Appendix A

Air Quality and Greenhouse Gas Impact Assessment

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

23 September 2013

Dorian Walsh
Hansen Bailey

Sent via email: mwalker@hansenbailey.com.au

RE: BOGGABRI COAL MINE PROJECT APPROVAL MODIFICATION – AIR QUALITY

Dear Dorian,

1 INTRODUCTION

Boggabri Coal Mine is located 15 kilometres north-east of Boggabri in the North West Region of NSW and is operated by Boggabri Coal Pty Limited (Boggabri Coal), a wholly owned subsidiary of Idemitsu Australia Resources Pty Limited.

Hansen Bailey has been requested by Idemitsu Australia Resources Pty ltd (IAR) to prepare an Environmental Assessment (EA) to support an application to modify Project Approval (PA) 09_0182 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (the Modification). A description of the proposed Modification is provided below. This report has been commissioned by Hansen Bailey on behalf of Boggabri Coal to assess the air quality impacts of the proposed Modification to PA 09_0182.

1.1 Modification Description

Approval is sought for the following:

- Construction of permanent mine access from the Kamilaroi Highway;
- Temporary storage of processed mine overburden material at the existing Rock Quarry and the reuse of this material during the construction of the rail spur embankments; and
- Reuse of the existing Daisymede laydown compound.

Figure 1-1 shows an indicative layout of the proposed Modification.

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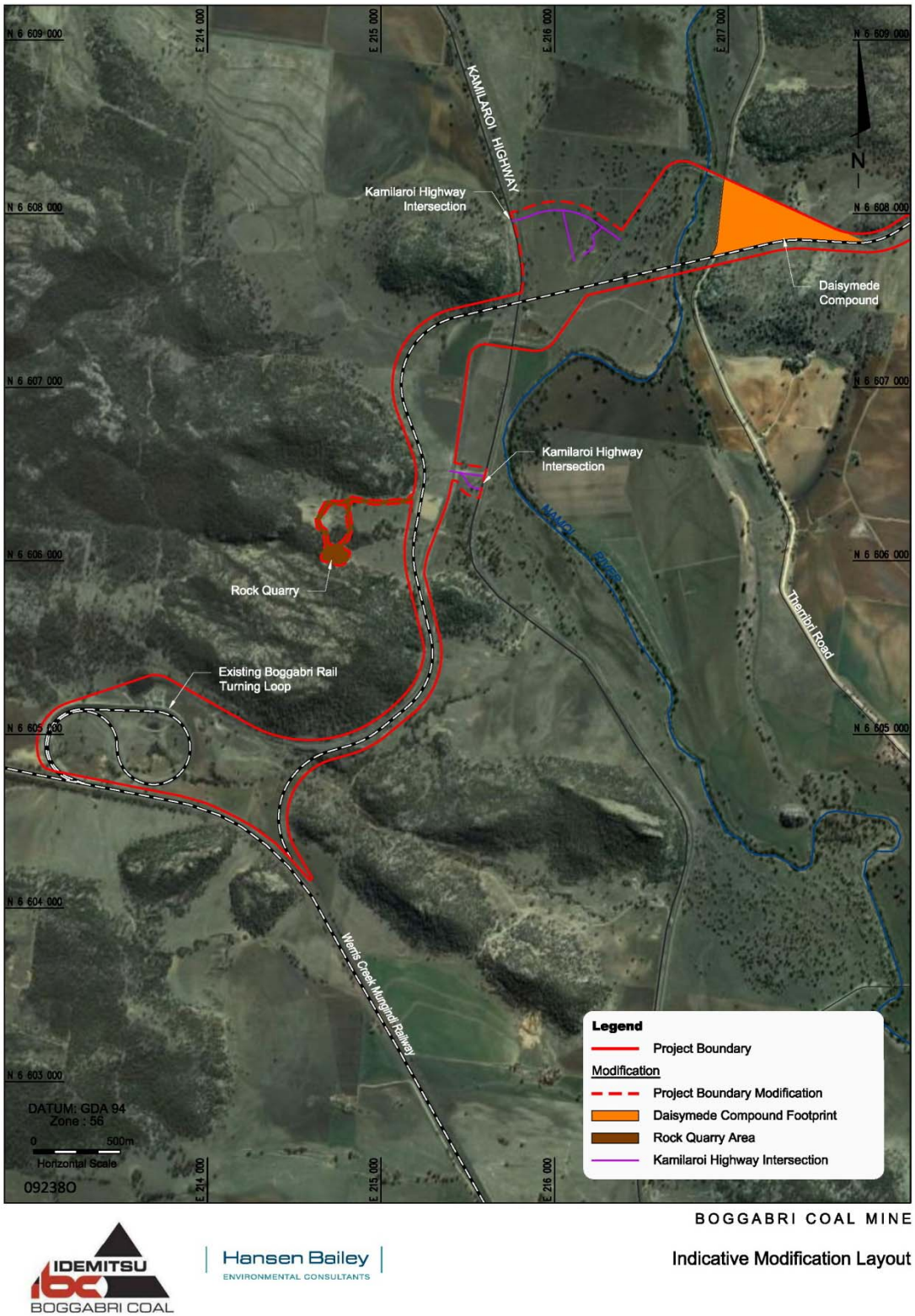

