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Via email: Michael.Plain@stratfordcoal.com.au

RE: Rail Haulage Dust Audit – Duralie Coal Mine

Dear Michael,

Thank you for engaging Todoroski Air Sciences (TAS) to conduct an audit of coal dust emissions from the rail haulage of unwashed run-of-mine (ROM) coal from the Duralie Coal Mine to the Stratford Coal Mine.

This letter outlines the observations and findings of the audit conducted on 28 November 2013 and includes some recommendations to the current operations.

Background

The Duralie Coal Mine (the Project) is located within the Gloucester Valley, approximately 13km north of the township of Stroud.

The operation of the Project has the potential to affect the air quality in the surrounding environment and impact the nearest sensitive receptors which are located to the west and south of the Project.

A previous study of dust emissions from rail transport conducted in accordance with Schedule 3, Condition 21A of the Project Approval (08_0203) for the Duralie Extension Project (**Katestone, 2012**) concluded that the current dust mitigation practices of watering ROM coal at the Duralie Coal Mine rail load-out facility were appropriate for controlling potential dust emissions from laden trains transporting ROM coal to the Stratford Coal Mine.

The current rail dust mitigation measures at Duralie Coal Mine are outlined the most recent *Air Quality and Greenhouse Gas Management Plan* (**Duralie Coal, 2013**), and include:

- ✦ The application of water to the coal surface as each wagon is loaded, approximately 90 litres of water is applied to the surface of the ROM coal in each wagon; and
- ✦ Re-wetting of the coal surface via sprayers when the fully loaded trains depart from the rail load-out facility.

On November 1, 2012 the Duralie Coal Mine had its Project Approval conditions modified to extend the hours that the Duralie ROM coal shuttle train can operate between the Duralie and Stratford mines in the Gloucester Valley of NSW. The modified Project Approval conditions requires an independent environmental audit of the activities involved in the transport of ROM coal by rail for processing at the nearby Stratford Coal Mine which is a distance of approximately 20 kilometres by rail to the north of the Duralie Coal Mine.

The modification to the Project Approval specifically contains the following condition shown below, which is the driver for this audit.

*9A. By the end of December 2013, and with every Independent Environmental Audit thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of a **Rail Haulage Audit** of the project. This audit must:*

(a) be conducted by a suitably qualified, experienced and independent experts whose appointment has been endorsed by the Director-General;

(b) review the existing rail haulage operations and determine whether all reasonable and feasible measures are being implemented to minimise the:

- noise and dust impacts of these operations;*
- use of the shuttle train during the approved night-time hours;*
- dispatch of trains from the site between 9.25pm and 1am the following day; and*

(c) recommend appropriate measures or actions to improve the efficiency of these rail haulage operations and minimise their associated impacts; and

(d) evaluate the use of the exceptional circumstances provision in condition 8 of schedule 2, and the associated reporting on any use of this provision on the Proponent's website (see condition 8A in schedule 2).

This audit aims to examine the potential dust impact of the rail haulage operations, whether all reasonable and feasible measures are being implemented to minimise dust emissions and make any relevant recommendations in regard to potential improvements that can be made.

The exceptional circumstances component is targeted at noise emissions and was not a component of this review.

In conducting this review, we took the view that ancillary activities, such as loading and unloading of trains, form part of the activities associated with rail haulage essentially to the extent of such activities directly associated with rail haulage of ROM coal from Duralie Coal mine to Stratford Coal mine.

Ambient air quality

Available ambient air quality monitoring data collected by Duralie Coal mine and Stratford Coal mine are presented in **Figure 1** and **Figure 2**.

The data show the levels of dust at the monitoring locations, which are near receptor dwellings.

The recorded dust levels are below the key applicable criteria of 50 µg/m³ for 24-hour average PM₁₀.



Due primarily to the low dust levels, the data were not analysed in detail this audit. Other reasons to not analyse this data in detail include that the available monitoring locations are not located in close proximity to the rail line, or are in locations that would be influenced by other mining activity. The data therefore could not be used to reliably isolate and calculate the effects of the rail haulage activity on ambient dust levels.

