

Quarterly Environmental Monitoring Report

Quarter 1 - 2015 (January - March)



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Table of Contents

Executive Summary		i
1.0	Introduction	1
2.0	Monitoring Results – Quarter 1 2015 (January – March)	2
2.1	Air Quality	2
	2.1.1 Total Suspended particulates (TSP) and PM10	4
	2.1.2 Dust Deposition	6
2.2	Noise Management and Monitoring	9
2.3	Lighting, Management and Monitoring	10
2.4	Biodiversity and Land Management Monitoring	11
2.5	Subsidence Management and Monitoring	11

List of Tables

Table 1	Development Consents and Environmental Protection Licences applicable to RUM	1
Table 2	Short and Long Term Monitoring criteria for Air Quality at RUM	2
Table 3	Quarter 1 2015 HVAS TSP and PM10 monitoring results	4
Table 4	Quarter 1 2015 Dust Deposition Monitoring Results	7
Table 5	RUM Noise Impact Assessment Criteria dB(A)	10
Table 6	Obtrusive lighting criteria (AS: 4282-1997)	10

List of Figures

Figure 1	RUM air quality monitoring locations	3
Figure 2	TSP Monitoring results – Office HVAS	4
Figure 3	TSP Monitoring Results – Railway HVAS	5
Figure 4	PM10 Monitoring results – Railway HVAS	5
Figure 5	Insoluble Solids – January 2015	8
Figure 6	Insoluble Solids – February 2015	8
Figure 7	Insoluble Solids – March 2015	9

Executive Summary

Ravensthorpe Underground Mine (RUM) is located approximately 25 km northwest of Singleton in the Hunter Valley Coalfields. RUM undertakes underground coal mining operations.

Schedule 4 Condition 6 of the modified Development Consent DA 104-96, requires RUM to *provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent*. This Quarterly Environmental Monitoring Report (QEMR) has been prepared to satisfy this requirement and provides a summary of environmental performance, based on environmental monitoring results during Quarter 1 (Q1) of 2015 (January – March).

In summary, results for Q1 of 2015 are as follows:

- Air monitoring
 - Annual average TSP results exceeded the annual average assessment criterion at the Office and Railway monitoring locations during Q1 of 2015.
 - The annual average PM₁₀ result exceeded the annual average assessment criterion at the Railway monitoring location during Q1 of 2015.
 - The rolling annual average of the Depositional Dust Gauges exceeded the OEH assessment criterion at all sites during Q1 2015. Elevated insoluble solids results at most locations were observed over Q1 of 2015. This observation was consistent with above long term average TSP and PM10 particulates results over the same period.
- Noise monitoring.
 - Attended noise monitoring was conducted during Q1 2015.

1.0 Introduction

Ravensworth Underground Mine (RUM) is located approximately 25 km northwest of Singleton in the Hunter Valley Coalfields. RUM undertakes underground coal mining operations.

A number of development consents and Environment Protection Licences (EPL) from state and local authorities regulate and drive the environmental monitoring program at RUM and Ravensworth Mining Complex (RMC). These are listed in **Table 1** below.

Table 1 Development Consents and Environmental Protection Licences applicable to RUM

Consent / EPL	Reference	Authority	Expiry
Development Consent – Coal Mining	DA 104-96	Department of Planning and Infrastructure (DP&I)	31/7/2024
Environment Protection Licence – Ravensworth Mining Complex	EPL 2652	Office of Environment and Heritage (OEH)	N/A

Schedule 4 Condition 6 of the modified Development Consent DA 104-96, requires RUM to *provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.*

This Quarterly Environmental Monitoring Report (QEMR) has been prepared to satisfy this requirement and provides a summary of environmental performance, based on environmental monitoring results during Q1 2015.

The QEMR uses parameters and information from specific environmental management plans for the RUM operations, including:

- Surface Dust Management Procedure;
- Noise Management Plan;
- Lighting Management Plan;
- Biodiversity and Land Management Plan; and
- Subsidence Management Plan.

Monitoring for other environmental aspects, including cultural heritage and water management, will be reported on in future QEMRs, and in the Annual Environmental Monitoring Report (AEMR).

2.0 Monitoring Results – Quarter 1 2015 (January – March)

2.1 Air Quality

The Ravensworth Mining Complex EPL (2652) requires dust deposition monitoring at four locations around the site (D1 to D4), as well as two monitoring points for Total Suspended Particulates (TSP) conducted by two High Volume Air Samplers (HVAS), referred to as the Railway HVAS and Office HVAS.

Dust deposition monitoring is also carried out at two additional locations (D5 and D6)¹, as well as the monitoring of particulate matter less than 10 µm (PM10) at one location (Railway PM10).

