TODOROSKI AIR SCIENCES
Suite 2B, 14 Glen Street Eastwood, NSW 2122
Phone: 02 9874 2123
Fax: 02 9874 2125
Email: info@airsciences.com.au
Web: www.airsciences.com.au
ACN: 151 202 765 | ABN: 74 955 076 914

9 August 2019

Dianne Munro
Principal
Hansen Bailey
Via email: [redacted]

RE: Air Quality Study for Rix's Creek South Continuation Project – Camberwell Impacts

Dear Dianne,
As requested, Todoroski Air Sciences has conducted an analysis of the existing modelling for the Rix's Creek South Continuation Project to present the potential cumulative annual average air quality impacts associated with the Project at additional receptor locations in Camberwell.

The additional receptor locations are identified in **Table A-1** and **Figure A-1** in **Appendix A**.

The analysis utilised the existing air quality modelling presented in:

- *Air Quality and Greenhouse Gas Assessment Rix's Creek Continuation of Mining Project* (AQIA) (**Todoroski Air Sciences, 2015**);
- *Response to Agency Submissions for Rix's Creek Continuation of Mining Project* (**Todoroski Air Sciences, 2016**); and,
- *Rix's Creek South Continuation Project – Trade-off Scenarios for the Independent Planning Commission of NSW* (**Todoroski Air Sciences, 2018**).

The purpose of the analysis is to consider five additional receptors in Camberwell in the assessment of potential impacts. These receptors are further away from the Rix's Creek South Continuation Project activities and will experience less impact from the Project than the nearer Camberwell receptor locations which are already included in the assessment of impacts per the existing air quality modelling.

This letter serves to present the potential contribution of annual average $PM_{2.5}$ and PM_{10} levels due to the Rix's Creek South Continuation Project and the other significant dust sources included in the dispersion modelling (i.e. other mines and background).

Model scenario

The 2023 modelling scenario per Option 2 of the trade-off scenarios (**Todoroski Air Sciences, 2018**) is analysed in this letter as it is Bloomfield's preferred Project option.

An analysis for the 2023 modelling scenario with the Rix's Creek Reduced Schedule (**Todoroski Air Sciences, 2016**) and the Option 1 trade-off scenario (**Todoroski Air Sciences, 2018**) is also presented in **Appendix B**.

The modelling assumptions for the other mines and the applied background levels are per the AQIA (**Todoroski Air Sciences, 2015**). The emissions estimates for the other mines were derived from information available at the time of the modelling for the Rix's Creek South Continuation Project.

We also note that at the time of the modelling the Rix's Creek South Continuation Project, the Ashton South East Open Cut (SEOC) Project was expected to commence and to have progressed south by the time the 2023 modelling scenario would arise. As the Ashton SEOC Project has yet to commence, two cases have been considered either including or excluding the Ashton SEOC Project as part of the analysis.

Analysis of modelling predictions

The predicted contribution from each of the dust sources for the Option 2 scenario (including Ashton SEOC) are summarised in **Table 1**. The total dust levels and the percentage contribution from each of the sources for the Option 2 scenario (including Ashton SEOC) are summarised in **Table 2**.

Table 1: Predicted contribution of each dust source for Option 2 scenario (including Ashton SEOC)

Receptors	N88	N91	N103	N161	N105	N88	N91	N103	N161	N105
Source	Annual average $PM_{2.5}$ (µg/m³)					Annual average PM_{10} (µg/m³)				
Background	5.2	5.2	5.2	5.2	5.2	11.5	11.5	11.5	11.5	11.5
Rix's Creek North*	0.6	0.7	0.7	0.7	0.8	4.8	5.5	5.2	5.7	6.5
Glendell	0.5	0.5	0.3	0.5	0.5	4.1	3.7	2.4	3.5	3.8
Rix's Creek South	0.4	0.5	0.6	0.5	0.5	3.1	3.4	4.2	3.6	3.3
Ravensworth Coal Mine	0.4	0.4	0.5	0.4	0.4	2.7	2.9	3.6	3.0	2.7
Ashton SEOC	0.1	0.2	0.3	0.2	0.1	1.1	1.2	2.0	1.4	1.1
Mt Owen	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.6	0.7	0.7
Ravensworth East	0.1	0.1	0.1	0.1	0.1	0.7	0.6	0.5	0.6	0.6
Hunter Valley Operations	0.0	0.0	0.1	0.1	0.0	0.3	0.4	0.4	0.4	0.4
Total dust level (µg/m³)	**7.5**	**7.7**	**7.7**	**7.7**	**7.7**	**28.9**	**29.8**	**30.3**	**30.3**	**30.5**

