

Review of soils and rehabilitation aspects of
Fingerboards Environmental Effects Statement,
Glenaladale, Victoria:
Expert witness statement, supplementary
statement

Statement by:

Dr Jessica Drake
PhD (Soil Science), Australian National University
BSc (REM) Honours, Australian National University
Grad Cert (Science Communication), ANU

Environmental Regulation and Soil Scientist
Murrang Earth Sciences

Contact details:

M: [REDACTED]
E: Jessica.Drake@murrang.com.au
W: <http://www.murrang.com.au>
Tw: @MurrangEarthSci
GPO Box 2310, CANBERRA 2601

Reviewed by:

Dr Kyle Horner
LOMAH Water Solutions

Statement written for:

Environmental Justice Australia
A/- Submitter No. 813
PO Box 12123 A'Beckett St PO
Melbourne VIC 8006

17 March 2021

Document details

Report title
Review of soils and rehabilitation aspects of Fingerboards Environmental Effects Statement, Glenaladale, Victoria: Expert witness statement, supplementary statement

Report number	Version	Review number	Author	Reviewer	Date submitted
MES4019-R07	DRAFT	0	JD	KNH	9 March 2021
MES4019-R07	DRAFT	1	JD	EJA	11 March 2021
MES4019-R07	FINAL	2	JD	-	17 March 2021

Receiver	Delegate	Format
Environmental Justice Australia	Virginia Trescowthick and Nick Witherow	Email

Table of contents

A.	Acknowledgement of expert witness code of conduct	4
B.	Summary.....	4
C.	Qualifications	5
D.	Conflicts of interest.....	7
E.	Instructions	8
F.	Findings.....	10
F.1	Baseline soil information	10
F.2	Soil erosion in the project area.....	10
F.3	Soil erosion potential.....	11
F.4	Soil rehabilitation.....	12
F.5	Rehabilitation criteria and soils	13
F.6	Rehabilitation and mitigation strategies for soils	15
F.7	Characterisation of tailings.....	16
G.	Limitations	16
H.	Attachment A: Curriculum Vitae.....	18
I.	Attachment B: Letter of Instruction.....	22

Review of soils and rehabilitation aspects of Fingerboards Environment Effects Statement, Glenaladale, Victoria: Expert witness statement, supplementary statement

A. Acknowledgement of expert witness code of conduct

1. I have read the Guide to Expert Evidence provided by Planning Panels Victoria, and agree to comply with it; and
2. 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 Panel.

B. Summary

3. Based on my review of supplementary material (Point 21) related to soils and rehabilitation:
 - It is my opinion that the information provided on the discussed changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of *“Soil and rehabilitation aspects of Fingerboards Environmental Effects Statement, Glenaladale, Victoria: Expert witness statement”* dated 27 January 2021 (now referred to as Drake EWS) in relation to the baseline assessment of soils.
 - It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to current erosion present in the project area.
 - It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to soil erosion potential. However, soil erosion potential in relation to centrifuged tailings should be included in the EES.
 - It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does partially affect the material outcome of Drake EWS in relation to soil rehabilitation. Should centrifuged fine tailings be used as part of the manufactured subsoil, new experiments will need to be undertaken as part of the EES to a) identify and evaluate the effects of the Fingerboards project in relation to soil rehabilitation, and b) identify and appropriately assess the actual or likely effects of

using centrifuged fine tailings as they relate to soil rehabilitation. The information provided, however, does not change the outcome of Drake EWS in relation to methods, experimental design and statistical analysis of the subsoil manufacturing experiments.

- It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to the soils, overburden and tailings as part of rehabilitation and closure planning and criteria in the Fingerboards EES.
- It is in my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does affect the material outcome of the Fingerboards EES. It is in my opinion that the Fingerboards EES has not adequately considered the centrifuged management of tailings in rehabilitation, closure plans or design criteria.
- It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to risks and mitigation strategies for soils, overburden and tailings as part rehabilitation and closure planning in the Fingerboards EES. Risks and mitigation strategies in relation to centrifuged tailings as part of rehabilitation and closure planning should be included in the EES.
- It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to the fact that tailings should be characterised, assessed and managed as a waste.

This statement is subject to a range of limitations, including time, scope, subject areas reviewed etc.