The RUM air quality monitoring network comprises:

- Five dust deposition gauges (DDG) monitoring relatively coarse (>50µm) dust particles (insoluble solids; ash residue), that generally settle out from the air over the period of one month, and are measured in grams per square metre per month (g/m²month). Note that one dust gauge (D05) was removed in February 2012 due to construction of the Ravensworth North Project;
- Two high volume air samplers (HVAS) monitoring Total Suspended Particulate matter (TSP) measured in micrograms per cubic metre (µg/m³); and
- One HVAS monitoring 24-hour average concentrations of particulate matter with diameters of less than 10 µm (PM10) measured in micrograms per cubic metre (µg/m³).

The locations of RUM air quality monitoring points are marked on **Figure 1**. These occur on mine owned lands, and are monitored in accordance with AS 3580 and *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC, 2007). It is important to note that the air quality monitoring network is located on the RUM site and is isolated from privately owned residences. The results of air quality monitoring are not necessarily reflective of offsite impacts and do not necessarily represent dust generated at RUM only.

The Ravensworth Mining Complex EPL and DA 104/96 list air quality guidelines at non-mine owned residences. The criteria are detailed in **Table 2**.

Table 2 Short and Long Term Monitoring criteria for Air Quality at RUM

Pollutant	Standard	Average Period	Agency
TSP	90 µg/m ³	Annual Average	National Health and Medical Research Council (NHMRC)
PM10	50 µg/m ³	24 hour maximum Total	Office of Environment and Heritage (OEH)
	30 µg/m ³	Annual Average	OEH
	50 µg/m ³	24 hour averages, 5 exceedences permitted a year	National Environment Protection Council (NEPC)
Dust Deposition	4g/m ² .month	Annual average	OEH

¹ Dust monitor D5 was removed in early 2012.

