Cowtime Investments Pty Limited

Koolbury ROW off New England Highway

Muswellbrook, NSW, 2333

2 March 2021

The Secretary
Department of Planning, Industry and Environment
12 Darcy Street,
PARRAMATTA NSW 2150

Dear Sir/Madam,

Mount Pleasant Optimisation Project - SSD 10418
Background and Introduction

We own the land which comprises a large dairy farm immediately adjacent to the Mount Pleasant open cut coal Mine (the **Mine**). We and our parents before us have been operating the dairy farm since 1982.

It is the largest dairy remaining in the Upper Hunter.

We produce close to10 Million litres of milk each year at the dairy, milking cows twice a day 365 days per year (366 in a leap year).

We lease some land and some water from the owners/operators of the Mine which we use as part of the dairy farming operation (and have done so for many years). We keep that land in tip top shape and that, combined with the first class presentation which we make to our property presents the area between the high profile New England Highway and Great Northern Railway and the Mine beautifully presented.

We are the nearest commercial agricultural enterprize operating adjacent to the Mine.

We have been experiencing impacts from the Mine since it started in 2017. These include dust, noise and lighting. These impacts have had a very significant negative effect on the lifestyle of the 3 families who live on the farm (necessary for operation of the farm) and on the operation of the farm.

As a result of those negative effects, we have been in discussion with the owners/operators of the Mine for them to purchase our property since 2019 but unfortunately those negotiations have not progressed.

We have no objection to the approval of the Mine's development application but we do think and we submit that the impacts of the Mine on us (both past and future – it its proposed doubled size) are so significant that the owners/operators of the Mine should be required to purchase our property in accordance with the usual provisions for such matters.

We acknowledge the benefits which the approval of the development application for the Mine would bring to the Upper Hunter, to the State of New South Wales and to Australia, however, we submit that we are bearing the brunt of the impacts from this massive development and that burden is going to increase enormously if the development application is approved. We don't think that it is fair or

appropriate for us to disproportionately bear the burden of the impacts of the development and so we request the incorporation of a "voluntary land acquisition" condition in the consent for the Mine.

We also believe that the incorporation of such a condition is consistent with the Voluntary Land Acquisition and Mitigation Policy (**VLAMP**) referred to in *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (**SEPP Mining**). We commissioned an independent air quality expert to review the relevant parts of the Environmental Impact Statement (**EIS**) for the development application and they have advised that there are some areas in the EIS air quality impact assessment which do not accurately reflect the likely impacts on our property and that as a result of some incorrect assumptions incorporating in the modelling. As result, our expert advises that if the air quality impacts assessment had adopted more appropriate assumptions then it would be likely that the VLAMP would dictate inclusion of a voluntary land acquisition condition relative to our property.

We are not opposed to the approval of the Mine. We just request the inclusion of a voluntary land acquisition condition for the benefit of our Property.

The impacts on us from the Mine are so significant and the financial impost of requiring the operators to acquire our property is, in the scheme of the estimated approximately $1 Billion capital costs, not material.

Our Property

Our property comprises the following:

Owner	Property Particulars	Area	Residence Included
Cowtime Investments	Lot 1 DP396313 & Lot 302 DP715492	59.89 Hectares	Yes
DN Raphael Pty Ltd	Lot 61 DP747681 & Lot 56 DP1025497	120.35 Hectares	Yes
Cowtime Investments	Lot C/325110, 1/653966, 1&2 C/784322, 101/844259	89.20 Hectares	Yes
Cowtime Investments & DN Raphael Pty Ltd	97 Burtons Lane		

Our property is very close to the Mine – approx.. 700 metres at the nearest point. The residences are 1,200 72 Kayuga Road to mine operations. Doug's home approximately 2,500 meters as the crow flies and John and Catherine's house approx.2,800 metres as the crow flies (distances calculated from Google Earth search to nearest points of the mining operation (all within 3km of the mine as the crow flies) away from the mine. The areas involved can be seen in the **attached** aerial photograph (a little out of date) onto which we have written notes showing where our property is located.

Our Lives Experience Since the Mine Started

The Mine commenced operations in 2017. Prior to that, despite the approval having been granted in 1999, there was no activity at the Mine and no impacts. Our existence at our farm was undisturbed by

mining operations (excepting only on very rare occasions when we were able to see parts of the Bengalla operation, but there was no perceptible dust, blasting or noise impacts from Bengalla).

In the **attached** photographic records you will see some images of what things were like before the Mine commenced operations (see Annexure A).

Our lived experience (24 hours a day, 7 days a week) since the Mine commenced operations has been unpleasant and difficult. We have been impacted by noise and dust and also visual impacts and blasting impacts.

The dust has been relentless. Its presence make our workplace, home and work life significantly less pleasant overall and, on some occasions, seemingly unbearable. The dust permeates everything in the house and our swimming pool and our drinking water and all our equipment and pastures.

Some photographs of the dust taken from our property are **attached**. They depict how things are very often at our property with the impacts from the dust from the Mine. Irrespective of any of the modelling or predictions, this is how it is at our property.

That is the situation with the Mine operating as currently approved. The proposal which is currently before you seeks approval to increase maximum production of coal to double the current maximum (and we understand that the Mine has not been operating at anywhere near its maximum allowed levels until now).

We understand that the strip ratios increase as the Mine progresses under this proposal and therefore there is more earth moved for each tonne of coal mined. Whilst it is extremely difficult to work out from the EIS the total amount of overburden (including topsoils and clays), page 3-20 of the EIS indicates that “Waste Rock” production starts at 34.2 Mbcms and increases to a peak of 89.2 Mbcms during the project. We are not told how much overburden is moved now or in the future in total terms however it is possible to extrapolate from the EPA NSW figures for conversion of overburden bcms to tonnes (ie 1:2.4) that with coal production increasing from 10.5 Mt pa the 34.2 bcms will convert to 82 M tonnes of waste rock. This is confirmed by the Mt Pleasant Mining Operations Plan. When ROM coal production peaks at 21 Million tonnes per annum the waste rock production will be 214 Million tonnes per annum.

So disregarding topsoil and clays removed and assuming all materials are handled only once (an assumption which would generate the minimum impact) the total amount of material handled at the Mine if this is approved will peak at over 235 Million tonnes in a year disregarding topsoils and clays and rehabilitation and handling and disposal of the 33% waste on processing pf coal. Rehabilitation will involve a material amount of additional material handling which will also generate further dust.

In year 5 (2023-24), the Mining Operations Plan for the Mine reports that 10.5 million tonnes of ROM coal will generate

Accordingly, the amount of material moved generated from the mining of double the amount of coal will be three times as much (not double) and accordingly it could be presumed therefore that the increase in dust generated by that activity would increase by in the vicinity of 3 times.

