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24 March 2022

Joe Fittell
Team Leader
Resource Assessments (Coal & Quarries)
Department of Planning, Industry and Environment

Dear Joe,

RE: MOUNT PLEASANT OPTIMISATION PROJECT – AIR QUALITY PEER REVIEW

In December 2021, MACH Energy Australia Pty Ltd (MACH) provided a response to the air quality peer review completed by Jane Barnett of ERM Australia Pacific Pty Ltd (herein referred to as the Initial Air Quality Peer Review). Additional peer review comments were subsequently provided by Jane Barnett of Zephyr Environmental Pty Ltd following receipt of MACH's response (letter dated 4 February 2022; referred to herein as the 'Supplementary Air Quality Peer Review').

The Supplementary Air Quality Peer Review concluded the majority of concerns Ms Barnett raised in the Initial Air Quality Peer Review are now closed. However, requested some additional technical data and made some additional commentary regarding two specific inputs in the air quality emission modelling conducted for the Project by Todoroski Air Sciences (TAS). TAS has responded to the technical aspects raised in the Supplementary Air Quality Peer Review, and this response is provided in Attachment 1.

MACH is not qualified to comment on the relative importance of individual air quality model input factors or alternative modelling methodologies. MACH would, however, like to bring the Department's attention to the following contextual facts:

- TAS completed the Mount Pleasant Operation air quality assessments for both Modification 3 and Modification 4 of DA 92/97. This modelling was accepted by the NSW Government and forms the basis for Mount Pleasant Operation air quality conditions under Development Consent DA 92/97.
- The Mount Pleasant Operation reports its compliance with relevant Development Consent Conditions (including air quality limits) every year in its Annual Review and MACH encourages the Department to review its compliance record in this regard, including the results of the recent independent review conducted by Jacobs at the behest of the Department.
- In addition to the air quality performance requirements under Development Consent DA 92/97, the Mount Pleasant Operation Environmental Protection Licence (EPL) 20850 includes conditions requiring the majority of dust-generating activity at the mine to be ceased under a specific combination of adverse weather conditions and measured PM_{10} levels at the Muswellbrook Northwest monitor. MACH understands this form of air quality related shutdown condition under an EPL has not been applied to any other coal mine in NSW.

The range of air quality management measures available to the Project, and how they would be applied by MACH to maintain compliance with relevant air quality limits set under any Project Development Consent has been covered in both the EIS, and in responses to specific queries raised by the Environment Protection Authority.

In conclusion, if the Project is approved and the air quality criteria set by the Consent Authority are derived from the TAS air quality modelling, MACH is confident that the Mount Pleasant Operation incorporating the Project would continue to comply with air quality criteria set under the new Development Consent, as it does at present.

Please feel free to contact me if you require further information.

Chris Lauritzen
General Manager - Resource Development
Mount Pleasant Operation

MACHEnergy

ATTACHMENT 1

TODOROSKI AIR SCIENCES RESPONSE TO SUPPLEMENTARY AIR QUALITY PEER REVIEW

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16 March 2022

Chris Lauritzen
General Manager – Resource Development
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RE: Further Response to Peer Review – Mount Pleasant Optimisation Project Air Quality Impact Assessment

Dear Chris,

Todoroski Air Sciences has considered the issues identified in the *Independent Technical Peer Review – Air Quality Impact Assessment Mount Pleasant Optimisation Project* (peer review) (**Zephyr Environmental, 2022**) (the peer review) regarding the *Mount Pleasant Optimisation Project Air Quality Impact Assessment* (AQIA) (**Todoroski Air Sciences, 2020**) and subsequent *Response to Peer Review – Mount Pleasant Optimisation Project Air Quality Impact Assessment* (Response to Peer Review) (**Todoroski Air Sciences, 2021**).

The peer review closes out the majority of the issues raised in previous correspondence, but seeks further clarification to close out the matters raised about the residual model grid.

This letter responds to the additional issues raised in the peer review. Each of the issues is shown in grey italics and is followed by our response immediately below.

Issue 8: Provision of spatially varying data

TAS has provided a partial response to this issue. Attachment 1 of the TAS response (TAS 2021) presents a table of information but does not provide the final data used to calculate the grid presented in Figure 6-10 of the AQIA. For example, there are no co-ordinates provided for the Monitor IDs, nor the final value representative of the 2012-2015 period used to form the varying grid. This could be done simply by providing a spreadsheet with the relevant columns of information (X co-ordinate, Y co-ordinate, derived annual average PM_{10} and TSP concentration at each monitor). The assumed values at the domain boundary and their relative co-ordinates should also be provided. This would enable us to replicate the varying grid and confirm it is correct. To provide clarity, confirmation is also required as to which statistic (maximum, mean, median etc.) is used to calculate the representative value using the 2012-2015 data.