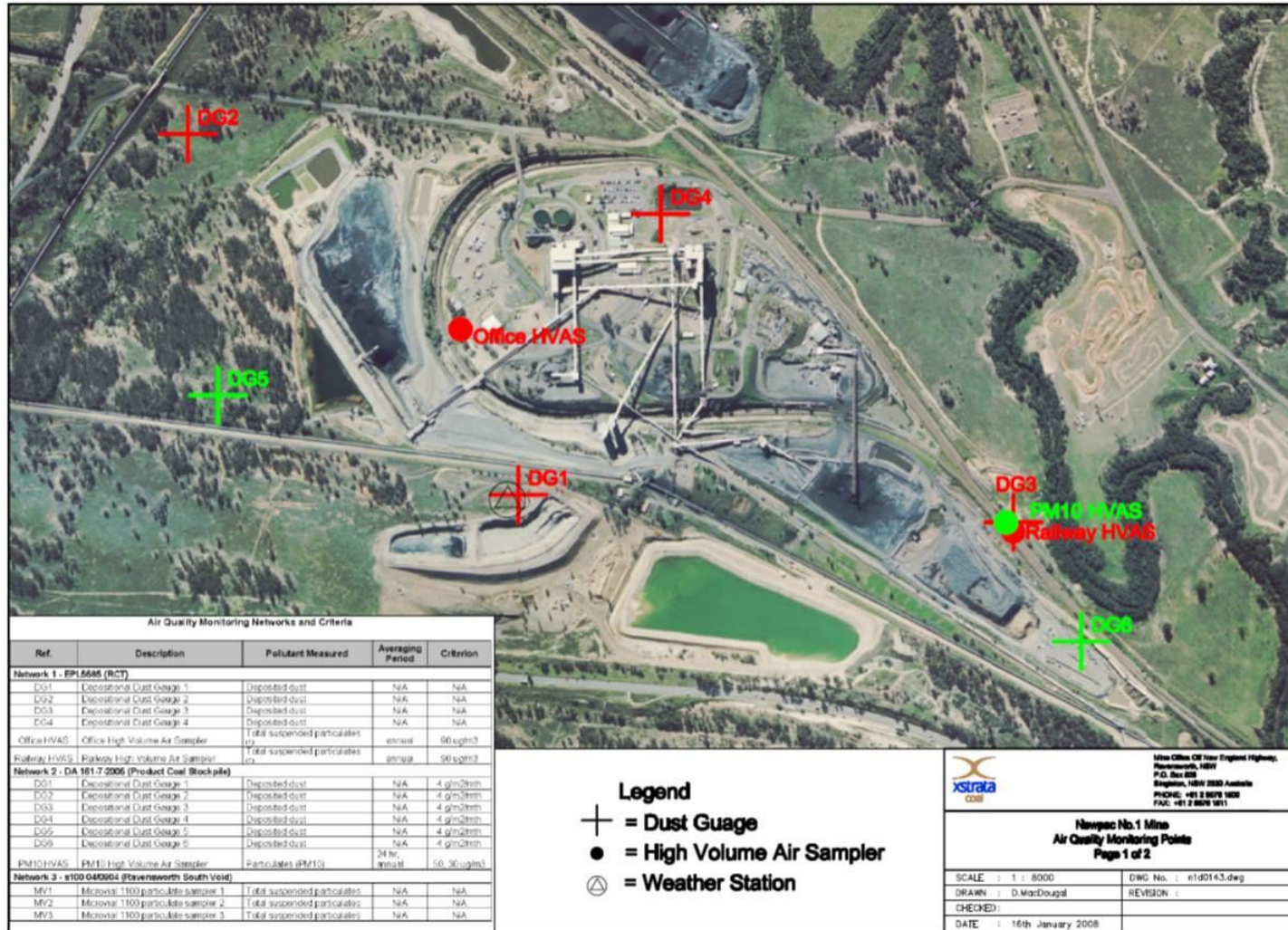


Figure 1 RUM air quality monitoring locations

2.1.1 Total Suspended particulates (TSP) and PM10

Monitoring results for TSP at the Office HVAS, Railway TSP and PM10 at the Railway HVAS are summarised in **Table 3** and shown in **Figure 2** through to **Figure 4**.

Table 3 Quarter 1 2015 HVAS TSP and PM10 monitoring results

Site	Q1 readings required (µg/m3)	Q1 readings captured (µg/m3)	Q1 maximum (µg/m3)	Q1 minimum (µg/m3)	Q1 average (µg/m3)	Annual averages	
						2013 (µg/m3)	2014 (µg/m3)
Office HVAS (TSP)	15	15	190	40.3	110	152	146
Railway HVAS (TSP)	15	15	140	22.3	80.4	123	121
Railway HVAS (PM10)	15	14	55	8.9	28.1	42.4	40.8