The Air Quality Impact Assessment (AQIA)

The EIS incorporates a 700 page AQIA. To assist in understanding whether this was a reasonable assessment of the impacts of the proposed Mine on our property, we engaged an independent air

quality expert (Northstar Air Quality – Mr Martin Doyle Director). Their report is **attached** (the **Northstar Report**)

The Northstar Report notes that "*there exists the potential for significant underestimation of particulate emissions and impacts associated with the development. The assessment of voluntary acquisition rights should be revisited as this has not been performed appropriately*...".

The Northstar Report also notes that the AQIA:

- uses unjustifiably low silt content for unpaved haulage routes which is well below documented average silt contents for similar roads
- uses and unjustified control factor on unpaved haulage routes
- assesses 24 hour impacts on our property relying upon annual emissions inventories irrespective of peak activity rates as compared to average activity rates
- applies the VLAMP in a flawed way

The findings in the Northstar Report indicate that the assessment of the impacts of the proposed Mine on our property are not reliable.

For that reason, the Northstar Report findings support our contention that any consent to the development application which has been lodged for the Mine should incorporate a condition which requires purchase of our property on the usual conditions per the VLAMP.

We have also compared the AQIA with similar reports for other mines in the Hunter Valley which have sought approvals. It seems that other mines model the dust impacts of more plant and equipment than what is modelled for this mine in this AQIA. In short, the question is why hasn't this mine assessed the impacts of a full suite of mining plant and equipment. Assuming that some plant and equipment has not been included in the modelling, the actual dust impacts from the proposed mine expansion will be much greater than what has been modelled.

Amenity

The amenity at our property is currently badly impacted by the Mine (as depicted in the attached photographs taken from our property). That is expected to be exacerbated by an approval which authorises the movement of over three times the amount of material currently authorised for movement under the existing development consent.

The potential of the AQIA to underestimate the air quality impacts as highlighted in the Northstar Report is borne out by our lived experience at our property. Our photos of life on our property since the Mine commenced show clearly the air quality (from blasts and mining operations) issues which we live with on a daily basis.

We also hear the noise from the mine during the day but also more disruptively during the night.

These impacts affect:

(a) our lifestyle, which has deteriorated materially from what we had. The compensation for having a job which involves hard physical labour, in all climatic conditions (hot, cold, rain, hail or shine) and being on duty 365 days per year is a peaceful and clean and healthy environment;

(b) our health, with lower air quality and dirt inside our houses and lost sleep;

(c) our dairy operation – we have **attached** a report from our dairy expert which lays out (from an independent expert) what some of the impacts from the Mine have been on our dairy operation). We set out below some further detail on this issue;

(d) our outlook with the visual impacts from the Mine; and

(e) our ability to sell our farm. As the farm's proximity to the Mine and the actual and perceived current and future impacts from the Mine, it will be virtually impossible for us to sell our property for its value and that will impede the ability of the owners of our property to retire from their occupation when the right time comes.

Sense of Place

As our before and after photographs depict, we have suffered a significant loss of "sense of place" from the commencement of this Mine and we think that the operators should be required to purchase our property in the event that we elect to no longer be subject to the impacts and walk away from our property which has lost its "sense of place" for us.

Apart from the amenity and other impacts mentioned above, there has been an almost total dislocation of the farming community around us. Farmers rely on one another for emotional, technical and practical support and assistance. They interact, give and receive advice, support one another through the hard times (of which there are plenty) and they help each other fix gear, undertake tasks for which many hands are required and lend each other equipment from time to time. The displacement of the farming community in the area of the property has been a heavy loss for ourselves and our operation.

Distributive Inequity

We acknowledge that there may be significant economic benefits which would flow from the Mine being approved to continue but we are not participating in that benefit. Accordingly, the burdens of the Mine proceeding are with us, the nearest neighbours (who don't participate in any upside from the Mine development proceeding) whereas we bear an enormous burden relating to the Mine.

The EIS acknowledges (at ES-24 and also referred to in Appendix N to the EIS) that "…*negative social impacts would continue to be experienced by people in close geographical proximity to the current operation* …". Of the $855M estimated net present value of the economic benefits to the State of NSW from the Mine none will flow to us but a material proportion of the environmental burdens which flow from the Mine (amenity, lifestyle, business, loss of sense of place, dust will land with us.

Material Incompatibility

We note the statement at ES-19 of the EIS (which is repeated at least once at page 8-5 and 8-18) that "*There would not be any material incompatibility between the project and existing rural residential land uses* …" and the inference that there has not been any "*material incompatibility*" between those rural uses and the existing operations. Both of these 2 notions are rejected by us.

The contrary is true. There has been material incompatibility between our operation and the Mine. Whilst our operation (which was occurring well before the Mine operation commenced) has not had any impact on the Mine's operation, the Mine's operation has heavily detracted from the rural and residential uses of our property.

The context in which this statement is made in the EIS is consideration of the matters under clause 12 of SEPP Mining which requires consideration being given to (our emphasis):

"(*ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and*

(iii) any ways in which the ***development may be incompatible with*** *any of those existing, approved or likely preferred uses*"

What is required to be considered is not "significant incompatibility" but rather any incompatibility.

Our operation is completely consistent with the zoning objective and what is permissible in the planning zone in which it is located. The same cannot be said for the Mine.

Contrary to the requirements of clause 12 of SEPP Mining, there is no consideration given in the EIS to the impacts of the Mine proposal on our dairy farming operation. There has been no consideration given (for example) to the impacts from the Mine on the health and productivity of the dairy cattle.

Inability to Sell

Of significant concern to us is the fact that we will not be able to sell our property for its full value (or perhaps at all) because of the impacts from the Mine. This may result in an inability for us to retire from our occupation when the time comes for us to do that. This is our principal asset and in the absence of its sale we will not be able to repay our debts and retire from our occupation.

Communications

We want to be clear that we have not previously made submissions in respect of previous modification applications for the Mine because in each case we were not aware of the applications' existence. Our concerns and feeling of the impacts from the Mine are not new and you will see that from our photographs **attached**.

Impacts on Our Commercial Dairy Enterprise

Our long standing dairy consultant is a PHD in Nutritional Physiology and Endocrinology in livestock. He focuses on dairy farms in Australia. He has worked with us on our farm for over 5 years and therefore has had the opportunity to observe the operation and performance of our farm for meaningful periods both before and after the commencement of the Mine.

Our diary experts says the following things about impacts from the Mine at our farm.:

(a) There has been a decline in productivity at our farm since the Mine commenced operations. That decline in productivity is linked with the impacts from the Mine.

(b) There has been a decline in animal health at our farm linked to the Mine impacts.

(c) There has been a decline in reproductive performance of our herd at our Farm since the Mine commenced.

(d) Our Farm's pastures have deteriorated significantly in quality since the Mine commenced operations.

