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Supplementary Expert Witness Statement of Simon Welchman Fingerboards Minerals Sands Project

Department of Environment, Land, Water and Planning

Fingerboards Mineral Sands Project Inquiry and Advisory Committee

Prepared for:

White & Case on behalf of Kalbar Operations Pty Ltd

February 2021

Prepared by:

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1. INTRODUCTION

1. Name:

   a. Simon John Welchman

2. Address

   a. My business address is Ground Floor, 16 Marie Street, Milton, Queensland 4064.

3. Qualifications

   a. I hold the following qualifications:

      - I am a Director of Katestone Environmental Pty Ltd ("**Katestone**"), a consulting firm that works in the areas of air quality, odour, greenhouse gases, climate and weather forecasting.

      - Bachelor of Environmental Engineering (Hons) from the University of Queensland.

   b. My curriculum vitae is attached as Annexure A.

4. I have sufficient expertise to make this statement because I am a qualified environmental engineer who has worked for 25 years in the field of air quality. Since 2004, I have been director of Katestone. During my time as director, I have conducted, managed, supervised and conducted quality assurance on more than one hundred air quality projects per year. I have also guided the development of Katestone's quality assurance process and project management system.

5. I have been instructed by White & Case on behalf of Kalbar Operations Pty Ltd to:

   a. Prepare an expert witness report for the Inquiry and Advisory Committee (IAC) hearing into the Fingerboards Project EES.

   b. Present evidence at the IAC hearing.

6. This written supplementary statement of evidence has been prepared in accordance with Planning Panel Victoria's Guide to Expert Evidence.

7. I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

Simon Welchman

9 February 2021

2. BACKGROUND

8. Katestone Environmental Pty Ltd (Katestone) was commissioned to complete an Air Quality and Greenhouse Gas (GHG) Assessment of the Fingerboards Mineral Sands Project (the Project) that was included in the Project's Environment Effects Statement (EES). Katestone's report is included in the EES as Appendix A009 – Stage Two Air Quality and Greenhouse Gas Assessment (EES air quality assessment).

9. I prepared a Statement of Evidence (First Statement of Evidence) in relation to air quality and greenhouse gas issues that was filed with the Inquiry and Advisory Committee (IAC) hearing into the Fingerboards Project EES on 3 February 2021.

10. This supplementary statement of evidence has been prepared to investigate the effect on dust emissions from the Fingerboards Project of Kalbar's proposal to use tailings centrifuges to dewater tailings.

3. TAILINGS CENTRIFUGES

11. I am advised that Kalbar has been investigating the potential for including centrifuges as part of the Project to address concerns raised by some submitters around the sensitivity of the EES water impact assessments to the assumptions made in the Project water balance provided in EES Appendix A006 (Appendix A).

12. I am advised that there would be clear advantages for the Project if centrifuges are included, such as:

    a. *Centrifuges would provide certainty about water recovery from the fine tailings that is independent of climatic and soil conditions.*

    b. *There is no need to construct the temporary tailings storage facility (TSF) or the in-pit fines TSFs if centrifuges are used, as they create a dry cake from fine tailings.*

    c. *Centrifuges allow the continuous backfilling of the mined voids without the need to rip and remove in-pit fine TSFs before the commencement of rehabilitation operations, which means that the disturbed mining area is smaller, and rehabilitation can occur sooner after the completion of mining in any particular area.*

    d. *The continuous mining and backfilling operation significantly reduces overburden haul distance, which in turn reduces noise and dust generation.*

    e. *Any risk of seepage from fine tailings is removed as this material is fully dewatered to a state that will only retain capillary moisture that cannot seep to the environment.*

13. I understand that the Project can avoid the need for TSFs by the use of solid bowl centrifuges, which would produce dry cake from fine tailings. The centrifuge generates two products. Firstly, a clear overflow water (called the centrate) containing very little suspended solids, and secondly a readily transportable solid cake.

14. I am advised that the dry cake can be immediately used for backfilling of the pit. The dry cake will be transported during dayshift from the centrifuge facility to the active backfill area in the void, where it will be placed as backfill with the overburden. Transport during dayshift when dispersion is good will reduce dust levels relative to night transport.

15. I understand that, by avoiding the need for TSFs, the active mining footprint is reduced, which in turn facilitates closer and more rapid backfilling and rehabilitation of mining voids. This is likely to reduce dust emissions from the Project.