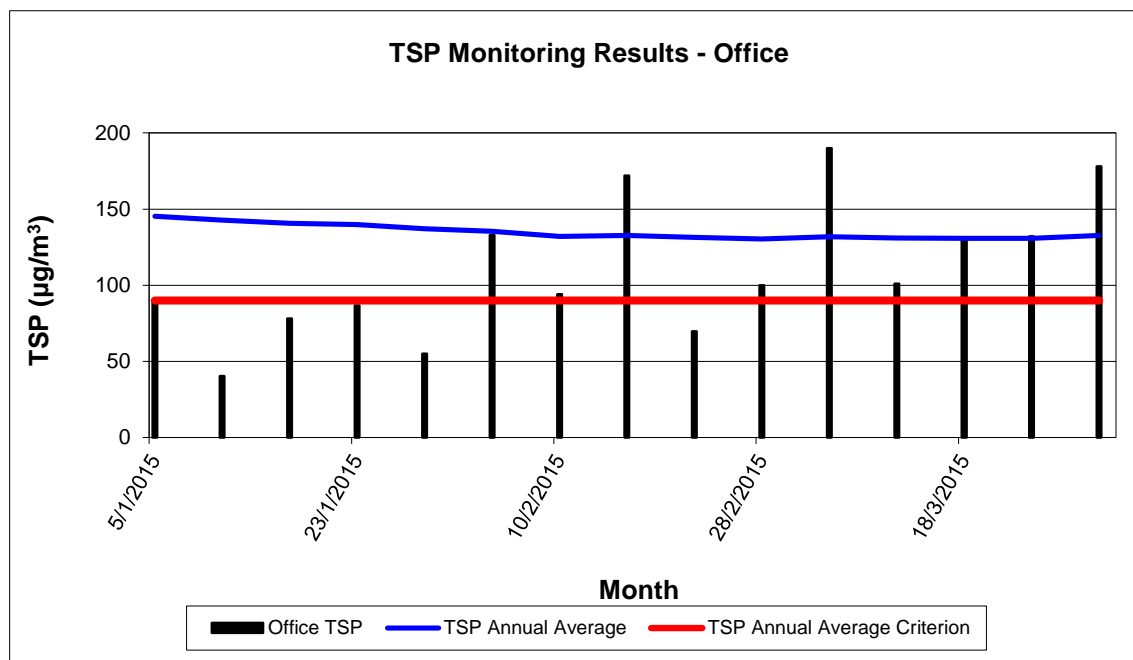


Figure 2 TSP Monitoring results – Office HVAS

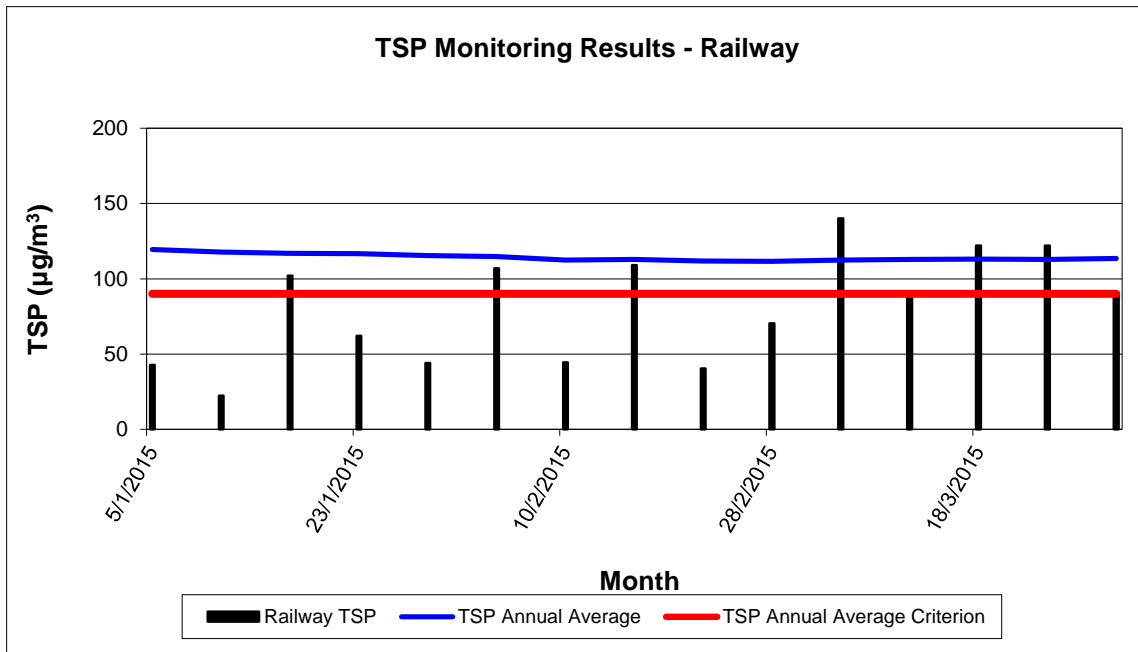


Figure 3 TSP Monitoring Results – Railway HVAS

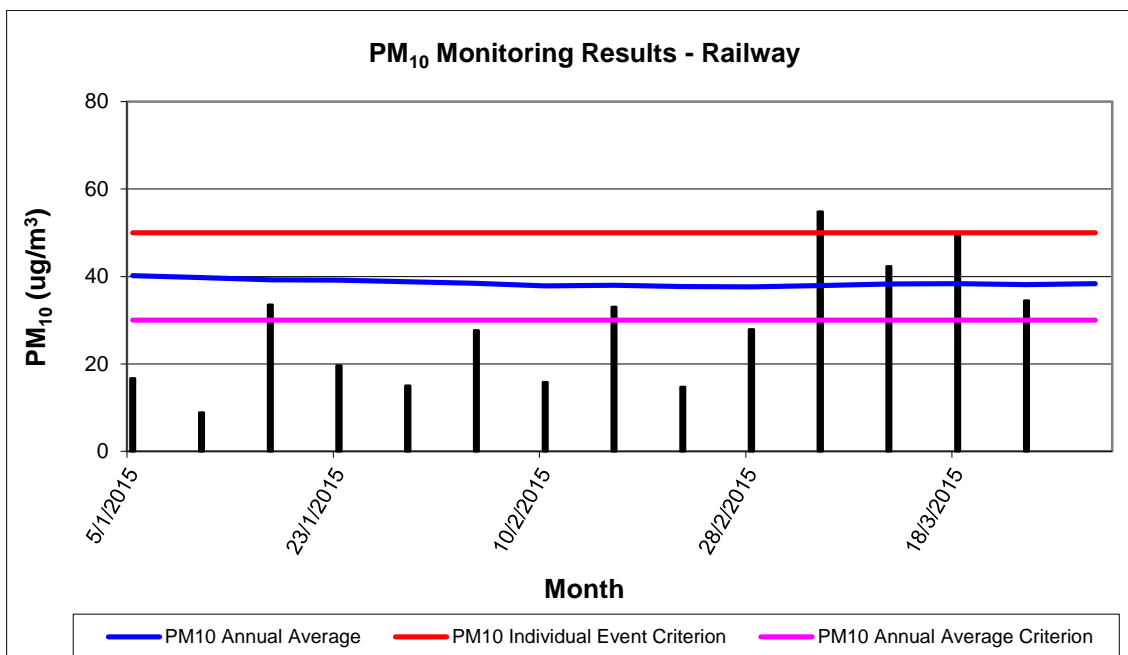


Figure 4 PM10 Monitoring results – Railway HVAS

The TSP at the Office site fluctuated this quarter with nine of the results recording above the NHMRC TSP annual average criterion (Figure 2). The elevated readings at the Office site may have been influenced by the nearby coal stockpile and the associated activity in the area. The average TSP reading for the reporting period was lower than both the 2013 and 2014 annual averages and the rolling annual average remained at a relatively constant level over the quarter.