(e) The profitability of our Farm has declined due to the need to import feed to the farm in order to offset the pasture productivity declines.

Conclusions

1. We are asking for the inclusion in any development consent for the mine a condition requiring that the operator of the mine acquire our farm assets if we so direct. We are not opposed to the mine per se, just seek that we have the right to require purchase.

2. Our business has been negatively affected. That is demonstrated by our independent expert's report. We have managed around it as best we can but the impacts will increase with the increased size of the proposed mine.

3. Our quality of life has been reduced materially by the presence of this mine due the impacts of dust, noise and the visual impacts.

4. There are questions about whether the impacts from the mine in terms of dust appear have been satisfactorily assessed in the EIS leading to the impacts being much greater than predicted in the EIS.

5. We are asking for the right and the ability to remove ourselves from these impacts which are not acceptable or fair to expect us to bear.

……..

Cowtime Investments Pty Limited

16 March 2021

NOTE: MAP IS NOT CURRENT IN REGARD TO MT PLEASANT WORKS

ANNEXURE A

BEFORE THE MINE

AFTER THE MINE COMMENCED


27July 2018


27 July 2018


27 July 2018


27 July 2018


22 November 2018


22 November 2018


7 August 2019


12 August 2019


12 August 2019


13 August 2019


13 August 2019

16 August 2019

.

18 August 2019


18 August 2019


18 August 2019


20 August 2019


20 August 2019


23 August 2019


24 August 2019


25 August 2019


25 August 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


6 September 2019


9 September 2019

9:52
◀ Phone
4G

Done
12 of 12


10 September 2019


10 September 2019


10 September 2019


11 September 2019


30 September 2019


3 October 2019


3 October 2019

17 September 2020

17 September 2020


November 2019


November 2019


28 November 2020

4 March 2020

4 March 2020

15 May 2020

15 May 2020

17 September 2020

17 September 2020


28 November 2020

2021

2021

2021

2021

2021

EXPERTS REPORT OF AIR QUALITY IMPACT REPORT

NORTHSTAR AIR SERVICES

Letter

Date: Wednesday, 17 March 2021

Cowtime Investments Pty Limited

Project Name: Mount Pleasant Optimisation Project – Air Quality Impact Assessment – Review
Reference: 21.1079.L1V2

Northstar Air Quality Pty Ltd (Northstar) has performed a review of the air quality impact assessment (AQIA) for the Mount Pleasant Optimisation Project (Todoroski Air Sciences Pty Ltd, dated 16 December 2020). The review has been requested by Cowtime Investments Pty Limited.

We have identified a number of issues which may have the potential to significantly alter the conclusions of the report, and we recommend that the NSW Department of Planning, Industry and Environment request that these are fully addressed prior to any determination of the project. There exists the potential for significant underestimation of particulate emissions and impacts associated with the development. The assessment of voluntary acquisition rights should be revisited as this has not been performed appropriately, and given the potential issues with the assessment, the conclusions drawn may also significantly change.

If you require any further information or clarification, please do not hesitate to contact the undersigned at your convenience.

For and on behalf of

Northstar Air Quality Pty Ltd

Martin Doyle

Director

Reviewed by: Gary Graham

Introduction

This letter provides a summary of the review of the AQIA report prepared on behalf of MACH Energy Australia Pty Ltd by Todoroski Air Sciences (ref: 19060984, dated 16 December 2020).

The review is summarised in **Table 1**. A qualitative evaluation of the significance of the observation has been provided. This is not intended to reflect an opinion of "error" but highlight where the observation has the potential to change the conclusions drawn from the report. The following scale has been used:

High	The observation has a significant potential to influence the conclusions drawn from the report.
Medium	The observation has a reasonable potential to influence the conclusions of the report.
Low	The observation has a low potential to influence the conclusions of the report.
Observation	The observation has no potential to change the conclusions of the report. Provided as a note only.

Table 1 Review Observations

Report Reference	Issue	Suggestion / Recommendation	Significance
6.4.1 App C	The use of an unjustifiably low silt content for unpaved haulage routes, which is well below documented average silt contents for similar roads, and well below a measured value for a coal mine in the area.	The AQIA should be updated to provide full justification for the use of such a low silt content (evidenced by measurement), or the sensitivity of the results determined by adoption of a justified silt content value for the unpaved haul roads.	High
App C	The use of an unjustified control factor on unpaved haulage routes of between 80 % and 90 %. The use of a variable control factor on different roads (80 % on some roads, 90 % on others)	The AQIA should be updated to provide full justification for the use of an 80 % to 90 % emission control factor on unpaved haulage routes (evidenced by measurement).	Medium
App C	Assessment of 24-hr impacts is reliant on annual emissions inventories. No discussion is provided as to how the peak activity rates at the mine relates to the average activity rate, and there exists potential for maximum 24-hour emission rates (and subsequent modelled impacts) to be underestimated.	Provide justification that the peak 24-hour emissions of particulate from the development are the same as the average activity rate (i.e. activities are the same every day). If this is not the case, the potential maximum 24-hour activity rate for each source of emissions should be considered and modelled to present a potential maximum 24-hour impact, not an average 24-hour impact.	High
7.3	Flawed application of the NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP), when assessing the incremental impact of short -term (maximum 24-hour average) PM_{10} and $PM_{2.5}$ concentrations (with up to five allowable exceedances of the criteria over the life of the development). The VLAMP criteria have been applied over one modelled year, with a further 25 years of project lifetime not considered.	The AQIA should be updated to provide consideration of the likelihood of the number of exceedances of the incremental PM_{10} and $PM_{2.5}$ VLAMP criteria, cumulatively, across all 26 years of development. This analysis should also consider the comments made above, which have a significant potential to result in increases in annual and short-term emissions of particulate matter from the development.	High

Further discussion of each issue is provided overleaf.

Further Information

The emission inventory associated with Scenario 5 (Table C-6) has been reviewed, given that this represents the highest emission rate associated with any scenario modelled. Minor errors associated with, for example, $PM_{2.5}$ emission factors for 'loading/emplacing coal' (Table C-1) were identified but do not appear to result in significant changes to the total annual emission from the project. The result of the holistic review of emissions indicates that the activity rates, emission factors and material parameters adopted by the consultant can be replicated to result in similar annual emissions totals.

However, the adoption of certain parameters, or emission control rates have not been adequately justified, and these may have implication son the results of the modelling assessment.