Figure 1-1: Indicative Modification Layout

2 ASSESSMENT CRITERIA

Table 2-1 summarises the air quality goals for concentrations of particulate matter that are relevant to this study.

Table 2-1: Air quality standards / goals for particulate matter concentrations

Pollutant	Averaging period	Standard / Goal	Agency
Total suspended particulate matter (TSP)	Annual mean	90 µg/m^3	• National Health and Medical Research Council
Particulate matter with an equivalent aerodynamic diameter less than 10 µm (PM_{10})	24-hour maximum	50 µg/m^3	• NSW EPA impact assessment criteria; • NEPM reporting goal, allows five exceedances per year for bushfires and dust storms;
	Annual mean	30 µg/m^3	• NSW EPA impact assessment criteria;

Notes: µg/m^3 – micrograms per cubic metre, µm – micrometre.

Table 2-2 shows the maximum acceptable increase in dust deposition over the existing dust levels from an amenity perspective. These criteria for dust fallout levels are set to protect against nuisance impacts (**NSW DEC, 2005**).

Table 2-2: EPA criteria for dust (insoluble solids) fallout

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

3 CURRENT AIR QUALITY

3.1 Introduction

Air quality standards and goals refer to pollutant levels that include the contribution from specific projects and existing sources. To fully assess impacts against all the relevant air quality standards and goals it is necessary to have information or estimates on existing dust concentration and deposition levels in the area in which the Modification is likely to contribute to these levels. It is important to note that the existing air quality conditions (that is, background conditions) will be influenced to some degree by the existing mining operations.

The following sections provide a summary of the monitoring results for dust deposition, PM_{10} and TSP in the area surrounding the Modification.

3.2 Dust Deposition

Dust deposition is monitored using dust deposition gauges at 15 locations in the vicinity of the Modification. Dust deposition gauges use a simple device consisting of a funnel and bottle to estimate the rate at which dust settles onto the surface over a period of one month. The measured dust fallout levels include the effects of all existing sources of particulate matter including the existing mining operations.

Data collected from the gauges between 2005 and May 2013 are summarised in **Table 3-1**.

The data indicate that deposition levels are generally low and within the EPA's annual average assessment criteria of 4 g/m^2/month for insoluble solids.

Table 3-1: Dust deposition data (insoluble solids) (g/m²/month)[a]

Dust gauge	2005 average	2006 average	2007 average	2008 average	2009 average	2010 average	2011 average	2012 average
D1[b]	0.7	0.9	1.8	2.1	1.7	4.0[c]	1.8	2.9[h]
D2[b]	0.7	1.5	2	2.1	1.5	2.7	1.5	3.6[i]
D3	2.1	1.6	2.9	1.8	3.2	0.9	3.4[d]	-
D4	2.2	1.5	2.3	1.6	1.7	2.4	2.8[e]	4.3[j]
D5	1.4	1.3	1.7	1.4	1.7	0.8	0.9	1.3
D6	1.5	1	1.7	1.6	1.3	0.9	1.2	2.2
D7	0.8	1.2	1.5	1.2	1	0.8	1.7	1.3
D8	1.1	1.1	1.3	1.2	1.1	0.9	1.3	1.2
D9	1.1	1.3	1	1.3	1.9	1.5	4.2[f]	2.3[k]
D10	1.1	0.8	1.1	1.1	0.9	0.4	0.5[g]	-
D11	1.5	1.2	1	1.4	1.1	0.7	0.4[g]	-
D12	1.1	1.6	1.9	1.7	1.7	2.8	1.8	1.1
D13	1.5	1.8	2.2	2.4	1.6	1.6	0.6	1.3
D14	0.9	0.9	1.6	1.7	3.7	3.6	1.3	1.5[l]
D15	-	-	-	1.1	1.4	1.1	2.1	1.4
D16	-	-	-	-	-	-	2.3	-

