Air Quality 12

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12 AIR QUALITY

12.1 INTRODUCTION

This section provides a summary of the key findings of the EIS air quality and greenhouse gas assessment undertaken for the Eastern Leases Project (the project) by Katestone Environmental Pty Ltd. The detailed results of the assessment are provided in the *Air Quality Report* (Appendix I).

The Environmental Risk Assessment presented in Section 4 identifies all potential project risks in relation to air quality and determines the consequence and likelihood of each risk, and the overall risk rating. Risk ratings are provided for the risk both with and without the application of mitigation measures. The risk assessment has concluded that, with the application of the proposed mitigation measures, all risks associated with air quality are low risk. This section provides further detail on the impacts on air quality that have been identified for the project, as well as the mitigation measures that will be applied.

12.2 PROJECT SETTING AND SENSITIVE RECEPTORS

The project site is characterised by elevated rocky outcrops and gently sloping valleys. Elevations within the project site range from approximately 10 m Australian Height Datum (AHD) to 120 m AHD. The project activities will predominantly take place in the low lying valley areas of the project site. The project site comprises natural bushland, with no existing development or infrastructure within or adjacent to the project site. The existing mine is located approximately 2 km to the west of the Southern Eastern Lease (Southern EL) at the closest point (Figure 12-1).

There are four sensitive receptors identified in proximity to the project site. These are listed in Table 12-1 and shown on Figure 12-1. These receptors are the nearest residences or recreation areas to the project site.

Table 12-1 Sensitive Receptors

RECEPTOR ID	NAME	TYPE	EASTING (GDA94)	NORTHING (GDA94)	NEAREST DISTANCE TO PROJECT SITE
R1	Angurugu	Township	658061	8453390	6.5 km to the north-west of Northern Eastern Lease (Northern EL)
R2	Yedikba	Outstation	657336	8443030	2.2 km to the west of Southern EL
R3	Wurrumenbumanja	Outstation	663633	8436591	3.5 km to the south of Southern EL
R4	Leske Pools Swimming Hole	Recreation Area	665871	8437377	2.4 km to the south of the Southern EL

Coordinates in GDA94 MGA53

The township of Angurugu (receptor R1) is home to approximately 850 residents. It is located in close proximity to the existing mine (Figure 12-1). The closest Angurugu residence to the existing mining operations is located approximately 500 m to the north-east of the concentrate product stockpile.

Yedikba (receptor R2) and Wurrumenbumanja (receptor R3) are Aboriginal outstations, comprising a small number of residential buildings. The outstations are not permanently occupied, and their level of use is understood to vary from occasional visitation to sporadic residency.

The Leske Pools Swimming Hole (receptor R4) is a public recreation area used by Groote Eylandt residents and visitors to the island for swimming, camping and fishing activities. There are no facilities, such as toilets or treated drinking water, at Leske Pools and the area is not permanently occupied.

12.3 AIR QUALITY ASPECTS

Particulate matter (i.e. dust) will be the key air emission generated by activities on the project site. This section explains the various kinds of particulate matter (i.e. PM_{10}, total suspended particulate matter [TSP], and dust deposition) that will be generated.

Particulate matter can be categorised by size and/or by chemical composition. The potential for harmful effects depends on both. The human respiratory system has a built-in defence mechanism that prevents particles larger than approximately 10 μm (ten one-thousandths of one millimetre) from reaching the more sensitive parts of the respiratory system. However, fine particles (aerodynamic diameter less than 10 μm or PM_{10}) have the potential to affect human health as these particles can be trapped in the nose, mouth or throat, or can be drawn into the lungs.

The total mass of particles suspended in the air is referred to as TSP. This includes particles in the PM_{10} size range and larger particles up to approximately 30 to 50 μm in aerodynamic diameter. Particles larger than 30 to 50 μm settle out of the atmosphere quickly and are generally not considered to be a concern for human health. However, these large particles still have the capacity to give rise to nuisance effects, and the potential for this is measured by the dust deposition rate.