C. Qualifications

4. I am an environmental regulation and soil scientist. My areas of expertise are a) understanding the nexus between science and regulation, and b) soil science. In relation to soil science, I specifically work in soil chemistry, organic material and waste application to soil, soil and plant nutrient dynamics, saline and sodic soils, erosion management, and rehabilitation and restoration of soils.
5. My expertise has been developed over more than 15 years of research and work experience, within universities, private sector, government and non-government organisations. I majored in land management during my undergraduate degree in Resource and Environmental Management, where I undertook all available courses at the time on land management and soils at the Australian National University. Following this, I undertook an Honours year at the Australian National University where my research focused on understanding the benefits and risks of dairy farm effluent application to soil as a function of time. During my Honours year in

2004-2005, I became a member of Soil Science Australia and I have maintained my membership since.

6. After graduating with an Honours degree, I worked in soil and environmental management for ACT Forests. This job included mapping soil and erosion in a post-bushfire catchment, developing new approaches to soil and environmental protection during logging operations, providing soil erosion and environmental protection training to staff, and implementing soil erosion management on-ground. I worked in this role for about 1.5 years until there was a restructure where ACT Forests was amalgamated into Environment ACT. Following this, I spent 8 months in the Solomon Islands teaching environmental management, and then 1 year at EarthTech as their soil scientist. My role at EarthTech was focused on erosion control and management in catchments, analysing and interpreting soil results for engineering solutions, and other soil related advice to the business. I resigned from this position to undertake a PhD.
7. My PhD topic was on soil science within the context of mine rehabilitation. I undertook research on the issue of small-scale variation in soil that occurs when soil is stripped from mine sites for later rehabilitation. This research included: developing a new framework for considering holistic mine site rehabilitation; a review into small-scale soil variation including sampling, analysis and statistics; sampling and analysing stockpiled soils at a mine site; undertaking glasshouse and laboratory experiments into rehabilitation of nutrient cycling in soils from a mine site using different amendments; and developing new approaches for analysing phosphorous and nitrogen contents of soils from mine sites. The soils studied in my PhD were from a mine site and were either sodic, saline or saline sodic in nature.
8. Following my PhD, I worked as a post-doctoral fellow at Monash University in the area of soil science. In this role I undertook research into organic amendment application to soils, and how the amendments altered soil chemistry and carbon, as well as plant health. This research was undertaken on dairy farms and revegetation areas on a range of soils, including sodic and saline sodic soils.
9. At the completion of my post-doctoral fellowship, I worked as a higher education teacher for 10 months prior to starting work as a Specialist Applied Scientist – Land and Groundwater at Environment Protection Authority (EPA) Victoria for 2.5 years. This role continued the use of

my soil and land management skills, where I led scientific programs on waste application to land in a regulatory context (regulatory science) and was also responsible for providing technical advice to the business on waste application to land, waste soil, or land issues. This included reviewing Environmental Effects Statements for land, soil and waste issues, as well as mining rehabilitation plans.

10. Since July 2018, I have worked at Murrang Earth Sciences where I continue my work in soil and regulatory sciences. My recent work at Murrang Earth Sciences includes: erosion assessments and management plans for vegetation management sites, including sodic soils; soil analytical assessments and management plans for farms and private landholders, including sodic and saline sodic soils; undertaking reviews and assessments on waste application to land; and, developing resources about soil for clients and community.

D. Conflicts of interest

11. I am close friends with Mr Andrew Halliday who works in the Development Assessments Unit (DAU) of EPA Victoria, where he may on occasions work on some aspects of mining in the state of Victoria. We, Andrew and I, do not discuss this work in a professional or personal setting. As a courtesy for his own work, I have let Andrew know that I am providing an expert witness statement on an environmental effects statement.
12. I previously worked at EPA Victoria as Specialist Applied Scientist – Land and Groundwater. I believe I saw early plans for the Fingerboards project when I was employed by EPA Victoria, and I provided some advice to EPA Victoria based on the information provided at that point in time.
13. Dr Rob Loch, owner and employee of Landloch Pty Ltd, was engaged to undertake sections of the EES. I previously engaged Dr Rob Loch in 2005/2006 for erosion control advice within ACT Forests and supported his engagement in November 2008 for mine site rehabilitation and erosion control advice for the mine where I undertook my PhD research. His engagement added knowledge to my PhD research. I was offered a job by Rob Loch at Landloch in 2007, which I declined due to personal reasons. I have had minimal contact with Rob since finishing my PhD in 2012.