16. The dry cake stockpiles will be designed to store for a maximum volume of up to 24 hours of production. This will result in a total stockpile volume of approximately 3,600m³ at each of the two centrifuge plants. The centrifuge cake will be hauled via overland haul route using dump trucks. A front-end loader (FEL) will reclaim material from the cake stockpile and load the dump trucks.

17. The centrifuge plants would be located in close proximity to the mining area in order to reduce the overland haul distance of the dry cake back the mining void, and thereby minimise dust generation. I am advised that, based on the preliminary mine planning, Kalbar anticipates that each centrifuge plant would be relocated to a new position every four to five years. The plant positions have been selected such that the average one-way haul distance from the plant to the mine void is 750m.

18. The cake haul roads will be constructed haul roads with a low-silt gravel capping layer to minimise dust generation, in addition to the normal operational dust management procedures such as water trucks and road dust suppressants.

19. Given that the dry cake stockpile at the centrifuge plant is damp, it is not expected to be a source of dust. I am advised that when the cake dries, it forms a hard crust that is unlikely to generate any dust when exposed to wind. In addition, the dry cake stockpile is continuously transferred to the mine pit, reducing the chance of wind erosion.

20. The haul of cake from the centrifuge plant to the mining void will be a new dust generating source; however, this is expected to be offset by reduced overburden haul distances of the overburden in mining operations and accelerated mine rehabilitation.

21. I have conducted an air quality assessment of the Project with tailings centrifuges. The results of the air quality assessment are detailed in the following section.

4. AIR QUALITY ASSESSMENT

4.1 Methodology

22. The air quality assessment of the Project with tailings centrifuges was conducted using consistent methodologies to the EES air quality assessment. In particular, the following aspects of the EES air quality assessment were adopted for the air quality assessment of the tailings centrifuges:

    - Meteorological data
    - Assessment criteria:
        - Protocol for Environmental Management, Mining and Extractive Industries, EPA Victoria, 2007 (PEM)
        - State Environment Protection Policy (Ambient Air Quality) (SEPP AAQ) / Proposed Final Environment Reference Standard (Proposed Final ERS)
    - Land-use and terrain data
    - Emission estimation techniques
    - Dispersion model configuration.

23. Emission rates of air pollutants have been revised for the Project with the centrifuge using activity data supplied by Kalbar.

4.2 Dust emission rates

24. The EES air quality assessment estimated dust emissions for three years of operation of the Project, namely: Year 5, Year 8 and Year 12. The following sections provide estimates of dust emission rates from the Project with the implementation of the centrifuges for these same operational years.

4.2.1 Year 5

25. Table 1 shows the dust emission rates that have been estimated for Year 5 operations. By using centrifuges, dust emissions from overburden haulage, vehicle exhaust emissions and wind erosion of exposed and rehabilitated areas are reduced. In particular, overburden haulage emissions reduce by around 20%. Dust emissions from tailings management are anticipated to increase due mainly to the materials being hauled during the day to their disposal site. Previously, there was no haulage associated with tailings management. However, in relation to TSP and PM_{10}, the increase from tailings management is more than offset by the reduction achieved from overburden haulage. In relation to $PM_{2.5}$, the emission rate increases by 1% as a result of the centrifuge scenario.

26. There is no change in dust emissions from other activities associated with the Project in Year 5.

Table 1 Year 5 - Estimated TSP, PM_{10} and $PM_{2.5}$ emission rates due to the Project (g/s) – EES scenario vs centrifuge scenario

Activity	EES Scenario			Centrifuge Scenario		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Topsoil/overburden removal						
Topsoil excavation	2.08	0.37	0.05	2.08	0.37	0.05
Topsoil dumping	0.007	0.003	0.001	0.007	0.003	0.001
Overburden excavation	4.0	1.1	0.2	4.0	1.1	0.2
Dozers on overburden	0.3	0.1	0.03	0.3	0.1	0.03
Overburden haulage	8.7	1.3	0.1	7.1	1.0	0.1
Overburden dumping	0.2	0.1	0.02	0.2	0.1	0.02
Overburden screening	0.002	0.001	0.0001	0.002	0.001	0.0001
Ore removal						
Dozers on ore	0.84	0.16	0.09	0.84	0.16	0.09
Ore transfers and screening	0.1	0.1	0.01	0.1	0.1	0.01
Ore transport/processing	No emissions – wet processes					
Product handling						
Truck loading - HMC	No emissions – material is entirely >40µm					
Product haulage	1.52	0.29	0.07	1.52	0.29	0.07
Rehabilitation						
Dozer rehab/contouring	0.03	0.01	0.004	0.03	0.01	0.004
Wind erosion						
Stockpiles	0.5	0.3	0.04	0.5	0.3	0.04
Exposed and rehabilitated areas	3.3	1.6	0.2	3.2	1.6	0.2
Vehicle exhaust	-	0.76	0.69	-	0.74	0.67
Grading	1.13	0.34	0.04	1.13	0.34	0.04
Tailings management	0.0006	0.0001	0.0001	0.46	0.13	0.04