Minor emissions of other substances, such as $PM_{2.5}$ (particles with an aerodynamic diameter less than 2.5 μm), volatile organic compounds, trace metals or oxides of nitrogen, carbon or sulphur will be generated by the project, mainly due to exhaust emission from mine vehicles and earth moving equipment. Exhaust emissions can be an issue in areas where there is a dense network of heavily trafficked roads. As discussed in the *Air Quality Report* (Appendix I) the project will not emit these pollutants in sufficient levels to result in any measurable adverse air quality impacts at sensitive receptors.

Manganese occurs naturally in the overburden material, and consequently a fraction of the particulate emissions from the project will contain manganese. The proponent currently undertakes occupational health and safety surveillance and monitoring of the workforce at the existing mine, which includes monitoring manganese levels in the air. This work has not indicated any human health issues associated with manganese in particulate emissions. Further detail is provided in Section 18 – Health and Safety.

12.4 REGULATORY REQUIREMENTS

In the absence of published air quality objectives for the NT, air quality objectives have been obtained from the National Environment Protection Council's *National Environmental Protection (Ambient Air Quality) Measure* (Air NEPM) and the NSW Government's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) (NSW DEC, 2005).

The air quality objectives are reproduced in Table 12-2 and are discussed in detail in the *Air Quality Report* (Appendix I). These objectives are applicable to dust levels at sensitive locations, such as residences.

Table 12-2 Applicable Ambient Air Quality Objectives

PARAMETER	AVERAGING PERIOD	VALUE
PM_{10}	24-hour	50 µg/m³ *(with five exceedances per annum permitted)*
TSP	1-year	90 µg/m³
Dust Deposition (incremental)[1]	1-year	2 g/m^2/month

[1] This is not an absolute objective, but rather the permissible additional dust deposition permitted for a project.

12.5 METEOROLOGY

Wind is an extremely important consideration in air quality studies as dust emissions are transmitted by the prevailing winds. The *Air Quality Report* (Appendix I) provides a detailed description of the site meteorology.

Locations that are downwind of a dust source will experience higher dust concentrations than sites located upwind. Wind speed is a critical factor as exposed dust sources, such as active quarries, will have higher dust emissions during strong winds (considered to be greater than 5 m/s) than during lighter winds. This is due to dust particles being more likely to be lifted and carried further during strong winds.

At the project site, winds occur predominantly from easterly directions, with 60% of winds occurring from the north-east and south-east. Winds greater than 0 and up to 2 m/s were measured at the site 18% of the time and winds between 2 to 5 m/s were measured 45% of the time. Strong winds (> 5 m/s), which an important parameter for the dispersion of dust, occur only 12% of the year. Calm conditions (i.e. no wind) occur for 25% of the year.

12.6 EXISTING AIR QUALITY

Air quality on Groote Eylandt is affected by the following:

- Natural features of the environment such as pollens, grass seeds, windblown dust from unvegetated areas, and salt spray;
- Smoke from fires, including bushfires, cultural burning practices, and domestic burning of rubbish and leaf litter;
- Operations at the existing mine and Milner Bay Port Facility;
- Airport operations near Angurugu;
- Diesel power stations located on the Rowell Highway near the Milner Bay Port Facility and at Umbakumba; and
- Motor vehicles.

The proponent currently operates a monitoring network that measures particulate matter as PM_{10}, wind direction and wind speed. Data from monitoring stations located at Angurugu and Alyangula (shown as A1 and A2 on Figure 12-1) were extrapolated to determine background air quality levels at sensitive receptors. Further detail on background monitoring data, and the way in which the data was extrapolated for individual sensitive receptors, is provided in the *Air Quality Report* (Appendix I).

The extrapolated background concentrations of dust used in this air quality assessment are shown in Table 12-3. Note the assessment has utilised the NSW Approved Methods Incremental Guideline for Dust Deposition, and therefore a background concentration for dust deposition is not required. The existing background air quality is well within the ambient air quality objectives.

Table 12-3 Background Air Quality Levels Used for Assessment (µg/m^3)

RECEPTOR LOCATION	PM_{10} (24-HOUR)	TSP (ANNUAL)
R1 Angurugu	32	64
R2 Yedikba	32	64
R3 Wurrumenbumanja	20	40
R4 Leske Pools Swimming Hole	20	40
Air Quality Objectives	***50 µg/m^3 ****	***90 µg/m^3***

** Five exceedances per annum permitted*

12.7 PREDICTION METHODOLOGY

The *Air Quality Report* (Appendix I) combines detailed information on mining activities, local and regional meteorology and existing air quality to estimate the potential effect of project activities on ambient dust levels. Estimated dust levels are compared with the applicable air quality objectives to confirm whether any potential adverse impacts on health or amenity may occur.

