport reject material from the Newstan Colliery Surface Site to the Newstan Colliery Northern Reject Emplacement Area (NREA), the Newstan Colliery Southern Reject Emplacement Area (SREA) and/or Hawkmount Quarry via existing private haul roads;
- Increase the volume of water discharged via licenced discharge points at the Newstan Colliery Surface Site and Cooranbong Entry Site;
- Provide employment for up to 120 full-time personnel;
- Provide a life of operation of 30 years from the granting of development consent; and
- Operate 24 hours per day, seven days per week.

2.4 Identification of Emission Sources

2.4.1 Newstan Colliery Surface Site

In regards to the activities identified in **Section 2.3**, the following emission sources have been identified at the Newstan Colliery Surface Site:

- Construction and installation of equipment to enable the handling and preparation of coal;
- Handling, processing and transportation of ROM coal and product coal;
- Handling and transportation of coal rejects; and
- Wind erosion from open and exposed areas such as coal stockpiles and rejects emplacement areas.

Atmospheric pollutants likely to be generated by the potential activities include fugitive emissions of particulates (TSP, PM₁₀, PM_{2.5}¹) in addition to those generated through the combustion of fuel in vehicle engines (NO_x, SO₂, VOCs, CO, PM₁₀)².

It is considered appropriate to assume that the emissions due to combustion of fuel in vehicle engines on site will be negligible compared to the existing background levels. Hence, the emission products of combustion from vehicle engines are not considered further in this assessment.

Also, it is considered that emissions of particulate matter during the construction and installation of project infrastructure will be minor when compared to the Project operation and therefore has not been considered further within this assessment.

¹ PM₁₀ is used to describe particulate matter with an aerodynamic diameter of 10 microns (µm) or less. Correspondingly, PM_{2.5} describes particulates with aerodynamic diameters of 2.5 µm or less. TSP (Total Suspended Particulate) describes particulate matter which is less than 30 µm diameter.

²Oxides of Nitrogen (NO_x), Sulfur dioxide (SO₂), Volatile Organic Compounds (VOCs), Carbon monoxide (CO).

There are two ventilation fans located at the Newstan Colliery Surface Site which are owned and operated by Centennial Newstan Pty Ltd to ventilate the underground workings of the Newstan Colliery. Although the operation of these ventilation fans do not form part of this Project (given they will become part of Centennial's Newstan Extension of Mining Project), their continued operation has been considered in this assessment to provide a comprehensive cumulative assessment of air quality impacts as a result of the operations at the Newstan Colliery Surface Site. Emissions from the ventilation fans include TSP, PM₁₀, PM_{2.5} and odour.

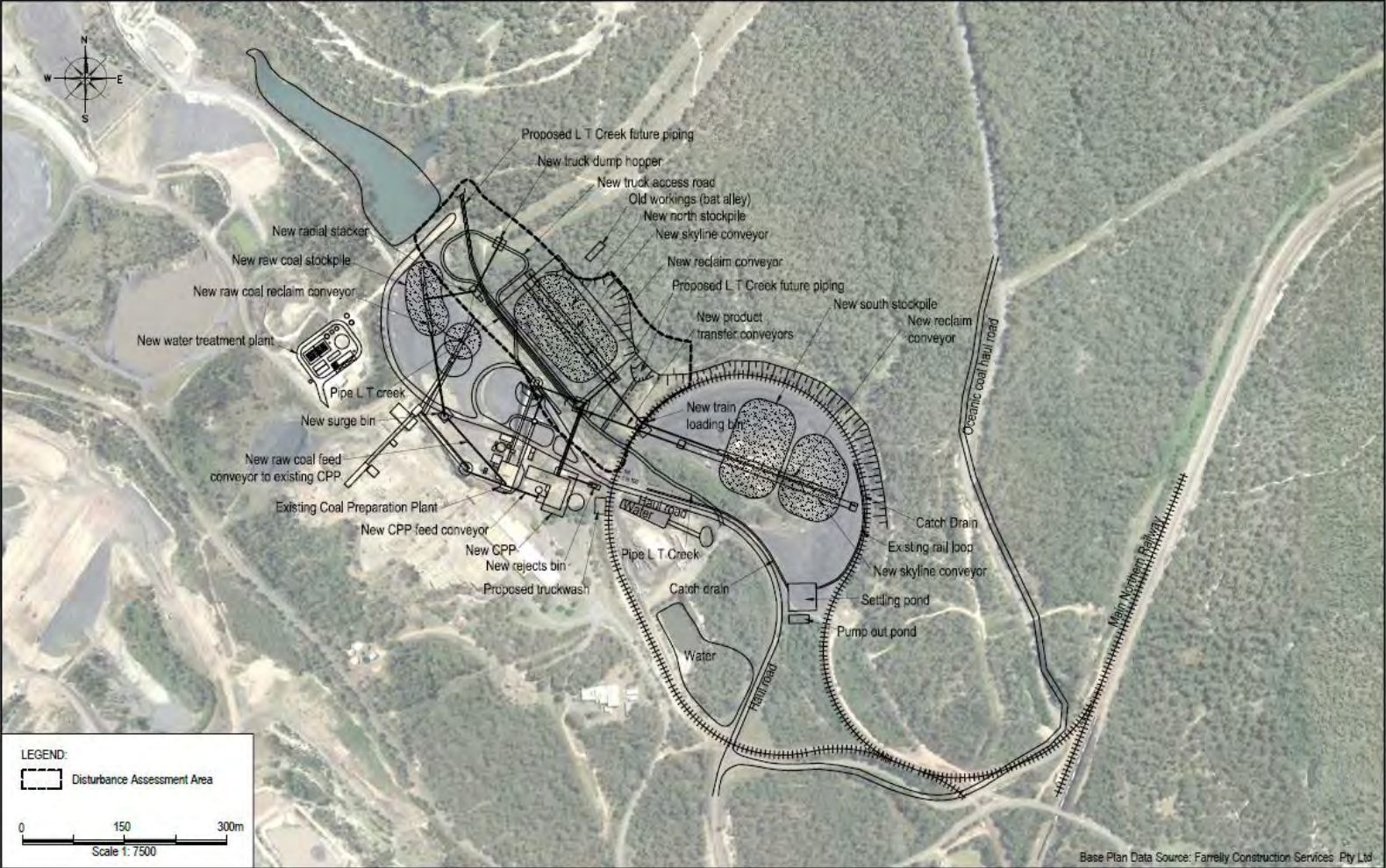
The emission sources and major pollutants identified at the Newstan Colliery Surface Site are summarised in **Table 2**.

Table 2 Summary of Potential Emission Sources – Newstan Colliery Surface Site

Emission Source	Emission Type	Pollutants
Haul roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}
Excavator	Material handling	TSP, PM ₁₀ , PM _{2.5}
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}
Coal bins	Material handling	TSP, PM ₁₀ , PM _{2.5}
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}
Unloading from stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}
Miscellaneous transfer points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}
Coal processing plant	Process emissions	TSP, PM ₁₀ , PM _{2.5}
Northern rejects emplacement area (NREA)	Wind erosion	TSP, PM ₁₀ , PM _{2.5}
Reject dumping at NREA	Material handling	TSP, PM ₁₀ , PM _{2.5}
Southern rejects emplacement area (SREA)	Wind erosion	TSP, PM ₁₀ , PM _{2.5}
Reject dumping at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}
Ventilation shafts	Process emissions	TSP, PM ₁₀ , PM _{2.5} Odour

A conceptual layout of the proposed re-developed Newstan Colliery Surface Site is shown in **Figure 3**.

Figure 3 Conceptual Layout of Newstan Colliery Surface Site



Source: Centennial 2012

2.4.2 Private Haul Roads

In addition to the operations at Newstan Colliery Surface Site and Cooranbong Entry Site, private haul roads between Newstan Colliery Surface Site, Awaba Colliery Surface Site, Eraring Power Station, Hawkmount Quarry and Cooranbong Entry Site will be used to transport product coal and rejects.

It has been advised by Centennial that the private haul roads are all sealed and regularly maintained using best management practices.

It is considered appropriate to include private haul roads as potential particulate emission sources as these will be in continuous operation.

2.4.3 Hawkmount Quarry

The Project's production waste management strategy incorporates the emplacement of coarse rejects at the existing Hawkmount Quarry (together with the NREA and SREA). The quarry has not been used for extraction purposes for several years, and there is no evidence of any closure or rehabilitation activities. It is estimated it will provide an additional 400,000 cubic metres (m³) of capacity for coarse rejects emplacement (Centennial 2012).

The major identified sources of emissions and respective pollutants are shown in **Table 3**.

Table 3 Summary of Potential Emission Sources – Hawkmount Quarry

Emission Source	Emission Type	Pollutants
Reject dumping	Material handling	TSP, PM ₁₀ , PM _{2.5}
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}
Open Area	Wind erosion	TSP, PM ₁₀ , PM _{2.5}

2.4.4 Cooranbong Entry Site

The Cooranbong Entry Site currently processes up to 4 Mtpa of coal each year. The coal is brought in from the underground workings of the Mandalong Mine using the south drift conveyor located at the north-western end of the site. The coal is then screened and crushed before it is transported to the Newstan Colliery Surface Site via the sealed private haul roads and to Eraring Power Station (EPS) via an enclosed overland conveyor.

Centennial Mandalong is approved to deliver up to 4 Mtpa of coal from the Cooranbong Entry Site to Centennial's Newstan Colliery Surface Site via private haul roads for further processing and up to 4 Mtpa of coal directly to EPS via Eraring Energy's overland conveyor.

As part of the Northern Coal Logistics Project, it is proposed to increase the amount of coal delivered from the Cooranbong Entry Site to the EPS and Newstan Colliery Surface Site from the current limit of 4 Mtpa to up to 6 Mtpa. It is noted that the amount of coal transported to Newstan Colliery Surface Site and EPS will vary according to the respective demands and other site specific factors. However, to assess the worst case impacts from the operations at the Cooranbong Entry Site, two scenarios are assessed and are discussed in detail in **Section 5.2**.

Atmospheric pollutants likely to be generated by the activities at the Cooranbong Entry Site include fugitive emissions of particulates (PM₁₀, PM_{2.5} and TSP and deposited dust) in addition to those generated through the combustion of fuel in vehicles (NO_x, SO₂, VOCs, CO, PM₁₀).

There is one ventilation fan located at the Cooranbong Entry Site which is owned and operated by Centennial Mandalong Pty Ltd to ventilate the underground workings of the Cooranbong Colliery. Although the operation of this ventilation fan does not form part of this Project (given it will become part of Centennial's Mandalong Southern Extension Project), its continued operation has been considered in this assessment to provide a comprehensive cumulative assessment of air quality impacts as a result of the operations at the Cooranbong Entry Site. Emissions from the ventilation fan include TSP, PM₁₀, PM_{2.5} and odour.

The presence of EPS in the vicinity of the Project Site will have a significant impact on the air quality in the region. The methodology used to account for the cumulative impacts of EPS emissions with those from the Project Site is presented in **Section 7.4**.

It is considered appropriate to assume that the concentration of pollutants generated due to combustion of fuel is likely to be negligible compared to the impacts from EPS. Therefore, the impacts from combustion of fuel in vehicles at Cooranbong Entry Site are not considered further in this assessment.

The emission sources and major pollutants identified at the Cooranbong Entry Site are summarised in **Table 4**.

Table 4 Summary of Potential Emission Sources – Cooranbong Entry Site

Emission Source	Emission Type	Pollutants
Haul roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}
Haul trucks	Wind erosion	TSP, PM ₁₀ , PM _{2.5}
Front end loader (FEL)	Material handling	TSP, PM ₁₀ , PM _{2.5}
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}
Coal bins	Material handling	TSP, PM ₁₀ , PM _{2.5}
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}
Unloading from stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}
Miscellaneous transfer points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}
Coal screening	Process emissions	TSP, PM ₁₀ , PM _{2.5}
Coal crushing	Process emissions	TSP, PM ₁₀ , PM _{2.5}
Ventilation fans	Process emissions	TSP, PM ₁₀ , PM _{2.5} , Odour

A conceptual layout of the Cooranbong Entry Site is shown in **Figure 4**.

Figure 4 Conceptual Layout of Cooranbong Entry Site



Source: Centennial 2012

2.5 Emission Controls

2.5.1 Newstan Colliery Surface Site

A comprehensive AQIA was completed for the Newstan Colliery Surface Site in September 2011, which assessed the incremental and cumulative impacts from the existing operations

Additionally, a best practice assessment was completed by SLR Consulting in September 2012 (as part of a widespread NSW EPA Pollution Reduction Program [PRP] aimed at the coal mining industry), to assess the major sources of particulates from site operations and the emissions reductions realised through the implementation of a number of implemented control measures, for the current and proposed operations. It was concluded from the best practice measures assessment that the particulate control measures to be implemented as part of the site upgrade (e.g. truck wheel wash, skyline stackers, ROM dump hopper) would represent best practice particulate control, once installed.

Furthermore, the PRP showed that PM₁₀ emissions per tonne of coal handled reduced by 12% following the implementation of the proposed measures.

A summary of the emissions sources along with the associated pollutants evaluated in this assessment and the respective emission controls applied is shown in **Table 5**. The estimation of these emissions and the subsequent emissions inventory are discussed in detail in **Section 5**.

Table 5 Summary of Potential Emission Sources – Newstan Colliery

Emission Source	Emission Type	Pollutants	Control (Efficiency)
Paved haul roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Front end loader (FEL) on Coal	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer on Coal	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Coal bins	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Loading trains	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Unloading from stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Miscellaneous transfer points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Coal processing plant	Process emissions	TSP, PM ₁₀ , PM _{2.5}	Enclosed (100%)
Northern rejects emplacement area (NREA)	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer at NREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Reject dumping at NREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Southern rejects emplacement area (SREA)	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Excavators at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Reject dumping at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Ventilation shafts	Process emissions	TSP, PM ₁₀ , PM _{2.5} Odour	No Control

2.5.2 Private Haul Roads

It has been advised by Northern Coal Services that the private haul roads are all sealed and regularly maintained using best management practices. The estimation of these emissions and the subsequent emissions inventory are discussed in detail in **Section 5**.

The coal haulage trucks operating on the private haul roads linking the Newstan Colliery Surface Site, Awaba Colliery Surface Site, Cooranbong Entry Site, Hawkmount Quarry and the Eraring Power Station operate with E5 European standard engines. However it is beyond the scope of this assessment to quantify the control efficiency provided by the E5 European standard engines compared to Australian standard engines.

2.5.3 Hawkmount Quarry

A summary of the emissions sources along with the associated pollutants evaluated in this assessment and the respective controls applied is shown in **Table 6**. The estimation of these emissions and the subsequent emissions inventory are discussed in detail in **Section 5**.

Table 6 Summary of Potential Emission Sources – Hawkmount Quarry

Emission Source	Emission Type	Pollutants	Control
Reject dumping	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Open Area	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control

2.5.4 Cooranbong Entry Site

A summary of the emissions sources along with the associated pollutants evaluated in this assessment and the respective controls applied is shown in **Table 7**. The estimation of these emissions and the subsequent emissions inventory are discussed in detail in **Section 5**.

SLR has been informed by Centennial Mandalong that the mine has already commenced the implementation of the use of Tier 3 standard engines for its underground fleet to reduce particulate emissions. All machines are fitted with particulate filter assembly units.

Table 7 Summary of Project Emission Sources – Cooranbong Entry Site

Emission Source	Emission Type	Pollutants	Control
Front end loader (FEL)	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Paved Haul Roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Unloading from Stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water Sprays at 100,000 t stockpile – 50%
Miscellaneous Transfer Points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed – 70%
Ventilation shafts	Process emissions	TSP, PM ₁₀ , PM _{2.5} Odour	No Control

In addition to the emission controls identified above, a wheel wash has been installed within the site.

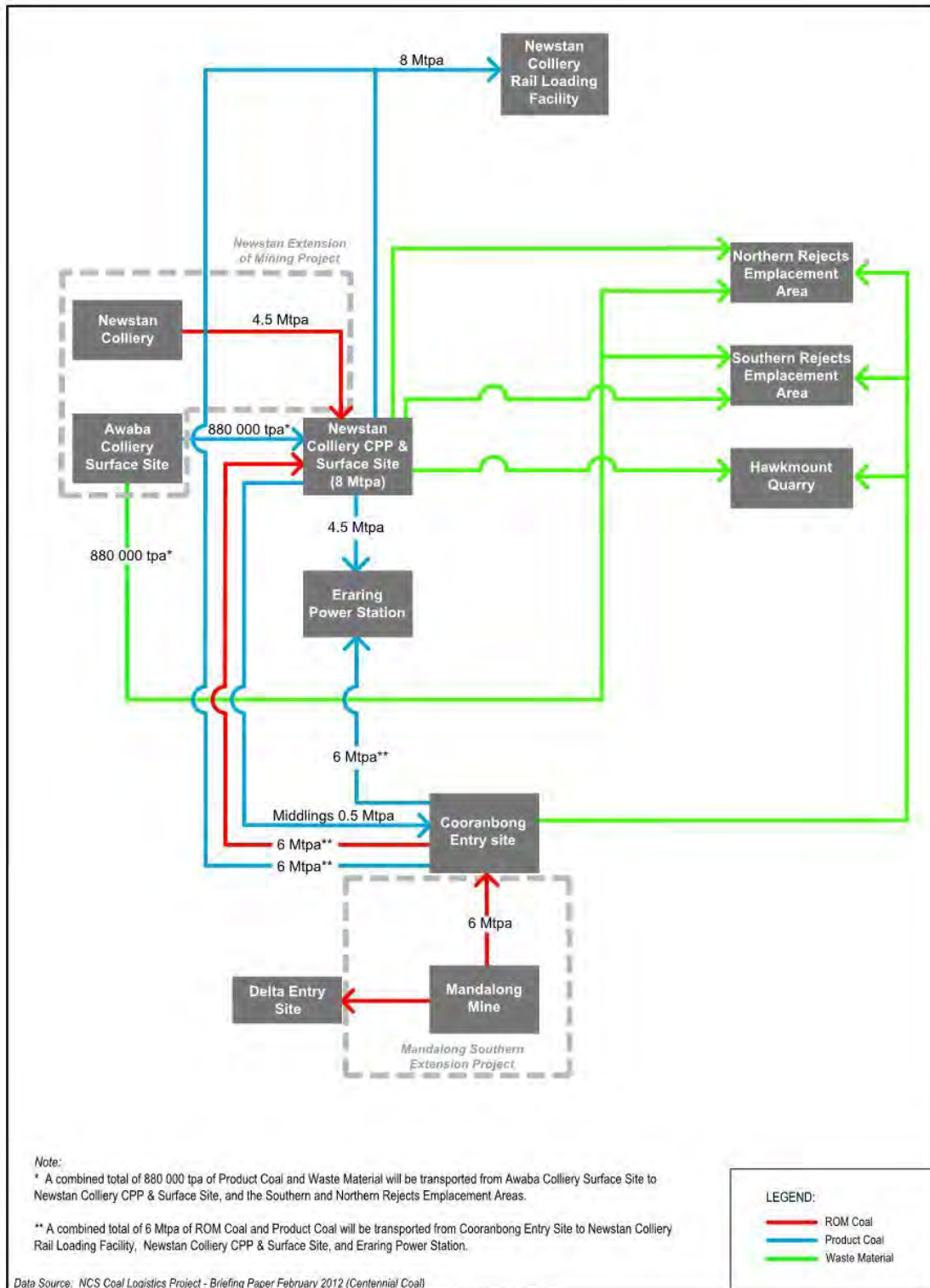
2.6 Hours of Operation

Northern Coal Services proposes to undertake the coal handling, processing and transportation operations of the Project 24 hours a day, seven days per week. This includes operations at the Newstan Colliery Surface Site, Cooranbong Entry Site, Hawkmount Quarry and private haul roads.

2.7 Coal Activity Rate

The coal activity rate and the movement of Coal for the Project is summarised in **Figure 5**.

Figure 5 Movement of Coal for Northern Coal Logistics Project (Source: Centennial 2012)



Note: The coal throughput shown above is the maximum throughput.

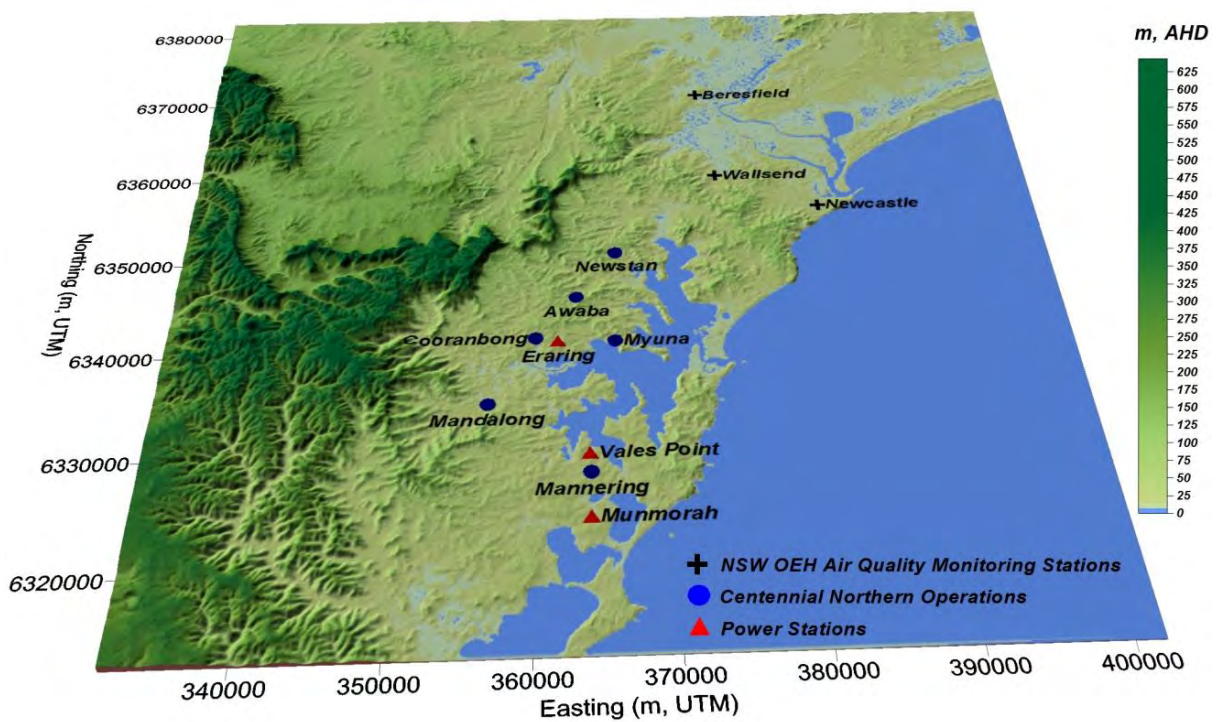
3 STUDY AREA

3.1 Local Topography

The topographical data used in the meteorological and dispersion modelling was sourced from the United States Geological Service's Shuttle Radar Topography Mission database that has recorded topography across Australia with a 3 arc second (~90 m) spacing.

The Newstan Colliery Surface Site, private haul roads, Hawkmount Quarry and Cooranbong Entry Site are located west of Lake Macquarie within undulating terrain. The topography of the local region surrounding the Project Application Area and surrounds is presented in **Figure 6**.

Figure 6 Local and Regional Topography



3.2 Sensitive Receptors

As discussed in **Section 2**, the main components of the Project are the Newstan Colliery Surface Site, Cooranbong Entry Site, private haul roads and Hawkmount Quarry. As the Project is spread over a large area, it is considered appropriate to assess the impacts at the sensitive receptors which are relevant to the main components of the Project separately.

The locations of the sensitive receptors identified in the vicinity of Newstan Colliery Surface Site, Cooranbong Entry Site and private haul roads are discussed in the following sections.

3.2.1 Newstan Colliery Surface Site

A number of residences/sensitive receptors are located in the area surrounding the Newstan Colliery Surface Site. A list of the nearest sensitive receptors identified in the vicinity of the site is presented in **Table 8** and **Figure 7**.

Table 8 Newstan Colliery Surface Site - Surrounding Sensitive Receptor Locations

Receiver ID	Location	Location (m, UTM)		Elevation (m, AHD)
		Easting	Northing	
NC1	Dwelling - Jefferson Road, Wakefield	365,779.7	6,351,882.4	40
NC2	Dwelling - Miller Road, Fassifern	365,720.1	6,351,115.5	58
NC3	Dwelling - Wallsend Road, Fassifern	367,462.9	6,349,487.1	12
NC4	Dwelling - Narara Street, Fassifern	367,399.3	6,348,880.4	27
NC5	Dwelling - Reynolds Street, Fassifern	366,904.1	6,348,625.7	72
NC6	Fassifern Primary School	367,580.8	6,349,693.9	11

Figure 7 Newstan Colliery Surface Site - Surrounding Sensitive Receptor Locations



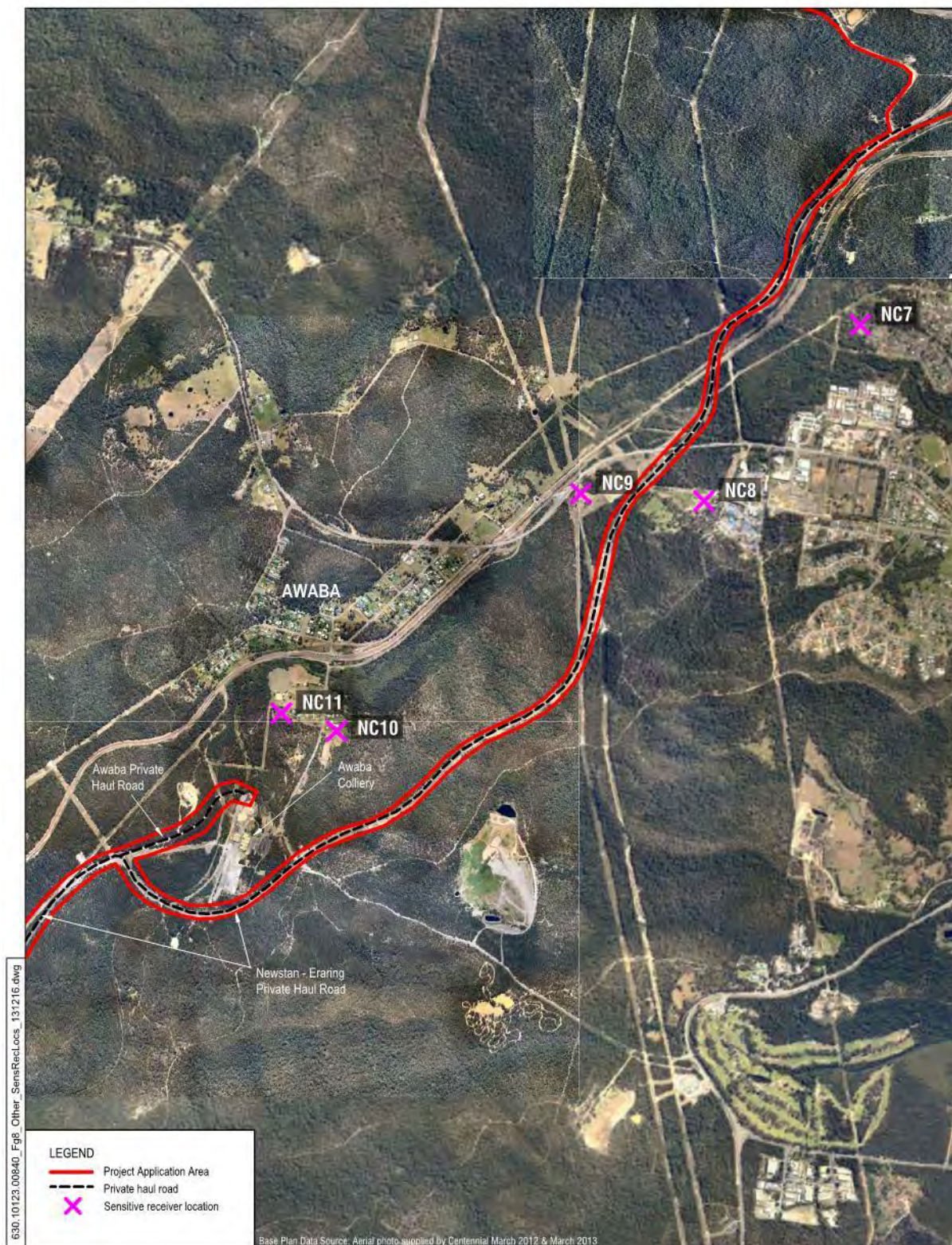
3.2.2 Private Haul Roads - Surrounding Sensitive Receptor Locations

For the purpose of assessing potential air quality impacts from the Newstan-Eraring Private Haul Road (no close residents along the other haul roads) the residential locations listed in **Table 9** and shown in **Figure 8** have been considered.

Table 9 Private Haul Roads - Surrounding Sensitive Receptor Locations

Receptor ID	Location	Location (m, UTM)		Elevation (m, AHD)
		Easting	Northing	
NC7	Dwelling - John Street, Blackalls Park	366,547.6	6,348,055.5	13
NC8	Dwelling - Toronto Street, Toronto	365,739.8	6,347,141.8	33
NC9	Dwelling - Awaba Road, Awaba	365,104.2	6,347,180.6	24
NC10	Dwelling - Sydney Street, Awaba	363,830.6	6,345,944.2	28
NC11	Dwelling - Olney Street, Awaba	363,548.3	6,346,041.9	33

Figure 8 Private Haul Roads – Surrounding Sensitive Receptor Locations



3.2.3 Cooranbong Entry Site

A number of residences/sensitive receptors are located in the area surrounding the Cooranbong Entry Site. A list of the nearest sensitive receptors identified in the vicinity of the Cooranbong Entry Site is presented in **Table 10** and **Figure 9**.

It is noted that the receptor numbers represent the respective house numbers close to Cooranbong Entry Site. Also, the receptor numbers are consistent with the AQIA completed for Cooranbong Entry Site in April 2012 (SLR 2012a).

Table 10 Cooranbong Entry Site - Surrounding Sensitive Receiver Locations

Receiver ID	Location	Location (m, UTM)		Elevation (m, AHD)
		Easting	Northing	
22	Residential Properties Gradwells Road, Cooranbong	359,999.6	6,340,497.4	26
23		360,226.8	6,340,525.2	14
26		360,202.1	6,340,460.8	12
28		360,077.6	6,340,254.9	15
30		359,299.0	6,339,788.6	7
31		359,721.6	6,340,039.6	12
32		360,189.7	6,340,230.2	6
33		359,181.8	6,339,820.8	12
35		359,869.7	6,339,907.7	8

Figure 9 Cooranbong Entry Site - Surrounding Sensitive Receptor Locations



4 AMBIENT AIR QUALITY CRITERIA

State air quality guidelines adopted by the NSW EPA are published in the *Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales* (NSW DEC, 2005) (hereafter 'The Approved Methods').

As specified within the DGR's, the Approved Methods has been consulted during the preparation of this assessment report. The Approved Methods lists the statutory methods that are to be used to model and assess emissions of air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria for the Project. The criteria listed in the Approved Methods are derived from a range of sources (including NHMRC, NEPC, WHO and ANZECC). The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW, and are considered to be appropriate for the setting.

4.1 Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms "dust" and "particulates" are often used interchangeably. The term "particulate matter" refers to a category of airborne particles, typically less than 30 microns (μm) in diameter and ranging down to 0.1 μm and is termed total suspended particulate (TSP). The annual goal for TSP recommended by the NSW EPA is 90 micrograms per cubic metre of air ($\mu\text{g}/\text{m}^3$).

The TSP goal was developed before the more recent results of epidemiological studies which suggested a relationship between health impacts and exposure to concentrations of finer particulate matter.

Emissions of particulate matter less than 10 μm and 2.5 μm in diameter (referred to as PM_{10} and $\text{PM}_{2.5}$ respectively) are considered important pollutants due to their ability to penetrate into the respiratory system. In the case of the $\text{PM}_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $\text{PM}_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

The NSW EPA PM_{10} assessment goals set out in the Approved Methods are as follows:

- a 24-hour maximum of 50 $\mu\text{g}/\text{m}^3$.
- an annual average of 30 $\mu\text{g}/\text{m}^3$.

The World Health Organisation (WHO) also set goals for PM_{10} which are as follows:

- a 24-hour maximum of 50 $\mu\text{g}/\text{m}^3$.
- an annual average of 20 $\mu\text{g}/\text{m}^3$.

It is noted that the annual average goal for PM_{10} set by the WHO is more stringent than that set by the NSW EPA. Both goals are assessed within this report even considering that the 30 $\mu\text{g}/\text{m}^3$ annual average PM_{10} goal is appropriate for the setting.

The Approved Methods do not set any assessment goals for $\text{PM}_{2.5}$. In December 2000, the National Environment Protection Council (NEPC) initiated a review to determine whether a national ambient air quality criterion for $\text{PM}_{2.5}$ was required in Australia, and the feasibility of developing such a criterion. The review found that:

- there are health effects associated with these fine particles.
- the health effects observed overseas are supported by Australian studies.

- fine particle standards have been set in Canada and the USA, and an interim criterion is proposed for New Zealand.

The review concluded that there is sufficient community concern regarding PM_{2.5} to consider it an entity separate from PM₁₀.

As such, in July 2003, a variation to the Ambient Air Quality NEPM was made to extend its coverage to PM_{2.5}, setting the following Interim Advisory Reporting Standards for PM_{2.5}:

- a 24-hour average concentration of 25 µg/m³; and
- an annual average concentration of 8 µg/m³.

The World Health Organisation also set goals for PM_{2.5} which are as follows:

- a 24-hour maximum of 25 µg/m³.
- an annual average of 10 µg/m³.

The WHO goals for PM_{2.5} are either the same (24 hour maximum) or less stringent (annual average) than those advised within the NEPM.

It is noted that the Advisory Reporting Standards relating to PM_{2.5} particles are reporting guidelines only at the present time and not intended to represent air quality criteria. A summary of the EPA particulate guidelines is shown in **Table 11**. A summary of the WHO guidelines is shown in **Table 12**.

Table 11 EPA Goals for Particulates

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m ³
PM ₁₀	24 Hours	50 µg/m ³
	Annual	30 µg/m ³
PM _{2.5}	24 Hours	25 µg/m ³ (interim <u>advisory</u> reporting standard only)
	Annual	8 µg/m ³ (interim <u>advisory</u> reporting standard only)

Table 12 WHO Goals for Particulates

Pollutant	Averaging Time	Goal
PM ₁₀	24 Hours	50 µg/m ³
	Annual	20 µg/m ³
PM _{2.5}	24 Hours	25 µg/m ³
	Annual	10 µg/m ³

4.2 Nuisance Impacts of Fugitive Emissions

The preceding section is concerned in large part with the health impacts of airborne particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 grams per square metre per month (g/m²/month).

Table 13 presents the impact assessment goals set out in the Approved Methods for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level to avoid dust nuisance.

Table 13 EPA Goals for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m ² /month	4 g/m ² /month

Source: Approved Methods, NSW DEC 2005.

4.2.1 Odour

According to NSW EPA, impact assessment criteria for complex mixtures of odours have been designed to take into account the range of sensitivity to odours within the community and to provide additional protection for individuals with a heightened response to odours. Where a number of the factors simultaneously contribute to making an odour “offensive”, an odour goal of 2 OU at the nearest residence (existing or any likely future residences) is appropriate, which generally occurs for affected populations equal or above 2,000 people.

The equation used by the NSW EPA to determine the appropriate impact assessment criteria for complex mixtures of odorous air pollutants, as specified in the Approved Methods, is expressed as follows:

$$\text{Impact assessment criterion (OU)} = (\log_{10}(\text{population}) - 4.5) / -0.6$$

A summary of appropriate impact assessment criteria for various population densities is provided in **Table 14**.

Table 14 Impact assessment criteria for complex mixtures of odorous air pollutants

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (Odour Units, OU)
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

For this Project, the only odour sources are the ventilation fans located at Newstan Colliery Surface Site and the Cooranbong Entry Site and hence it is likely that the only sensitive receptors affected by Project odour sources will be the receptors around Newstan Colliery Surface Site and Cooranbong Entry Site.

A school has been identified as one of these sensitive receptors (‘NC6’, **Section 3.2.1**) around Newstan Colliery Surface Site and therefore it is appropriate to adopt a conservative odour criterion of 2 OU for the receptors around Newstan Colliery Surface Site.

Considering the small number of potentially affected residential residences around the Cooranbong Entry Site, it is considered appropriate to adopt a conservative odour criterion of 4 OU for the receptors around Cooranbong Entry Site.

4.3 Summary of Project Air Quality Goals

The air quality goals adopted for this assessment, which confirm to current EPA and Federal air quality criteria, are summarised in **Table 15**.

Table 15 Project Air Quality Goals

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m ³ (NSW EPA)
PM ₁₀	24 Hours	50 µg/m ³ (NSW EPA)
	Annual	30 µg/m ³ (NSW EPA)
	Annual	20 µg/m ³ (WHO)
PM _{2.5}	24 Hours	25 µg/m ³ (NEPM interim <u>advisory</u> reporting standard only)
	Annual	8 µg/m ³ (NEPM interim <u>advisory</u> reporting standard only)
		10 µg/m ³ (WHO)
Dust Deposition	Annual	Maximum Incremental (Project only) increase of 2 g/m ² /month
		Maximum Total of 4 g/m ² /month (Project and other sources)
Odour	1-hour	2 OU (99 th percentile) – receptors around Newstan Colliery Surface Site
		4 OU (99 th percentile) – receptors around Cooranbong Entry Site

Source: Approved Methods, NSW DEC 2005, WHO 2005.

5 EMISSIONS ESTIMATION

This section describes the various components of the Project (**Section 5.1**), the methodology used to estimate emissions (**Section 5.3**), the activity data used in the emissions estimation (**Section 5.4**) and the respective emissions inventory (**Section 5.5**).

5.1 Emission Sources

A summary of the emission sources assessed in this assessment is shown in **Table 16**.

Table 16 Summary of the Emission Sources Assessed

	Emission Sources	Pollutants	Controls (Efficiency)
Newstan Colliery Surface Site			
Paved haul roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Front end loader (FEL) on Coal	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer on Coal	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Coal bins	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Loading trains	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Unloading from stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Miscellaneous transfer points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed (70%)
Coal processing plant	Process emissions	TSP, PM ₁₀ , PM _{2.5}	Enclosed (100%)
Northern rejects emplacement area (NREA)			
Bulldozer at NREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Reject dumping at NREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Southern rejects emplacement area (SREA)			
Bulldozer at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Excavators at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water sprays (50%)
Reject dumping at SREA	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Controls
Ventilation fans	Process emissions	TSP, PM ₁₀ , PM _{2.5} Odour	No Control
Private Haul Roads (Paved)			
Newstan-Eraring private haul road	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Cooranbong private haul road	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Awaba private haul road	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control

	Emission Sources	Pollutants	Controls (Efficiency)
Hawkmount Quarry			
Reject dumping	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Open Area	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control
Cooranbong Entry Site			
Front end loader (FEL)	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Bulldozer	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Coal stockpiles	Wind erosion	TSP, PM ₁₀ , PM _{2.5}	No Control
Loading stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	No Control
Internal Paved Haul Roads	Wheel generated dust	TSP, PM ₁₀ , PM _{2.5}	No Control
Unloading from Stockpiles	Material handling	TSP, PM ₁₀ , PM _{2.5}	Water Sprays at Stockpile A – 50%
Miscellaneous Transfer Points (including conveying)	Material handling	TSP, PM ₁₀ , PM _{2.5}	Enclosed – 70%
Ventilation fans	Process emissions	TSP, PM ₁₀ , PM _{2.5} Odour	No Control

5.2 Operational Scenarios Assessed

As discussed in **Section 2.4.4**, coal from Cooranbong Entry Site will be transported to either Newstan Colliery Surface Site or EPS depending on demand and other site specific factors.

In order to assess the worst case impacts from the Project, a total of ten modelling scenarios have been assessed in this study.

- eight scenarios associated with the operations at the Newstan Colliery Surface Site and
- two scenarios associated with the operations at the Cooranbong Entry Site.

A description of the eight scenarios assessed for the Newstan Colliery Surface Site as part of this study is shown in **Table 17**. A description of the two scenarios assessed for the Cooranbong Entry Site as part of this study is shown in **Table 18**.

Table 17 Summary of the Operational Scenarios Modelled – Newstan Colliery Surface Site

Scenario	Newstan Colliery Surface Site	Private Haul Roads	Hawkmount Quarry	Purpose of this Scenario
Scenario 1	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 4 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Trucks dumping coal at rail loop stockpile Manual train loading using FELs	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 4 Mtpa of coal using current infrastructure and handling operations at the Newstan Colliery Surface Site
Scenario 2a	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 6 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Trucks dumping coal at rail loop stockpile Manual train loading using FELs	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 6 Mtpa of coal using current infrastructure and handling operations at the Newstan Colliery Surface Site
Scenario 2b	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 6 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Automation of coal transfer from CPP to rail loop stockpile Manual train loading using FELs	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 6 Mtpa of coal using new infrastructure at the Newstan Colliery Surface Site: Automation of coal transfer from CPP to rail loop stockpile
Scenario 2c	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 6 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Trucks dumping coal at rail loop stockpile Automation of train loading operations	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 6 Mtpa of coal using new infrastructure at the Newstan Colliery Surface Site: Automation of train loading operations
Scenario 3a	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 8 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Trucks dumping coal at rail loop stockpile Manual train loading using FELs	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 8 Mtpa of coal using current infrastructure and handling operations at the Newstan Colliery Surface Site
Scenario 3b	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 8 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Automation of coal transfer from CPP to rail loop stockpile Manual train loading using FELs	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 8 Mtpa of coal using new infrastructure at Newstan Colliery Surface Site: Automation of coal transfer from CPP to rail loop stockpile
Scenario 3c	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 8 Mtpa of coal by rail Trucks dumping coal at ROM stockpile Trucks dumping coal at rail loop stockpile Automation of train loading operations	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 8 Mtpa of coal using new infrastructure at Newstan Colliery Surface Site: Automation of train loading operations
Scenario 4	Receipt of 6 Mtpa of coal from the Cooranbong Entry Site Export of 8 Mtpa of coal by rail Trucks dumping coal at ROM dump hopper Trucks dumping coal at rail loop stockpile Automation of train loading operations	32 truck trips per hour between Newstan Colliery, Cooranbong Entry Site, EPS and Hawkmount Quarry	Reject dumping Bulldozer operations Wind erosion	To assess the impacts due to export of 8 Mtpa of coal using new infrastructure at Newstan Colliery Surface Site: Coal dumping at ROM hopper

Table 18 Summary of the Operational Scenarios Modelled – Cooranbong Entry Site

Scenario	Purpose of this Scenario
Scenario 5a	To assess the impacts due to the receipt and handling of 6 Mtpa of coal from the Mandalong Mine and the export of 6 Mtpa of coal to Newstan Colliery Surface Site by trucks
Scenario 5b	To assess the impacts due to the receipt and handling of 6 Mtpa of coal from the Mandalong Mine and the export of 6 Mtpa of coal to EPS by overland conveyor

5.3 Methodology

Particulate emissions from the operational activities have been calculated using default or calculated emission factors for the relevant emission sources. Emission factors were sourced from the National Pollutant Inventory (NPI) *Emission Estimation Technique Manual (EETM) for Mining* version 3.1 (DSEWPC 2012), or from the US EPA AP-42 Emission Factor Handbook (US EPA, 2006) where suitable factors do not exist within the NPI documentation.

The NPI *EETM for Mining* (DSEWPC 2012) and US EPA AP 42 contain emission factors for TSP and PM₁₀. No emission factors for PM_{2.5} are provided within the NPI *EETM for Mining* and only limited emission factors for PM_{2.5} are provided in US EPA AP 42.

Limited research has been undertaken to assess the fraction of PM₁₀ from the wide range of sources which would be emitted as PM_{2.5}. Research has been conducted by the Midwest Research Institute (MRI) on behalf of the Western Regional Air Partnership (WRAP) with findings published within the document entitled '*Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors*' (MRI 2006). This document provides six proposed PM_{2.5}/PM₁₀ ratios for fugitive dust source categories as presented in **Table 19**.

Table 19 Proposed Particle Size Ratios for AP-42

Fugitive Dust Source	AP-42 Section	Proposed PM _{2.5} /PM ₁₀ Ratio
Paved roads	13.2.1	0.15
Unpaved roads (public & industrial)	13.2.2	0.1
Aggregate handling and storage piles	13.2.4	0.1
Industrial wind erosion	13.2.5	0.15
Agricultural tilling	-	0.2
Open area wind erosion	-	0.15

The PM_{2.5} / PM₁₀ ratios presented in **Table 19** have been used within this assessment to calculate the emissions of PM_{2.5} attributable to the Project operations. The most appropriate ratio has been applied to each of the sources.

The emission factors used for the estimation of TSP, PM₁₀ and PM_{2.5} emissions from the operational activities are presented in **Table 20**.

Table 20 Summary of Emission Factors Used to Estimate Emissions

Activity	Emission Factor Equation	Units	Variables	Source of Emission Factor	Controls (Efficiency)
Newstan Colliery					
Trucks dumping coal	$EF = k \times 0.0016 \times \frac{U^{1.3}}{\frac{2.2}{M^{1.4}}}$	kg/t	k = 0.74 (TSP) k = 0.35 (PM ₁₀) k = 0.053 (PM _{2.5}) U = mean wind speed (m/s) M = Moisture content (%)	USEPA 2006	Hood (unknown) and Water sprays (50%)
FEL/Excavator on coal	$EF_{TSP} = \frac{0.580}{M^{1.2}}$ $EF_{PM_{10}} = \frac{0.0441}{M^{0.9}}$ $EF_{PM_{2.5}} = 0.1 \times EF_{PM_{10}}$	kg/t	M = Moisture content (%)	DSEWPC 2012 MRI 2006	No controls
Bulldozer on coal	$EF_{TSP} = 35.6 \times \frac{s^{1.2}}{M^{1.4}}$ $EF_{PM_{10}} = 6.33 \times \frac{s^{1.5}}{M^{1.4}}$ $EF_{PM_{2.5}} = 0.1 \times EF_{PM_{10}}$	kg/h/vehicle	s=silt content (%) M=Moisture content (%)	DSEWPC 2012 MRI 2006	No controls
Coal stockpiles	$EF_{TSP} = 0.4$ $EF_{PM_{10}} = 0.2$ $EF_{PM_{2.5}} = 0.15 \times EF_{PM_{10}}$	kg/ha/h	-	DSEWPC 2012 MRI 2006	Water sprays (50%)
Miscellaneous Transfer Points (including conveying)	$EF = k \times 0.0016 \times \frac{U^{1.3}}{\frac{2.2}{M^{1.4}}}$	kg/t	k = 0.74 (TSP) k = 0.35 (PM ₁₀) k = 0.053 (PM _{2.5}) U = mean wind speed (m/s) M = Moisture content (%)	DSEWPC 2012 USEPA 2006	Enclosed (70%)
Loading trains	$EF_{TSP} = 0.0004$ $EF_{PM_{10}} = 0.00017$	kg/t	-	NPI EETM v3.1	Enclosed (70%)
Loading stockpiles	$EF_{TSP} = 0.004$ $EF_{PM_{10}} = 0.0017$ $EF_{PM_{2.5}} = 0.1 \times EF_{PM_{10}}$	kg/t	-	DSEWPC 2012 MRI 2006	Water sprays (50%)

Activity	Emission Factor Equation	Units	Variables	Source of Emission Factor	Controls (Efficiency)
Unloading from stockpiles	$EF_{TSP} = 0.004$ $EF_{PM10} = 0.0017$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/t	-	DSEWPC 2012 MRI 2006	Water sprays (50%)
Coal processing plant (primary crusher + screening)	$EF_{TSP} = 0.01$ $EF_{PM10} = 0.004$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/t	-	DSEWPC 2012 MRI 2006	Enclosed (100%)
Ventilation fans	$EF_{TSP} = 0.99$ $EF_{PM10} = 0.16$ $EF_{PM2.5} = 0.17$ $EF_{Odour} = 30,282$	g/s OU.m ³ /s	-	SLR 2012c SLR 2012b	No controls
Cooranbong Entry Site-					
Excavator / Front End Loader on coal	$EF_{TSP} = \frac{0.580}{M^{1.2}}$ $EF_{PM10} = \frac{0.0441}{M^{0.9}}$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/t	M = Moisture content (%)	DSEWPC 2012 MRI 2006	No controls
Bulldozer on coal	$EF_{TSP} = 35.6 \times \frac{s^{1.2}}{M^{1.4}}$ $EF_{PM10} = 6.33 \times \frac{s^{1.5}}{M^{1.4}}$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/h/vehicle	s=silt content (%) M=Moisture content (%)	DSEWPC 2012 MRI 2006	No controls
Loading Stockpiles	$EF_{TSP} = 0.004$ $EF_{PM10} = 0.0017$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/t	-	DSEWPC 2012 MRI 2006	No controls
Unloading from Stockpiles	$EF_{TSP} = 0.004$ $EF_{PM10} = 0.0017$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/t	-	DSEWPC 2012 MRI 2006	Water Sprays at Stockpile A – 50%
Miscellaneous Transfer Points	$EF = k \times 0.0016 \times \frac{U^{1.3}}{M^{1.4}}$	kg/t	k = 0.74 (TSP) k = 0.35 (PM ₁₀) k = 0.053 (PM _{2.5}) U = mean wind speed (m/s) M = Moisture content (%)	DSEWPC 2012 USEPA 2006	Enclosed (70%)

Activity	Emission Factor Equation	Units	Variables	Source of Emission Factor	Controls (Efficiency)
Wind Erosion	$EF_{TSP} = 0.4$ $EF_{PM10} = 0.2$ $EF_{PM2.5} = 0.15 \times EF_{PM10}$	kg/ha/h	-	DSEWPC 2012 MRI 2006	Water sprays (50%)
Ventilation fans	$EF_{TSP} = 0.99$ $EF_{PM10} = 0.16$ $EF_{PM2.5} = 0.17$ $EF_{Odour} = 30,282$	g/s OU.m ³ /s	-	SLR 2012c SLR 2012b	No controls
Hawkmount Quarry					
Trucks dumping rejects	$EF = k \times 0.0016 \times \frac{U^{1.3}}{M^{1.4}}$	kg/t	k = 0.74 (TSP) k = 0.35 (PM ₁₀) k = 0.053 (PM _{2.5}) U = mean wind speed (m/s) M = Moisture content (%)	USEPA 2006	Hood (unknown) and Water sprays (50%)
Bulldozer on rejects	$EF_{TSP} = 35.6 \times \frac{s^{1.2}}{M^{1.4}}$ $EF_{PM10} = 6.33 \times \frac{s^{1.5}}{M^{1.4}}$ $EF_{PM2.5} = 0.1 \times EF_{PM10}$	kg/h/vehicle	s=silt content (%) M=Moisture content (%)	DSEWPC 2012 MRI 2006	No controls
Open areas	$EF_{TSP} = 0.4$ $EF_{PM10} = 0.2$ $EF_{PM2.5} = 0.15 \times EF_{PM10}$	kg/ha/h	-	DSEWPC 2012 MRI 2006	No controls
Private Haul Roads					
Wheel generated dust from paved roads	$EF = k \times sL^{0.91} \times W^{1.02}$	kg/VKT	UESPA 2011	k = 3.23 (TSP) k = 0.62 (PM ₁₀) k = 0.15 (PM _{2.5}) sL = silt loading (g/m ²) W = average weight of the vehicles traveling the road (tonnes)	No controls

Note: The relevant sources are included/excluded as appropriate for each scenario discussed in **Section 5.2**.

5.4 Activity Rates

5.4.1 Ventilation Fans

Actual measurements of the particulate and odour emissions from the ventilation fans at Newstan Colliery Surface Site and Cooranbong Entry Site were not performed.

However, particulate and odour monitoring was conducted at the Mandalong Mine Access Site. For the purpose of this assessment, the results of the monitoring of the ventilation fans at the existing Mandalong Mine Access Site have been adopted to assess potential impacts from the existing ventilation fans at the Newstan Colliery Surface Site and Cooranbong Entry Site which will be operating under similar conditions, such as:

- proposed mining will be carried out in similar geological conditions to those currently experienced at the existing Mandalong Mine, and
- similar underground mining equipment will be used.

Specifically, to estimate emissions from the gas ventilation fans, a monitoring program was conducted by SLR Consulting at the existing Mandalong Mine Access Site in June 2012 and August 2012 (SLR 2012a and SLR 2012b respectively). The pollutant emissions that were monitored were:

- TSP;
- PM₁₀;
- PM_{2.5}; and
- Odour.

5.4.2 Material Handling

Annual activity data for the proposed activities occurring as part of the Project are provided in **Table 21** for material handling operations.

Table 21 Proposed Annual Activity Data for Material Handling Operations – Scenario 1 to 4

Operation / Activity	Scenario 1 Activity Rate (Annual)	Scenario 2a Activity Rate (Annual)	Scenario 2b Activity Rate (Annual)	Scenario 2c Activity Rate (Annual)	Scenario 3a Activity Rate (Annual)	Scenario 3b Activity Rate (Annual)	Scenario 3c Activity Rate (Annual)	Scenario 4 Activity Rate (Annual)	Units	Notes
Newstan Colliery Surface Site – Incoming Coal from Mandalong Southern Extension Project										
Trucks dumping coal at ROM stockpile	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	0	tonnes	Maximum proposed rate
Trucks dumping coal at dump hopper	0	0	0	0	0	0	0	6,000,000		None
Newstan Colliery Surface Site – Incoming Coal from Newstan Underground Mine										
Conveyor from Newstan Drift to CPP module 2 (Newstan Coal)	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	tonnes	Assumed 90% of coal direct to CPP
Conveyor from Newstan Drift to Newstan Coal ROM Stockpile (Newstan Coal)	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	tonnes	Assumed 10% of coal to stockpile
Newstan Colliery Surface Site – Onsite Coal Movement for Mandalong Coal										
Dozer on ROM stockpile (push to reclaim tunnel)	876	876	876	876	876	876	876	876	hours	Assumed to be operating 10% of time during the year
ROM Coal from ROM Coal Stockpile to stacker	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	tonnes	Maximum proposed rate
ROM Coal from stacker to stockpile	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	tonnes	10% of coal going to stockpile
Conveyor to CPP Module 1	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	5,400,000	tonnes	90% of coal direct from stacker to CPP
Newstan Colliery Surface Site – Onsite Coal Movement for Underground Coal										
Conveyor drop onto Newstan ROM Stockpile (from underground)	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	tonnes	Assumed 10% of coal to stockpile
Conveyor drop to CPP Module 2	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	4,050,000	tonnes	Assumed 90% of coal direct to CPP
Newstan Colliery Surface Site – Onsite Coal Processing for Total Coal										
CPP Module 1 & CPP Module 2 & CHP-Crush/Screen/Wash	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000	tonnes	Maximum proposed rate
Newstan Colliery Surface Site – Outgoing Product Coal										
Trucks dumping coal to Rail loop stockpile	4,000,000	6,000,000	0	6,000,000	8,000,000	0	8,000,000	8,000,000	tonnes	None
Conveyor drop to Rail Loop Stockpile	0	0	6,000,000	0	0	8,000,000	0	0	tonnes	None
Conveyor to train loading bin	0	0	0	6,000,000	0	0	0	0	tonnes	None
Conveyor loading trains/trucks	0	0	0	6,000,000	0	0	0	0	tonnes	None
Dozer at Product Stockpile (Rail Loop)	2,920	4,380	4,380	4,380	5,840	5,840	5,840	5,840	hours	Assumed to operating 8 hours per day for the full year
Front End Loader 1 at Product Stockpile (Rail Loop) loading trains	1,333,333	2,000,000	2,000,000	0	2,666,666	2,666,666	0	0	tonnes	Assumed to be 1/3 rd of the total product coal
Front End Loader 2 at Product Stockpile (Rail Loop) loading trains	1,333,333	2,000,000	2,000,000	0	2,666,666	2,666,666	0	0	tonnes	Assumed to be 1/3 rd of the total product coal
Front End Loader 3 at Product Stockpile (Rail Loop) loading trains	1,333,333	2,000,000	2,000,000	0	2,666,666	2,666,666	0	0	tonnes	Assumed to be 1/3 rd of the total product coal
Newstan Colliery Surface Site – Reject Coal										
Reject from CPP loaded to bin	1,073,100	1,073,100	1,073,100	1,073,100	1,073,100	1,073,100	1,073,100	1,073,100	tonnes	Assumed 6 truckloads per hour, 35t truck payload and 14 hrs/day operation
Reject from CPP loaded to trucks	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum

Operation / Activity	Scenario 1 Activity Rate (Annual)	Scenario 2a Activity Rate (Annual)	Scenario 2b Activity Rate (Annual)	Scenario 2c Activity Rate (Annual)	Scenario 3a Activity Rate (Annual)	Scenario 3b Activity Rate (Annual)	Scenario 3c Activity Rate (Annual)	Scenario 4 Activity Rate (Annual)	Units	Notes
										total reject to SREA
Trucks dumping reject/stone material at SREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Dozer at SREA	1,752	1,752	1,752	1,752	1,752	1,752	1,752	1,752	hours	Assumed to operating 20% of time throughout the year
Excavator at SREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Excavator at SREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Excavator at SREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Traxcavator at SREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Compactor at SREA	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	hours	Operating hours are from 6am to 5pm Monday to Friday 10 hrs/day on overburden.
Trucks dumping reject material at NREA	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to SREA
Dozer at NREA	1,752	1,752	1,752	1,752	1,752	1,752	1,752	1,752	hours	Assumed to be operating 20% of the time throughout the year
Hawkmount Quarry										
Trucks dumping rejects	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	tonnes	Assumed to be maximum total reject to Hawkmount Quarry
Dozer at Hawkmount Quarry	1,022	1,022	1,022	1,022	1,022	1,022	1,022	1,022	hours	Assumed to be operating 20% of the time throughout the year

Table 22 Proposed Annual Activity Data for Material Handling Operations – Scenario 5a and 5b

	Scenario 5a	Units	Notes	Scenario 5b	Units	Notes
Cooranbong Entry Site						
Coal handled by FEL 1 at 100,000 t stockpile	503,700	tonnes	Assumed to be 115 t/hr; 24 hrs/day; 50% of the time throughout the year	0	tonnes	All coal transported to EPS
Coal handled by FEL 2 at 100,000 t stockpile	192,720	tonnes	Assumed to be 110 t/hr; 24 hrs/day; 20% of the time throughout the year	0	tonnes	All coal transported to EPS
Coal handled by FEL at stockpile 3000 t stockpile	876,000	tonnes	Assumed to be 400 t/hr; 24 hrs/day; 25% of the time throughout the year	876,000	tonnes	All coal transported to EPS
Bulldozer on 100,000 t stockpile	208	hours	Assumed to be operating 4 hours/week, 52 weeks per year	0	hours	All coal transported to EPS
Loading 100,000 t stockpile	1,740,000	tonnes	Assumed to be total 29% loaded from stockpile A	0	tonnes	All coal transported to EPS
Loading 3000 t stockpile	876,000	tonnes	Assumed to be 400 t/hr; 24 hrs/day; 25% of the time throughout the year	876,000	tonnes	All coal transported to EPS
Unloading 100,000 t stockpile	1,740,000	tonnes	Assumed to be 29% loaded from stockpile A	0	tonnes	All coal transported to EPS
Unloading 3000 t stockpile	876,000	tonnes	Assumed to be 400 t/hr; 24hrs/day; 25% of the time throughout the year	876,000	tonnes	All coal transported to EPS
South drift conveyor	6,000,000	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS
2000t ROM Coal bin	0	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS
250t Raw coal bin	0	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS
1200t truck loading bin	4,260,000	tonnes	Assumed to be 71% of the coal loaded from truck loading bin	0	tonnes	All coal transported to EPS

	Scenario 5a	Units	Notes	Scenario 5b	Units	Notes
Cooranbong Entry Site						
Final product bin	0	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS
Screen/rotary breakers	0	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS
Crushing plant	0	tonnes	Maximum proposed production from Mandalong Mine	6,000,000	tonnes	All coal transported to EPS

5.4.3 Wheel Generated Dust

The Project proposes the continued use of the existing private haul roads that link Newstan Colliery Surface Site, Awaba Colliery Surface Site, Cooranbong Entry Site, Hawkmount Quarry and Eraring Power Station.

The length of each haul road is presented in **Table 23** with information on the haul road width, annual use and mean vehicle weight.

Table 23 Details of Haul Roads

Haul Road	Length (m)	Width (m)	One Way Trips per Hour	Vehicle Kilometres Travelled (VKT) per Year ¹	Mean Vehicle Weight (tonnes)
Newstan Colliery Surface Site					
Not Applicable ²					
Cooranbong Entry Site					
Haul roads within the site	800	8	16	224,256	50
Hawkmount Quarry					
Not Applicable					
Private Haul Roads					
Cooranbong private haul road	3,400	8	16	953,088	50
Newstan-Eraring private haul road	13,000	8	16	3,644,160	50
Awaba private haul road	700	8	16	196,224	50

¹ The calculated VKTs are based on 16 trucks per hour, operating for 24 hours per day and 365 days per year.

² The haul roads within the Newstan Colliery have been incorporated as part of the Newstan – Eraring private haul road

5.4.4 Wind Erosion

Several areas at Newstan Colliery Surface Site, Cooranbong Entry Site and Hawkmount Quarry are considered as potential wind erosion sources following upgrade and are presented in **Table 24**.

Table 24 Annual Activity Data for Wind Erosion Sources

Open Area	Total Area (ha)	Active Area (ha)
Newstan Colliery Surface Site		
ROM coal stockpile	0.8	0.8
Proposed Product stockpile (North)	2.2	2.2
Proposed Product stockpile (South)	2.4	2.4
Train wagon surface	0.4	0.4
Southern Reject Emplacement Area (SREA)	57	45
Northern Reject Emplacement Area (NREA)	37	8

Cooranbong Entry Site		
100,000 tonne stockpile	0.65	0.65
3,000 tonne stockpile)	0.09	0.09
1,500 tonne stockpile)	0.05	0.05
Hawkmount Quarry		
Hawkmount Quarry open area	2.8	2.8

5.5 Emissions Inventory

A summary of the emissions inventory for all scenarios at Newstan Colliery Surface Site and Cooranbong Entry Site is shown in **Figure 10** and **Figure 11** respectively.

A summary of the emissions inventory for the private haul roads and Hawkmount Quarry is shown in **Figure 12**.

A detailed emission inventory can be found in **Appendix A**.