The AQIA includes Figure 5-3 showing the locations of ambient air quality monitors in the vicinity of the Project. The figure includes the location of the monitors used in the development of the spatially varying background.

Table 1 presents the requested x and y coordinates for the ambient air quality monitors, and the requested "final value" (PM_{10}, µg/m^3) for each of these monitors used in the development of a spatially varying residual background. We confirm that the PM_{10} value in **Table 1** is the statistical mean value of the residuals (i.e. *background dust that is not accounted for directly in the air dispersion modelling of the Project and other local mining operations*) based on the 2012-2015 data as presented previously in Attachment 1 of the Response to Peer Review.

Table 1: Ambient air quality monitor coordinates and PM_{10} values used for spatially varying residuals

x-coordinate	y-coordinate	Monitor ID	Residual PM_{10} value used in the varying grid (µg/m3)
300863	6427497	Muswellbrook (NSW EPA)	14.3
300398	6429528	Muswellbrook NW (NSW EPA)	13.6
300565	6438063	Aberdeen (NSW EPA)	15.4
280690	6435571	Wybong (NSW EPA)	14.0
293347	6422484	DC01 (Mt Arthur)	0.5
299169	6426451	DC02 (Mt Arthur)	4.2
299690	6425185	DC03 (Mt Arthur)	1.3
301618	6425732	DC04 (Mt Arthur)	10.6
290210	6424790	DC05 (Mt Arthur)	5.3
296010	6424160	DC08 (Mt Arthur)	1.0
285114	6418026	DC04 (Mangoola)	8.6
287327	6421846	DC03 (Mangoola)	4.3
285496	6428797	DC02 (Mangoola)	6.9
300725	6426734	PM10-2 (Bengalla)	12.5
290775	6424455	PM10-3 (Bengalla)	8.7
302796	6429480	Site 1 (MCC)	10.4
302743	6430913	Site 2 (MCC)	13.7
303541	6431507	Site 3 (MCC)	10.9

For monitors close to one or more mines the AQIA includes significant levels of conservatively modelled dust that would otherwise be part of the background and the residual levels at these locations are thus inherently low.

As noted in the AQIA, due to the high density of available PM_{10} monitors in the central area of the modelling domain, and the presence of Muswellbrook (a large but unmodelled source of emissions), it is possible to apply spatially varying background levels to account for the variation in the background dust level in the central modelling domain. However, for the TSP, the density of monitors is not high and instead a constant value is applied in the assessment. For example, refer to Table 6-7 of the AQIA showing a constant annual TSP residual value of 34.8 µg/m^3. As such, there is no spatially varying grid for TSP.

To develop the spatially varying residual grid and provide a realistic representation of the residual annual average PM_{10} levels (reasonably free of boundary krigging anomalies, and without double counting background levels in the modelling), additional values are needed to "fill" spaces within the domain that are not captured by monitors. These include locations around the domain boundary and within the mining site areas. The corresponding residual PM_{10} values and their co-ordinates are provided in **Table 2**. These PM_{10} values represent assumed residuals.