Unpaved haulage route silt content

The adoption of the silt content on unpaved haulage routes at the project has not been justified in the AQIA. The consultant has adopted a silt content on unpaved haulage routes of 2 % which is significantly below the mean silt content percentage recommended by the US EPA in Table 13.2.2-1 of Chapter 13.2.2 of their AP-42 documentation (Unpaved Roads). In that documentation, US EPA indicate that the mean silt content of unpaved haul roads, to and from the pit at coal mines is 8.4 % (range 2.8 % to 18 %). The adopted silt content is significantly below the mean presented in AP-42 and is further below the lower threshold of values presented in that guidance. No justification for the adoption of such a low silt content on unpaved haulage routes is provided in the AQIA.

Three AQIA associated with coal mining operations close to the project, and one Pollution Reduction Plan (PRP) for a Hunter Valley coal mine have been reviewed to determine the range of silt contents adopted in previous similar assessments. A summary is provided in **Table 2**.

Table 2 Review of silt contents adopted in assessments in the immediate area

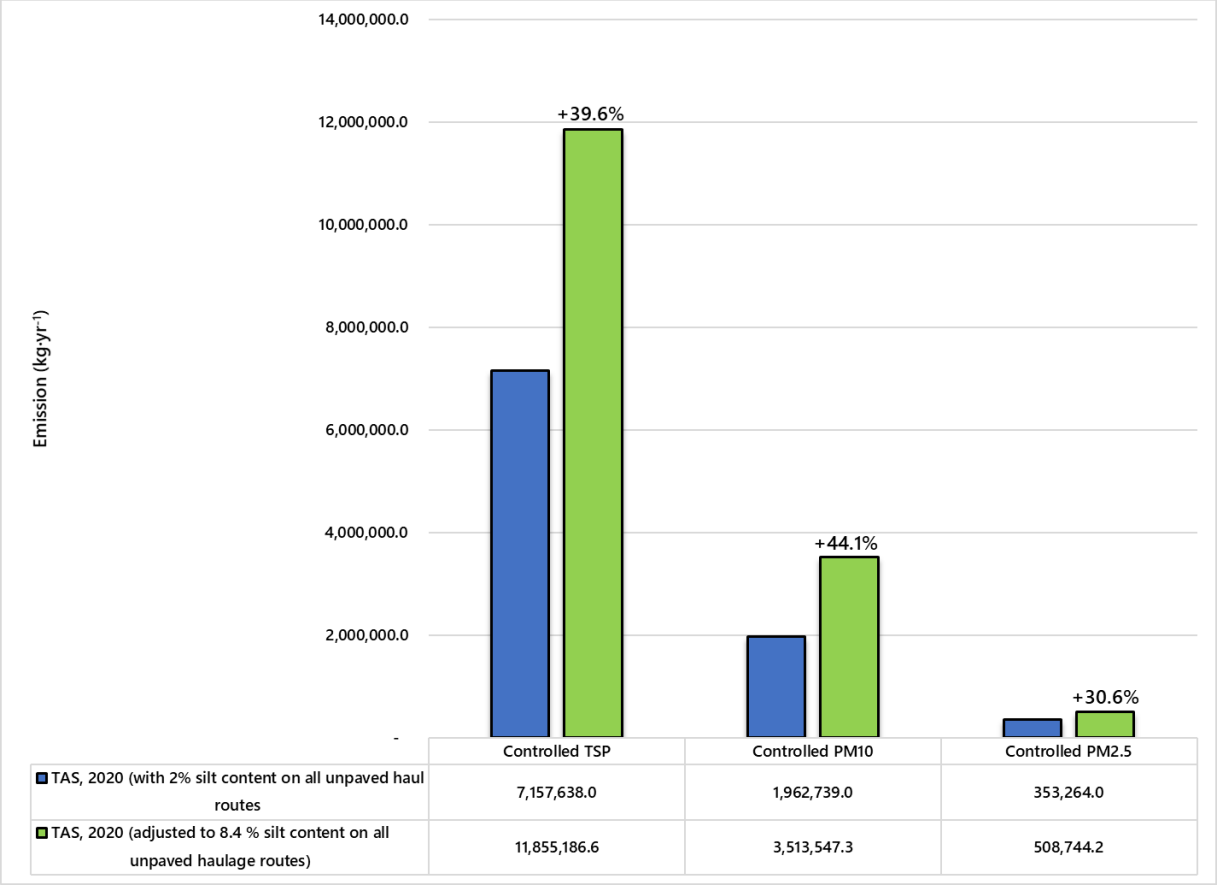
Assessment	Name	Author	Silt %	Notes
AQIA	Mt Pleasant Optimisation Project	Todoroski Air Sciences, 2020	2.0	Assumed, no justification provided in AQIA for use of silt content
AQIA	Warkworth Coal Mine Continuation Project	Todoroski Air Sciences, 2014	1.8	Assumed, no justification provided in AQIA for use of silt content
AQIA	Continuation of Bengalla Mine	Todoroski Air Sciences, 2013	2.8	Assumed, no justification provided in AQIA for use of silt content
AQIA	Drayton Coal Mine Extension	Pacific Environment Limited, 2017	4.1	Assumed, no justification provided in AQIA for use of silt content
PRP	Ravensworth Mine Complex	Xstrata Coal, 2013	8.9	Measured

In relation the Mt Pleasant AQIA, the following can be observed from **Table 2**:

1. The value of 2 % adopted for the project is not consistent with any other assessment performed in the immediate area.
2. None of the AQIA performed provide justification or evidence of the silt content adopted, which provides no confidence that the value of 2 % for the Mt Pleasant Coal Mine is reasonable.
3. All values of silt content adopted in the AQIA reviewed above are well below the US EPA AP-42 mean value for haul roads at coal mines of 8.4 %.
4. The only measured silt content value identified (Ravensworth) is 8.9 % which is significantly in excess of the 2 % adopted in the AQIA, and similar to the US EPA mean silt content value of 8.4 %.

A sensitivity analysis has been performed to assess the potential impact on annual emissions totals, should the US EPA default value for unpaved road silt content of 8.4% be adopted (which is noted to be slightly lower than the value measured in the area). The figure below indicates that should silt contents of unpaved haulage routes be increased from 2 % to 8.4 %, the site total emissions of PM_{10} may increase by over 44 % from those reported in the AQIA, which, in conjunction with other issues identified through the performance of this review, has the potential to significantly alter the conclusions of the AQIA.

Figure 1 Effects of increasing haul road silt content from 2 % to 8.4 %



	Controlled TSP	Controlled PM10	Controlled PM2.5
TAS, 2020 (with 2% silt content on all unpaved haul routes	7,157,638.0	1,962,739.0	353,264.0
TAS, 2020 (adjusted to 8.4 % silt content on all unpaved haulage routes)	11,855,186.6	3,513,547.3	508,744.2

Emission control factors on unpaved haulage routes

Emission control factors of 80 % or 90 % have been adopted in the AQIA, associated with unpaved haulage routes, with table 6-6 of the AQIA indicating that controls would be "*application of water and regular maintenance of unsealed surfaces*". Justification for the adoption of an 80 % or 90 % control factor associated with watering and regular maintenance has not been provided in the AQIA. These control efficiencies are high and should be fully justified in the report.