Figure 10 A Summary of the Particulate Emissions from All Scenarios – Newstan Colliery Surface Site

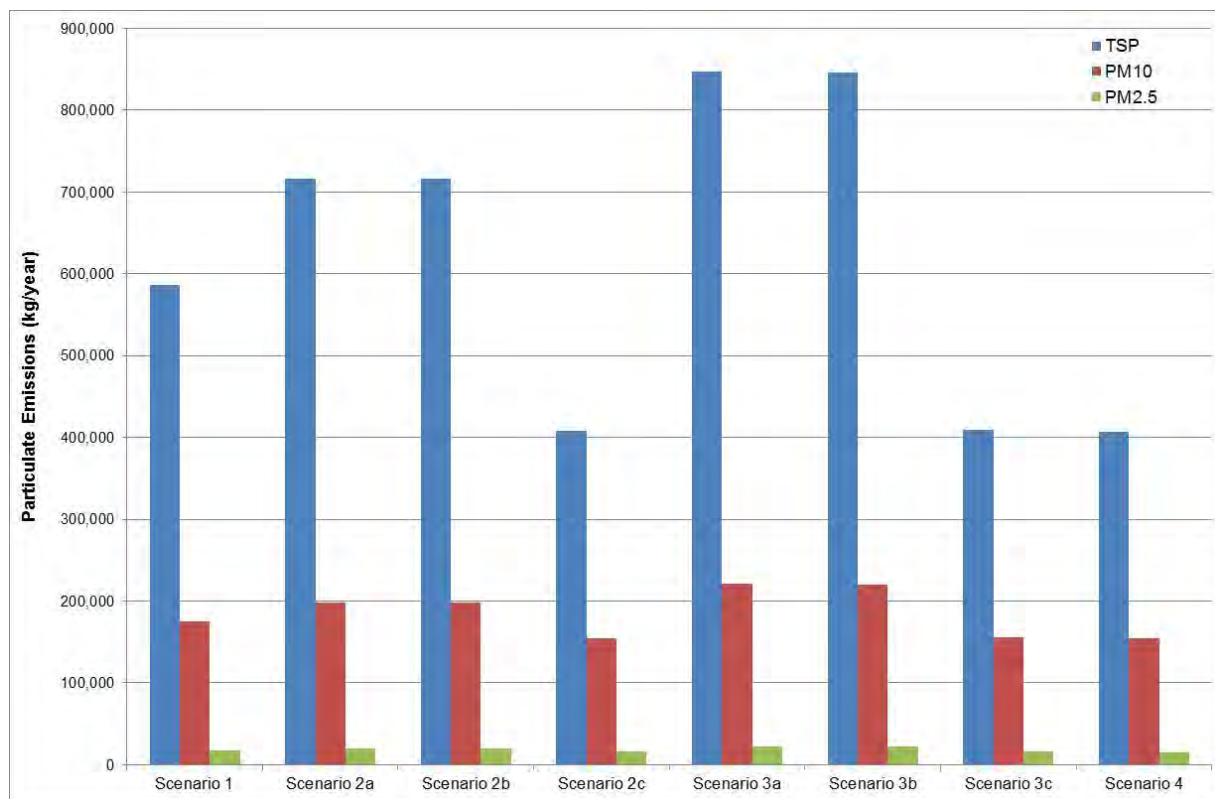


Figure 11 A Summary of the Particulate Emissions from All Scenarios – Cooranbong Entry Site

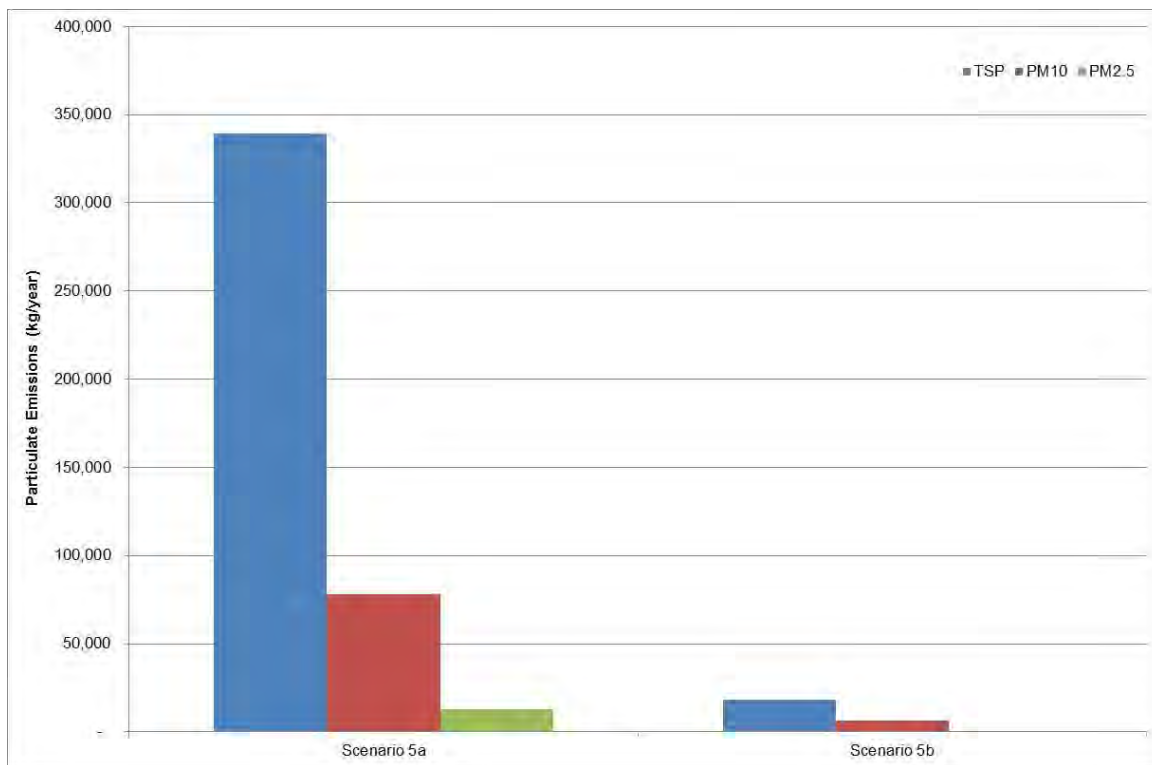
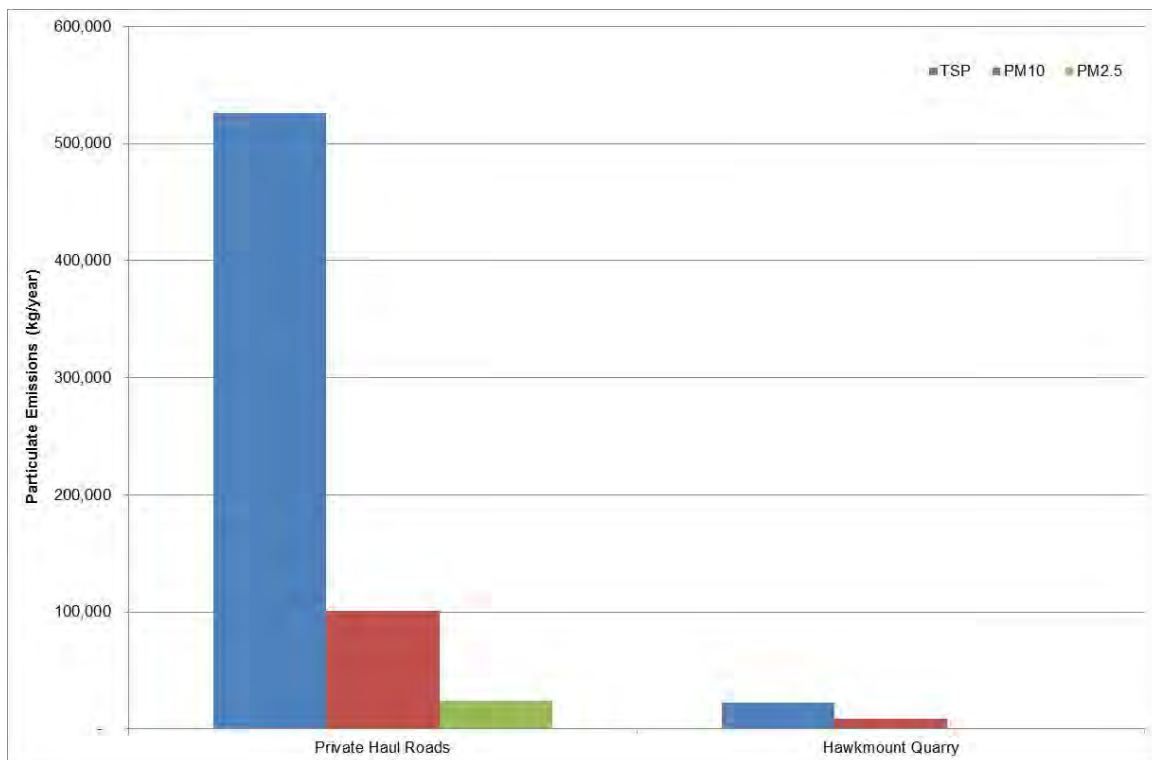


Figure 12 A Summary of the Particulate Emissions from Private Haul Roads and Hawkmount Quarry



Ventilation Fans

The monitored emissions from ventilation fans (SLR 2012b) are shown in **Table 25**. It is noted that the emissions from the existing Mandalong Mine Access Site are adopted for the emissions from the ventilation fans at the Newstan Colliery Surface Site and the Cooranbong Entry Site. .

Table 25 Monitored Pollutant Emissions from the Ventilation Fans at existing MMAS

Pollutant	Emission Rate	Units
TSP ¹	0.99	g/s
PM ₁₀ ¹	0.16	g/s
PM _{2.5} ¹	0.17	g/s
Odour ²	30,282	OU.m ³ /s

¹ Source: SLR 2012b

² Source: SLR 2012a, the average of three samples is adopted as the odour emission rate.

6 AIR DISPERSION MODELLING METHODOLOGY

6.1 Model Selection

Emissions from the Project operations have been modelled using the US EPA's CALPUFF (Version 6.267) modelling system. CALPUFF is a transport and dispersion model that ejects "puffs" of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so it typically uses the fields generated by a meteorological pre-processor CALMET, discussed further below. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period. The primary output files from CALPUFF contain either hourly concentration or hourly deposition fluxes evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

The advantages of using CALPUFF (rather than using a steady state Gaussian dispersion model such as AUSPLUME) is its ability to handle calm wind speeds (<0.5 m/s) and the effects of complicated terrain on plume dispersion. Steady state models assume that meteorology is unchanged by topography over the modelling domain and may result in significant over or under estimation of air quality impacts.

More advanced dispersion models (such as CALPUFF) are approved for use by many regulatory authorities in situations where these models may be more appropriate than use of the AUSPLUME model. Such situations include those noted above (i.e. high frequency of calm wind conditions and/or complicated terrain).

6.2 Meteorological Modelling

6.2.1 Meteorological Modelling Approach

To adequately characterise the dispersion meteorology of the Project Application Area, information is needed on the prevailing wind regime, ambient temperature, rainfall, relative humidity, mixing depth and atmospheric stability. The meteorology of the study area was characterised based on a 3-Dimensional prognostic meteorological dataset for the region surrounding the Project Application Area.

MM5

The three dimensional prognostic dataset generated by the Pennsylvania State University/National Centre for Atmospheric Research, or MM5, model was created and assimilated in the CALMET modelling process. The MM5 model is a prognostic mesoscale wind field model with four-dimensional data assimilation. CALMET's wind model allows MM5 generated data to be used as initial pseudo-observations (Scire *et al.*, 2006).

For this study, an MM5 meteorological dataset was obtained for a 120 km x 120 km domain for the 2006, 2007, 2008, 2009 and 2010 calendar years, centred over the study area, with a spatial grid resolution of 12 km. The model has 40 vertical levels, with the lowest level beginning at 11 m above ground level ranging to 3,500 m. The MM5 dataset contains the two-dimensional and three-dimensional parameters listed in **Table 26**.

Table 26 MM5 Dataset Parameters

Hourly 3-Dimensional Parameters	Hourly 2-Dimensional Parameters
Wind speed and direction	Sea-level pressure
Temperature	Rainfall amount
Pressure	Snow cover
Geopotential height	Short wave and long wave radiation at the surface
Vertical velocity	Air temperature and specific humidity at 2m
Relative humidity	Wind speed and direction at 10m
Mixing ratios for water vapour, cloud water, rain and other precipitation	Sea surface temperature

CALMET

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final wind field thus reflects the influences of local topography and land uses.

Table 27 details the parameters used in the meteorological modelling. No surface, upper air or buoy observations were used in the CALMET model ('No-Obs Mode' hereafter). This approach is recommended by NSW EPA (2010) as:

- No-Obs mode allows the important benefits of the non-steady-state approach in CALPUFF to be included in the dispersion modelling (e.g., spatially varying meteorology and dispersion, causality, recirculation, stagnation, pollutant build-up, fumigation, etc.);
- No-Obs mode makes use of three-dimensional, hourly prognostic meteorological data often available at high resolution to drive CALMET and CALPUFF;
- No-Obs mode greatly simplifies the preparation of the CALMET inputs because a large number of input variables dealing with observational data are not required and the difficulties of dealing with potentially incomplete observational datasets are eliminated;
- No-Obs mode provides a relatively straightforward approach that facilitates agency review and approval of the CALMET/CALPUFF simulations;

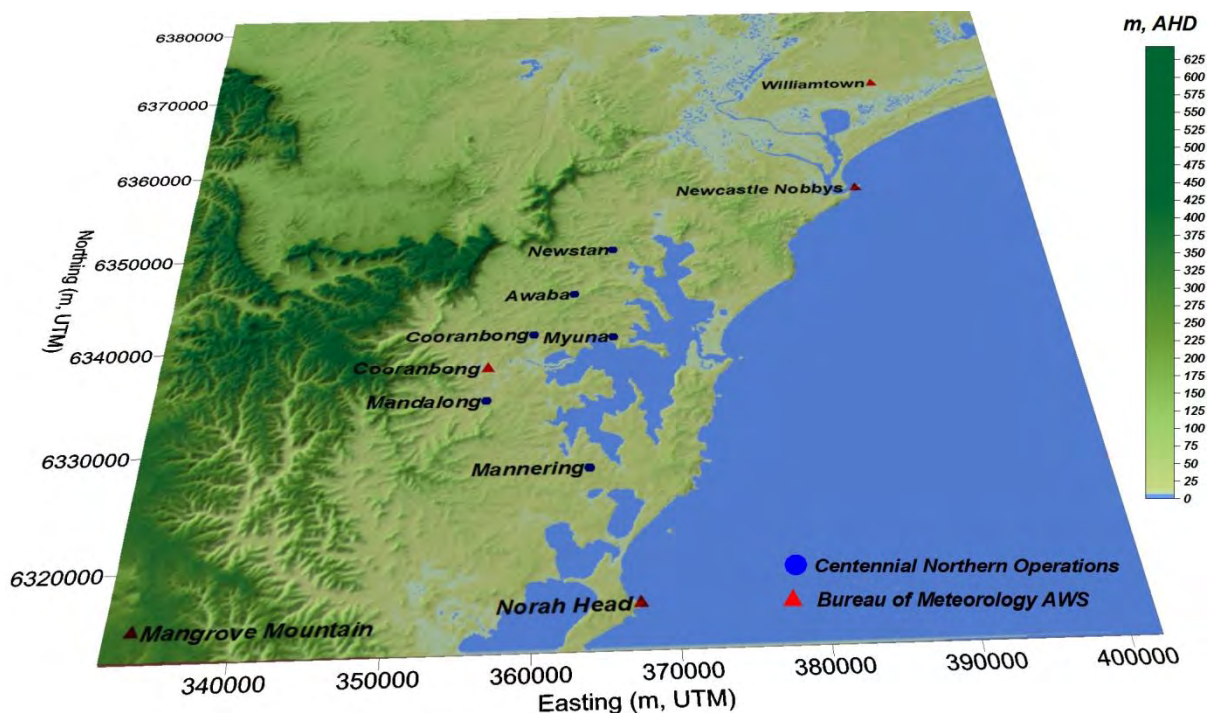
Table 27 CALMET Configuration Used for this Study

Meteorological grid domain	40 km x 40 km
Meteorological grid resolution	0.3 km
TERRAD Value	1.5 km
Vertical Resolution (Cell Heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1,200 m, 2,000 m, 3,000 m and 4,000m)
Modelling Years	2006, 2007, 2008, 2009 and 2010

6.2.2 Validation of Meteorological Modelling Approach

A validation of the meteorological modelling has been performed using data from the Bureau of Meteorology's (BoM's) Williamtown Automatic Weather Station (AWS), which is considered to be in a similar meteorological and topographical environment to the Centennial Northern Operations. The AWS at Williamtown (when compared to the coastal AWS of Newcastle Nobbys and Norah Head, and the inland Mangrove Mountain) is at a distance from the coast similar to that of the Centennial's northern operations. On this basis it is concluded that increased confidence in the ability of the CALMET model to represent the meteorology at Centennial's Northern Operations may be obtained if suitably accurate predictions can be shown to be made at the Williamtown RAAF AWS.

Figure 13 Locations of Centennial Northern Operations and Surrounding Bureau of Meteorology Automatic Weather Stations



A CALMET file has been generated for an area within a radius of 10 km from the BoM Williamtown RAAF AWS. All required inputs to CALMET including grid spacing, and switches including TERRAD, were set so as to be consistent between this validation run and those used in the generation of the meteorological field covering the operations of the Northern Coal Logistics Project. CALMET was run in 'No-Obs mode' with observational data from the BoM Williamtown RAAF AWS used as validation data.

It was concluded from the validation study (detailed study presented in **Appendix C**) that the CALMET model performed very well in representing the observed meteorological fields at Williamtown. Based on these findings it was concluded that, using the same parameters in modelling, it can be expected that the CALMET model would perform equally as well in predicting the meteorological fields over the area of the Project Site (and other Centennial Northern Operations).

6.2.3 Meteorological Data Used in Modelling

The Newstan Colliery Surface Site and Cooranbong Entry Site are separated by a distance of approximately 13 km. Even though the meteorological modelling domain provides an area sufficient to cover these sites, and it is acknowledged that the meteorological conditions experienced at both of these sites may be different, it is difficult to quantify both the 'meteorological sets' within this report. However, to provide an estimate of the predicted meteorological conditions which may be experienced at both sites, the modelled meteorological data 'extracted' at a point midway between the two sites (at Awaba Colliery Surface Site) is presented in this section.

It is noted that the meteorological dataset developed for use in this assessment has been compiled to provide a robust and conservative assessment of potential downwind impacts due to particulate and other pollutant emissions from activities occurring within the Project Application Area.

The factors considered in selecting the meteorological data for use in an air quality impact assessment can be considerably different to those that need to be considered when compiling data for a noise impact assessment. A full description of the differences between requirements for air quality and noise impact assessments is provided in **Section 6.2.5**.

Wind Speed and Direction

A summary of the annual wind behaviour predicted by CALMET for the Project for the years 2006, 2007, 2008, 2009 and 2010 are presented as wind roses in **Figure 14**, **Figure 15** and **Figure 16**, **Figure 17** and **Figure 18** respectively.

These wind roses indicate that the region predominantly experiences light to moderate (between 1.5 m/s and 8 m/s) winds with high speed winds (> 8m/s) prevailing for a low fraction of time during certain seasons and that the wind direction is seasonally dependent. Winds occur reasonably evenly from all quadrants except the west-northwest quadrant, from which winds occur infrequently. During autumn and winter, the region experiences a high percentage of winds from the west-northwest quadrant.

Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur just over 1% of the time during years 2006, 2007 and 2008, and less than 1% during years 2009 and 2010.

Figure 14 Annual Wind Roses for –Northern Coal Logistics Project (CALMET predictions, 2006)

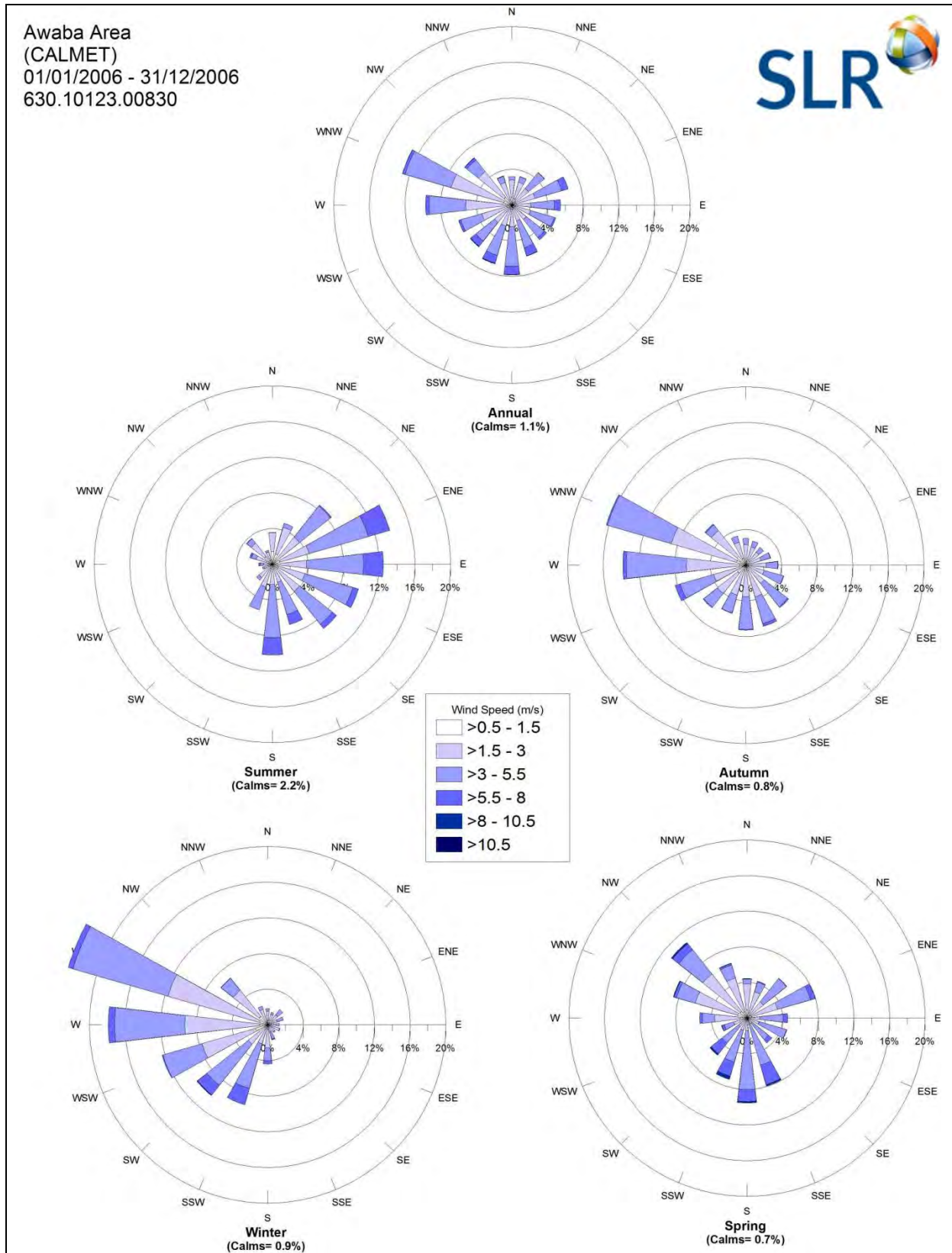


Figure 15 Annual Wind Roses for Northern Coal Logistics Project (CALMET predictions, 2007)

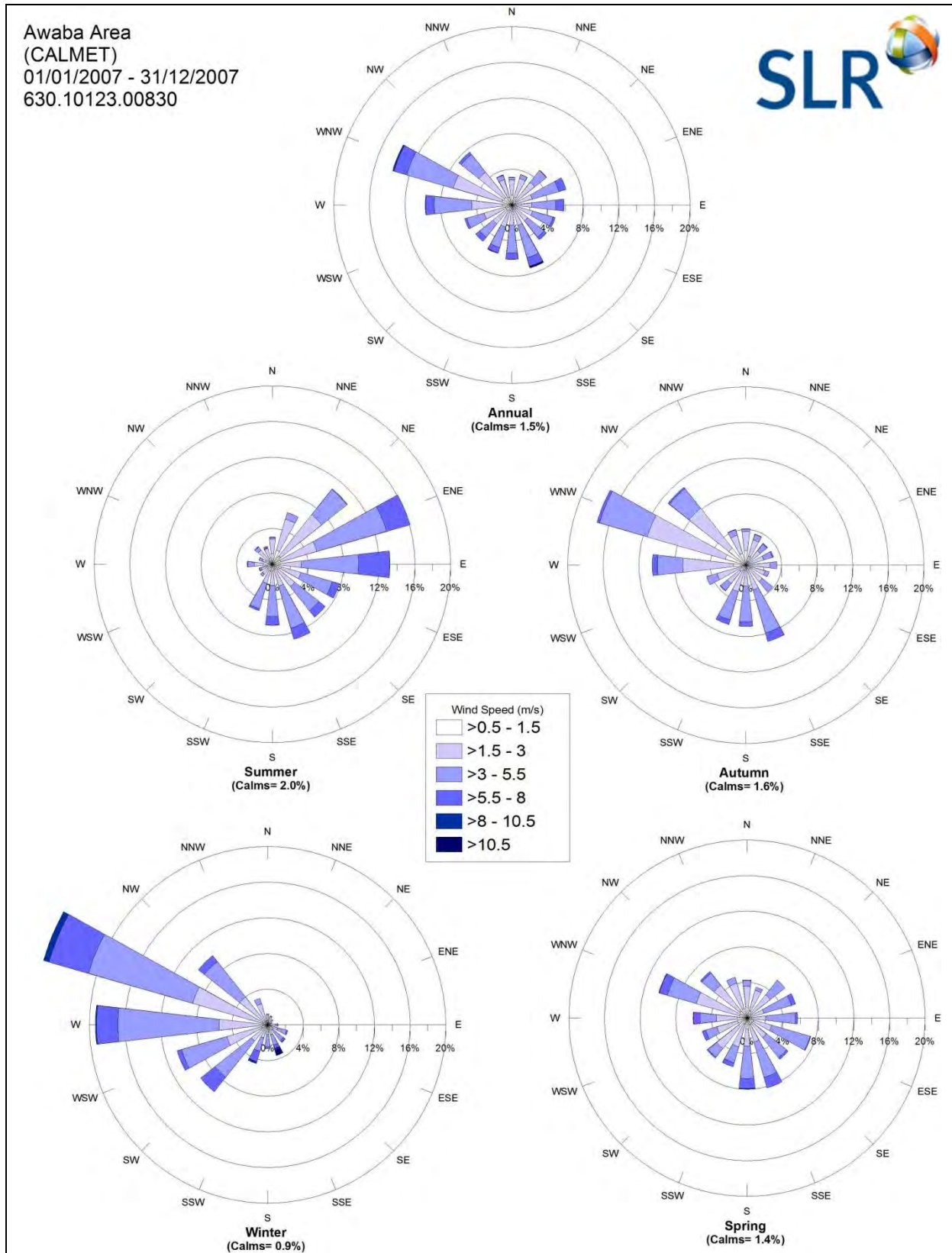


Figure 16 Annual Wind Roses for Northern Coal Logistics Project (CALMET predictions, 2008)

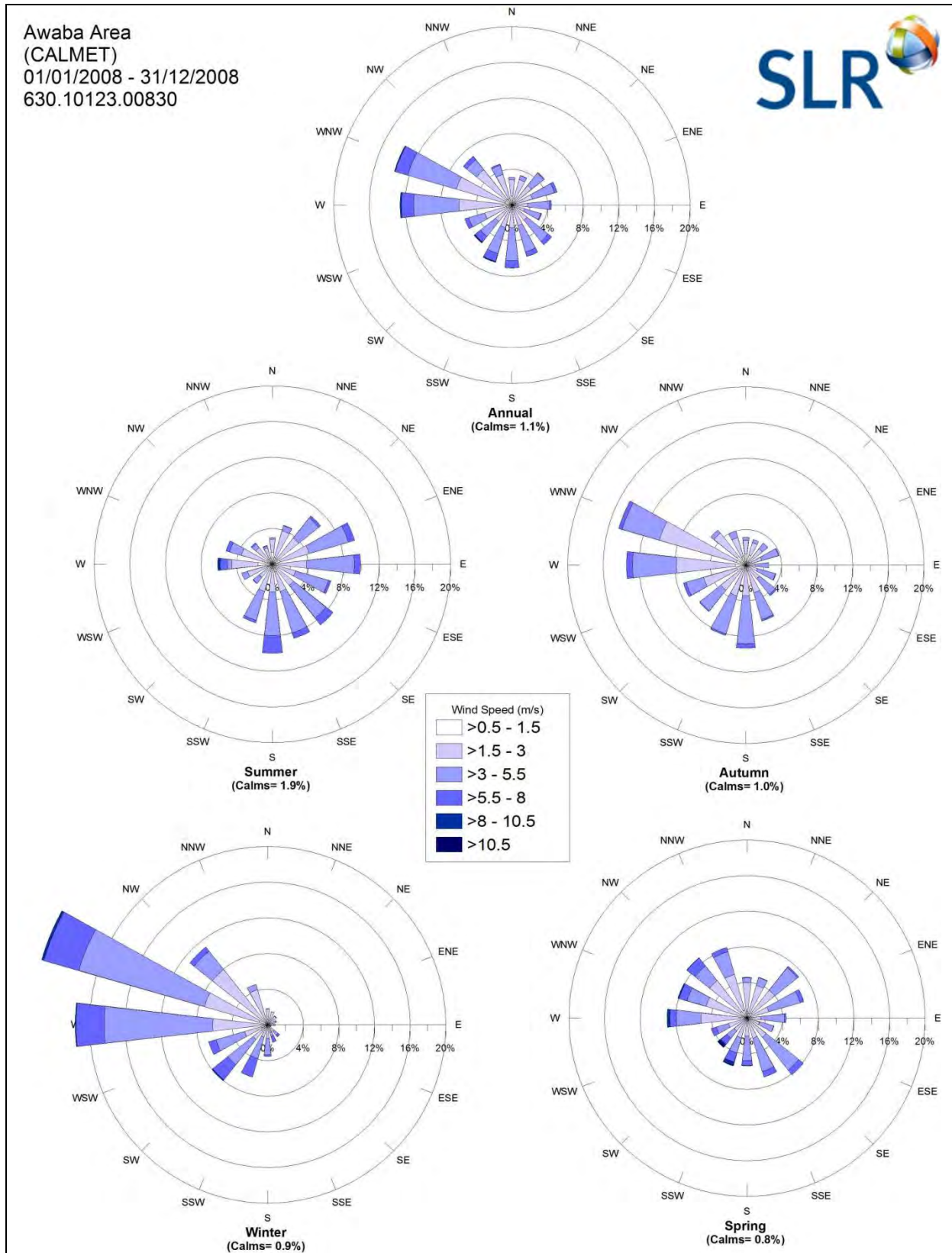


Figure 17 Annual Wind Roses for Northern Coal Logistics Project (CALMET predictions, 2009)

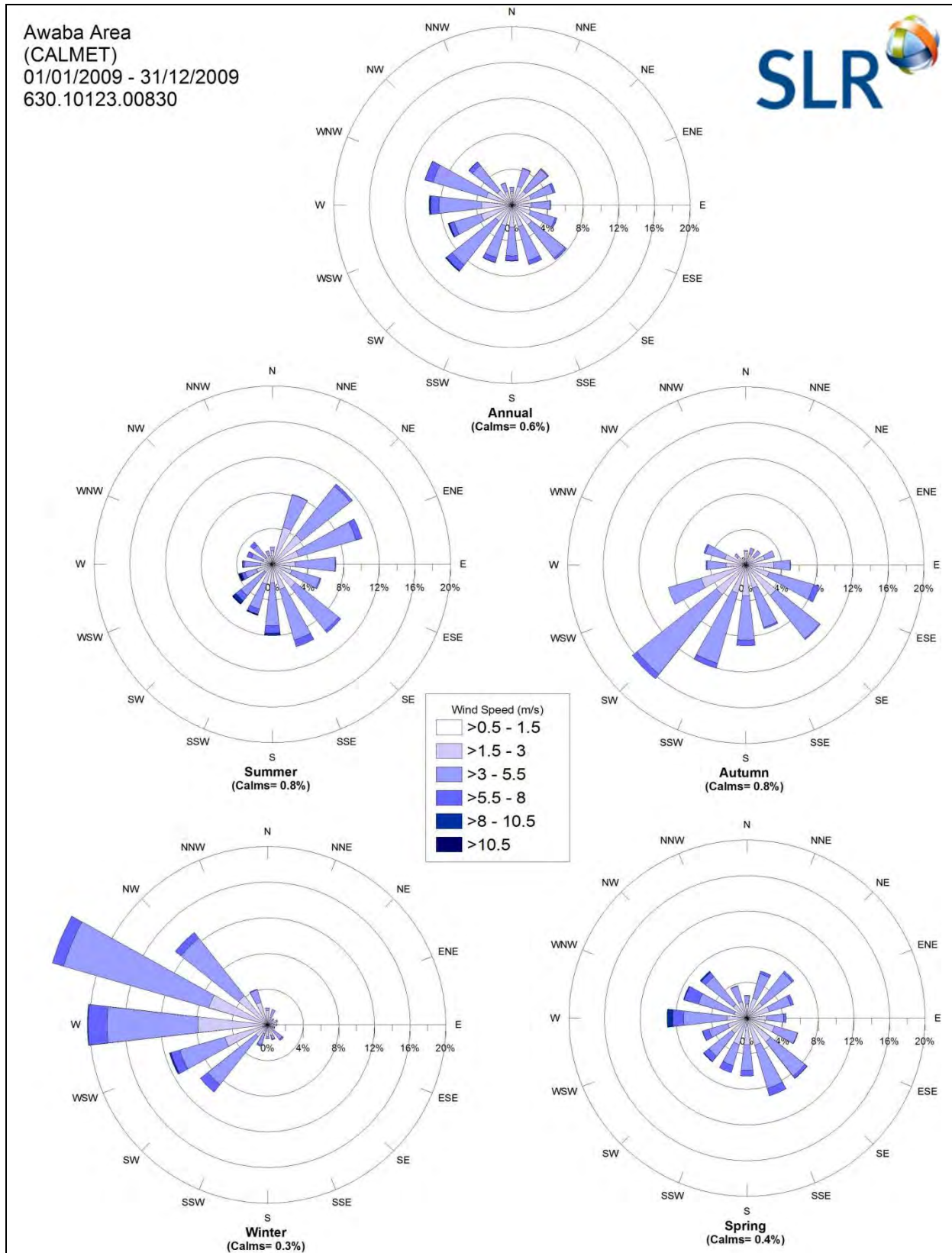
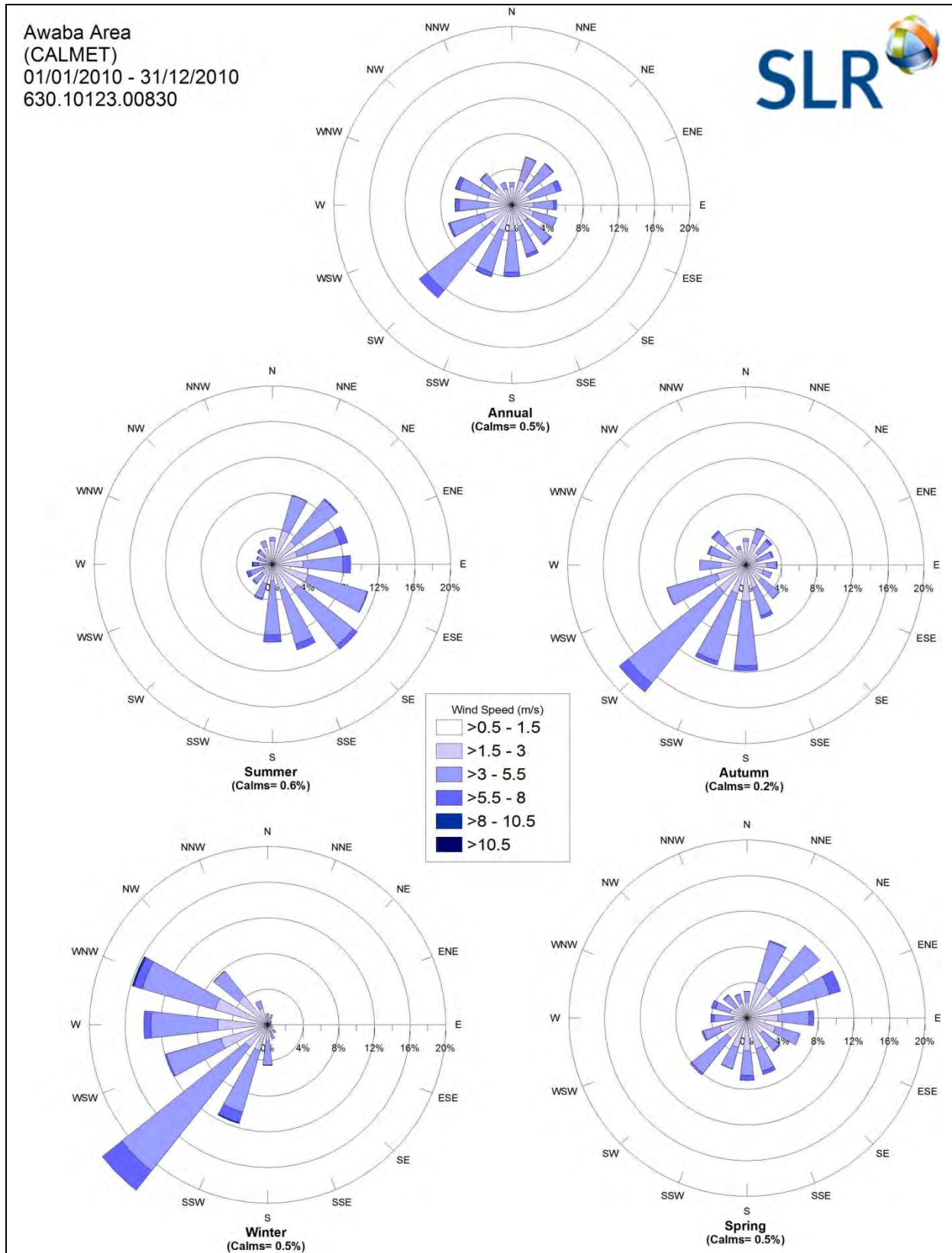


Figure 18 Annual Wind Roses for Northern Coal Logistics Project (CALMET predictions, 2010)



Atmospheric Stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Turner assignment scheme identifies six Stability Classes, A to F, to categorise the degree of atmospheric stability (see **Table 28**). These classes indicate the characteristics of the prevailing meteorological conditions and are used as input into various air dispersion models.

The frequency of each stability class predicted by CALMET in the area of the Awaba site during 2006, 2007, 2008, 2009 and 2010 is presented in **Figure 19**.

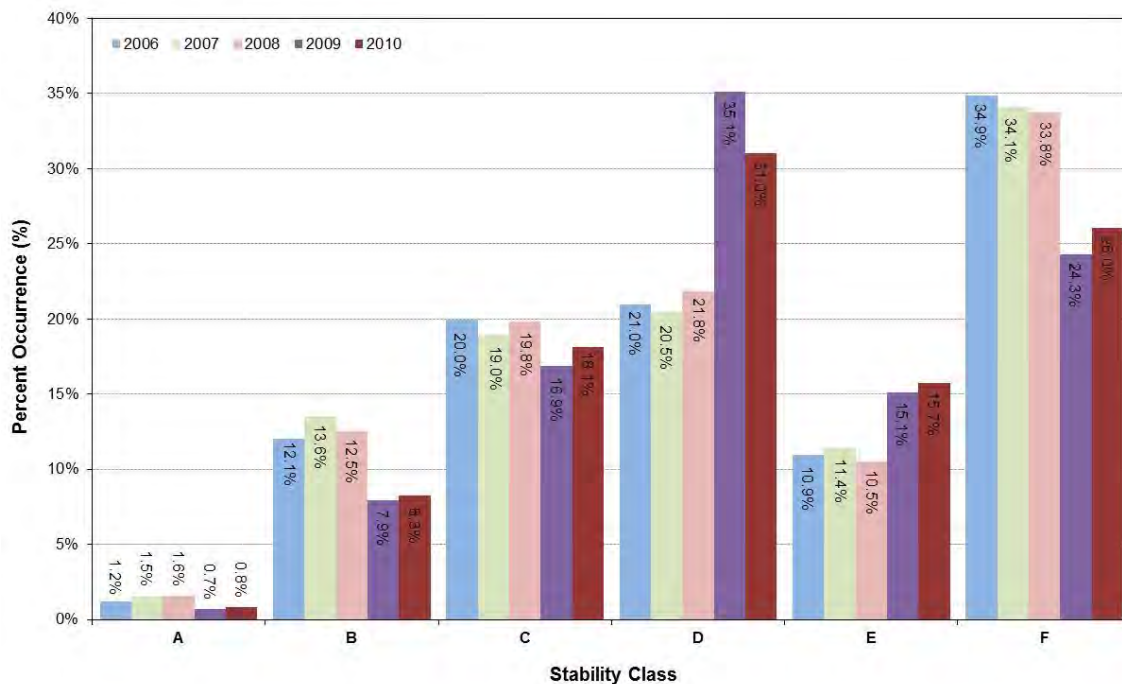
The results indicate a high frequency of conditions typical to Stability Class F. Stability Class F is indicative of very stable night time conditions, conducive to a low level of pollutant dispersion due to mechanical mixing. A similar trend in the stability classes during the years 2006 to 2010 is noted.

A higher percentage of stability class D is predicted for year 2009 and 2010. Stability Class D is indicative of neutral conditions, conducive to a moderate level of pollutant dispersion due to mechanical mixing.

Table 28 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Very unstable Low wind, clear skies, hot daytime conditions
B	Unstable Clear skies, daytime conditions
C	Moderately unstable Moderate wind, slightly overcast daytime conditions
D	Neutral High winds or cloudy days and nights
E	Stable Moderate wind, slightly overcast night-time conditions
F	Very stable Low winds, clear skies, cold night-time conditions

Figure 19 Stability Class Frequencies for Northern Coal Logistics Project (CALMET predictions, 2006-2010)



Mixing Heights

Diurnal variations in maximum and average mixing depths predicted by CALMET in the area of the Awaba site during 2006, 2007, 2008, 2009 and 2010 are illustrated in **Figure 20**, **Figure 21**, **Figure 22**, **Figure 23** and **Figure 24** respectively. As would be expected, an increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer. It is noted that a similar range of mixing heights is predicted for the years 2006, 2007, 2008, 2009 and 2010.

Figure 20 Mixing Heights for Northern Coal Logistics Project (CALMET predictions, 2006)

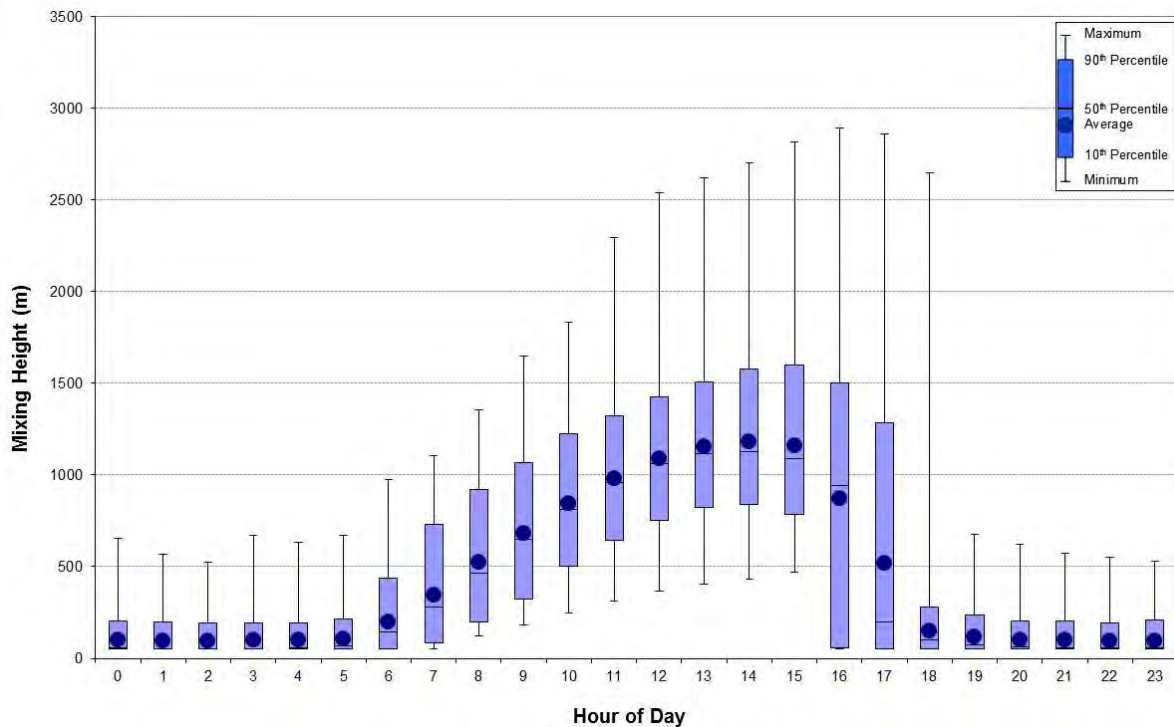


Figure 21 Mixing Heights for Northern Coal Logistics Project (CALMET predictions, 2007)

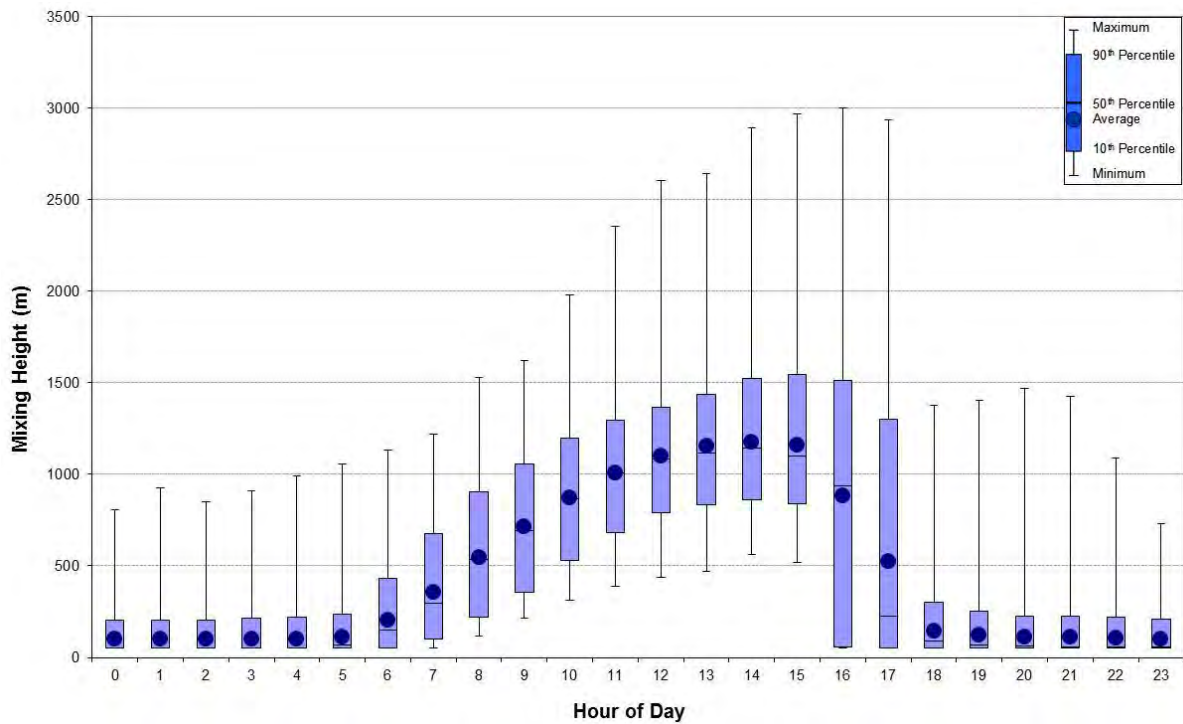


Figure 22 Mixing Heights for Northern Coal Logistics Project (CALMET predictions, 2008)

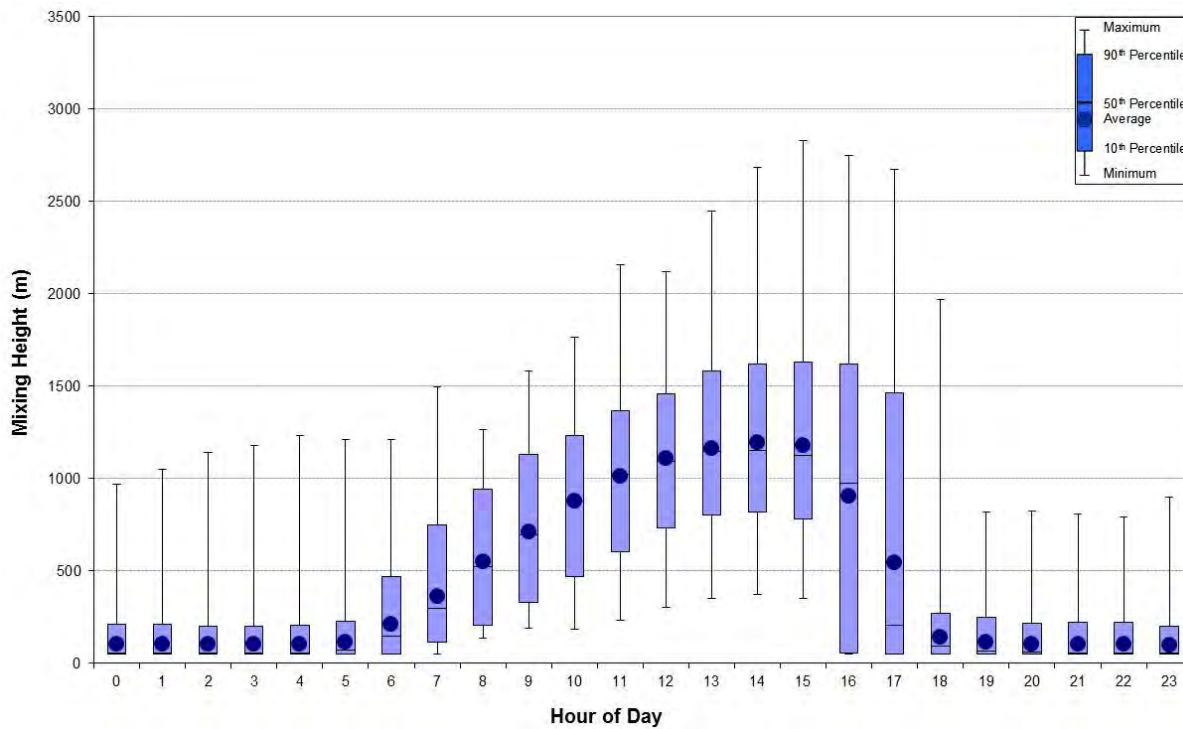


Figure 23 Mixing Heights for Northern Coal Logistics Project (CALMET predictions, 2009)

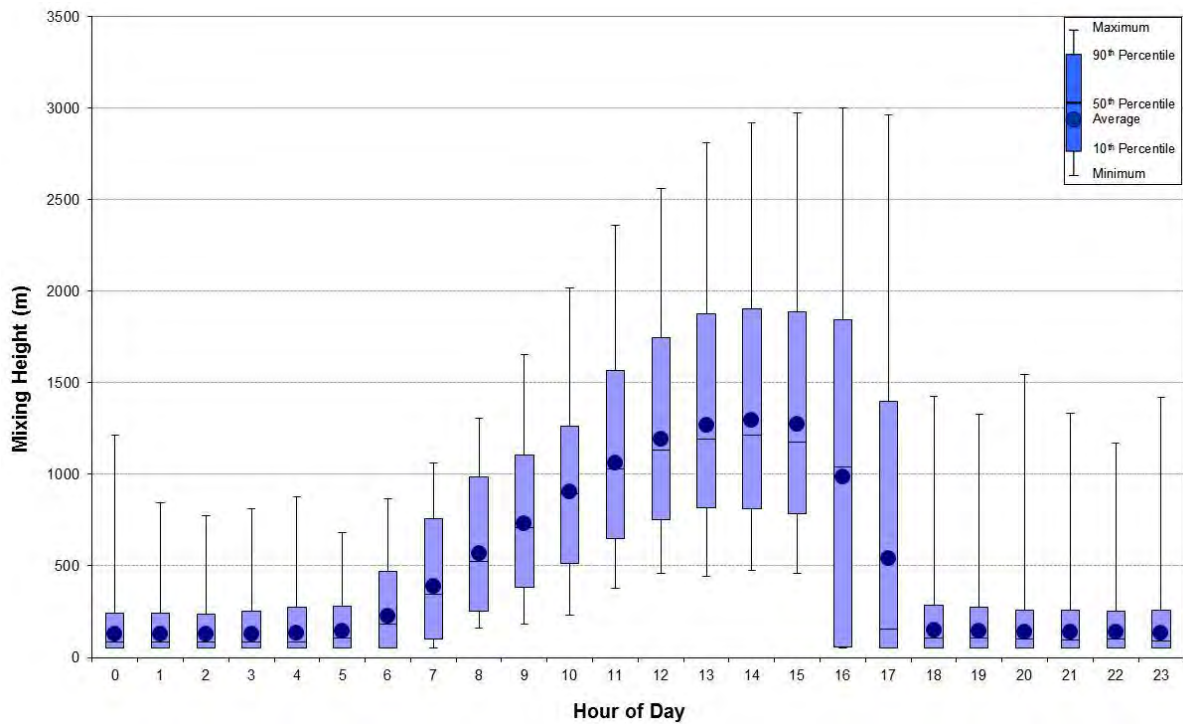
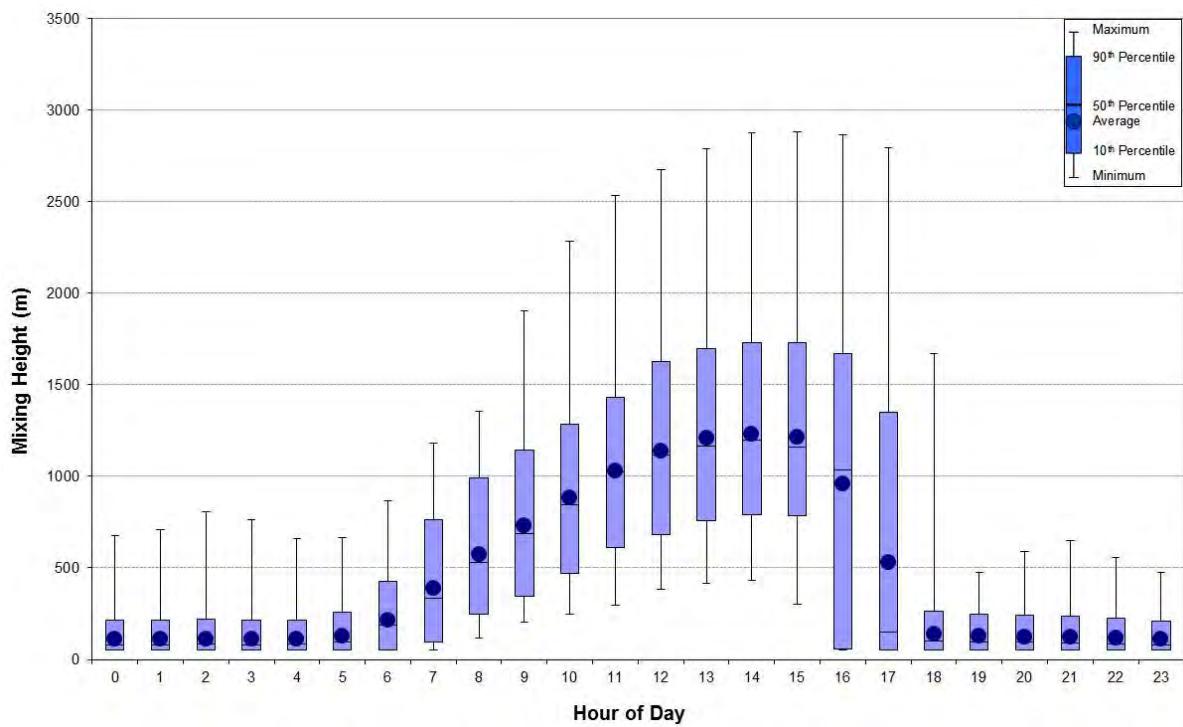


Figure 24 Mixing Heights for Northern Coal Logistics Project (CALMET predictions, 2010)



6.2.4 Meteorological Data Conclusion

The MM5 data generated by the Pennsylvania State University/National Centre for Atmospheric Research from was used for input into CALMET. The CALMET model was run for 2006, 2007, 2008, 2009 and 2010.

During the investigation, it was found that there was no apparent trend in the modelled wind speeds, wind directions or mixing heights. However for the modelled stability classes, it was found that a higher percentage of F class is predicted for the years 2006 to 2008. Stability Class F is indicative of very stable night time conditions, conducive to a low level of pollutant dispersion due to mechanical mixing. Although it can be argued that this will result in higher predicted odour concentrations, it is not considered to have a significant impact on the results or the conclusions of this assessment.

Based on the latest meteorological year available at the time of writing this report, the meteorological conditions in the year 2010 will be used for CALPUFF dispersion modelling.

6.2.5 Compatibility of Modelled Meteorological Data to other Assessments

This section describes compatibility of modelled meteorological data (refer to **Section 6.2**) for air quality impact assessments to other assessments such as the noise & vibration assessment.

Whilst the starting point for each assessment may be similar, the requirements for meteorological data vary as stated in guidance documentation from the appropriate regulatory authorities.

The meteorological dataset developed for use in the air quality impact assessment has been compiled to provide a robust and conservative assessment of potential downwind impacts due to particulate and other pollutant emissions from activities occurring within the Project Application Area. The factors considered in selecting the meteorological data for use in an air quality impact assessment can be considerably different to those that need to be considered when compiling data for a noise impact assessment, or even an air quality impact assessment which is addressing other issues, such as the potential for odour nuisance impacts.

For example, impacts resulting from particulate emissions tend to be greatest under moderate to strong wind speeds, when wind-blown dust is generated and particulate matter can be carried significant distances before settling out of the air. In comparison, worst-case noise and odour impacts tend to occur under calm wind conditions when there is little atmospheric turbulence to dissipate the noise/odours.

Dust impacts are also assessed based on longer term averages (24-hour and annual averages), whereas noise and odour nuisance impacts are more likely to be associated with peak events.

Also, the dataset as a whole is required to contain different meteorological parameters to assess the noise impacts or air quality impacts. For example, for air quality impacts, the mixing heights in the dataset are required to assess the vertical dispersion of pollutants which can have a significant impact on the resultant ground level concentration at the discrete receptors. Whereas for noise impacts, the mixing heights do not directly influence the noise impacts experienced.

For these reasons, the meteorological data used in this assessment is likely to differ from that used in the assessment of noise impacts from the site and possibly incompatible with the modelled meteorological data for the noise & vibration assessment.

6.3 Dispersion Model Configuration

6.3.1 Odour Peak-to-Mean Ratios

The Approved Methods states that Peak-to-Mean ratios should be incorporated when conducting atmospheric dispersion modelling of odour.

It is commonly recognised that dispersion models such as CALPUFF need to be supplemented to accurately simulate atmospheric dispersion of odours. This is because the instantaneous perception of odours by the human nose typically occurs over a time scale of approximately one second but dispersion model predictions are typically valid for time scales equivalent to ten minutes to one hour averaging periods. To estimate the effects of plume meandering and concentration fluctuations perceived by the human nose, it is possible to multiply dispersion model predictions by a correction factor called a “peak-to-mean ratio”. The peak to mean ratio (P/M60) is defined as the ratio of peak 1 second average concentrations to mean 1-hour average concentrations.

To estimate peak concentrations, this assessment has used data presented in Table 6.1 of the *Technical Framework – Assessment and management of odour from stationary sources in NSW* (hereafter ‘Odour Framework’). Specifically, to establish a conservatively high estimate of peak odour concentrations, a Peak-to-Mean Ratio (P/M60) of 2.3 has been applied to the emission rates for all identified sources modelled within this assessment.

7 EXISTING AIR QUALITY

The air quality in the region surrounding the Northern Coal Logistics Project is influenced by emissions generated by a range of sources, originating from both within and outside of the local area. Specifically, for the area surrounding the Northern Coal Logistics Project, air quality will be influenced by pollution transported into the area from more distant sources, emissions from power stations in the area, non-Project related traffic-generated pollution and pollution generated by the Project itself.

To determine the *incremental* impact of particulate emissions from the Project on the surrounding environment and sensitive receptors, a dispersion modelling exercise has been performed.

To appropriately assess the *cumulative* impact of the Project, the incremental impact needs to be added to a dataset which includes the contributions of all other significant sources of particulate in the region. Given that air quality monitoring locations in the local area are limited to those close to major particulate sources (such as mine sites) the use of an alternative dataset has been investigated to avoid possible double-counting of Project-related emissions.

This section outlines the methodology used to generate the background pollutant dataset used in this assessment. It involves the following steps:

- 1 Assessment of background dataset from the onsite monitoring conducted at the Newstan Colliery Surface Site and Cooranbong Entry Site - **Section 7.1** and **Section 7.2**.
- 2 Selection of an appropriate background dataset representative of regional air quality without the influence of major industrial sources in the local area (i.e. power stations and Project-related emissions) – **Section 7.3**;
- 3 Addition of an appropriate incremental contribution to ambient particulate levels due to controlled process and fugitive emissions from power stations in the local area (such as Eraring, Munmorah and Vales Point power stations) – **Section 7.4**; and,
- 4 Assessment of an appropriate incremental contribution (if any) to ambient particulate levels due to controlled process and fugitive emissions from other mining and ancillary operations in the local area (such as Teralba Quarry Extension, West Wallsend Colliery, Macquarie Coal Preparation Plant, Awaba Colliery and Mandalong Mine Access Site) – **Section 7.5**.

7.1 On-site Monitoring Program – Newstan Colliery Surface Site

On-site ambient monitoring has been performed at the Newstan Colliery Surface Site for TSP, PM₁₀, PM_{2.5} and dust. A summary of the onsite monitoring program at Newstan Colliery is shown in **Table 29**.

Table 29 Summary of On-Site Monitoring Program at Newstan Colliery

Pollutant	Equipment Used
TSP	HVAS1, HVAS2
PM ₁₀	HVAS1, HVAS2, TEOM
PM _{2.5}	HVAS1, HVAS2
Dust Gauges	DG1 to DG7, DG9 to DG12

Note: HVAS = High Volume Air Sampler, TEOM = Tapered Element Oscillating Microbalance, DG = Dust Gauge

7.1.1 TSP and PM₁₀ - HVAS

On-site ambient TSP and PM₁₀ monitoring has been performed at the Newstan Colliery Surface Site since November 2006 using a High Volume Air Sampler (HVAS). The ambient air quality monitoring program has been incorporated into a wider environmental monitoring campaign, and includes TSP

and PM₁₀ measurements using co-located HVAS (refer **Figure 25**). The monitoring is undertaken in accordance with AS3580.9.3:2003 and AS3580.9.6:2003 for TSP and PM₁₀, respectively.

The measured 24-hour average TSP and PM₁₀ concentrations at HVAS 1 and HVAS 2 are presented graphically in **Figure 26** and **Figure 27** respectively, while the overall average TSP and PM₁₀ concentrations recorded during the monitoring period are summarised in **Table 30**.