12.7.1 Selection of Representative Project Years

Three project years were selected for the air quality assessment (Project Year 3, Project Year 9 and Project Year 13). These project years represent the worst case years for dust impacts at the four sensitive receptors, both in terms of the proximity of project activities to the receptors and the quantity of material planned to be moved.

12.7.2 Estimation of Emissions

Dust emission rates for activities for each project year were calculated using emission factors published in authoritative sources, including the National Pollutant Inventory (NPI) Handbooks or the United States Environmental Protection Agency (USEPA) AP-42 Emission Estimation Manuals (USEPA, 1998; USEPA, 2006; NPI, 2012). Operating parameters, such as throughputs, location of equipment and utilisation rates, were based on information provided by the proponent.

The air quality assessment included the following key project activities that could contribute to dust generation:

- Activities associated with the active quarries such as stripping topsoil, drilling, blasting, excavating and moving overburden, and extracting and transporting ore;
- Wind erosion of exposed surfaces; and
- Transport of overburden (including rehandling), ore and topsoil.

Dust controls, such as watering of haul roads and progressive rehabilitation practices across the project site, were taken into account in the calculation of dust emission rates for the project.

12.7.3 Dispersion Modelling

Modelling was undertaken using the CALPUFF dispersion model. The CALPUFF model utilises the three-dimensional wind fields from a meteorological model to simulate the dispersion of air pollutants to predict ground-level concentrations across a gridded domain. CALPUFF is well used and accepted throughout Australia. Further detail on the model is provided in the *Air Quality Report* (Appendix I).

12.8 IMPACT ASSESSMENT

12.8.1 PM_{10}

Table 12-4 presents the predicted 6th highest 24-hour average ground-level concentrations of PM_{10} for each project year assessed, for the project in isolation (i.e. without background) and with background levels applied. The 6th highest values are presented because the air quality objective for PM_{10} is for 6th highest values (Table 12-2). The predicted levels of PM_{10} (including background levels) are within the air quality objective of 50 µg/m^3 at all sensitive receptors for all assessed project years. Contours of the predicted 6th highest 24-hour average ground-level concentrations of PM_{10} are presented in Figure 12-2 for Project Year 13 (the project year assessed with the highest PM_{10} concentrations at the most sensitive receptors). Contours for the other years that were assessed are provided in the *Air Quality Report* (Appendix I).

Table 12-4 Predicted Concentrations of PM_{10} (µg/m^3)

RECEPTOR	PROJECT YEAR 3		PROJECT YEAR 9		PROJECT YEAR 13	
	Project in Isolation	Project + Background	Project in Isolation	Project + Background	Project in Isolation	Project + Background
R1 Angurugu	12.3	44.3	6.4	38.4	12.0	44.0
R2 Yedikba	17.3	49.3	17.3	49.3	17.2	49.2
R3 Wurrumenbumanja	3.0	23.0	7.8	27.8	10.1	30.1
R4 Leske Pools Swimming Hole	3.0	23.0	9.4	29.4	15.7	35.7
Air Quality Objective	***50 µg/m^3***					

12.8.2 Total Suspended Particulate Matter

Table 12-5 presents the predicted annual average TSP concentrations for each project year assessed, for the project in isolation (i.e. without background) and with background levels applied. The predicted levels of TSP (including background levels) are within the air quality objective of 90 µg/m^3 at all sensitive receptors for all assessed project years. Contours of the predicted annual average TSP concentrations are presented in Figure 12-3 for Project Year 13.