14. I also have a professional relationship with Dr Corinne Unger, author of the Rehabilitation Independent Peer Review Report (Attachment K of the EES), and to the best of my knowledge we last emailed in 2018.
15. Dr Laura-lee Innes, an employee of Murrang Earth Sciences and thus my colleague, has been engaged by EPA Victoria to undertake an expert witness statement with regards to the waste and radiation aspects of the Fingerboards Environment Effects Statement (the EES). I have in no way discussed any part of my findings presented herein with Laura-lee, and she has not discussed any part of her findings.
16. Dr Julia Jasonsmith, an employee of Murrang Earth Sciences and thus my colleague, has been engaged by Environmental Justice Australia (EJA) to undertake an expert witness statement with regards to the tailings aspects of the EES. As we have both been engaged by EJA, we have had some discussions of the technical information we have reviewed and have kept our interaction on these topics to a minimum. I have read part of Julia's expert witness statement, namely Sections A-D and F and we have both used the same pro forma for our statements.
17. This expert witness statement was peer-reviewed by Dr Kyle Horner, Principal Hydrogeologist of LOMAH. This peer review was undertaken as part of the Murrang Earth Sciences Statement of Performance to ensure the quality and accuracy of the information within this statement. All opinions presented, unless otherwise stated, are my own.

E. Instructions

18. Environmental Justice Australia, acting on behalf of Submitter No. 813, sought expert opinion regarding the soils and rehabilitation aspects of the *'Fingerboards Mineral Sands Project Environmental Effects Statement (EES) August 2020'* from Murrang Earth Sciences. Given my experience and skills outlined in Section C, I undertook this work as an employee of Murrang Earth Sciences, in the Expert Witness Statement *"Soil and rehabilitation aspects of Fingerboards Environmental Effects Statement, Glenaladale, Victoria: Expert witness statement"* dated 27 January 2021.
19. Environmental Justice Australia, acting on behalf of Submitter No. 813, has sought supplementary statement from Murrang Earth Sciences regarding the changes to the project

related to centrifuges for water recovery and tailings management in relation to the soils and rehabilitation aspects of the ‘*Fingerboards Mineral Sands Project Environmental Effects Statement (EES) August 2020*’. Given my experience and skills outlined in Section C, I undertook this work as an employee of Murrang Earth Sciences.

20. Environmental Justice Australia provided a memo (Section I: Attachment B) to Murrang Earth Sciences, dated 23 February 2021. This memo instructed me as follows:

1. *Our client seeks a Supplementary Statement to address how the proposed changes impact the findings and conclusions contained in your Expert Witness Statement dated 27 January 2021.*
2. *We request that you undertake a review of the documents above (albeit only those sections of relevance to soils and rehabilitation) and prepare a Supplementary Statement providing your opinion on:*
 - a. *The compliance of the soils and rehabilitation components of the EES (as amended by the documents above) with the relevant evaluation objective in the Scoping Requirements.*
 - b. *The adequacy of the baseline data collected by the project proponent to confidently describe pre-development conditions (as relevant to soil and rehabilitation).*
 - c. *The appropriateness of the methods used to identify and evaluate the effects of the project (as relevant to soil and rehabilitation).*
 - d. *Whether the actual or likely effects in relation to soil and rehabilitation are identified and or appropriately assessed.*
 - e. *The adequacy of the proposed design and mitigation measures, including the design criteria and draft mine rehabilitation and closure plans.¹*
 - f. *Any other matters you identify which you consider relevant within the limits of your expertise.*
 - g. *Any appropriate qualifications or conditions that should be attached to findings or conclusions, such as uncertainties or gravity of threats or impacts.*
3. *Further to the matters set out at paragraph [2], we request that specific consideration be given to potential impacts on soils and rehabilitation arising from the increased use of flocculants.²*
4. *As an expert you are able to consider any such material you consider relevant to your enquiry. Please identify in your report any further materials you consult outside of the briefed materials.*

¹*NOTE: We anticipate an updated Draft Rehabilitation Mine Plan will be filed by the proponent with the Inquiry and Advisory Committee on 26 February 2021.*

²*Dr Jasonsmith identifies that polyacrylamides can be broken down into smaller, toxic chemicals called acrylamides in low-air environments (Expert Witness Statement of Dr Julia Jasonsmith, 19 January 2021, 13[40] (Document 91)).*

21. This expert witness statement supplementary report is based on “*Soil and rehabilitation aspects of Fingerboards Environmental Effects Statement, Glenaladale, Victoria: Expert witness statement*” dated 27 January 2021 (now referred to as Drake EWS), a letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, Expert Witness Statement of Ivan Saracik dated 8 February 2021, unless otherwise stated. I did not undertake

any field visits to the location of the proposed Fingerboards project as part of this supplementary report.