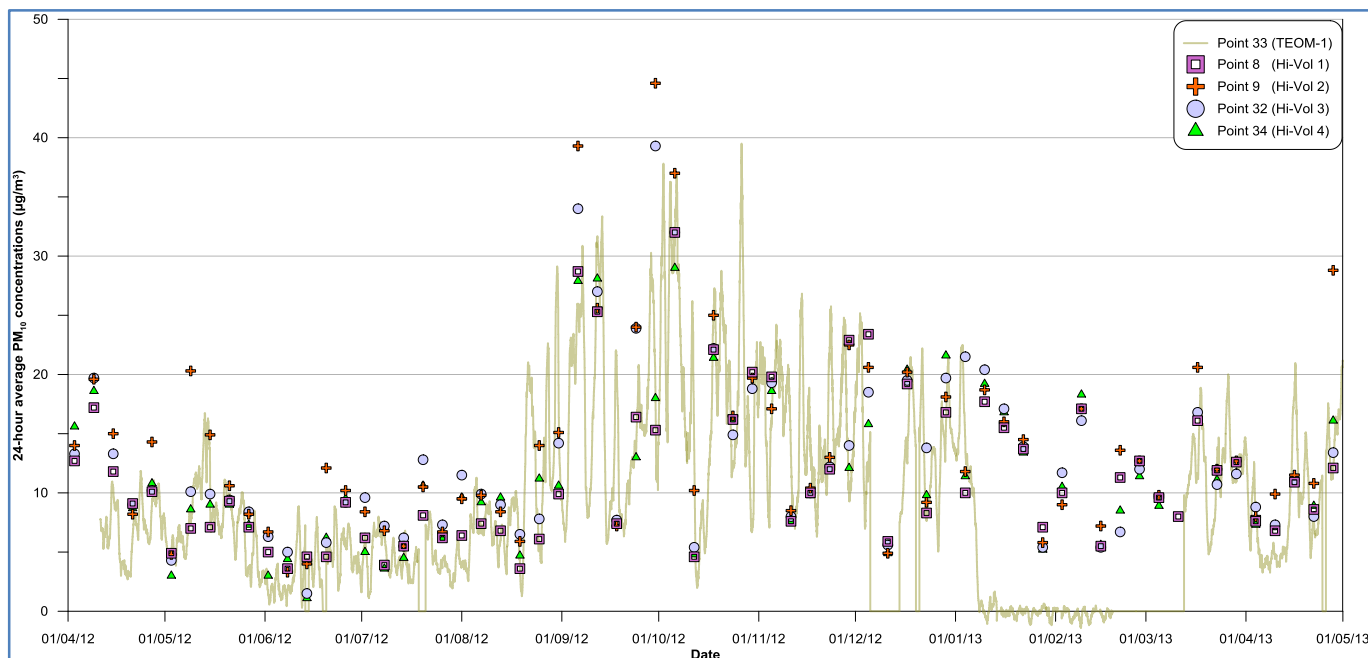


Figure 1: Duralie TEOM and HVAS 24-hour average PM₁₀ levels

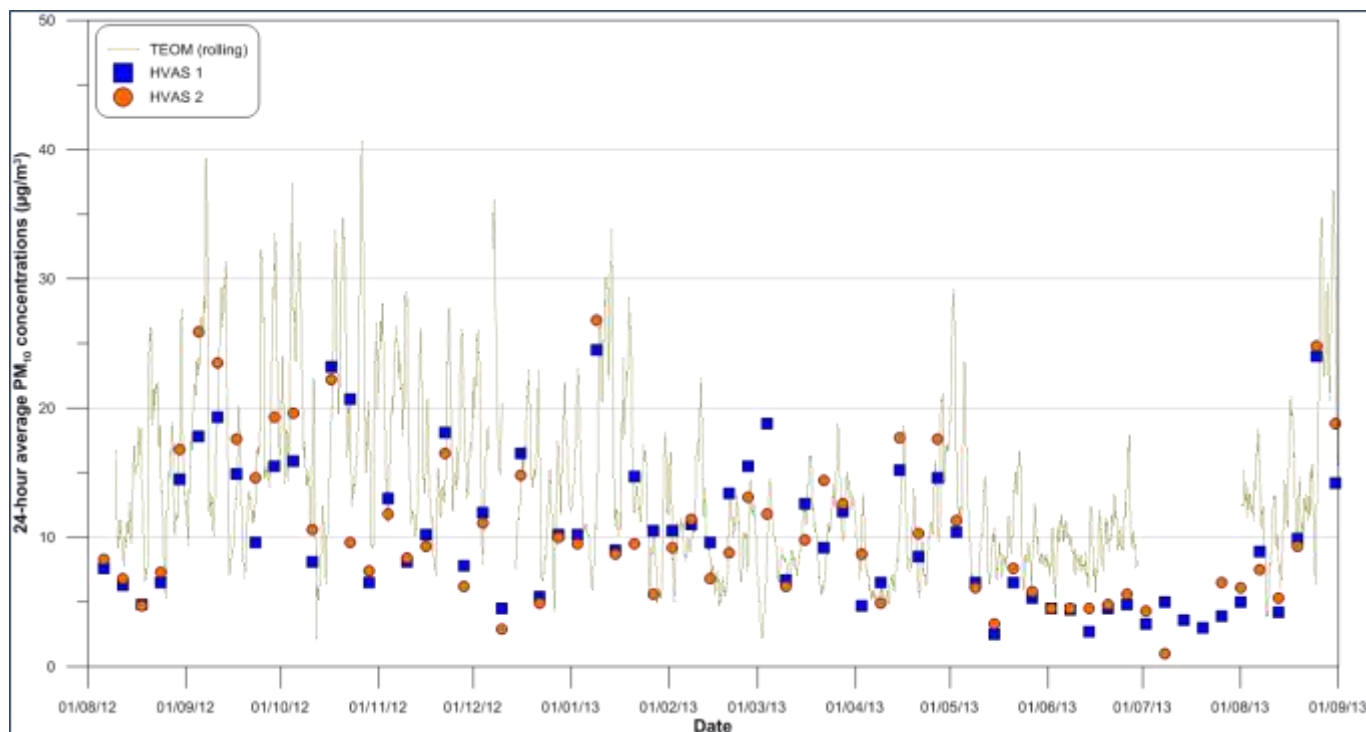


Figure 2: Stratford TEOM and HVAS 24-hour average PM₁₀ levels

Site Inspection Observations

The audit site inspection was conducted on 28 November 2012. On this day, the weather conditions were clear and the ambient temperature relatively hot, and was preceded by several hot days on which there was little or no rain.

Generally, it is considered that this day was an ideal time to conduct an audit of potential dust emissions, as the likelihood of dust being released would be increased due to the preceding period of dry and hot conditions.

A bushfire was observed nominally to the west-northwest of the operations on this day, but this event did not affect the audit. It is mentioned only to emphasise the nature of the hot dry conditions on the day of the audit.

The audit was conducted by observing the relevant activities in the sequence that they occur from; the loading of ROM coal into bins in preparation for loading trains, the loading of trains, transport of ROM coal by rail, unloading of the ROM coal, conveying and stacking the coal into stockpiles, and finally the return rail journey with empty rail wagons.

The series of photographs below was taken on the day of the audit and is used to illustrate the observations made.

The audit began in the Duralie Coal Mine office. The schedule of coal trains was examined, as were complaints records.

No complaints related to coal dust from rail transport had been made.

The transport of coal by rail was delayed on the day due to a fault with one of the locomotives. This did not effect on the audit findings, and in fact, as outlined later on, may have contributed to a greater risk of coal dust generation by the rail hauling activities on this day.

Figure 3 shows a haul truck unloading ROM coal into the hopper serving the rail load out bin. Whilst not obvious, coal can be seen tipping off the tray of the truck and into the hopper. There was no visible dust emission from any part of this activity. This is attributed to two things: the relatively moist nature of the ROM coal, and the use of water sprays on the inside of the hopper bin during coal unloading.