TSP results recorded at the Railway site fluctuated over the period, with seven of the results recording above the NHMRC TSP annual average criterion (**Figure 3**). The average TSP reading for the reporting period was lower than both the 2013 and 2014 annual averages and the rolling annual average remained at a relatively constant level over the quarter.

PM10 results from the Railway site exhibited a fluctuating trend with six of the results exceeding the annual average assessment criterion and one result exceeding the 24 hour average assessment criterion (**Figure 4**). The average PM10 result for Q1 was lower than both the 2013 and 2014 annual average PM10 results and the rolling annual average remained at a relatively constant level over the quarter.

All HVAS are located within the RUM and RCCP surface working areas. The results do not reflect offsite impacts.

2.1.2 Dust Deposition

Monitoring results for the five DDG are summarised in **Table 4** and shown in **Figure 5**, **Figure 6** and **Figure 7**.

Table 4 Quarter 1 2015 Dust Deposition Monitoring Results

Site	January 2015				February 2015				March 2015			
	Insoluble solids (g/m ² .month)	Ash residue (g/m ² .month)	Insoluble Solids YTD average (g/m ² .month)	Annual Rolling Average (g/m ² .month)	Insoluble solids (g/m ² .month)	Ash residue (g/m ² .month)	Insoluble Solids YTD average (g/m ² .month)	Annual Rolling Average (g/m ² .month)	Insoluble solids (g/m ² .month)	Ash residue (g/m ² .month)	Insoluble Solids YTD average (g/m ² .month)	Annual Rolling Average (g/m ² .month)
D1	1.9	1.2	1.9	4.7	3.3	2.3	2.6	4.5	3.8	2.7	3.0	4.5
D2	4.7	2.7	4.7	6.6	7.8	3.4	6.3	6.3	10.7	5.4	7.7	6.7
D3	2.7	1.8	2.7	6.4	4.1	2.5	3.4	6.1	8.9	6.1	5.2	6.5
D4	4.7	3.1	4.7	9.1	587.4c	283.9c	4.7	8.8	4.2	2.5	4.5	8.5
D6	5.3	1.7	5.3	6.3	2.1	1.5	3.7	6.0	6.2	4.6	4.5	6.2