22. I was provided photos and drone footage by a member of Submitter No. 813 on the 7th March 2021. I have not used these photos or drone footage to inform this supplementary report.

F. Findings

F.1 Baseline soil information

23. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to the baseline assessment of soils.
24. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 all discuss the changes to water recovery and tailings management. The documents do not include any additional or revised information on the assessment of soils at the Fingerboards site. Therefore, the information provided does not change the outcome of Drake EWS in relation to the baseline assessment of soils.

F.2 Soil erosion in the project area

25. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to current erosion present in the project area.
26. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 all discuss the changes to water recovery and tailings management. The reports do not include any additional or revised information on the assessment of erosion at the

Fingerboards site. Therefore, the information provided does not change the outcome of Drake EWS in relation to current erosion present in the project area.

F.3 Soil erosion potential

27. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to soil erosion potential. However, soil erosion potential in relation to centrifuged tailings should be included in the EES.

28. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, and the Supplementary Statement of Dr Loch dated 6 February 2021 all discuss the changes to water recovery and tailings management. The reports do not include any any additional or revised information on the assessment of erosion at the Fingerboards site. Therefore, the information provided in these documents do not change the outcome of Drake EWS in relation to current erosion present in the project area.

29. The information provided in the Expert Witness Statement of Ivan Saracik dated 8 February 2021 states:

Anionic polyacrylamide (PAM) has been sold since 1995 to reduce irrigation- induced erosion and enhance infiltration. Its soil stabilizing and flocculating properties improve runoff water quality by reducing sediments, N, dissolved reactive phosphorus (DRP) and total P, chemical oxygen demand (COD), pesticides, weed seeds, and microorganisms in runoff.

30. From Point 29, the expert discusses that PAM has stabilising and flocculating properties. As tailings are to be used in a manufactured subsoil, we note that PAM may have an effect on soil erosion potential. The discussion by Ivan Saracik has not been done in context of soil erosion potential and does not include important factors such as dispersion potential and behaviour, nor any information on the roles of organic matter or organic carbon in soil dispersion and stability, as discussed in the Drake EWS. Therefore, the statement in Point 29 does not affect the material outcome of the Drake EWS. However, soil erosion potential in relation to centrifuged tailings should be included in the EES.

F.4 Soil rehabilitation

31. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does partially affect the material outcome of Drake EWS in relation to soil rehabilitation. Should centrifuged fine tailings be used as part of the manufactured subsoil, new experiments will need to be undertaken as part of the EES to a) identify and evaluate the effects of the Fingerboards project in relation to soil rehabilitation, and b) identify and appropriately assess the actual or likely effects of using centrifuged fine tailings as they relate to soil rehabilitation. The information provided, however, does not change the outcome of Drake EWS in relation to methods, experimental design and statistical analysis of the subsoil manufacturing experiments.
32. The information provided in the Supplementary statement of Dr Loch dated 6 February 2021 states:
- I have not been advised by Kalbar Operations whether preparation of a manufactured subsoil using a mixture of fine and coarse tailings will use fine tailings from the centrifuges or not. If it does, then a procedure of breaking the dried lumps of fine tailings to a finer particle size distribution suitable for mixing with the sand tailings will need to be developed. (That would be required only for the small proportion of fine tailings used in manufacturing subsoil for rehabilitation works.) It is likely that the mixing of dry fine tailings of suitable particle size (probably in the order of <5 mm) with sand tailings could achieve good (thorough and even) mixing.*
33. It is my understanding from Point 32 that the work undertaken in Appendix A021 and A022 does not use centrifuged fine tailings in the subsoil manufacturing experiments.
34. I agree with Dr Loch's statement in Point 32, that additional procedures and mixing will need to be considered should fine tailings from centrifuges be used in the manufactured subsoil.
35. Should centrifuged fine tailings be used in the manufactured subsoils, then new experiments will need to be undertaken as part of the EES to a) identify and evaluate the effects of the Fingerboards project in relation to soil rehabilitation, and b) identify and appropriately assess the actual or likely effects of using centrifuged fine tailings as they relate to soil rehabilitation.
36. All other discussion in Drake EWS related to methods, experimental design and statistical analysis of the subsoil manufacturing experiments is not affected by the information

provided. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 relates to the changes to water recovery and tailings management. The reports do not include any additional or revised information on methods, experimental design and statistical analysis of the subsoil manufacturing experiments. Therefore, the information provided does not change the outcome of Drake EWS in relation to methods, experimental design and statistical analysis of the subsoil manufacturing experiments.