Table 12-5 Predicted Concentrations of TSP (µg/m^3)

RECEPTOR	PROJECT YEAR 3		PROJECT YEAR 9		PROJECT YEAR 13	
	Project in Isolation	Project + Background	Project in Isolation	Project + Background	Project in Isolation	Project + Background
R1 Angurugu	3.5	67.5	1.6	65.6	3.1	67.1
R2 Yedikba	7.6	71.6	9.7	73.7	9.1	73.1
R3 Wurrumenbumanja	0.4	40.4	2.0	42.0	2.7	42.7
R4 Leske Pools Swimming Hole	0.4	40.4	1.6	41.6	4.7	44.7
Air Quality Objective	***90 µg/m^3***					

12.8.3 Dust Deposition

Table 12-6 presents the predicted annual average dust deposition concentrations for each project year assessed, for the project in isolation (i.e. without background). The predicted levels of dust deposition are within the air quality objective of 2 g/m^2/month at all sensitive receptors for all assessed project years. Contours of the predicted annual average dust deposition concentrations are presented in Figure 12-4 for Project Year 13.

Table 12-6 Predicted Concentrations of Dust Deposition (g/m^2/month)

RECEPTOR	PROJECT YEAR 3	PROJECT YEAR 9	PROJECT YEAR 13
	Project in Isolation	Project in Isolation	Project in Isolation
R1 Angurugu	0.10	0.04	0.09
R2 Yedikba	0.30	0.30	0.30
R3 Wurrumenbumanja	0.01	0.04	0.05
R4 Leske Pools Swimming Hole	0.01	0.04	0.10
Air Quality Objective	***2 g/m^2/month***		

12.8.4 Cumulative Dust Impacts

The existing mine and its associated facilities are the only other mining/industrial development on Groote Eylandt. Dust from the existing mine, along with dust from natural sources, has been captured in the background monitoring data used in the assessment. The EIS air quality assessment therefore includes an assessment of cumulative impacts from the project and the existing mine.

12.9 DUST MITIGATION AND MONITORING

The existing mine operates in accordance with an Air Emissions Management Plan. This plan will be revised to include the construction and operation of the project. A number of controls have been included in the project design to limit dust emissions from the project including:

- Haul roads will be watered to minimise dust emissions;
- Haul roads will be constructed with a compacted base and regularly maintained so as to prevent erosion and the build-up of fine material;
- Trucks will be limited to a maximum speed of 30 km/hr; and
- The area of disturbed land will be minimised as far as practicable, and disturbed areas will be progressively rehabilitated.

Dust will be monitored on an ongoing basis. As a minimum this will include monitoring PM_{10} at Angurugu (R1) and Yedikba (R2). Meteorological data is available from the Bureau of Meteorology weather station located near Angurugu (Figure 12-1).

If monitoring indicates any exceedances of air quality objectives, an investigation will be conducted by the proponent, and additional dust controls will be applied as necessary.

In addition to maintaining the monitoring program described above, the proponent will continue the operation of its complaints handling procedure. Matters relating to dust emissions from the mine are routinely discussed between the proponent and the Anindilyakwa Land Council (ALC).

12.10 GREENHOUSE GASES

12.10.1 Greenhouse Gas Emissions

Greenhouse gases (GHGs) will be produced by the project, predominantly as a result of diesel fuel consumption. An assessment of GHG emissions has been undertaken in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and is detailed in the *Air Quality Report* (Appendix I) for each year of the project. GHG emissions were estimated from data supplied by the proponent and the National Greenhouse Accounts (NGA) Factors workbook (Department of Climate Change and Energy Efficiency, July 2012). Table 12-7 summarises the predicted GHG emissions for the life of the project.

Table 12-7 Summary of Greenhouse Gas Emissions for the Life of the Project

ACTIVITY	TOTAL ENERGY CONSUMPTION (GJ)	TOTAL SCOPE 1 EMISSIONS (KTCO_2-E)
Diesel Consumption (equipment / haul trucks)	5,685,317	397.4
Diesel Consumption (electricity)	2,234,576	155.3
Explosives (ANFO)	-	0.7
Total	**7,919,892**	**553.4**

The proponent currently has NGER reporting obligations associated with the existing mine. GHG emissions and energy use/production associated with the project will be accounted for in ongoing annual NGER reporting associated with the existing mine in accordance with the NGER Act and supporting legislation.

12.10.2 Greenhouse Gas Mitigation Strategies

The following initiatives are proposed to mitigate, reduce, control or manage GHG emissions through energy efficiency:

- Regular assessment, review and evaluation of GHG reduction opportunities;
- Procurement policies that require the selection of energy efficient equipment and vehicles;
- Monitoring and maintenance of equipment in accordance with manufacturer recommendations;
- Optimisation of diesel consumption through logistics analysis and planning; and
- GHG initiatives will be reported through the proponent's Mining Management Plan.