*Includes Integra Underground

Table 2: Total dust level and percent contribution of each dust source for Option 2 scenario (including Ashton SEOC)

Receptors	N88	N91	N103	N161	N105	N88	N91	N103	N161	N105
Source	Annual average $PM_{2.5}$ (% of total)					Annual average PM_{10} (% of total)				
Background	69	68	67	67	67	40	39	38	38	38
Rix's Creek North*	8	9	9	10	11	17	18	17	19	21
Glendell	7	6	4	6	7	14	12	8	12	12
Rix's Creek South	6	6	7	6	6	11	11	14	12	11
Ravensworth Coal Mine	5	5	6	5	5	9	10	12	10	9
Ashton SEOC	2	2	3	2	2	4	4	6	4	3
Mt Owen	1	1	1	1	1	2	2	2	2	2
Ravensworth East	1	1	1	1	1	2	2	2	2	2
Hunter Valley Operations	1	1	1	1	1	1	1	1	1	1
	Annual average $PM_{2.5}$ (µg/m³)					Annual average PM_{10} (µg/m³)				
Total dust level (µg/m³)	7.5	7.7	7.7	7.7	7.7	28.9	29.8	30.3	30.3	30.5

*Includes Integra Underground

The summarised results in **Table 2** indicate that the underlying background level is the greatest contributor to the dust levels at the additional receptor locations in Camberwell, followed by the Rix's Creek North mine, Glendell, Rix's Creek South and Ravensworth Coal Mine.

Detailed modelling predictions for the Option 2 scenario are presented in **Table B-1** and **Table B-2** in **Appendix B**. These tables include the incremental modelling predictions for each of the modelled sources and also the background level at the time.

The contribution at the receptor locations due to Rix's Creek South ranges from 0.4-0.6µg/m^3 for annual average $PM_{2.5}$ and from 3.1-4.2µg/m^3 for annual average PM_{10}. These levels are approximately 7% and 14% respectively of the total dust level predicted for these receptor locations.

A comparison of the cases including or excluding the Ashton SEOC Project can be made by examination of **Table B-1** and **Table B-2** in **Appendix B**. As noted, at the time of the modelling the Ashton SEOC project was expected to have progressed south by the time the modelled scenario would occur and as such the modelled contribution from the Ashton SEOC project is relatively low at the receptors in question.

Please feel free to contact us if you would like to clarify any aspect of this report.

Yours faithfully,
Todoroski Air Sciences

Aleks Todoroski

Philip Henschke

TODOROSKI AIR SCIENCES | info@airsciences.com.au | 02 9874 2123

References

Todoroski Air Sciences (2015)

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

Todoroski Air Sciences (2016)

"Response to Agency Submissions for Rix's Creek Continuation of Mining Project", prepared for Rix's Creek Mine by Todoroski Air Sciences, June 2016.

Todoroski Air Sciences (2018)

"Rix's Creek South Continuation Project – Trade-off Scenarios for the Independent Planning Commission of NSW", prepared for Rix's Creek Mine by Todoroski Air Sciences, November 2018.

Appendix A

Additional receptor locations

Table A-1: Additional receptor location details

Receptor ID	Name	Lot	DP
N88	[redacted]	[redacted]	[redacted]
N91			
N105			
N161			
N103			