Figure 25 Location of HVASs and Dust Deposition Gauges at Newstan Colliery

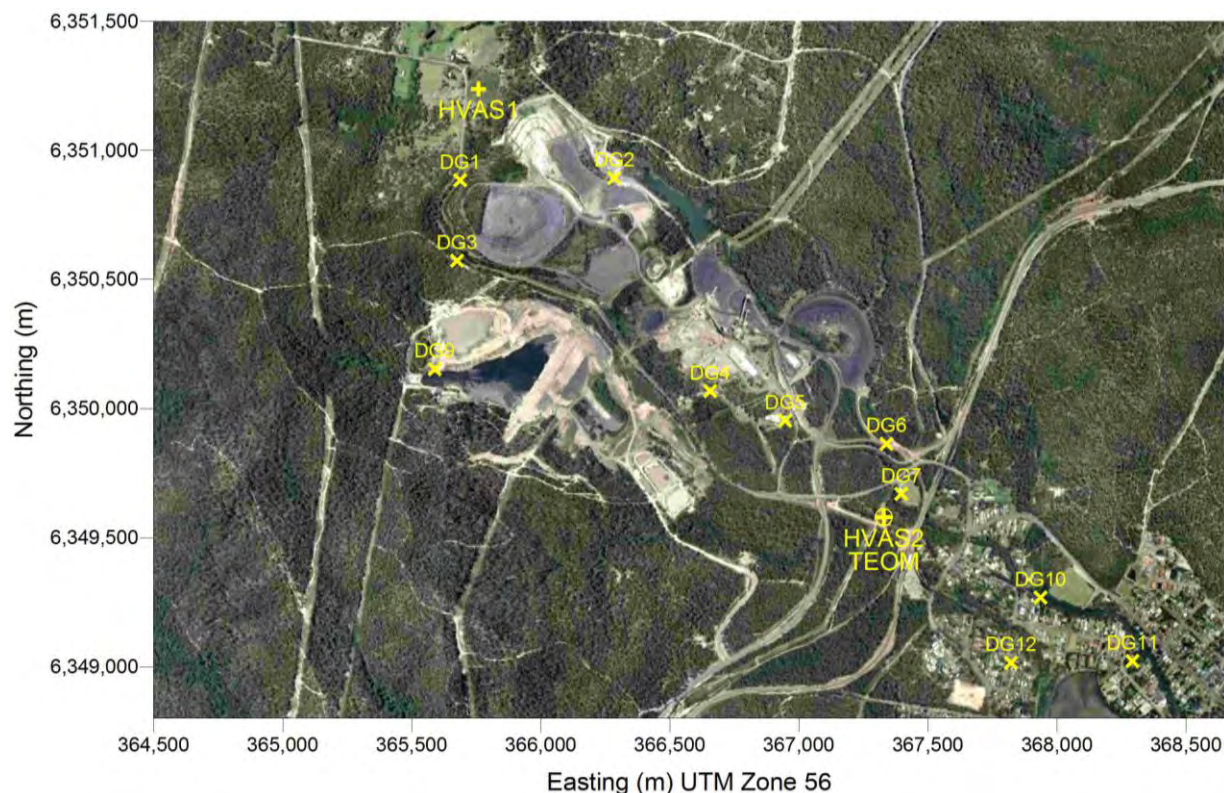


Figure 26 24-Hour Average TSP and PM₁₀ Concentrations Monitored at HVAS 1

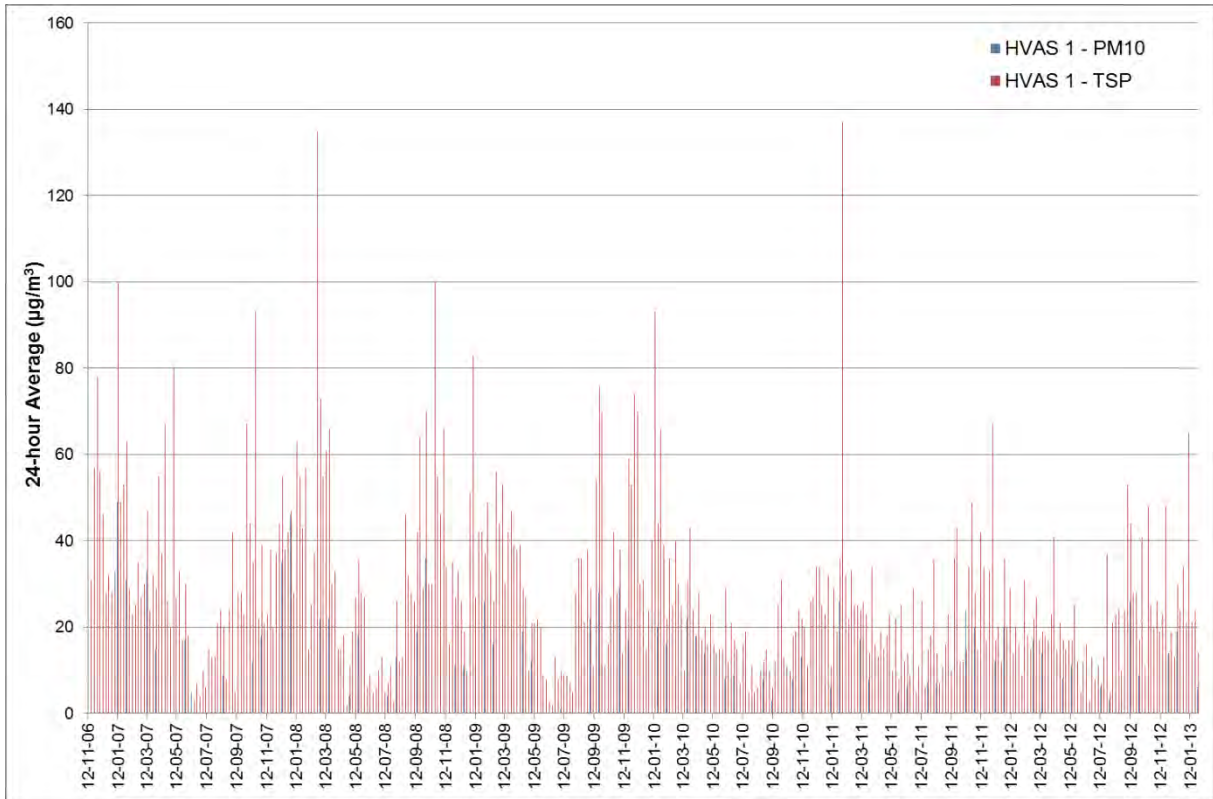


Figure 27 24-Hour Average TSP and PM₁₀ Concentrations Monitored at HVAS 2

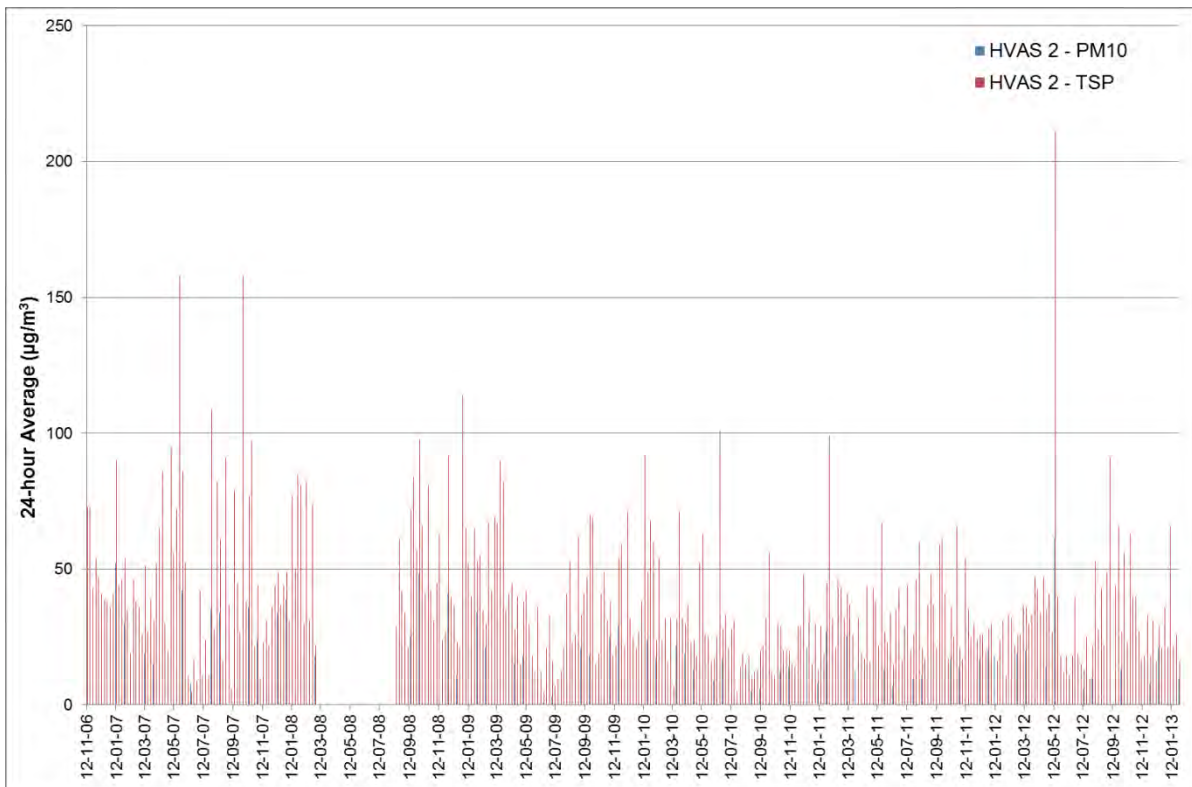


Table 30 Summary of HVAS Monitoring at Newstan Colliery (November 2006 to January 2013)

Pollutant	TSP		PM ₁₀	
	Maximum	Average	Maximum	Average
HVAS 1	137.0	27.8	62.0	15.2
HVAS 2	211.0	38.7	84.0	20.0

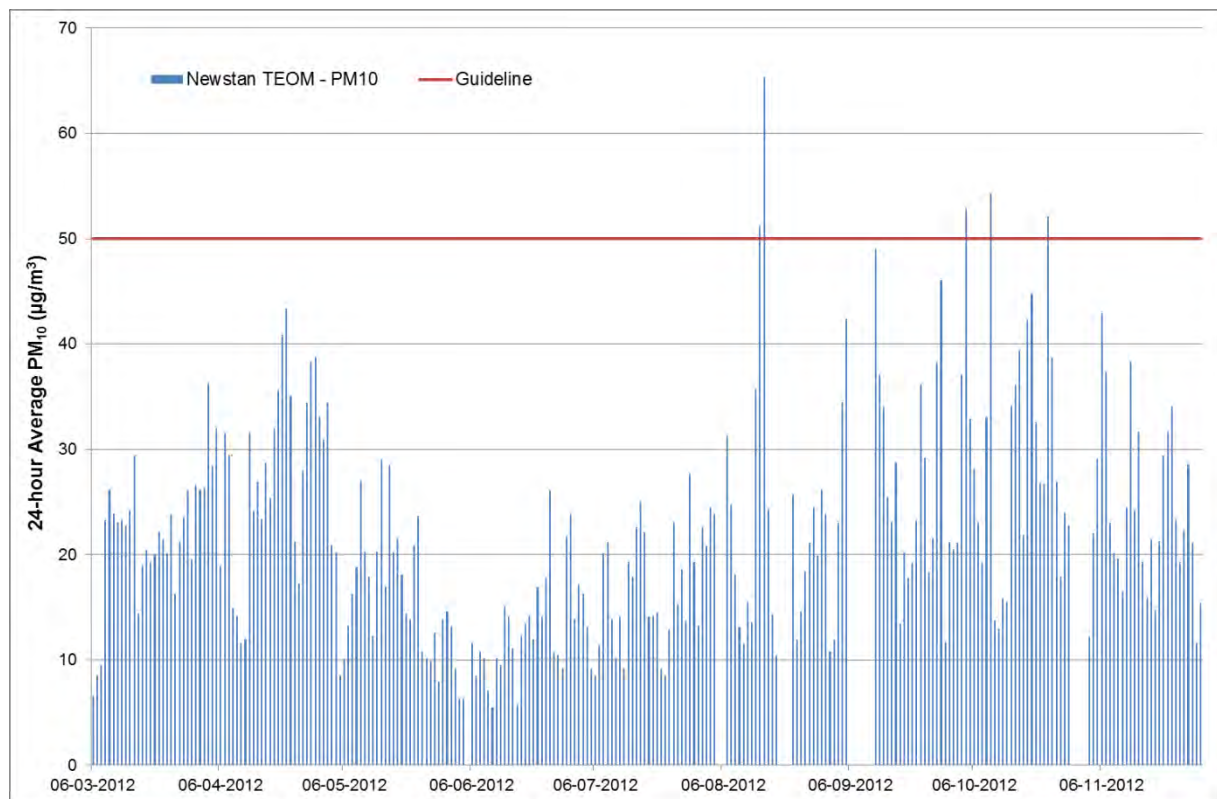
Of note, the ratio of mean TSP to PM₁₀ measurements at HVAS 1 and HVAS 2 is of the order of 2.1 to 1. Also, it is noted that the monitored TSP and PM₁₀ concentrations at Newstan Colliery Surface Site includes contributions from existing activities at Newstan Colliery Surface Site as well as other industrial facilities in the region.

As the monitoring data was measured on a 1-in-6-day cycle, it is not suitable for use in a contemporaneous cumulative impact analysis.

7.1.2 PM₁₀ – TEOM

Continuous PM₁₀ monitoring using co-located tapered element oscillating microbalance (TEOM) has been conducted at Newstan Colliery Surface Site since 6 March 2012. At the time of writing this report, validated data is available up to 30 November 2012. A summary of the available PM₁₀ monitoring results using TEOM are shown in **Figure 28**.

Figure 28 24-hour Average PM₁₀ Concentrations at TEOM (co-located at HVAS 2)



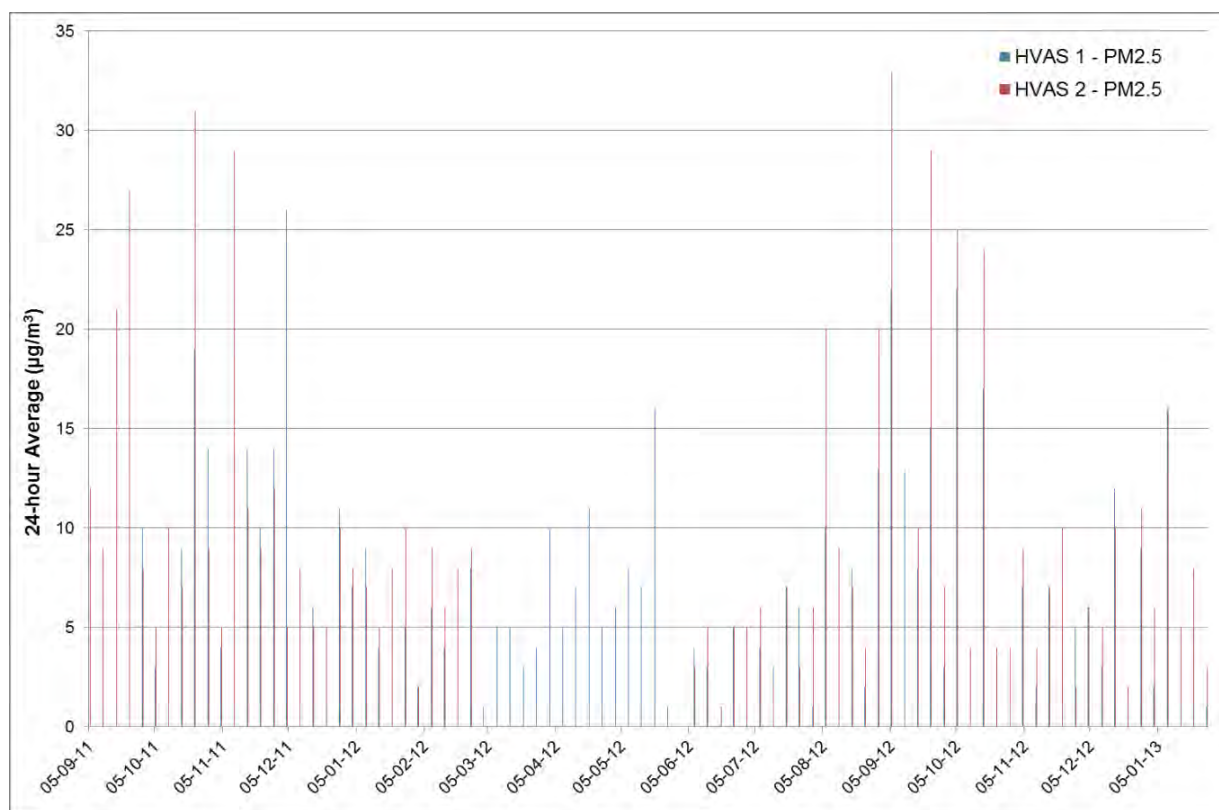
It is noted from **Figure 28** that since the monitoring began, there have been a total of five exceedances of the 24-hour average guideline ($50 \mu\text{g}/\text{m}^3$). The maximum concentration recorded was $65.3 \mu\text{g}/\text{m}^3$ on 16 August 2012. The average over the nine months of monitoring has been $21.8 \mu\text{g}/\text{m}^3$. The continuous monitoring data is deemed unsuitable for use as background as it is not contemporaneous with the modelled meteorological year.

7.1.3 PM_{2.5} - HVAS

On-site ambient PM_{2.5} monitoring has been performed at the Newstan Colliery Surface Site since September 2011 using a co-located HVAS with TSP and PM₁₀ (refer **Figure 25**).

The measured 24-hour average PM_{2.5} concentrations at locations HVAS 1 and HVAS 2 are presented graphically in **Figure 29**.

Figure 29 24-Hour Average PM_{2.5} Concentrations Monitored at HVAS 1 and HVAS 2



Pollutant	PM _{2.5}	
	Maximum	Average
HVAS 1	26.0	7.6
HVAS 2	33.0	9.5

It is noted that the monitored PM_{2.5} concentrations at Newstan Colliery Surface Site includes contributions from existing activities at Newstan Colliery Surface Site as well as other industrial facilities in the region.

As the monitoring data was measured on a 1-in-6-day cycle, it is not suitable for use in a contemporaneous cumulative impact analysis.

7.1.4 Dust

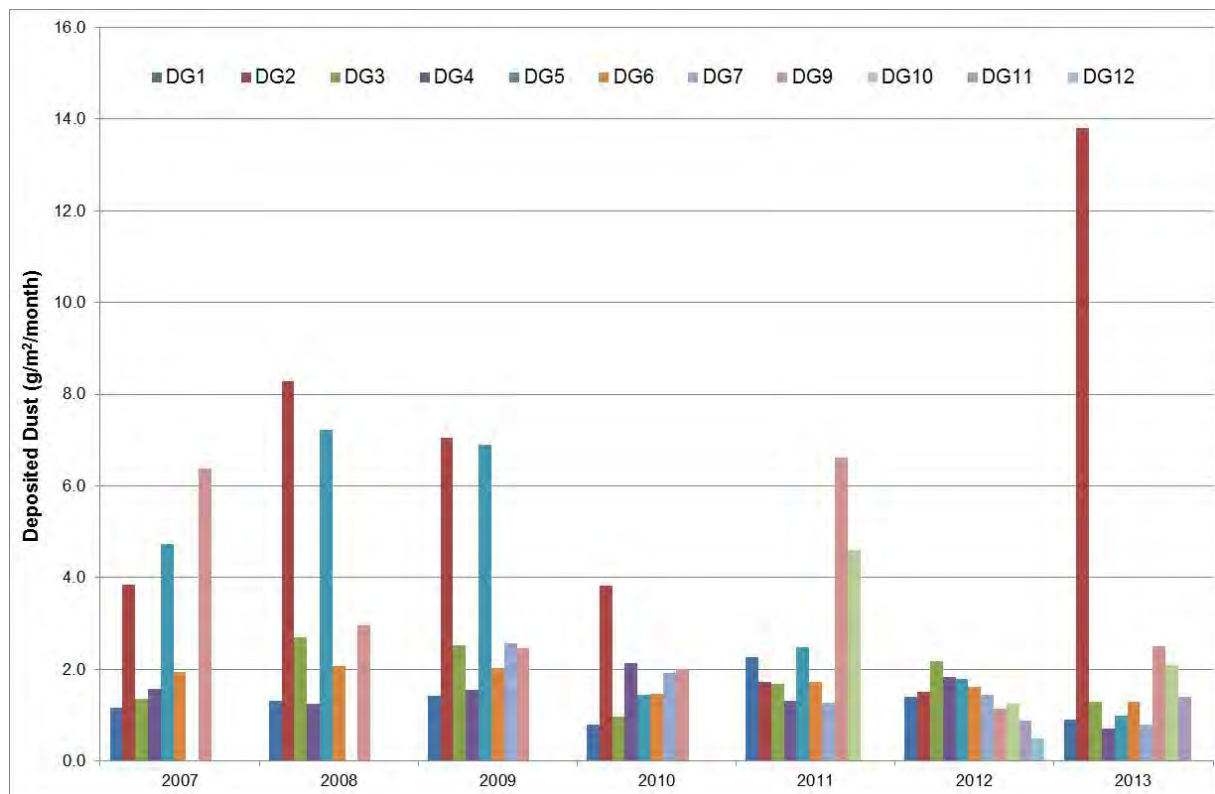
Newstan Colliery has a dust monitoring program in place since January 2007. The location of the dust monitoring sites is shown in **Figure 25**.

A summary of the dust deposition monitoring program is listed in **Table 31** and shown in **Figure 30**.

Table 31 Summary of the Dust Deposition Monitoring Program at Newstan Colliery

Gauge #	Monitoring Period	Average Deposition Rate (g/m ² /month)
DG1	January 2007 – February 2013	1.4
DG2	January 2007 – February 2013	4.6
DG3	January 2007 – February 2013	1.9
DG4	January 2007 – February 2013	1.6
DG5	January 2007 – February 2013	4.1
DG6	January 2007 – February 2013	1.8
DG7	January 2007 – February 2013	1.7
DG9	January 2007 – February 2013	3.5
DG10	December 2011 – January 2013	1.6
DG11	January 2012 – January 2013	0.9
DG12	June 2012 – September 2012	0.5
Overall Average		2.1

Figure 30 Summary of the Dust Deposition Monitoring Program at Newstan Colliery



It is noted that the long term average dust deposition rates shown in **Table 31** include the contribution of operations at Newstan Colliery Surface Site and background dust levels.

7.2 On-site Monitoring Program – Cooranbong Entry Site

On-site ambient monitoring has been performed at the Cooranbong Entry Site for dust deposition only.

7.2.1 Dust

Two dust deposition gauges are maintained at the Cooranbong Entry Site, DG1 and DG4, installed in November 2009 and January 2005 respectively. The location of the dust monitoring sites is shown in **Figure 31**.

Figure 31 Locations of Dust Deposition Gauges – Cooranbong Entry Site



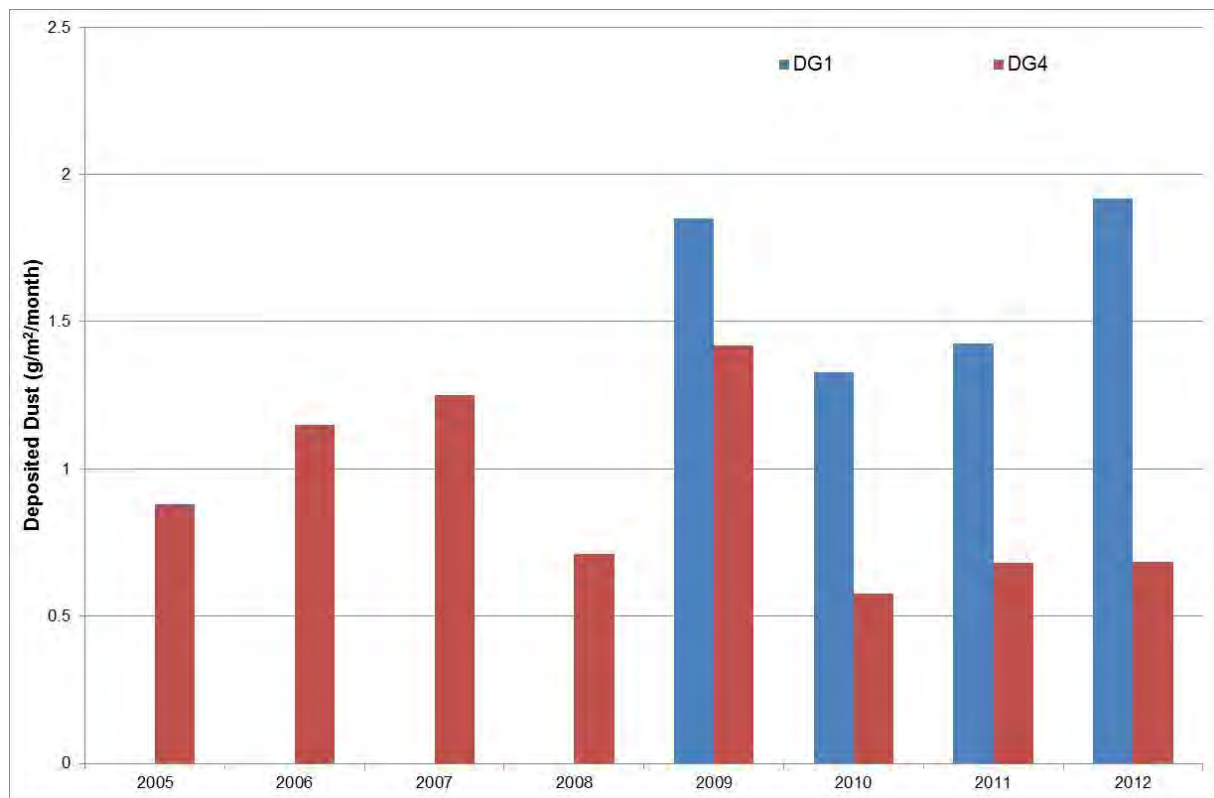
A summary of the dust deposition monitoring program is listed in **Table 32** and shown in **Figure 32**.

Table 32 Summary of the Dust Deposition Monitoring Program at Cooranbong Entry Site

Gauge #	Monitoring Period	Average Deposition Rate (g/m ² /month)
Newstan Colliery		
DG1	November 2009 – December 2012	1.6
DG4	January 2005 – December 2012	0.9

Gauge #	Monitoring Period	Average Deposition Rate (g/m ² /month)
Overall Average		1.3

Figure 32 Summary of the Dust Deposition Monitoring Program at Cooranbong Entry Site



It is noted that the long term average dust deposition rates shown in **Table 32** include the contribution of operations at Cooranbong Entry Site and background dust levels.

7.3 Regional Background Air Quality

7.3.1 Particulates (PM₁₀ and PM_{2.5})

Particulate data (PM₁₀ and PM_{2.5}) from three NSW EPA air quality monitoring stations were obtained to assist in the determination of the background particulate environment excluding the impacts of power stations and Project-related sources. Data for the years 2006, 2007, 2008, 2009 and 2010 (concurrent with the meteorological modelling performed [see **Appendix C**]) was obtained for Newcastle, Beresfield and Wallsend. PM_{2.5} is not monitored at the EPA Newcastle site. The locations of these three sites are presented in **Figure 6**.

Statistics for each site for each of the five years are presented in **Table 33**, **Table 34** and **Table 35**. All data is presented as 24-hour average concentrations in µg/m³, except averaging period (hours), skew and kurtosis (dimensionless) and data capture (percentage of the monitoring period). Presented in **Figure 33** and **Figure 34** are time series plots for PM₁₀ and PM_{2.5}, respectively.

Figure 33 24-hour Average PM₁₀ Concentrations Measured at NSW EPA Beresfield, Wallsend and Newcastle Monitoring Sites 2006 – 2010

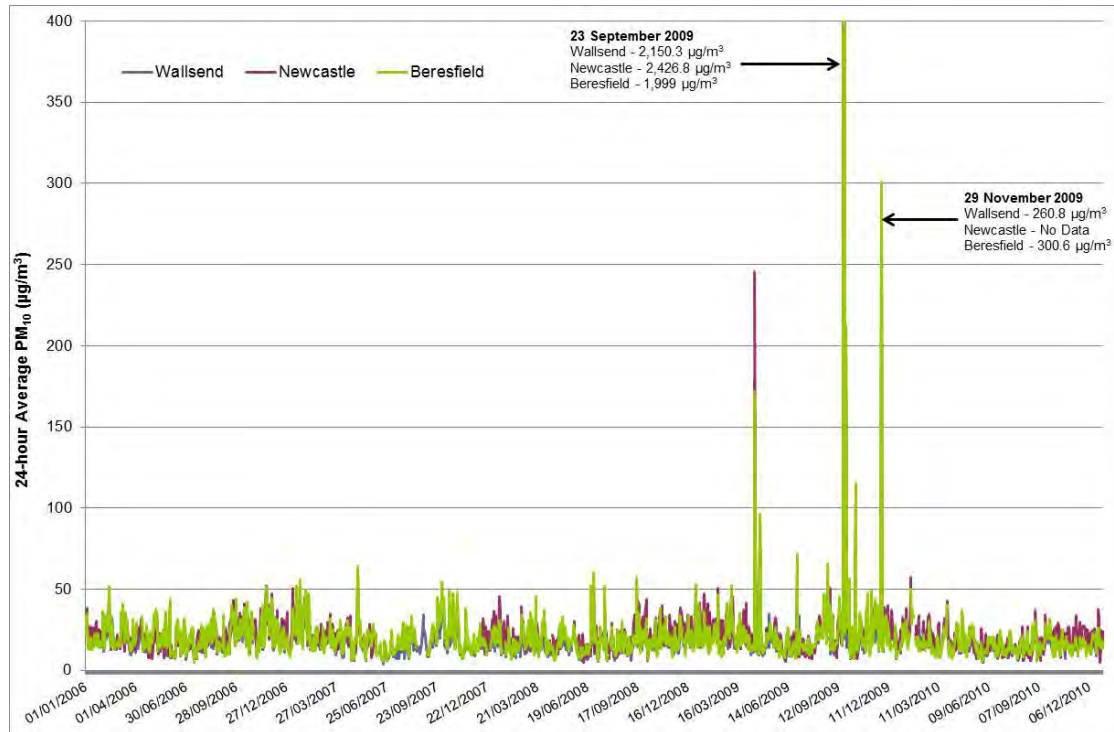
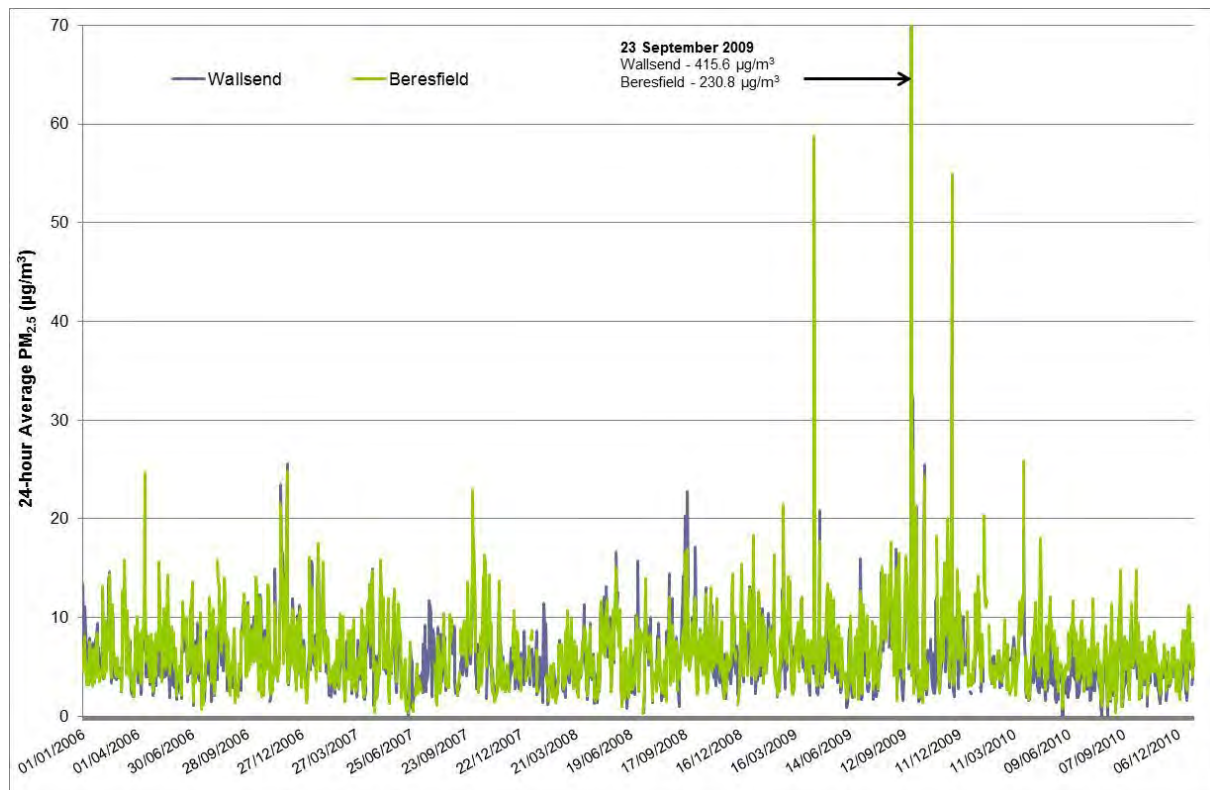


Figure 34 24-hour Average PM_{2.5} Concentrations Measured at NSW EPA Beresfield and Wallsend Monitoring Sites 2006 – 2010



It is noted that on 23 September 2009, a dust storm was experienced in the region (DECC 2009), resulting in very high 24 hour averages for PM₁₀ and PM_{2.5}. The recorded concentrations shown in **Figure 33** and **Figure 34** include the concentrations recorded on 23 September 2009 but the graphs have been truncated at appropriate levels to show the variations.

Table 33 Statistical Summary of Wallsend Background Monitoring Data

Statistic	2006		2007		2008		2009		2010	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Data Points	359	362	341	337	303	320	333	323	318	338
Mean (µg/m ³)	18.6	6.4	17.4	5.8	15.7	5.8	19.9	6.8	14.7	4.6
Standard Deviation (µg/m ³)	± 7.1	± 3.3	± 7.4	± 3.2	± 6.4	± 3.4	±15.6	±5.3	±4.7	±2.3
Skew ¹	+1.1	+1.5	+1.4	+1.0	+2.0	+1.4	+6.7	+4.1	+0.7	+1.4
Kurtosis ²	+2.0	+4.9	+2.9	+1.0	+7.5	+3.4	+61.3	+27.6	+0.6	+4.7
Minimum (µg/m ³)	5.6	1.1	3.6	-0.1	5.0	0.1	6.9	0.9	5	-0.2
Percentiles (µg/m³)										
1 st	7.3	1.6	6.9	1.2	6.3	1.0	7.2	1.5	6.2	0.3
2 nd	7.7	1.8	7.2	1.6	6.7	1.2	7.7	1.7	7.0	1.1
3 rd	8.4	2.0	7.3	1.7	7.3	1.4	8.3	1.9	7.5	1.3
5 th	9.3	2.2	8.2	2.0	8.2	1.8	8.8	2.2	8.2	1.6
10 th	10.8	2.8	9.6	2.3	9.0	2.4	9.9	2.5	9.3	2.0
25 th	13.6	4.0	12.7	3.3	11.8	3.4	12.7	3.9	11.4	3.1
50 th	17.4	5.9	16.0	5.1	14.8	5.2	16.5	5.6	14.0	4.2
75 th	22.7	8.1	20.8	7.5	18.6	7.4	23.2	8.4	17.7	5.7
90 th	27.5	10.5	26.5	10.0	23.2	10.0	31.0	12.4	20.8	7.4
95 th	31.4	11.9	33.3	12.2	26.4	11.9	35.1	14.3	23.6	9.0
97 th	34.2	13.5	35.0	13.9	30.1	13.0	38.2	16.9	25.3	10.1
98 th	35.8	14.4	36.7	14.8	31.9	14.3	54.8	18.7	26.5	10.7
99 th	40.7	15.5	40.0	15.2	39.9	17.0	73.1	24.6	28.0	11.7
Maximum 1 (µg/m ³)	52.0	25.6	50.9	18.2	56.5	22.8	179.5	50.5	32.8	18.8
Maximum 2 (µg/m ³)	45.3	23.5	50.8	15.7	43.6	20.3	173.9	49.8	29.5	13.7

Statistic	2006		2007		2008		2009		2010	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Maximum 3 (µg/m ³)	45.1	18.4	46.5	20.3	43.0	19.6	81.1	32.3	28.6	12.0
Data Capture	98.4%	99.2%	93.4%	92.3%	82.8%	87.4%	90.4%	87.0%	85.2%	92.0%

- Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
- 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Table 34 Statistical Summary of Beresfield Background Monitoring Data

Statistic	2006		2007		2008		2009		2010	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Data Points	352	361.0	329	314	349	336	358	341	354	355
Mean (µg/m ³)	21.2	6.8	20.4	6.3	18.4	5.9	22.7	7.9	16.6	6.0
Standard Deviation (µg/m ³)	± 8.7	± 3.5	± 10.0	± 3.7	± 7.9	± 3.0	±17.7	±5.6	±6.3	±3.1
Skew ¹	+0.8	+1.5	+1.4	+1.1	+1.8	+0.8	+6.0	+4.4	+1.4	+1.6
Kurtosis ²	+0.2	+4.0	+2.4	+1.4	+5.8	+0.8	+51.2	+32.9	+3.9	+5.8
Minimum (µg/m ³)	4.8	0.7	5.7	0.3	5.8	0.2	7.2	1.4	5.6	0.4
Percentiles (µg/m³)										
1 st	7.6	1.7	6.6	0.5	7.0	1.1	7.9	1.8	7.2	1.1
2 nd	8.3	2.0	7.4	1.3	7.6	1.4	8.3	2.1	7.6	1.5
3 rd	8.8	2.1	8.1	1.4	8.2	1.6	9.3	2.2	8.4	1.7
5 th	10.1	2.6	8.6	1.8	9.2	1.9	10.1	2.7	8.7	2.1
10 th	11.7	3.2	10.2	2.4	10.1	2.3	11.6	3.2	9.7	2.6
25 th	14.6	4.3	13.1	3.5	13.4	3.6	14.2	4.8	12.3	4.0
50 th	18.8	5.9	18.4	5.5	16.9	5.7	18.4	6.6	15.4	5.4
75 th	26.6	8.6	25.2	8.4	21.5	7.6	26.1	9.6	20.0	7.5
90 th	34.1	11.3	32.0	11.5	27.2	9.6	35.1	13.4	24.6	9.9
95 th	36.7	13.3	41.3	13.6	32.1	11.5	46.3	15.7	28.2	11.6
97 th	39.1	14.1	47.7	14.6	34.5	12.1	53.1	18.1	30.1	12.1
98 th	42.1	15.2	49.1	15.7	36.9	13.7	65.4	20.3	31.9	13.1
99 th	44.1	16.5	53.8	16.9	52.1	14.8	82.0	25.9	36.9	14.8
Maximum 1 (µg/m ³)	51.9	24.9	64.0	23.0	59.9	16.9	211.4	58.8	50.0	25.9
Maximum 2 (µg/m ³)	51.4	24.7	57.9	17.9	57.6	16.6	171.8	55.0	47.2	20.4
Maximum 3 (µg/m ³)	46.3	21.6	56.2	17.5	53.1	15.4	115.2	28.1	40.6	18.0

Statistic	2006		2007		2008		2009		2010	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Data Capture	96.4%	98.9%	90.1%	86.0%	95.4%	91.8%	98.0%	93.0%	96.9%	97.2%

- Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
- 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Table 35 Statistical Summary of Newcastle Background Monitoring Data

Statistic	2006	2007	2008	2009	2010
	PM ₁₀	PM ₁₀	PM ₁₀	PM ₁₀	PM ₁₀
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour
Data Points	355	172	341	339	365
Mean (µg/m ³)	21.1	22.8	20.5	24.9	17.9
Standard Deviation (µg/m ³)	±7.4	±8.9	±7.9	±19.3	±7.9
Skew ¹	+0.7	+1.2	+0.9	+7.4	+0.5
Kurtosis ²	+0.8	+2.5	+1.2	+75.3	+2.0
Minimum (µg/m ³)	6.5	6.1	4.9	5.6	0.0
Percentiles (µg/m³)					
1 st	7.6	6.2	7.1	7.2	0.0
2 nd	7.8	8.2	8.2	7.6	0.0
3 rd	9.1	10.1	8.7	8.2	0.0
5 th	11.1	11.1	10.1	9.7	6.5
10 th	12.4	13.0	11.4	11.8	9.1
25 th	15.8	17.2	15.1	16.5	13.2
50 th	20.5	21.6	19.1	22.3	17.4
75 th	25.6	26.8	24.6	27.8	22.8
90 th	30.7	33.4	31.1	36.1	27.1
95 th	34.1	39.2	34.3	43.1	30.1
97 th	36.1	43.4	38.1	50.7	33.8
98 th	38.0	47.8	39.2	60.3	34.6
99 th	42.0	52.4	43.1	80.8	37.6
Maximum 1 (µg/m ³)	51.2	58.1	54.4	245.4	57.1
Maximum 2 (µg/m ³)	47.2	57.2	50.6	211.6	48.3
Maximum 3 (µg/m ³)	43.3	50.4	45.6	86.6	42.5

Statistic	2006	2007	2008	2009	2010
	PM₁₀	PM₁₀	PM₁₀	PM₁₀	PM₁₀
Averaging Period	24-hour	24-hour	24-hour	24-hour	24-hour
Data Capture	97.3%	47.1%	93.2%	92.3%	100.0%

- Notes
- 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
 - 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

The statistics presented indicate that in general, higher concentrations of PM₁₀ and PM_{2.5} are measured at Beresfield when compared with Wallsend. Also, higher concentrations of PM₁₀ are measured at Newcastle when compared with Wallsend.

This is unsurprising given the location of the Newcastle site in an urban location, with a not insignificant contribution to particulate concentrations from vehicle traffic and industrial sources located in the area. The Beresfield station is also located near to a major road and the influence from vehicle traffic in the particulate monitoring record will be observed.

Data from the Wallsend station shows lower maximum concentrations and lower annual average particulate concentrations than the other two sites in the area. The Wallsend station is located approximately 9 km from the urban centre of Newcastle and although it will experience some contribution from vehicle traffic, the impact will not be as significant as that experienced within Newcastle. Additionally, impacts from industry will be markedly lower at Wallsend.

Based on the statistical analysis and discussion of the particulate monitoring data for the three stations, it is concluded that the use of the Wallsend PM₁₀ and PM_{2.5} data as a "regional background" dataset is appropriate and valid. The prevailing air quality conditions experienced in the area surrounding the Project site (not considering the effects of nearby power stations or Project activities) is expected to be most similar to those experienced at Wallsend.

Also noted is that the data recorded at Wallsend monitoring station captured 85% and 92% data for PM₁₀ and PM_{2.5} respectively. The missing data has been replaced by the respective annual averages. This is considered appropriate in the absence of data, as it ensures that the regional background is taken into account for the cumulative impact assessment.

7.3.2 TSP

Currently, there is no TSP monitoring performed by the NSW EPA at any of the three monitoring locations.

In this instance, TSP concentrations have been assumed to be 2.1 times those of the measured PM₁₀ concentrations at Wallsend. The ratio of 2.1 has been referenced from onsite monitoring of TSP and PM₁₀ (as discussed in **Section 7.1**). Based on this measured ratio, the annual average background TSP concentration is estimated to be 30.9 µg/m³.

7.3.3 Odour

No site specific odour monitoring has been performed at Newstan Colliery Surface Site. However, an odour monitoring program was conducted by SLR Consulting (SLR 2012b) at the existing Mandalong Mine Access Site operation ventilation fan, located approximately 20 km south-west of Newstan Colliery Surface Site.

The odour monitoring campaign identified the characteristics of the odour from the ventilation fans as yeast, exhaust and metallic. It is considered that there are no similar odour sources in the vicinity of Newstan Colliery Surface Site or Cooranbong Entry Site.

In the absence of any similar odour sources, the background odour concentration is assumed to be negligible (i.e zero).

7.4 Power Stations

To determine the background particulate concentrations experienced across the domain, the increment from power stations located in the area needs to be added to the regional background particulate concentrations from **Section 7.3**. The locations of Vales Point, Munmorah and Eraring power stations in relation to Centennial's Northern operations are presented in **Figure 6**.

A dispersion modelling exercise has been performed using publicly available information to determine the contribution from power station emissions to particulate concentrations within the modelling domain. The information in **Table 36** has been obtained for stack sources associated with Eraring, Vales Point and Munmorah power stations. Emission rates of PM_{2.5} were not publicly available and therefore the WRAPAIR factor (refer **Section 5**) of 0.1 has been applied to the PM₁₀ emission rates for all particulate emissions sources.

Table 36 Point Source Emissions from Eraring, Munmorah and Vales Point Power Stations

Source	ID	Easting (m)	Northing (m)	Height (m)	Diameter (m)	Temperature (°C)	Velocity (m/s)	TSP (g/s)	PM ₁₀ (g/s)	PM _{2.5} (g/s)
Eraring	ES1	361,938	6,340,750	200	10.5	107	17	64.0	12.7	1.3
Eraring	ES2	361,975	6,340,938	200	10.5	107	17	64.0	12.7	1.3
Munmorah ¹	MS1	364,190	6,324,292	150	7.9	153	19	30.5	30.5	3.1
Vales Point ²	VPS1	364,347	6,329,916	178	11	110	15.4	60.0	12.5	1.3

¹ No information on TSP emissions rate available – taken to be the same as PM₁₀ (equivalent to 50 mg/m³ stack concentration).

² Vales Point B Station (A Station decommissioned and two associated 138 m stacks now redundant).

The influence of building wake effects on the power station stack emissions has been taken into account in the dispersion modelling. Building dimensions were estimated using Google Earth images and the relationship between known stack heights and associated shadow lengths. This relationship has then been applied to the building shadow lengths to estimate building heights. The building heights used in the modelling assessment are presented in **Table 37**.

Table 37 Details of Building Coordinates and Dimensions at Eraring, Munmorah and Vales Point Power Stations

Site	Building	ID	Easting (m)	Northing (m)	Height (m)
Eraring	Powerhouse	EB1	361,836	6,341,059	40
			361,985	6,341,040	
			361,924	6,340,658	
			361,783	6,340,675	
Munmorah	Powerhouse	MB1	364,147	6,324,453	42
			364,190	6,324,393	
			364,010	6,324,241	
			363,961	6,324,294	
Vales Point	Powerhouse	VPB1	364,169	6,330,013	39
			364,335	6,330,136	
			364,364	6,330,099	
			364,199	6,329,976	
	Coal units	VPB3	364,239	6,329,993	59
			364,317	6,330,055	
			364,348	6,330,031	
			364,261	6,329,973	

In addition to emissions from stack sources, emissions from coal stockpiles and ash dams have also been considered. The location and surface area of coal stockpiles have been obtained from Google Earth imagery. Heights of all coal stockpiles have been assumed to be 5 m above ground level (AGL). For ash dams, half of the total area observed in Google Earth imagery has been taken to be available for wind erosion. For modelling purposes, the height of the ash dams has been taken to be 0 m AGL.

Emission rates for all stockpiles and ash dams have been taken to be the National Pollutant Inventory (NPI) default for wind erosion of 0.4 kg/ha/hr for TSP and 0.2 kg/ha/hr for PM₁₀ and 0.02 kg/ha/hr for PM_{2.5}. The emission rate for PM_{2.5} has been calculated using the WRAPAIR emission factors as discussed in **Section 5**.

It is acknowledged that the use of the default value may result in under- or over-estimation of 24-hour particulate concentrations at some locations, although taking into account the nature and scale of this assessment, it is considered to be appropriate.

Details of stockpile and ash dam locations are presented in **Table 38**.

Table 38 Details of Stockpile and Ash Dam Locations at Eraring, Munmorah and Vales Point Power Stations

Site	Stockpile	ID	Easting (m)	Northing (m)	Height (m)
Eraring	Coal	ESP1	361,715	6,341,677	5
			361,715	6,341,345	
			362,097	6,341,345	
			362,097	6,341,677	
Coal	ESP2	362,161	6,341,677	5	
		361,897	6,341,674		

			361,897	6,341,935	
			362,161	6,341,935	
	Ash Dam	EAD1	363,128	6,342,672	0
			362,915	6,342,178	
			364,080	6,341,921	
			364,142	6,342,278	
Munmorah	Coal	MSP1	364,158	6,324,004	5
			364,374	6,324,048	
			364,418	6,323,861	
			364,226	6,323,811	
Vales Point	Coal	VPSP1	363,648	6,329,355	5
			363,937	6,329,204	
			363,815	6,328,965	
			363,519	6,329,106	
	Coal	VPSP2	364,787	6,329,587	5
			364,852	6,329,562	
			364,760	6,329,398	
			364,700	6,329,429	
	Ash Dam	VPAD1	362,437	6,328,584	0
			363,447	6,327,984	
			362,433	6,326,172	
			361,976	6,327,423	

Through the dispersion modelling exercise, particulate concentrations experienced at each of the identified sensitive receptor locations (refer **Section 3.2**) due to emissions from the power stations have been estimated. Additionally, impacts have also been predicted at the Wallsend EPA monitoring station (refer **Section 7.3**) to verify that concentrations of particulate measured at the station do not include a significant contribution from power station related emissions.

The maximum modelled 24-hour average PM₁₀ concentration at the Wallsend monitoring station from power station operations was predicted to be 0.8 µg/m³, and it is therefore concluded that the PM₁₀ monitoring data from Wallsend does not include a significant contribution from power station operations, and that data may be used as a “regional background” dataset for the domain.

The maximum modelled 24-hour average PM_{2.5} concentration at the Wallsend monitoring station from power station operations was predicted to be 0.01 µg/m³. It is therefore concluded that the PM_{2.5} monitoring data from Wallsend monitoring station does not include a significant contribution from power station operations and therefore the data can be used as a “regional background” dataset for the domain.

Figure 35 presents the predicted incremental PM₁₀ concentrations from power station operations at the sensitive receptors during 2010. **Figure 36** presents the predicted incremental PM_{2.5} concentrations from power station operations at the sensitive receptors during 2010.

Figure 35 shows that over the modelling year 2010, the maximum predicted 24-hour average PM₁₀ concentration due to the power station emissions was 4.0 µg/m³ on 3 October 2010 at Receptor ‘23’ (near Cooranbong Entry Site).

Figure 35 Predicted Power Station Related PM₁₀ Concentrations at Receptors - 2010

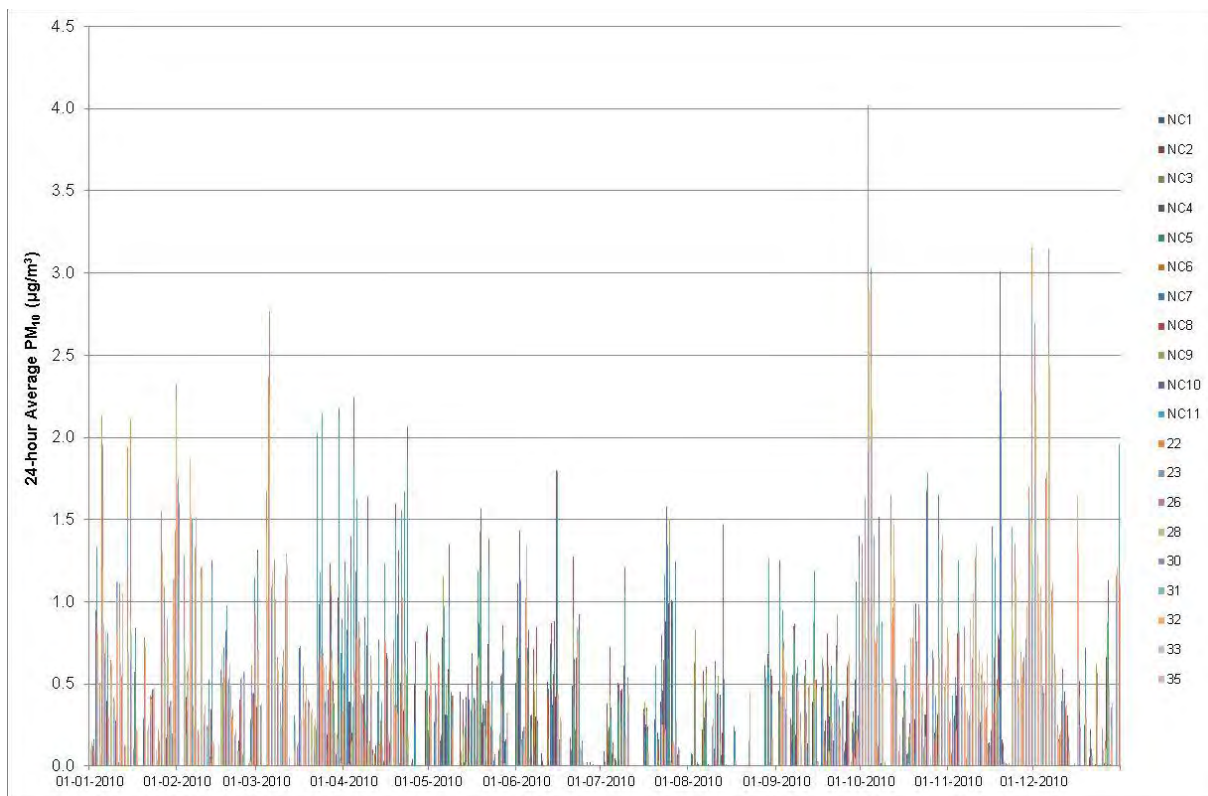
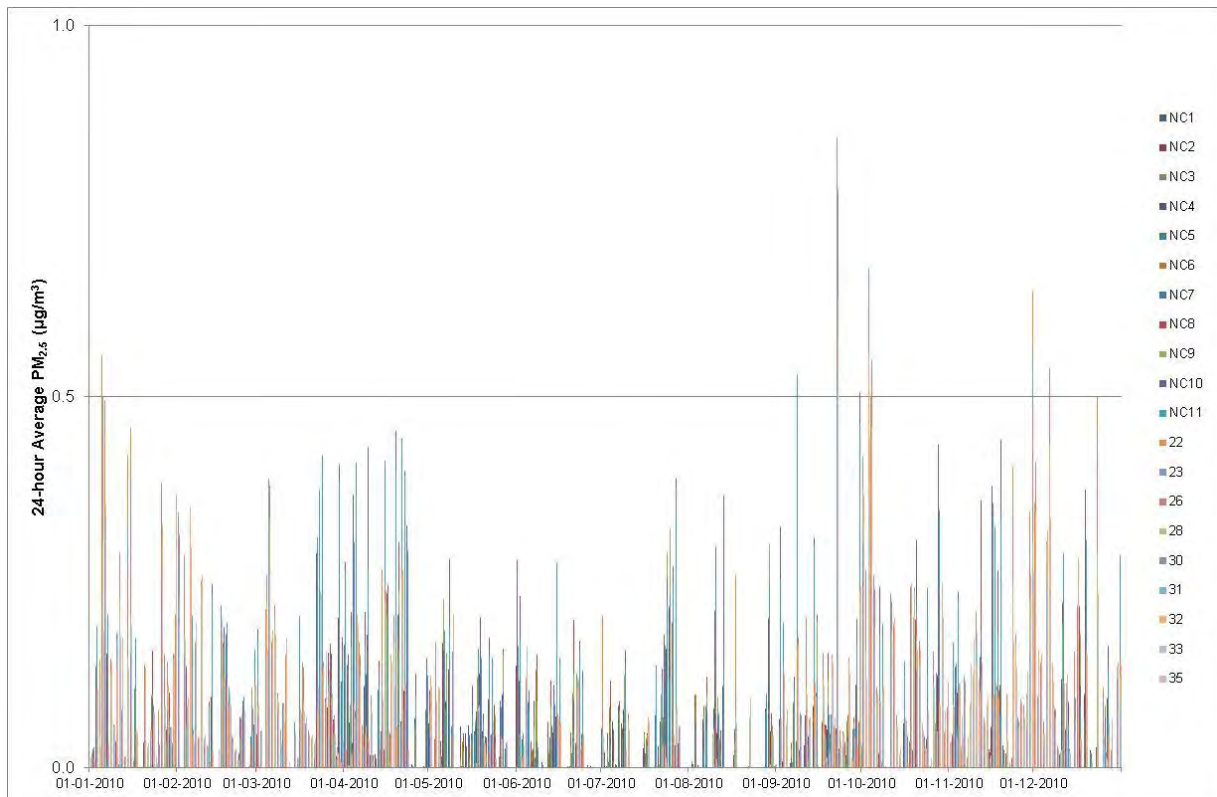


Figure 36 shows that during the year 2010, the maximum predicted 24-hour average PM_{2.5} concentration due to the power station emissions was 0.8 µg/m³ on 22 September 2010 at Receptor '22' (near Cooranbong Entry Site).

Figure 36 Predicted Power Station Related PM_{2.5} Concentrations at Receptors - 2010



For each receptor location, daily-varying background PM₁₀ and PM_{2.5} concentration files have been constructed, using the regional background particulate data from Wallsend, added to the predicted incremental particulate concentrations from modelling of the power stations.

As the maximum concentrations of PM₁₀ and PM_{2.5} are predicted at receptors '23' and '22' respectively, it is considered appropriate to assess the contributions of regional background and power stations at these two receptors. Presented in **Figure 37** and **Figure 38** are the time series of background PM₁₀ and PM_{2.5} concentrations for receptor '23' and receptor '22' respectively.

As mentioned in Section 7.3.1, the missing data recorded at Wallsend monitoring station for PM₁₀ and PM_{2.5} has been replaced by the respective annual averages. This is considered appropriate in the absence of data, as it ensures that the regional background is taken into account for cumulative impact assessment.

Figure 37 Regional Background and Power Station Increment at Receptor '23' (PM₁₀)

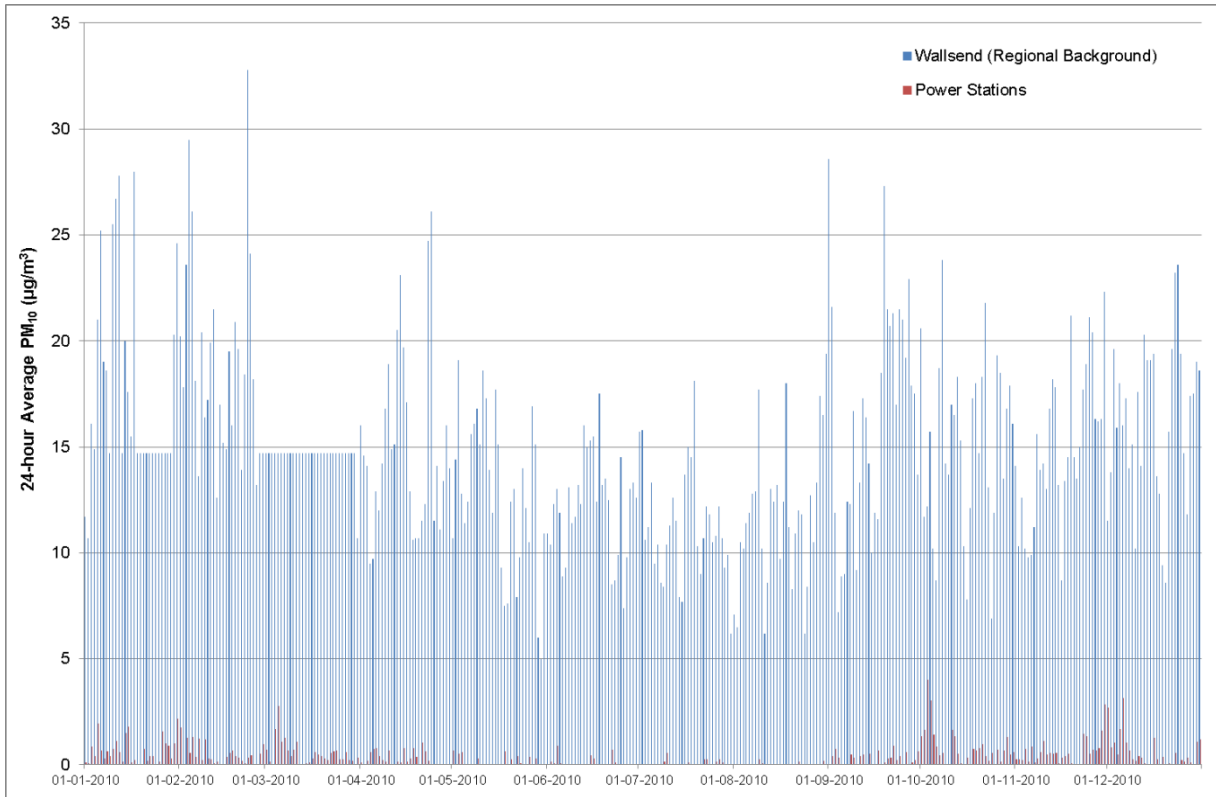
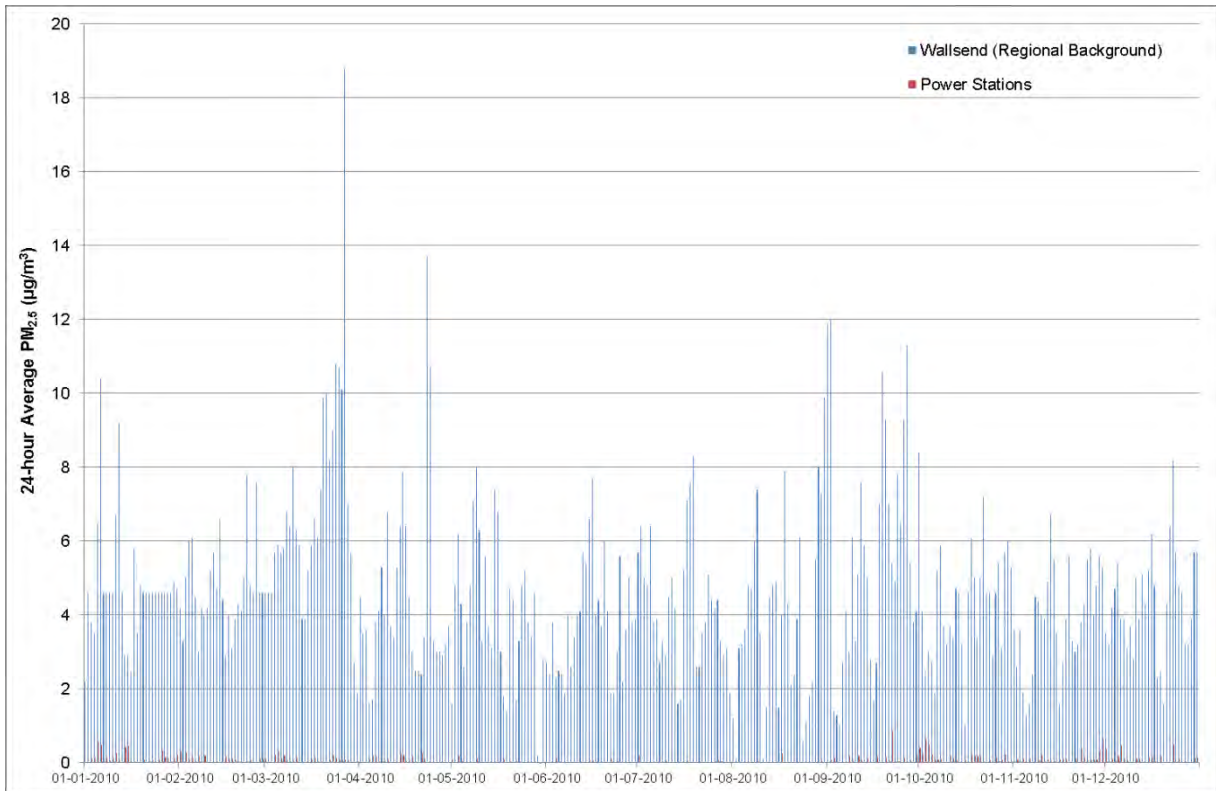


Figure 38 Regional Background and Power Station Increment at Receptor '22' (PM_{2.5})



The derived background concentration files (regional plus power station) vary spatially across the modelling domain based on the results of power station emission modelling results.