The proponent also conducts regular internal reviews of reported GHG data, and audits of NGER data are conducted by an external party. This data is then used to measure performance against internal policies, objectives and targets. Through this review process, corrective actions are raised and implemented as part of the annual budget planning cycle.

FIGURES

EASTERN LEASES PROJECT

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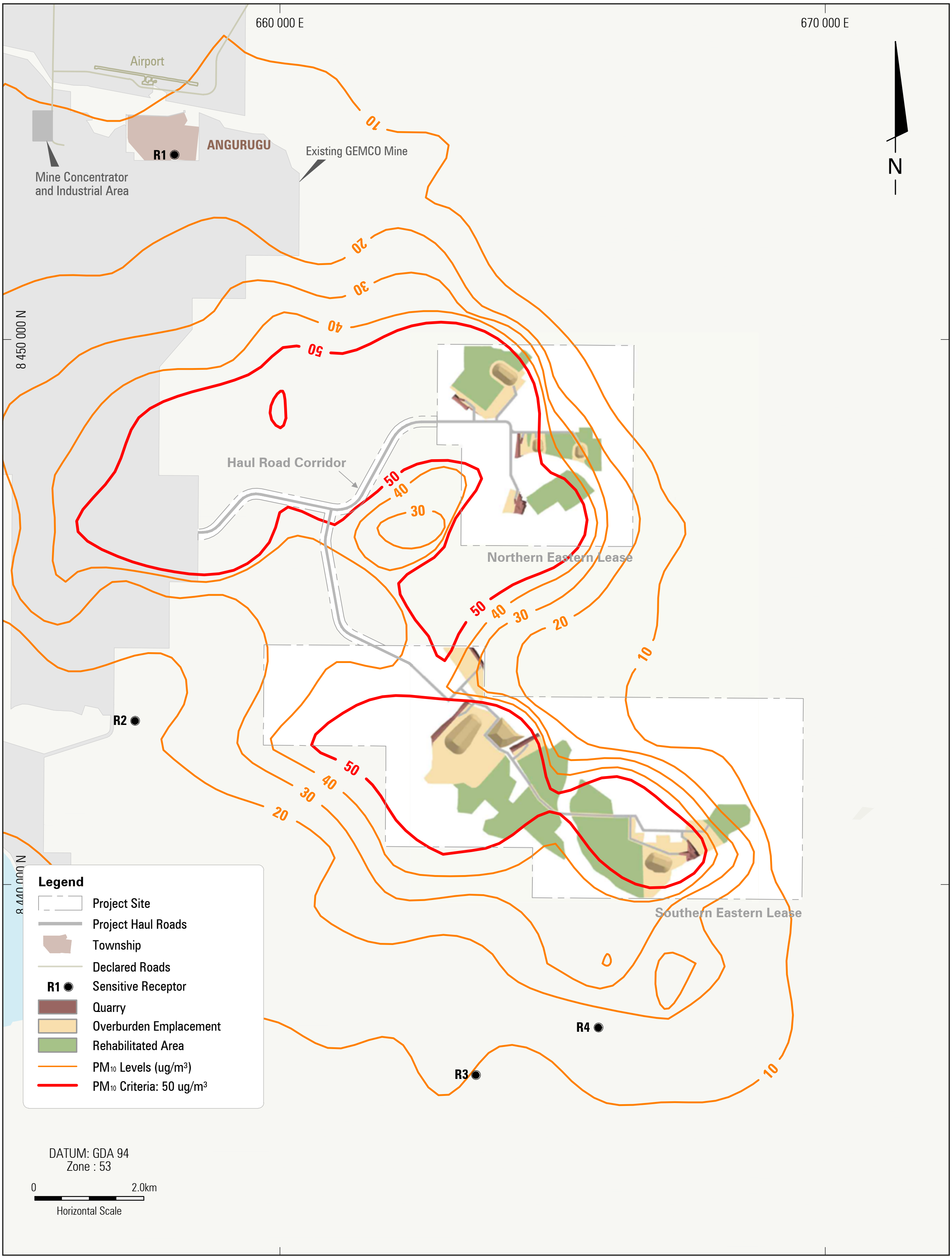
Sensitive Receptors