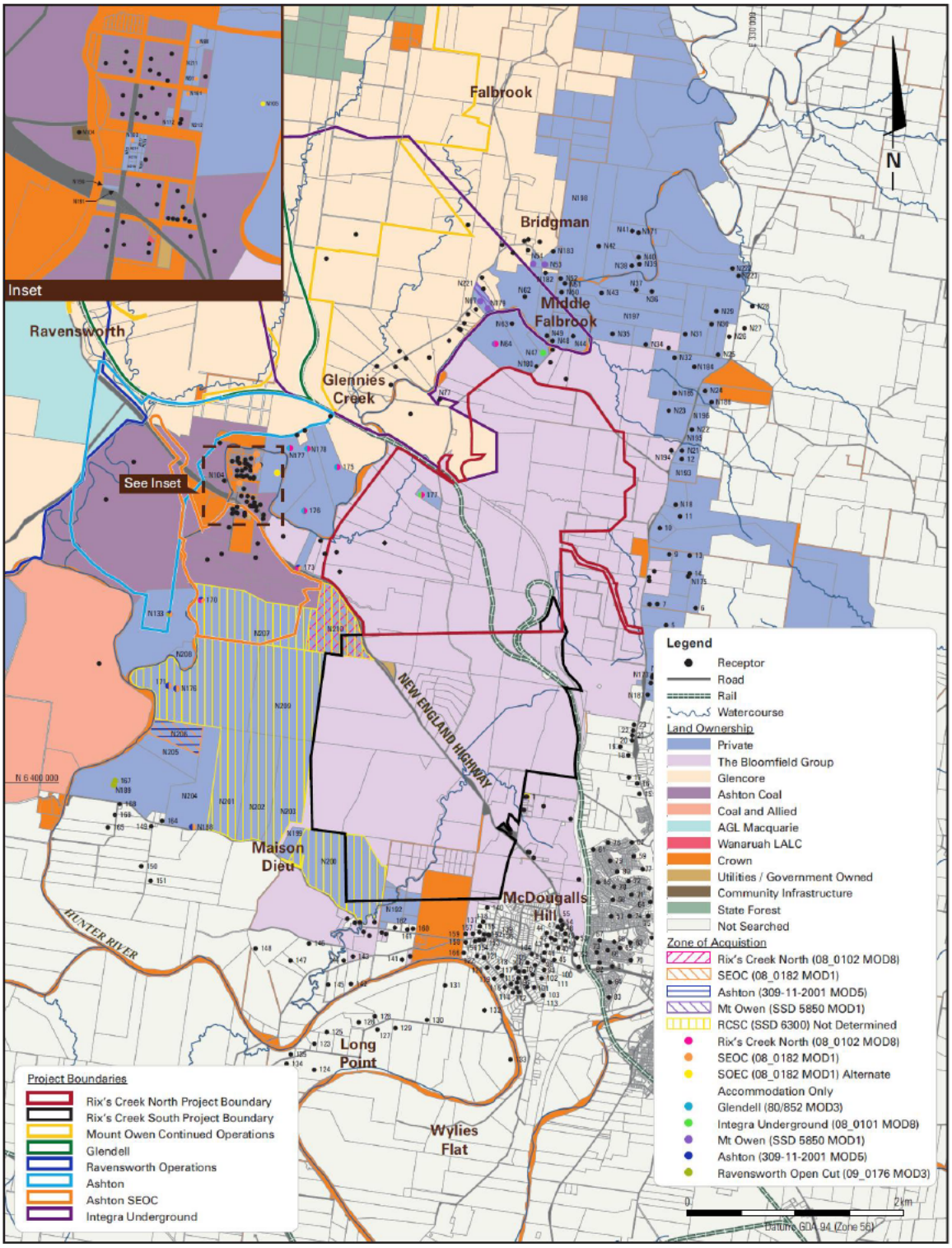

Figure A-1: Additional receptor locations

Appendix B

Detailed analysis tables

Table B-1: Analysis of annual average predictions – Rix's Creek Option 2 2023

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North*	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	0.1	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.5
N91	0.5	0.2	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.7
N103	0.6	0.3	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.7
N161	0.5	0.2	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.7
N105	0.5	0.1	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.7
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North*	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	3.1	1.1	4.1	0.3	4.8	0.7	0.7	2.7	11.5	28.9
N91	3.4	1.2	3.7	0.4	5.5	0.7	0.6	2.9	11.5	29.8
N103	4.2	2.0	2.4	0.4	5.2	0.6	0.5	3.6	11.5	30.3
N161	3.6	1.4	3.5	0.4	5.7	0.7	0.6	3.0	11.5	30.3
N105	3.3	1.1	3.8	0.4	6.5	0.7	0.6	2.7	11.5	30.5

*Includes Integra Underground

Table B-2: Analysis of annual average predictions – Rix's Creek Option 2 2023 (excluding Ashton SEOC)