TOTAL	**22.8**	**6.5**	**1.54**	**21.6**	**6.3**	**1.56**

4.2.2 Year 8

27. shows the dust emission rates that have been estimated for Year 8 operations. By using centrifuges, dust emissions from overburden haulage and vehicle exhaust emissions are reduced. In particular, overburden haulage emissions reduce by around 40%. Dust emissions from tailings management and exposed and rehabilitated areas increase to an extent that offsets the reduction to haulage. Consequently, overall emissions for the EES scenario and centrifuge scenario are very similar. I estimate that PM10 emissions from the centrifuge scenario would be 2% (or 0.1g/s) higher. I estimate a 1% increase for TSP.

28. There is no change in dust emissions from other activities associated with the Project in Year 8.

29. Table 2 shows the dust emission rates that have been estimated for Year 8 operations. By using centrifuges, dust emissions from overburden haulage and vehicle exhaust emissions are reduced. In particular, overburden haulage emissions reduce by around 40%. Dust emissions from tailings management and exposed and rehabilitated areas increase to an extent that offsets the reduction to haulage. Consequently, overall emissions for the EES scenario and centrifuge scenario are very similar. I estimate that PM_{10} emissions from the centrifuge scenario would be 2% (or 0.1g/s) higher. I estimate a 1% increase for TSP.

30. There is no change in dust emissions from other activities associated with the Project in Year 8.

Table 2 Year 8 - Estimated TSP, PM_{10} and $PM_{2.5}$ emission rates due to the Project (g/s) – EES scenario vs centrifuge scenario

Activity	EES Scenario			Centrifuge Scenario		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Topsoil/overburden removal						
Topsoil excavation	1.03	0.18	0.02	1.03	0.18	0.02
Topsoil dumping	0.003	0.002	0.0002	0.003	0.002	0.0002
Overburden excavation	0.2	0.1	0.01	0.2	0.1	0.01
Dozers on overburden	0.4	0.1	0.04	0.4	0.1	0.04
Overburden haulage	1.2	0.2	0.02	0.68	0.11	0.01
Overburden dumping	0.1	0.03	0.005	0.1	0.03	0.005
Overburden screening	0.002	0.001	0.0001	0.002	0.001	0.0001
Ore removal						
Dozers on ore	0.45	0.09	0.05	0.45	0.09	0.05
Ore transfers and screening	0.1	0.1	0.01	0.1	0.1	0.01
Ore transport/processing	No emissions – wet processes					
Product handling						
Truck loading - HMC	No emissions – material is entirely >40µm					
Product haulage	1.52	0.29	0.07	1.52	0.29	0.07
Rehabilitation						

Activity	EES Scenario			Centrifuge Scenario		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Dozer rehab/contouring	0.07	0.01	0.01	0.07	0.01	0.01
Wind erosion						
Stockpiles	0.5	0.3	0.04	0.5	0.3	0.04
Exposed and rehabilitated areas	4.2	2.1	0.3	4.4	2.2	0.3
Vehicle exhaust	-	0.58	0.53	-	0.55	0.50
Grading	1.13	0.34	0.04	1.13	0.34	0.04
Tailings management	0.0009	0.0002	0.0001	0.46	0.10	0.02
TOTAL	**11.0**	**4.3**	**1.2**	**11.1**	**4.4**	**1.2**

4.2.3 Year 12

31. Table 3 shows the dust emission rates that have been estimated for Year 12 operations. By using centrifuges, dust emissions from overburden haulage, vehicle exhaust emissions and wind erosion of exposed and rehabilitated areas are reduced. In particular, overburden haulage emissions reduce by around 15%. Dust emissions from tailings management are anticipated to increase due mainly to the materials being hauled during the day to their disposal site. Previously, there was no haulage associated with tailings management. However, this increase is less than the reduction achieved from overburden haulage.