'C' indicates contaminated gauge

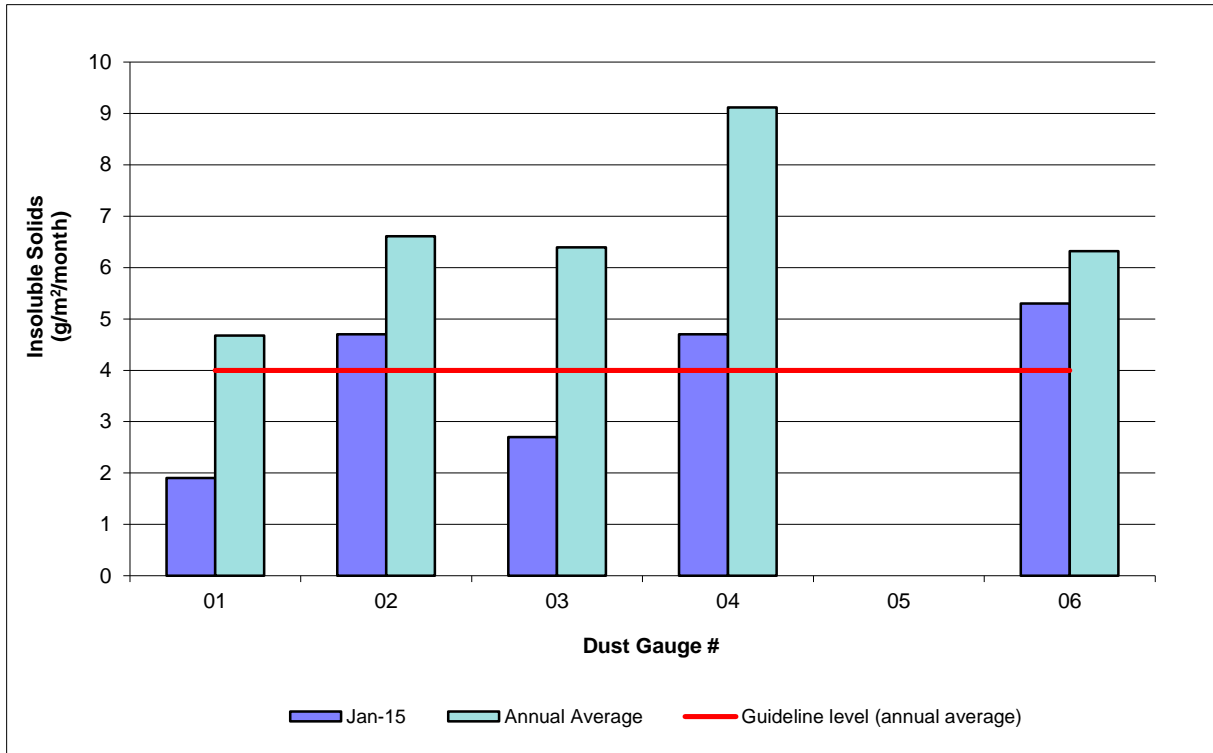


Figure 5 Insoluble Solids – January 2015

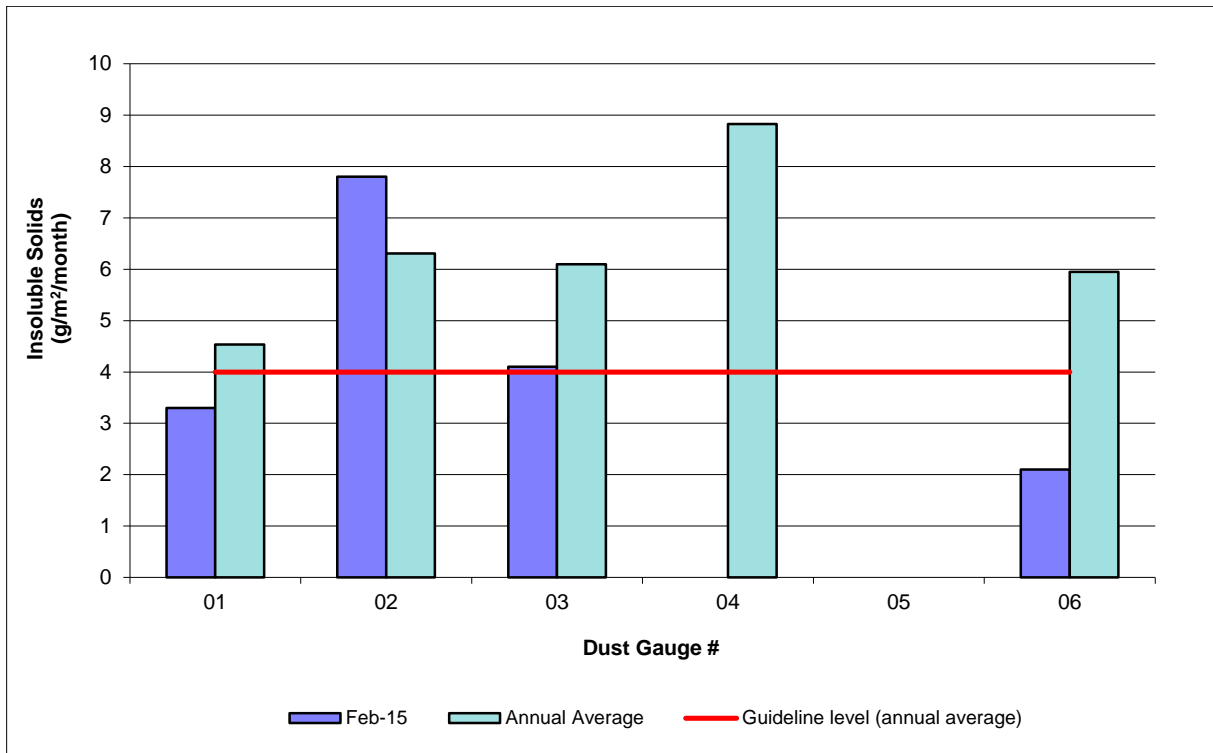


Figure 6 Insoluble Solids – February 2015

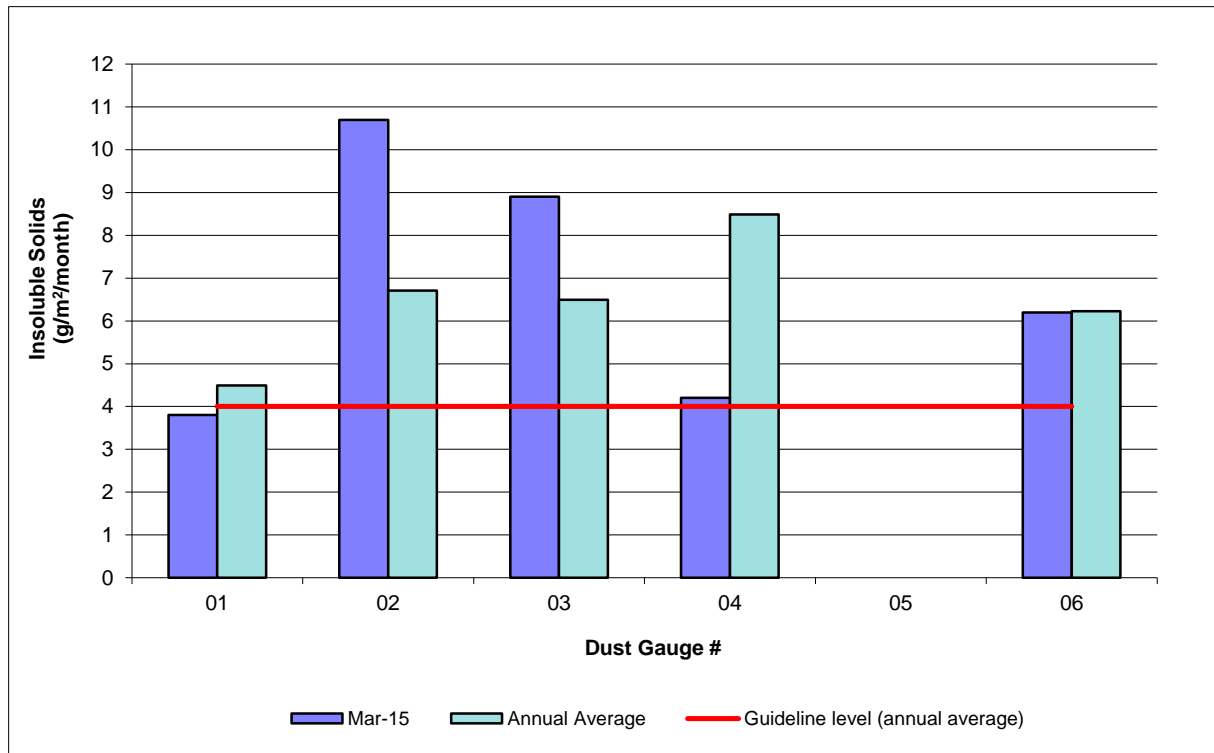


Figure 7 Insoluble Solids – March 2015

During January, February and March (Q1) the rolling annual average results exceeded the OEH assessment criterion of 4g/m²/month at all sites for Q1 (**Table 2**).

There was no apparent trend observed with insoluble solids results at all locations over the period. This observation was consistent with the variable trend observed in TSP and PM₁₀ particulates results over the same period. Ash residue to insoluble solids ratios exceeded 50% at all sites except for D06 in January 2015 (32%) and D02 in February 2015 (44%) over the period indicating that gauge contents were mainly inorganic. All depositional dust gauges are located within the RUM and RCCP surface areas, adjacent to coal stockpiles, surface hardstands and surface roads. The results do not reflect offsite impacts.

2.2 Noise Management and Monitoring

Due to underground mining methods utilised at RUM, the majority of noise is generated by the processing and transportation of coal at the pit top. Operating plant and equipment include the conveyors, stackers, bulldozers, and rail loading infrastructure. Activities that are potential noise sources at RUM include coarse reject haulage, light vehicle movement, coal stockpiling, train loading, mine ventilation, coal handling at the preparation plant, and workshop activities. Results from the nearest monitoring location (nearest residence) are also influenced by other mines in the vicinity of RUM.

Development consent and EPL conditions require specific noise limits to be adhered to, as summarised in **Table 5**.

Table 5 RUM Noise Impact Assessment Criteria dB(A)

Consent / EPL	Noise Source	Receiver Location	Day LA _{eq} (15min)	Evening LA _{eq} (15min)	Night LA _{eq} (15min)	Night LA _(max)