FIGURE 12-1



EASTERN LEASES PROJECT

Predicted 6th Highest 24-hour Average Ground-level Concentrations of PM_{10} Project Year 13 (Project in Isolation)

FIGURE 12-2

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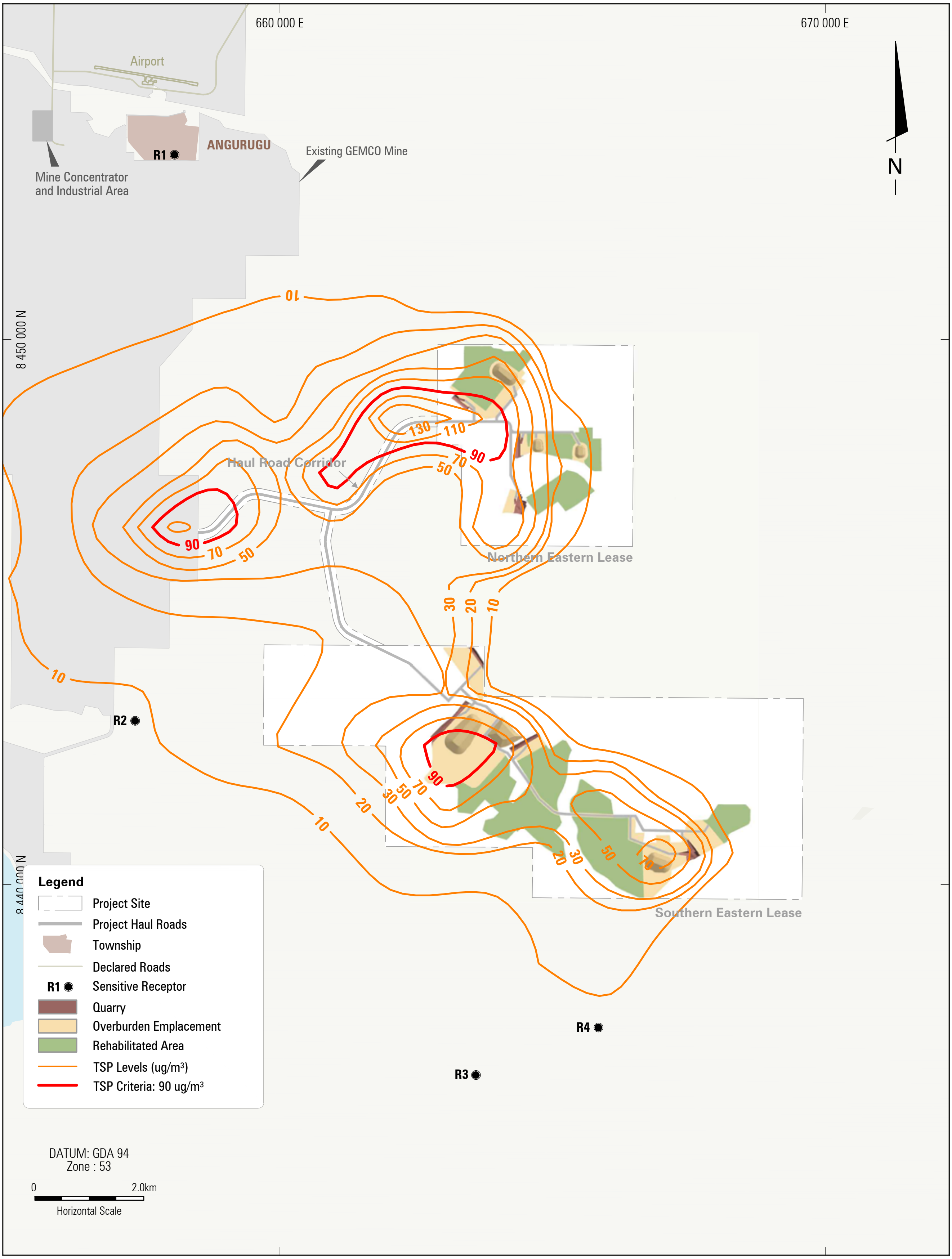