Figure 3: Loading ROM coal to hopper servicing rail load out bin

From the hopper, the ROM coal passes through a rotary mill to break up large lumps of coal and separate large rocks. Whilst a photograph was not taken, the process is essentially enclosed and there was no visible emission of dust. After the rotary mill, the coal is conveyed to the rail load out bin. Again, there was no visible emissions of dust from the conveying of the coal.

At the rail load out bin, the chute at the bottom of the bin was aligned to sit directly above the coal wagons. Water spray nozzles are attached to the chute and operate whenever the chute is open.

Figure 4 shows the operation of the coal load out chute and water sprays. It can be seen that the water sprays saturates the coal with extensive pooling of water evident on the coal surface.

The chute is positioned close to the height of the top of the coal wagons. This serves the purpose of “profiling” the coal surface to a smooth even level, and avoiding spillage of coal.

A smooth even coal surface profile is an important consideration in regard to air flows over the travelling train, and helps to reduce turbulence which may dislodge coal particles from the surface.

The effectiveness of the chute in controlling spillage is evident in the generally clean area under the rail load out bin, as shown in **Figure 5**.

No dust was evident during the rail load out operation. This is attributed the moist nature of the ROM coal, and the use of water sprays on the surface of the coal being loaded into the wagons.



Figure 4: Loading of ROM coal into rail wagons at Duralie Coal Mine



Figure 5: Area under wagon load out at Duralie Coal Mine

During the audit, the departure of the train was delayed due to a fault with one of the locomotives. This meant that the loaded train was stationary in the sun for a prolonged period prior to departure. The situation would carry more risk as the coal surface may dry out, and potentially release coal particles more easily.