[a] Excluding contaminated data;

[b] Monitor located inside Boggabri Mine boundary;

[c] An elevated reading of 11.6 g/m²/month was recorded in June 2010 at D1. Whilst the field notes do not indicate that the sample was contaminated, the results contains greater than 70% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke.

[d] This value is the average of just two valid samples (May and July 2011) for D3. All other samples collected at this site during 2011 have been identified in field notes as contaminated with insects.

[e] An elevated reading of 8.9 g/m²/month was recorded in June 2011 at D4. Whilst the field notes do not indicate that the sample was contaminated, the results contains greater than 75% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke.

[f] An elevated reading of 13.1 g/m²/month was recorded in June 2011 at D9. Whilst the field notes do not indicate that the sample was contaminated, the results contains greater than 75% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke.

[g] These values are the average of just seven valid samples (D10 and D11). No results were recorded for the months August-December 2011.

[h] An elevated reading of 4.3 g/m²/month was recorded in April 2012 at D1 and field notes identified this sample to be contaminated with algae and insects.

[i] An elevated reading of 4.8 g/m²/month was recorded in January 2012 and 5.7 g/m²/month was recorded in Sept 2012 at D2. Whilst the field notes do not indicate that the samples were contaminated, the results contain greater than 60-70% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke. Additionally samples in July and August are noted as contaminated by bird droppings and noted as being "very dirty samples".

[j] Elevated reading were recorded at D4 in January, February,. March, April and May. The field notes indicates that in January there were lots of dead insects and that for each of February to May the funnel was blocked with bird droppings.

[k] An elevated reading of 4.1 g/m²/month was recorded in June 2012 at D9 Whilst the field notes do not indicate that the sample was contaminated, the results contains greater than 75% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke.

[l] An elevated reading of 6 g/m²/month was recorded in July 2012 at D14. Whilst the field notes do not indicate that the sample was contaminated, the results contains greater than 75% combustible matter, suggesting contribution from sources other mining, for example, bushfires or wood smoke.

3.3 PM_{10} and TSP concentrations

Particulate matter (PM_{10}) concentrations have been monitored by Boggabri Coal since 2005. 24-hour average concentrations of PM_{10} are collected at the Merriown property (approximately 1km west of the mining operations) every sixth day using a High Volume Air Sampler (HVAS). In July 2012, Boggabri Coal installed a continuous PM_{10} monitor (TEOM – Tapered Element Oscillating Microbalance) at the Tarrawonga homestead, which is located south-west of the mining operations at Boggabri and Tarrawonga. An additional HVAS monitor is located to the south of the Modification as a part of the Tarrawonga Mine environmental monitoring system. **Figure 3-1** shows a graphical representation of the all the available data.

Data collected by the Boggabri Coal HVAS were available for the period August 2005 and May 2013. There have been five elevated concentrations above the EPA 24-hour average goal of 50 $\mu g/m^3$. Two of these events in December 2005 occurred when strong northerly winds were reported by Bureau of Meteorology (**Bureau of Meteorology, 2005**). Narrabri Station, 60 km northwest of Boggabri, recorded winds greater than 115 km/h on the 28th December 2005, as such, it is likely there was significant sources of wind-generated dust that contributed to the elevated results from both mining and agricultural activities in the area. Sampling field notes also indicated there was fire in Pilliga (approximately 115 km north-west of Boggabri) on 30 December 2005 which will also have contributed to the elevated concentrations.

There were two other days where the dust levels were recorded to be above the EPA criterion, both of which occurred in November and December of 2009. As with the above, these elevated levels are unlikely to have been caused by operations at Boggabri Coal Mine. The Bureau of Meteorology identifies dust storms and raised dust levels to the west of the area in both of these monitoring periods (**Bureau of Meteorology, 2009a and 2009b**). There have been no recorded concentrations above the criterion in the HVAS data since December 2009.