32. There is no change in dust emissions from other activities associated with the Project in Year 12.

Table 3 Year 12 - Estimated TSP, PM_{10} and $PM_{2.5}$ emission rates due to the Project (g/s) – EES scenario vs centrifuge scenario

Activity	EES Scenario			Centrifuge Scenario		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Topsoil/overburden removal						
Topsoil excavation	1.56	0.27	0.03	1.56	0.27	0.03
Topsoil dumping	0.005	0.002	0.0003	0.005	0.002	0.0003
Overburden excavation	3.1	0.9	0.1	3.1	0.9	0.1
Dozers on overburden	0.3	0.1	0.03	0.3	0.1	0.03
Overburden haulage	8.1	1.2	0.1	6.9	1.0	0.1
Overburden dumping	0.2	0.1	0.012	0.2	0.1	0.012
Overburden screening	0.002	0.001	0.0001	0.002	0.001	0.0001
Ore removal						
Dozers on ore	0.45	0.09	0.05	0.45	0.09	0.05
Ore transfers and screening	0.2	0.1	0.01	0.2	0.1	0.01
Ore transport/processing	No emissions – wet processes					
Product handling						

Activity	EES Scenario			Centrifuge Scenario		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Truck loading - HMC	No emissions – material is entirely >40µm					
Product haulage	1.55	0.30	0.07	1.55	0.30	0.07
Rehabilitation						
Dozer rehab/contouring	0.42	0.08	0.04	0.42	0.08	0.04
Wind erosion						
Stockpiles	0.5	0.3	0.04	0.5	0.3	0.04
Exposed and rehabilitated areas	5.0	2.5	0.4	4.7	2.3	0.4
Vehicle exhaust	-	0.74	0.67	-	0.71	0.64
Grading	1.13	0.34	0.04	1.13	0.34	0.04
Tailings management	0.0012	0.0002	0.0001	0.50	0.13	0.04
TOTAL	**22.4**	**6.8**	**1.6**	**21.4**	**6.6**	**1.6**

4.3 Results of dispersion modelling

4.3.1 Background

33. The EES air quality assessment investigated the potential for the Project to affect air quality in its vicinity during construction, operations and decommissioning. To assess the operational stage, three years during the mine life were selected, namely: Year 5, Year 8 and Year 12.

34. The EES air quality assessment identified standard dust control measures and additional control measures that will be applied to minimise the emissions and potential impact of dust from the Project. Standard control measures are a combination of controls that are benchmarked as either best practice or maximum extent achievable (MEA), which will be routinely implemented to achieve a minimisation of dust emissions. Additional control measures are proactive and reactive strategies that utilise forecast weather conditions and real-time monitoring data to schedule and/or adjust management measures or mining activities.

35. The EES air quality assessment and my First Statement of Evidence showed that the following air pollutants would comply with the respective air quality criteria during Year 5, Year 8 or Year 12 operations with the application of standard mitigation measures:

    - $PM_{2.5}$
    - Respirable crystalline silica
    - Heavy metals
    - Dust deposition rates.

36. The EES air quality assessment and my First Statement of Evidence showed that standard and additional mitigation measures were required to ***comply*** with the PEM objective for 24-hour average concentrations of PM_{10} at all sensitive receptors.

37. The EES air quality assessment and my First Statement of Evidence showed that 24-hour average and annual average concentrations of $PM_{2.5}$ are predicted to comply with the SEPP AAQ and Proposed Final ERS. In relation to PM_{10}, 24-hour and annual average concentrations may exceed the Environmental Quality Objectives of the SEPP AAQ and the Proposed Final ERS. My First Statement of Evidence showed that 24-hour and annual average concentrations of PM_{10} would **comply** with the SEPP AAQ and Proposed Final ERS with additional mitigation measures (see paragaraph 59 of My First Statement of Evidence.

38. As a consequence of the above, the key air pollutant for consideration of the Project using centrifuges is PM_{10} and the key operational years for consideration are Year 5 and Year 12. All other air pollutants were found to **comply** with their respective air quality objectives and the Project using centrifuges would results in further reduction in their levels.

4.3.2 Year 5

39. Table 4 shows predicted maximum 24-hour average ground-level concentrations of PM_{10} due to the EES air quality assessment compared to the centrifuge scenario. As a consequence of the centrifuge scenario, maximum 24-hour average ground-level concentrations of PM_{10} are reduced by between 2.6 and 9.4%.