DA 104-96	No.3 Ventilation Shaft Site	All privately-owned land	38	38	36	-
EPL 2652	-	Any privately owned residence not having a written agreement with the Licensee	38	38	36	46

During noise monitoring, RUM records the location, a tabulation of noise results (consisting of LA_{eq}, LA_{max}, LA₁₀, and LA₉₀ noise levels), notes on the principal noise sources/operations, and if required, a summary of measurements that have exceeded criteria levels, including a description of plant or operations that caused the exceedence.

Please note that night time noise monitoring results were not available at the time of reporting. These results will appear in quarterly report 2, 2015.

2.3 Lighting, Management and Monitoring

RUM has two key sources of outdoor lighting that have the potential to cause adverse light impacts at the site boundary, in particular road users of the New England Highway (NEH). The two sources of outdoor lighting are those provided for the ROM stockpile and the product coal stockpile. The ROM stockpile is located on the south western side of the mine site and the Product Coal stockpile is located on the south eastern side of the mine site. This lighting is required to provide for the safe operation of mobile plant and personnel at the two coal stockpiles. Two additional minor sources of light are vehicular and mobile plant headlights, and the automatic light sensor in use at Ventilation Shaft 3 surface facilities.

To comply with DA 104-96, RUM has implemented various controls across the site, including:

- External fixed lights have been fitted so that they do not shine above the horizontal;
- Light shields to direct light on fixed lights that have been installed;
- Communication (via Tool Box Talks) of the potential impacts of lighting to operators of mobile plant; and
- Installation of vegetative visual screens where practical (eg. Along the New England Highway boundary at the Ventilation Fan #3 surface facilities).