It is normal practice to activate the bank of water spray nozzles to wet the coal surface for departing trains. This was done on this day, as shown in **Figure 6**, where the sprayed water can be seen pooling on the coal surface of the departing wagons.



Figure 6: Water spays on departing rail wagons at Duralie Coal Mine

The loaded trains leave Duralie Coal Mine and head north towards the Stratford Coal Mine. The trains are unable to reach maximum speed for some time as there are tight bends in the rail line and it is on a grade. Discussions with the rail operators indicated that the maximum train speed on the rail line occurs near the Martins Crossing Road rail crossing.

The same train shown in the previous figures was observed reaching this point, as shown in **Figure 7**.

No dust was evident from the surface of the coal wagons or the rail line. The train was observed for some time prior to reaching the location, and after passing the location.

It is noteworthy, that due to the previously mentioned locomotive problem, some of the leading wagons were empty on this occasion. This would cause greater air turbulence over the moving train and mean that there was more scope for liberation of coal dust from the loaded wagons behind.

Figure 7 shows the last empty wagon (left) and the first full wagon (centre).



Figure 7: The loaded train at Martins Crossing Road crossing after departing from Duralie Coal Mine

The same train was observed unloading coal at the Stratford Coal Mine rail loop. This is shown in **Figure 8**. The figure shows coal dropping from the bottom of the wagon, through the grate under the rail line and into the revivals hopper. The coal vigorously unloaded from the wagon in a short period, however no dust was noticeable during this operation. It is noted that a water spray operates during the unloading operation.

The system is automated to prevent excess discharge of coal, and this prevents spillage over the top of the receives hopper. A skirt is evident in the figure and serves the function of capturing coal that may bounce off the grate and rail line during unloading. These are relatively important dust controls, as rail bogies that plough through an overloaded hopper inevitably pick up coal which can later blow off or deposit on the rail line and become a source of dust.

After unloading, the hatches at the bottom of the wagon are closed. **Figure 9** shows the closed hatches. The figure also shows the water spray that operates during the load out operation. The water spray is on the far side of the train to the photographer, but is seen as a mist in **Figure 9**.

Figure 9 and **Figure 10** show that coal does fall onto the rail line, and that the wheels of the wagons pass through this coal. The observations suggested that the coal does this because it is relatively wet. However the observations were that the coal sits on only a narrow part of the rail line and simply falls aside once a train's wheels begins to touch the coal.

Figure 11 shows that after unloading, and pushing aside coal resting on the rail line surface, there was no parasitic coal evident on any parts of the wagon. This is important as it shows that the rail unloading operation works effectively to prevent coal carry over on the wagons, and avoids potential dust problems associated with coal coming off the wagons or depositing onto the tracks at a later time.



Figure 8: Coal dropping from the bottom of the wagon into the rail unloading hopper (underneath the wagon)



Figure 9: Immediately after coal unloading, showing continuous water sprays (other side of wagon to photographer), and coal resting on the rail track.



Figure 10: Same wagon just after unloading showing coal resting on rail track.



Figure 11: Same wagon after unloading and passing over coal resting on rail track, showing no evidence of parasitic coal attached to rail wagon bogies and undercarriage

The unloaded coal is then transported by conveyor and loaded onto ROM coal stockpiles at Stratford Coal Mine coal washery. It is understood that coal from Stratford Coal Mine is stockpiled separately to coal from Duralie Coal Mine.

The operation of the conveyor and the fall of ROM coal onto the stockpiles is shown in **Figure 12**. No dust was observed during this operation.



Figure 12: Conveying and loading Duralie Coal Mine ROM coal to the Stratford Coal Mine stockpiles

After unloading, the coal trains return to Duralie Coal Mine. There is a risk that residual fine coal particles on the inside surfaces of the coal wagons, or from remnant coal in the wagons may blow off during the return journey. Anecdotally, some studies have found that the unloaded wagons may have similar emissions to loaded wagons. Thus observations were also made of empty coal wagons on the return journey to observe whether any dust emissions occurred.

Due to significant congestion on the line, and scheduling delays arising due to the fault with one of the locomotives, the returning train was delayed by approximately 4 hours. During this time the train was stationary in the sun on a hot day, and would have thoroughly dried out any potential damp layer of fine coal particles on the wagons, or on the surface of any residual coal remaining inside the wagons.

Thus the potential for coal dust emissions from the empty wagons was high when the observations were made.

Observations of the empty coal wagon were made at the Woods Road crossing, and are shown in **Figure 13**, **Figure 14** and **Figure 15**. The train accelerated up to high speed whilst the observations were being made.

There was no visible dust evident from the unloaded wagons.