EASTERN LEASES PROJECT

Predicted Annual Average Ground-level Concentrations of TSP Project Year 13 (Project in Isolation)

FIGURE 12-3

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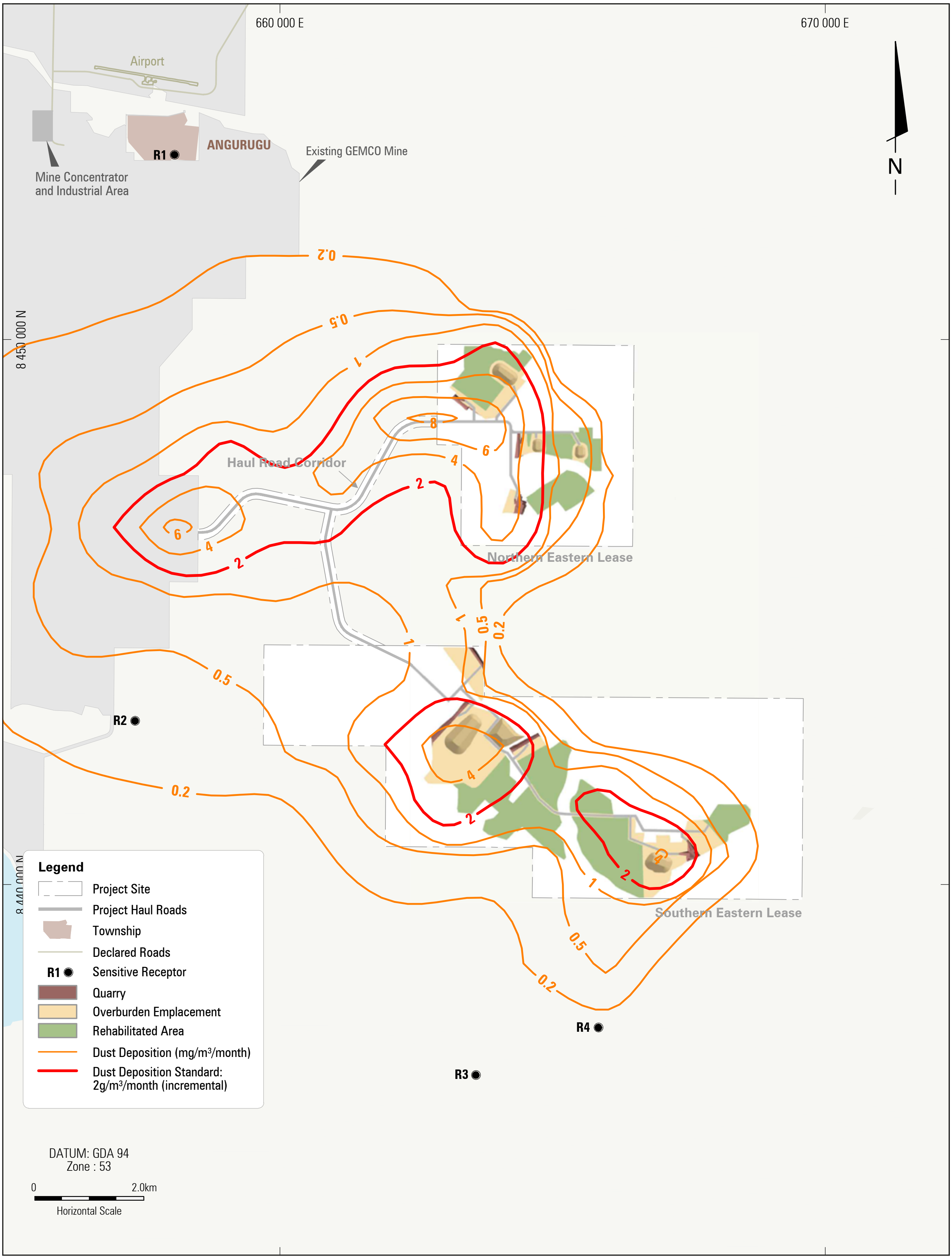

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EASTERN LEASES PROJECT

Predicted Annual Average
Ground-level Concentrations of Dust Deposition
Project Year 13

FIGURE 12-4