For the assessment of cumulative TSP concentrations, the annual average predictions provided by the power station modelling study were added to an estimated annual average regional background value of 30.9 $\mu\text{g}/\text{m}^3$ (as discussed in **Section 7.3.2**).

7.5 Surrounding Mining and Ancillary Industries

A number of surrounding industries have been identified in the region, which are anticipated to have a cumulative impact on the identified sensitive receptors. This section identifies those industries and assesses the possibility of their operations resulting in having a cumulative impact on the sensitive receptors. A summary of the industries considered in this regard is shown in **Table 39**.

Table 39 A Summary of the Mining and Ancillary Industries in the Region

Industry	Location	Section
Teralba Quarry Extensions	~ 2.5 km northeast of Newstan Colliery Surface Site	Section 7.5.1
West Wallsend Colliery	~ 4.5 km north of Newstan Colliery Surface Site	Section 7.5.2
Macquarie Coal Preparation Plant	~4.5 km northeast of Newstan Colliery Surface Site	Section 7.5.3
Awaba Colliery	~ 5.5 km northeast of Cooranbong Entry Site	Section 7.5.4
Mandalong Mine Access Site	~ 7.5 km southwest of Cooranbong Entry Site	Section 7.5.5

7.5.1 Teralba Quarry Extension

An AQIA was completed by SLR Consulting in November 2011 which assessed the air quality impacts associated with the proposed Teralba Quarry Extension located adjacent to Rhonda Road in Teralba.

A total of three scenarios were assessed, of which the scenario that assessed the extraction in the Southern Extension Area (Stage C) was regarded as the worst case scenario out of the three scenarios assessed. In order to assess the cumulative impacts from Teralba Quarry Extension Project on the identified sensitive receptors (in **Section 3.2**), it is considered appropriate to assess the predicted 24-hour average PM_{10} concentrations.

Table 40 Predicted 24-hour Average PM_{10} Concentrations for Scenario 5A - Extraction in the Southern Extension Area (Stage C)

Receptor	Incremental	Cumulative
A	0.9	40
B	1.5	41
C	1.9	43
D	1.2	41
E	0.3	40
F	0.2	40
G	0.0	39
H	0.0	39
I	0.0	39

Source: SLR 2011a

It is noted that the predicted incremental 24-hour average PM₁₀ concentrations were negligible at a receptor 'I' (the furthest receptor from Teralba Quarry), which is receptor 'NC1' (near Newstan Colliery Surface Site) in the current assessment.

It is therefore concluded that the Teralba Quarry Extension Project will not have any significant cumulative impacts with the Northern Coal Logistics Project.

7.5.2 West Wallsend Colliery

The Xstrata owned West Wallsend Colliery has been identified as a potential source of particulate in the region.

West Wallsend Colliery services an underground coal mine, and is located approximately 4.5 km north of Newstan Colliery Surface Site.

The West Wallsend Colliery includes a car park, administrative buildings, store, maintenance workshop, bath house, surface coal handling infrastructure, hard stand area, wash-down bays, coal bin, three ventilation shafts and water management dams and drain.

An AQIA was completed by Umwelt Environmental Consultants in 2010 for the West Wallsend Colliery Continued Operations Project (Umwelt 2010), which concluded that the maximum 24-hour average PM₁₀ concentrations predicted at a privately owned residence, located approximately 2.5 km from the Colliery would be approximately 4.7 µg/m³.

Considering the relatively large separation distance between the West Wallsend Colliery and identified sensitive receptors within this assessment, it is considered appropriate to assume that West Wallsend Colliery is unlikely to have any significant cumulative impact with the Northern Coal Logistics Project.

7.5.3 Macquarie Coal Preparation Plant (MCP)

The MCP is operated in conjunction with West Wallsend Colliery, and is located approximately 5 km north-east of Newstan Colliery Surface Site. The MCP handles and processes ROM coal received from West Wallsend Colliery.

The MCP surface holding consists of a coal preparation plant, car park, administrative buildings, bath house, store, coal stockpiles, coal load-out bin, rail loop, coarse reject emplacement area, tailings dam and water management dams and drain.

No air quality impact assessment is available for reference for this site. In the absence of any publicly available impact assessment, it is difficult to comment on the likelihood of the impacts due to this site operation on the identified sensitive receptors.

Referring to the modelling conducted for power stations (**Section 7.4**), it is noted that at a receptor approximately 2.5 km away from a power station (EPS), the maximum 24-hour average PM₁₀ predicted is 4.0 µg/m³. It is also noted that the EPS and MCP have very similar emission sources with the exception of stacks (albeit marginally different in size) i.e. coal stockpiles, continuous coal handling and tailings dam. Based on the aforementioned factors, it is assumed that the MCP is unlikely to have any significant cumulative impact with the Northern Coal Logistics Project.

7.5.4 Awaba Colliery

An AQIA was completed by SLR Consulting in May 2010 which assessed the air quality impacts associated with the Awaba Colliery underground mine located approximately 5.5 km north-east of the Cooranbong Entry Site.

At the time of the assessment, the facilities associated with Awaba Colliery were coal processing and handling, Awaba Quarry, coal stockpiles and exposed areas and product transportation (via haul roads).

It is noted that the maximum predicted incremental 24-hour average PM₁₀ concentrations was around 17 µg/m³ at receptor 'R4' in the May 2010 Awaba Colliery AQIA, which is the same as receptor 'NC11' (near Awaba Colliery Surface Site) for the current assessment.

It is noted that all coal handling and processing operations at the Awaba Colliery ceased in early 2012, thus reducing emissions considerably. The potential utilisation of the Awaba Colliery for the Newstan Colliery underground mining workforce and associated mining support infrastructure will be considered as part of the Newstan Extension of Mining Project.

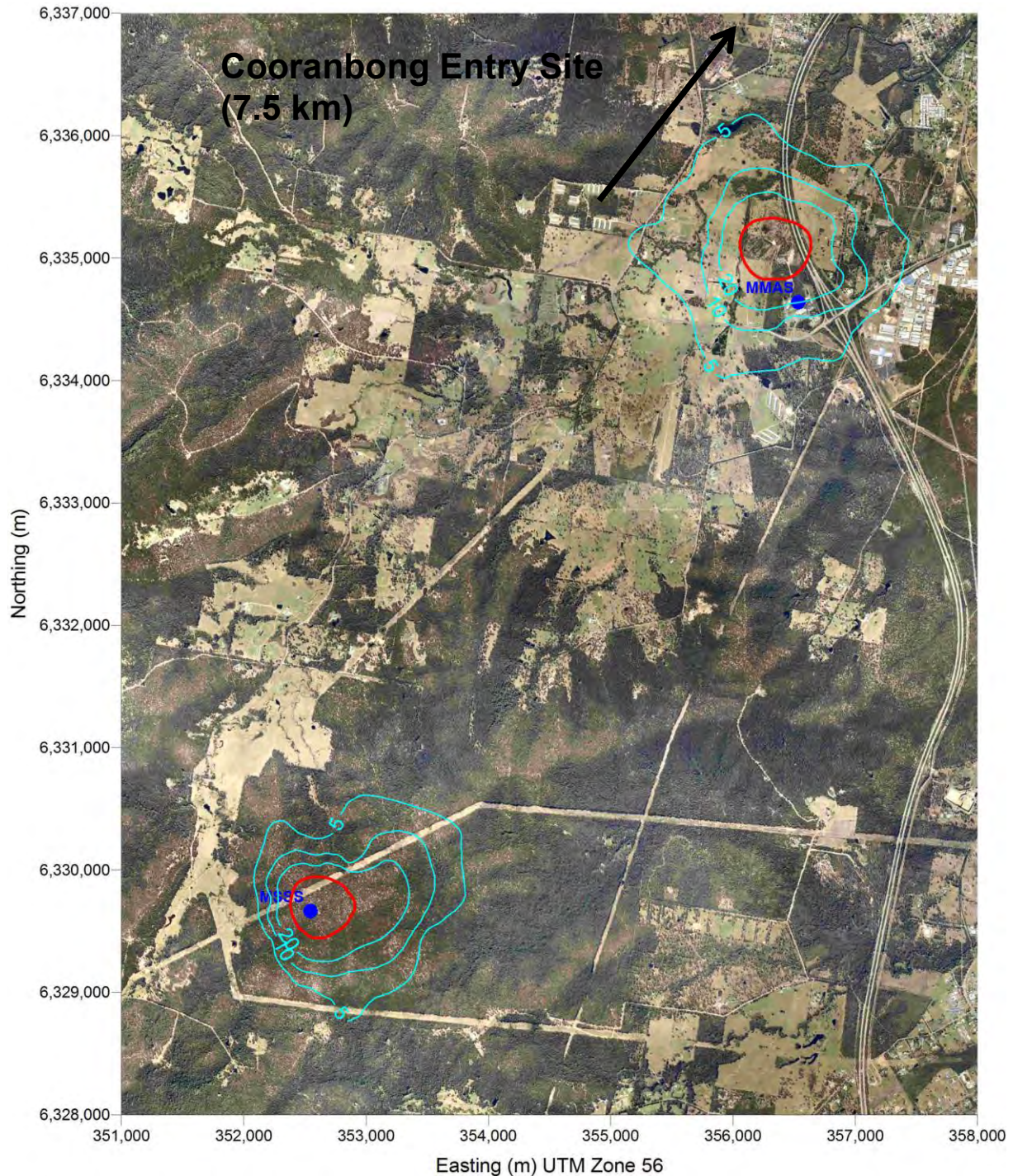
7.5.5 Mandalong Mine Access Site

An AQIA was completed by SLR Consulting in March 2013 which assessed the air quality impacts associated with the Mandalong Mine Access Site and proposed Mandalong South Surface Site located approximately 7.5 km south-west of the Cooranbong Entry Site. In terms of particulate emissions, the activity associated with the Mandalong Mine Access Site which is of primary relevance to this study are ventilation shaft emissions.

In order to assess the cumulative impacts from the Mandalong Mine Access Site on the identified sensitive receptors (in **Section 3.2**), it is considered appropriate to assess the predicted 24-hour average PM₁₀ concentrations.

A contour plot of the 24-hour average PM₁₀ for the above mentioned scenario is reproduced in **Figure 39**.

Figure 39 Predicted 24-hour Average PM₁₀ Concentrations for the Mandalong Mine Access Site and Mandalong South Surface Site



It was concluded that the maximum incremental 24-hour average PM₁₀ concentrations predicted at a receptor located approximately 1.3 km from the Mandalong Mine Access Site is approximately 4.8 µg/m³.

Considering the relatively large separation distance (~7.5 km) between the Mandalong Mine Access Site and identified sensitive receptors (**Section 3.2**), it is considered appropriate to assume that the Mandalong Mine Access Site is unlikely to have any significant cumulative impact with the Project.

7.6 Background Air Quality for Assessment Purposes

For the purposes of assessing the potential air quality impacts from the Project, an estimation of ambient air quality concentrations is required. The site-specific ambient air quality concentrations adopted for this assessment are summarised in **Table 41**.

7.6.1 Dust

The onsite dust monitoring at Newstan Colliery Surface Site and Cooranbong Entry Site shows that the average dust deposition is 2.1 g/m²/month and 1.3 g/m²/month respectively. However it was noted that the monitored dust deposition averages include a contribution from the relevant operations and other regional dust sources. It is considered appropriate to adopt a value of 2 g/m²/month as a background dust deposition level.

7.6.2 TSP

NSW EPA managed monitoring stations (Wallsend, Beresfield and Newcastle) do not monitor TSP concentrations.

Concurrent TSP concentrations are available from two HVAS (HVAS 1 and HVAS 2) at Newstan Colliery. These monitored concentrations are deemed unfit for use in the cumulative assessment, as they are recorded on a 1-in-6 day cycle.

However, a TSP:PM₁₀ ratio was noted from this data and applied to the available continuous PM₁₀ data to obtain appropriate TSP concentrations.

7.6.3 PM₁₀

Concurrent PM₁₀ concentrations are available from two HVAS (HVAS 1 and HVAS 2) at Newstan Colliery Surface Site. These monitored concentrations are deemed unfit for use in the cumulative assessment, as they are recorded on a 1-in-6 day cycle. Continuous PM₁₀ concentrations from a TEOM are also available (co-located at HVAS 2) at Newstan Colliery Surface Site. These monitored concentrations are deemed unfit for use in the cumulative assessment, as they are not recorded during a contemporaneous year with modelled meteorological year (2010).

The PM₁₀ concentrations recorded at Wallsend monitoring station are used to represent a regional background concentration of PM₁₀.

7.6.4 PM_{2.5}

The PM_{2.5} concentrations recorded at Wallsend monitoring station are used to represent a regional background concentration of PM_{2.5}.

Table 41 Ambient Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level	Notes
TSP	Annual	30.9 µg/m ³ PLUS Power Station Increments	Maximum Increment due to Power Station is 0.79 µg/m ³ at Receptor '23'
PM ₁₀	24-hour	Varying	Maximum Increment due to Power Station is 4.0 µg/m ³ at Receptor '23'
	Annual	14.7 µg/m ³ PLUS Power Station Increments	
PM _{2.5}	24-hour	Varying	Maximum Increment due to Power Station is 0.85 µg/m ³ at Receptor '22'
	Annual	4.6 µg/m ³ PLUS Power Station	

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level	Notes
		Increments	
Deposited Dust	Annual	2 g/m ² /month	Assumed
Odour	1-hour	0 OU	Assumed

8 AIR QUALITY IMPACT ASSESSMENT

Dispersion modelling predictions of dust deposition rates, TSP, PM₁₀ and PM_{2.5} and odour concentrations at the residences/properties nominated in **Section 3.2** attributable to the Northern Coal Logistics Project are presented in **Section 8.1** to **Section 8.7**. Pollutant isopleth plots are also provided in **Appendix B** which show the maximum predicted incremental (Project operations only) concentrations and deposition rates of the pollutants assessed.

As discussed in **Section 7** a detailed assessment of the background concentrations in the area surrounding the Project site has been performed. A regional background concentration has been determined, to which a contribution from local power stations has been added. Within this results section, a contribution from Project activities has been added to the background dataset (refer to **Section 7.6**), in order to provide information on the cumulative impact of Project activities on the air quality within the local area. For TSP, PM₁₀ and PM_{2.5} concentration results, several values are presented. The value presented and an explanation of each is provided in **Table 42**.

Table 42 Results Presentation and Explanation

Description in Results Tables	Data Presented	Reason for Presentation
Increment Background	Maximum <i>Regional</i> Background Concentration	Allows identification of the maximum regional measured particulate concentration across the entire year <u>without</u> power station and Project related sources.
Increment Power Station	Maximum Incremental Contribution from <i>Power Stations</i>	Indicates the maximum impact at each receptor across the entire year from power station operation only.
Increment Project	Maximum Incremental Contribution from <i>Project</i>	Identifies the maximum impact across the entire year from Project related sources only.
Cumulative Total Background + Project	Maximum Cumulative Concentration (ALL SOURCES)	Indicates the maximum particulate concentration when regional background, power station sources and Project sources are added together. However, the day of maximum impact from the Project may not fall on the same day as maximum impact from the power stations and regional background.

The following Sections detail the dispersion modelling results for dust deposition (**Section 8.1**), TSP (**Section 8.2**), PM₁₀ (**Section 8.3** and **Section 8.5**), PM_{2.5} (**Section 8.4** and **Section 8.6**) and Odour (**Section 8.7**).

8.1 Dust Deposition

8.1.1 Newstan Colliery Surface Site and Private Haul Roads

Table 43 shows the results of the dispersion modelling for dust deposition from the Project at each of the identified receptors around Newstan Colliery Surface Site and private haul roads. Contour plots of the incremental increase in dust deposition are also presented in **Appendix B**.

The results indicate that incremental and cumulative annual average dust deposition rates at all nominated receptors surrounding the Newstan Colliery Surface Site are predicted to be well below the criterion of $2 \text{ g/m}^2/\text{month}$ (incremental increase in dust deposition) and below $4 \text{ g/m}^2/\text{month}$ (cumulative dust deposition) for all modelled scenarios.

Table 43 Predicted Annual Average Dust Deposition Rates - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	2.0	<0.1	0.3	2.3	0.3	2.3	0.3	2.3	0.2	2.2	0.3	2.3	0.3	2.3	0.2	2.2	0.2	2.2
NC2	2.0	<0.1	0.7	2.7	0.7	2.7	0.7	2.7	0.6	2.6	0.8	2.8	0.7	2.7	0.6	2.6	0.6	2.6
NC3	2.0	<0.1	0.5	2.5	0.6	2.6	0.5	2.5	0.4	2.4	0.7	2.7	0.6	2.6	0.5	2.5	0.5	2.5
NC4	2.0	<0.1	0.3	2.3	0.3	2.3	0.3	2.3	0.3	2.3	0.4	2.4	0.4	2.4	0.3	2.3	0.3	2.3
NC5	2.0	<0.1	0.5	2.5	0.5	2.5	0.5	2.5	0.4	2.4	0.6	2.6	0.5	2.5	0.4	2.4	0.4	2.4
NC6	2.0	<0.1	0.7	2.7	0.9	2.9	0.7	2.7	0.5	2.5	1.0	3.0	0.9	2.9	0.6	2.6	0.6	2.6
NC7	2.0	<0.1	0.3	2.3	0.4	2.4	0.3	2.3	0.3	2.3	0.4	2.4	0.4	2.4	0.3	2.3	0.3	2.3
NC8	2.0	<0.1	0.5	2.5	0.5	2.5	0.5	2.5	0.5	2.5	0.6	2.6	0.5	2.5	0.5	2.5	0.5	2.5
NC9	2.0	<0.1	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4
NC10	2.0	<0.1	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4	0.4	2.4
NC11	2.0	<0.1	0.4	2.4	0.4	2.4	0.4	2.4	0.3	2.3	0.4	2.4	0.4	2.4	0.3	2.3	0.3	2.3

Note: Criteria – 2 g/m²/month (incremental), 4 g/m²/month (cumulative)

8.1.2 Cooranbong Entry Site

Table 44 shows the results of the dispersion modelling for dust deposition from the Project at each of the identified receptors around Cooranbong Entry Site. Contour plots of the incremental increase in dust deposition are also presented in **Appendix B**.

The results indicate that incremental and cumulative annual average dust deposition rates at all nominated receptors surrounding the Cooranbong Entry Site are predicted to be well below the criterion of 2 g/m²/month (incremental increase in dust deposition) and below 4 g/m²/month (cumulative dust deposition) for both modelled scenarios.

Table 44 Predicted Annual Average Dust Deposition Rates - Cooranbong Entry Site

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	2.0	<0.1	0.5	2.5	0.1	2.1
23	2.0	<0.1	0.4	2.4	0.1	2.1
26	2.0	<0.1	0.3	2.3	0.1	2.1
28	2.0	<0.1	0.2	2.2	<0.1	<2.1
30	2.0	<0.1	0.2	2.2	<0.1	<2.1
31	2.0	<0.1	0.2	2.2	<0.1	<2.1
32	2.0	<0.1	0.2	2.2	<0.1	<2.1
33	2.0	<0.1	0.2	2.2	<0.1	<2.1
35	2.0	<0.1	0.2	2.2	<0.1	<2.1

Note: Criteria – 2 g/m²/month (incremental), 4 g/m²/month (cumulative)

8.2 Particles (as TSP) – Annual Average

8.2.1 Newstan Colliery Surface Site and Private Haul Roads

Table 45 presents the annual average TSP concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Newstan Colliery Surface Site and private haul roads. The calculated background TSP concentrations have been discussed in detail in **Section 7**.

The results indicated that the annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m³ at all identified sensitive receptor locations around Newstan Colliery Surface Site and private haul roads for all modelled scenarios.

Table 45 Predicted Annual Average TSP Concentrations - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	30.9	0.3	6.1	37.3	7.0	38.2	6.4	37.6	5.4	36.6	7.9	39.1	7.1	38.3	5.7	36.9	5.6	36.9
NC2	30.9	0.3	15.2	46.4	16.7	47.9	15.6	46.9	14.3	45.5	18.2	49.5	16.8	48.0	14.7	45.9	14.6	45.9
NC3	30.9	0.4	11.5	42.7	13.3	44.6	11.7	42.9	9.9	41.2	15.4	46.7	13.2	44.4	10.5	41.7	10.5	41.7
NC4	30.9	0.4	6.9	38.2	7.9	39.2	7.1	38.4	5.9	37.2	9.2	40.5	8.1	39.3	6.2	37.4	6.2	37.4
NC5	30.9	0.4	10.3	41.6	11.6	42.9	10.5	41.8	9.0	40.3	13.2	44.5	11.6	42.9	9.4	40.7	9.4	40.7
NC6	30.9	0.3	15.6	46.8	19.4	50.7	16.5	47.8	11.8	43.1	23.8	55.0	19.9	51.1	12.8	44.1	12.8	44.1
NC7	30.9	0.4	7.7	39.0	8.3	39.6	7.7	39.0	7.0	38.3	9.1	40.4	8.3	39.6	7.2	38.5	7.2	38.5
NC8	30.9	0.5	11.7	43.1	12.2	43.6	11.8	43.2	11.3	42.7	12.7	44.1	12.2	43.6	11.4	42.8	11.4	42.8
NC9	30.9	0.5	9.1	40.5	9.5	40.9	9.2	40.6	8.6	40.0	10.0	41.4	9.6	41.0	8.8	40.2	8.8	40.2
NC10	30.9	0.7	8.2	39.9	8.4	40.0	8.3	39.9	8.1	39.7	8.6	40.2	8.4	40.0	8.1	39.8	8.1	39.8
NC11	30.9	0.7	8.0	39.6	8.1	39.7	8.0	39.6	7.9	39.5	8.3	39.9	8.1	39.8	7.9	39.5	7.9	39.5

Note: Project criterion – 90 µg/m³

8.2.2 Cooranbong Entry Site

Table 46 presents the annual average TSP concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Cooranbong Entry Site. The calculated background TSP concentrations have been discussed in detail in **Section 7**.

Table 46 Predicted Annual Average TSP Concentrations – Cooranbong Entry Site

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	30.9	0.7	11.5	43.1	8.6	40.2
23	30.9	0.8	8.0	39.7	6.6	38.3
26	30.9	0.8	7.1	38.8	6.6	38.3
28	30.9	0.7	5.4	37.0	3.8	35.4
30	30.9	0.6	5.2	36.7	3.5	34.9
31	30.9	0.6	5.6	37.2	2.4	33.9
32	30.9	0.7	4.6	36.2	1.8	33.4
33	30.9	0.6	5.3	36.8	1.5	33.0
35	30.9	0.6	4.0	35.6	1.7	33.2

Note: Project criterion – 90 µg/m³

The results indicated that the annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m³ at all identified sensitive receptor locations around Cooranbong Entry Site for both modelled scenarios.

8.3 Particles (as PM₁₀) – Annual Average

8.3.1 Newstan Colliery Surface Site and Private Haul Roads

Table 47 presents the annual average PM₁₀ concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Newstan Colliery Surface Site and private haul roads. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

The results indicated that the annual average PM₁₀ concentrations are predicted to be well below the criterion of 30 µg/m³ criteria set by the EPA and the 20 µg/m³ criteria set by the WHO at all identified sensitive receptor locations around Newstan Colliery Surface Site and private haul roads for all modelled scenarios.

Table 47 Predicted Annual Average PM₁₀ Concentrations - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Annual Average PM ₁₀ (µg/m ³)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	14.7	0.1	1.7	16.5	1.8	16.7	1.7	16.5	1.6	16.5	2.0	16.8	1.8	16.6	1.7	16.5	1.7	16.5
NC2	14.7	0.1	4.5	19.3	4.8	19.6	4.5	19.3	4.5	19.3	5.1	19.9	4.7	19.5	4.6	19.4	4.6	19.4
NC3	14.7	0.1	2.4	17.2	2.8	17.6	2.3	17.2	2.3	17.1	3.2	18.0	2.6	17.5	2.4	17.3	2.4	17.3
NC4	14.7	0.1	1.4	16.3	1.6	16.4	1.4	16.2	1.3	16.2	1.9	16.7	1.6	16.4	1.4	16.2	1.4	16.2
NC5	14.7	0.2	2.0	16.9	2.3	17.1	2.0	16.8	1.9	16.8	2.6	17.4	2.2	17.0	2.0	16.9	2.0	16.9
NC6	14.7	0.1	3.2	18.1	4.0	18.8	3.2	18.0	2.8	17.7	4.9	19.7	3.8	18.7	3.1	17.9	3.1	17.9
NC7	14.7	0.2	1.5	16.4	1.6	16.5	1.5	16.3	1.4	16.3	1.8	16.6	1.6	16.4	1.5	16.4	1.5	16.4
NC8	14.7	0.2	2.3	17.2	2.4	17.3	2.3	17.2	2.2	17.1	2.5	17.4	2.3	17.2	2.3	17.2	2.3	17.2
NC9	14.7	0.2	1.8	16.7	1.9	16.8	1.8	16.7	1.7	16.6	2.0	16.9	1.8	16.7	1.8	16.7	1.8	16.7
NC10	14.7	0.3	1.6	16.7	1.7	16.7	1.6	16.7	1.6	16.7	1.7	16.7	1.7	16.7	1.6	16.7	1.6	16.7
NC11	14.7	0.3	1.6	16.6	1.6	16.6	1.6	16.6	1.6	16.6	1.7	16.7	1.6	16.6	1.6	16.6	1.6	16.6

Note: Project criterion – 20 µg/m³

8.3.2 Cooranbong Entry Site

Table 48 presents the annual average PM₁₀ concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Cooranbong Entry Site. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

Table 48 Predicted Annual Average PM₁₀ Concentrations – Cooranbong Entry Site

Receptor ID	Annual Average PM ₁₀ (µg/m ³)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	14.7	0.7	2.2	17.6	1.1	16.1
23	14.7	0.8	1.6	17.1	1.2	16.3
26	14.7	0.8	1.4	16.9	1.2	16.3
28	14.7	0.7	1.1	16.5	1.1	16.1
30	14.7	0.6	1.0	16.3	0.9	15.8
31	14.7	0.6	1.1	16.4	0.9	15.9
32	14.7	0.7	0.9	16.3	1.1	16.1
33	14.7	0.6	1.0	16.3	0.9	15.8
35	14.7	0.6	0.8	16.1	0.9	15.9

Note: Project criterion – 20 µg/m³

The results indicated that the annual average PM₁₀ concentrations are predicted to be well below the criterion of 30 µg/m³ criteria set by the EPA and the 20 µg/m³ criteria set by the WHO at all identified sensitive receptor locations around Cooranbong Entry Site for both modelled scenarios.

8.4 Particles (as PM_{2.5}) – Annual Average

8.4.1 Newstan Colliery Surface Site and Private Haul Roads

Table 49 presents the annual average PM_{2.5} concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Newstan Colliery Surface Site and private haul roads. The calculated background PM_{2.5} concentrations have been discussed in detail in **Section 7**.

The results indicated that the annual average PM_{2.5} concentrations are predicted to be well below the criterion of 10 µg/m³ set by the WHO and 8 µg/m³ set by the NEPM at all identified sensitive receptor locations around Newstan Colliery Surface Site and private haul roads for all modelled scenarios.

Table 49 Predicted Annual Average PM_{2.5} Concentrations - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Annual Average PM _{2.5} (µg/m ³)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	4.6	<0.1	0.4	5.0	0.4	5.0	0.4	5.0	0.4	5.0	0.4	5.1	0.4	5.0	0.4	5.0	0.4	5.0
NC2	4.6	<0.1	0.9	5.5	0.9	5.6	0.9	5.5	0.9	5.5	1.0	5.6	0.9	5.6	0.9	5.5	0.9	5.5
NC3	4.6	<0.1	0.6	5.3	0.7	5.3	0.6	5.2	0.6	5.2	0.8	5.4	0.7	5.3	0.6	5.3	0.6	5.3
NC4	4.6	<0.1	0.5	5.1	0.5	5.1	0.4	5.1	0.4	5.1	0.5	5.2	0.5	5.1	0.5	5.1	0.5	5.1
NC5	4.6	<0.1	0.7	5.4	0.8	5.4	0.7	5.3	0.7	5.3	0.8	5.5	0.8	5.4	0.7	5.4	0.7	5.4
NC6	4.6	<0.1	0.8	5.4	0.9	5.5	0.8	5.4	0.7	5.3	1.0	5.6	0.9	5.5	0.8	5.4	0.8	5.4
NC7	4.6	<0.1	0.5	5.2	0.6	5.2	0.5	5.2	0.5	5.2	0.6	5.2	0.5	5.2	0.5	5.2	0.5	5.2
NC8	4.6	<0.1	0.8	5.5	0.9	5.5	0.8	5.5	0.8	5.5	0.9	5.5	0.9	5.5	0.8	5.5	0.8	5.5
NC9	4.6	<0.1	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3	0.7	5.3	0.6	5.3	0.6	5.3	0.6	5.3
NC10	4.6	<0.1	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3	0.6	5.3
NC11	4.6	<0.1	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.3	0.6	5.2	0.6	5.2	0.6	5.2

Note: Project criterion – 8 µg/m³

8.4.2 Cooranbong Entry Site

Table 50 presents the annual average PM_{2.5} concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Cooranbong Entry Site. The calculated background PM_{2.5} concentrations have been discussed in detail in **Section 7**.

Table 50 Predicted Annual Average TSP Concentrations – Cooranbong Entry Site

Receptor ID	Annual Average PM _{2.5} (µg/m ³)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	4.6	0.1	0.6	5.2	0.3	5.0
23	4.6	0.1	0.4	5.1	0.3	5.0
26	4.6	0.1	0.4	5.1	0.3	5.0
28	4.6	0.1	0.3	5.0	0.2	4.8
30	4.6	<0.1	0.3	4.9	0.2	4.8
31	4.6	0.1	0.3	5.0	0.2	4.8
32	4.6	0.1	0.3	4.9	0.2	4.8
33	4.6	<0.1	0.3	5.0	0.2	4.8
35	4.6	0.1	0.2	4.9	0.2	4.8

Note: Project criterion – 8 µg/m³

The results indicated that the annual average PM_{2.5} concentrations are predicted to be well below the criterion of 10 µg/m³ set by the WHO and 8 µg/m³ set by the NEPM at all identified sensitive receptor locations around Cooranbong Entry Site for both modelled scenarios.

8.5 Particles (as PM₁₀) – 24-Hour Average

8.5.1 Newstan Colliery Surface Site and Private Haul Roads

Table 51 presents the maximum 24-hour average PM₁₀ concentrations predicted by the dispersion modelling at each of the receptors around Newstan Colliery Surface Site and private haul roads. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

Table 51 Predicted Maximum 24-Hour Average PM₁₀ Concentrations - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Maximum 24-hour Average PM ₁₀ (µg/m ³)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	32.8	1.0	16.7	36.0	16.7	36.5	16.7	36.0	16.7	36.0	20.4	40.2	16.7	36.2	16.7	36.0	16.7	36.0
NC2	32.8	1.0	31.5	49.0	31.5	49.2	31.5	49.1	31.5	48.8	31.5	49.5	31.5	49.2	31.5	48.8	31.5	48.8
NC3	32.8	1.0	14.5	35.0	21.9	35.0	17.1	35.0	13.4	35.0	26.0	39.4	19.6	35.1	14.7	35.0	14.7	35.0
NC4	32.8	1.0	10.7	33.5	13.0	33.5	11.8	33.5	7.6	33.5	16.9	33.9	15.2	33.5	8.1	33.5	8.0	33.5
NC5	32.8	1.0	15.3	36.5	20.0	40.8	13.3	36.2	13.4	33.5	31.0	45.1	21.7	39.0	15.8	34.3	15.8	34.3
NC6	32.8	1.0	25.6	47.6	36.5	53.6	27.6	49.4	20.3	40.1	56.9	72.0	44.9	60.0	23.8	41.6	23.7	41.5
NC7	32.8	1.0	7.4	33.4	9.6	33.4	7.6	33.4	5.0	33.4	12.0	33.4	9.4	33.4	5.7	33.4	5.7	33.4
NC8	32.8	1.4	7.4	33.7	7.6	33.7	7.4	33.7	7.4	33.7	8.3	33.7	7.8	33.7	7.4	33.7	7.4	33.7
NC9	32.8	1.6	6.6	34.6	6.8	34.6	6.6	34.6	6.5	34.6	6.9	34.6	6.7	34.6	6.6	34.6	6.6	34.6
NC10	32.8	3.0	6.4	34.8	6.4	34.8	6.4	34.8	6.4	34.8	6.4	34.8	6.4	34.8	6.4	34.8	6.4	34.8
NC11	32.8	2.3	6.5	35.5	6.5	35.5	6.5	35.5	6.5	35.5	6.5	35.5	6.5	35.5	6.5	35.5	6.5	35.5

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 42**

The results indicated that the 24-hour average PM₁₀ concentrations are predicted to exceed the criterion of 50 µg/m³ at receiver NC6 for scenarios:

- 2a - Exporting up to 6 Mtpa of coal by rail, trucks dumping coal at the rail loop stockpile and manual train loading using front end loaders;
- 3a - Exporting up to 8 Mtpa of coal by rail, trucks dumping coal at the rail loop stockpile and manual train loading using front end loaders; and
- 3b - Exporting up to 8 Mtpa of coal by rail, automation of coal transport from the CPP to the rail loop stockpile and manual train loading using front end loaders.

8.5.1 Cooranbong Entry Site

Table 52 presents the 24-hour average PM₁₀ concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Cooranbong Entry Site. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

Table 52 Predicted Maximum 24-Hour Average PM₁₀ Concentrations – Cooranbong Entry Site

Receptor ID	Maximum 24-hour Average PM ₁₀ (µg/m ³)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	32.8	3.8	34.4	46.7	7.8	33.0
23	32.8	4.0	21.8	37.2	7.2	33.0
26	32.8	3.7	23.7	35.0	7.5	33.1
28	32.8	2.9	12.3	33.2	6.9	33.1
30	32.8	1.9	12.5	33.3	6.5	33.1
31	32.8	2.3	16.3	36.4	5.7	33.1
32	32.8	2.9	12.2	33.3	5.4	33.1
33	32.8	2.0	10.3	33.3	4.8	33.2
35	32.8	2.2	13.6	33.2	4.4	33.1

Note: Project criterion – 50 µg/m³

The results indicated that the 24-hour average PM₁₀ concentrations are predicted to be well below the criterion of 50 µg/m³ at all identified sensitive receptor locations around Cooranbong Entry Site for both modelled scenarios.

8.6 Particles (as PM_{2.5}) – 24-Hour Average

8.6.1 Newstan Colliery Surface Site and Private Haul Roads

Table 51 presents the maximum 24-hour average PM_{2.5} concentrations predicted by the dispersion modelling at each of the sensitive receptors around Newstan Colliery Surface Site and private haul roads. The calculated background PM_{2.5} concentrations have been discussed in detail in **Section 7**.

Table 53 Predicted Maximum 24-Hour Average PM_{2.5} Concentrations - Newstan Colliery Surface Site and Private Haul Roads

Receptor ID	Maximum 24-hour Average PM _{2.5} (µg/m ³)																	
	Background		Scenario 1		Scenario 2a		Scenario 2b		Scenario 2c		Scenario 3a		Scenario 3b		Scenario 3c		Scenario 4	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
NC1	18.8	0.2	2.7	19.9	2.9	19.9	2.7	19.9	2.7	19.9	3.5	20.0	2.8	19.9	2.7	19.9	2.7	19.9
NC2	18.8	0.2	5.2	20.8	7.3	20.8	5.9	20.8	6.1	20.8	9.1	20.9	7.2	20.8	6.6	20.8	6.6	20.8
NC3	18.8	0.2	3.4	19.2	3.9	19.2	3.4	19.1	3.1	19.2	4.5	19.3	3.6	19.2	3.2	19.2	3.2	19.2
NC4	18.8	0.2	2.7	19.3	2.9	19.5	2.8	19.4	3.0	19.3	3.0	19.5	2.9	19.5	3.0	19.3	3.0	19.3
NC5	18.8	0.2	4.3	19.3	4.7	19.3	4.6	19.3	4.4	19.3	6.2	19.3	4.7	19.3	4.4	19.3	4.4	19.3
NC6	18.8	0.2	5.3	19.1	6.7	19.2	4.6	19.1	4.7	19.1	11.6	19.2	8.8	19.2	5.4	19.1	5.4	19.1
NC7	18.8	0.2	2.2	19.1	2.7	19.1	2.2	19.1	2.2	19.1	3.4	19.1	2.7	19.1	2.2	19.1	2.2	19.1
NC8	18.8	0.4	4.1	19.2	4.1	19.2	4.1	19.2	4.1	19.2	4.1	19.3	4.1	19.2	4.1	19.2	4.1	19.2
NC9	18.8	0.3	3.3	19.4	3.4	19.4	3.3	19.4	3.3	19.4	3.4	19.4	3.3	19.4	3.3	19.4	3.3	19.4
NC10	18.8	0.5	2.7	19.5	2.7	19.5	2.7	19.5	2.7	19.5	2.7	19.6	2.7	19.6	2.7	19.5	2.7	19.5
NC11	18.8	0.5	2.2	20.0	2.2	20.0	2.2	20.0	2.2	20.0	2.2	20.0	2.2	20.0	2.2	20.0	2.2	20.0

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 42**

The results indicated that the 24-hour average PM_{2.5} concentrations are predicted to be below the criterion of 25 µg/m³ at all identified sensitive receptor locations around the Newstan Colliery Surface Site for all modelled scenarios.

8.6.2 Cooranbong Entry Site

Table 52 presents the 24-hour average PM_{2.5} concentrations predicted by the dispersion modelling from the Project at each of the identified receptors around Cooranbong Entry Site. The calculated background PM_{2.5} concentrations have been discussed in detail in **Section 7**.

Table 54 Predicted Annual Average TSP Concentrations – Cooranbong Entry Site

Receptor ID	Maximum 24-hour Average PM ₁₀ (µg/m ³)					
	Background		Scenario 5a		Scenario 5b	
	Regional	Power Station	Increment	Cumulative	Increment	Cumulative
22	18.8	0.8	7.4	18.9	2.0	18.9
23	18.8	0.8	5.1	18.9	2.0	18.9
26	18.8	0.8	6.0	18.9	2.4	18.9
28	18.8	0.6	3.7	18.9	1.0	18.9
30	18.8	0.5	3.2	18.9	1.1	18.9
31	18.8	0.6	3.7	18.9	1.4	18.9
32	18.8	0.6	3.3	18.9	1.0	18.9
33	18.8	0.5	2.8	19.1	1.1	18.9
35	18.8	0.4	3.2	18.9	1.1	18.9

Note: Project criterion – 8 µg/m³

The results indicated that the annual average PM_{2.5} concentrations are predicted to be well below the criterion of 25 µg/m³ at all identified sensitive receptor locations around Cooranbong Entry Site for both modelled scenarios.

8.7 Odour

Table 55 presents the 99th percentile 1-hour average odour concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the odour emission rates listed in **Section 5** for Project operations. It is noted that the background odour concentration is assumed to be zero.

As discussed in **Section 5.1**, the only odour source from Project operations during all the scenarios, are the mine ventilation fans located at the Newstan Colliery Surface Site and Cooranbong Entry Site. As all the scenarios are differentiated based on the coal handling at the Newstan Colliery Surface Site, it is appropriate to assume that the predicted odour concentrations are the same for all the scenarios. Contour plots of the predicted odour concentrations are presented in **Appendix B**.

Table 55 99th Percentile 1-hour Average Odour Concentrations – Scenario 1, 2a, 2b, 2c, 3a, 3b,3c, 4, 5a and 5b

Receptor ID	Increment	Odour Criteria
NC1	<1	2
NC2	<1	2
NC3	<1	2
NC4	<1	2

Receptor ID	Increment	Odour Criteria
NC5	<1	2
NC6	<1	2
NC7	<1	2
NC8	<1	2
NC9	<1	2
NC10	<1	2
NC11	<1	2
22	<1	4
23	<1	4
26	<1	4
28	<1	4
30	<1	4
31	<1	4
32	<1	4
33	<1	4
35	<1	4

It is noted that the 99th percentile 1-hour average odour concentration is predicted to be below the Project criterion of 2 OU for the receptors surrounding the Newstan Colliery Surface Site and 4 OU for the receptors surrounding Cooranbong Entry Site for all modelled scenarios.

8.8 Assessment of Multiple Scenarios at Newstan Colliery Surface Site

As discussed in **Section 5.2**, to assess the impacts due to the proposed infrastructural changes at the Newstan Colliery Surface Site, a total of eight scenarios have been assessed. The results for the short term (24-hour average) impacts of PM₁₀ are discussed in this section. It is considered appropriate to assess the short term (24-hour average) impacts for PM₁₀ as the long term (annual averages) impacts are dependent on the short term impacts. As the TSP and PM_{2.5} emissions are based on the PM₁₀ emissions (see **Section 5.3**), it is considered that the predicted PM₁₀ concentrations will appropriately reflect the air quality impacts in the vicinity of the Newstan Colliery Surface Site.

Also, as the eight scenarios are differentiated based on the activities at the Newstan Colliery Surface Site only, it is considered appropriate to assess the results at the receptors in its vicinity only, namely 'NC1' to 'NC6'.

8.8.1 Scenario 2a, Scenario 2b and Scenario 2c

These three scenarios represent exporting 6 Mtpa of coal from the Newstan Colliery Surface Site. A summary of the three scenarios is shown in **Table 17**.

Table 56 presents the maximum 24-hour average PM₁₀ concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5.5**. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

Table 56 Predicted Maximum 24-Hour Average PM₁₀ Concentrations – Scenario 2a, Scenario 2b and Scenario 2c

Receptor ID	Increment		Scenario 2a (Exporting 6 Mtpa coal) (Current Infrastructure)		Scenario 2b (Exporting 6 Mtpa coal) (Automatic Coal Handling)		Scenario 2c (Exporting 6 Mtpa coal) (Automatic train loading)	
	Regional Background <i>Maximum predicted incremental result from background only</i>	Power Stations <i>Maximum predicted incremental result from power stations only</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>
	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)
NC1	32.8	1.0	16.7	36.5	16.7	36.0	16.7	36.0
NC2	32.8	1.0	31.5	49.2	31.5	49.1	31.5	48.8
NC3	32.8	1.0	21.9	35.0	17.1	35.0	13.4	35.0
NC4	32.8	1.0	13.0	33.5	11.8	33.5	7.6	33.5
NC5	32.8	1.0	20.0	40.8	13.3	36.2	13.4	33.5
NC6	32.8	1.0	36.5	53.6	27.6	49.4	20.3	40.1

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 42**.
Project Criterion: 50 µg/m³

It can be seen that when 6 Mtpa of coal is exported using the current infrastructure (Scenario 2a), exceedance of the 24-hour average PM₁₀ criterion is predicted at receptor 'NC6' (the Fassifern Primary School). Receptor 'NC6' is located south-east of the rail loop stockpile.

The predicted results for Scenario 2b represent automating the transfer of coal from the CPP to rail loop stockpile. It is noted from **Table 56** that automating the coal transfer from the CPP to rail loop stockpile results in a decrease in the incremental concentrations of up to 25% ('NC6'). However the corresponding predicted cumulative concentration at 'NC6' decreases by just 8% only.

The predicted results for Scenario 2c represent automating the train loading operations. It is noted from **Table 56** that this upgrade would result in a decrease in the incremental concentrations of up to 44% ('NC6') and the corresponding predicted cumulative concentration at 'NC6' decreases by approximately 25%.

Source Contribution Analysis – Scenario 2a (Receptor NC6)

As an exceedance of the 24-hour average criterion was predicted at receptor 'NC6' for Scenario 2a, it is considered appropriate to study the likely cause of exceedance at this receptor. A source contribution analysis is conducted for receptor 'NC6' and shown in **Table 57**.

Table 57 Source Contribution Analysis for Scenario 2a – Receptor 'NC6'

Emission Source	Contribution	Percentage
Cooranbong Entry Site – sources	0.4	0.5%
Newstan Fans	0.4	0.5%
ROM Coal stockpile	0.1	0.1%
Product stockpile (North)	0.7	0.8%
Product Stockpile (South)	0.4	0.5%
Train Wagon Surface	0.2	0.2%
Southern Reject Emplacement Area	9.6	11.9%
Northern Reject Emplacement Area	1.3	1.6%
Hawkmount Quarry	0.1	0.1%
Newstan Raw Coal Stockpile	0.1	0.2%
Reject from CPP loaded to bin	0.0	0.0%
Reject from CPP loaded to trucks	0.0	0.0%
Trucks dumping reject/stone material at SREA	0.0	0.0%
Dozer at SREA	0.6	0.8%
SREA Excavator #1	0.3	0.3%
SREA Excavator #2	0.3	0.4%
SREA Excavator #3	0.3	0.4%
Traxcavator	0.4	0.5%
Trucks dumping reject material at NREA	0.0	0.0%
Dozer at NREA	0.4	0.4%
Trucks dumping reject material at Hawkmount Quarry	0.0	0.0%
Dozer at Hawkmount Quarry	0.1	0.1%
Haul Roads (Newstan to Cooranbong to EPS)	15.6	19.2%
ROM Coal from dump hopper to stacker	0.0	0.1%
ROM Coal from Stacker to Stockpile	0.0	0.0%

Emission Source	Contribution	Percentage
Dozer on ROM Stockpile (push to reclaim stockpile)	1.2	1.5%
Conveyor to CPP Module 1	0.0	0.1%
Conveyor from Newstan drift to Newstan Coal ROM Stockpile	0.0	0.0%
Conveyor drop onto Newstan ROM stockpile	0.0	0.0%
Conveyor from Newstan Drift to CPP Module 2	0.0	0.0%
CPP Module 1 & CPP Module 2 & CHP-Crush/Screen/Wash	0.0	0.0%
Dozer at Product Stockpile (Rail Loop)	9.9	12.2%
FEL # 1 at Product Stockpile (Rail Loop) loading trains	7.2	8.9%
FEL # 2 at Product Stockpile (Rail Loop) loading trains	8.2	10.0%
FEL # 3 at Product Stockpile (Rail Loop) loading trains	7.3	8.9%
Trucks dumping coal to Rail loop stockpile	0.2	0.3%
Trucks dumping coal at Newstan ROM stockpile	0.1	0.1%
Haul road - rail loop stockpile	15.6	19.2%
TOTAL	81.1	100.0%

It is noted that the total 24-hour average PM₁₀ concentrations in **Table 57** is not the same as reported in **Table 56** for receptor 'NC6' because the source contribution analysis assumes that each source is contributing at its peak, whereas in reality this might not be the case.

From the source contribution analysis, it can be seen that:

- the combined contribution of the dozer and FELs operating on rail loop stockpile is 40.0%; and
- the contribution of trucks transporting coal to and dumping coal at the rail loop stockpile is 19.5%.

Summary

Scenario 2a represents air quality impacts due to exportation of 6 Mtpa of coal from the Newstan Colliery Surface Site. Exceedance of the 24-hour average PM₁₀ criterion is predicted at the receptor 'NC6' if current coal handling operations are continued. A source contribution analysis was conducted and it was shown that the combined coal handling using bulldozer and FELs during manual train loading at the rail loop stockpile was the largest contributor of PM₁₀ emissions.

Scenario 2b represents the air quality impacts resulting after automating the transfer of coal from the CPP to the rail loop stockpile. This automation of coal transfer provides a minor improvement in the predicted air quality impacts resulting in the air quality criteria being achieved at all sensitive receivers surrounding the Newstan Colliery Surface Site.

Scenario 2c represents the air quality impacts after automation of train loading operations. The automation of train loading operations provides a significant improvement in the predicted air quality impacts resulting in the air quality criteria being achieved at all sensitive receivers surrounding the Newstan Colliery Surface Site.

8.8.2 Scenario 3a, Scenario 3b and Scenario 3c

These three scenarios represent exporting 8 Mtpa of coal from the Newstan Colliery Surface Site. A summary of the three scenarios is shown in **Table 17**.

Table 58 presents the maximum 24-hour average PM₁₀ concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5.5**. The calculated background PM₁₀ concentrations have been discussed in detail in **Section 7**.

Table 58 Predicted Maximum 24-Hour Average PM₁₀ Concentrations – Scenario 3a, Scenario 3b and Scenario 3c

Receptor ID	Increment		Scenario 3a (Exporting 6 Mtpa coal) (Current Infrastructure)		Scenario 3b (Exporting 6 Mtpa coal) (Automatic Coal Handling)		Scenario 3c (Exporting 6 Mtpa coal) (Automatic train loading)	
	Regional Background <i>Maximum predicted incremental result from background only</i>	Power Stations <i>Maximum predicted incremental result from power stations only</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>	Increment <i>Maximum predicted incremental result from current scenario only</i>	Cumulative <i>Maximum predicted concurrent and cumulative result from background, power stations and project</i>
	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)
NC1	32.8	1.0	20.4	40.2	16.7	36.2	16.7	36.0
NC2	32.8	1.0	31.5	49.5	31.5	49.2	31.5	48.8
NC3	32.8	1.0	26.0	39.4	19.6	35.1	14.7	35.0
NC4	32.8	1.0	16.9	33.9	15.2	33.5	8.1	33.5
NC5	32.8	1.0	31.0	45.1	21.7	39.0	15.8	34.3
NC6	32.8	1.0	56.9	72.0	44.9	60.0	23.8	41.6

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 42**.
Project Criterion: 50 µg/m³

It can be seen that when 8 Mtpa of coal is exported using the current infrastructure (Scenario 3a), exceedance of the 24-hour average PM₁₀ criterion is predicted at receptor 'NC6'.

The predicted results for Scenario 3b represent automating the transfer of coal from the CPP to rail loop stockpile. It is noted from **Table 58** that automating the coal transfer from CPP to rail loop stockpile results in a decrease in the incremental concentrations of up to 21% ('NC6'). However the corresponding predicted cumulative concentration at 'NC6' decreases by just 16% only and is still predicted to exceed the 24-hour average PM₁₀ criterion.

The predicted results for Scenario 3c represent automating the train loading operations. It is noted from **Table 58** that that this upgrade would result in a decrease in the incremental concentrations of up to 58% ('NC6') and the corresponding predicted cumulative concentration at 'NC6' decreases by approximately 42%.

Source Contribution Analysis – Scenario 3a (Receptor NC6)

As an exceedance of the 24-hour average criterion was predicted at receptor 'NC6' for Scenario 3a, it is considered appropriate to study the likely cause of exceedance at this receptor. A source contribution analysis is conducted for receptor 'NC6' and shown in **Table 59**.

Table 59 Source Contribution Analysis for Scenario 3a – Receptor 'NC6'

Emission Source	Contribution	Percentage
Cooranbong Entry Site - sources	0.4	0.4%
Newstan Fans	0.4	0.4%
ROM Coal stockpile	0.1	0.1%
Product stockpile (North)	0.7	0.7%
Product Stockpile (South)	0.4	0.4%
Train Wagon Surface	0.2	0.2%
Southern Reject Emplacement Area	9.6	9.4%
Northern Reject Emplacement Area	1.3	1.3%
Hawkmount Quarry	0.1	0.1%
Newstan Raw Coal Stockpile	0.1	0.1%
Reject from CPP loaded to bin	0.0	0.0%
Reject from CPP loaded to trucks	0.0	0.0%
Trucks dumping reject/stone material at SREA	0.0	0.0%
Dozer at SREA	0.6	0.6%
SREA Excavator #1	0.3	0.3%
SREA Excavator #2	0.3	0.3%
SREA Excavator #3	0.3	0.3%
Traxcavator	0.4	0.4%
Trucks dumping reject material at NREA	0.0	0.0%
Dozer at NREA	0.4	0.3%
Trucks dumping reject material at Hawkmount Quarry	0.0	0.0%
Dozer at Hawkmount Quarry	0.1	0.1%
Haul Roads (Newstan to Cooranbong to EPS)	15.6	15.2%
ROM Coal from dump hopper to stacker	0.0	0.0%
ROM Coal from Stacker to Stockpile	0.0	0.0%

Emission Source	Contribution	Percentage
Dozer on ROM Stockpile (push to reclaim stockpile)	1.2	1.2%
Conveyor to CPP Module 1	0.0	0.0%
Conveyor from Newstan drift to Newstan Coal ROM Stockpile	0.0	0.0%
Conveyor drop onto Newstan ROM stockpile	0.0	0.0%
Conveyor from Newstan Drift to CPP Module 2	0.0	0.0%
CPP Module 1 & CPP Module 2 & CHP-Crush/Screen/Wash	0.0	0.0%
Dozer at Product Stockpile (Rail Loop)	18.2	17.8%
FEL # 1 at Product Stockpile (Rail Loop) loading trains	9.6	9.4%
FEL # 2 at Product Stockpile (Rail Loop) loading trains	10.9	10.6%
FEL # 3 at Product Stockpile (Rail Loop) loading trains	9.7	9.4%
Trucks dumping coal to Rail loop stockpile	0.5	0.5%
Trucks dumping coal at Newstan ROM stockpile	0.1	0.1%
Haul road - rail loop stockpile	20.8	20.3%
TOTAL	102.5	100.0%

It is noted that the total 24-hour average PM₁₀ concentrations in **Table 59** is not the same as reported in **Table 58** for receptor 'NC6' because the source contribution analysis assumes that each source is contributing at its peak, whereas in reality this might not be the case.

From the source contribution analysis, it can be seen that:

- the combined contribution of the dozer and FELs operating on rail loop stockpile is 47.2%; and
- the contribution of trucks transporting coal to and dumping coal at the rail loop stockpile is 20.8%.

Summary

Scenario 3a represents air quality impacts due to exportation of 8 Mtpa of coal from the Newstan Colliery Surface Site. Exceedance of the 24-hour average PM₁₀ criterion is predicted at the receptor 'NC6'. A source contribution analysis was conducted and was shown that the combined coal handling using bulldozer and FELs during manual train loading at the rail loop stockpile was the largest contributor to PM₁₀ concentrations.

Scenario 3b represents the air quality impacts resulting after automating the transfer of coal from the CPP to the rail loop stockpile. This automation of coal transfer provides a minor improvement in the predicted air quality impacts, however still results in exceedance of the 24-hour average PM₁₀ criterion at NC6.

Scenario 3c represents the air quality impacts after automation of train loading operations. The automation of train loading operations provides a significant improvement in the predicted air quality impacts resulting in the air quality criteria being achieved at all sensitive receivers surrounding the Newstan Colliery Surface Site.

8.8.3 Scenario 4

Scenario 4 represents the exportation of 8 Mtpa of coal from the Newstan Colliery Surface Site and is designed to assess the benefits of installing a dump hopper in reducing air quality impacts from the operations at the Newstan Colliery Surface Site. As can be seen in Table 51, when compared to Scenario 3C, very little benefit is gained by the installation and operation of a dump hopper at the Newstan Colliery Surface Site with only up to a 0.4% reduction in the predicted air quality impacts being achieved at the nearest sensitive receptors.

8.8.4 Discussion/Analysis

A summary of the predicted incremental and cumulative 24-hour average PM₁₀ concentrations for the seven scenarios is presented in **Figure 40** and **Figure 41** respectively.

Figure 40 Summary of Incremental 24-hour Average PM₁₀ Concentrations – NC1 to NC6

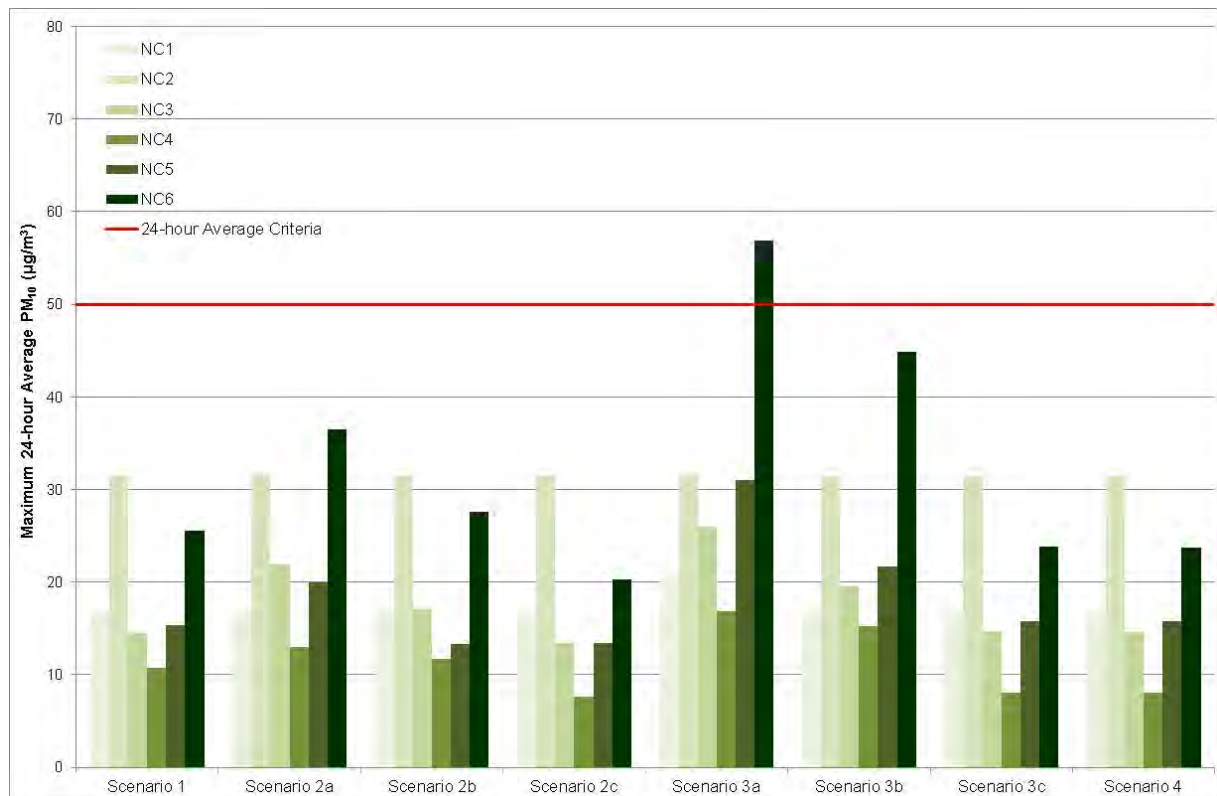
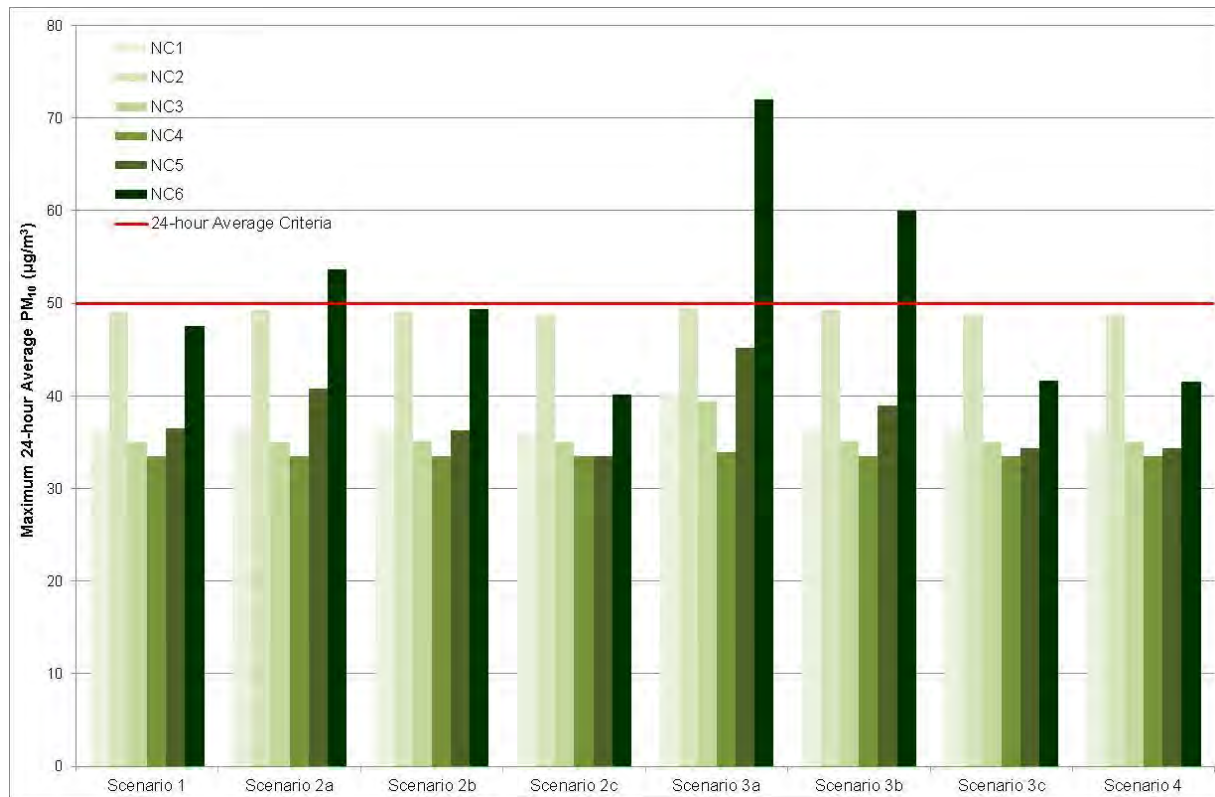


Figure 41 Summary of Cumulative 24-hour Average PM₁₀ Concentrations - NC1 to NC6



The predicted results for Scenario 1, Scenario 2a and Scenario 3a represent the air quality impacts due to export of 4 Mtpa, 6 Mtpa and 8 Mtpa using the existing coal handling methods at the Newstan Colliery Surface Site. It can be seen from **Figure 41** that using the existing coal handling systems, export of 6 Mtpa and 8 Mtpa will result in exceedance of the 24-hour average PM₁₀ criterion at receptor 'NC6'.

The automation of coal transfers between the CPP and the rail loop stockpile decreases the cumulative 24-hour average PM₁₀ concentrations to below the relevant criterion for Scenario 2b however still results in exceedances when throughput increases to 8 Mtpa (Scenario 3b).