F.5 Rehabilitation criteria and soils

37. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to the soils, overburden and tailings as part of rehabilitation and closure planning and criteria in the Fingerboards EES.

38. Further to point 37, it is in my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does affect the material outcome of the Fingerboards EES. It is in my opinion that the Fingerboards EES has not adequately considered the centrifuged management of tailings in rehabilitation, closure plans or design criteria.

39. The information provided in the Supplementary statement of Dr Loch dated 6 February 2021 states:

The elimination of TSFs will eliminate the delay required for each TSF to be filled and dried, with the result that filling of the pits will be completed and rehabilitation works will be able to be initiated earlier after completion of mining. That may enable some reduction in the area of land disturbed at any time, and it is possible that stockpiling of topsoil during the first years of mining will be reduced.

Elimination of TSFs containing fine tailings will mean that the final pit area will not contain layers of relatively impermeable fine (and compacted) tailings with possible potential to impact on sub-surface water movement (both lateral and vertical). As the overburden placed in the pit is likely to also be of low permeability (both before and after mining), I am not sure whether the tailings layers would have had significant impact or not.

40. It is my understanding from Point 39 that there will be changes to the placement of fine tailings in rehabilitation of the mine area should the proponent decide to proceed with centrifugation.

41. The information provided in Updated EES Chapter 3 dated 8 February 2021 states:

Fines tailings will be dewatered through solid bowl centrifuges located within a building near the mine void to produce a damp cake. Two centrifuge buildings are proposed, each one serving an active mining area and MUP. The cake will be stockpiled and trucked to the mine void during the day and evening shifts where it will be filled together with the overburden to the commencement level of the final subsoil rehabilitation layer.

42. The information provided in Technical Note 01 states:

In the EES scenario, rehabilitation commences only once the in-pit TSF has reached its design capacity and the fine tailings have dried sufficiently to be ripped and blended, to form a subsoil surface for the placement of topsoil. The removal of TSFs, and the continuous backfilling of the centrifuge cake with the overburden, negates the delay required for the TSF drying and rehabilitation can commence soon after the final rehabilitation surface level has been reached. The rehabilitation surface on top of the cake/overburden backfill will be identical to the method proposed in the EES, consisting of a manufactured subsoil, followed by topsoil and revegetation. Overall, rehabilitation can occur in a more continuous manner with the introduction of the centrifuges.

43. It is my understanding from Points 41 and 42 that fine tailings will still be used in the mine void as part of rehabilitation.

44. The information provided in the letter from the proponent dated 18 January 2021 and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 relates to the changes to water recovery and tailings management, and importantly does not include any additional or revised information on how the centrifuged fine tailings will be used in rehabilitation.

45. As discussed in Drake EWS, it is difficult to understand what materials will be placed in the area for rehabilitation, where and in what order. This is because a) there is inconsistency in how the materials are discussed in the EES in terms of their placement within the project area as part of rehabilitation, and b) the discussion of how materials placement interrelates with the minimum fine tailings depth of 3 m is unclear (e.g. if fine tailings should be at least 3 m deep, why are they discussed as being used in the top 3 m of the landform?). The information provided in Points 39, 41 and 42 do not help to clarify these two issues as stated in the Drake EWS.

46. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 relate to the changes to water recovery and tailings management. The reports do not include any additional or revised information on a) how centrifuged tailings will be used in a manufactured subsoil, b) how much topsoil will be used in rehabilitation of the site, or c) how the manufactured subsoil will be used on the site, as discussed in Drake EWS. Therefore, the information provided does not change the outcome of Drake EWS, in relation to these three issues.
47. The information in Points 39, 41 and 42, however, do suggest that changes to tailings management by using a centrifuge approach will affect rehabilitation. Therefore, the design criteria and draft mine rehabilitation and closure plans will need to be updated to reflect this change. As no changes to rehabilitation, closure plans or design criteria have been presented in the documents provided for this supplementary statement, it is in my opinion that the Fingerboards EES has not adequately considered the management of tailings in rehabilitation, closure plans or design criteria.