Table 4 Predicted maximum 24-hour average ground-level concentrations of PM_{10} due to Year 5 operations for EES scenario vs centrifuge scenario

Receptor	Maximum 24-hour PM_{10} (µg/m^3) – EES Scenario		Maximum 24-hour PM_{10} (µg/m^3) – Centrifuge Scenario	
	Project	Cumulative	Project	Cumulative
R1	34.3	59.1	31.8	59.1
R5	33.6	59.2*	31.1	57.8*
R6	31.0	58.7*	29.1	57.7*
R7	56.7	57.7*	52.6	57.5*
R8	17.4	57.8	16.3	57.8
R9	16.3	57.4	15.0	57.4
R10	11.8	57.4	11.1	57.4
R11	13.5	57.4	12.5	57.4
R12	12.9	57.4	12.0	57.4
R13	10.6	57.4	9.6	57.4
R14	16.4	57.7	15.4	57.7
R15	53.1	59.5*	49.7	59.2*
R16	43.2	58.2*	39.9	58.0*
R17	36.9	57.8	34.1	57.7
R18	34.1	57.7	31.6	57.7
R19	25.8	57.8	23.9	57.8
R20	20.2	57.5	19.1	57.5
R21	17.4	57.7	16.1	57.7
R22	19.5	58.3	19.0	58.2
R23	20.8	57.6	19.7	57.6
R24	18.1	57.6	16.9	57.5
R25	15.9	58.8	14.5	58.7
R26	19.0	57.5	17.7	57.4

Receptor	Maximum 24-hour PM_{10} ($\mu g/m^3$) – EES Scenario		Maximum 24-hour PM_{10} ($\mu g/m^3$) – Centrifuge Scenario	
	Project	Cumulative	Project	Cumulative
R27	17.9	57.4	16.8	57.4
R28	18.6	57.7	17.9	57.7
R29	42.1	58.6	39.0	58.5
R30	21.1	57.8	19.3	57.7
R31	32.1	57.6	30.8	57.6
R32	16.5	57.5	15.6	57.5
R33	13.6	57.4	12.7	57.4
R34	16.6	57.5	15.7	57.5
R35	19.6	57.5	18.5	57.5
R36	20.8	58.6	19.3	58.5
R37	20.9	59.3	20.0	59.2
R38	14.5	59.6	13.6	59.5
R39	18.0	59.6	16.8	59.5
R40	19.5	59.7	18.1	59.5
R41	18.2	58.3*	16.9	59.8
R42	30.5	58.8*	28.1	57.6*
R43	18.3	57.9	17.0	57.8
R44	40.0	58.3	38.3	58.2
R45	20.9	57.6	19.9	57.5
R46	18.6	59.7	17.3	59.5
R47	21.4	57.6	20.3	57.6
R48	37.2	57.8	34.5	57.8
R49	24.2	57.7	22.4	57.7
Ambient background included	-	Time-varying background	-	Time-varying background
Air quality criteria	**-**	**60**	**-**	**60**
Table notes: * Includes additional dust mitigation measures				

40. Table 5 shows the number of days of exceedance of the PEM criterion with the adoption of standard and additional mitigation measures for Year 5 for the EES scenario compared with the centrifuge scenario. The centrifuge scenario results in two fewer exceedances under the standard mitigation scenario compared with the EES scenario. The application of additional mitigation will ensure that the PEM criterion is achieved at all sensitive receptors for both the EES scenario and the centrifuge scenario in Year 5.

41. Compliance with the Environmental Quality Objectives of the SEPP AAQ and the Proposed Final ERS for PM_{10} is evaluated in Section 4.4.

Table 5 **Number of exceedance days for receptors with 24-hour average concentrations of PM_{10} above 60 µg/m³ due to Year 5 operations, EES scenario vs centrifuge scenario**

Receptor	Number of exceedance days – EES Scenario		Number of exceedance days – Centrifuge Scenario	
	Standard mitigation	Standard and additional mitigation	Standard mitigation	Standard and additional mitigation
R5	1	0	1	0
R6	1	0	1	0
R7	1	0	1	0
R15	3	0	2	0
R16	2	0	2	0
R41	1	0	0	0
R42	1	0	1	0

4.3.3 Year 12

42. Table 6 shows predicted maximum 24-hour average ground-level concentrations of PM_{10} due to the EES air quality assessment compared to the centrifuge scenario. As a consequence of the centrifuge scenario, maximum 24-hour average ground-level concentrations of PM_{10} are reduced by between 2.8 and 7.5%.