The TEOM installed at the Tarrawonga homestead has recorded ten exceedances of the 24-hour average goal of 50 $\mu g/m^3$, however, as shown below it is unlikely that Boggabri Coal was the major cause of these:

- 19th and 26th October 2012
  - The Bureau of Meteorology weather station at Gunnedah experienced the driest October on record (**Bureau of Meteorology, 2012a**). It is therefore likely there were other local sources which also contributed to these elevated levels.
- 2nd December 2012
  - The Bureau of Meteorology weather station at Gunnedah recorded its highest maximum daily temperature on 1st December (40.9°C) and its lowest minimum temperature on 2nd December (23.2°C) (**Bureau of Meteorology, 2012b**). These extreme temperatures are likely to have had a significant influence on the elevated levels.
- 20th, 24th, 25th and 28th April 2013
  - The Bureau of Meteorology weather station at Gunnedah recorded zero rainfall during April which equalled the previous record lowest rainfall for April which occurred in 2005 (**Bureau of Meteorology, 2013a**). It is therefore likely there were other local sources which contributed to these elevated levels.
- 1st, 5th and 11th May 2013
  - The extended period of dry weather in April continued through the early part of May with no rainfall recorded until 13th May (**Bureau of Meteorology, 2013b**). It is therefore likely there were other local sources which contributed to these elevated levels.

The monitoring data collected at the Tarrawonga HVAS were only available to from May 2007 to June 2011 for inclusion on **Figure 3-1**. These data indicate that there have been five elevated recordings above the EPA goal, with four occurring between September and December 2009, a period in which a number of dust storms and strong winds were experienced in New South Wales. The maximum 24-hour average PM_{10} concentration recorded was 97 µg/m^3 on 8 December 2009, a day when most of the State experienced strong winds and elevated dust levels. The 2009-2010 Annual Environment Management Report (AEMR) for Tarrawonga (**Tarrawonga Coal, 2010**) reports that an investigation of the exceedance of the 26 March 2010 showed that it occurred with winds predominantly from the north east and south west, indicative of other non-mine-related influences on PM_{10} levels. There have been no recorded exceedances since 26 March 2010(**Tarrawonga Coal, 2011**; **Tarrawonga Coal, 2012**)

The rolling annual average of the Boggabri HVAS PM_{10} is below the EPA goal of 30 µg/m^3. In April 2009, the rolling annual average PM_{10} concentrations were 19 µg/m^3, and have been as high as 25 µg/m^3 (April 2007). Overall, the PM_{10} concentrations decreased significantly in June 2008, a slight increase is observed during 2009, with a decrease occurring from March 2010. There are insufficient data available to calculate an annual average from the Boggabri TEOM data, however the rolling average has not exceeded 23 µg/m^3.

There are no TSP data collected, however, experience with monitoring in other mining areas in the State indicates that where mining activities are a significant source of the particulate matter, then on an annual basis, approximately 40% of the TSP will be in the form PM_{10}. This would suggest that the annual average TSP concentrations are in the range 48 µg/m^3 to 63 µg/m^3. These concentrations are less than EPA's annual average 90 µg/m^3 assessment criterion for TSP.