The predicted results for Scenario 2c, and Scenario 3c represent the air quality impacts due to export of 6 Mtpa and 8 Mtpa using the automation of train loading operations. It can be seen from **Figure 41** that automating train loading operations result in the decrease of cumulative 24-hour average PM₁₀ concentrations at receptor 'NC6' and it is predicted to be below the relevant criterion for both scenarios 2c and 3c.

As discussed in the previous section, it is predicted that the export of 6 Mtpa coal can be achieved with automation of coal transfers between the CPP and rail loop stockpile, however to export 8 Mtpa of coal, automation of train loading operations would be required.

It can be seen from the analysis, that the handling of ROM coal is predicted to contribute only a small percentage to the overall predicted concentrations. As such, the installation of a ROM coal dump hopper may be installed to improve the operational efficiency at the Newstan Colliery Surface Site however is not required to achieve air quality criteria.

In order to achieve the air quality criteria at the Newstan Colliery Surface Site for the life of the Project, it is recommended that:

- Train loading operations are automated once it is proposed to export 6 Mtpa from the Newstan Colliery Surface Site; and
- Coal transfers between the CPP and the rail loop stockpile are automated once it is proposed to export 6 Mtpa AND train loading operations are automated once it is proposed to export 8 Mtpa from the Newstan Colliery Surface Site.

8.9 Dust Management and Mitigation

8.9.1 Construction

The following procedures and requirements should be followed during the life of the Project to minimise the impact of dust generated in association with the proposed Project:

- Watering of roads and sealing of roads where possible;
- Trucks entering and leaving the site should be well maintained in accordance with the manufacturer's specification to comply with all relevant regulations. Truck movement should be controlled on site and restricted to designated roadways. All loaded trucks should be covered to minimise transport of dust offsite; and,
- If necessary, modifying construction activities during periods of high wind.

The following are general, basic procedures which are designed to control dust and other emissions from construction operations and on-site equipment. The aim of these procedures is to minimise off-site dust nuisance and air quality impacts. Consideration should be given to adopt measures appropriate to the proposed project.

- Activities carried out on site should be such as to ensure that all equipment used and all facilities erected are designed and operated to control the emission of smoke, dust, fume and other objectionable matter into the atmosphere.
- Precautions to be taken include spraying of earthworks, roads and other surfaces as necessary with water or other suitable liquids, providing dust suppression equipment to any onsite materials batching plant and the modification of operations during high or unfavourable wind conditions.
- Working areas and access roads should be stabilised as soon as practicable to prevent or minimise windblown dust.
- All disturbed areas should be stabilised as soon as practicable to prevent or minimise windblown dust.
- All unsealed trafficable areas be kept sufficiently damp during working hours to minimise windblown or traffic generated dust emissions. Continued use of water on dirt roads helps the formation of a crust so that dust is not as easily generated.
- Water sprays, sprinklers and water carts are to be employed if needed to adequately dampen stockpiles, work areas and exposed soils to prevent the emissions of dust from the site. Water carts and other equipment are to be available to enable watering at least at an hourly rate of 2 litres per square metre.
- Stockpiles and handling areas should be maintained in a condition which minimises windblown or traffic generated dust. Areas that may be inaccessible by water carts should be kept in a condition which minimises windblown or traffic generated dust using other means.
- All equipment for dust control will be kept in good operating condition. The equipment will be operable at all times with the exception of shutdowns required for maintenance. Construction equipment will be properly maintained to ensure exhaust emissions comply with relevant regulatory requirements.
- Cleared vegetation, demolition materials and other combustible waste material should not be burnt on site.
- Silt should be removed from behind filter fences and other erosion control structures on a regular basis, so that collected silt does not become a source of dust.
- Any dust, soil or mud deposited on public roads by sub-contractors construction activities and vehicle movements should be removed as soon as practicable.

8.9.2 Operation

In order to achieve the air quality criteria at the sensitive receptors surrounding Newstan Colliery Surface Site for the life of the Project, it is recommended that:

- Train loading operations are automated once it is proposed to export 6 Mtpa from the Newstan Colliery Surface Site; and
- Coal transfers between the CPP and the rail loop stockpile are automated once it is proposed to export 6 Mtpa AND train loading operations are automated once it is proposed to export 8 Mtpa from the Newstan Colliery Surface Site.

Continue to utilise E5 European standard engines for coal haulage trucks that operate on the private haul roads linking the Newstan Colliery Surface Site, Awaba Colliery Surface Site, Cooranbong Entry Site, Hawkmount Quarry and the Eraring Power Station.

Following Project approval, air quality management plans for the Newstan Colliery Surface Site, Cooranbong Entry Site and private haul roads are to be updated to reflect the upgraded operations.

8.9.3 Air Quality Monitoring

Dust deposition monitoring is performed around the Newstan Colliery Surface Site and Cooranbong Entry Site, as discussed in **Section 7.1** and **Section 7.2**.

Dust deposition, TSP, PM₁₀ and PM_{2.5} monitoring is performed around the Newstan Colliery Surface Site, and PM₁₀ monitoring (in additional to dust deposition monitoring) has recently commenced around the Cooranbong Entry Site as discussed in **Section 7.1**. The monitoring program currently in operation at Newstan Colliery Surface Site and Cooranbong Entry Site are to continue for the Project following development consent.

It is considered that real time monitoring by TEOM at Newstan Colliery Surface Site represents best practice management and it will be continued as part of the Project.

9 CONCLUSION

SLR Consulting was commissioned by Northern Coal Services to conduct an Air Quality Impact Assessment for the Northern Coal Logistics Project located between Fassifern and Dora Creek on the western side of Lake Macquarie, New South Wales.

The Northern Coal Logistics Project comprises of the operations at Newstan Colliery Surface Site, Hawkmount Quarry, Cooranbong Entry Site and the private haul roads. As part of the Project, various upgrades have been proposed to the operations at the Newstan Colliery Surface Site. The aim of this AQIA was to assess the air quality impacts on surrounding sensitive receivers associated with the Project.

Dispersion modelling was conducted for the identified sources at contributing operations for particulates (TSP, PM₁₀ and PM_{2.5}) and odour for ten scenarios:

- eight scenarios associated with the operations at the Newstan Colliery Surface Site; and
- two scenarios associated with the operations at the Cooranbong Entry Site.

In order to assess the background air quality of the region a number of industrial facilities with the potential to have a cumulative impact on the local airshed were identified. A dispersion modelling exercise was performed to determine suitable background levels of pollutants in order to assess the cumulative impacts.

The dispersion modelling exercise for the Project indicates that:

- The annual average deposited dust concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average TSP concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average PM₁₀ concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The annual average PM_{2.5} concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.
- The 24-hour average PM₁₀ concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for the Cooranbong Entry Site. The 24-hour average PM₁₀ concentrations were likely to exceed the relevant criterion for three scenarios at the receptor 'NC6' surrounding the Newstan Colliery Surface Site. To achieve the relevant PM₁₀ criterion at all of the identified sensitive receptors surrounding the Newstan Colliery Surface Site, it was recommended that:
 - Train loading operations are automated prior to the export of greater than 6 Mtpa from the Newstan Colliery Surface Site; or
 - The automation of coal transfers between the CPP and the rail loop stockpile is implemented prior to the export of greater than 6 Mtpa and train loading operations are automated prior to the export of greater than 8 Mtpa from the Newstan Colliery Surface Site.
- The 24-hour average PM_{2.5} concentrations were unlikely to exceed the relevant criterion at any of the identified sensitive receptors for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.

- The 99th percentile odour concentrations were predicted to be below the relevant criterion at all the identified sensitive receptors during Project operations for all modelled scenarios for both the Newstan Colliery Surface Site and the Cooranbong Entry Site.

10 REFERENCES

- Centennial 2012, Northern Coal Services – Northern Coal Logistics Project, Project Description (for specialist consultants), Centennial Coal, October 2012.
- DSEWPC, 2012, National Pollutant Inventory Emission Estimation Technique Manual for Mining version 3.1 published by the Department of Sustainability, Environment, Water, Population and Communities. January 2012.
- DECC 2009, NSW Annual Compliance Report 2009, National Environment Protection (Ambient Air Quality) Measure (NEPM), Department of Environment, Climate Change and Water 30 November 2010.
- MRI 2006, *Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors*, prepared by: Midwest Research Institute, prepared for: Western Governors Association – Western Regional Air Partnership (WRAP), MRI Project number 110397, dated: 1 November 2006.
- NSW DEC 2005, NSW Department of Environment and Conservation, “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW”, 26 August 2005.
- SLR 2011a, Air Quality Assessment, Teralba Quarry Extensions, Specialist Consultant Studies Compendium Volume 2, Part 7, prepared by SLR Consulting Pty Ltd, November 2011.
- SLR 2011b, Awaba Underground Coal Mine – Part 3A Application – Air Quality Impact Assessment, Report number 30-2497-R1, prepared by SLR Consulting, 7 May 2010.
- SLR 2011c, Mandalong Mine – Cooranbong Entry Site – Air Quality Impact Assessment and Greenhouse Gas Assessment, report number 670.10120-R2, 16 November 2011.
- SLR 2012a, Mandalong Mine – Cooranbong Entry Site – Air Quality Impact Assessment and Greenhouse Gas Assessment, report number 670.10120-R2, dated 30 April 2012.
- SLR 2012b, Odour Monitoring – Ventilation Shaft Mandalong Mine, report number 610.11503-R1, 9 August 2012.
- SLR 2012c, Test Report 610.11731 – Particulate Testing, 22 August 2012.
- SLR 2013, Mandalong Southern Extension Project – Air Quality Impact Assessment, Report number 630.10123-R1, dated: 1 March 2013.
- Umwelt 2010, Environmental Assessment - West Wallsend Colliery Continued Operations Project, prepared by Umwelt (Australia) Pty Ltd on behalf of Oceanic Coal Australia Limited, May 2010.
- USEPA 2006, Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.4 Aggregate Handling and Storage Piles, United States Environmental Protection Authority, 11/2006.
- USEPA 2011, Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.1 Paved Roads, United States Environmental Protection Authority, 01/2011.

SCENARIO 1													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer at Product Stockpile (Rail Loop)	2,920	hrs	None	NPI Dozer on Coal	53,153	16,178	1,618	None	0	53,153	16,178	1,618
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	1,333,333	tpa	None	NPI FEL on Coal	68,912	9,721	972	None	0	68,912	9,721	972
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	1,333,333	tpa	None	NPI FEL on Coal	68,912	9,721	972	None	0	68,912	9,721	972
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	1,333,333	tpa	None	NPI FEL on Coal	68,912	9,721	972	None	0	68,912	9,721	972
NS	Trucks dumping coal to Rail loop stockpile	4,000,000	tpa	None	AP42 Batch drop	833	394	60	None	0	833	394	60
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Misc Tran Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402
NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491

SCENARIO 2a													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer at Product Stockpile (Rail Loop)	4,380	hrs	None	NPI Dozer on Coal	79,730	24,267	2,427	None	0	79,730	24,267	2,427
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Trucks dumping coal to Rail loop stockpile	4,000,000	tpa	None	AP42 Batch drop	833	394	60	None	0	833	394	60
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402
NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491

SCENARIO 2b													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer at Product Stockpile (Rail Loop)	4,380	hrs	None	NPI Dozer on Coal	79,730	24,267	2,427	None	0	79,730	24,267	2,427
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,000,000	tpa	None	NPI FEL on Coal	103,368	14,581	1,458	None	0	103,368	14,581	1,458
NS	Conveyor to Product Stockpile via Skyline Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor drop onto Product Stockpile	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Water Sprays on Skyline Stacker (50%)	50	625	296	30
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402

Appendix A – Detailed Emission Inventory

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NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491
SCENARIO 2c													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls		Controlled Emissions		
						TSP	PM ₁₀	PM _{2.5}			TSP	PM ₁₀	PM _{2.5}
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer on Product Stockpile	4,380	hrs	None	NPI Dozer on Coal	79,730	24,267	2,427	None	0	79,730	24,267	2,427
NS	Conveyor to Train Loading Bin	6,000,000	tpa	None	NPI FEL on Coal	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Loading Train Loading Bin	6,000,000	tpa	None	NPI FEL on Coal	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Loading Trains	6,000,000	tpa	None	NPI FEL on Coal	2,400	1,020	102	Enclosure on Loading trains (70%)	70	720	306	31
NS	Trucks dumping coal to Rail loop stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402

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NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491
SCENARIO 3a													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls		Controlled Emissions		
						TSP	PM ₁₀	PM _{2.5}			TSP	PM ₁₀	PM _{2.5}
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer at Product Stockpile (Rail Loop)	5,840	hrs	None	NPI Dozer on Coal	106,306	32,356	3,236	None	0	106,306	32,356	3,236
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Trucks dumping coal to Rail loop stockpile	8,000,000	tpa	None	AP42 Batch drop	1,667	788	119	None	0	1,667	788	119
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402

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NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491
SCENARIO 3b													
Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer at Product Stockpile (Rail Loop)	5,840	hrs	None	NPI Dozer on Coal	106,306	32,356	3,236	None	0	106,306	32,356	3,236
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Front End Loader at Product Stockpile (Rail Loop) loading trains	2,666,667	tpa	None	NPI FEL on Coal	137,823	19,441	1,944	None	0	137,823	19,441	1,944
NS	Conveyor to Product Stockpile via Skyline Stacker	8,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,667	788	79	Enclosed conveyor (70%)	70	500	237	24
NS	Conveyor drop onto Product Stockpile	8,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,667	788	79	Water Sprays on Skyline Stacker (50%)	50	833	394	39
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	7	1
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884

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Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402
NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491
SCENARIO 3c													
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan ROM stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Dozer on Product Stockpile	4,380	hrs	None	NPI Dozer on Coal	79,730	24,267	2,427	None	0	79,730	24,267	2,427
NS	Conveyor to Train Loading Bin	8,000,000	tpa	None	NPI FEL on Coal	1,667	788	79	Enclosed conveyor (70%)	70	500	237	24
NS	Loading Train Loading Bin	8,000,000	tpa	None	NPI FEL on Coal	1,667	788	79	Enclosed conveyor (70%)	70	500	237	24
NS	Loading Trains	8,000,000	tpa	None	NPI FEL on Coal	3,200	1,360	136	Enclosure on Loading trains (70%)	70	960	408	41
NS	Trucks dumping coal to Rail loop stockpile	8,000,000	tpa	None	AP42 Batch drop	1,667	788	119	None	0	1,667	788	119
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
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NS - SREA	Traxcavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
NREA	Trucks dumping reject material at NREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NREA	Dozer at NREA	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
HQ	Trucks dumping reject material at HQ	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
HQ	Dozer at HQ	1,022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS	ROM Coal Stockpile	0.8	ha	None	NPI Wind Erosion	2,803	1,402	140	Water Sprays (50%)	50	1,402	701	70
NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
NS	Product Stockpile (South)	2.4	ha	None	NPI Wind Erosion	8,410	4,205	420	Water Sprays (50%)	50	4,205	2,102	210
NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884

Appendix A – Detailed Emission Inventory

Report Number 630.10123-R1

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Site	Activity	Annual	Units	Notes	EF	Uncontrolled Emissions			Controls	Controlled Emissions			
						TSP	PM ₁₀	PM _{2.5}		TSP	PM ₁₀	PM _{2.5}	
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402
NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491
SCENARIO 4													
NS	Trucks transporting coal and/or reject material from Cooranbong to Mandalong Coal ROM Stockpile	4,793,472	VKT	15km, 16 trucks/hr (max), 8760hrs/yr (24hrs/day) 1 loop (1 loop is from Newstan to Eraring, From Eraring to Cooranbong, Cooranbong to Newstan).	AP42 WGD	525,920	100,951	24,424	USEPA Paved road emission factor used	0	525,920	100,951	24,424
NS	ROM Coal from Dump Hopper to Stacker	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	ROM Coal from Stacker to Stockpile	600,000	tpa	None	NPI Miscellaneous Transfer Point	125	59	6	Water Sprays on skyline stacker (50%)	50	63	30	3
NS	Dozer on ROM Stockpile (push to reclaim tunnel)	876	hrs	10% of time, Only 2 dozers on whole site so assumed 1 on ROM	NPI Dozer on Coal	15,946	4,853	485	None	0	15,946	4,853	485
NS	Conveyor to CPP Module 1	6,000,000	tpa	None	NPI Miscellaneous Transfer Point	1,250	591	59	Enclosed conveyor (70%)	70	375	177	18
NS	Conveyor from Newstan Drift to Newstan Coal ROM Stockpile	450,000	tpa	10% of coal to Stockpile	NPI Miscellaneous Transfer Point	94	44	4	Enclosed conveyor (70%)	70	28	13	1
NS	Conveyor drop onto Newstan ROM Stockpile	450,000	tpa	None	NPI Miscellaneous Transfer Point	94	44	4	Water Sprays on skyline Stacker (50%)	50	47	22	2
NS	Conveyor from Newstan Drift to CPP Module 2	4,050,000	tpa	90% of coal direct to CPP	NPI Miscellaneous Transfer Point	844	399	40	Enclosed conveyor (70%)	70	253	120	12
NS	CPP Module 1 & CPP Module 2 & CHP- Crush/Screen/Wash	8,000,000	tpa	Maximum of 8Mtpa through CPP	NPI Prim Crush, NPI Screen	720,000	512,000	51,200	Enclosed (100%)	100	0	0	0
NS	Trucks dumping coal at Newstan Dump Hopper	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	375	177	27
NS	Dozer on Product Stockpile	4,380	hrs	None	NPI Dozer on Coal	79,730	24,267	2,427	None	0	79,730	24,267	2,427
NS	Conveyor to Train Loading Bin	6,000,000	tpa	None	NPI FEL on Coal	1,250	591	59	None	0	375	177	18
NS	Loading Train Loading Bin	6,000,000	tpa	None	NPI FEL on Coal	1,250	591	59	None	0	375	177	18
NS	Loading Trains	6,000,000	tpa	None	NPI FEL on Coal	2,400	1,020	102	None	0	720	306	31
NS	Trucks dumping coal to Rail loop stockpile	6,000,000	tpa	None	AP42 Batch drop	1,250	591	90	None	0	1,250	591	90
NS	Reject from CPP loaded to bin	1,073,100	tpa	Assumed 6 truck load per hour 35t truck payload and 14hrs/day operation	NPI Miscellaneous Transfer Point	149	71	11	Enclosed conveyor (70%)		45	21	3
NS	Reject from CPP loaded to trucks	1,000,000	tpa	None	AP42 Batch drop	149	71	11	None	0	149	71	11
NS - SREA	Trucks dumping reject/stone material at SREA	1,000,000	tpa	None	AP42 Batch drop	139	66	10	None	0	139	66	10
NS - SREA	Dozer at SREA	1022	hrs	20% of time	NPI Dozer on Coal	12,436	3,785	379	None	0	12,436	3,785	379
NS - SREA	Excavator	1,000,000	tpa	Operating hours are from 6am to 5pm Monday to Friday 10 hrs per day on overburden - 2600 hrs	NPI Excavator on Coal	36,596	5,627	563	Water Sprays (50%)	50	18,298	2,814	281
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NS	Product Stockpile (North)	2.2	ha	None	NPI Wind Erosion	7,709	3,854	385	Water Sprays (50%)	50	3,854	1,927	193
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NS	Train Wagon Surface	0.4	ha	None	NPI Wind Erosion	1,346	673	67	None	0	1,346	673	67
NS - SREA	Southern Reject Emplacement Area	45	ha	Total area 57 ha, but 45 ha as active area	NPI Wind Erosion	157,680	78,840	7,884	None	0	157,680	78,840	7,884

Appendix A – Detailed Emission Inventory

Report Number 630.10123-R1

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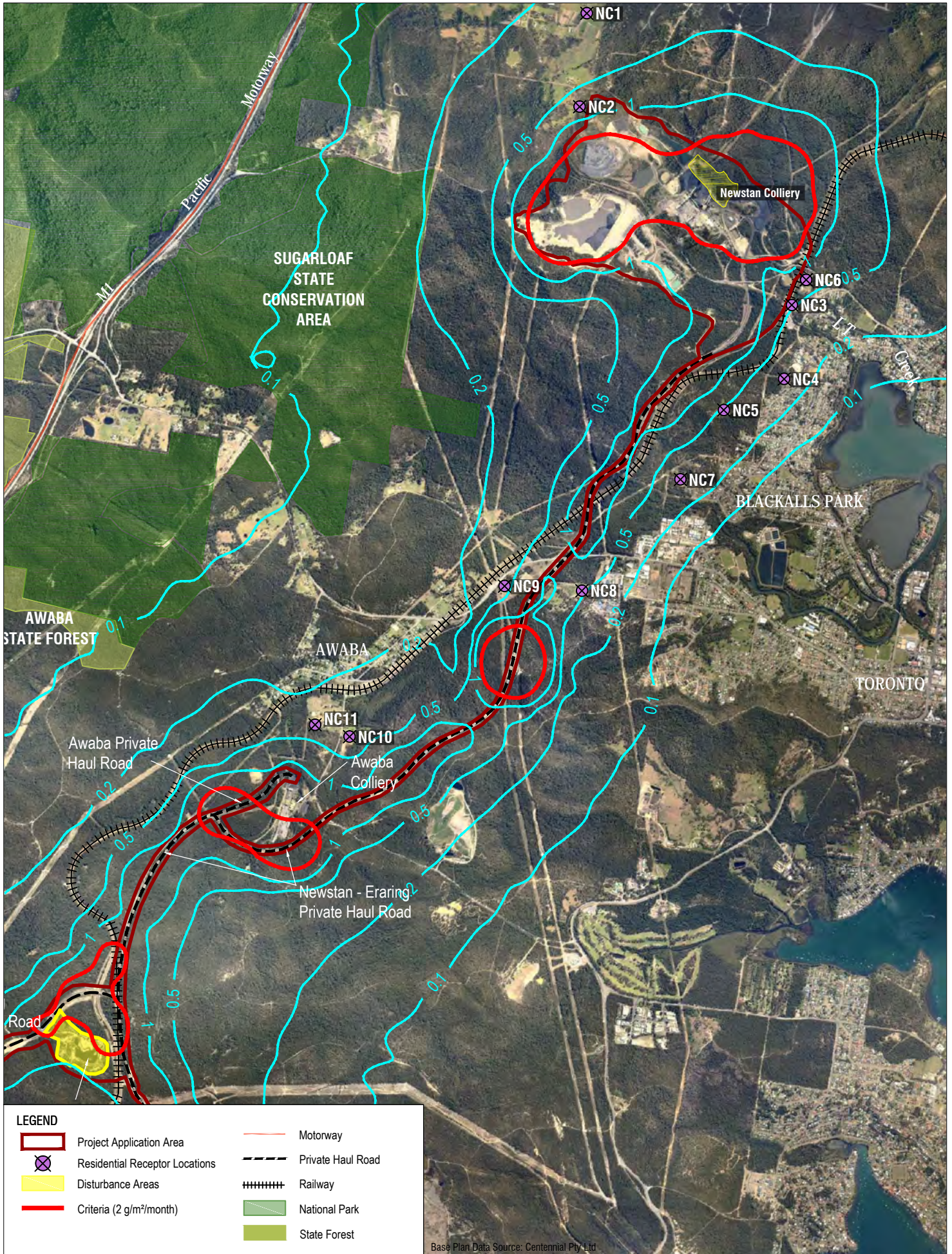
NS - NREA	Northern Reject Emplacement Area	8	ha	Total area 37 ha, but 8 ha as active area	NPI Wind Erosion	28,032	14,016	1,402	None	0	28,032	14,016	1,402
NS - HMQ	Hawkmount Quarry	2.8	ha	None	NPI Wind Erosion	9,811	4,906	491	None	0	9,811	4,906	491

Appendix B

Report Number 630.10123-R1

Page 1 of 1

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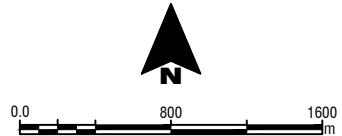


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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (2 g/m ² /month)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month

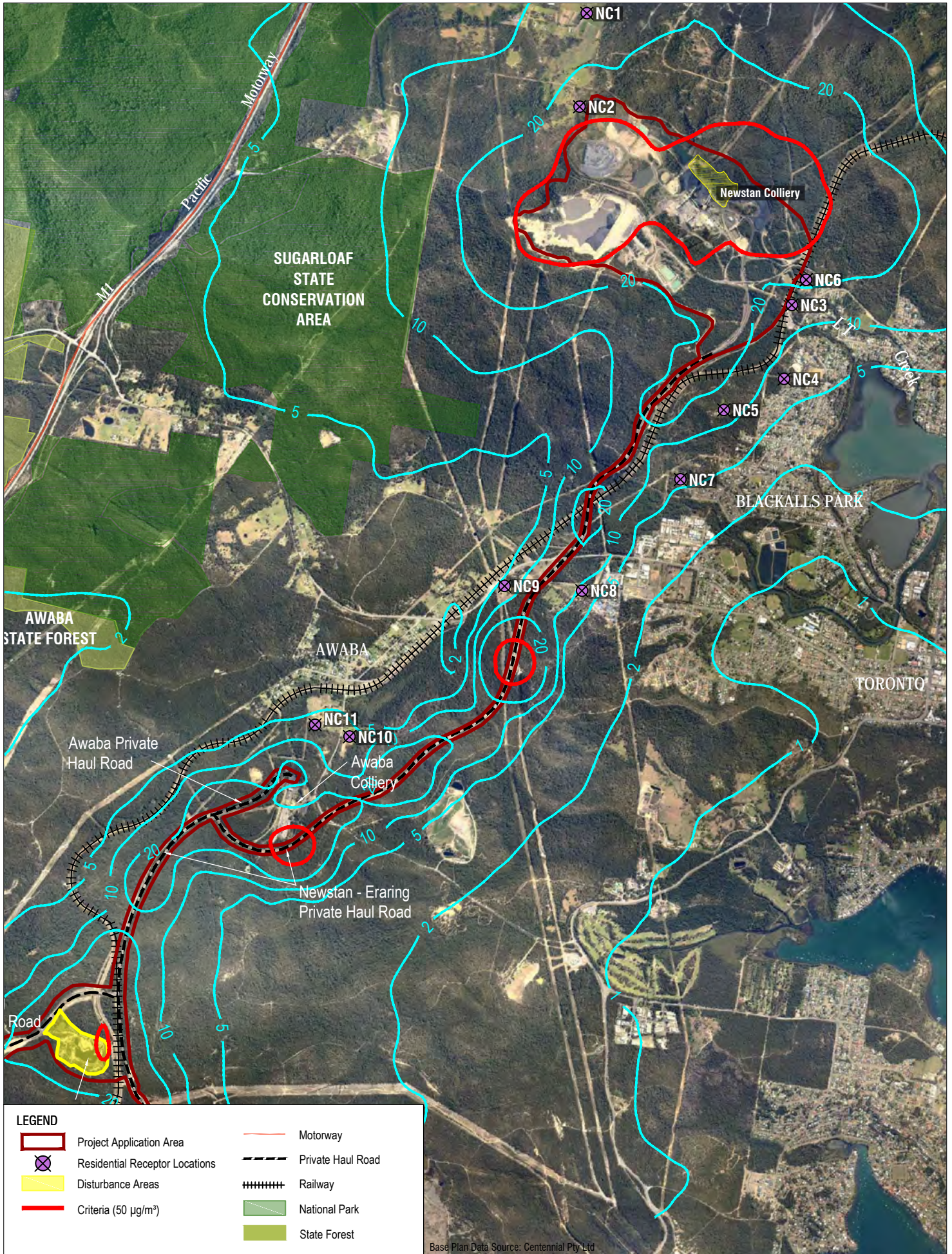
Scenario 1

Increment Only

APPENDIX B

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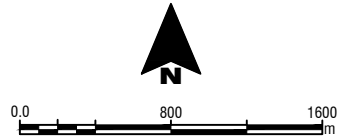
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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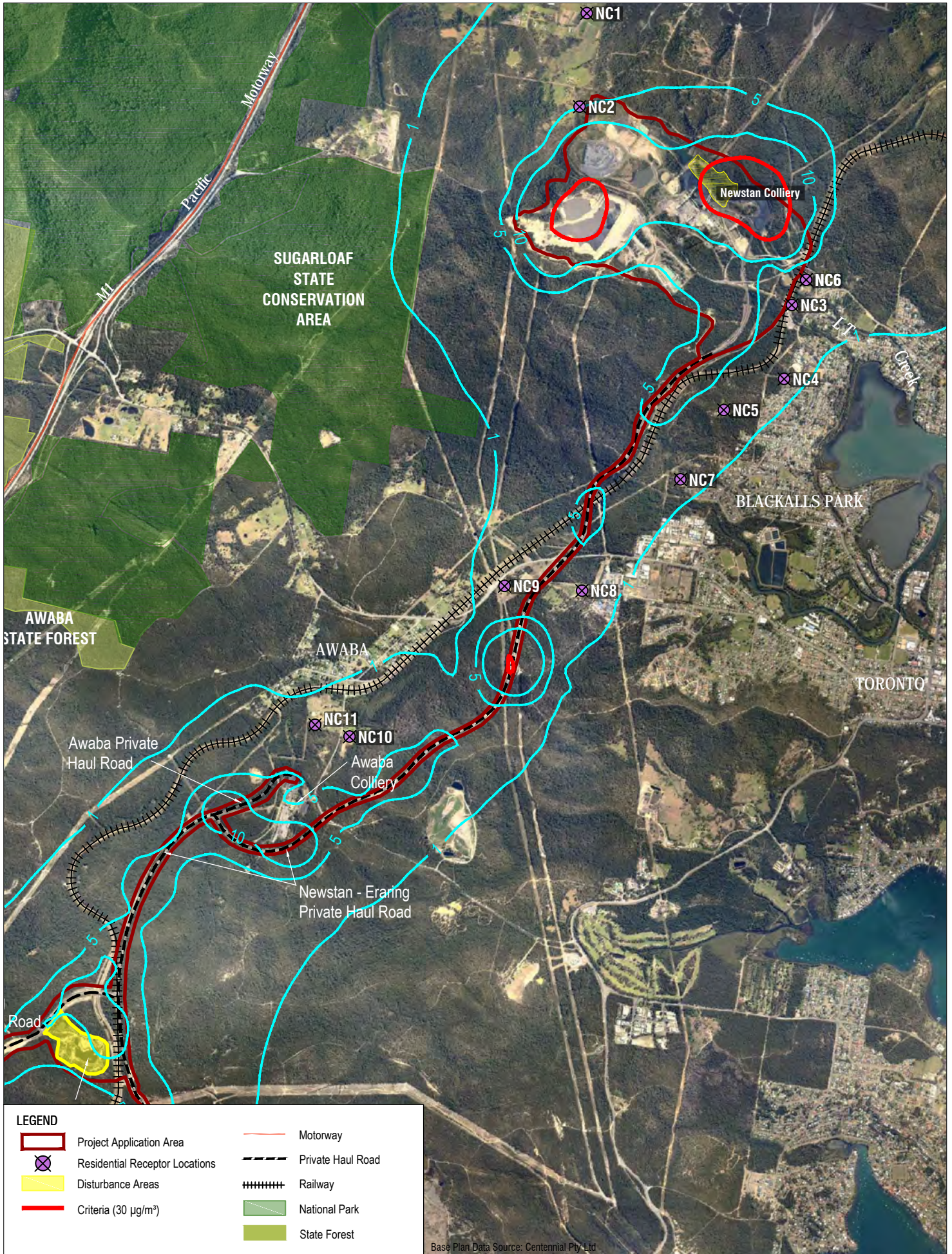


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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 1
Increment Only
APPENDIX B

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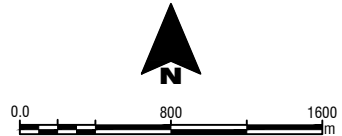
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	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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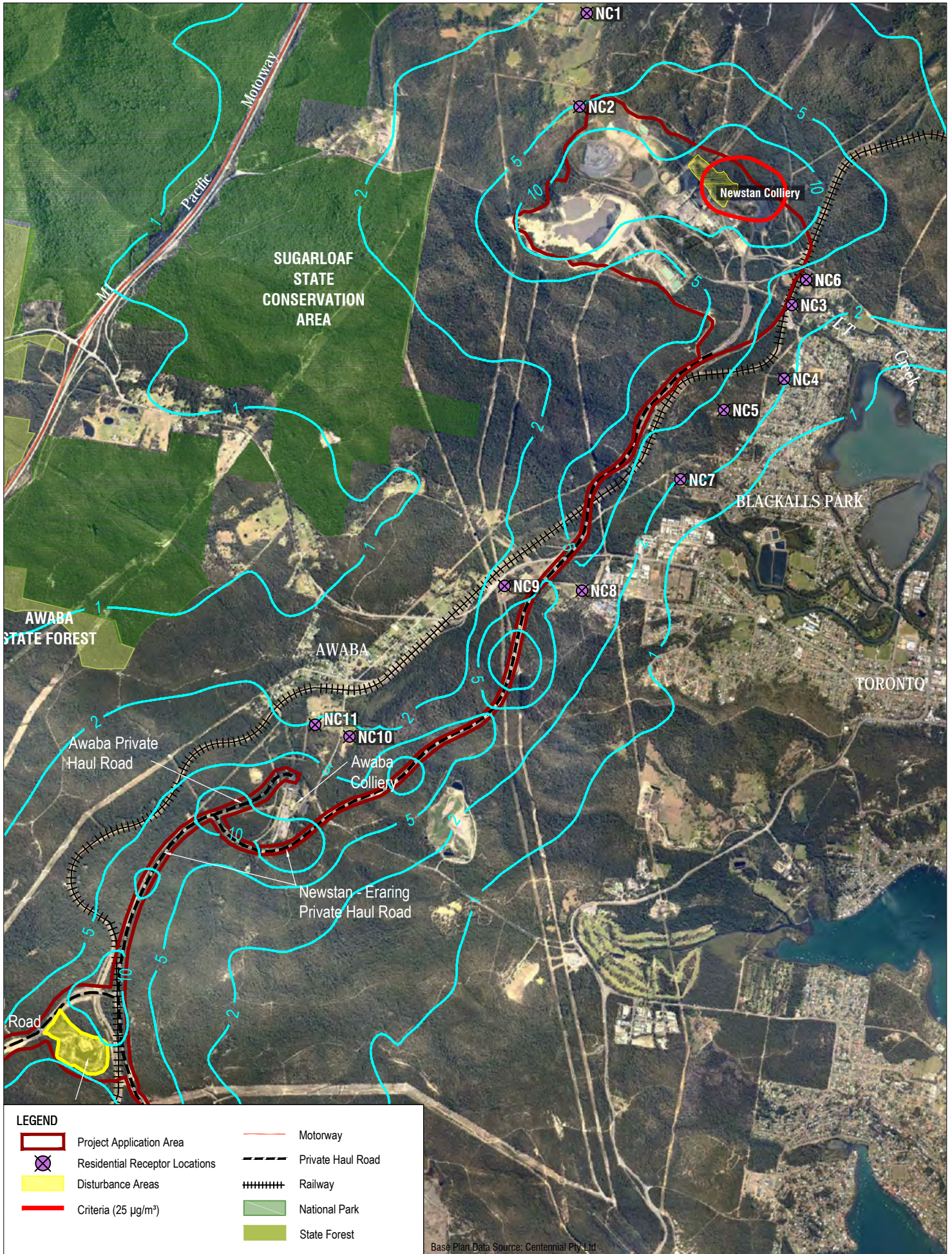


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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 1
Increment Only
APPENDIX B

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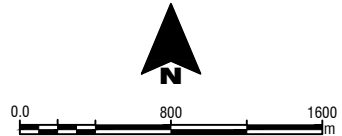


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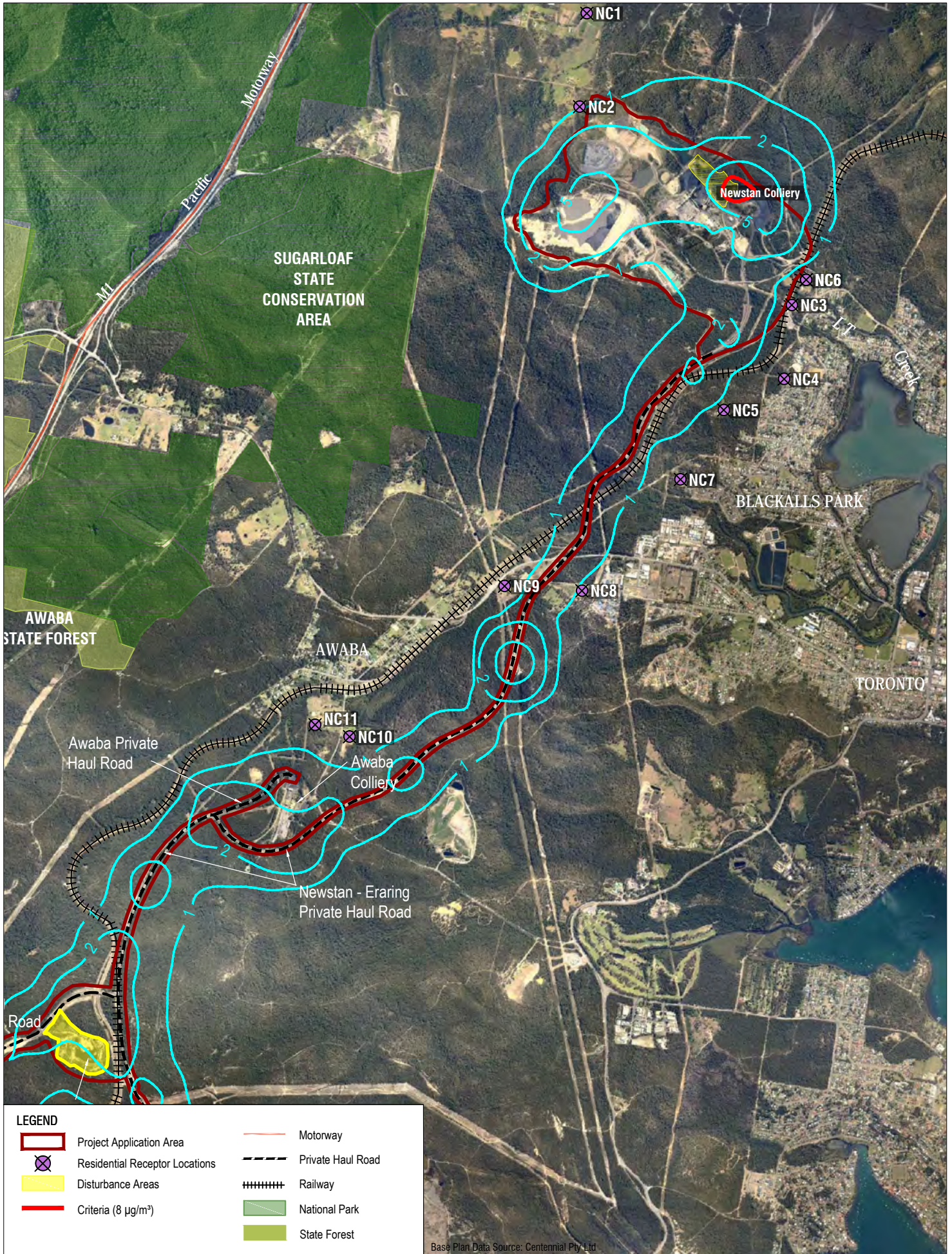
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CENTENNIAL COAL LOGISTICS AIR
PM2.5 - 24 Hour µg/m³
Scenario 1
Increment Only
APPENDIX B

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LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

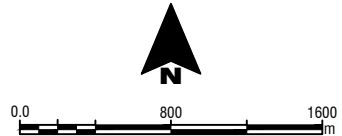
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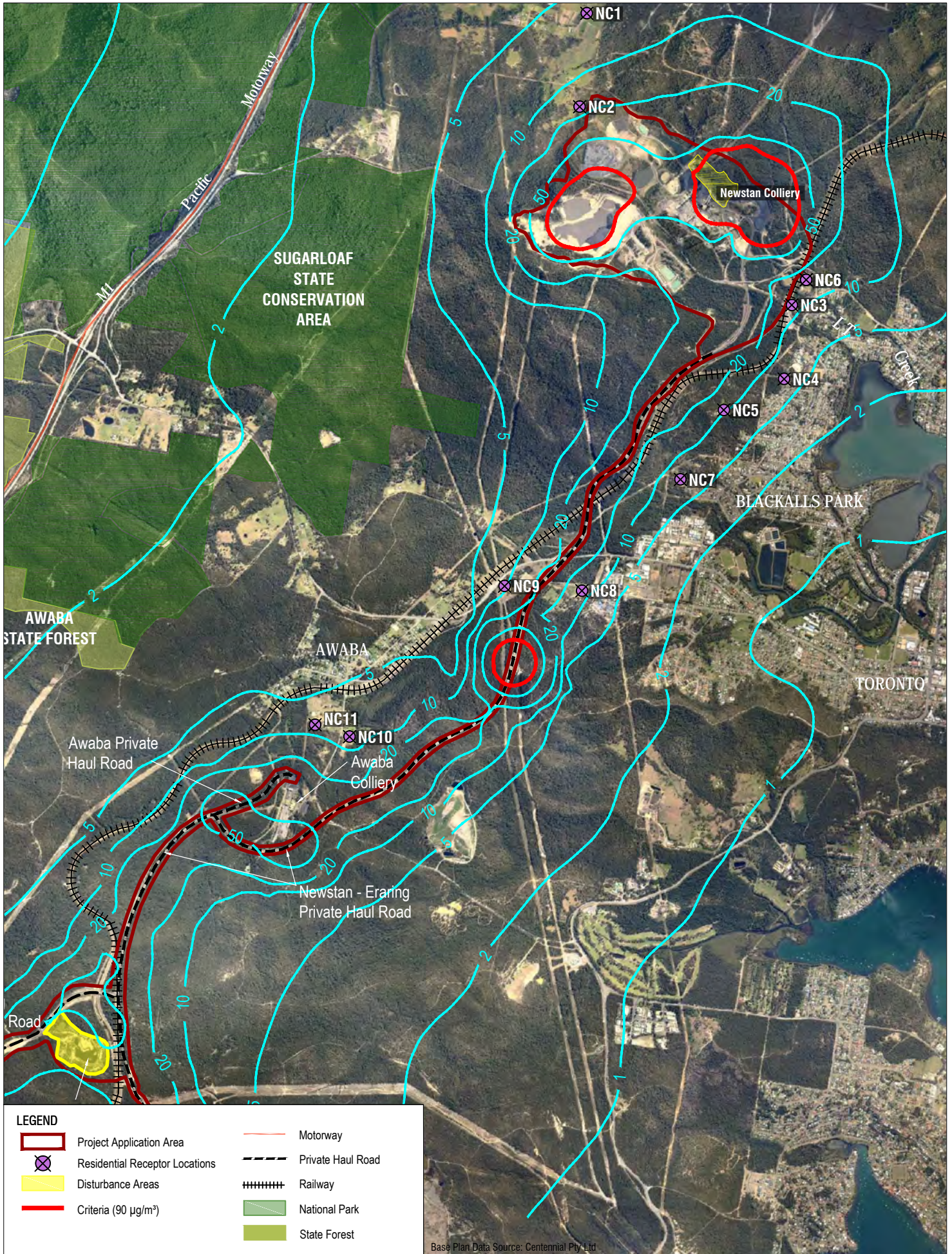


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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 1
Increment Only
APPENDIX B

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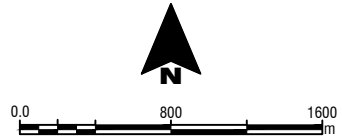
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	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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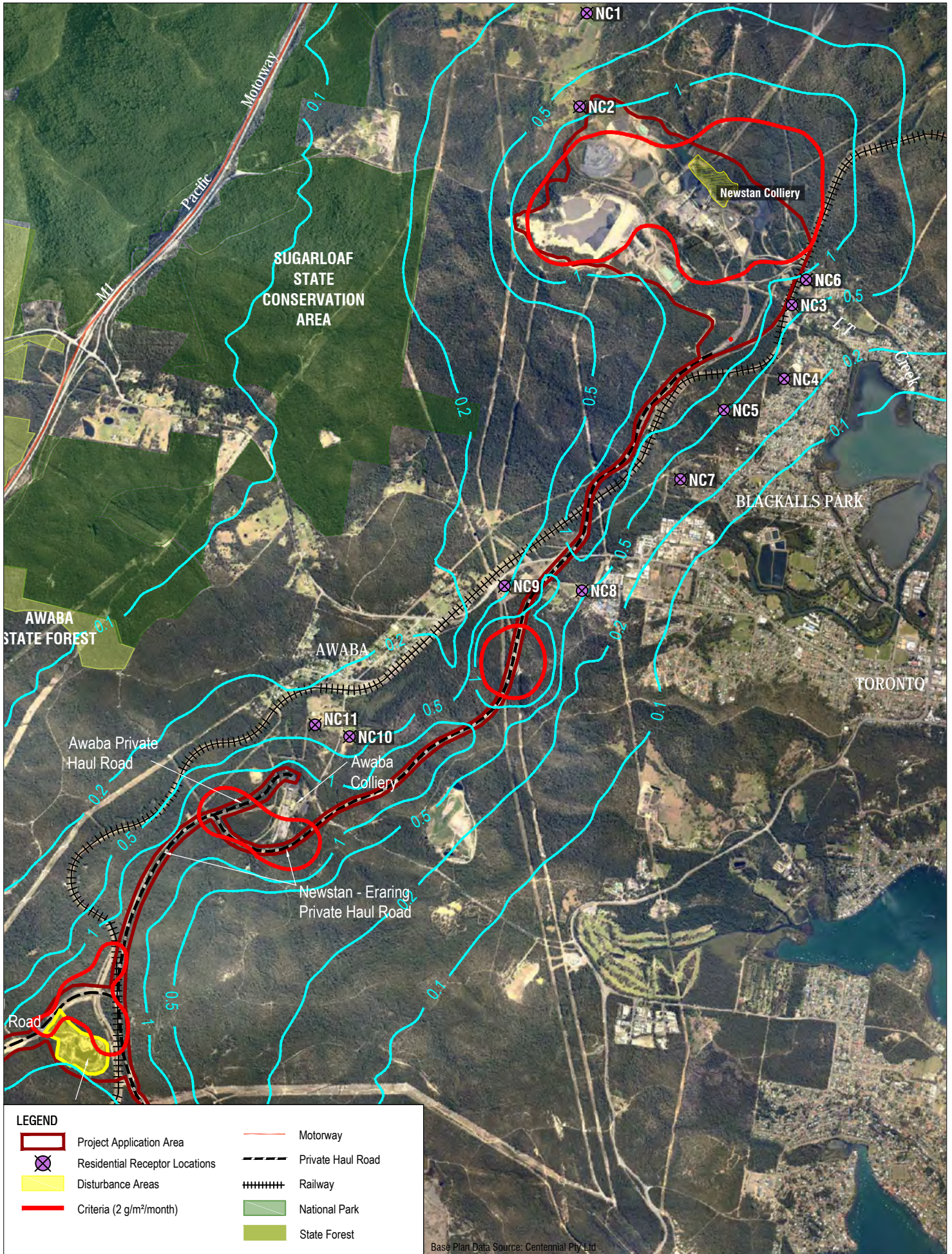


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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 1
Increment Only
APPENDIX B

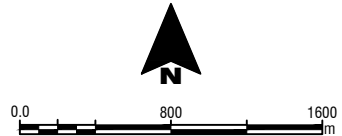
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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month

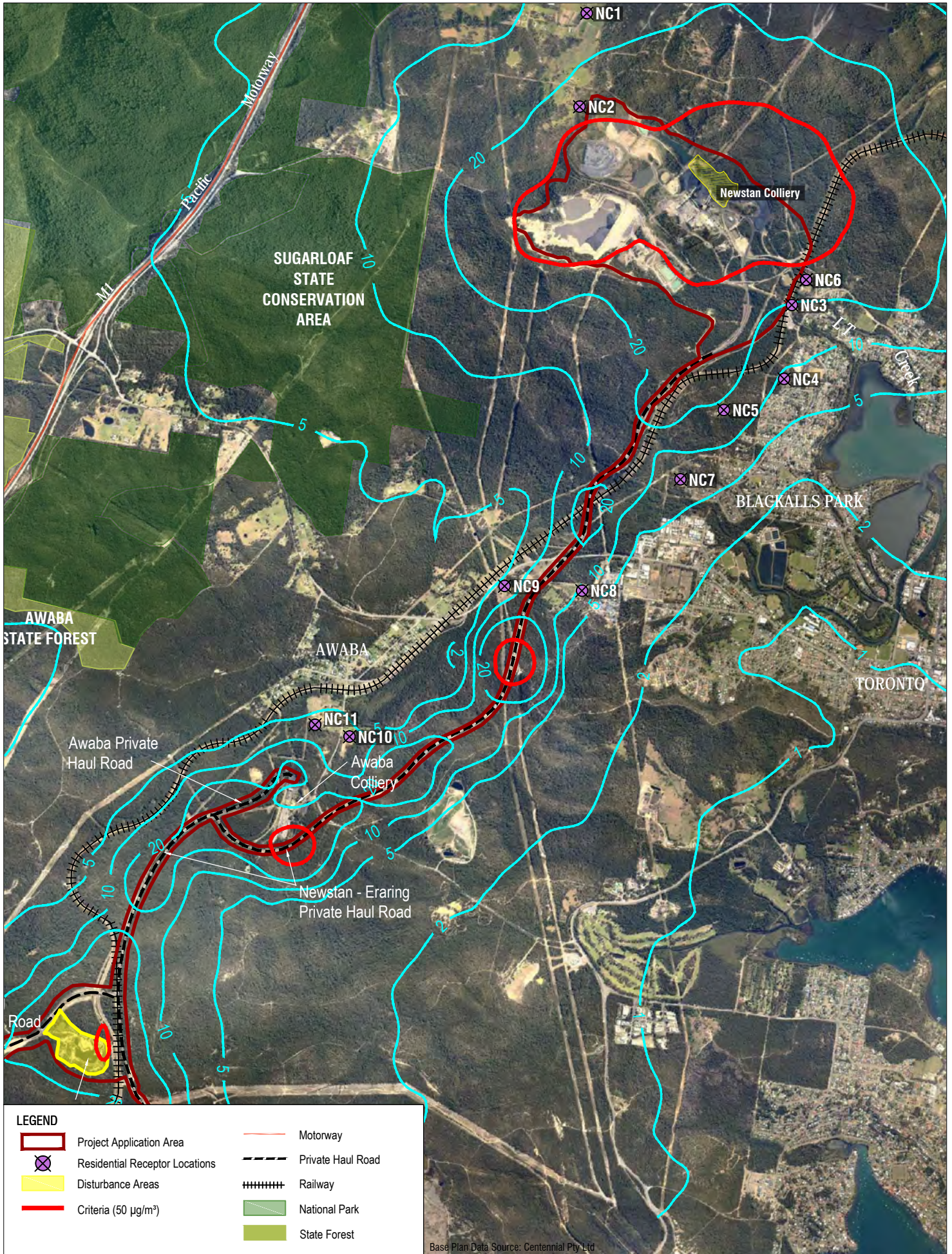
Scenario 2a

Increment Only

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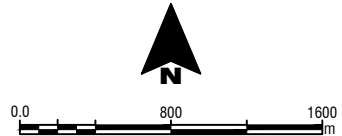


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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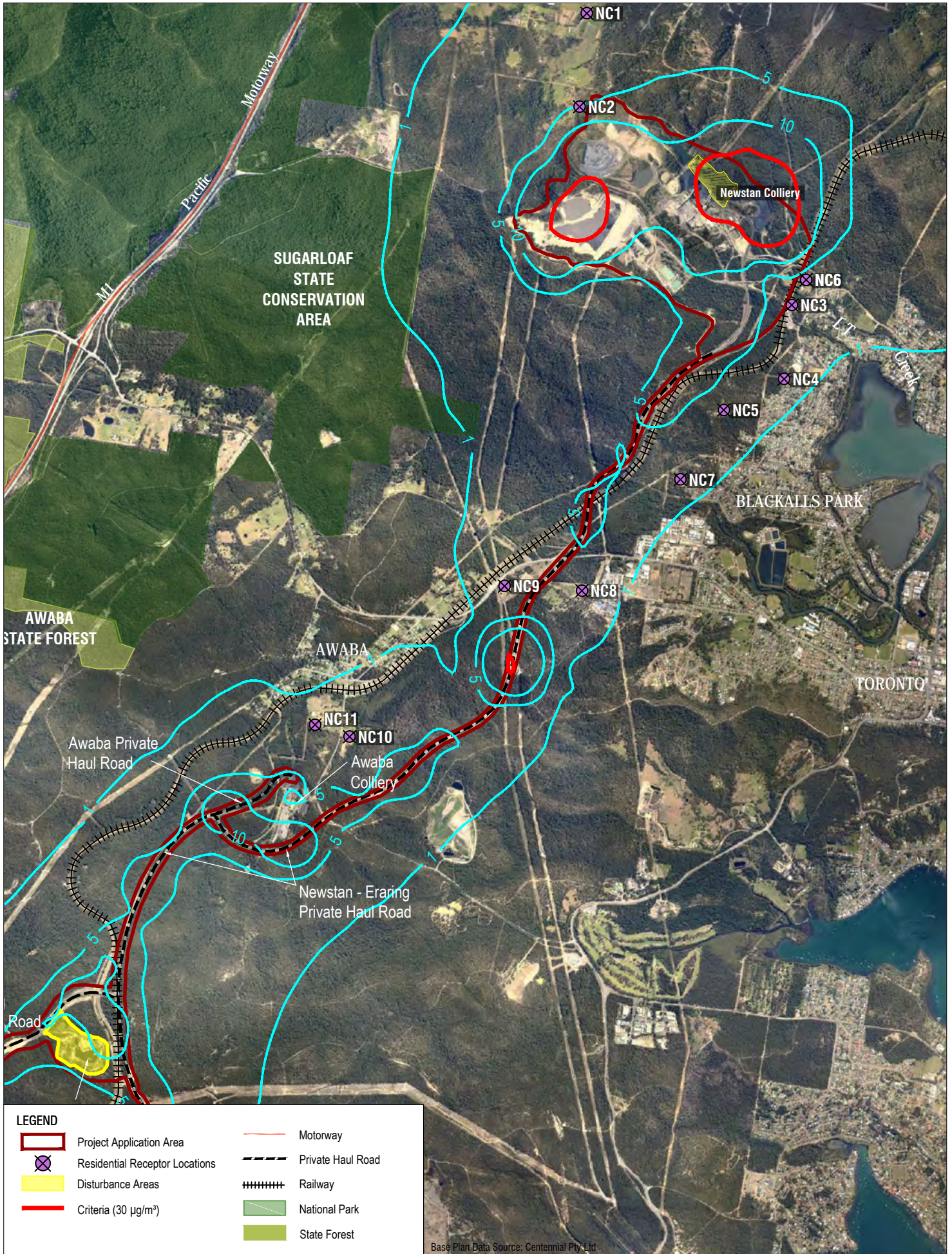
CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 2a
Increment Only

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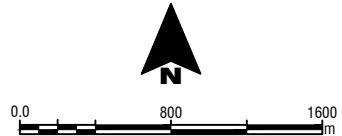
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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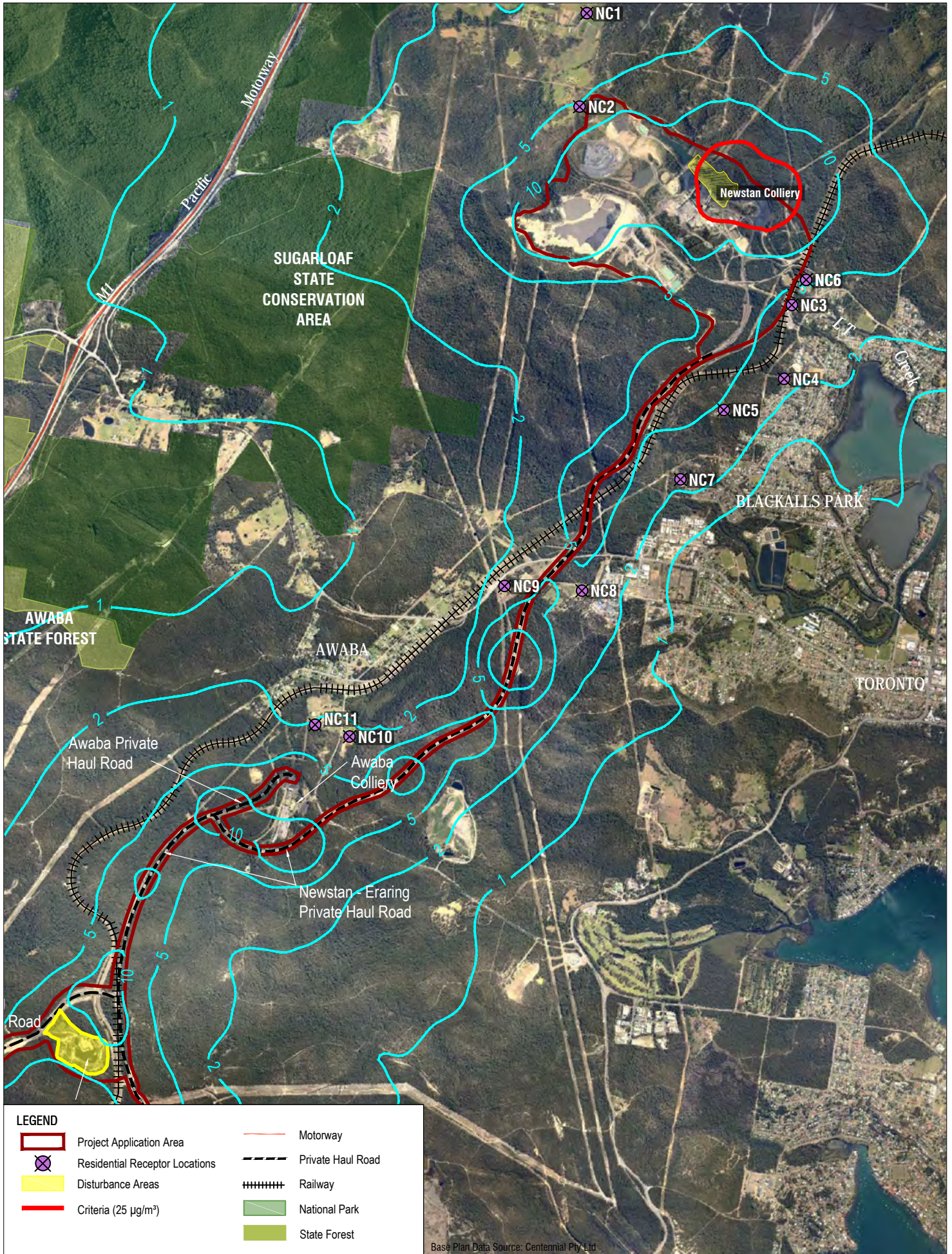


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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 2a
Increment Only
APPENDIX B

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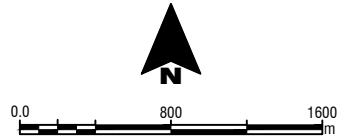
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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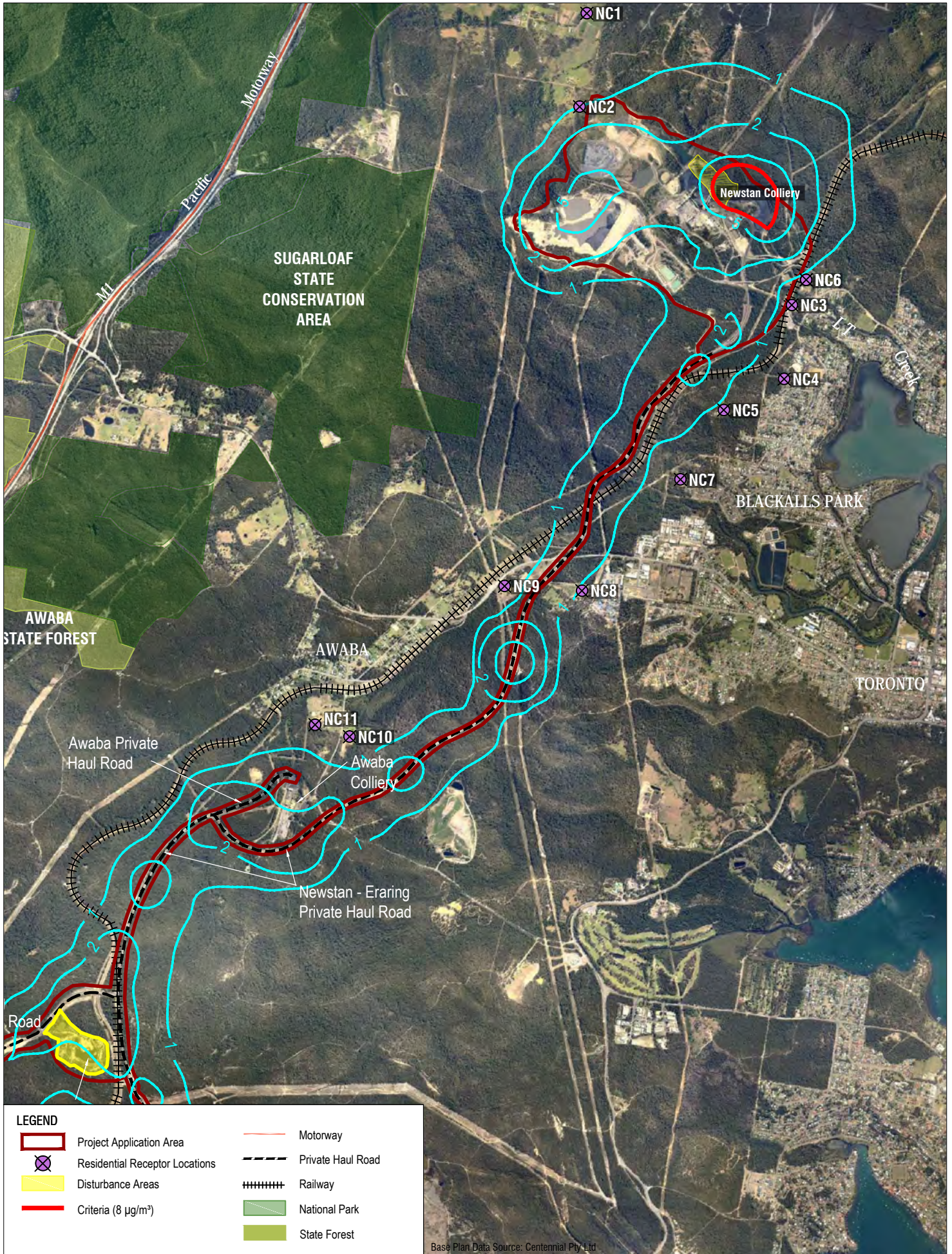


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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³
Scenario 2a
Increment Only
APPENDIX B

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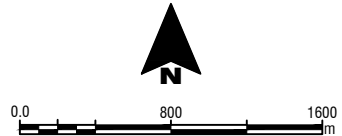
Base Plan Data Source: Centennial Pty Ltd

LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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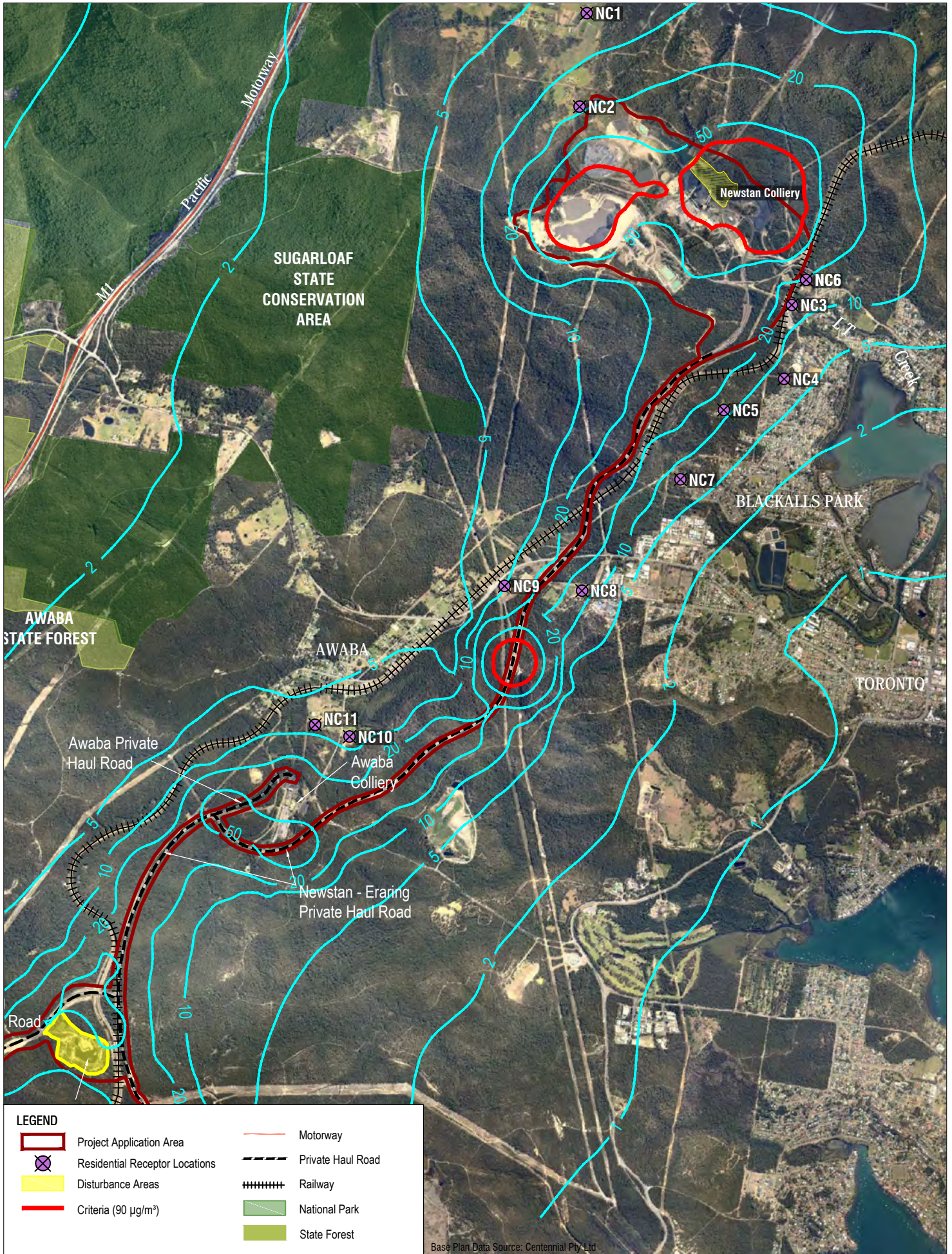
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 2a
Increment Only

APPENDIX B

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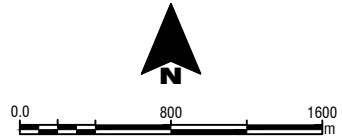
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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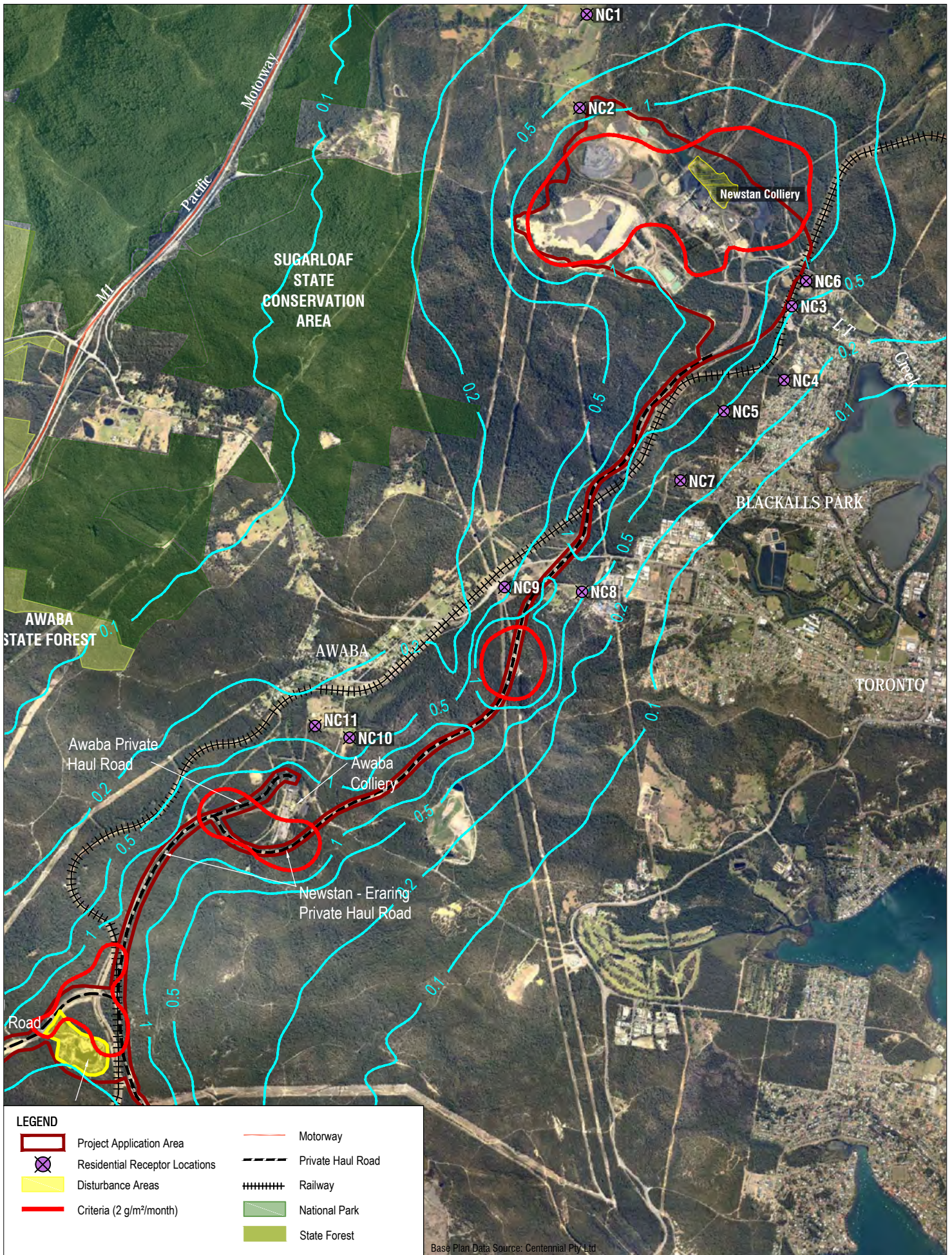


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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 2a
Increment Only
APPENDIX B

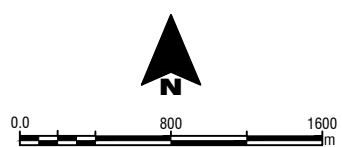
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Base Plan Data Source: Centennial Pty Ltd

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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month

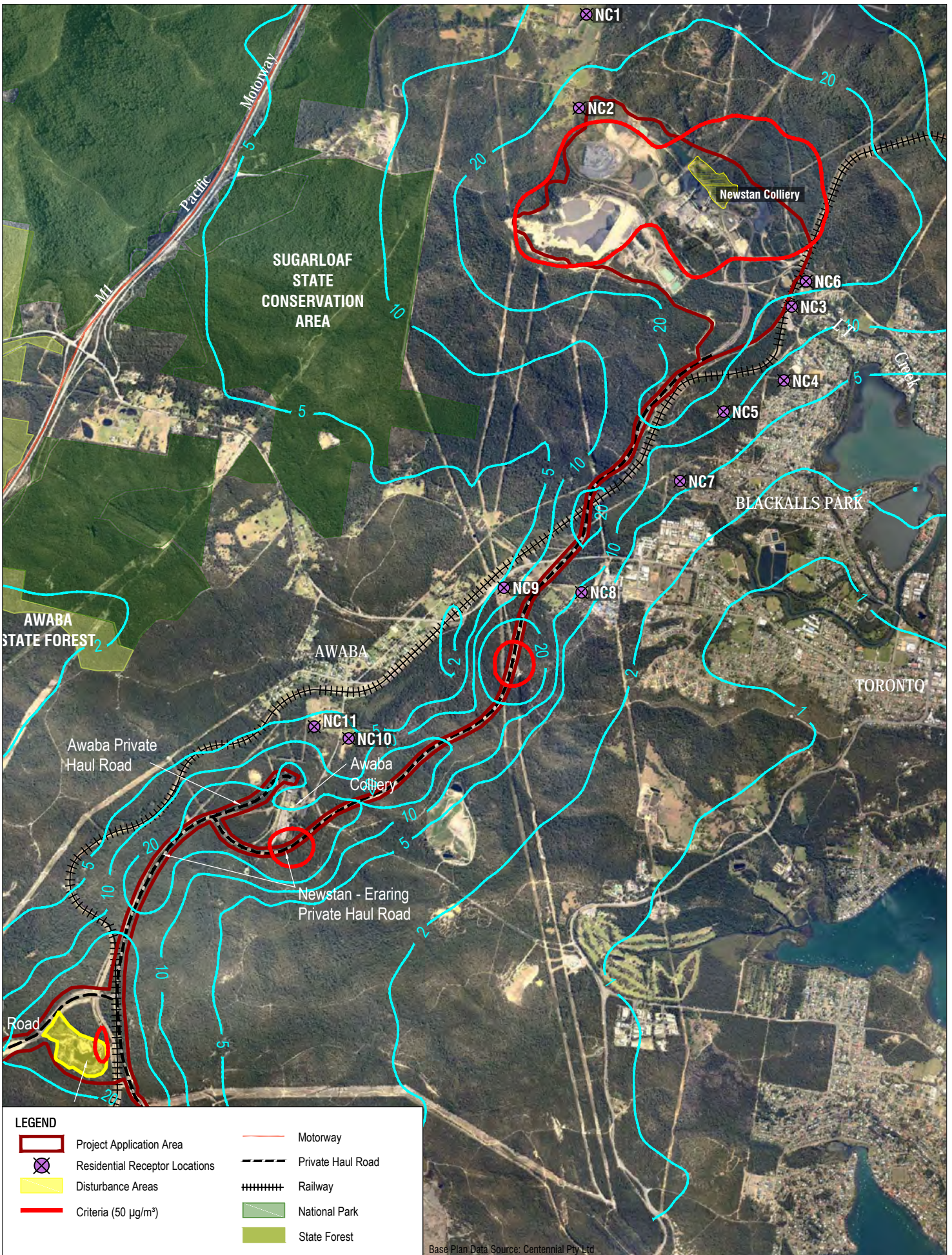
Scenario 2b

Increment Only

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Base Plan Data Source: Centennial Pty Ltd

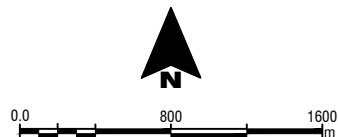
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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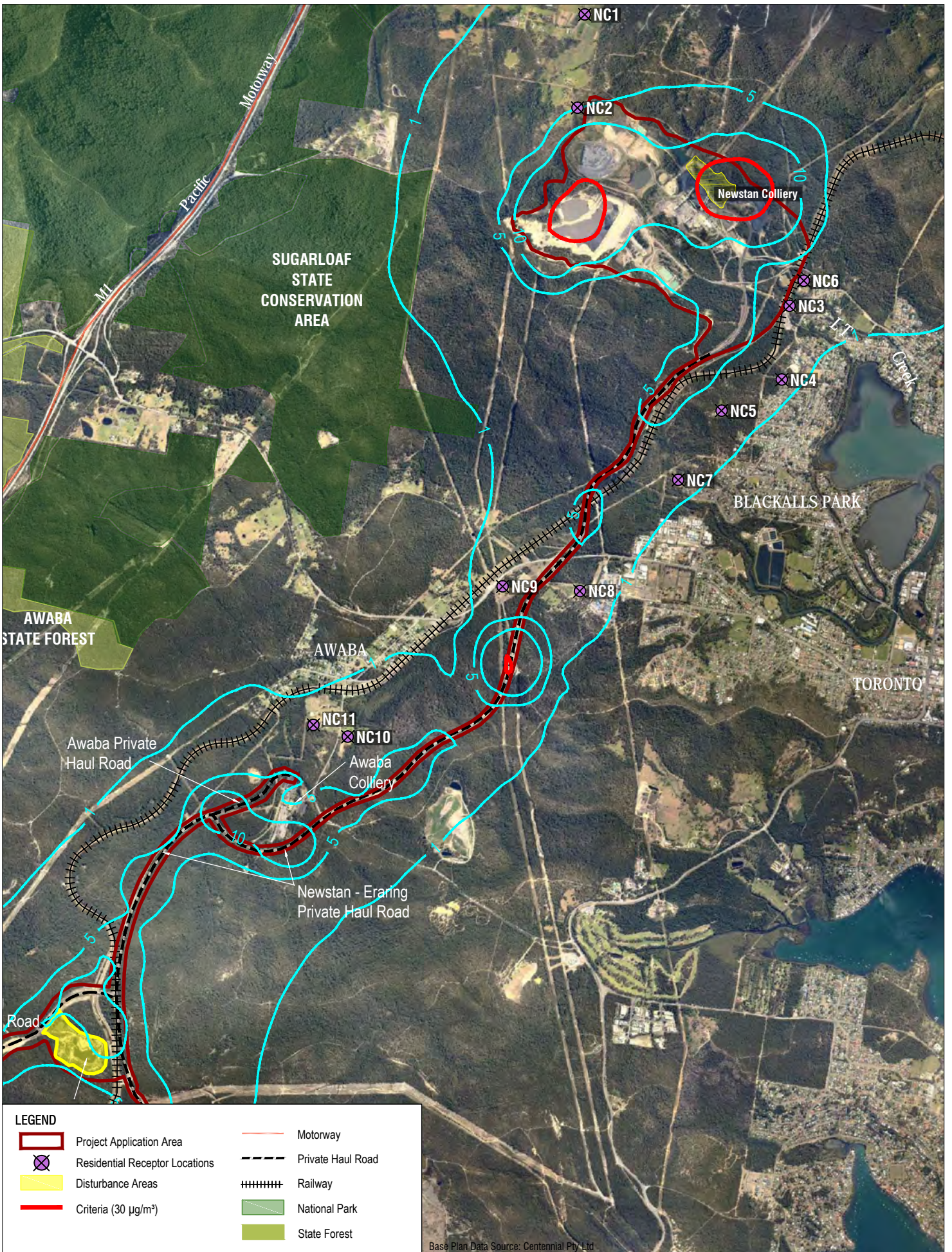
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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 2b
Increment Only

APPENDIX B

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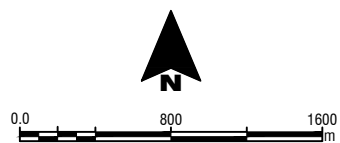
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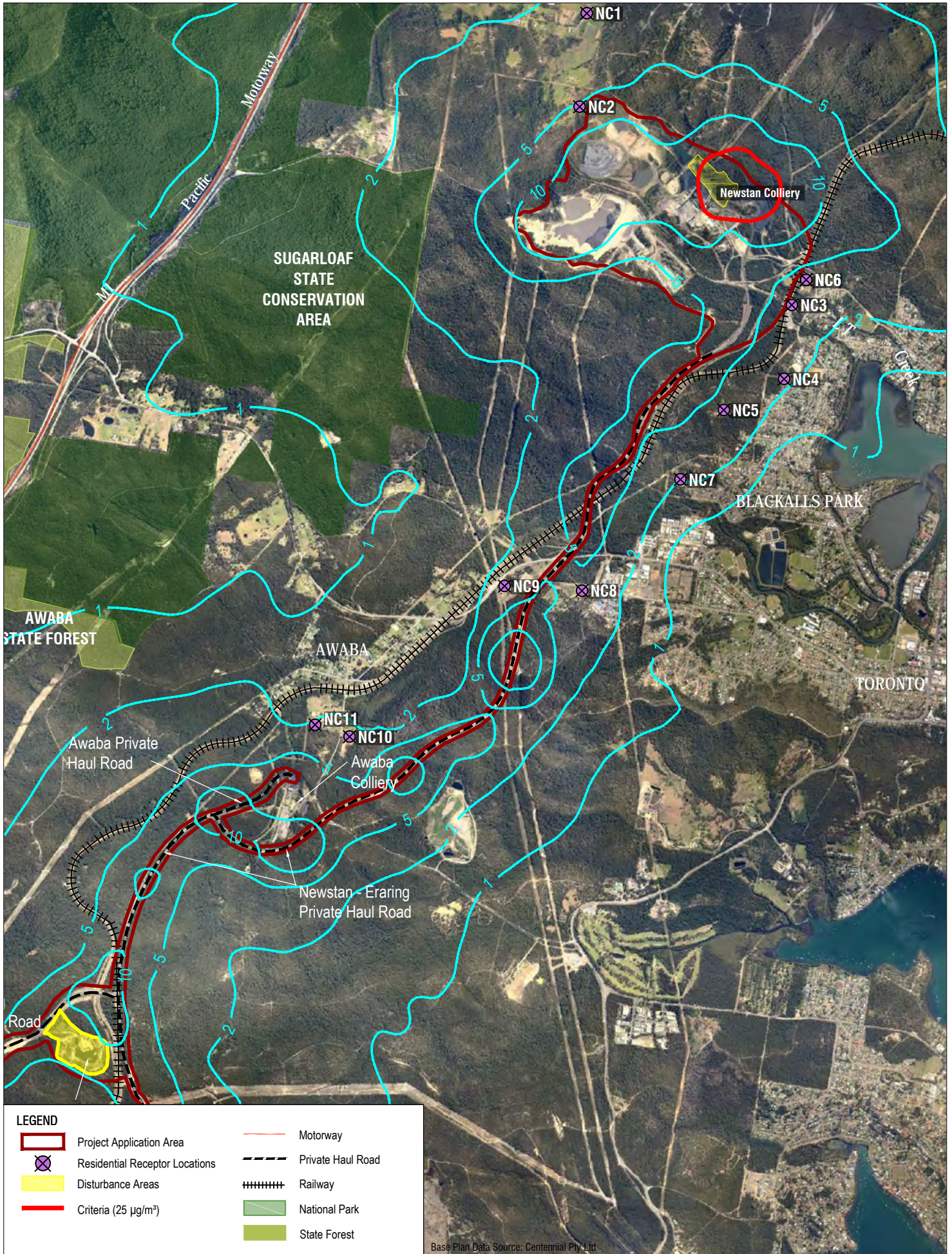


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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual $\mu\text{g}/\text{m}^3$
Scenario 2b
Increment Only
APPENDIX B

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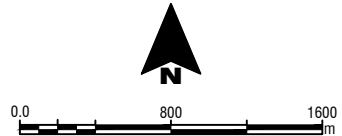
Base Plan Data Source: Centennial Pty Ltd

LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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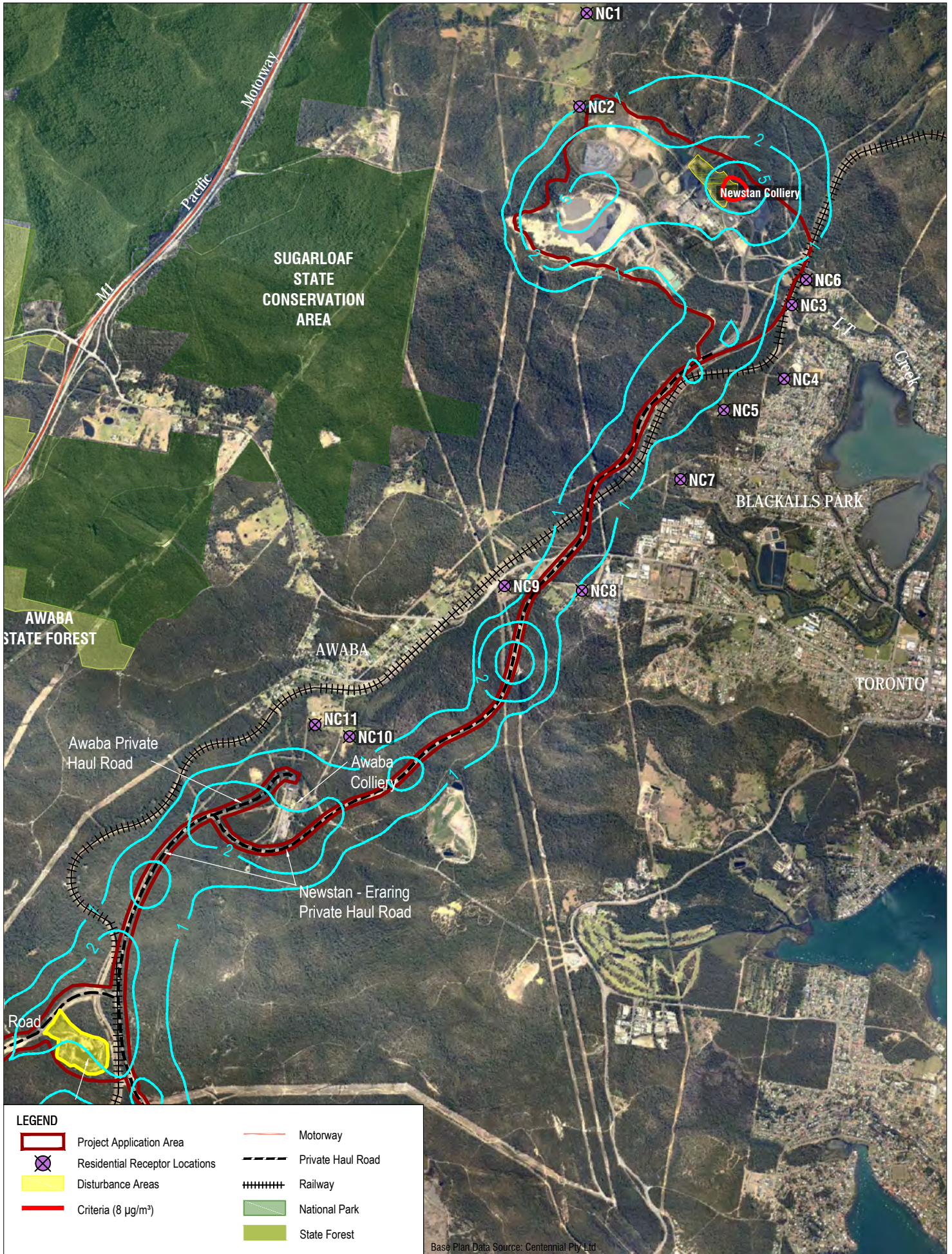
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³
Scenario 2b
Increment Only

APPENDIX B

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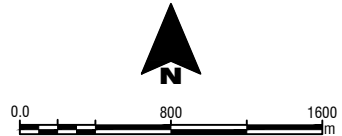
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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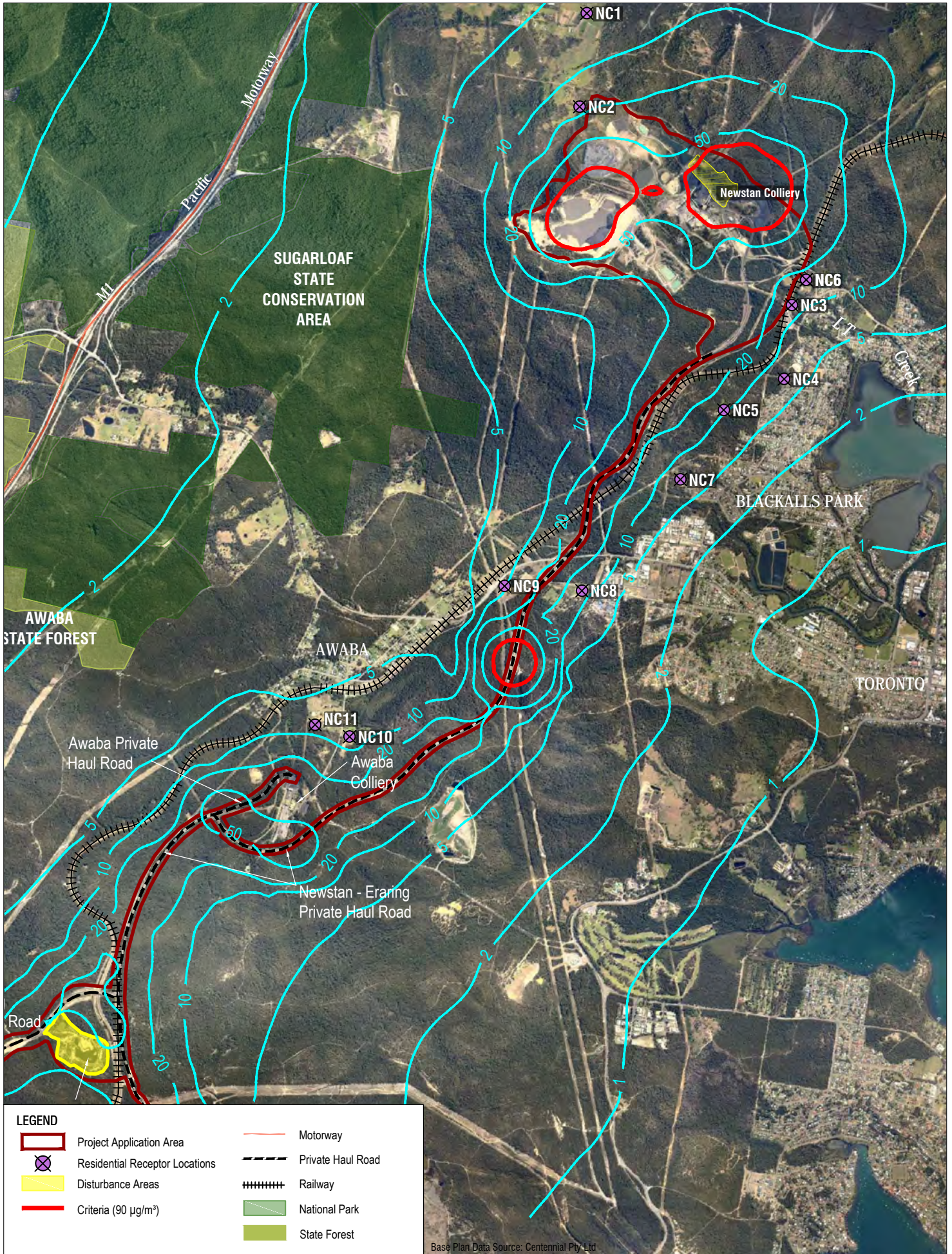
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 2b
Increment Only

APPENDIX B

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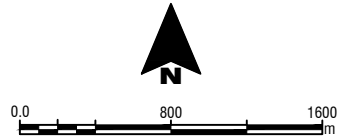


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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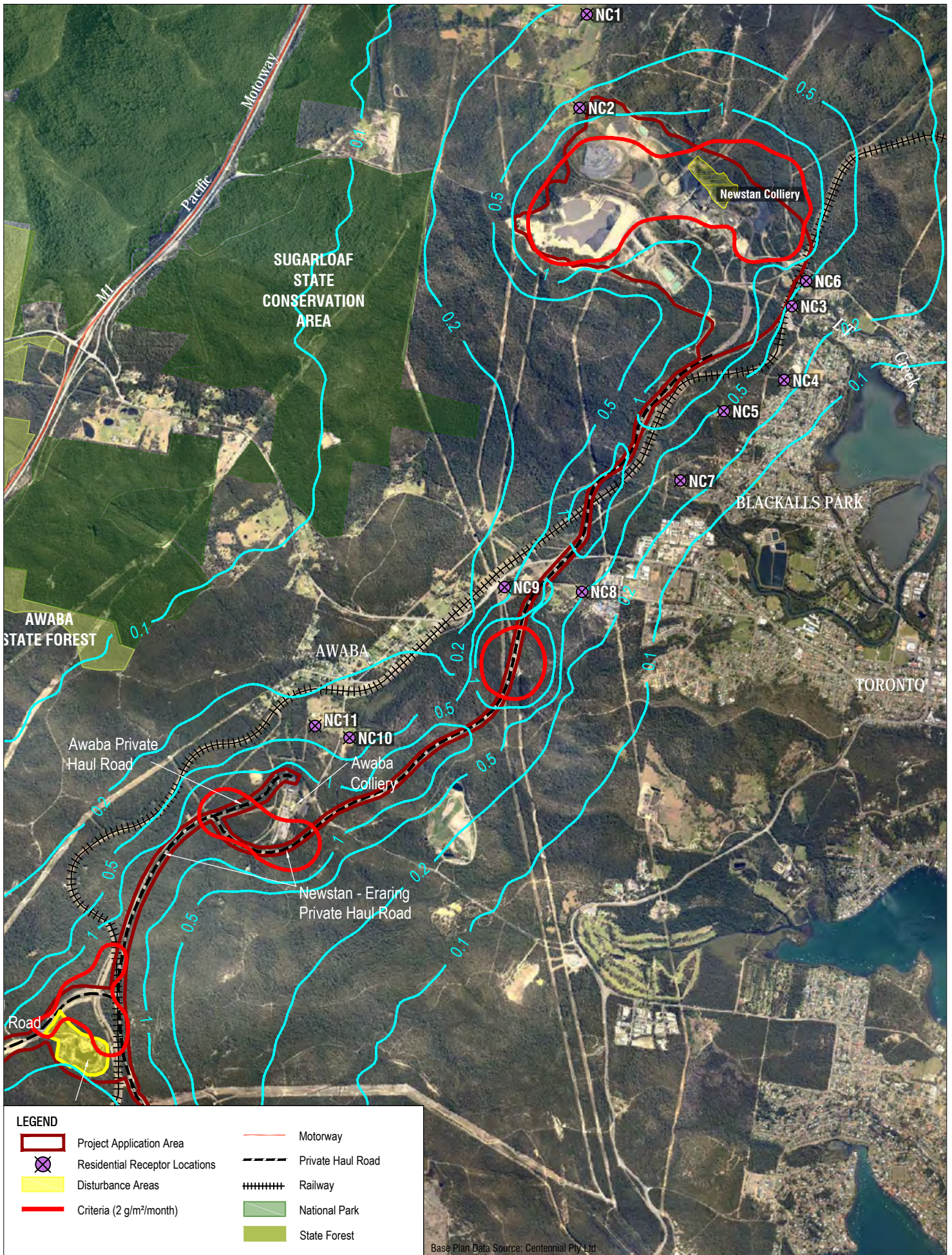
CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 2b
Increment Only

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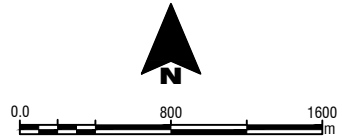
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (2 g/m ² /month)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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CENTENNIAL COAL LOGISTICS AIR

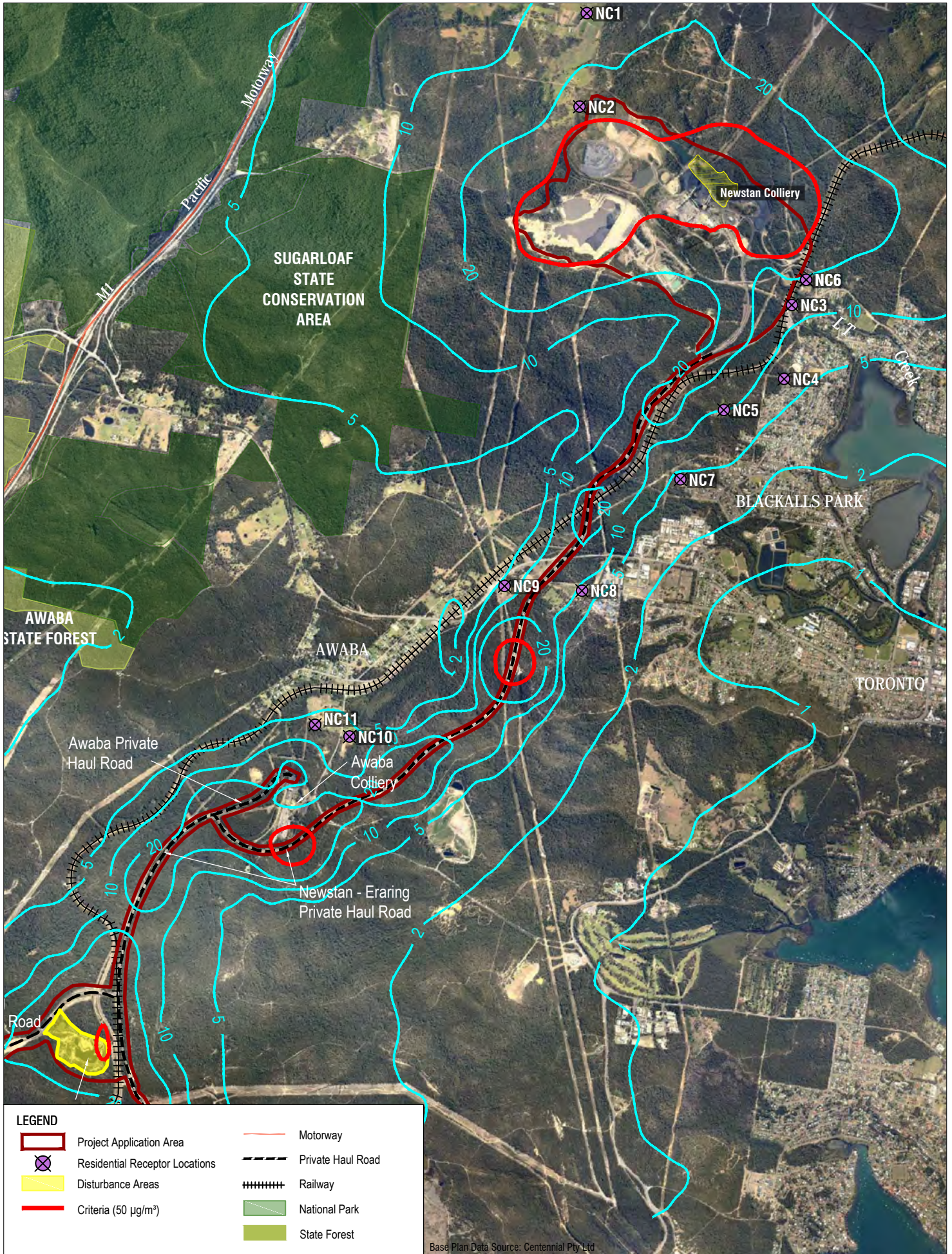
Dust Deposition Annual g/m²/month

Scenario 2c

Increment Only

APPENDIX B

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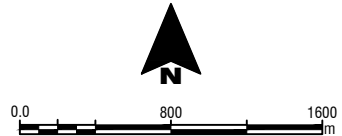


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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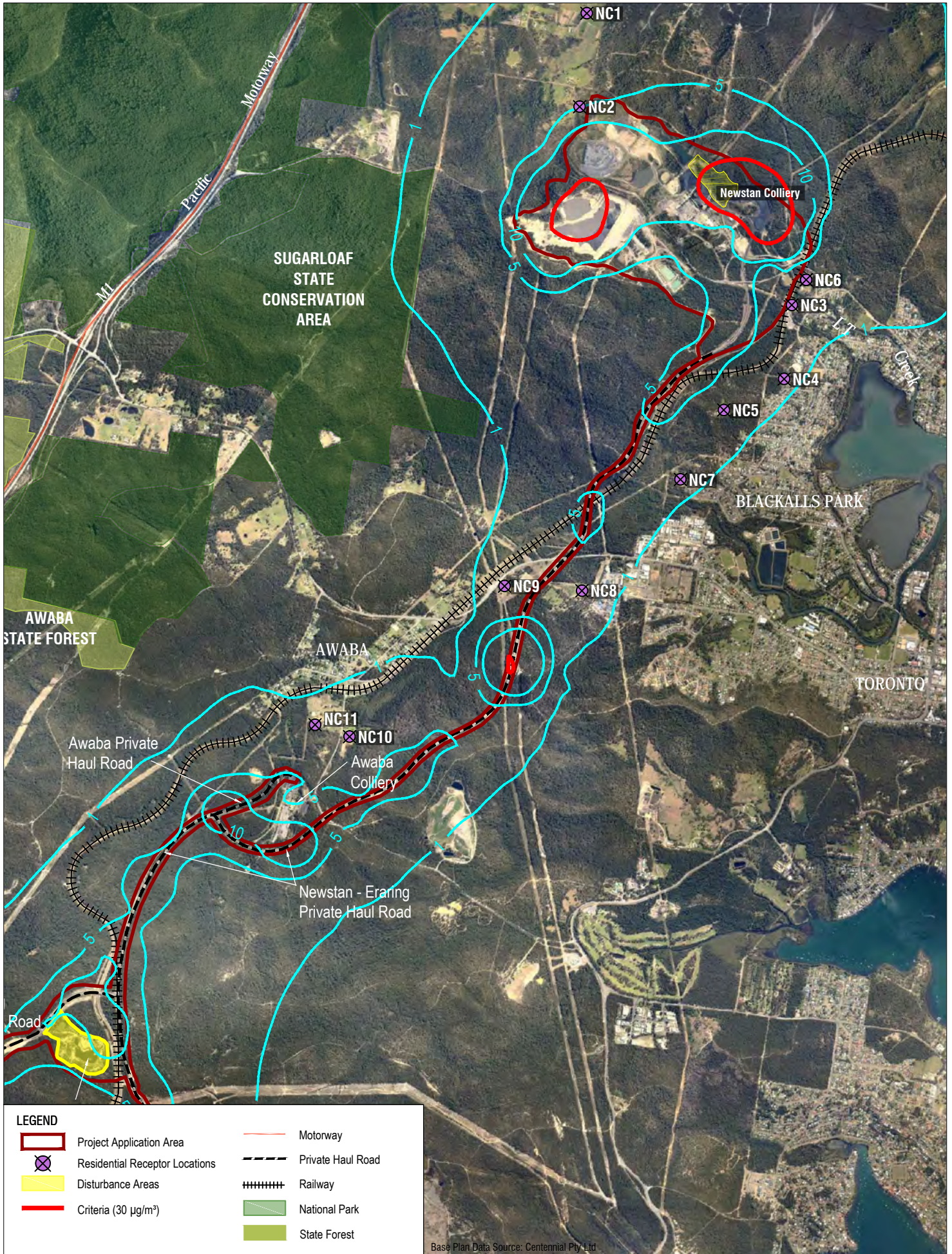
CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 2c
Increment Only

APPENDIX B

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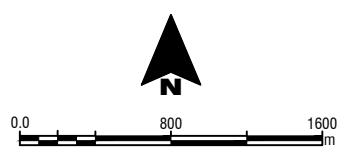
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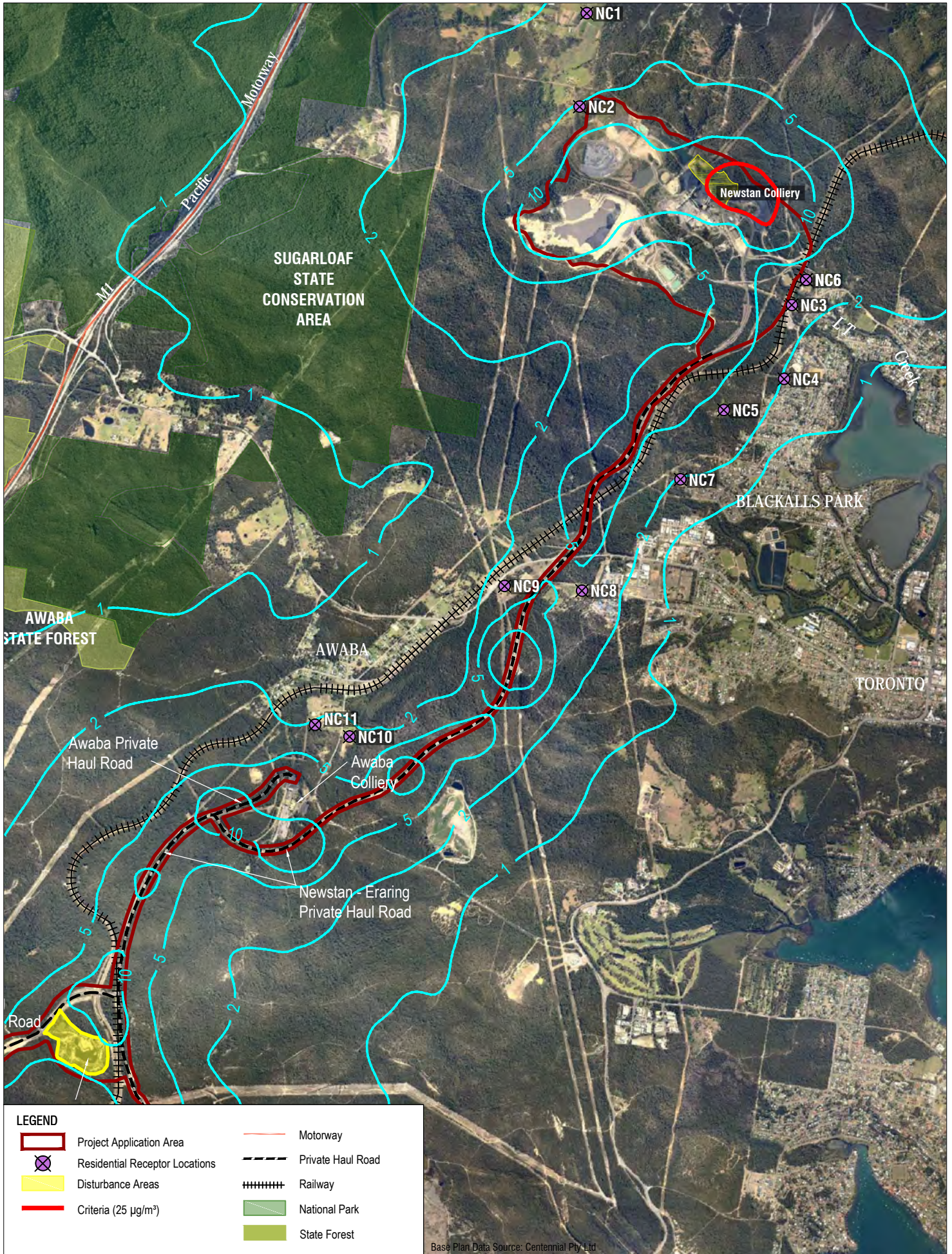
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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual $\mu\text{g}/\text{m}^3$
Scenario 2c
Increment Only
APPENDIX B

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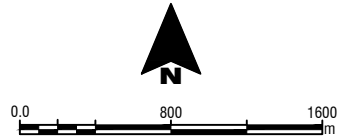


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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Projection:	(GDA94) MGA Zone



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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³

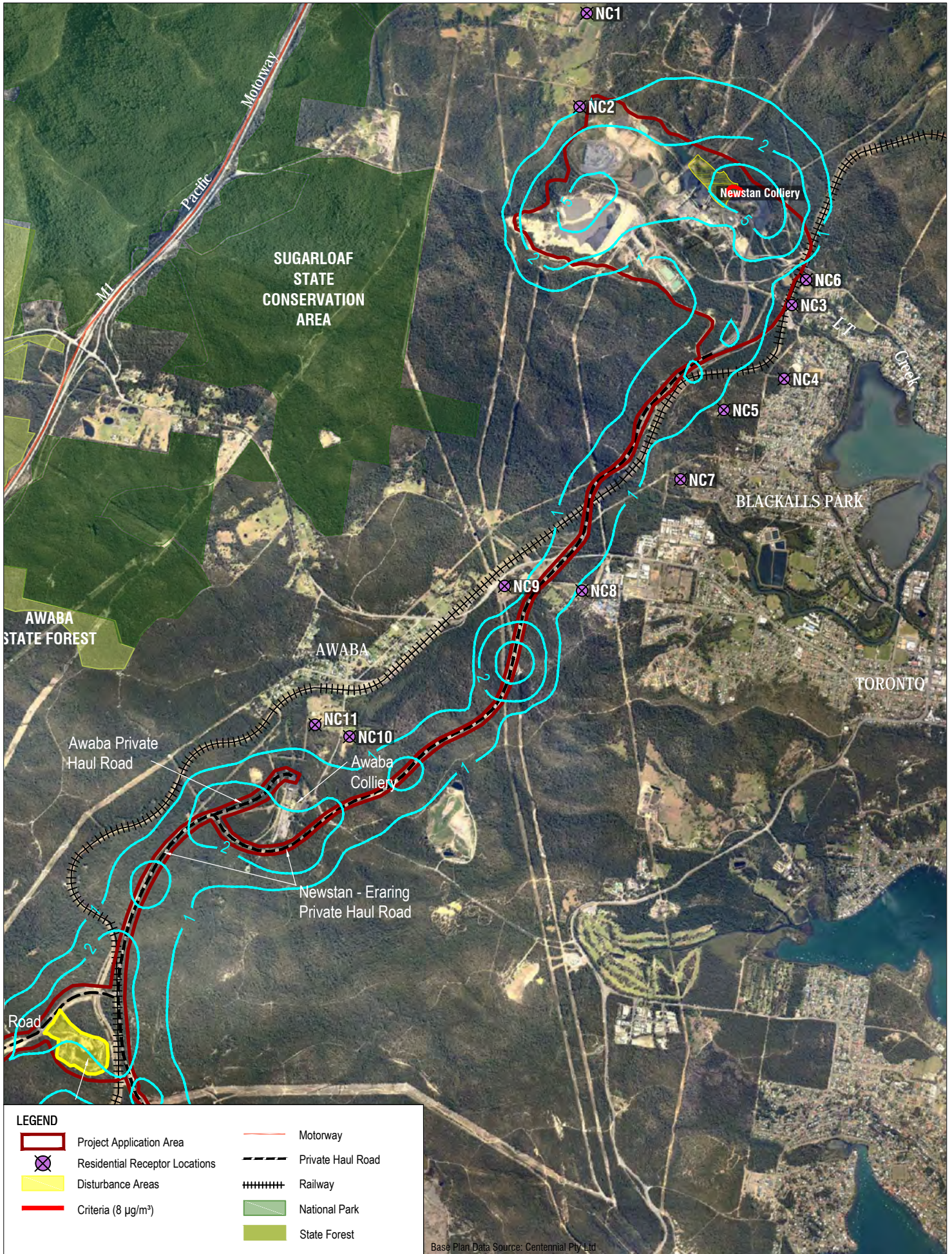
Scenario 2c

Increment Only

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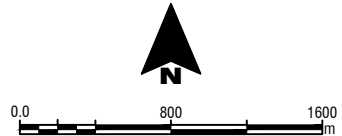


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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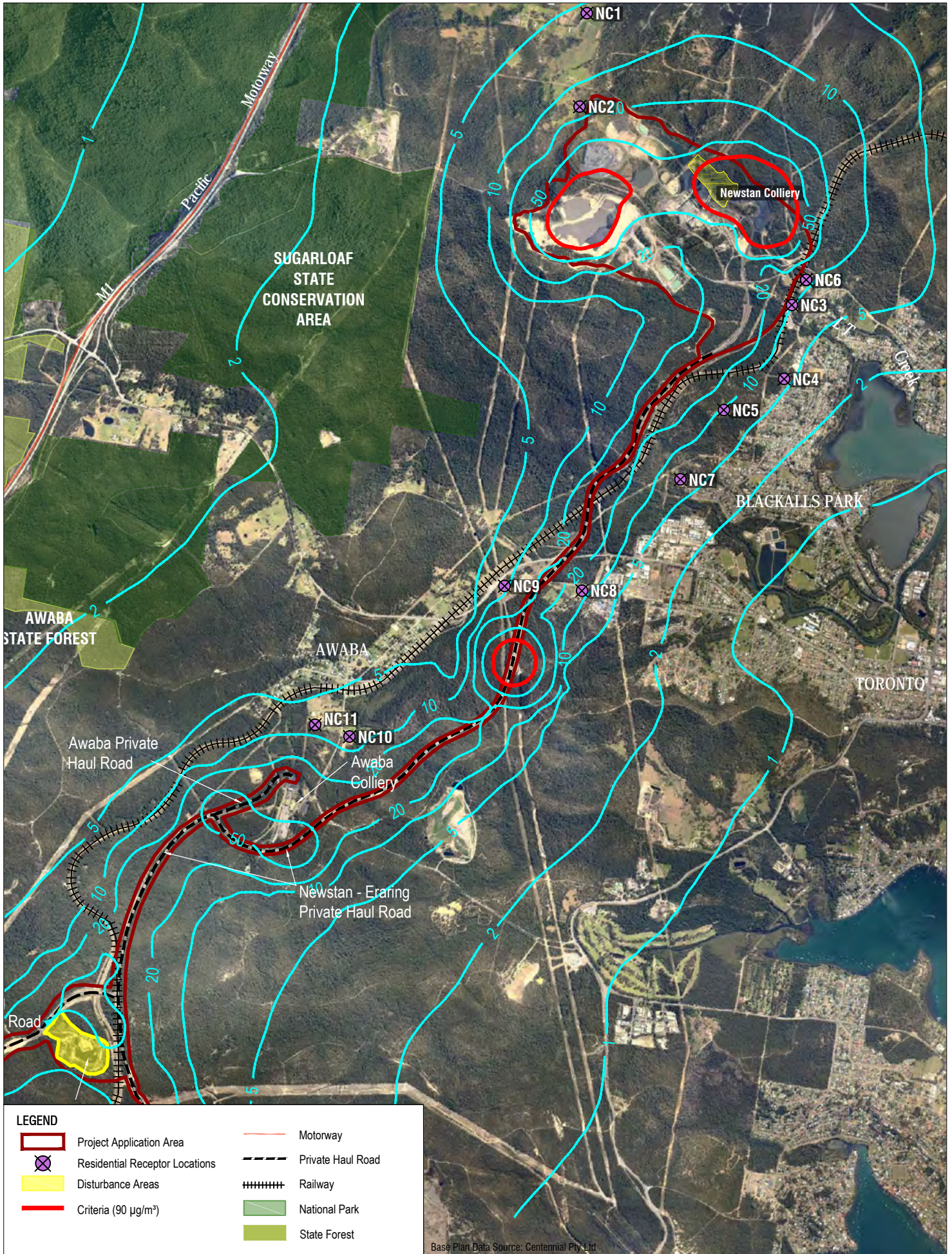
CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 2c
Increment Only

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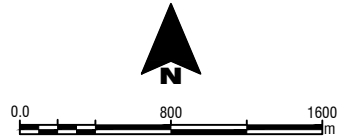
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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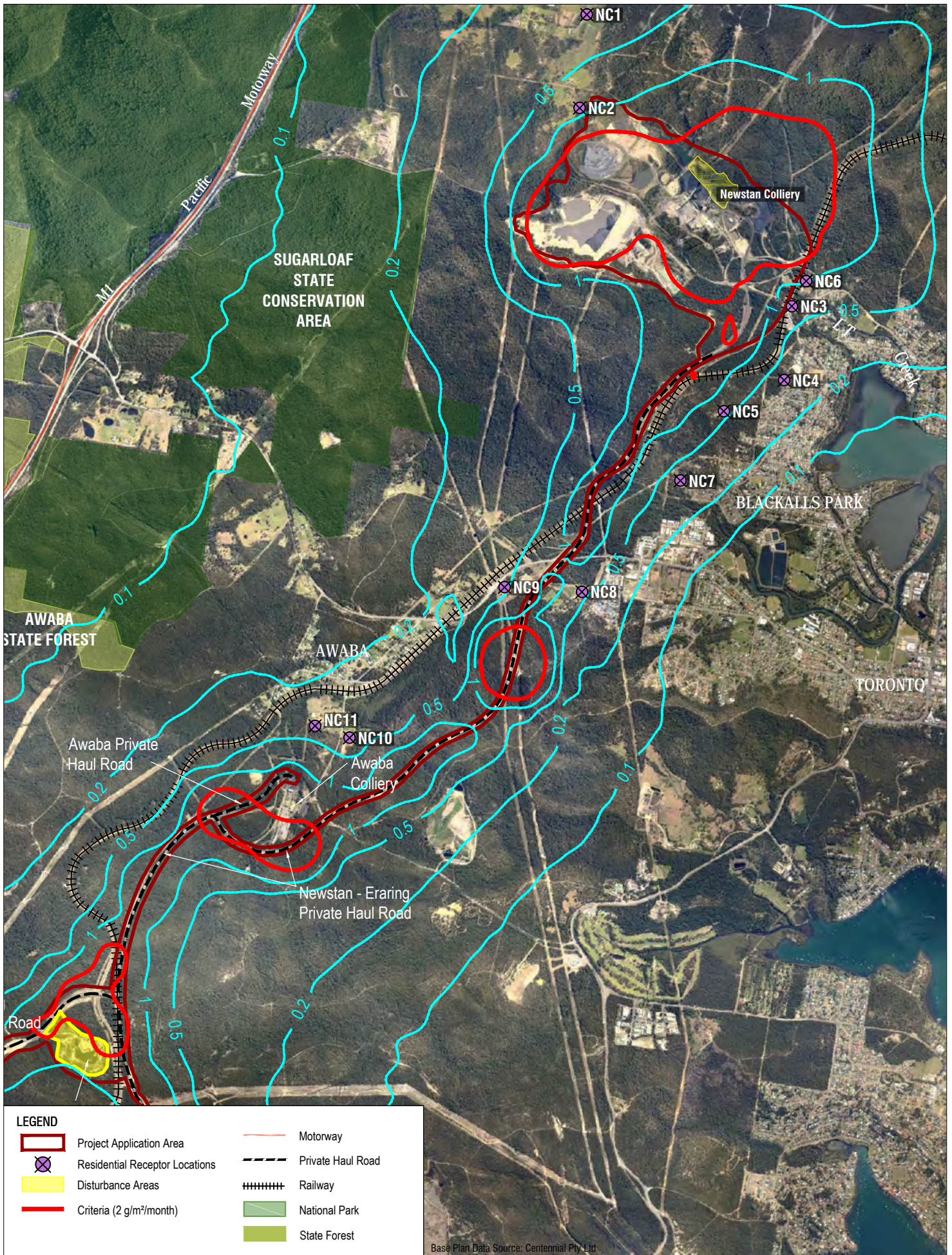


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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 2c
Increment Only
APPENDIX B

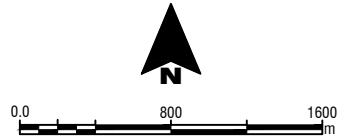
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Base Plan Data Source: Centennial Pty Ltd

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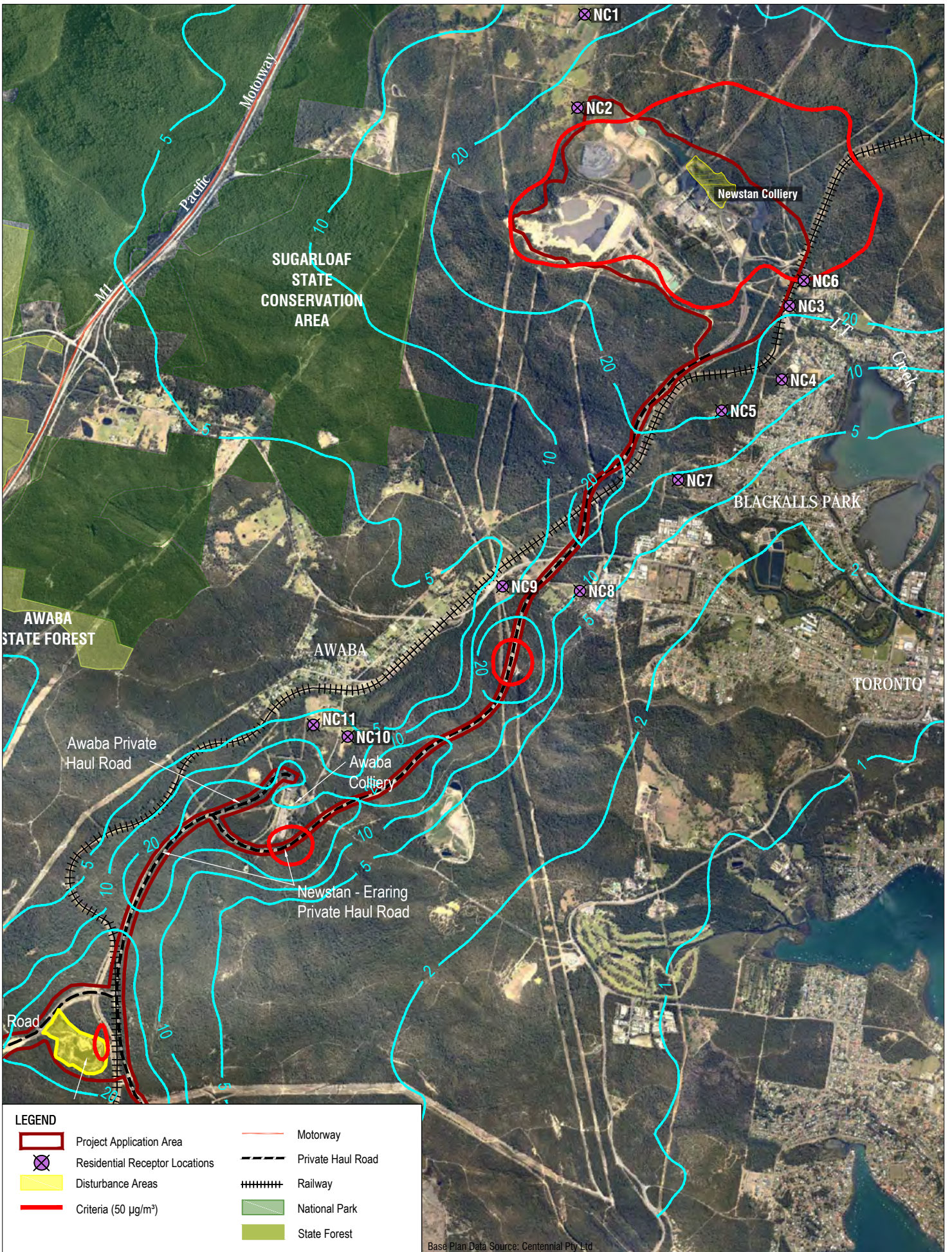
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CENTENNIAL COAL LOGISTICS AIR
Dust Deposition Annual g/m²/month
Scenario 3a
Increment Only
APPENDIX B

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Base Plan Data Source: Centennial Pty Ltd

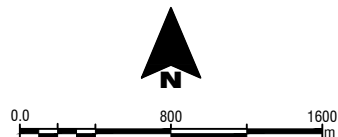
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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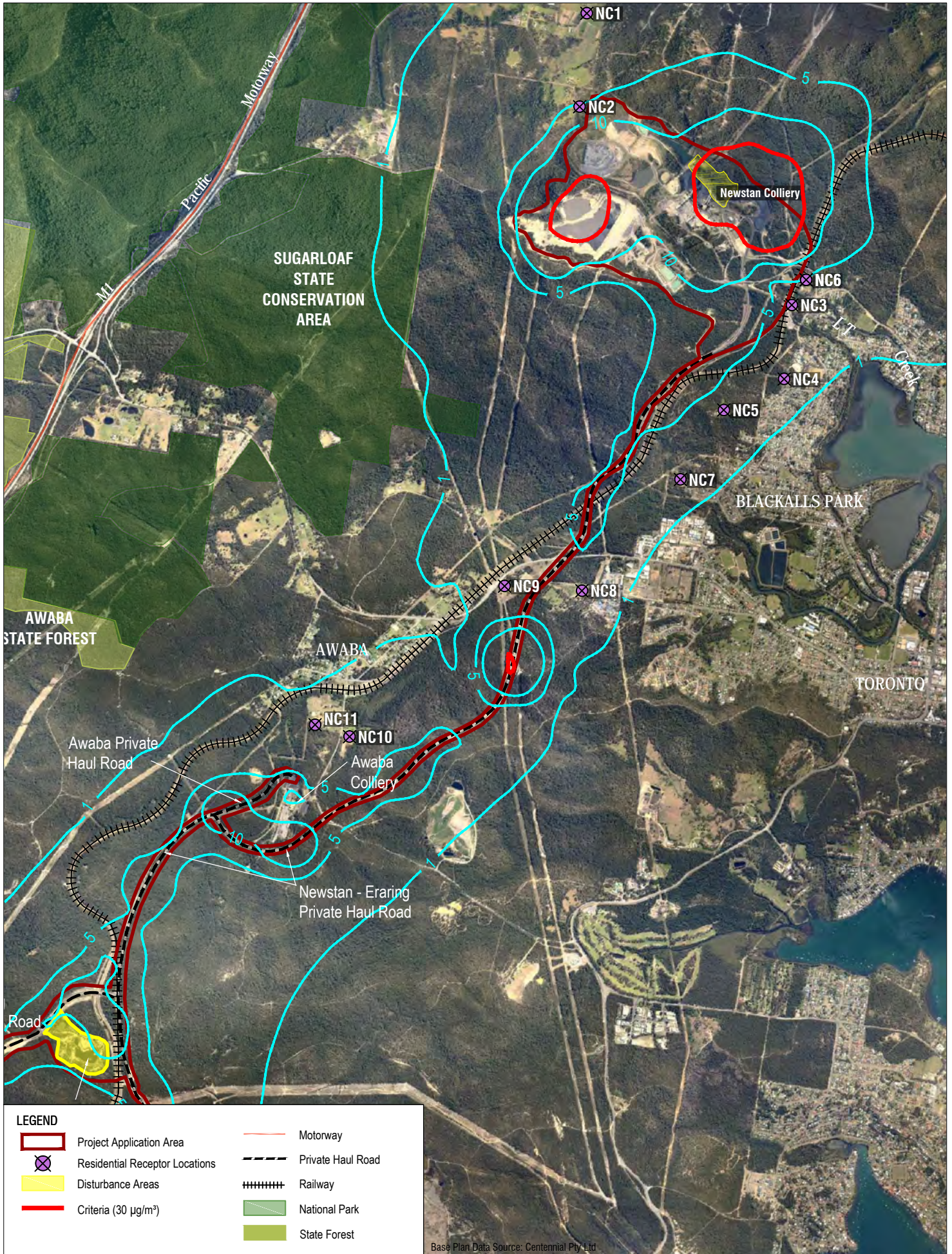