Furthermore, review of the emissions inventory (Appendix C) indicates that a control efficiency of 80 % has been applied to some roads at the site, with 90 % applied to others. The AQIA is silent on the difference between the roads such that different control efficiencies are applied. Additional information should be provided to justify the application of the particular rate on each road at the site.

Assessment of peak 24-hour activity rates

Appendix C of the AQIA provides the emissions inventories for each scenario modelled, with the emissions provided as annual totals. No discussion is provided in the AQIA as to how these annual emissions totals have been applied in modelling, although it is assumed that these emission rates have been averaged over

the modelling year to allow determination of annual average particulate impacts at the surrounding receptor locations, which is a standard approach. However, should those 'average' emission rates be applied when determining the potential maximum short-term impacts of a project (i.e. maximum 24-hour average particulate concentrations), there is a high risk that short-term peaks in activity rates are not appropriately captured, and under-estimation of the maximum 24-hour particulate concentrations at receptor locations and across land holdings might occur.

No discussion is provided in the AQIA which provides any clarity on the derivation of 'average' activity/emission rates and 'peak' activity/emissions rates.

Application of the NSW Voluntary Land Acquisition Criteria

Section 3.4 of the AQIA outlines the NSW Voluntary Land Acquisition and Mitigation Policy (2018) (VLAMP). With reference to land acquisition, the policy indicates that voluntary acquisition rights may apply where the development contributes to exceedances of the air quality criteria at any residence on privately owned land, workplace on privately owned land, or on more than 25 % of any privately owned land where there is an existing dwelling, or where a dwelling could be built under existing planning controls.

In relation to annual average particulate matter criteria (TSP, PM_{10} and $PM_{2.5}$), the impact is assessed as a cumulative impact (i.e. the development, plus the existing background air quality). In relation to short term impacts (24-hour PM_{10} and $PM_{2.5}$), the impact is assessed as an incremental impact (i.e. the impact of the development on its own). In relation to dust deposition, the criteria are applied as a cumulative and incremental impact.

When assessing the incremental impact of the short-term (24-hour) PM_{10} and $PM_{2.5}$ concentrations, the VLAMP provides an allowance of up to five exceedances of the criteria over the life of the development. In the case of the Mt Pleasant Coal Optimisation Project, the life of the development is 26 years.

Section 7.3 of the AQIA presents the results of the assessment against the VLAMP criteria. However, the AQIA incorrectly states that the adoption of the 6th highest model prediction (24-hour PM_{10}) accounts for five exceedances of the criterion, which is incorrectly reported as being consistent with the VLAMP.

It is not considered that this approach is consistent with the VLAMP, as what is presented in Section 7.3 is the assessment of the number of exceedances in one year of operation, not over the life of the development (26 years). Although six years of dispersion modelling results are presented in Figure 7-4 of the AQIA, the number of exceedances in each year should be added together to determine whether the VLAMP acquisition criteria have been exceeded, not assessed independently, year to year.

Given the range of uncertainties identified above in relation to the calculation of emissions from the development, the appropriate application of control factors, and the potential for underestimation of short-term particulate impacts, the potential for exceedance of the VLAMP criteria (both short and longer term)

should be readdressed, and should take into account the likely number of exceedances of the relevant criteria over the 26 years of development lifetime, cumulatively, year on year.

DAIRY EXPERTS REPORT

DR LES SANDLES

IMPACT OF MINING ON GLEN EDEN DAIRY FARM IN THE HUNTER VALLEY

Dr Les Sandles
Brix & Mortals Pty Ltd (trading as BEST-biz)

CONSULTANT'S PARTICULARS. AND SCOPE OF REPORT

I am an Agricultural Consultant specialising in Agronomy and Nutrition. I graduated in Agricultural Science (Hons), and subsequently completed my PhD in Nutritional Physiology and Endocrinology. furthered my academic training with two post-Doctoral fellowships - the first with the CSIRO Nutrition (Adelaide) and the second in dairy nutrition at Cornell University (NY, USA). On returning to Australia, I took up a research scientist position with DPI Victoria, before establishing my own dairy farm and dairy consulting business (BEST-fed Nutrition) in 1989. "BEST-fed" grew into BEST-fed International with offices established in four countries as my reputation for my knowledge, experience, client successes grew. My farmer-focussed, industry changing, Dairy Nutrition and Management Courses became particularly well-regarded and sought after both here and abroad. Since 2010, my consultancy has focussed on greater involvement with a small number of clients, consulting assignments with Dairy Australia, and executive advisory positions with Dairy Australia and the Agricultural Abundance Program.

I work with operational dairy farms in Victoria, South Australia and New South Wales delivering advice and solving problems in soils, pastures and dairy cattle to improve, among other things:

- soil health
- pasture productivity
- animal health
- reproductive performance
- milk yield and quality
- profitability

BEST-fed and Glen Eden dairy farm near Muswellbrook have had a working relationship for about 20 years, and I have personally worked closely with Glen Eden since February 2016, and I know the operation and the herd well.

I have been asked to prepare a report on how the impacts from the recently commenced Mount Pleasant Open Cut Coal Mine (the **Mine**) have affected operations and productivity and animal health at the Glen Eden dairy farm (the **Farm**) since the Mine started operations in 2017/2018.

IMPACT OF THE MINE

In short, by my observations there has been a decline in productivity at the Farm and a decline in animal health and reproductive performance of the herd since the Mine commenced operations. My own observations are also that the farmers (principally John and Doug Raphael) have personally experienced a negative impacts from the dust and noise and visual impact from the Mine. They operate in a very competitive and difficult industry, members of which are prone to negative psychological impacts from the pressures of weather and markets as well as the various other pressures of running a business, and my observation is that John and Doug have been psychologically impacted negatively by the Mine.

I set out below my comments and observations in relation to impacts from mining on dairy farming and, in particular, the impacts of the Mine on the Farm.

1. DAIRY INDUSTRY COMPETITIVENESS

The Hunter Valley's temperate climate combined with the arable, fertile soils, a reliable water supply, and proximity to Australia's largest urban centre make for a perfect dairy landscape. This has enabled HV dairyfarmers to access the lucrative domestic liquid milk market rather than relying heavily on the lower returns of the export market.

The ability to produce high quality pasture and an assortment of fodder crops, with easy access to grains, enables dairy farms to generate outstanding levels of productivity (litres per Ha) with remarkable consistency.
Whilst the numbers of farms have significantly reduced over the last couple of decades, the region increased its share of NSW milk production until recently. This was largely due to larger herd sizes and increased yields as farmers invested in better infrastructure (pivot irrigators and larger (often rotary) dairies) and developed a better understanding of the nutritional requirements of high producing herds. Farmers focussed on growing better pastures and high-quality fodder crops (lucerne and maize) and complemented these with significant quantities of bought in supplements (grains and by-products).