Smoke emissions from the diesel engine of the locomotive however were evident, and occurred under hard acceleration for a brief period of approximately 10 to 15 seconds. These emissions are not easy to see in the photograph, but have been circled in red in **Figure 15**.

It is noted that the locomotive diesel engine smoke emissions associated with the returning train were not unusual or remarkable relative to any other rail engines observed on the day, (i.e. XPT and goods trains).



Figure 13: Empty coal wagon accelerating towards maximum speed



Figure 14: Close up of empty coal wagon nearing maximum speed



Figure 15: Smoke from diesel locomotive under hard acceleration

Conclusions and recommendations

The conditions at the time of the audit were close to ideal, in that they were likely worst case conditions for the release of coal dust from the rail haulage operations.

The audit however was unable to identify any visible dust emissions associated with the transport of ROM coal from Duralie Coal Mine to Stratford Coal Mine.

Emissions of smoke were clearly visible on this day, and it is considered that any coal dust emissions with scope to cause annoyance or harm to any receptors would also have been observable on this day.

It is understood that there have been no reported complaints related to coal dust from rail haulage.

In this situation it is concluded, through this audit, that dust emissions related to rail haulage from the Duralie Coal Mine to Stratford Coal Mine are insignificant.

The situation is attributed to the application of water sprays at key points in the coal handling process, good design and operation of load out bins and receiving hopper and the generally moist nature of the ROM coal.

There were no aspects of the operation that would warrant changes to reduce emissions, as there were no tangible emissions of dust evident at any part of the process.

It is recommended that the mine continues to operate the water sprays during loading of the coal wagons, upon departure of the coal train, during unloading of the coal train, and at hoppers and other points along the coal handling process.

It is not recommended that any changes be made to the existing monitoring network. This audit found that the dust emissions from the rail haulage were found to be insignificant and therefore do not warrant further monitoring provided that existing practices are maintained in this regard.

To maintain a high level of control as observed during the audit, it is suggested that the operator consider regularly checking:

- ✦ that the water sprays operate effectively;
- ✦ for excessive coal on the ground in the areas around the coal load out bin at Duralie Coal Mine and at the coal unloading terminal at Stratford Coal mine; and,
- ✦ there is no accumulation of coal on the wagon bogies, and that wagon hatches are sealed tightly.

All observed faults with water sprays should be promptly rectified.

In the event that excessive amounts of coal are found in the areas around the coal load out bin at Duralie Coal Mine and at the coal unloading terminal at Stratford Coal mine, the coal should be cleaned up promptly, and the site inspected shortly afterwards (a day or two later) in order to observe/ identify the cause of any excess coal spillage. Where a problem is found it should be promptly rectified.

Where excess parasitic coal is found on a number of wagons, the rail unloading operation should be observed to check for overfilling of the receiving hopper, and promptly rectified should a problem be found.

Wagons observed to have improperly closing hatches should be reported to the rail operator for rectification during maintenance.

Based on the findings of this report, it would not appear to be necessary to conduct further audits, provided the operator continues to implement its current controls to the rail haulage operations, and maintains a log of periodic checks, (that encompass the key aspects outlined above) to confirm that the operations are implementing all reasonable and feasible mitigation measures.

Table 1 presents a summary of the audit findings.

Table 1: Summary of audit findings

Relevant Condition	Observation	Complaint (yes/no)	Recommendation
Review the existing rail haulage operations to determine whether all reasonable and feasible measures are being implemented to minimise the: <ul style="list-style-type: none"> dust impacts of these operations 	<p>All reasonable and feasible measures were observed to be applied.</p> <p>No visible dust was observed for any part of the process, and measured dust levels are low. It is concluded that there is no impact on dust due coal emissions from the rail haulage activity.</p>	Yes	<p>No changes to operational practices are required.</p> <p>Provided that;</p> <p>Regular inspections are recorded/documentated by the mine to confirm that it is maintaining its existing controls and practices into the future. (For example, this could be a visual check or photo per a simple check off list), and</p> <p>If any issue be found during a regular inspection, it should be promptly rectified, and the solution documents, then;</p> <p>No further audits of dust from rail haulage would be warranted.</p>

Please feel free to contact me if you need to discuss (or require clarification on) any aspect of the above.

Yours faithfully,

Todoroski Air Sciences



Aleks Todoroski



References

Katestone (2012)

"Duralie Extension Project, Study of Dust Emissions from Rail Transport", Prepared for Duralie Coal Pty Ltd by Katestone Environmental Pty Ltd, February 2012

Duralie Coal (2013)

"Duralie Coal Mine Air Quality and Greenhouse Gas Management Plan", September 2013