Compliance monitoring of lighting is not required under the RUM EPL, however RUM adheres to the lighting criteria described in AS 4282-1997 Control of the obtrusive effects of outdoor lighting (**Table 6**).

Table 6 Obtrusive lighting criteria (AS: 4282-1997)

Time Period	Commercial/residential areas	Residential – Light Surrounds	Residential – Dark Surrounds
Pre-curfew (6am-11pm)	25 lux	10 lux	10 lux
Post curfew (11pm – 6am)	4 lux	2 lux	1 lux

The applicable criteria for RUM is 'Residential – Dark Surrounds', as there is no road lighting on the stretch of the New England highway that runs adjacent to the Mine.

There was no lighting monitoring conducted in Q1 2015. The most recent lighting inspection for RUM was carried out in Quarter 3 2011 (July- September 2011). The findings in Quarter 3 2011 indicated that there were no

complaints or breaches, and that RUM complied with Australian Standards, *AS 4282-1997 Control of the obtrusive effects of outdoor lighting*.

2.4 Biodiversity and Land Management Monitoring

The RUM *Biodiversity Rehabilitation and Land Management Plan* (RUM SD PLN 0013) outlines mechanisms for protection of threatened flora and fauna, management of the compensatory habitat area established under DA 161-7-2005 and the prevention of the introduction and management of weeds across the mine site.

RUM and RCT lands are primarily located on previously mined disturbed areas. No threatened flora species were recorded during field surveys for the 1996 or 2005 EIS. The pit top areas are almost entirely cleared, with open pasture on gentle slopes and no significant remnant vegetation. With no significant remnant vegetation of shrub layers present, the botanical and ecological value of this area is considered low.

Two vegetation communities exist on the non-operational area of the RUM mining lease area: the Central Hunter Box – Ironbark Woodland, and various planted areas.

RUM has previously (1996 and 2005) undertaken flora and fauna surveys to monitor the distribution and abundance of native flora and fauna, and to monitor changes in flora and fauna populations. Two broad fauna habitat types, Woodland and Grassland, are recognised at RUM. The Woodland habitat is dominated by relatively young narrow-leaved ironbark (*Eucalyptus crebra*) and grey box (*E. moluccana*), and provides good quality habitat for woodland bird species. The small area of Grassland is dominated by native grass species, and provides a foraging habitat for macropods, reptiles, small mammals and birds of prey.

During 2011 clearing of the Compensatory Habitat Area commenced. This area was developed as a requirement of Development Consent DA 161-7-2005, however has since been removed due to the expansion of Ravensworth Surface Operations. The Ravensworth Surface Operations Offset Package has compensated for this clearing and as of 2012 the area where the Compensatory Habitat area was previously situated will be managed by RSO.

No biodiversity or land monitoring was undertaken by RUM in Q1 2015. However, annual inspections of rehabilitated areas are undertaken at RUM to assess:

- soil conditions;
- erosion, drainage and sediment control structure;
- runoff water quality;
- revegetation germination rates;
- plant health; and
- weed infestation.

Details of these inspections will be recorded on *XCN HSEC FRM 5.13.2 – Annual Rehabilitation Inspection Form*. Monitoring results based on the above will appear in future QEMRs wherever appropriate.

2.5 Subsidence Management and Monitoring

RUM is currently using longwall extraction methods. Throughout Q1 2015, RUM were working the Pikes Gully Seam.

The majority of land within the RUM mining lease is rehabilitated spoil with some final voids left for use as water storage, disposal of tailings and fly ash. There are few natural surface features, with the visual character of the Ravensworth area dominated by mining features. The structures within the application area include power lines, above ground water and tailing pipelines and equipment associated with this, and stockpiles conveyor equipment.

The RUM Subsidence Management Plan (SMP) incorporates monitoring activities that use pre-mining surveys on RUM infrastructure within the subsidence zone as base data against which subsidence effects can be assessed. These surveys take into account conveyors, power lines and fly ash lines. Subsidence is marked with 1.8m star pickets, driven a minimum of 1.2m into the ground, with marks generally spaced at 10m intervals.

Periodic surveys are carried out at the same time longwall mining passes under the area of influence. Subsidence is deemed to have stopped when less than 20mm movement is measured between two consecutive surveys.

Visual inspections are carried out over the active mining area (commensurate with mining rate, location of the subsidence profile, and previously observed subsidence effects) by RUM personnel. Any evidence of surface

movement or subsidence damage detected in surveys or visual inspections is recorded and communicated to affected parties as soon as practicable.

Subsidence monitoring was undertaken by RUM surveyors in Q1 2015. For more information please refer to our Quarterly Subsidence Management Status Report (prepared in accordance with RUM PG LW 8-9 SMP approval) for results.