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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 3a
Increment Only
APPENDIX B

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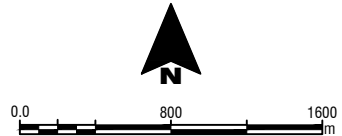
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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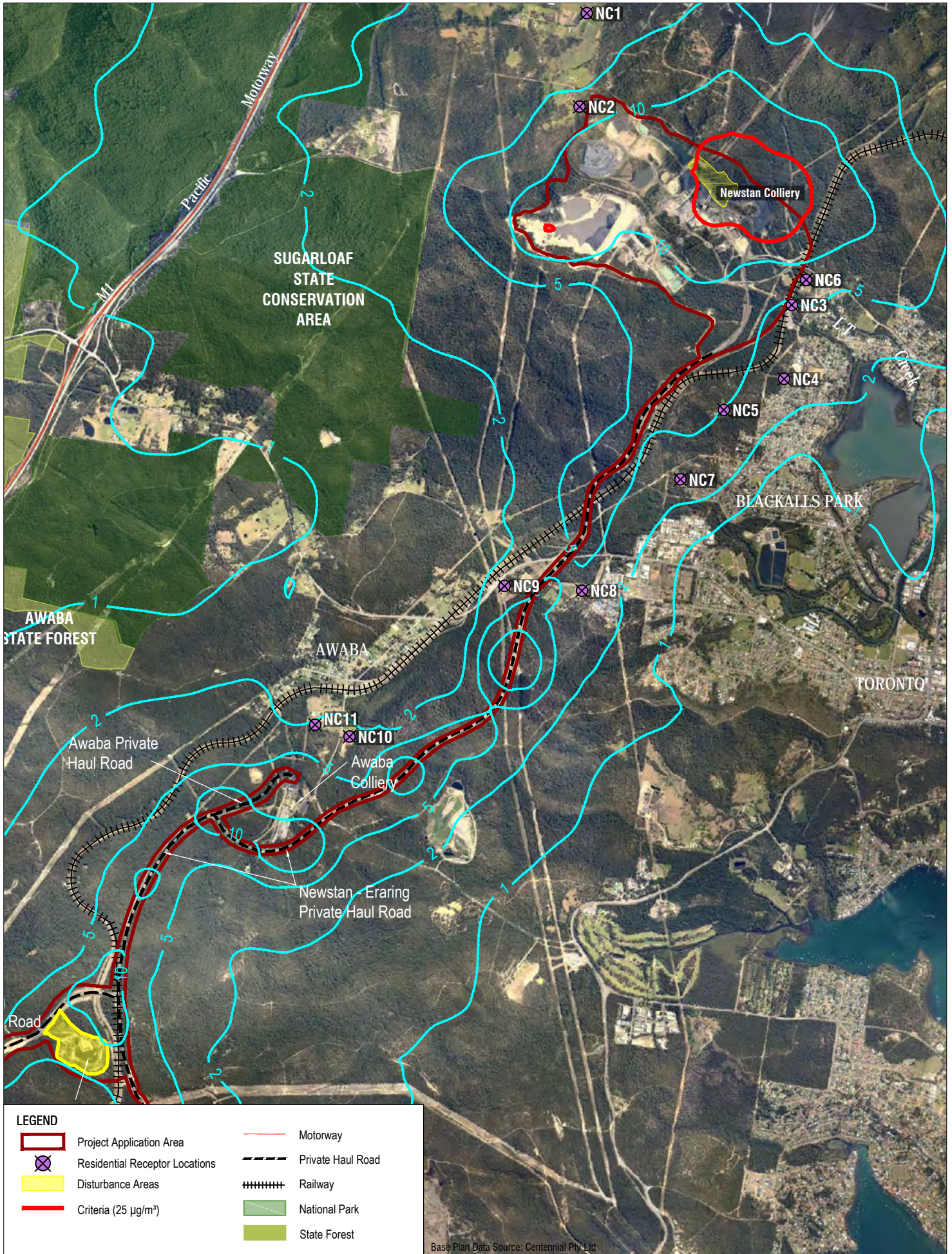


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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 3a
Increment Only
APPENDIX B

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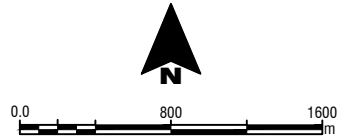


Base Plan Data Source: Centennial Pty Ltd

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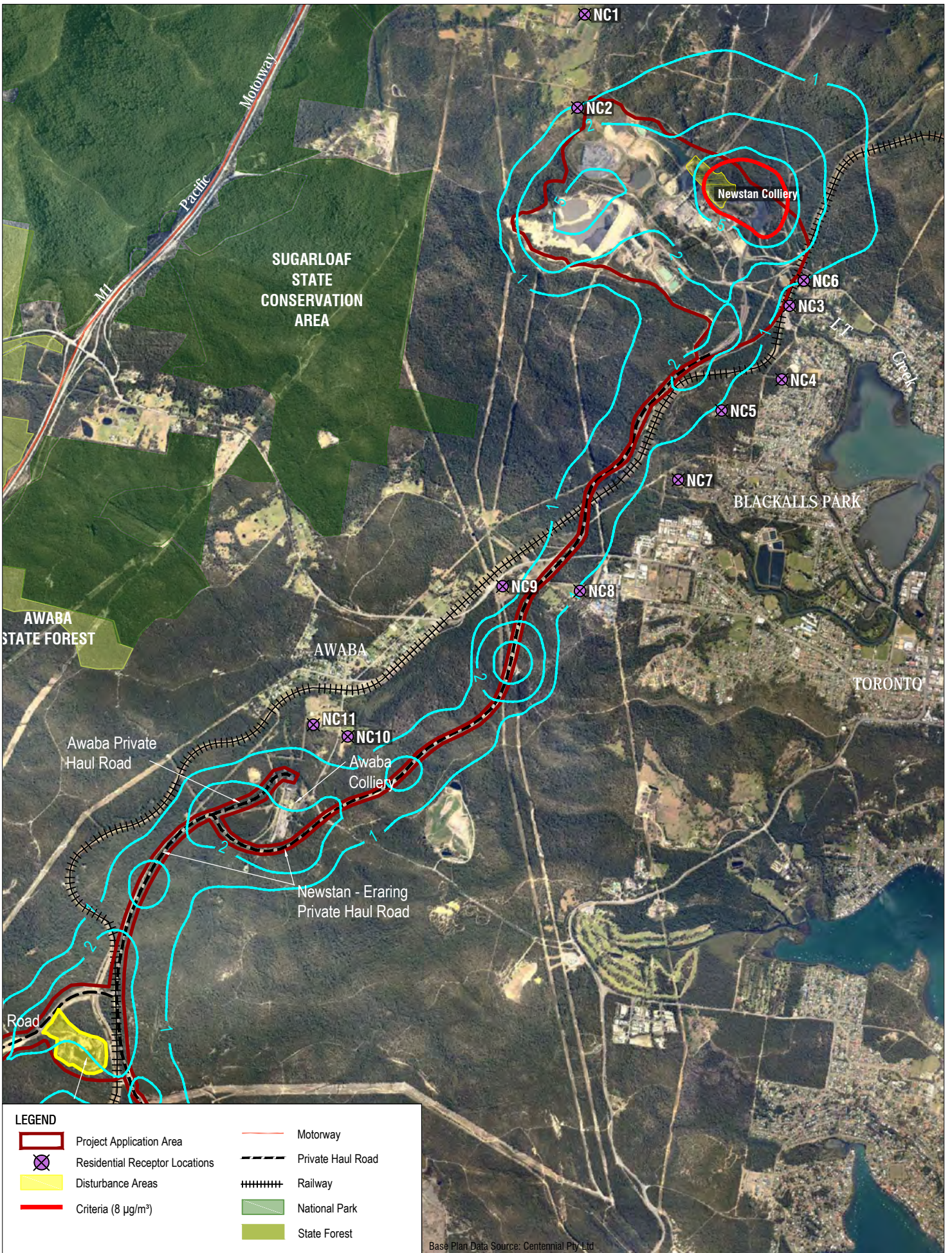


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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³
Scenario 3a
Increment Only
APPENDIX B

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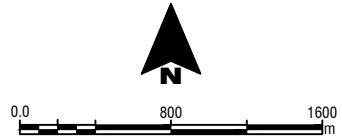
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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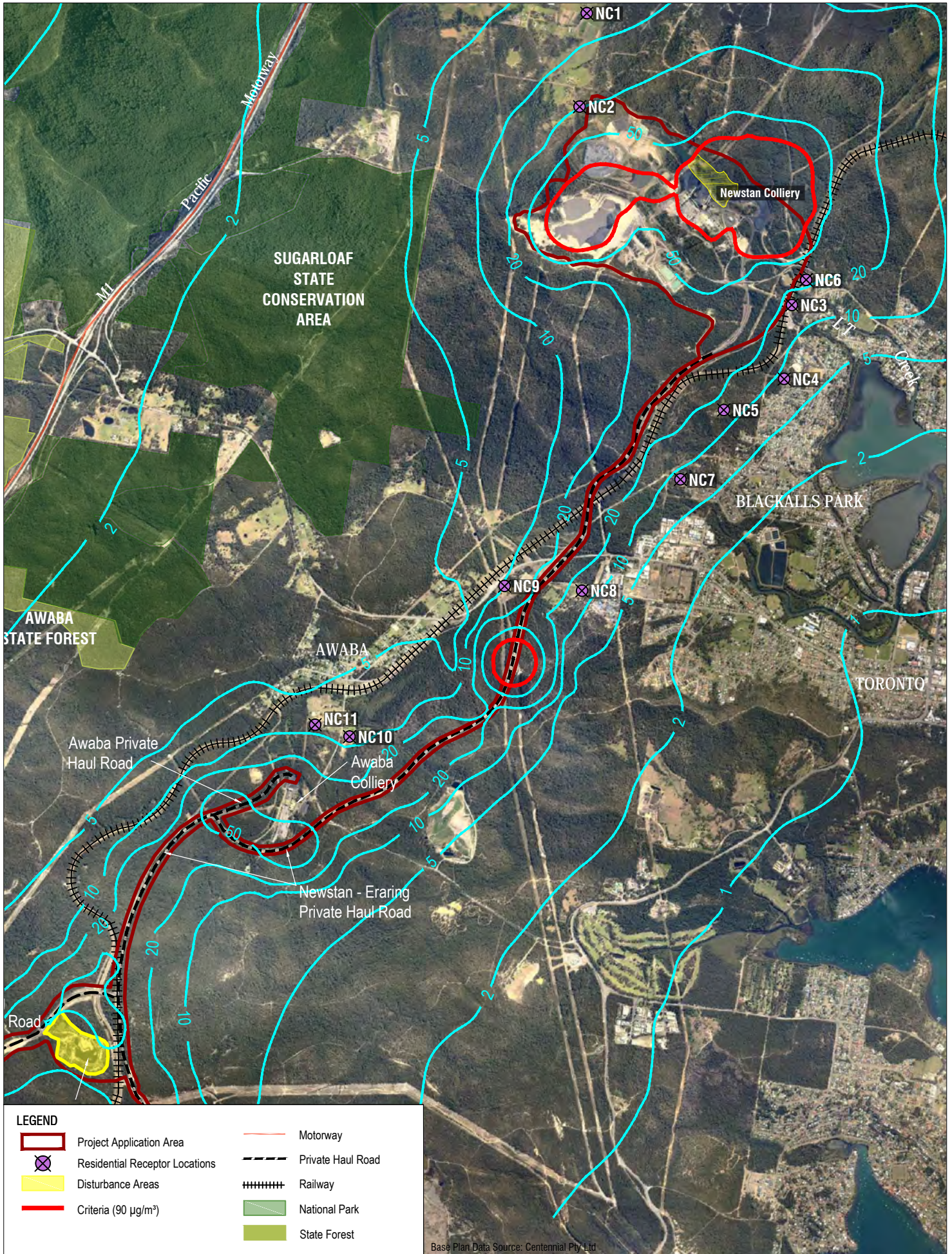


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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 3a
Increment Only
APPENDIX B

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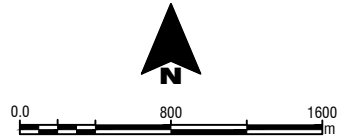


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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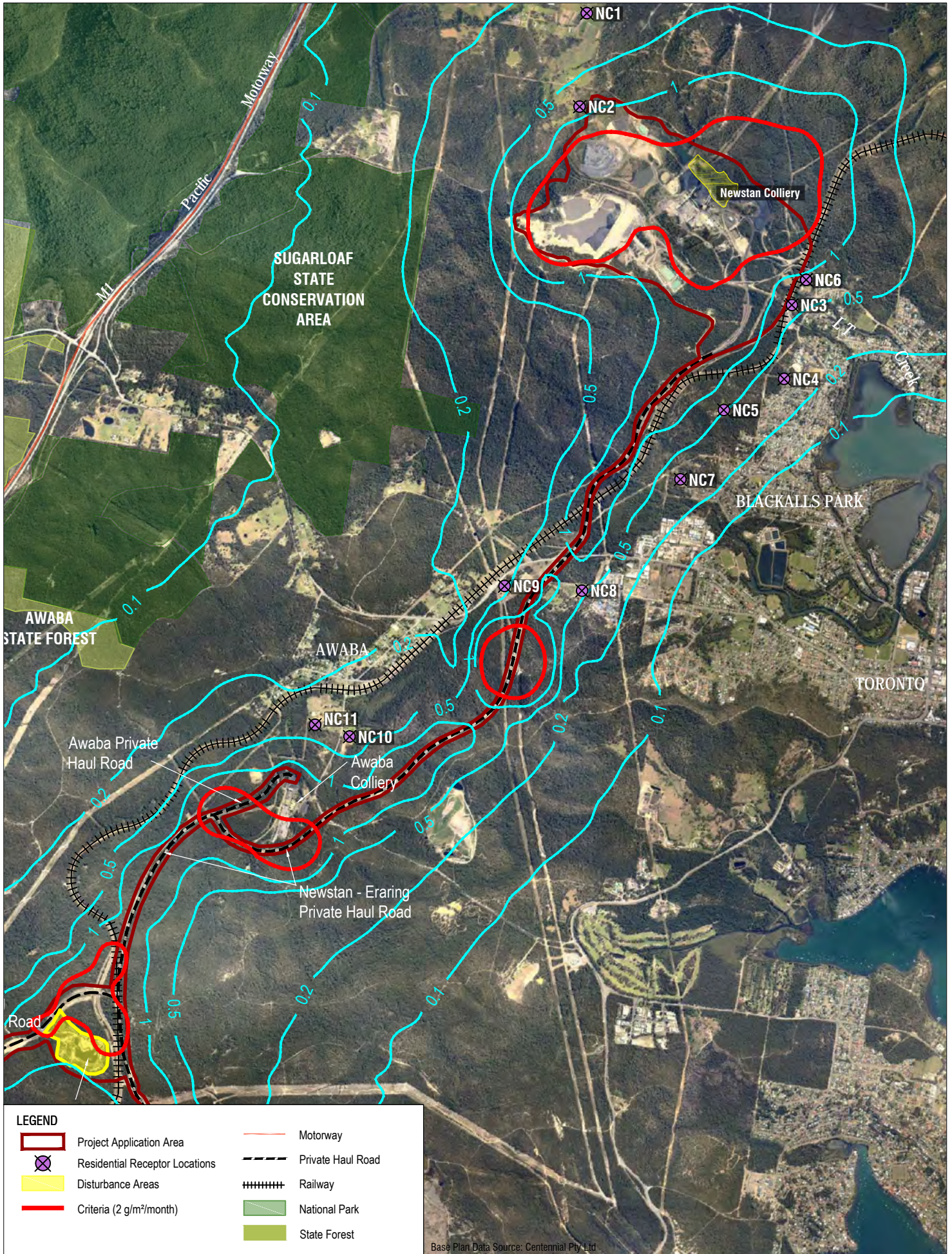
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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 3a
Increment Only
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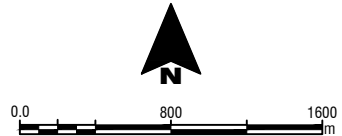
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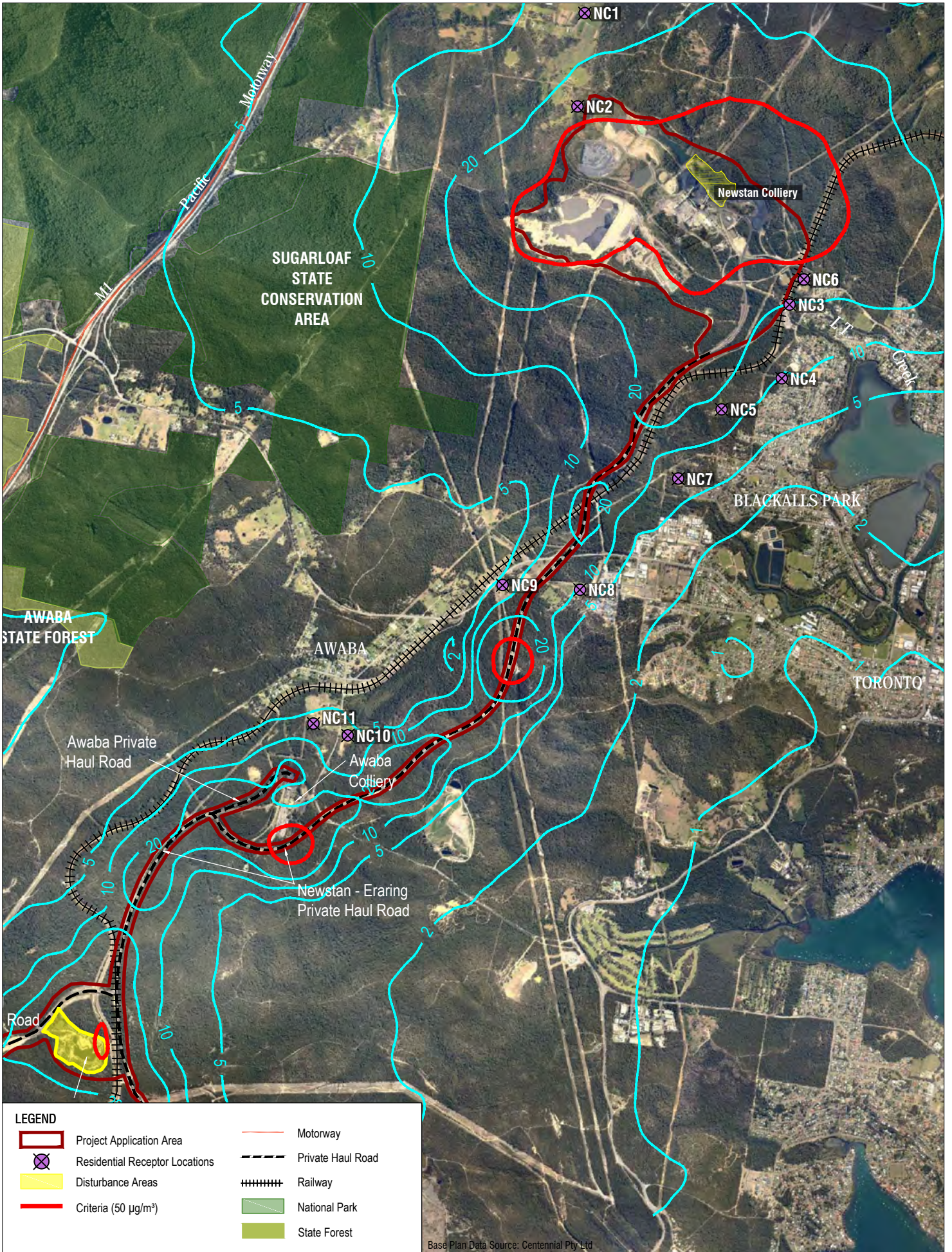
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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month
Scenario 3b
Increment Only
APPENDIX B

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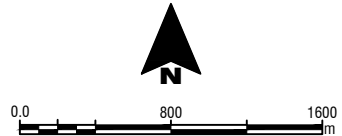
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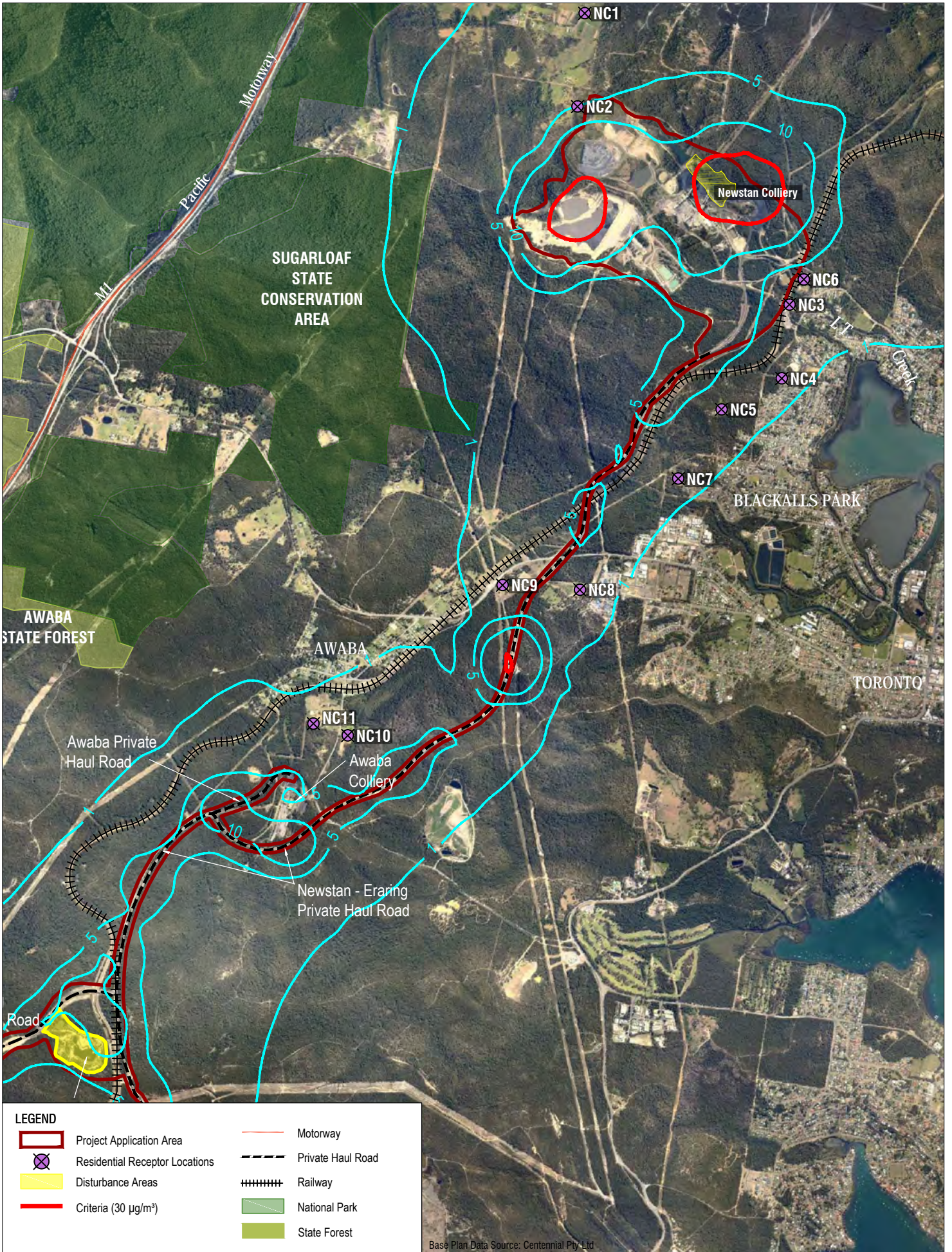


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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour $\mu\text{g}/\text{m}^3$
Scenario 3b
Increment Only
APPENDIX B

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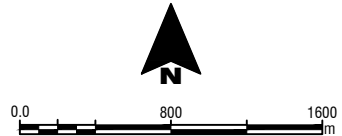
Base Plan Data Source: Centennial Pty Ltd

LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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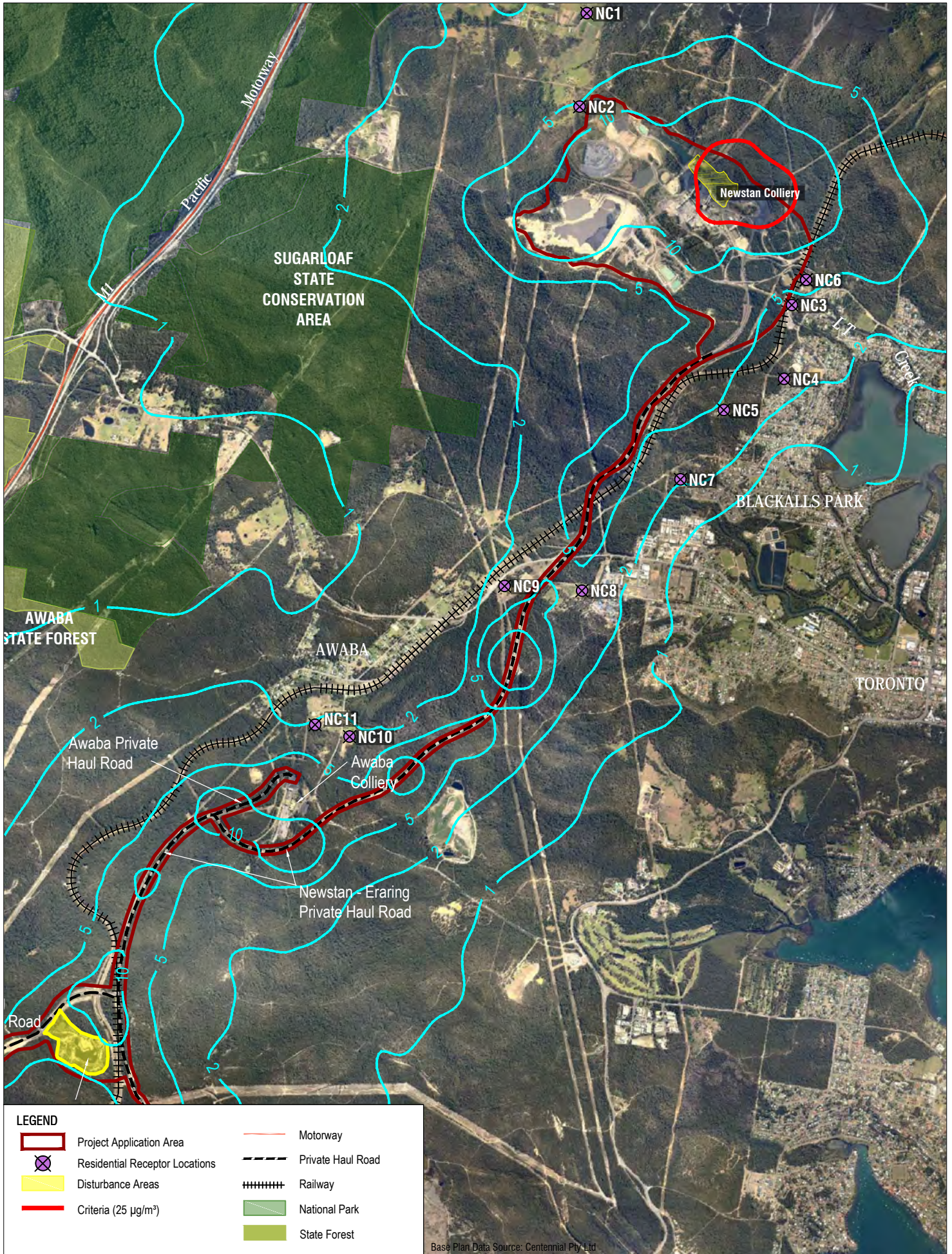
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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 3b
Increment Only

APPENDIX B

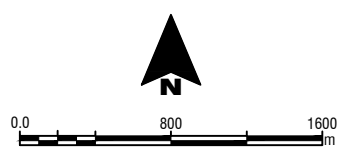
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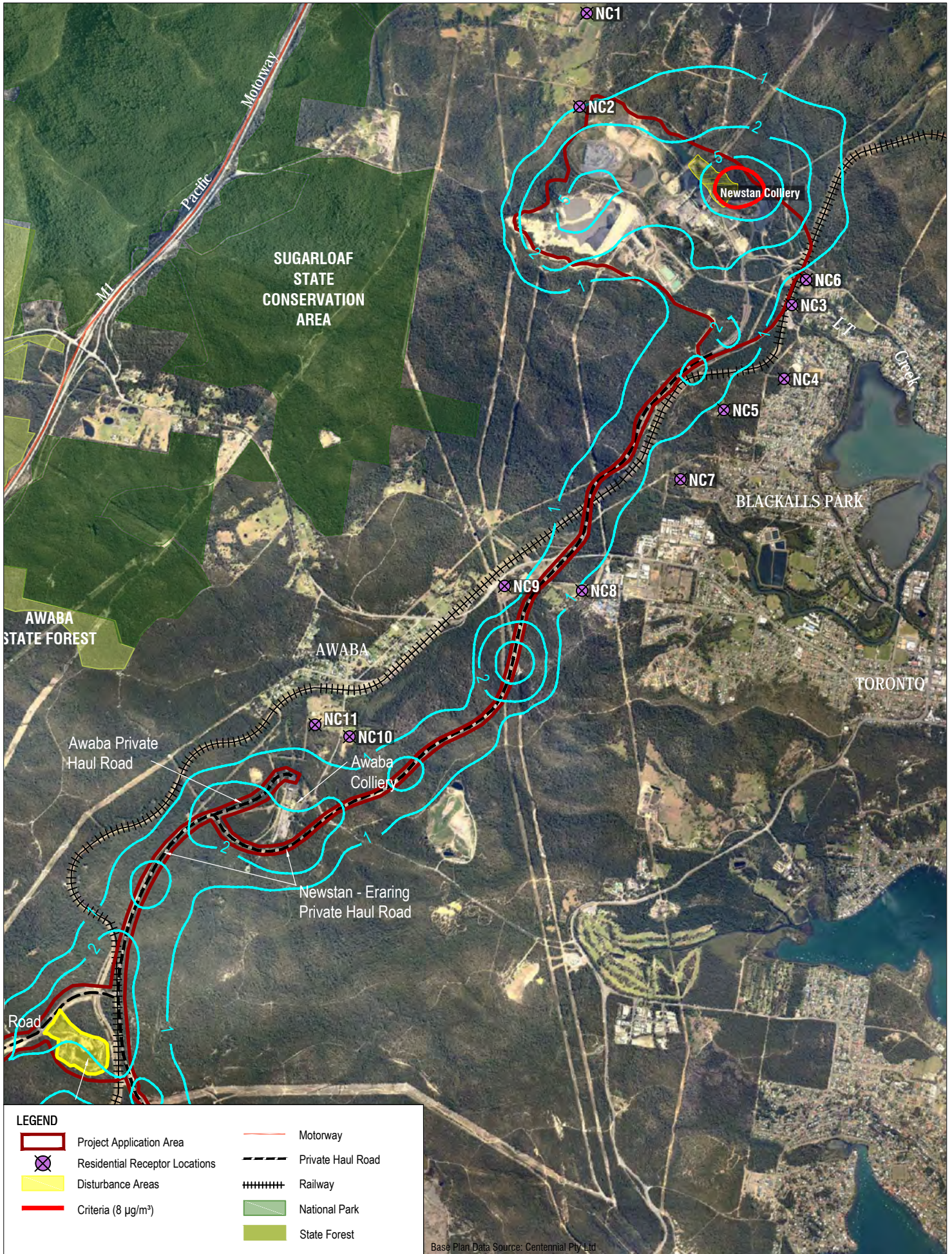
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour $\mu\text{g}/\text{m}^3$
Scenario 3b
Increment Only
APPENDIX B

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Base Plan Data Source: Centennial Pty Ltd

LEGEND

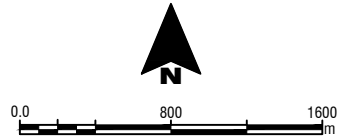
	Project Application Area		Motorway
	Residential Receptor Locations		Private Haul Road
	Disturbance Areas		Railway
	Criteria (8 µg/m³)		National Park
			State Forest

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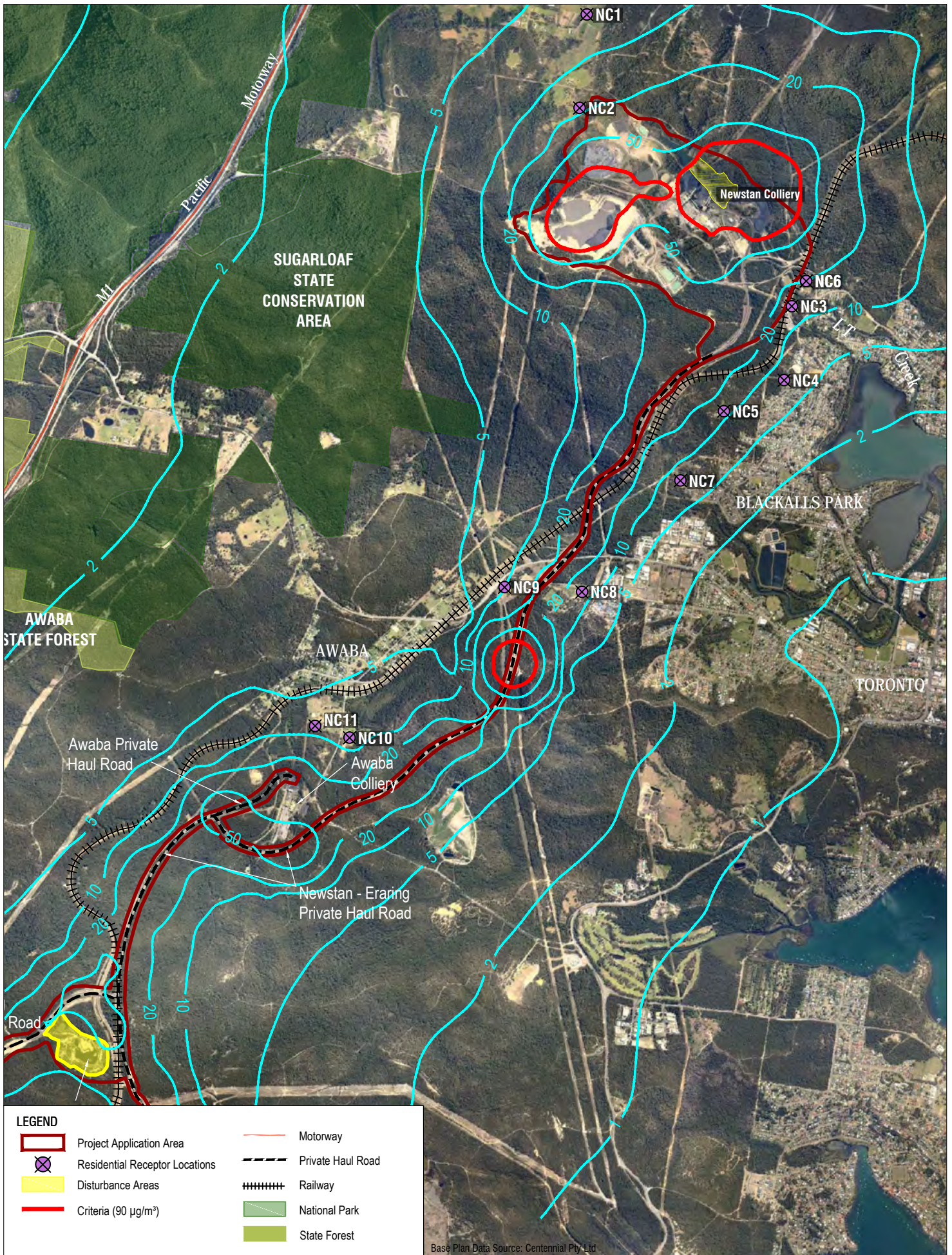
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 3b
Increment Only

APPENDIX B

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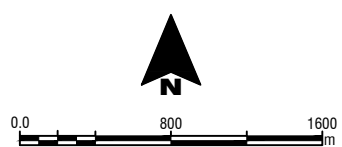


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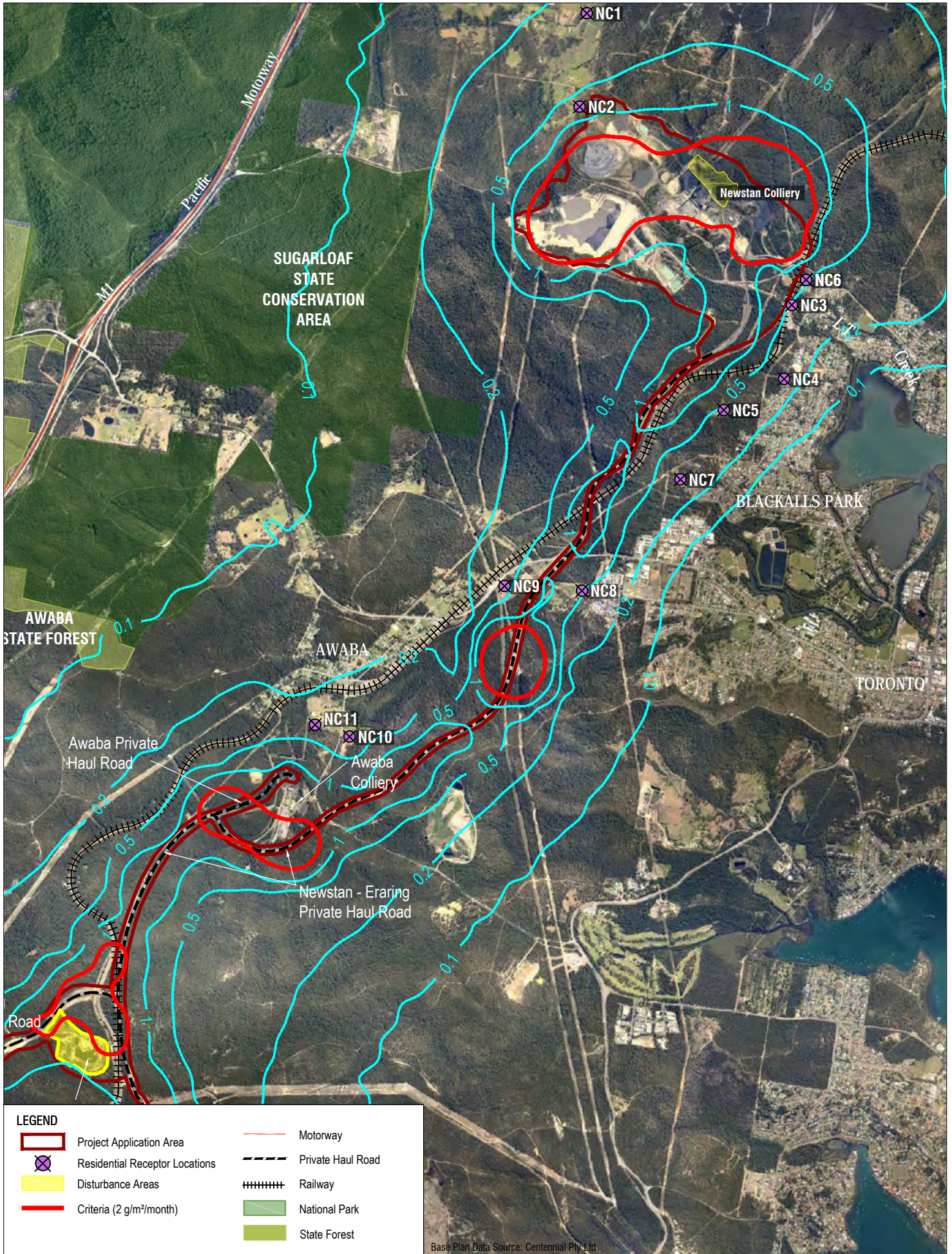
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Projection:	(GDA94) MGA Zone 56



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CENTENNIAL COAL LOGISTICS AIR
TSP Annual $\mu\text{g}/\text{m}^3$
Scenario 3b
Increment Only
APPENDIX B

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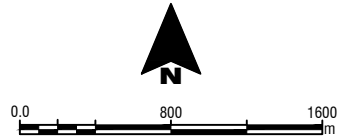


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (2 g/m²/month)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month

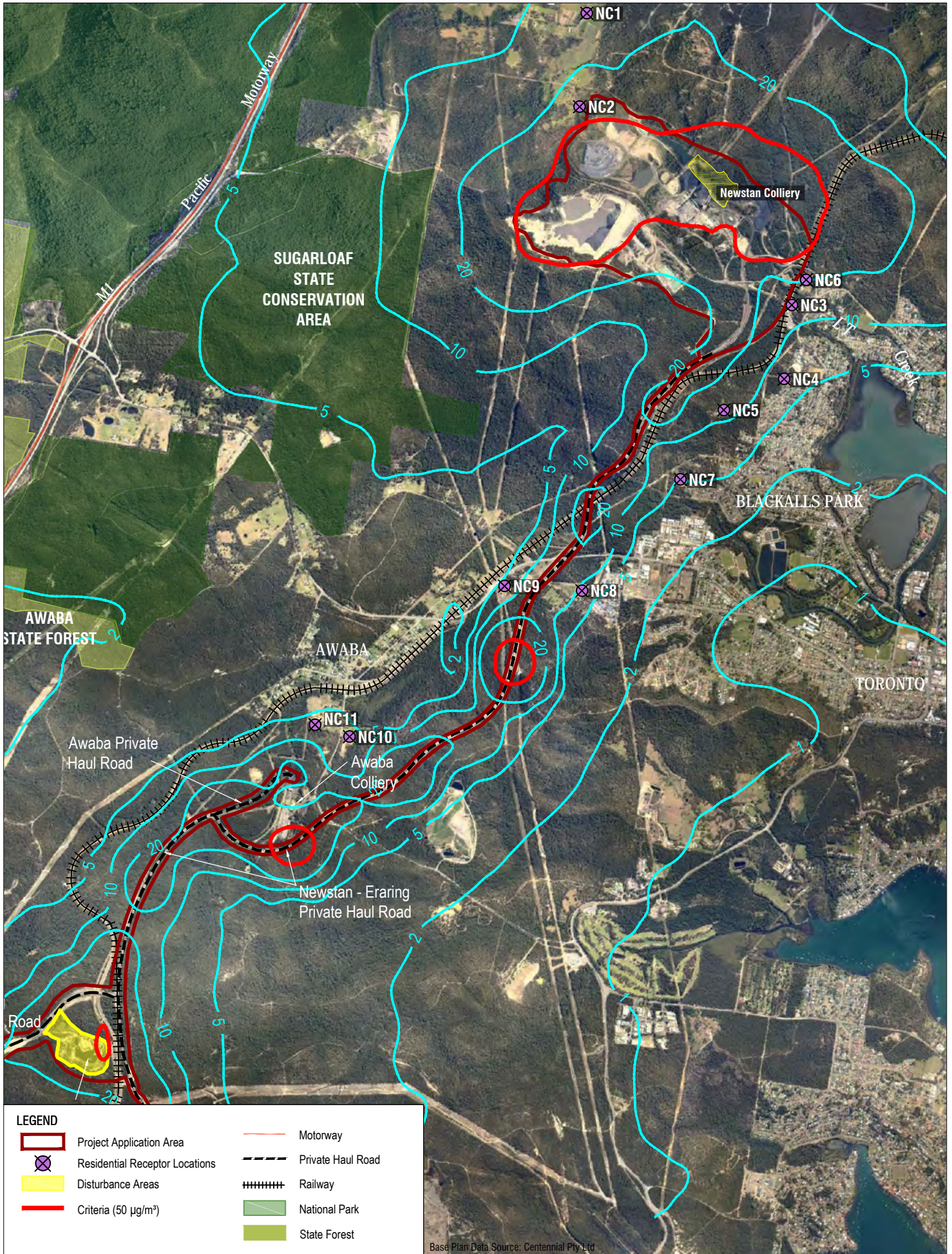
Scenario 3c

Increment Only

APPENDIX B

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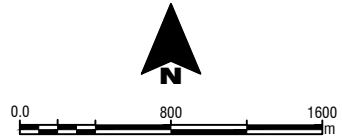


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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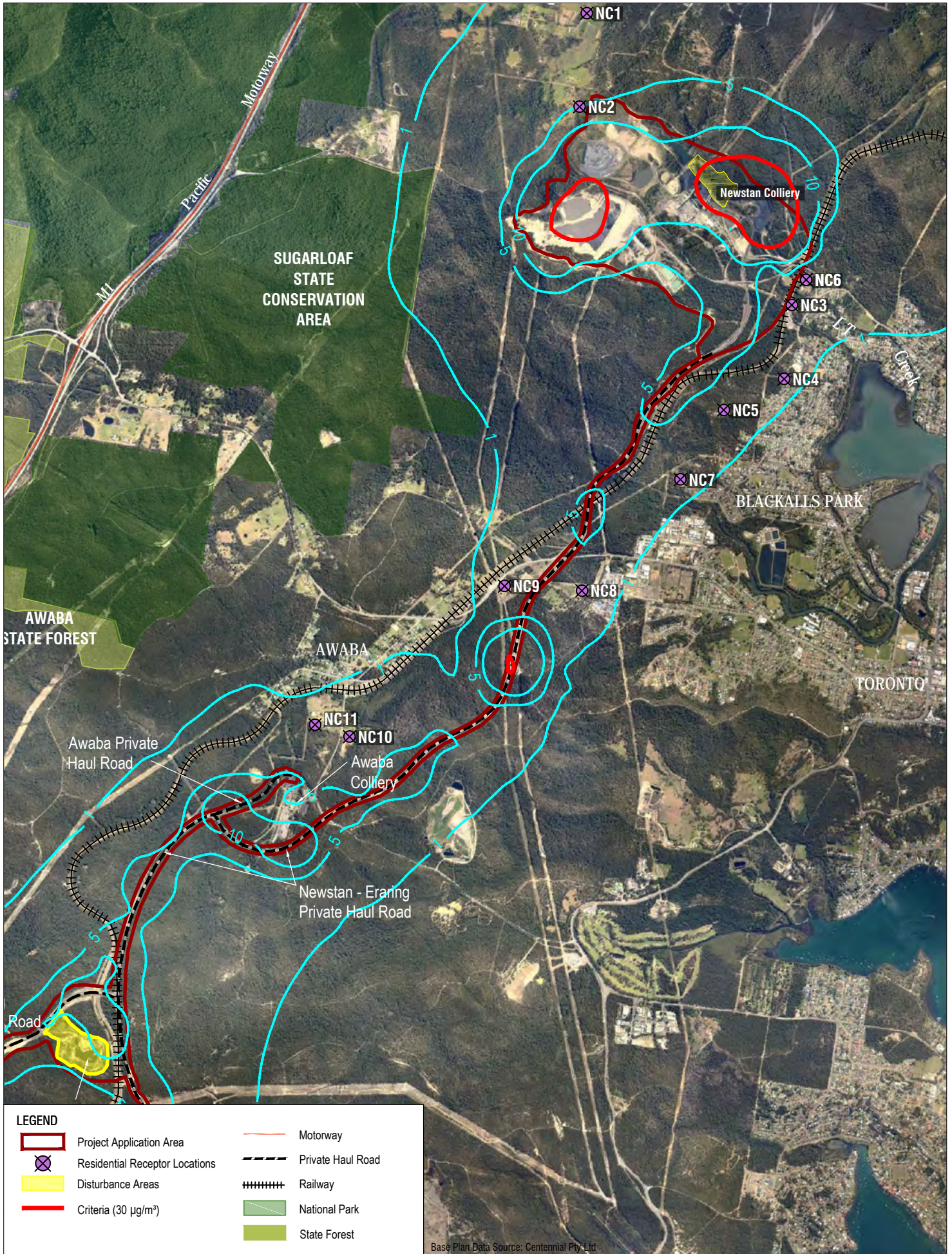
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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 3c
Increment Only
APPENDIX B

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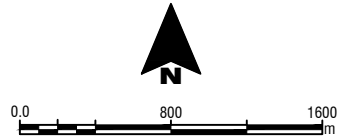
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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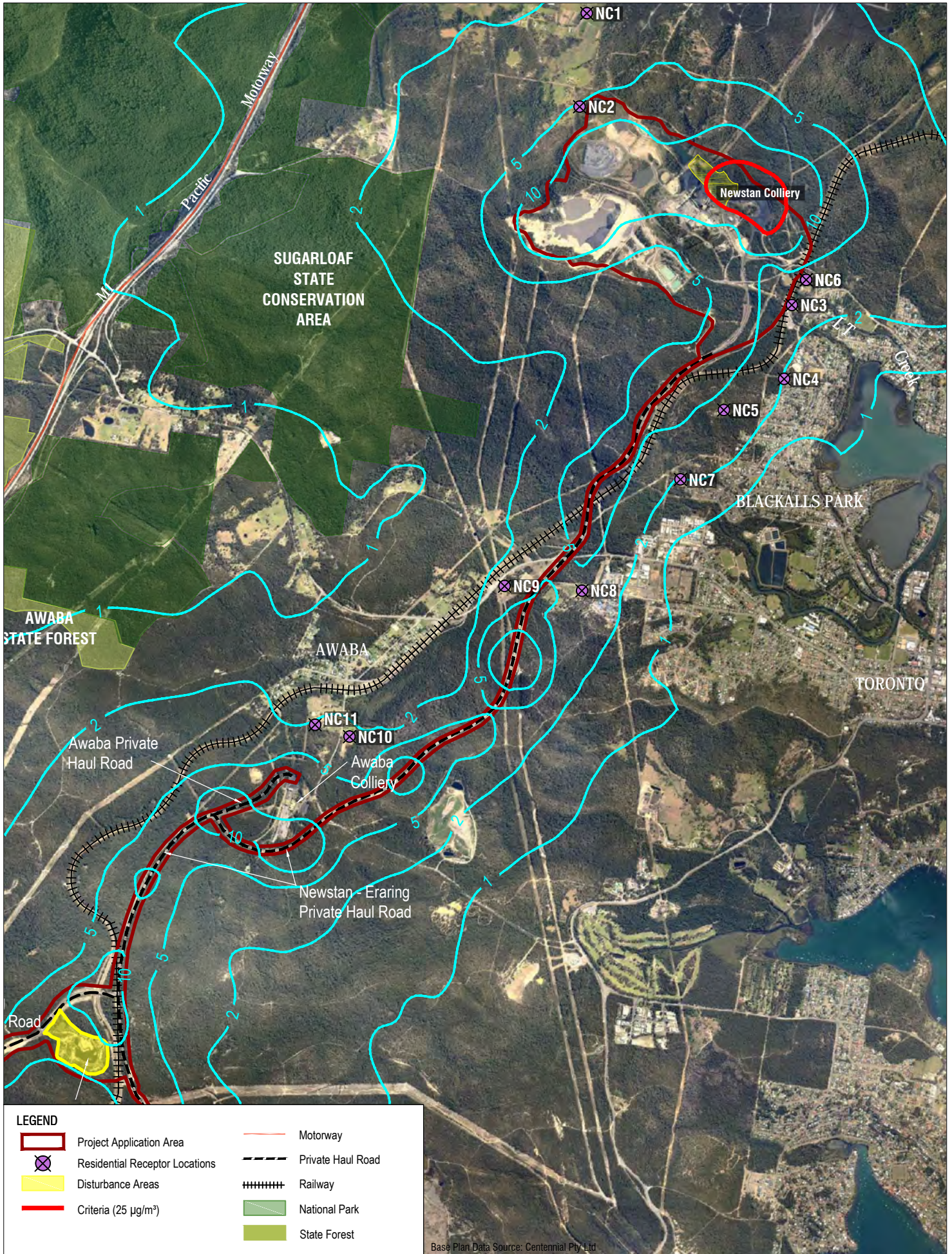
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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 3c
Increment Only

APPENDIX B

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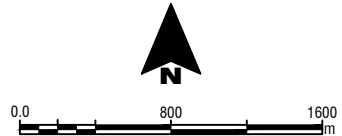


LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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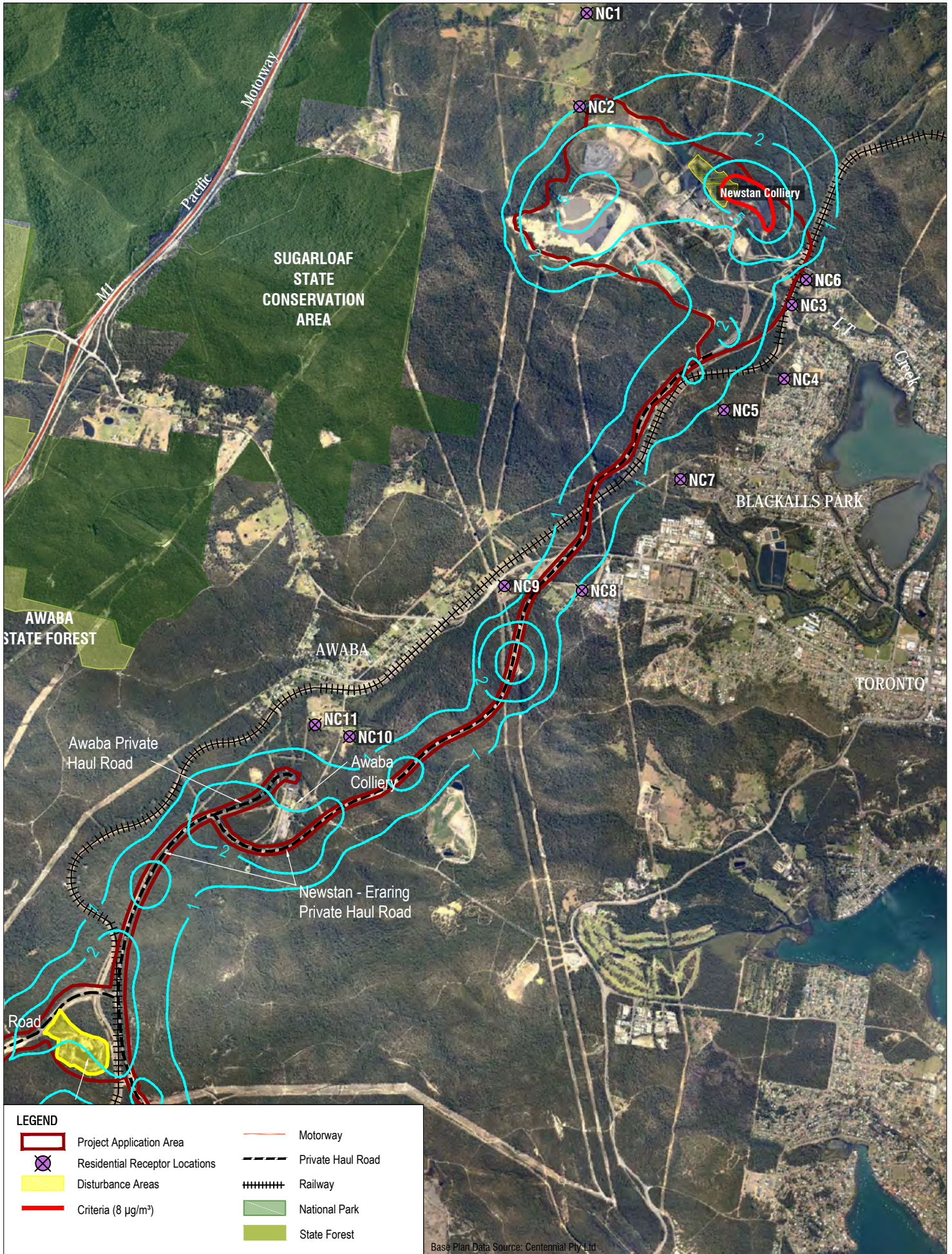
CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³
Scenario 3c
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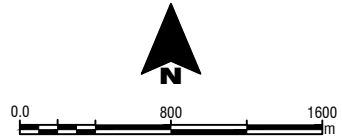
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LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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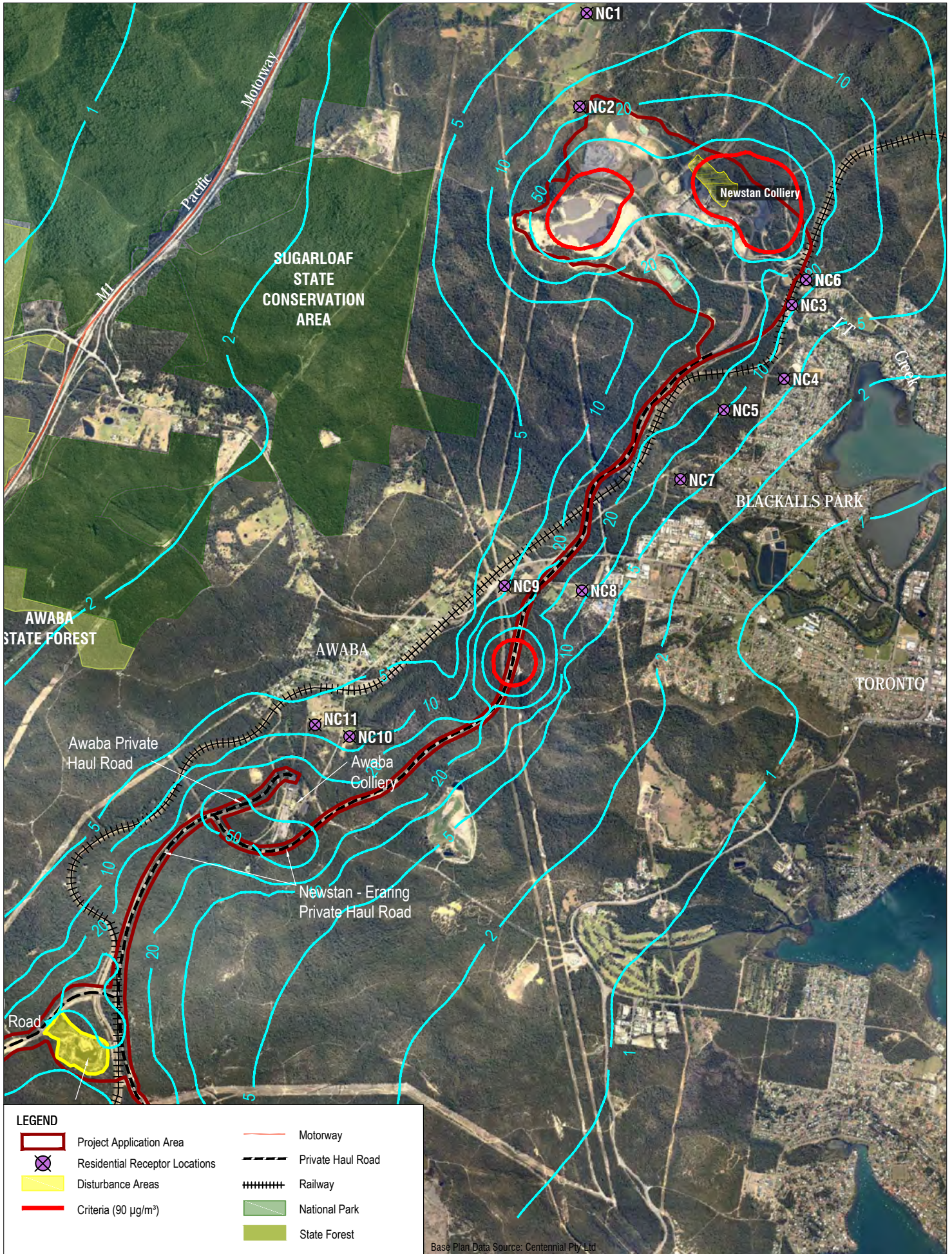
Centennial Newstan Pty Ltd

CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 3c
Increment Only

APPENDIX B

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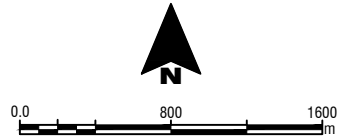
Base Plan Data Source: Centennial Pty Ltd

LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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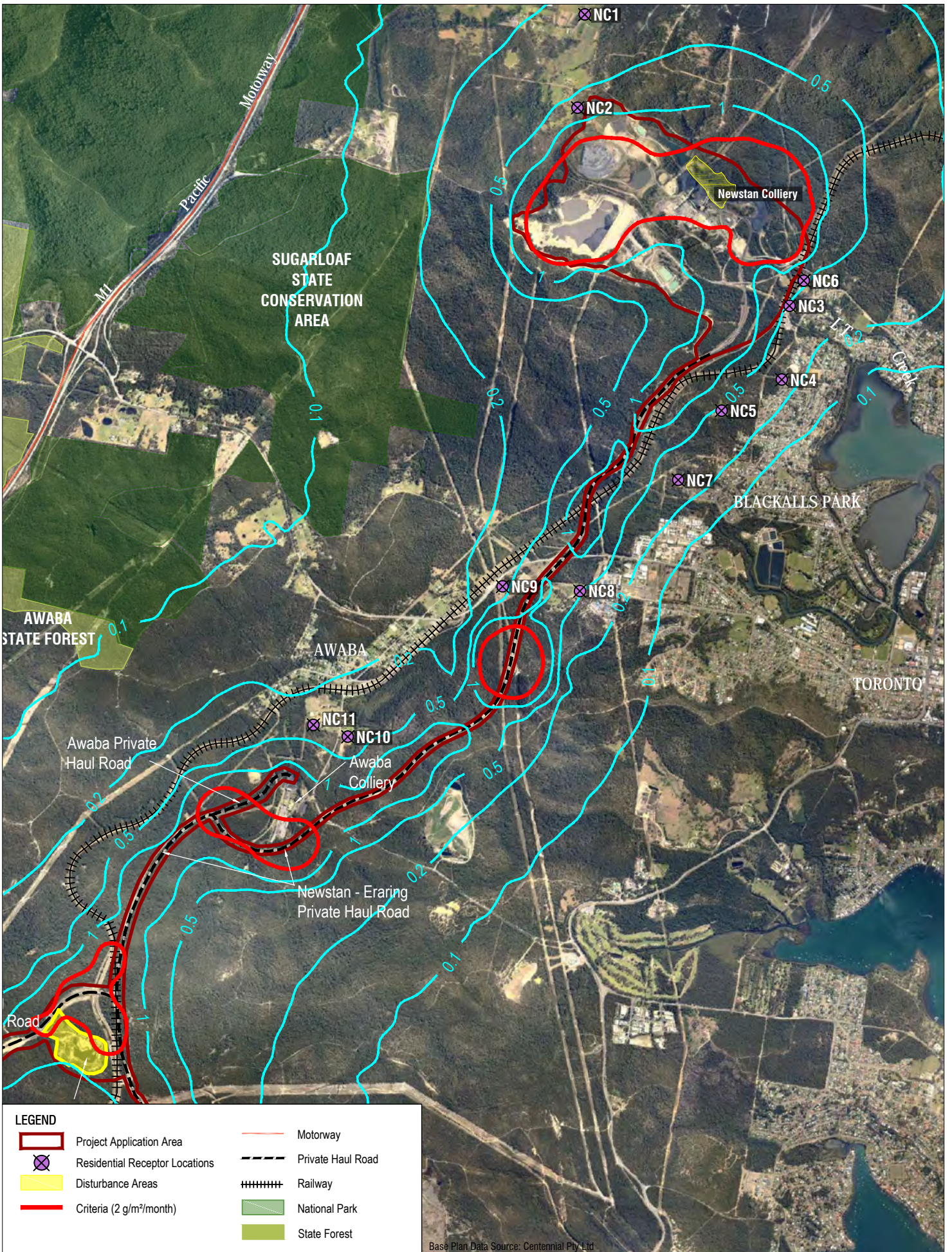
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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 3c
Increment Only