F.6 Rehabilitation and mitigation strategies for soils

48. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to risks and mitigation strategies for soils, overburden and tailings as part rehabilitation and closure planning in the Fingerboards EES. Risks and mitigation strategies in relation to centrifuged tailings as part of rehabilitation and closure planning should be included in the EES.
49. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 relates to the changes to water recovery and tailings management. The reports do not include any additional or revised information on the risks and mitigation strategies for centrifuged tailings, soils, overburden or coarse tailings as part of rehabilitation and closure planning. Therefore, the information provided does not change the outcome of Drake EWS in

relation to risks and mitigation strategies for soils, overburden and tailings as part of rehabilitation and closure planning in the Fingerboards EES. Risks in relation to centrifuged tailings as part of rehabilitation and closure planning should be included in the EES.

F.7 Characterisation of tailings

50. It is my opinion that the information provided on the changes to the project related to centrifuges for water recovery and tailings management does not affect the material outcome of Drake EWS in relation to the fact that tailings should be characterised, assessed and managed as a waste.

51. The information provided in the letter from the proponent dated 18 January 2021, Technical Note 01, Updated EES Chapter 3 dated 8 February 2021, Supplementary Statement of Dr Loch dated 6 February 2021, and the Expert Witness Statement of Ivan Saracik dated 8 February 2021 relates to the changes to water recovery and tailings management. The reports do not include any additional or revised information on characterisation of tailings or use of '*National Environmental Protection (Assessment of Site Contamination) Measure*' (NEP(ASC)M)¹ or the *Environment Protection Act (1970)* in relation to tailings. Therefore, the information provided does not change the outcome of Drake EWS in relation the fact that tailings should be characterised, assessed and managed as a waste.

G. Limitations

52. I was requested as per Point 20, to consider the impacts on soils and rehabilitation arising from the increased use of flocculants. I was unable to consider this request as I do not have sufficient experience in environmental chemistry or ecotoxicology to provide an opinion on this matter.

53. Geotechnical engineering, hydrology and hydrogeology are critical in understanding the project area prior to project implementation and for planning rehabilitation. I do not have any

¹ National Environment Protection Council (NEPC) (2014). National Environmental Protection (Assessment of Site Contamination) Measure.

formal training in these areas, and thus my supplementary statement does not consider these aspects. They are, however, crucial in understanding the stability of soils both during and after the project is completed, as well as for understanding success of rehabilitation, soil-water interactions, erosion potential of the site (particularly at the mine-offsite interface and for tunnel erosion) and water available for plant growth.

54. I did not review or consider other aspects of rehabilitation or closure planning other than soils, manufacturing of soils, tailings, overburden and soil-plant interactions in this statement. Rehabilitation is inherently interdisciplinary. Thus, I acknowledge that there are a range of aspects that are relevant to the adequacy of the rehabilitation and closure planning of the project area that have not been fully covered as part of this statement (e.g., ecology).
55. The statements made as part of this supplementary statement were limited to the sections of the EES reviewed, as per Point 21, due to time and resources.
56. I have not considered any information related to the engineering associated with the decommissioning of earth structures or tailings storage facilities, infrastructure areas or decommissioning of infrastructure areas, geotechnical engineering, fire, ecology (including vegetation and revegetation), visual values, social values, economics, performance requirements, hydrology, hydrogeology, statistics or radiation. Therefore, these aspects have not been covered in this expert witness statement, but may be related to or influenced by the information presented herein.

H. Attachment A: Curriculum Vitae

Dr Jess Drake

jessica.drake@murrang.com.au
murrang.com.au

Work experience

Environmental consulting

Environmental Regulation and Soil Scientist

Murrang Earth Sciences, July 2018 – Present

4.5 years

I am currently the Environmental Regulation and Soil Scientist at Murrang Earth Sciences. My work includes provision of regulatory science in soils, waste, waste to land and chemicals in the environment, and specialist technical knowledge in land, agriculture, soils, waste to land, mining rehabilitation, organic waste, composting, erosion, soil fertility, sodicity and salinity, report writing, scientific research, development of monitoring programs, evidence-based decision making, emerging risk research, collaboration and consultation with stakeholders, project management.