Table 6 **Predicted maximum 24-hour average ground-level concentrations of PM_{10} due to Year 12 operations for EES scenario vs centrifuge scenario**

Receptor	Maximum 24-hour PM_{10} (µg/m³) – EES Scenario		Maximum 24-hour PM_{10} (µg/m³) – Centrifuge Scenario	
	Project	Cumulative	Project	Cumulative
R1	45.5*	58.6*	40.4*	58.6*
R5	27.9	58.7*	25.8	58.8*
R6	23.3	58.6*	21.9	58.7*
R7	43.6	58.6*	40.7	58.7*
R8	24.6	57.3*	23.5	57.3*
R9	18.0	57.3*	17.1	59.3
R10	13.9	57.5	13.2	57.4
R11	17.9	57.3*	16.9	59.1
R12	15.5	57.7	14.7	57.4
R13	14.2	57.4	13.2	57.4
R14	21.9	57.6	20.7	57.6
R15	45.7	58.4*	43.7	58.4*
R16	46.5	58.1*	44.4	58.1*
R17	51.8	57.5*	49.1	57.9
R18	54.2	59.8	50.7	57.9
R19	59.3	57.6*	56.2	57.6*
R20	17.4	57.6	16.4	57.6
R21	20.9	57.7	19.6	57.7

Receptor	Maximum 24-hour PM_{10} (µg/m³) – EES Scenario		Maximum 24-hour PM_{10} (µg/m³) – Centrifuge Scenario	
	Project	Cumulative	Project	Cumulative
R22	43.9	58.0*	41.9	58.0*
R23	20.9	57.6	19.8	57.5
R24	20.2	57.5	19.2	57.5
R25	27.2	58.2	26.0	58.2
R26	20.3	57.6	19.1	57.6
R27	14.1	57.5	13.2	57.5
R28	43.6	57.9	40.7	57.8
R29	49.2	58.6	45.9	58.5
R30	54.4	58.2*	52.0	58.2*
R31	29.4	58.0	28.0	57.9
R32	25.4	57.7	23.9	57.7
R33	18.3	57.5	17.3	57.5
R34	19.5	57.6	18.6	57.6
R35	16.9	57.6	16.0	57.6
R36	28.2	57.4*	26.8	57.4*
R37	15.6	59.2	14.7	59.1
R38	15.8	58.2*	15.0	58.2*
R39	24.6	57.9*	23.3	58.0*
R40	19.1	58.0*	18.3	58.1*
R41	19.4	58.5*	18.4	58.5*
R42	30.6	58.3*	29.3	58.3*
R43	26.5	57.7	24.7	57.7
R44	51.7*	58.3*	41.2*	58.3*
R45	38.8	57.9	37.7	57.9
R46	23.3	58.0*	22.2	58.0*
R47	30.6	58.2	28.9	58.1
R48	56.2	57.6*	53.2	58.8
R49	52.2	57.6*	49.2	57.6*
Ambient background included	-	Time-varying background	-	Time-varying background
Air quality criteria	**-**	**60**	**-**	**60**
Table notes: * Includes additional dust mitigation measures				

43. Table 7 shows the number of days of exceedance of the PEM criterion with the adoption of standard and additional mitigation measures for Year 12 for the EES scenario compared with the centrifuge scenario. The centrifuge scenario results in seven fewer exceedances under the standard mitigation scenario compared with the EES scenario. The application of additional mitigation will ensure that the PEM criterion is achieved at all sensitive receptors for both the EES scenario and the centrifuge scenario in Year 12.

44. Compliance with the Environmental Quality Objectives of the SEPP AAQ and the Proposed Final ERS for PM_{10} is evaluated in Section 4.4.