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	-	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.4
N91	0.5	-	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.5
N103	0.6	-	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.5
N161	0.5	-	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.5
N105	0.5	-	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.6
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	3.1	-	4.1	0.3	4.8	0.7	0.7	2.7	11.5	27.8
N91	3.4	-	3.7	0.4	5.5	0.7	0.6	2.9	11.5	28.6
N103	4.2	-	2.4	0.4	5.2	0.6	0.5	3.6	11.5	28.4
N161	3.6	-	3.5	0.4	5.7	0.7	0.6	3.0	11.5	28.9
N105	3.3	-	3.8	0.4	6.5	0.7	0.6	2.7	11.5	29.5

*Includes Integra Underground

Table B-3: Analysis of annual average predictions – Rix's Creek Reduced Schedule 2023

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	0.1	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.5
N91	0.4	0.2	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.6
N103	0.5	0.3	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.7
N161	0.5	0.2	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.7
N105	0.4	0.1	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.7
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	2.9	1.1	4.1	0.3	4.8	0.7	0.7	2.7	11.5	28.8
N91	3.2	1.2	3.7	0.4	5.5	0.7	0.6	2.9	11.5	29.7
N103	4.0	2.0	2.4	0.4	5.2	0.6	0.5	3.6	11.5	30.2
N161	3.4	1.4	3.5	0.4	5.7	0.7	0.6	3.0	11.5	30.1
N105	3.1	1.1	3.8	0.4	6.5	0.7	0.6	2.7	11.5	30.3

*Includes Integra Underground

Table B-4: Analysis of annual average predictions – Rix's Creek Reduced Schedule 2023 (excluding Ashton SEOC)

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	-	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.4
N91	0.4	-	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.5
N103	0.5	-	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.4
N161	0.5	-	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.5
N105	0.4	-	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.6
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	2.9	-	4.1	0.3	4.8	0.7	0.7	2.7	11.5	27.7
N91	3.2	-	3.7	0.4	5.5	0.7	0.6	2.9	11.5	28.4
N103	4.0	-	2.4	0.4	5.2	0.6	0.5	3.6	11.5	28.2
N161	3.4	-	3.5	0.4	5.7	0.7	0.6	3.0	11.5	28.7
N105	3.1	-	3.8	0.4	6.5	0.7	0.6	2.7	11.5	29.3

*Includes Integra Underground

Table B-5: Analysis of annual average predictions – Rix's Creek Option 1 2023

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	0.1	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.5
N91	0.5	0.2	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.7
N103	0.5	0.3	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.7
N161	0.5	0.2	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.7
N105	0.4	0.1	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.7
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	3.0	1.1	4.1	0.3	4.8	0.7	0.7	2.7	11.5	28.9
N91	3.4	1.2	3.7	0.4	5.5	0.7	0.6	2.9	11.5	29.8
N103	4.1	2.0	2.4	0.4	5.2	0.6	0.5	3.6	11.5	30.3
N161	3.5	1.4	3.5	0.4	5.7	0.7	0.6	3.0	11.5	30.2
N105	3.3	1.1	3.8	0.4	6.5	0.7	0.6	2.7	11.5	30.5

*Includes Integra Underground

Table B-6: Analysis of annual average predictions – Rix's Creek Option 1 2023 (excluding Ashton SEOC)

Receptor ID	Annual average $PM_{2.5}$ Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	0.4	-	0.5	0.0	0.6	0.1	0.1	0.4	5.2	7.4
N91	0.5	-	0.5	0.0	0.7	0.1	0.1	0.4	5.2	7.5
N103	0.5	-	0.3	0.1	0.7	0.1	0.1	0.5	5.2	7.4
N161	0.5	-	0.5	0.1	0.7	0.1	0.1	0.4	5.2	7.5
N105	0.4	-	0.5	0.0	0.8	0.1	0.1	0.4	5.2	7.6
	Annual average PM_{10} Modelling prediction (µg/m³)									
	Rix's Creek South	Ashton SEOC	Glendell	Hunter Valley Operations	Rix's Creek North	Mt Owen	Ravensworth East	Ravensworth Coal Mine	Background	Total
N88	3.0	-	4.1	0.3	4.8	0.7	0.7	2.7	11.5	27.8
N91	3.4	-	3.7	0.4	5.5	0.7	0.6	2.9	11.5	28.6
N103	4.1	-	2.4	0.4	5.2	0.6	0.5	3.6	11.5	28.3
N161	3.5	-	3.5	0.4	5.7	0.7	0.6	3.0	11.5	28.9
N105	3.3	-	3.8	0.4	6.5	0.7	0.6	2.7	11.5	29.5

*Includes Integra Underground