Freelance Environmental Scientist

Melbourne, January 2015 – November 2015

I worked independently for a year as a Freelance scientist. I worked alongside communities to help them investigate and solve their real-world problems. Some of my work included technical lead, research, editing and writing land management documents, education and soil reports.

Environmental Scientist

Earth Tech Pty Ltd Environment Group - Canberra, March 2007 – March 2008

Role included undertaking site assessment, planning and supervision of erosion control works in riparian areas. Modelling erosion and rainfall/runoff. Soil amelioration and land reclamation. Project management and administration. Policy procedures. Budget management. Communications and liaison with stakeholders and clients.

Government

Specialist Applied Scientist – Land and Groundwater

4 years

EPA Victoria - Melbourne, November 2015 – April 2018

As a Specialist Applied Scientist my two main functions were to provide technical advice to EPA and government, and to undertake research to inform policy. My functions generally included provision of specialist technical knowledge to business (land, groundwater, waste to land, mining rehabilitation, emerging chemicals, organic waste and composting), report writing, scientific research for policy review, development of monitoring programs, evidence-based decision making, emerging risk research, external-facing scientific representation, collaboration and consultation with stakeholders.

Soil and Environment Project Officer

Environment ACT – Canberra, March 2005 – August 2006

My short-term contract role included environmental management of operations, staff training in environmental management, soil mapping, erosion control programs, on-ground and aerial land restoration and rehabilitation, joint programs and stakeholder engagement, project management, administration, budget management and policy development.

Research

8 years

Senior Research Scientist

Monash University – Melbourne, December 2012-August 2015

As a Senior Research Scientist (Post-Doctoral) on a short-term research contract, I undertook two research projects in science-extension funded by the Australian Government. These projects worked directly with farmers on ground to help them solve their real-world problems. During this time, I also wrote and won grants for other industry and business research projects. Main tasks during this research included: project management, outreach and communication, liaison, capacity building, research, design, analysis, collaboration, information dissemination through reports and events, student and staff supervision, one-on-one research training, practical recommendations and planning, grant writing.

PhD Scholar – Soil Science

The Australian National University – Canberra, March 2008-October 2012

As a PhD Scholar, I undertook research on mine rehabilitation. The original theme of the PhD was to use organic amendments to kick-start nutrient cycling. However, halfway through my PhD I discovered a high-degree of small-scale soil variability which affected nutrient analyses. This meant that half my PhD was on nutrient cycling and the other half on methods of nutrient analysis. My main tasks during this research included: project management, outreach and communication, liaison, research, design, analysis, information dissemination through reports and events, staff supervision.

Teaching

6 years

Teacher – Conservation and Land Management

Vocational School of Science and Health, RMIT – Melbourne, January 2015 – November 2015

As a casual teacher, I designed of all practical assessment and coursework, undertook teaching practical skills, lecturing, tutorials and field/lab work, course coordination and administration, and supervising students.

Higher Education Teacher in Environmental Studies (University and Vocational)

Building and Environment Centre, Canberra Institute of Technology – Canberra July 2011 – December 2012

The Fenner School, ANU – Canberra, September 2007 – December 2011

As a casual teacher, I designed all assessment and coursework, teaching practical skills, lecturing, tutorials and field/lab work, course coordination and administration, supervising students.

During this time, I also worked as a back-fill lab manager, my role was not just about running a laboratory, but also about training and teaching students. Roles included maintaining and running specialised soil and water laboratory equipment, standardising new and adapting methods, undertaking analytical and statistical work, supervising and teaching students, OHS, budget and other project management duties.

Environmental Science Advisor

Live and Learn – Solomon Islands, August 2006 – January 2007

My role at Live and Learn, a short term volunteer placement, was primarily about teaching and capacity building. It included program development and implementation, teaching stakeholders, mentoring, capacity building, scientific support, project management, liaison and communication with stakeholders and collaborators.