ABS data on dairy production within the Hunter region shows that in 2005-06, 199 dairy farmers contributed $117million to the NSW economy (ABS 2006a). Significant changes in farm numbers have occurred since then.

Table 1- 2006 Upper Hunter Dairy data (ABS2006a, 2006b)*

Local Gov't Area)	Estim. value of Milk ($ mill)	Prod'n of milk as a % of NSW total	No. of Farms	Employ-ment
Dungog	$29 m	3%	66	216
Gloucester	$19 m	2%	37	124
Muswellbrook	$28 m	3%	42	137
Singleton	$25 m	3%	27	201
Upper Hunter	$15 m	2%	27	73
Total	**$117 m**	**13%**	**199**	**751**
NSW total	$895 m	100%	1,441	5,903

In 2011, 125 dairy farms in the Upper Hunter region produced 16% of NSW milk (Table 2) contributing $170m to the NSW economy. By 2017-18 dairy farm numbers had declined to 115 representing 17% of NSW milk production, and since then declined dramatically (Figure 1 indicates there are currently only about 70 dairy farms remaining: Map 2021).

2. IMPACT OF MINE NOISE ON DAIRY COWS

Health and productivity of dairy cows is closely tied to the amount of time cows are at rest. It is critical for herd health and performance that a strict time budget is observed of which the 13h/d allocated to resting laying down is of prime importance. Stressors such as noise can significantly impact this bovine "time budget" resulting in reduced animal performance and poor health and reproduction outcomes. Effects of noise are often amplified at night.

The critical issues are distance from the source of the noise, wind speed and direction, and in particular temperature inversions which can (and do) amplify noise levels. The coal fields around the Hunter Valley are particularly prone to strong temperature inversions as indicated by the presence of Pasquill stability classes of F and G. These temperature inversions are most commonly caused by radiative cooling of the ground at night, leading to the cooling of the air interface and associated cold air pooling. This is especially prevalent on cloudless winter nights with little wind.

Mining companies generally acquire land in the vicinity of an open-cut mine site to create a buffer zone. The proximity of Glen Eden to the adjacent Mt Pleasant mine places the entire dairy operation squarely within a typical buffer zone. My experience is, that this means the usual strategies for mitigating noise, dust and other mining concerns offer minimal, if any, protection.

When ambient noise levels are low, in adverse meteorologic conditions, topographic shielding and buffer zones are largely ineffective and mine noise can disturb sleep (ref).
While mines may operate consistently 24/7, noise levels recorded at remote sensitive receivers vary considerably. This is an accepted consequence of changing weather conditions. Thus, it is relatively unimportant what is measured generally, but rather what is audible/heard/experienced at particular locations at particular times. An analogy might be a relatively quiet intersection on a country road. If you enter it inattentively 2 times out of 3 you are going to be OK, but that third time is deadly. Averages do not describe or represent the consequences of that impact!

It is recognised within the mining sector that certain meteorological conditions increase noise levels by focusing sound-wave propagation paths. While the amount of noise generated on the mine site doesn't change, under certain conditions the acoustic energy is focussed or concentrated in a particular direction and/or to a particular location. In effect, the noise generally dispersed relatively evenly is redistributed along a narrow path.

Temperature inversions (temperature increasing with increasing height) are of particular concern, and frequently occur in winter and at sundown. Under such conditions, the sound waves will be refracted downwards, amplified, and heard over larger distances. Such meteorological effects typically increase noise levels by 3 to 10 dB effects, and under certain conditions by much more (Parnell, 2015), resulting in significant noise impacts in areas prone to these effects.

In my experience, the proximity of the Glen Eden operation to the Mt Pleasant mine is such that noise from the mine would almost certainly occur at different and unpredictable times (depending upon meteorological conditions and where the cattle are in their grazing rotation) at levels and with suddenness which would have material impacts on the cattle, and the resultant stress has negatively impacted milk production levels, milk quality and reproductive performance. It is not possible to quantify the volumetric impact with precision but I can say that in my view the impact would be material.

Cattle hear noise differently to humans:

- they hear high-frequency sounds much better than us,
- their high-frequency hearing limit is 37 kHz (it's 18 kHz in humans (Heffner, 1998).
- their best hearing is about 8 kHz, compared with 4 kHz for humans (Phillips, 2009).
- cattle thresholds for discomfort are 90-100 dB, with physical damage to the ear occurring at 110 dB (Phillips, 2009).
- they can detect lower pitched sounds than other farm species (Heffner and Heffner 1993).
- dairy breeds are more sensitive to noise than other farm animal species, including In beef breeds (Lanier et al., 2000).

The raw noise emanating from the coal mine adjacent to Glen Eden could be as much as 40-50% above the discomfort threshold for cattle, and possibly higher again for dairy cattle.

Together, the location of the Farm in relation to the Mine, including the short distance separating them, prevailing wind direction, and frequency of temperature inversions, means the herd is relatively frequently exposed to distressing levels of noise. In my experience, mine-related noise affects dairy cattle and milk production in the following ways:

(a) it reduces the resting and rumination period of the herd, which in turn
(b) reduces grazing activity and pasture intake. The consequence of this is
(c) lower milk yield, and poorer body condition which
(d) decreases milk quality (low milk components and higher somatic cell count) and reduces the fertility rates in the milking herd.

In the dairy industry, the price of the commodity is very low and the profit margins are very slender. Therefore, the profit is in the marginal additional volume which can be produced. Any reduction in volumes (no matter how small) will have a significant impact on profits.

3. IMPACT OF DUST ON DAIRY LIVESTOCK: MILK YIELD, HEALTH & REPRODUCTIVE PERFORMANCE

The impact of mine dust directly on milk yield per cow is difficult to determine, largely because my job is to maintain or improve production, health and reproduction outcomes - regardless of the feed quality or quantity grown on the farm, and of the comfort of the animals. The efforts of the Farm's management team (the owners and myself) are reflected in the cost of maintaining these performance criteria via purchased ration inputs. These are discussed in the next section. However, the indirect consequences of mine dust on the dairy herd production are an altogether different story. Potentially, there are numerous indirect impacts of dust including respiratory issues (particularly in young stock), heat stress, reduced growth rates in calves, high incidences of reproductive failure, pasture quality, reduced feed intake, mycotoxicosis, excessive lameness, and peripartal metabolic disorders resulting in failed lactations, among others. Lactating cow health is a primary determinant of lactation success, and the consequences of dust-contaminated pastures and water are numerous and significant with excessive numbers of failed lactations, high incidence of lameness and poor reproductive performance being examples of issues commonly occurrences in the Glen Eden herd that are atypical of herds with similar levels of management elsewhere. Recently, the herd has experienced a highly unusual outbreak of mycotoxicosis due to Aflatoxin, a disease which I have not previously come across in dairy cattle grazing pasture (discussed below).