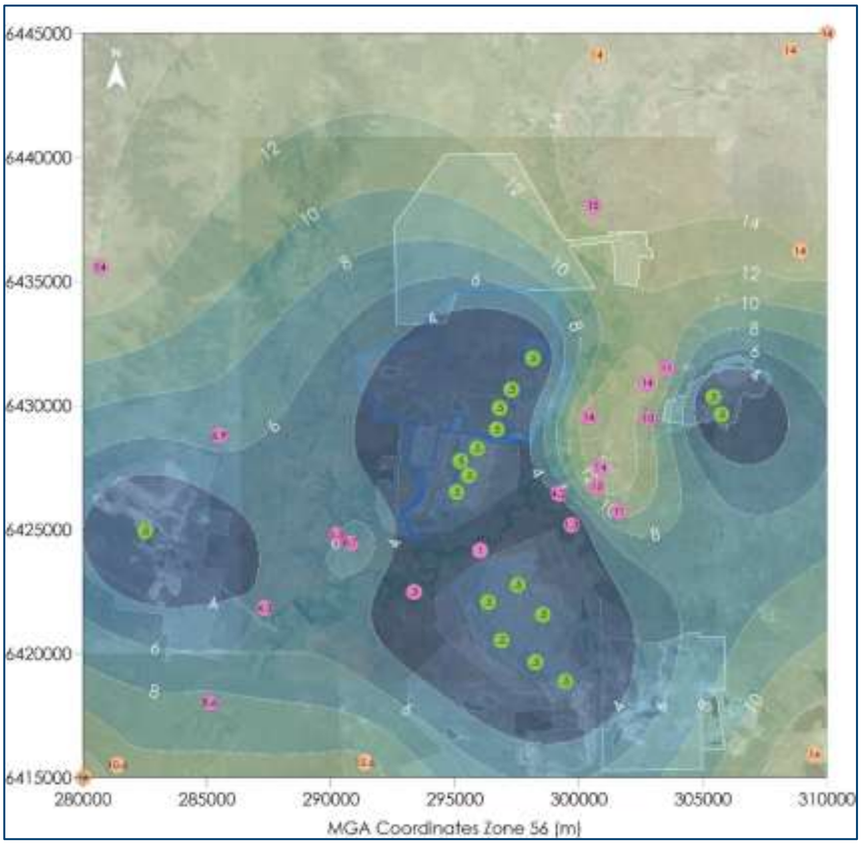
Table 2: Requested additional domain/ boundary locations and applied PM_{10} values

x	y	Residual PM_{10} value used in the varying grid
300719	6444135	14.0
308517	6444330	14.0
308907	6436239	14.0
309492	6415930	14.0
291361	6415605	10.6
281385	6415508	10.6
280000	6415000	14.0
310000	6445000	14.0

As stated in the AQIA, *"It is important that the above values are not confused with measured background levels, background levels excluding only the Mount Pleasant Operation, or the change in existing levels as a result of the Project. The values above are not background levels in that sense, but are the residual amount of the background dust that is not accounted for directly in the air dispersion modelling of the Project and other local mining operations."*

All of the land and sources of dust associated with all mining areas are explicitly modelled (i.e. including what would otherwise be background dust) noting that air dispersion models inherently overestimate mining impacts. The lowest off-site residual was therefore conservatively extended to represent the residual value across all of the mining site areas.

For convenience, all of the residual values are plotted on the residual grid map (Figure 5-3 in the AQIA) in the figure below.



Although it is not a specific issue raised to close out the peer review, the review concludes with the following:

Additionally, there are two important inputs that remain unsupported through site-specific evidence. As these inputs are critical for determining the emissions from one of the most significant sources, wheel generated dust, it is recommended that some monitoring be conducted to confirm:

1. the ability to achieve a 90% control efficiency through the application of water alone

2. silt content of 2% will be achieved on the main haul roads

The control efficiency of 90% applies only to the main coal haul road leading to the Coal Handling and Preparation Plant (CHPP). This haul road is a generally permanent haul road maintained for the life of project. It is constructed of high-quality materials to ensure its longevity and would easily achieve this level of control through regular maintenance.

The control efficiency was adopted based on measurements conducted for NSW EPA wheel generated dust Pollution Reduction Programs (PRP's) carried out by four separate Hunter Valley mines, including mines nearby to Mount Pleasant. Each of these reports were reviewed by the most senior EPA air expert staff and accepted without any amendment. These reports provide evidence, (at the high standards required for regulatory compliance), and sufficiently demonstrate the level of haul road control efficiency that is achievable at mine sites in the Hunter Valley. An additional information package was provided to the peer reviewer (**Todoroski Air Sciences, 2022**) which included the PRP program methodology and calculations for control efficiency. We note that this control factor has been applied for previous Air Quality Assessments for the Mount Pleasant Operation (MOD 3 and MOD 4) which have been previously reviewed by NSW EPA and other peer reviewers. Overall, the ability for mining operations to achieve a 90% (or higher) level of control on main haul roads is well proven and is documented in various reports and studies, as previously referenced.

We note that lower levels of control are applied in the AQIA modelling for haul roads that are not the main haul road, (i.e. a level of 80% is used, corresponding to the minimum level required by the EPA).