Table 7 Number of exceedance days for receptors with 24-hour average concentrations of PM_{10} above 60 µg/m^3 due to Year 12 operations, EES scenario vs centrifuge scenario

Receptor	Number of exceedance days – EES Scenario		Number of exceedance days – Centrifuge Scenario	
	Standard mitigation	Standard and additional mitigation	Standard mitigation	Standard and additional mitigation
R1	4	0	3	0
R5	1	0	1	0
R6	1	0	1	0
R7	2	0	2	0
R8	1	0	1	0
R9	1	0	0	0
R11	1	0	0	0
R15	1	0	1	0
R16	1	0	1	0
R17	1	0	1	0
R19	1	0	1	0
R22	1	0	1	0
R30	1	0	1	0
R36	1	0	1	0
R38	1	0	1	0
R39	1	0	1	0
R40	2	0	1	0
R41	1	0	1	0
R42	2	0	2	0
R44	4	0	3	0
R46	2	0	1	0
R48	1	0	0	0
R49	1	0	1	0

4.4 Assessment against SEPP AAQ environmental quality objectives

45. The submission of EPA Victoria suggests that the results of dispersion modelling should also be compared to the State Environment Protection Policy (Ambient Air Quality) (SEPP AAQ) objectives. The SEPP AAQ objectives for PM_{10} and $PM_{2.5}$ are equivalent to the objectives that are specified in the Proposed Final ERS (see Section 3.2.3 of my First Statement of Evidence).

46. My First Statement of Evidence investigated the mitigation measures that would be required to achieve compliance with the Environmental Quality Objectives of the SEPP AAQ for 24-hour average and annual average concentrations of PM_{10}.

47. The following mitigation measures were considered in my First Statement of Evidence, which were demonstrated to achieve compliance with the SEPP AAQ objectives for 24-hour average and annual average concentrations of PM_{10}:

- Scenario 1:
    - The EES air quality assessment assumed that overburden would be extracted using scapers. This scenario investigates the use of truck and shovel to extract overburden rather than scapers. Kalbar has determined that extraction of overburden by truck and shovel is viable.
    - The EES air quality assessment assumed that grading would occur continuously 24-hours per day. This scenario investigates grading for 12 hours of the day from 6am to 6pm (at the EES activity rate). This control measure is required from a noise abatement perspective.
    - The EES air quality assessment assumed that product haulage would occur 24-hours per day. This scenario investigates product haulage for 11 hours of the day at 2.2 times the EES activity rate. This control measure is required from a noise abatement perspective.
- Scenario 2: The EES air quality assessment assumed that overburden extraction would occur 24-hours per day. The assessment found that for nine days in Year 5, three days in Year 8 and 37 days in Year 12, additional mitigation measures in the form of ceasing certain activities was required to achieve compliance with the PEM objectives. This scenario adopts the mitigation measures described in Scenario 1, and also ceases overburden extraction during the night as a reactive control to be implemented in the event of elevated dust to achieve compliance with the SEPP AAQ environmental quality objectives for PM_{10}. As part of this scenario, the overburden extraction could occur at twice the normal rate during the day (6am to 6pm).
- Scenario 3: The EES air quality assessment assumed that overburden haulage and grading would occur 24-hours per day in the east and west pits. The assessment found that for nine days in Year 5, three days in Year 8 and 37 days in Year 12, additional mitigation measures in the form of ceasing certain activities was required to achieve compliance with the PEM objectives. This scenario adopts the mitigation measures described in Scenario 2 and further, ceases overburden haulage in the east pit and ceases grading in the east and west pits during the day as a reactive control to be implemented in the event of elevated dust to achieve compliance with the SEPP AAQ environmental quality objectives for PM_{10}.

48. Given the findings above, by adopting the mitigation measures that are specified in paragraph 47, the Project using centrifuges would also comply with the SEPP AAQ environmental quality objectives for PM_{10}.

4.5 Greenhouse gas emissions

49. I am advised that the centrifuges would use approximately 10,194 MWh of electricity per year in total, which will have associated greenhouse gas emissions of approximately 10,400 tCO_2-e per year. This represents a potential increase of 15% in average annual greenhouse gas emissions (Year 1 to Year 15) from the Project if all other aspects remained unchanged.

50. The centrifuges will produce various benefits for greenhouse gas emissions. For example, Amphirol will no longer be required and, therefore, its associated greenhouse gas emissions will be removed from the Project. Also, overburden haulage distances and associated greenhouse gas emissions from diesel fuel use will be reduced. I estimate overburden haulage for the Project using centrifuges will be reduced by 38% in Year 5, 34% in Year 8 and 37% in Year 12.

51. Whilst, I have not been able to determine the complete greenhouse gas emissions inventory for the Project with centrifuges, I expect total emissions of greenhouse gases will not be significantly different from that estimated in the EES air quality assessment.