APPENDIX B

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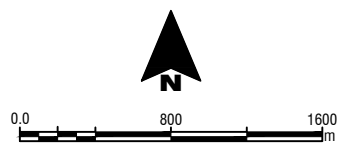
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (2 g/m ² /month)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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CENTENNIAL COAL LOGISTICS AIR

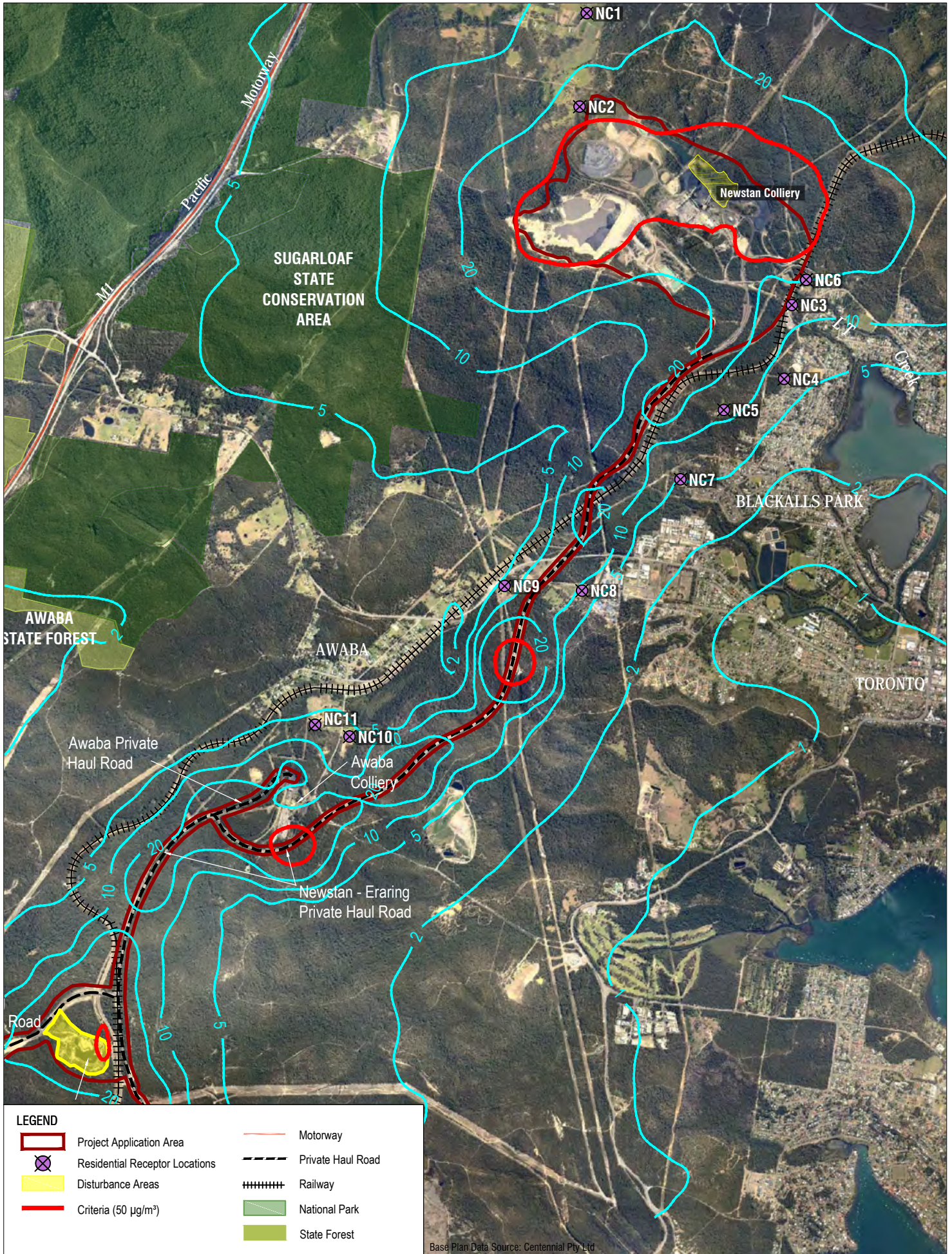
Dust Deposition Annual g/m²/month

Scenario 4

Increment Only

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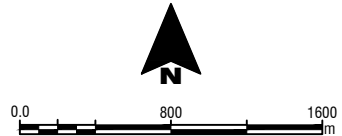
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	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (50 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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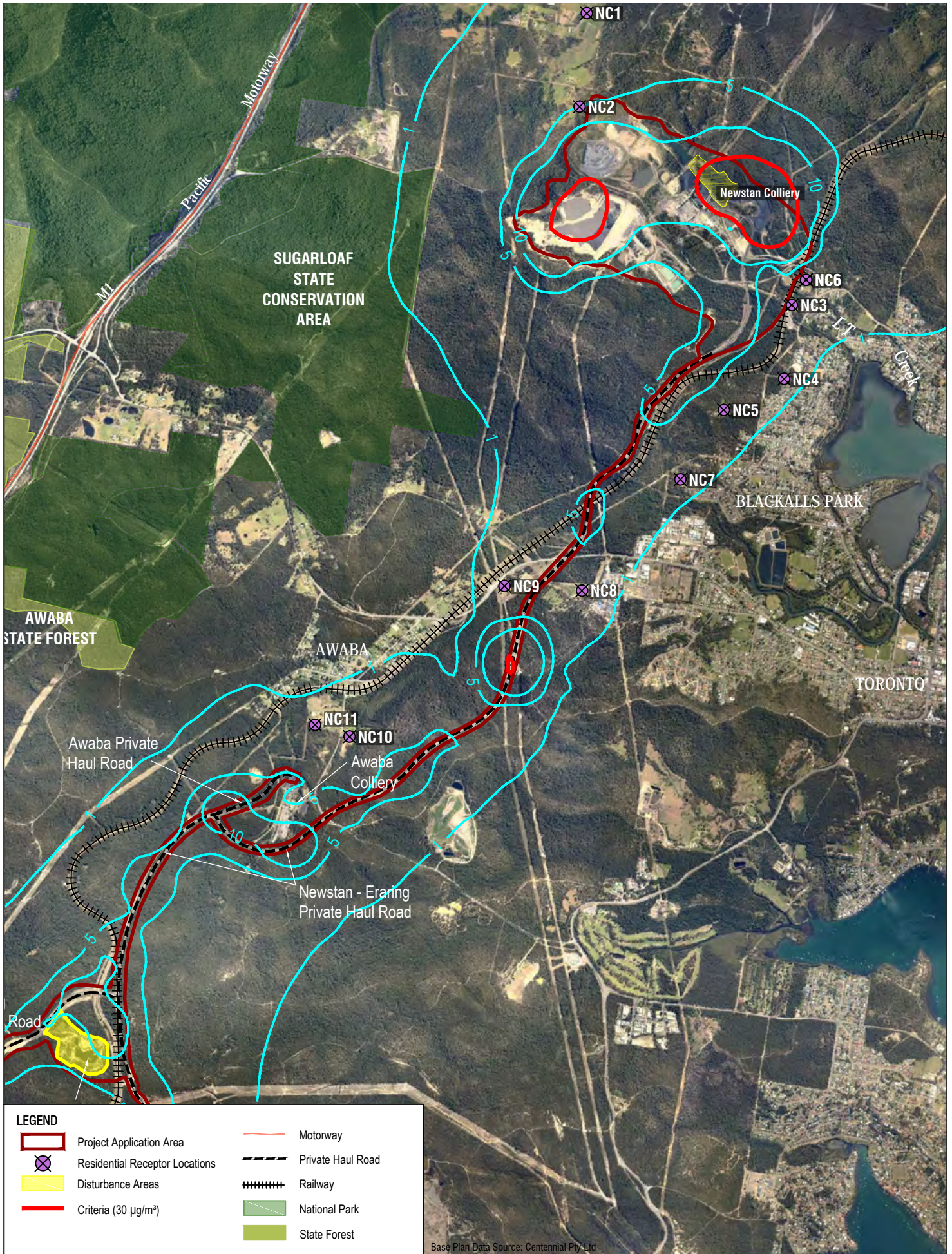


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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 4
Increment Only
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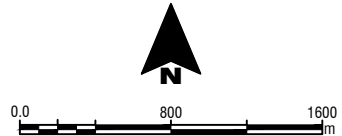
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (30 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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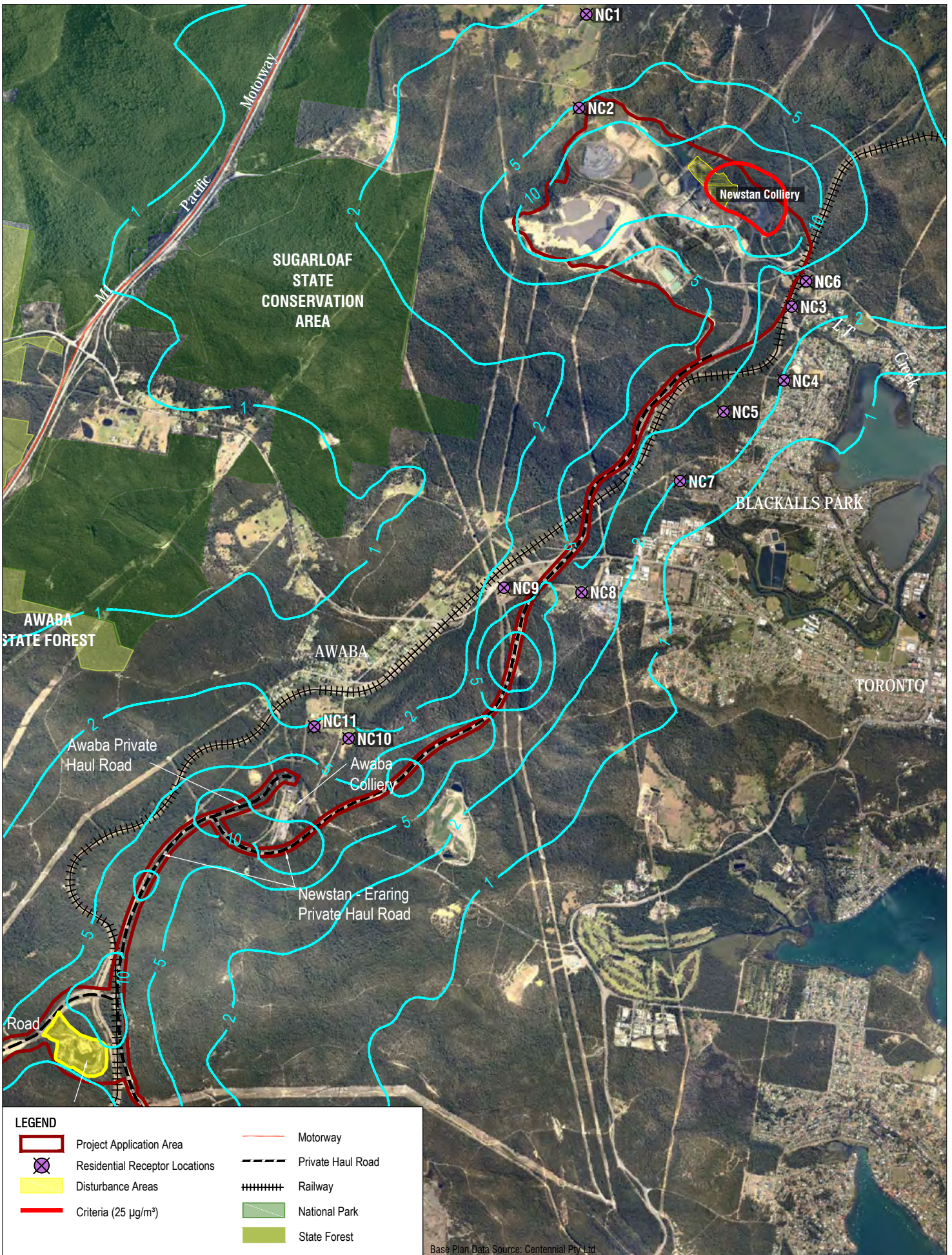


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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 4
Increment Only
APPENDIX B

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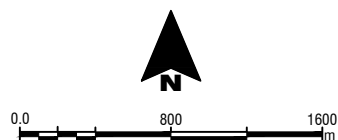
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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CENTENNIAL COAL LOGISTICS AIR

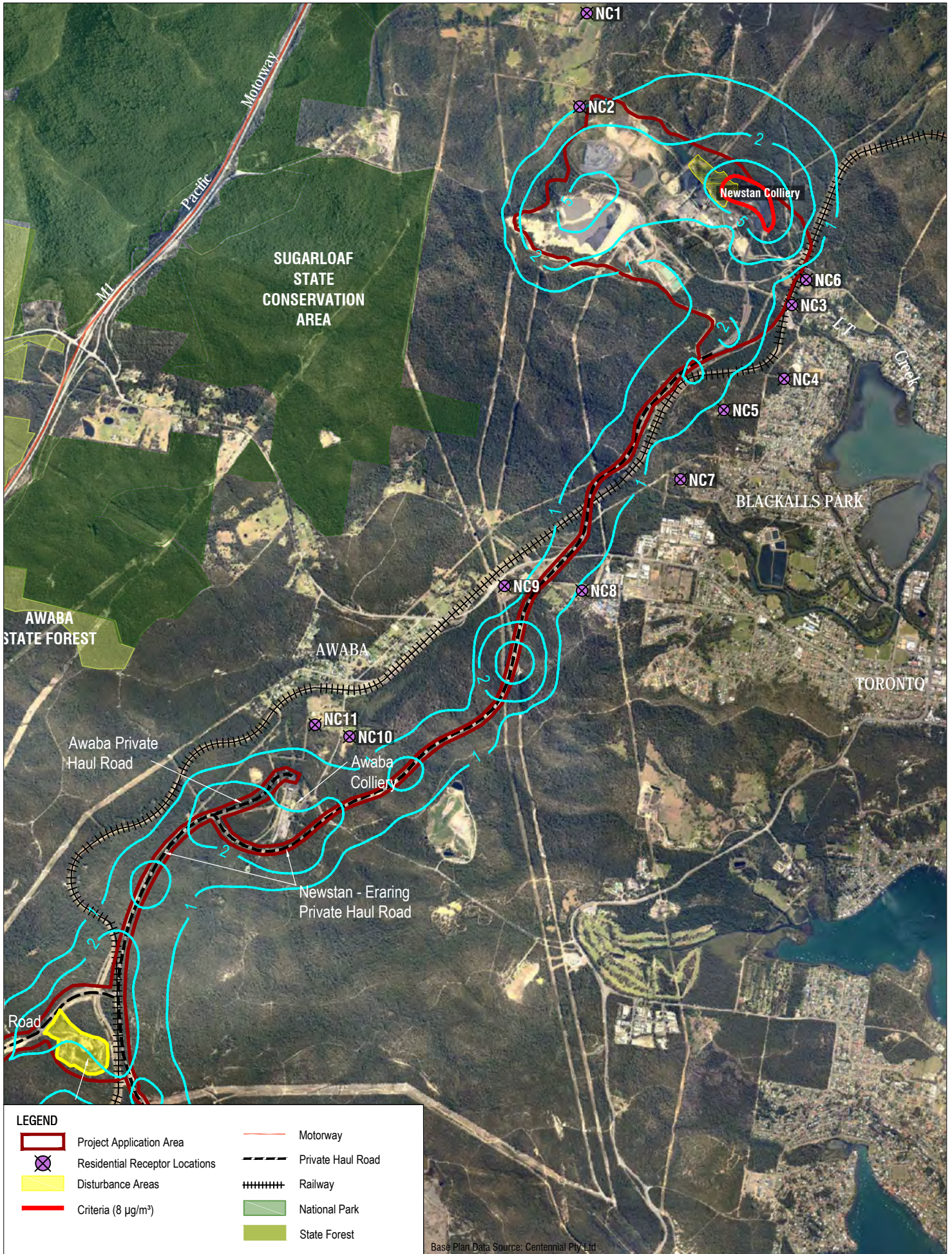
PM2.5 - 24 Hour µg/m³

Scenario 4

Increment Only

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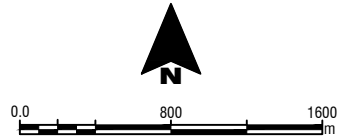
Base Plan Data Source: Centennial Pty Ltd

LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (8 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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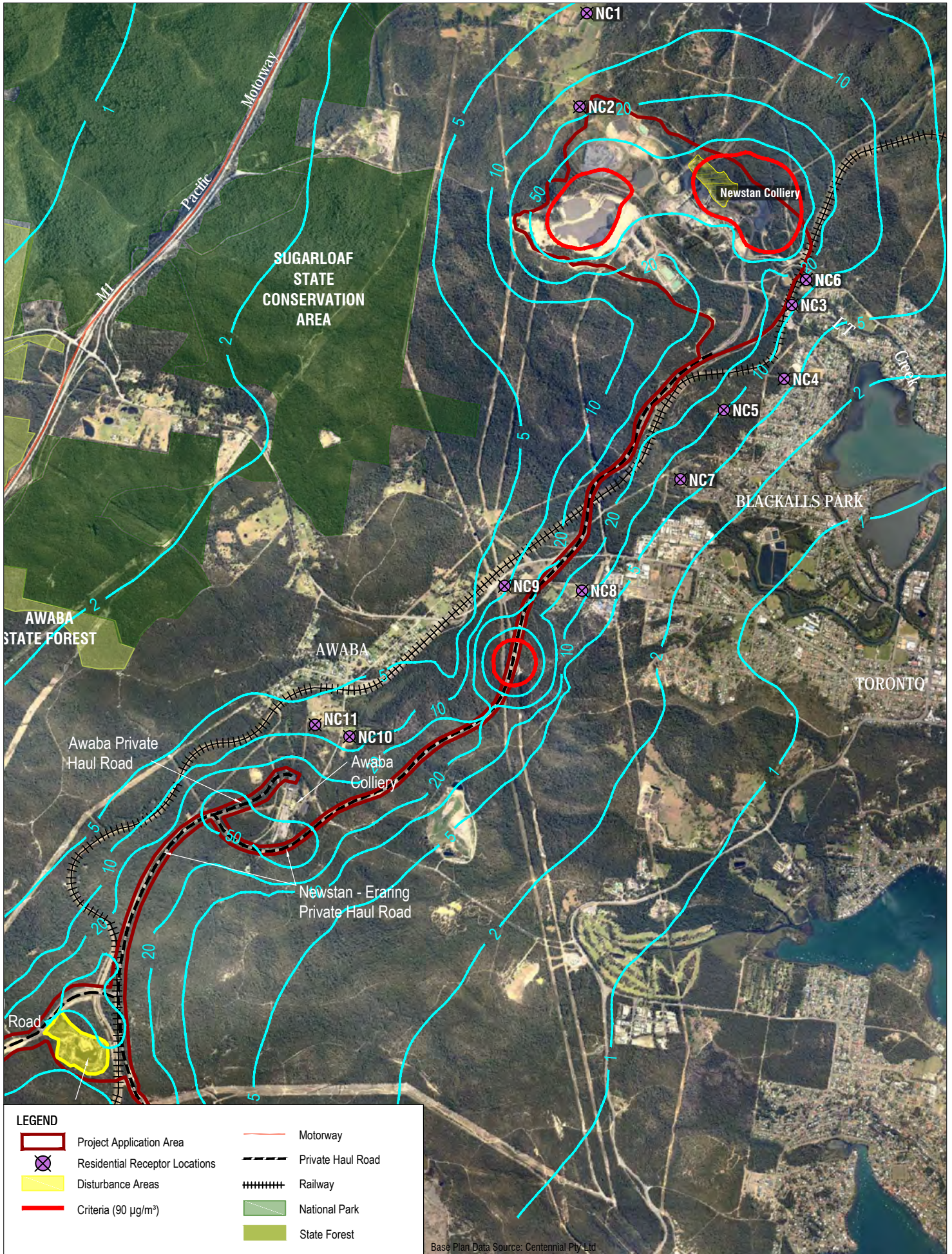
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual µg/m³
Scenario 4
Increment Only

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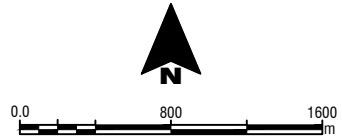
LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (90 µg/m³)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

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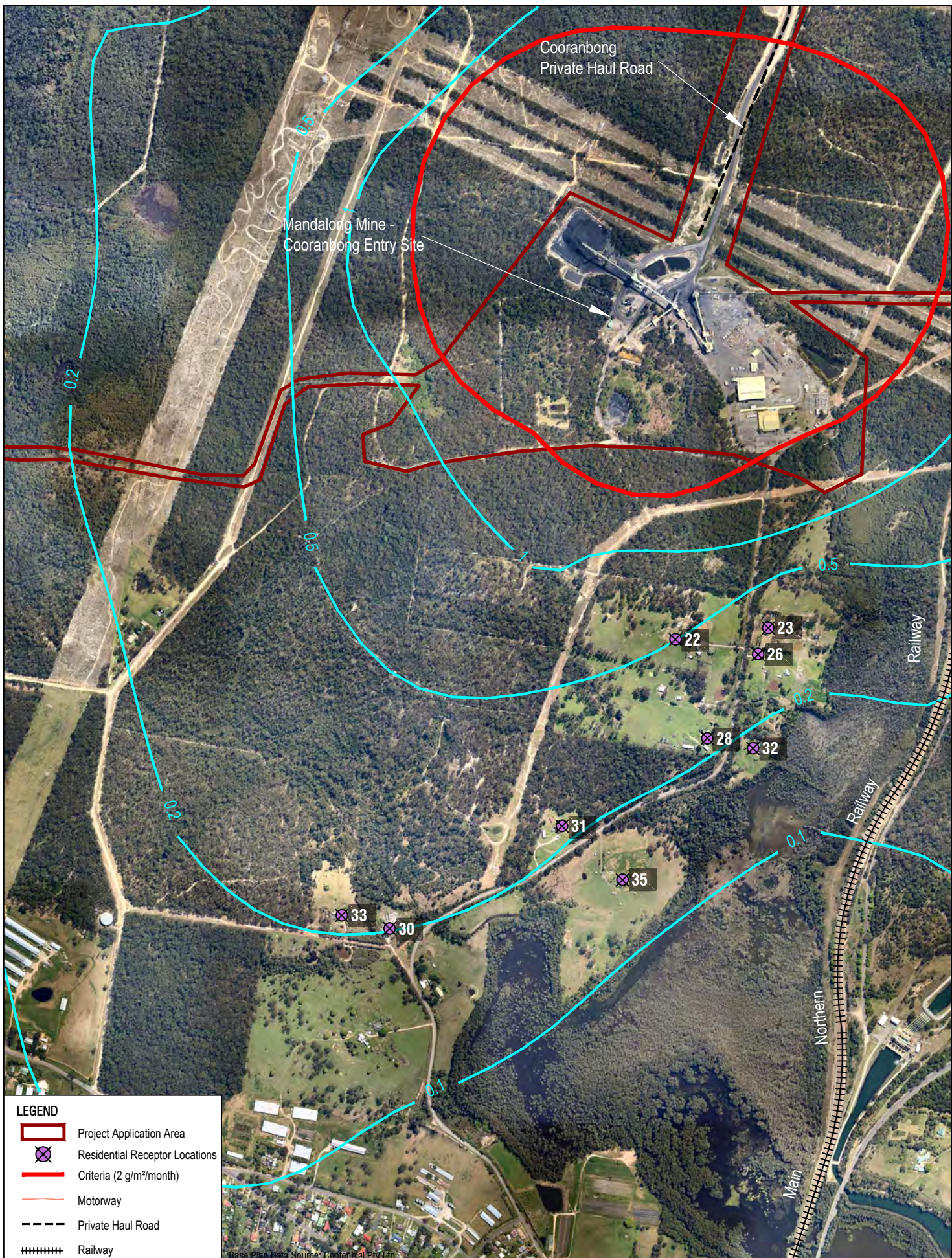


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CENTENNIAL COAL LOGISTICS AIR

TSP Annual µg/m³
Scenario 4
Increment Only
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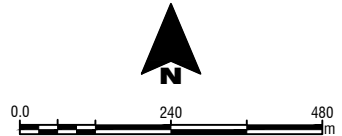
LEGEND

- Project Application Area
- Residential Receptor Locations
- Criteria (2 g/m²/month)
- Motorway
- Private Haul Road
- Railway

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CENTENNIAL COAL LOGISTICS AIR

Dust Deposition Annual g/m²/month
Scenario 5a
Increment Only

APPENDIX B

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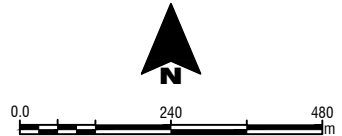
LEGEND

- Project Application Area
- X Residential Receptor Locations
- Criteria ($50 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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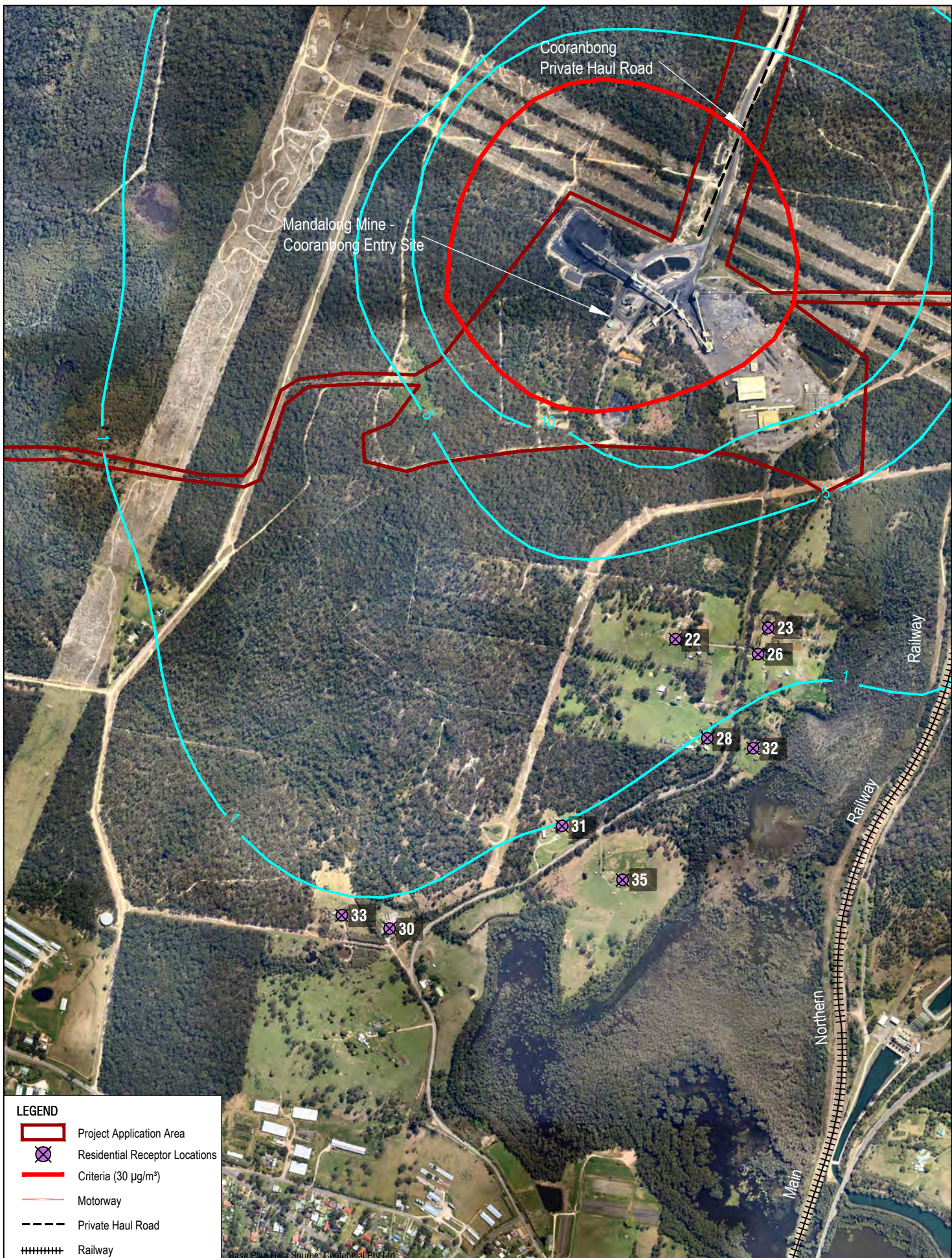
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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour $\mu\text{g}/\text{m}^3$
Scenario 5a
Increment Only
APPENDIX B

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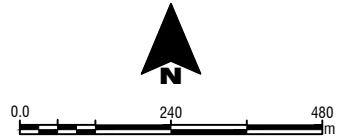
- Project Application Area
- X Residential Receptor Locations
- Criteria (30 µg/m³)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd



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CENTENNIAL COAL LOGISTICS AIR

PM10 - Annual µg/m³
Scenario 5a
Increment Only
APPENDIX B

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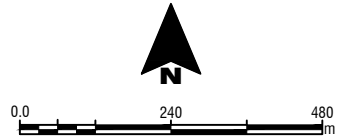
LEGEND

- Project Application Area
- Residential Receptor Locations
- Criteria ($8 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

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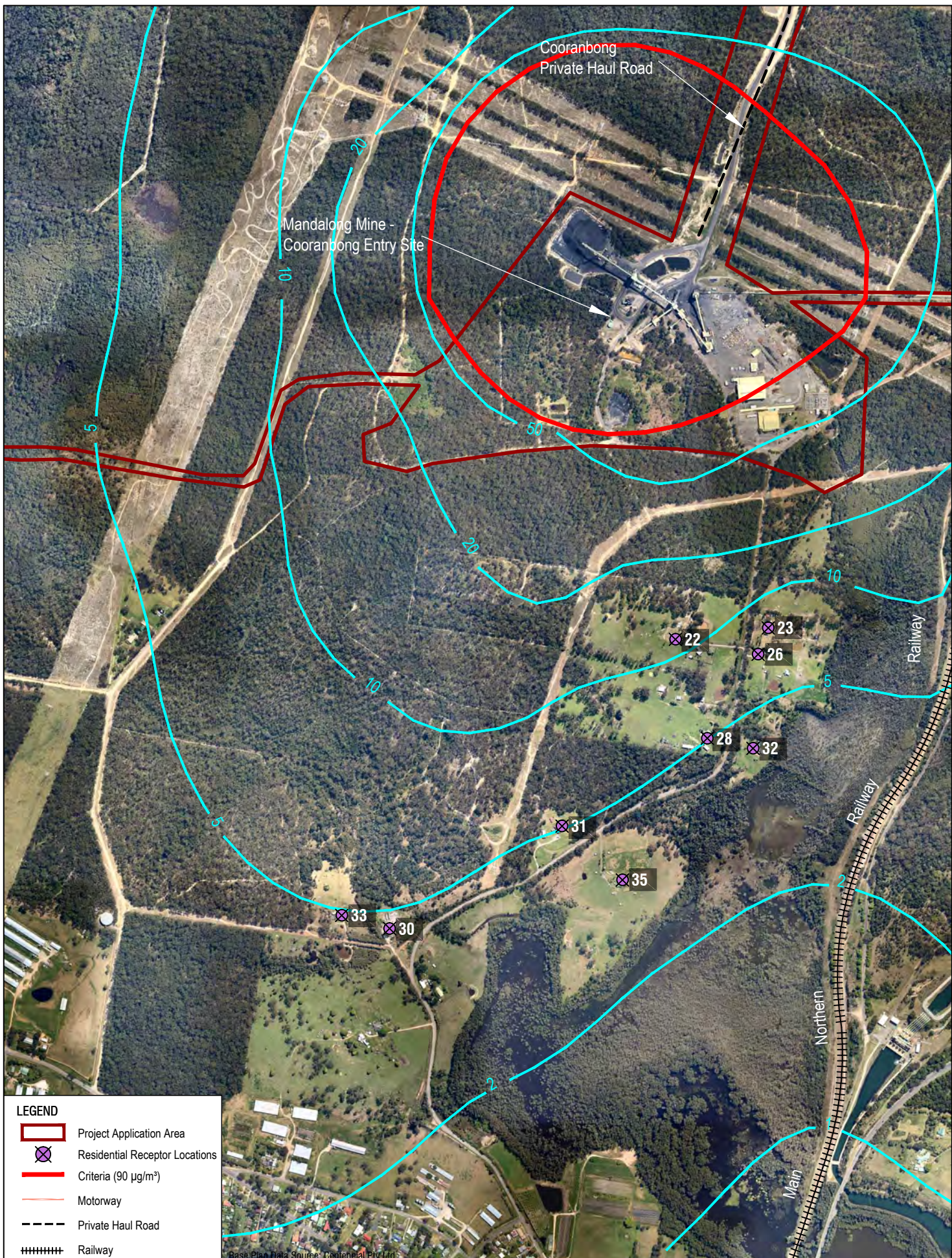
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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual $\mu\text{g}/\text{m}^3$
Scenario 5a
Increment Only
APPENDIX B

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LEGEND

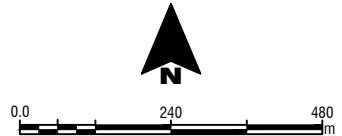
- Project Application Area
- X Residential Receptor Locations
- Criteria ($90 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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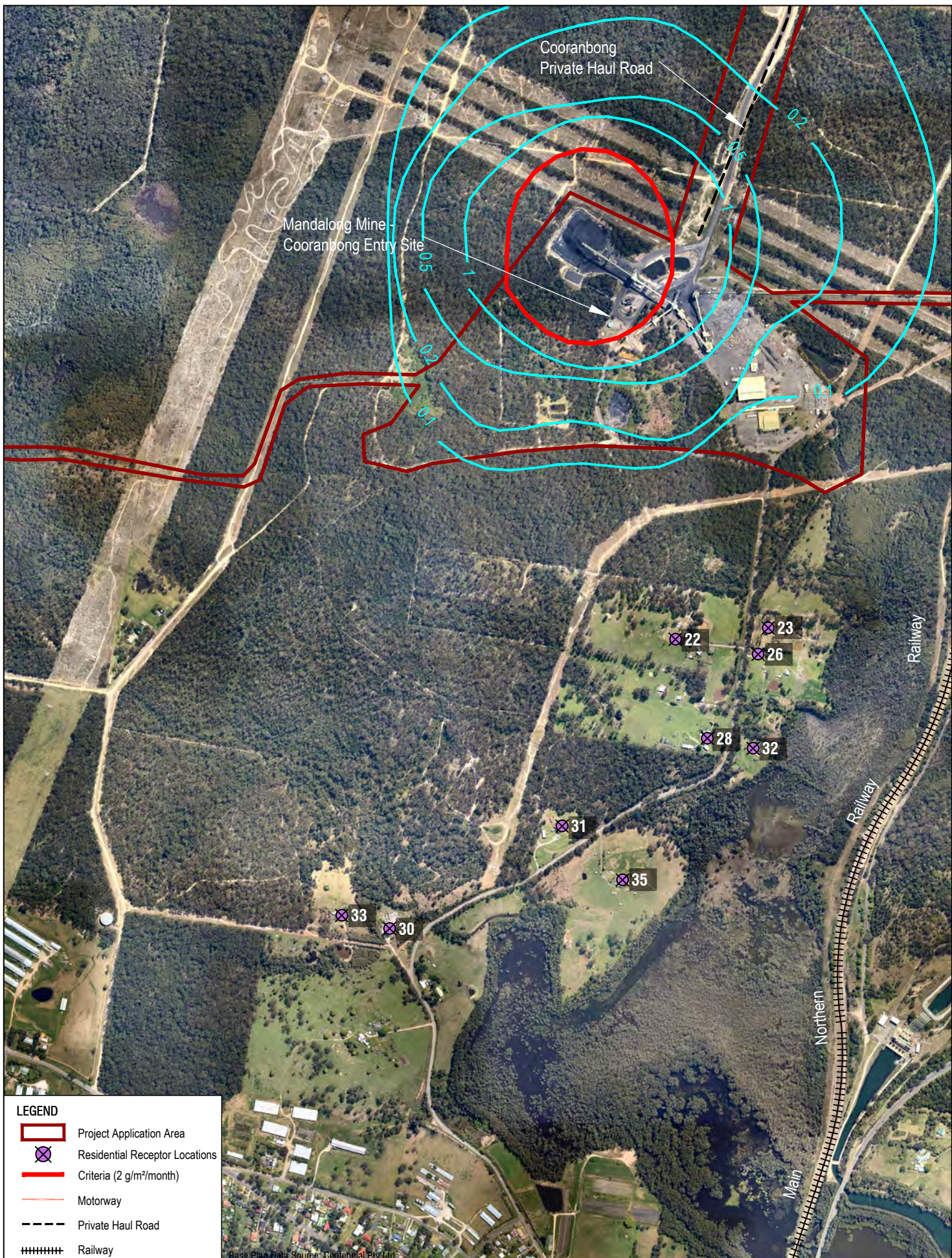
CENTENNIAL COAL LOGISTICS AIR

**TSP Annual $\mu\text{g}/\text{m}^3$
Scenario 5a
Increment Only**

APPENDIX B

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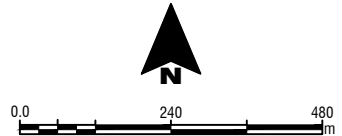
LEGEND

- Project Application Area
- X Residential Receptor Locations
- Criteria (2 g/m²/month)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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Projection:	(GDA94) MGA Zone 56



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CENTENNIAL COAL LOGISTICS AIR

**Dust Deposition Annual g/m²/month
Scenario 5b
Increment Only**

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LEGEND

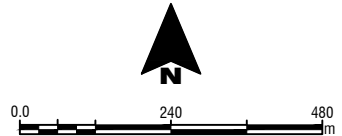
- Project Application Area
- X Residential Receptor Locations
- Criteria (50 µg/m³)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd



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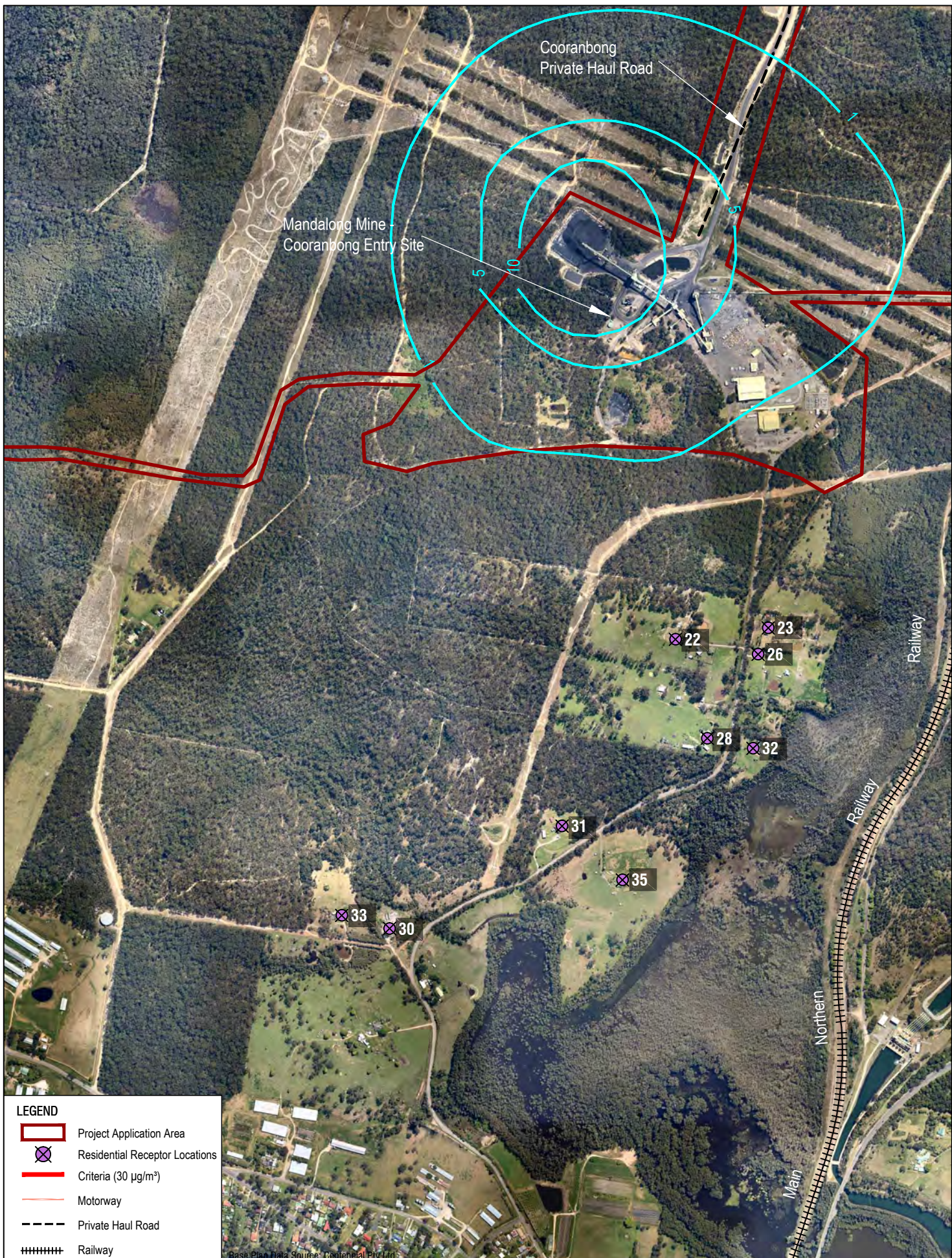
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CENTENNIAL COAL LOGISTICS AIR

PM10 - 24 Hour µg/m³
Scenario 5b
Increment Only
APPENDIX B

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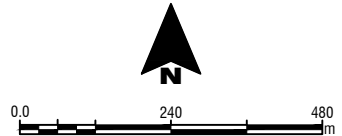
LEGEND

- Project Application Area
- ⊗ Residential Receptor Locations
- Criteria ($30 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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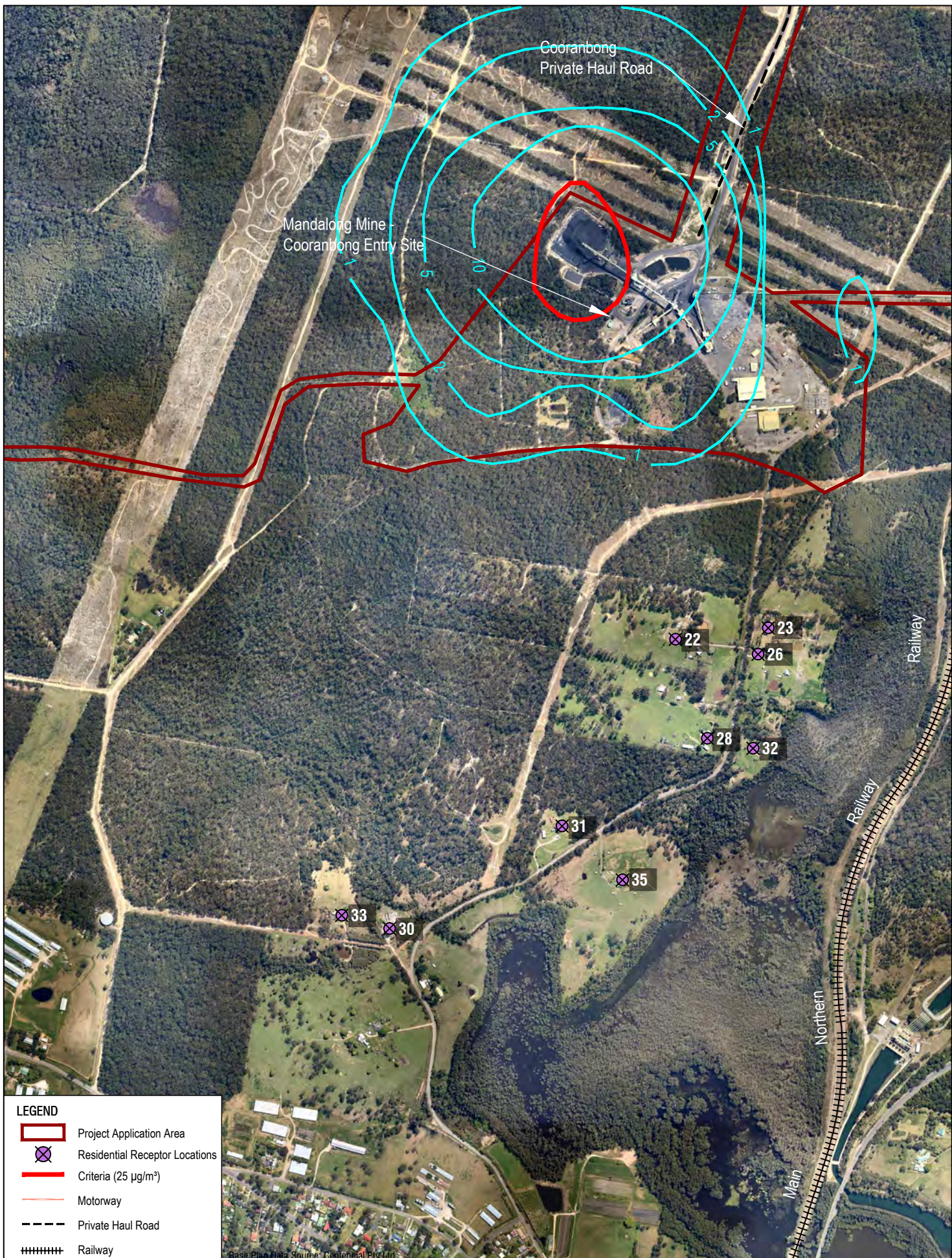
CENTENNIAL COAL LOGISTICS AIR

**PM10 - Annual $\mu\text{g}/\text{m}^3$
Scenario 5b
Increment Only**

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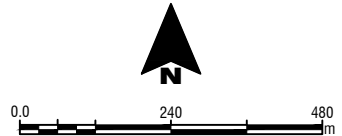
LEGEND

	Project Application Area
	Residential Receptor Locations
	Criteria (25 µg/m³)
	Motorway
	Private Haul Road
	Railway

Base Plan Data Source: Centennial Pty Ltd

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Drawn by:	LH
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Projection:	(GDA94) MGA Zone 56



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CENTENNIAL COAL LOGISTICS AIR

PM2.5 - 24 Hour µg/m³

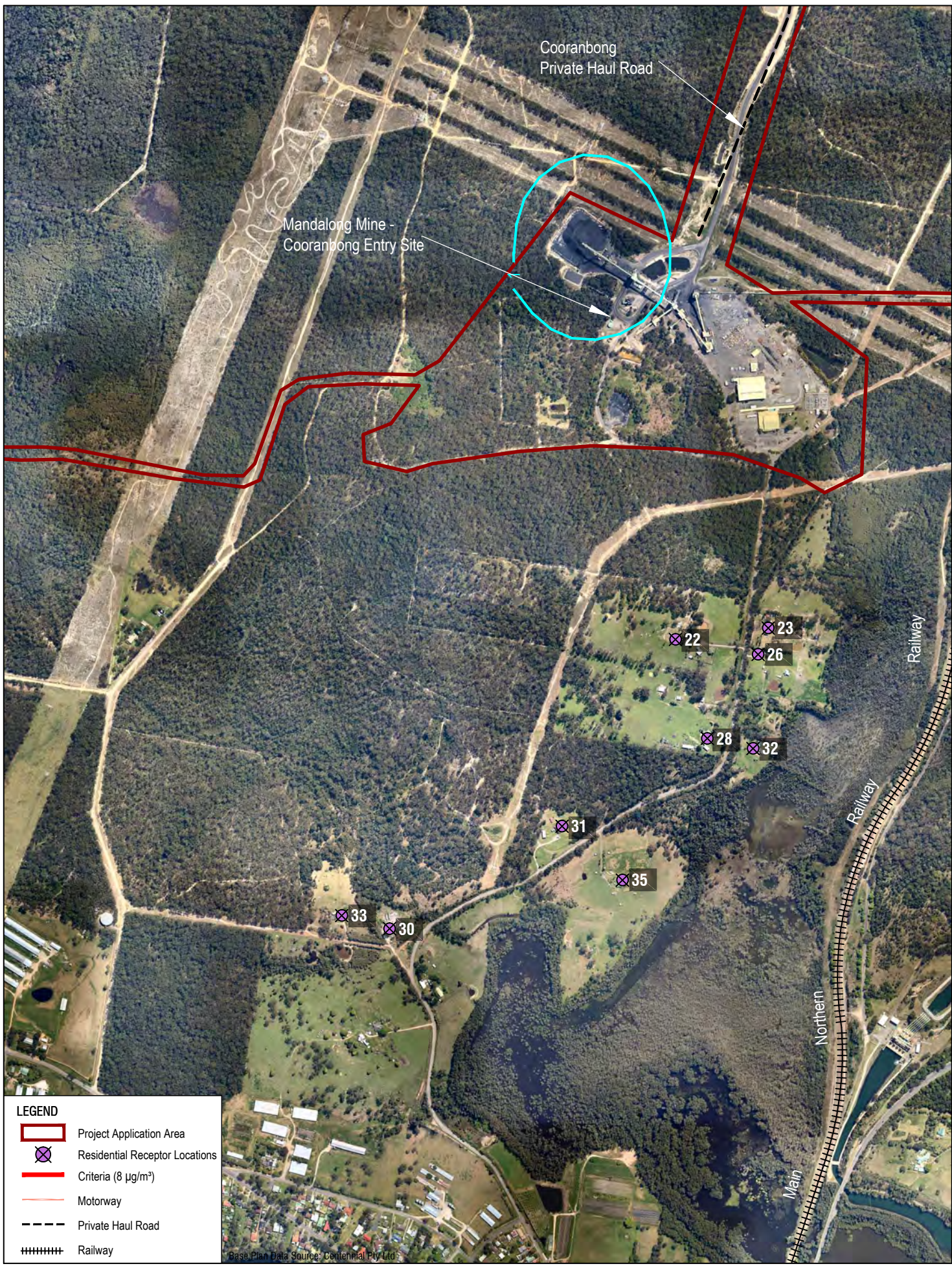
Scenario 5b

Increment Only

APPENDIX B

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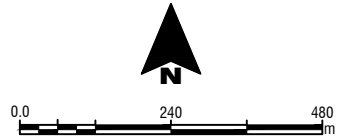
LEGEND

- Project Application Area
- X Residential Receptor Locations
- Criteria ($8 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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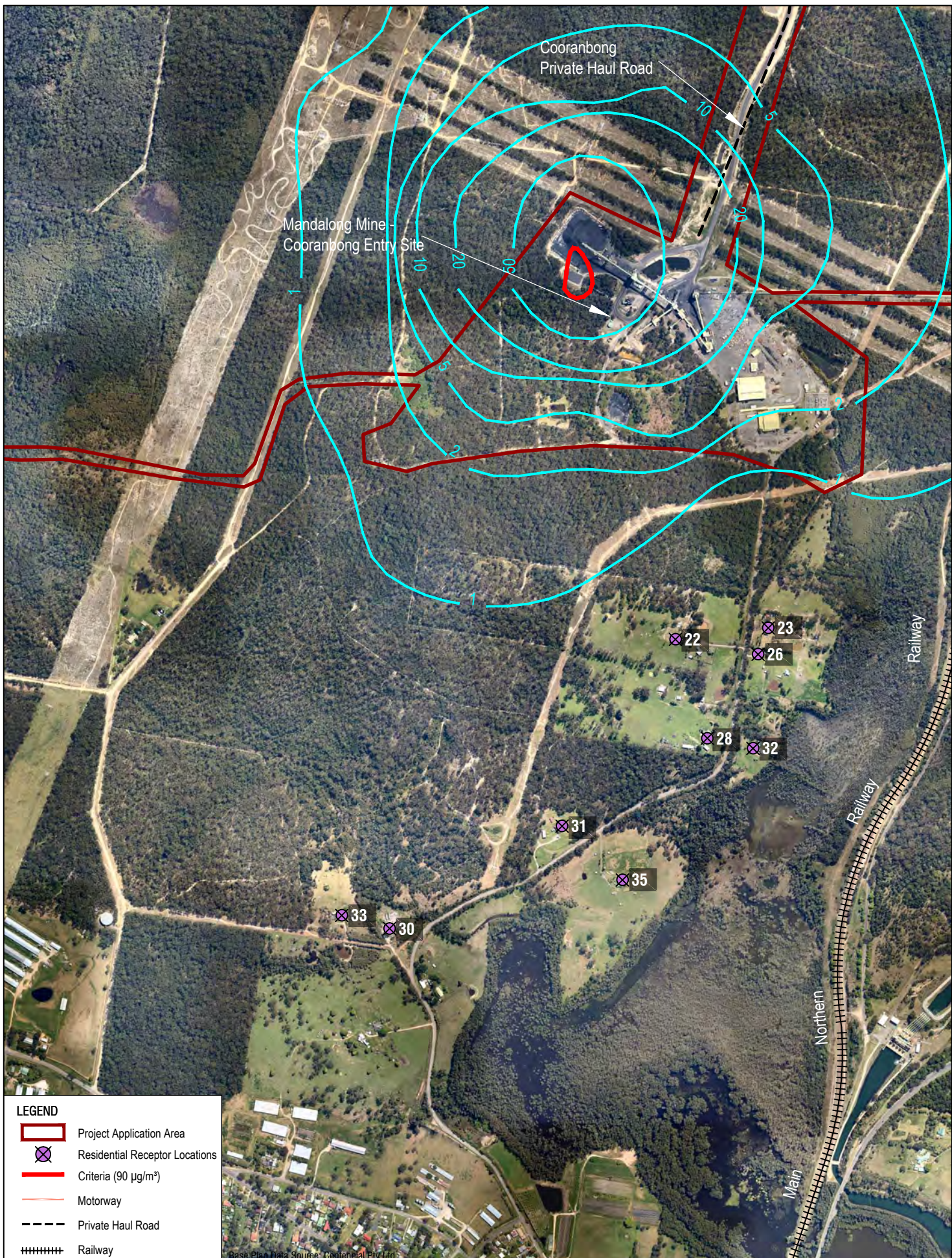
CENTENNIAL COAL LOGISTICS AIR

PM2.5 - Annual $\mu\text{g}/\text{m}^3$
Scenario 5b
Increment Only

APPENDIX B

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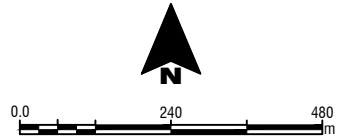
LEGEND

- Project Application Area
- X Residential Receptor Locations
- Criteria ($90 \mu\text{g}/\text{m}^3$)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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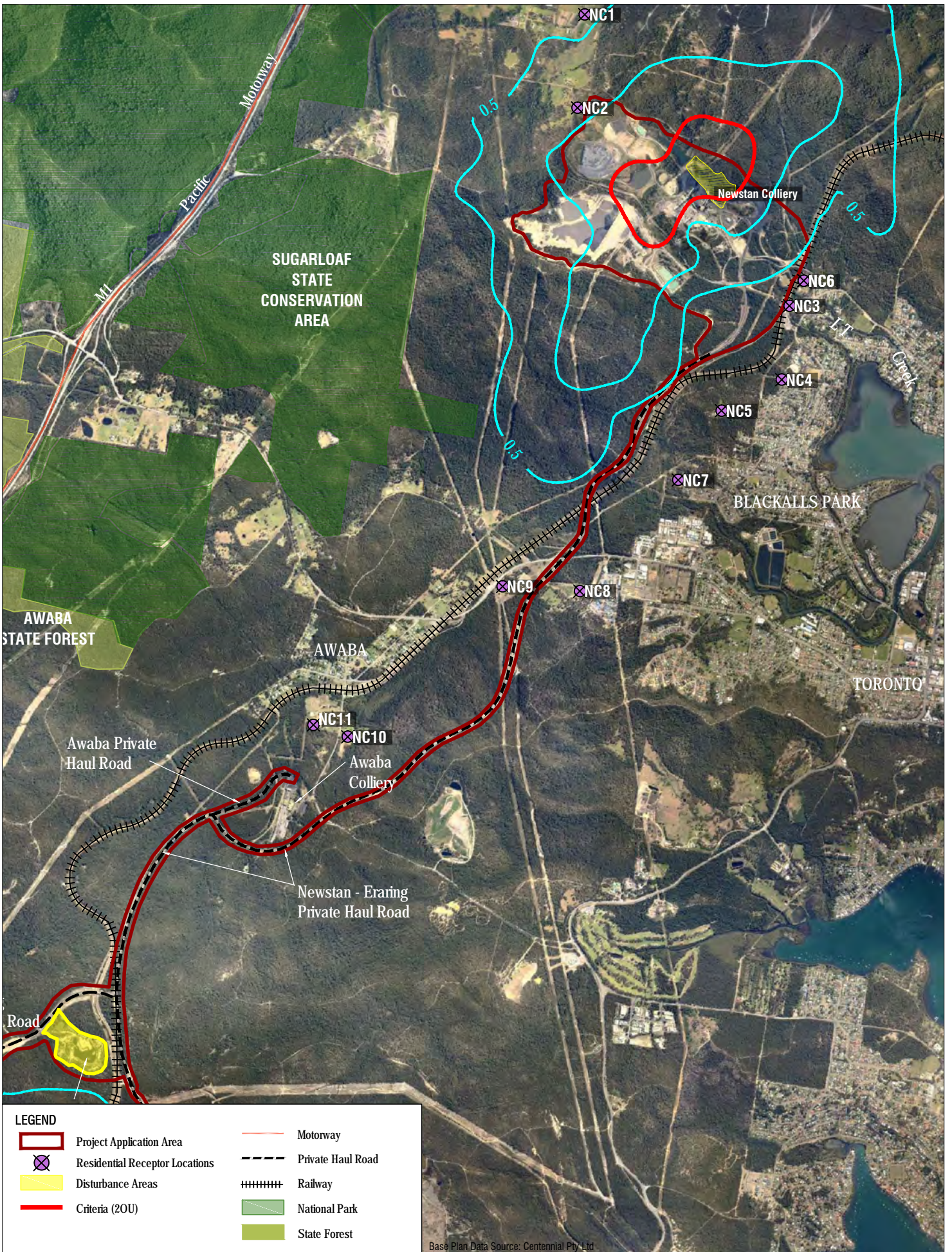
CENTENNIAL COAL LOGISTICS AIR

**TSP Annual $\mu\text{g}/\text{m}^3$
Scenario 5b
Increment Only**

APPENDIX B

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LEGEND	
	Project Application Area
	Residential Receptor Locations
	Disturbance Areas
	Criteria (20U)
	Motorway
	Private Haul Road
	Railway
	National Park
	State Forest

Base Plan Data Source: Centennial Pty Ltd

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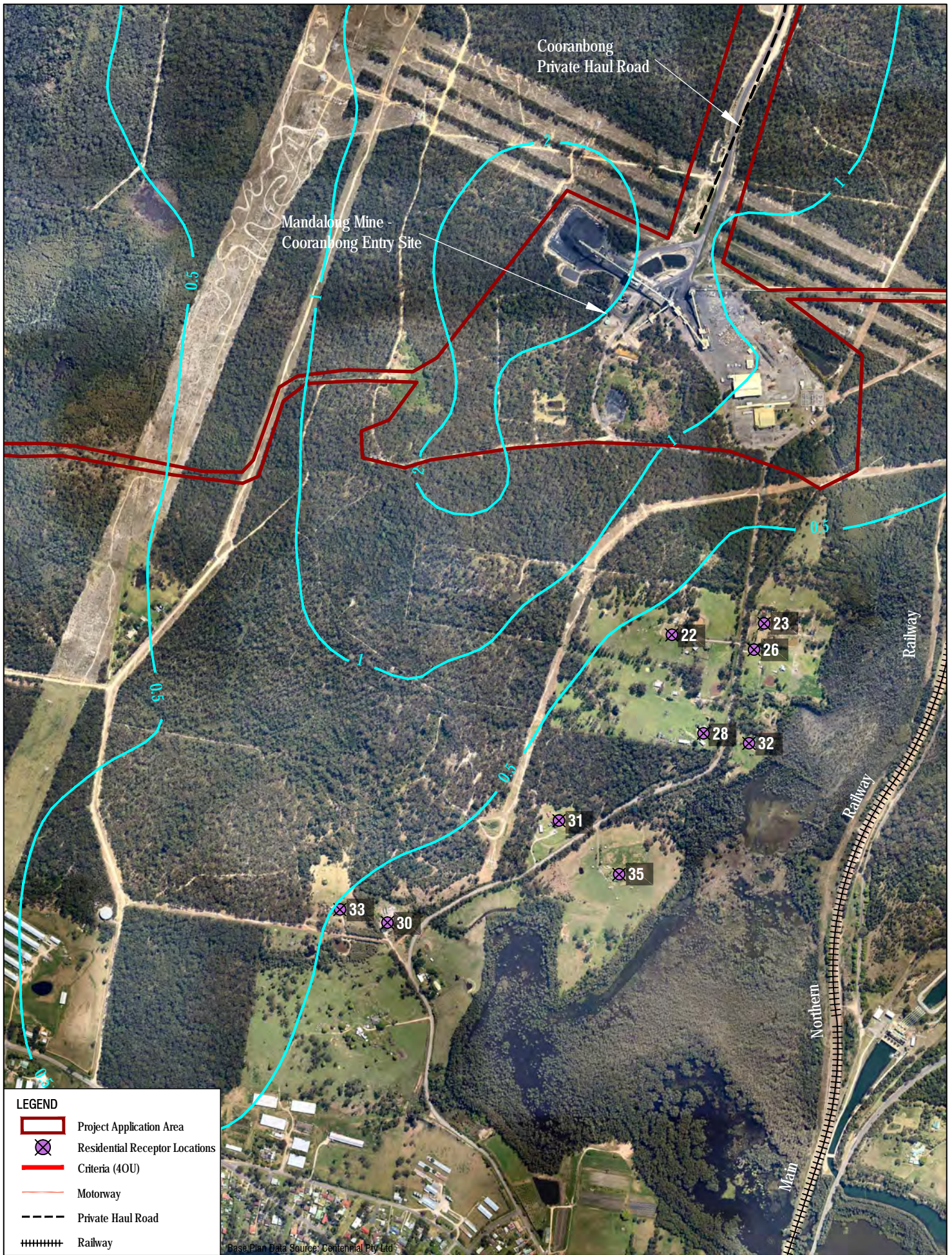
CENTENNIAL COAL LOGISTICS AIR

**Odour (OU)
 Increment Only**

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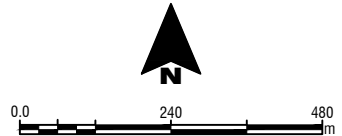
LEGEND

- Project Application Area
- X Residential Receptor Locations
- Criteria (40U)
- Motorway
- Private Haul Road
- Railway

Base Plan Data Source: Centennial Pty Ltd

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CENTENNIAL COAL LOGISTICS AIR

**Odour (OU)
Increment Only**

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