It is also important to observe that the air dispersion modelling presented in the AQIA presents a robust overall representation of the likely impacts associated with the entire operation, which is comprised of very many sources. The main haul road in question here, whilst it is a relatively significant part of the total emissions generated, is still just one of the many activities on the site and is relatively centrally located (further from receptors than most of the other activities/ sources). It also meanders somewhat and extends a long distance, (thus only part of it is likely to be upwind of any one receptor at any time). Due to this, the main haul road would not be a major contributor to contributed Mount Pleasant Operation mine dust at any receptor at any time.

We also point out that there are a numerous other variables applied in the emission factor equations used to estimate the dust emissions that input to the dispersion modelling, for each of the varying sources. It is important that suitably representative values are used to provide a realistic representation of the total emissions, and the haul road control factor and the silt fraction are just two of the many input values used in the model calculations.

It is known that these values will vary (higher or lower) at various times in practice, for example due to the normal cycle of degradation and re-conditioning of the road surfaces and due to changing weather conditions, or whether the trucks are loaded or unloaded. It is possible to use a large range of input variables to the model, and yet still arrive at the same, or very similar total emissions values for dust. We note that the entire ensemble of all such variables and the actual emissions from all such sources is more important, and ultimately the predicted dust levels in the air at receptors relative to performance on the ground is what actually matters.

We note that the peer review presents the 44 silt measurements for haul roads from the ACARP study (**PEL, 2015**), the values presented in the **TAS (2021)** and 28 additional measurements made across numerous mine sites from other studies which TAS has not found in the public domain. The peer review provides a Figure 1, which appears to aim to show the applied 2% silt content used for in the AQIA is not appropriate based on this dataset. The figure however contains silt fraction data for both controlled and uncontrolled roads, and main haul roads and non-main haul roads. (It is not stated what control levels are applied the controlled roads with silt data shown, or which silt data are for main roads and non-main haul roads).

The data in the reviewer's Figure 1 includes silt measurements from several mines in the Hunter Valley, taken from the ACARP study (**PEL, 2015**) referenced by the reviewer and forming the reviewer's primary source of supporting data. Figure 3.8 of the ACARP study (**PEL, 2015**), is reproduced below. The figure shows the levels of measured uncontrolled emissions from all haul roads at various coal mines. The emissions are expressed in terms of grams per vehicle kilometre travelled (g/VKT). The average PM_{10} emissions for uncontrolled roads in the figure are 260g/ VKT, and the maximum uncontrolled emissions at one mine, on one day, are approximately 750g/VKT. Superimposed on the ACARP study figure (see below) in red colouring is the value of the haul road emissions used in the AQIA of approximately 700g/VKT.