Direct Impacts on Livestock

It is true that livestock are exposed to dust from many natural sources, including airborne dust as a result of dust storms, yarding or general stock movements as is often stated in environmental assessments (eg. Belmont Coal Project Report No. 584/01). And, it is also true this dust tends to accumulate on the coat or fleece of the animals and generally falls out or is washed out in heavy rain (Hunt, 1999). However, daily exposure of livestock to airborne and settled dust is a vastly different issue. The cause of respiratory diseases in cattle are rarely investigated and assumed to be "pneumonia", however, it is only in recent times we have understood that diseases like "silicosis" and "asbestosis" in human populations occur from prolonged exposure to low levels of circulating material.

Indeed, the Hunter Valley was identified in 2014 as an air pollution 'hotspot', with the national standard for PM_{10} exceeded 118 times in 2013 across 11 air quality monitors in the Upper Hunter. Further, data from the Upper Hunter Air Quality Monitoring Network (UHAQMN) shows particle pollution in the population centres of Singleton and Muswellbrook exceeded national standards (*http://www. epa.nsw.gov.au/resources/air/epasenateaqsub.pdf*). Air quality monitoring records reveal also that, in the regional towns of Singleton and Muswellbrook and the village of Camberwell, national air quality standards for PM_{10} were breached 12 times in Singleton, three times in Muswellbrook and 36 times in Camberwell in 2013 (*http://www.environment.nsw.gov.au/AQMS/ hourlydata.htm*). Importantly, this data was collated prior to the Mine commencing open cut operations literally on Muswellbrook's doorstep!

Health and Social Harms of Coal Mining in Local Communities: Spotlight on the Hunter Region cites excess deaths from lung cancer, chronic heart, respiratory and kidney disease related to living near coal mines. While the evidence presented in that report is mostly from the United States, it offers valuable insight into the impact of living local to mines that cannot be

ascertained in smaller populations. Importantly, it highlights the dose-response effect related to coal quantity or surface area of the mine – an important consideration for an expansion project. Other effects include high blood levels of heavy metals in children, and higher rates of birth defects.
Living near coal-combusting power plants is associated with excess deaths from lung, laryngeal and bladder cancers. Respiratory complaints, increases in non-melanoma skin cancers, still-births and miscarriages are also reported issues arising from exposure to coal dust.
The financial burden of health damages in the human population surrounding Hunter Valley Mines is estimated to be in excess of $47 million in Singleton and $18.3 million in Muswellbrook each year from exposure to fine particles (PM2.5) emitted from coal mines and coal fired power stations into the air (Armstrong, 2015). These particles travel deep into the lungs and pass into the blood stream, posing a risk of stroke and heart attacks. It is inconceivable that dairy cattle in close proximity to the mine and exposed 24/7 (ie. without the protection of indoors and the benefits of air conditioners) are not more seriously impacted than the human population further afield.

Thus, while dust deposition associated with mining activities might meet the some emissions goals for allowable dust deposition for all potential grazing land outside the mine, negative health outcomes for humans in nearby communities is worryingly significant, and breaches are relatively common. It is no stretch to conclude that the potential negative health impact of long-term exposure to airborne dust with the close proximity of the Mine to the Farm (metres, not kilometers!) is likely to be much more severe and can and does present real issues to the humans and livestock of the farm.

Potential lung/respiratory issues aside, the mineral composition of mine dust includes numerous toxic minerals, including several known carcinogens (Table 2: Su et al., 2020).
The data contained in the table indicates that the sources of harmful elements in dust are complex. Some emanate from coal and some originate from the surrounding rock and overburden, and some from machinery emissions. These elements may have been enriched in the process of flight, and the content of the dust might have changed in the process of migration.

Contents of Harmful Trace Elements in Coal and Dust

content (μg/g)

		LTS		JLS-3		SH		PM2		HB6-3		DY	
hazard	**element**	**dust**	**coal**	**dust**	**coal**	**dust**	**coal**	**dust**	**coal**	**dust**	**coal**	**dust**	**coal**
three	Be	2.0	0.7	1.9	6.5	1.1	0.7	1.5	2.6	0.7	0.9	0.8	0.6
	Cd	0.15	0.0	0.4	0.05	0.08	0.1	0.59	0.1	0.23	0.1	0.09	0.1
	Pb	30.7	3.6	23.1	14.2	23.5	16.2	11.4	7.2	11.4	8.5	13.0	24.8
	Ni	12.3	12.1	20.0	21.0	6.6	1.9	25.8	26.5	2.5	23.9	4.1	1.7
two	As	47.93	0.4	0.6	3.16	2.79	2.9	10.44	0.9	10.31	0.9	8.41	1.4
	Cr	60.8	7.7	48.2	24.2	42.7	14.1	61.3	12.6	33.3	9.1	32.9	8.0
	Co	7.2	2.3	11.2	32.9	6.6	0.1	4.0	6.7	2.8	9.8	3.0	0.5
	Mn	153.6	3.0	98.9	39.9	118.6	28.0	91.9	29.7	100.8	5.0	38.6	19.5
	Th	2.80	0.4	1.2	5.62	2.72	0.3	2.77	0.5	2.56	0.6	2.92	0.3
	U	1.71	1.5	0.3	1.63	0.78	1.2	1.70	1.1	0.57	0.3	0.76	0.3
	B	5.5	2.1	59.3	1.9	6.3	49.5	7.4	1.6	8.9	50.0	8.7	29.9
	Hg	0.14	1.5	0.9	0.07	0.24	0.8	0.11	0.5	0.17	1.0	0.12	1.6
one	Ba	225.3	32.8	535.7	43.6	147.7	86.9	43.6	10.6	136.4	86.3	77.8	48.7
	Sn	9.2	9.6	0.5	5.0	8.6	4.8	9.7	7.2	7.0	4.7	10.4	4.6
	Tl	5.8	0.1	0.9	2.7	6.3	0.6	3.0	0.4	2.7	0.4	3.1	0.6
	V	54.0	5.0	65.6	23.0	16.4	8.1	42.8	7.9	14.4	9.5	17.1	10.1
	Sb	3.4	2.9	4.3	0.2	5.1	1.4	1.4	0.0	1.7	0.0	3.5	1.9
	Se	0.34	0.0	1.5	4.68	1.89	6.2	1.30	5.9	0.56	5.9	5.69	6.3
	Cu	21.0	8.5	21.5	11.3	15.4	9.8	17.6	15.8	14.6	12.5	11.7	7.7
	Mo	1.7	4.0	2.6	1.9	1.8	2.3	16.7	2.7	1.8	2.4	3.6	3.5
	Zn	642.7	2.4	53.2	6.7	60.7	2.9	50.5	11.4	443.6	3.9	61.1	2.9
	Ag	1.8	0.0	0.3	0.8	0.3	0.7	1.8	0.2	0.9	1.3	2.1	0.7
	P	316.2	127.4	134.4	29.5	706.4	62.3	82.3	39.9	362.8	19.5	327.3	51.3

The legacy of exposure to heavy metals, and trace mineral toxicities is generally witnessed long after the event unless acute toxicity occurs. To date, acute toxicity symptoms have not been observed in the Farm's livestock, and if it does occur, will probably be masked due to high turnover rates of dairy cattle which results in relatively short lifespans. If such issues exist, it will likely be observed as an elevation in morbidities and cull rates. Although outside the scope of this report, my greater concern is for the long-term health of the Farm's owners and staff.