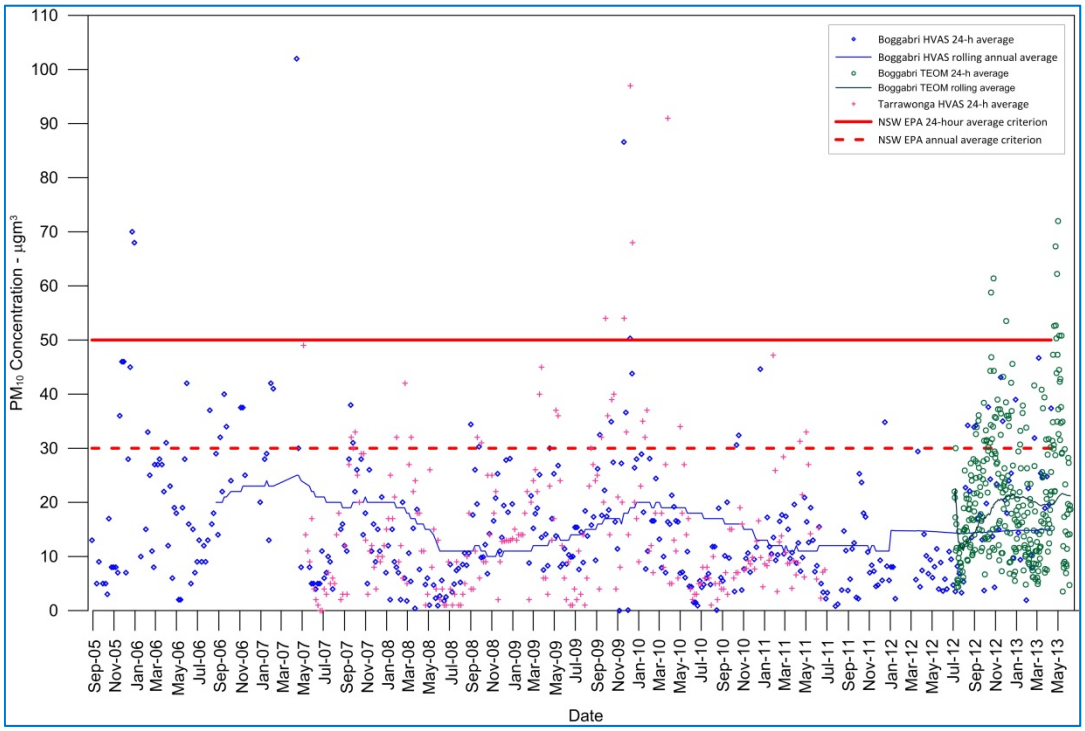

Figure 3-1: Measured PM_{10} concentrations

4 IMPACT ASSESSMENT

4.1 Introduction

When the air quality impact assessment was completed for the Boggabri Coal Continuation of Mining Environmental Assessment (Boggabri EA) in 2010 (**PAEHolmes, 2010**), emissions estimates were made for the following years:

- Year 1;
- Year 5;
- Year 10; and
- Year 21.

The assessment for each of these years assumed that the product coal would continue to be hauled from the site to the existing rail loadout adjacent to the main rail line via the private haul road. An additional scenario for Year 5 was completed assuming that the proposed rail spur would be operational.

The following sections present a comparison between the Year 5 (haul scenario), the Year 5 (rail spur scenario) and the additional dust emissions that would be created through the proposed temporary storage of processed mine overburden material at the existing Rock Quarry area and the reuse of this material during the construction of the rail spur embankments (i.e. the Modification).

4.2 Emission Estimation – Boggabri EA

The calculated TSP emissions from Year 5 of the Boggabri EA haul and rail spur scenario were 7,219,260 kg/y and 6,823,564 kg/y[1], respectively (**PAEHolmes, 2010**: Table 6-2). The mine plan and source allocation of the Year 5 (haul and rail spur scenario) modelled in the Boggabri EA (**PAEHolmes 2010**) are shown in **Figure 4-1** and **Figure 4-2**, respectively.

[1] The total emissions for the rail spur scenario were erroneously stated as 6,823,742 kg/y in **PAEHolmes, 2010**