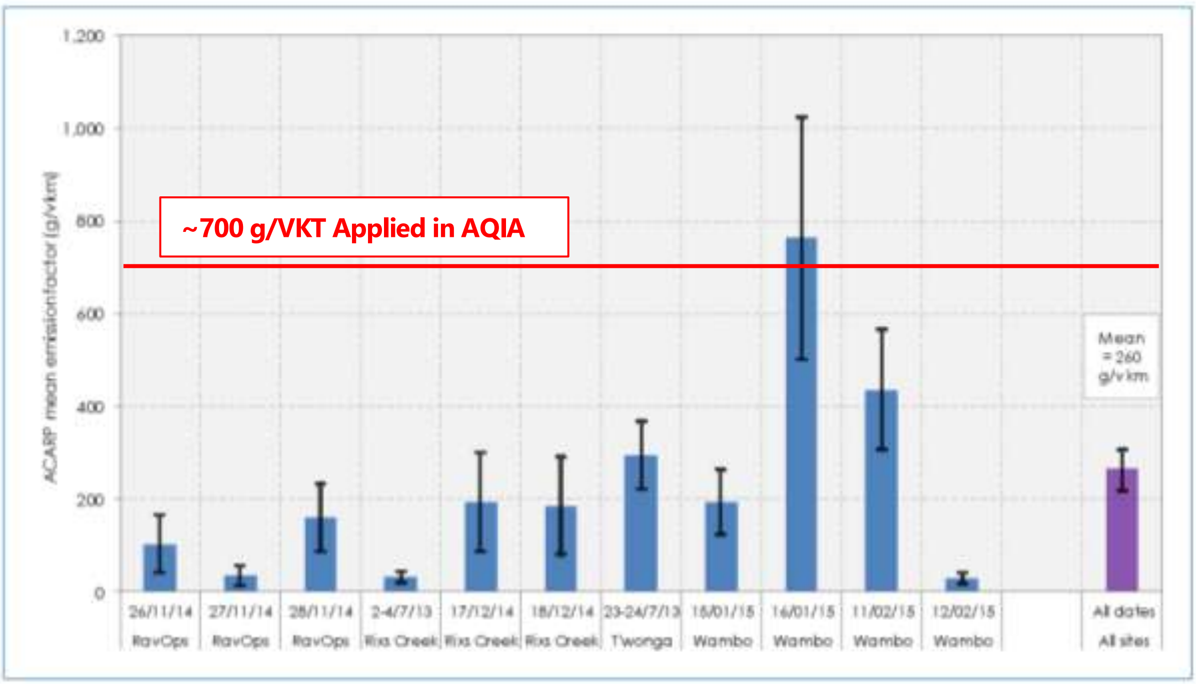


Figure 3.8: PM_{10} emission factors (g/vkm) for haul trucks by measurement campaign (mean values and 95% confidence intervals)

The ACARP report goes on to calculate the haul road emissions using the same AP-42 equations used in the AQIA modelling, and compares these with the actual measured results, which indicates that the measured emissions from "*…the Australian coal mines included in the study were significantly lower than the values obtained using the AP-42 calculations for equivalent conditions.*"

It is noted that the uncontrolled haul road emission level applied in the AQIA is approximately 700g/VKT (refer to Appendix C, Tables C-2 to C-7), as calculated with the 2% silt value. This rate of emissions is close to three times higher than the average level of uncontrolled emissions measured for haul roads in the ACARP study (260g/VKT), (and is relatively close to the maximum level measured (~750g/VKT) on any day at any mine in the ACARP study).

If the minimum EPA required haul road control efficiency of 80% is applied to the measured uncontrolled values in the ACARP study, the data show that (100 - 80)% x 260g/VKT = 52g/VKT is the maximum average rate of emissions that could be expected from application of minimum control on haul roads per the ACARP study, whereas the AQIA applied a value of (100 - 90)% x ~700g/VKT = ~70 g/VKT for the main haul road in the modelling; a significantly higher emission value than measured in the ACARP study when both the silt fraction and control level is considered. The AQIA applied a significantly higher emission rate of approximately 140g/VKT (approximately double) for non-main haul roads. This illustrates that the AQIA is consistent with the industry approach of estimating air quality emissions conservatively.

Thus, we do not accept the reviewer's comments in regard to any concern that the applied combination of silt content and control level in the AQIA is not conservative with respect to modelled emissions (as opposed to the wholistic assembly of many such model input factors), nor do we agree that the resulting emission estimates are unsupported by the factual evidence, including not only the extensive EPA PRP studies but also the information referenced by the reviewer when it is considered more holistically.

We specifically do not agree that it is reasonable to isolate these two variables and to overstate their relevance to total AQIA emission estimates, in light of the fact that emissions for haul road operations as modelled in the AQIA are conservative relative to the values measured in the ACARP study that is the basis for a significant part of the reviewer's data set on measured silt levels.

It is also highly relevant to consider that this mine has been in operation for a number of years and has been demonstrating that it can comply with the relevant performance outcomes in regard to the actual and predicted dust levels at nearby receptors. The current modelling applies the same assumptions as that for the proven operation of the mine at this site, and there is no reason to consider that the predicted outcomes of the modelling are unreliable in any way, or that the mine would not achieve the predicted levels at receivers

The modelling presented is a reasonable representation of the likely impacts associated with the operation.

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

References

Todoroski Air Sciences (2020)

"Mount Pleasant Optimisation Project Air Quality Impact Assessment", prepared for MACH Energy Australia Pty Ltd by Todoroski Air Sciences, December 2020.

Todoroski Air Sciences (2021)

"Response to Peer Review - Mount Pleasant Optimisation Project Air Quality Impact Assessment", prepared for MACH Energy Australia Pty Ltd by Todoroski Air Sciences, December 2021.

Todoroski Air Sciences (2022)

"Information Request for to Peer Review - Mount Pleasant Optimisation Project Air Quality Impact Assessment", prepared for MACH Energy Australia Pty Ltd by Todoroski Air Sciences, January 2022.

Zephyr Environmental (2022)

"Independent Technical Peer Review – Air Quality Impact Assessment Mount Pleasant Optimisation Project", prepared for Department of Planning and Environment by Zephyr Environmental, February 2022.

PEL (2015)

"ACARP Project C22027 – Development of Australia-Specific PM_{10} emission factors for coal mines, Australian Coal Association Research Program, September 2015).