4. IMPACT OF DUST ON PASTURE PRODUCTION

While dust accumulation on pasture at claimed rates of deposition have been reported to exert no effect on pasture palatability or stock production in grazing trials with dairy cattle (Hunt, 1999), the important issue is its impact on pasture production.

Of all of the ways dust impacts a dairy farm, quantitatively the most significant is the impact on pasture and crop production and quality. Ryegrass, the temperate species on which pasture-based dairy-farming relies, is particularly sensitive to dust, both directly (limiting light absorbance for photosynthesis) and indirectly (heating up the plant leaf and soil due to dust absorbing heat (the same effect as on dry soil and beach sand). The latter effect resulting in chemical changes in heat sensitive plants such as ryegrass leading to lower nutritional value (increased indigestible fibre, lower energy and protein).

In my view, the value of air quality monitors is questionable in terms of determining potential impacts of the growth of the pastures on which grazing-based dairy enterprises depend. Dust settles, and even the finest coating of dust seriously impairs several important functions of the plant. Numerous scientific studies document the deleterious effects of mining dust on the health of a variety of ecosystems and plants. Significant factors include increases in soil surface temperature as a result of coal dust (Sharrat & Glen, 1988), changes in soil pH (Anderson et. al., 1991), and metal ion concentrations (Carson, 1990; Anderson et. al., 1991). Further, fluoride contamination of farm water, pastures and crops has severe consequences for both plant productivity (Rao, 1971) and animal health (with the latter impacting calcium as described previously).

Coal dust emissions are well known to reduce the efficiency of plant photosynthesis as it interferes with photosynthetically active radiation (Sharifi et al., 1997; Naidoo & Chirkoot, 2004; Zhan-Yi et al., 2016), and the behaviour of stomata (Ricks & Williams, 1097; Hirano et al., 1995, Zhan-Yi et al., 2016). Changes in plant leaf morphology and leaf physiology have also been reported in response to exposure to coal dust (Sarma et al., 1993; Zhan-Yi et al., 2016), along with increases in plant leaf surface temperature (Zhan-Yi et al., 2016). More recently, significant changes in the growth, development and morphology of plant roots caused by coal dust has been reported (Zhan-Yi et al., 2016). The net negative effect of coal dust on plant root mass and plant photosynthetic rates may be as much as 60% (Zhan-Yi et al., 2016). These affects are considered to be the result of higher leaf temperatures and significantly lower stomatal conductance and net photosynthetic rates of plants impacted by coal dust in sensitive species.

Ryegrass, on which Glen Eden pastures are based (comprising approximately 90% of dry matter of the sward) are the most sensitive of all pasture species to temperature. My belief is that the Farm's pastures have deteriorated significantly in quality since the Mine commenced operations. The visual evidence for this is that grazing efficiency is poor due to increased fibre concentrations and lower protein levels in the pasture. These are consistent with heat stress resulting from elevated leaf and soil temperatures. Further, the (exceedingly rare) occurrence of aflatoxin-induced mycotoxicosis experienced by the Herd in 2019/20 is also consistent with increased temperatures in the humid layer at the base of the pasture.

My role on the Farm is to maximise production, health and reproductive outcomes of the herd, regardless of the quantity and quality of the pasture the cows are presented with. Poor quality pasture, and lack of pasture availability (reduced growth rates from compromised photosynthetic capability of the plants as previously discussed) are compensated for by increasing the amount of high quality purchased supplements such as lucerne hay, protein supplements (lupins, canola meal cottonseed, brewers grains), energy sources (wheat,

barley, fat) and feed additives (mycotoxin binders, buffers, vitamins, trace minerals, etc). Using a sophisticated ration formulation program, I manage the levels of supplements to maintain health, reproduction rates, and production levels of the herd.

Table 3 documents Glen Eden's annual milk production from the 2015/16 season to the present and clearly shows steady, but disappointingly poor improvement over the period as it represents approximately 80 litres per cow per year (or ¼ of a litre per cow per day for the lactation). morevoer, Table 3 cannot be considered in isolation of the cost of producing those litres as incremental improvements are also demanded in pasture management which typically account for around 300 litres per cow per lactation or 1 /litre per cow per day across the lactation.

The issue is exposed in Table 4 which documents the cost of imported nutritional support (grain, hay, other additives and nutrients), and demonstrates clearly the issues with pasture quality and quantity. Despite an additional $118,161 in high quality feed/ration component imports in Season 2018/19 over the previous season, milk sales declined by around 23,000 litres. And with a further $154,350 in the 2019/20 season, the apparent milk response was modest (190,758 litres; 0.52 litres/cow/day), and uneconomic ($0.81/litre).

Table 3. Annual milk production of Glen Eden from Season 2015/16 to the present

Season (FY)	Litres sold
2020/21 (YTD)	5,501,252
2019/20	9,010,956
2018/19	8,820,198
2017/18	8.843,820
2016/17	8,570,290
2015/16	8,607,068

Table 4. Annual cost of imported dairy ration inputs from Season 2015/16 to the present

Season (FY)	Imported ration component costs
2020/21 (YTD)	903,264
2019/20	1,964,434
2018/19	1,810,084
2017/18	1,691,923
2016/17	1,676,146
2015/16	1,584,758

CONCLUSION:

Supported by the elevated cost of production as a result of the Farm requiring a significantly greater investment in imported feed to maintain important productivity outcomes since the Mine commenced operations, my opinion is that the Mine has had a huge impact on the herd and pastures of Glen Eden. I am also of the opinion that this situation will be exacerbated with time due to the cumulative effects emissions from the Mine, and of dust in particular as it affects pasture growth and quality. Indeed, on observing the current trend in of increasing purchased nutritional supplements simply to maintain production, it is difficult to envisage a sustainable future for the Farm.

Leslie Sandles B Sc(Hon), PhD

Date: 16/03/'21