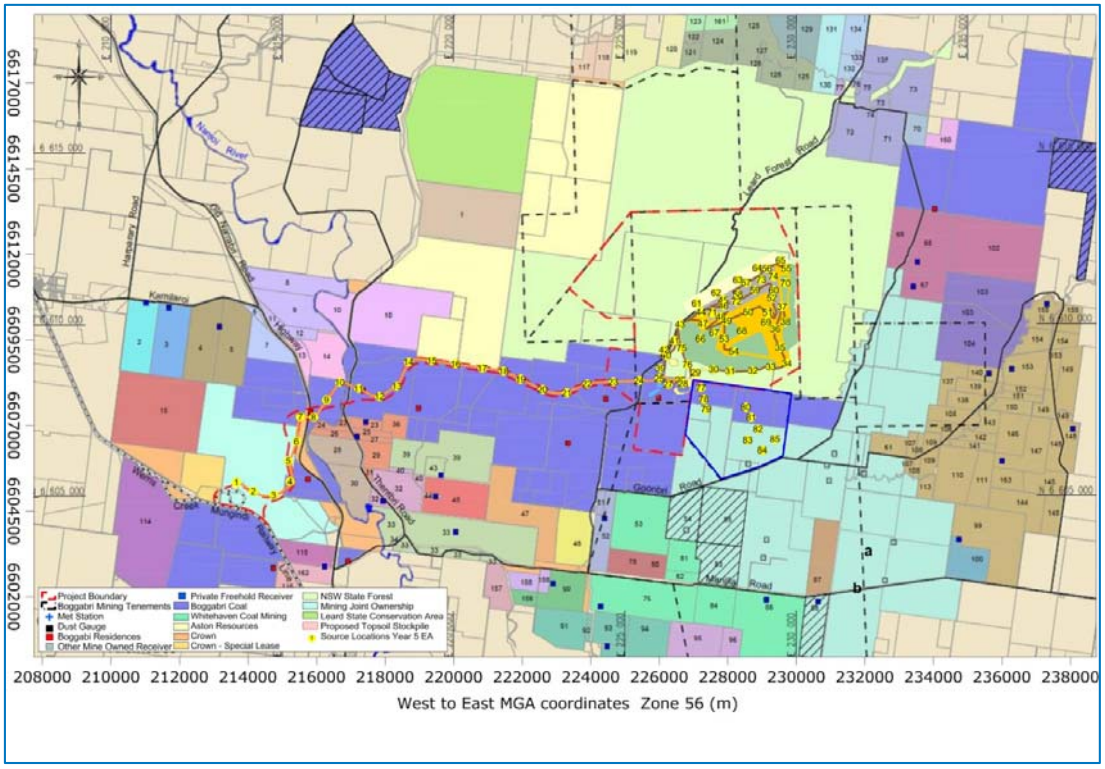

Figure 4-1: Year 5 (haul scenario) activity per Boggabri EA

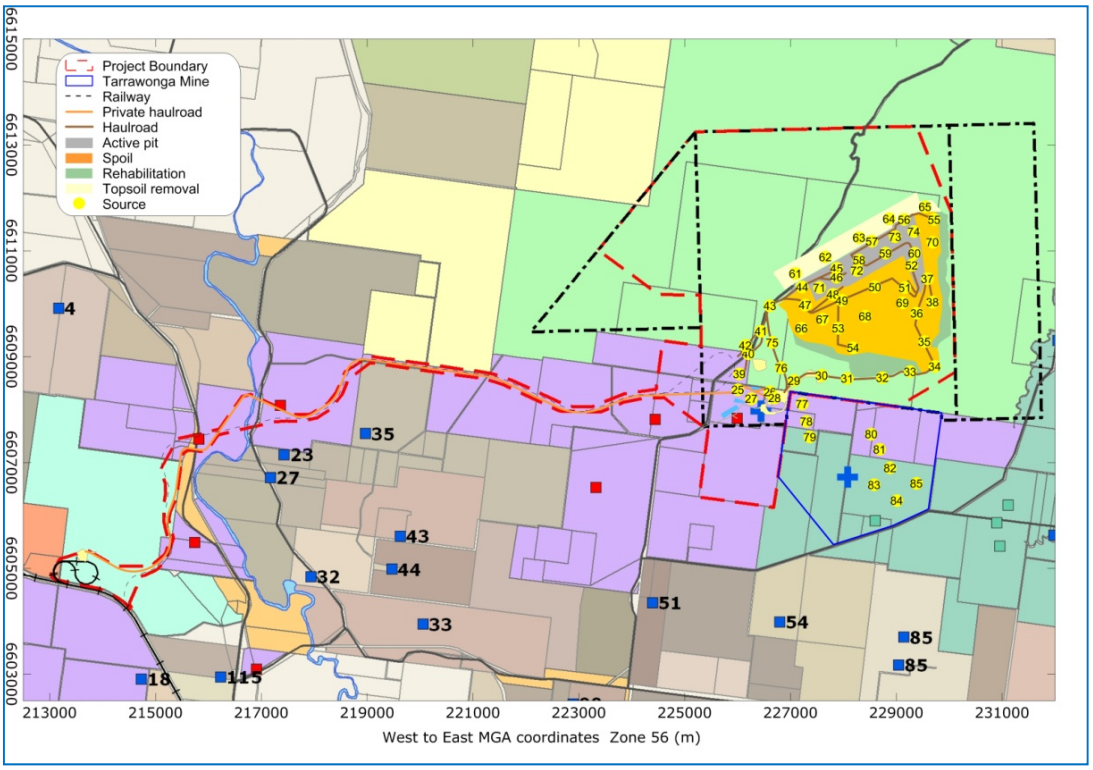

Figure 4-2: Year 5 (rail spur scenario) activity per Boggabri EA

4.3 Emissions Estimations – the Modification

The emissions estimates based on the additional activities associated with stockpiling crushed overburden at the Rock Quarry for use in the construction of the rail spur embankments and other areas of disturbance proposed for the Modification are summarised in **Table 4-2**. The following assumptions were made in the estimation of these emissions:

- 80% control on unsealed haul roads;
- 180,000t of processed overburden (OB) would stockpiled at the Rock Quarry;
- The Rock Quarry stockpile would cover an area of approximately 1.7ha;
- An additional 2.2 ha exposed area at the Daisymede laydown compound;
- Scrapers and the trucks listed below in **Table 4-1** would be involved in haulage of OB between the mine, rock quarry and rail spur embankments; and
- The maximum return haul distance of 20 km from the crushing and screening area to the Rock Quarry was assumed in the calculations. These emission estimates are considered to be conservative as the material required for construction would be placed along the length of the rail spur and therefore some return travel distances would be significantly shorter.

Table 4-1: Summary of Trucks used in haulage of OB for Construction Activities

Truck	Capacity (Tonnes)	GMVW	Empty
Truck and dog	28	15	42.5
740 ADTs	40	72.6	33.1
730 ADTs	30	50.97	22.85

Table 4-2: Summary of estimated TSP emissions from the Modification (kg/y)

ACTIVITY	TSP emission (kg/y)
OB - Hauling to Rock Quarry	38,876
OB - Emplacing at Rock Quarry	162
OB - Excavator loading OB @ Rock Quarry to haul truck	162
OB - Hauling from Rock Quarry along rail spur embankment	40,602
OB - Emplacing along rail spur embankment	162
WE - Stockpile @ Rock Quarry	5,957
WE - Stockpile @ Daisy	7,709
TOTAL	**93,630**[a]

a) Total does not match exactly due to rounding

The emissions associated with the Modification equate to an approximately 1.4% increase in total emissions when added to the Year 5 rail spur scenario modelled for the Boggabri EA, and a 1.3% change compared with the Year 5 haul scenario. As discussed above, the assumption that all material hauled would have a return haul distance of 20 km is conserved very conservative. Extensive experience in dispersion modelling has demonstrated that a change in total emissions of less than 10-20% has a negligible difference to the predicted impacts.

6 MANAGEMENT AND MITIGATION MEASURES

Mitigation measures to ensure minimal dust generation during construction will include, but not necessarily be limited to the following:

- Watering unsealed roads.
- Water carts on working areas.
- Modifying working practices by limiting excavation during periods of high winds.
- Establishment of vegetation on all disturbed areas as each stage is completed.
- All roadways, entrances and main traffic areas will be compacted or coated with a dust suppressant or mist spray regularly.
- Trucks entering and leaving the site being well maintained in accordance with the manufacturer's specification to comply with all relevant regulations.
- Truck movements controlled on site and restricted to designated roadways.
- Modifying construction activities during periods of high wind.

7 CONCLUSIONS

This letter report has investigated the likely effects on air quality from the proposed Modification.

The Modification is proposed to have a similar particulate emission inventory to that described for Year 5 of the Boggabri EA air quality impact assessment (**PAEHolmes, 2010**).

Based on the dispersion modelling completed for Year 5 of the Boggabri EA, the assessment concluded that when considered both in isolation, and cumulatively with other sources, the Modification is unlikely to result in exceedances of the EPA's impact assessment criteria any private properties in the vicinity of the site.

As the proposed activities for the Modification are not dissimilar to those already occurring at the site, and the current monitoring of 24-hour PM_{10} concentrations has been below the assessment criteria, other than during adverse weather conditions which has had regional impact on air quality, (see **Section 3**), it is considered that the cumulative 24-hour impacts will be similar during the Modification to those under existing conditions.

In view of the above, it is anticipated that the Modification may be managed to ensure that adverse air quality impacts do not occur at the nearest sensitive receptors to the Modification Boundary.

Please do not hesitate to contact me should you require any further information.

Judith Cox
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8 REFERENCES

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