Education

The Fenner School, Australian National University (2013) - PhD (Soil Science)

Centre for the Public Awareness of Science, Australian National University (2008) - Graduate Certificate in Science Communication

Australian National University (2005) - Bachelor of Science (Resource and Environmental Management) with First-Class Honours

Inspire Education (2015) - Certificate IV Training and Assessment

Memberships and volunteer work

Member of Castlemaine Landcare Group (2018-), including as committee member 2019-2020. Founding Member of Equity and Diversity Group of Soil Science Australia (SSA)(2013-2015) and Committee Member of Victorian Branch (2014-2015) and ACT/NSW branch (2009-2011). Member of SSA since 2005. Member of EGU in Soil Science Systems Division since 2013. Public Communication Activities, including invited speaker at Soil Change Matters 2014 and 2018 ANZ Soil Science Conference.

Grants and awards

Successful: 2019 Two Fruit Fly Community Program Grants, 2018 Observership Rural Women Scholarship, 2014 State (Tech Voucher) and Federal (Researcher in Business) funding for practical scientific research; 2014 Early Career Congress Scholarship from European Geophysical Union; 2008 and 2012 Student Prize from Soil Science Australia. Nominated: The Fenner School Teacher Award (2009) and Teaching Awards at RMIT (2015).

Publications and communications

Over forty government and industry reports, over 250 technical reviews, five papers published, three papers in refereed conference proceedings, ten conference papers, and one soil map. Online communication at Murrang Earth Sciences Blog.

Journal Publications

- Drake, J. A. Patti, A.F, Whan, K, Jackson, W.R, Cavagnaro, T.R. (2018) Can we maintain productivity on broad acre dairy farms during early transition from mineral to compost fertilisation? *Agriculture, Ecosystems and Environment*, 257, 12-19
- Mikkonen, H. G, Dasika, R, Drake, J.A, Wallis, C. J, Clarke, B. O, Reichman, S. M. (2018) Evaluation of environmental and anthropogenic influences on ambient background metal and metalloid concentrations in soil. *STOTEN*, 624, 599-610
- Drake, J. A, Carrucan, A, Jackson, W.R, Cavagnaro, T. R, Patti, A. F. (2015) Biochar application during reforestation alters species present and soil chemistry. *STOTEN*, 514, 359-365
- Jessica A Drake, Timothy R Cavagnaro, Shaun C Cunningham, W. Roy Jackson, Antonio F. Patti (2015) Does biochar improve establishment of tree seedlings in saline sodic soils? *Land Degradation and Development*, 27:1, 52-59
- Jessica Drake, Bennett Macdonald & Lorna Fitzsimons (2014) Precision of the Anion Exchange Membrane Phosphorus Technique When Using a Range of Low-Ionic Solutions in Analysis of Heterogeneous Mine Soils, *Communications in Soil Science and Plant Analysis*, 45:6, 829-843

I. Attachment B: Letter of Instruction

The following letter has been copied and pasted from the original version.

23 February 2021

Dr Jessica Drake
Environmental Regulation & Soil Scientist Murrang Earth Sciences

By email only: jessica.drake@murrang.com.au

Dear Dr Drake

Fingerboards Mineral Sands Mine Project, Glenaladale, Victoria – soils and rehabilitation We continue to act on behalf of [REDACTED]

We advise that the proponent has notified the Inquiry and Advisory Committee (**IAC**) of a number of changes to the project, in particular the addition of centrifuges for water recovery and tailings management. We **enclose** by hyperlink:

- Letter from the proponent dated 18 January 2021 ([Document 42](#))
- Technical Note 01 which details the implementation of centrifuges for water recovery and tailings management (Document 43)
- Updated EES Chapter 3: Project Description dated 8 February 2021 ([Document 122](#))
- Supplementary Statement of Dr Robert Loch, dated 6 February 2021 (Document 128); and
- Expert Witness Statement of Ivan Saracik on proposal to use centrifuges dated 8 February 2021 ([Document 130](#)).

The purpose of this letter is to seek a Supplementary Statement to address how the proposed changes impact the findings and conclusions contained in your Expert Witness Statement dated 27 January 2021.

Instructions

1. Our client seeks a Supplementary Statement to address how the proposed changes impact the findings and conclusions contained in your Expert Witness Statement dated 27 January 2021.
2. We request that you undertake a review of the documents above (albeit only those sections of relevance to soils and rehabilitation) and prepare a Supplementary Statement providing your opinion on:
 1. The compliance of the soils and rehabilitation components of the EES (as amended by the documents above) with the relevant evaluation objective in the Scoping Requirements.
 2. The adequacy of the baseline data collected by the project proponent to confidently describe pre- development conditions (as relevant to soil and rehabilitation).
 3. The appropriateness of the methods used to identify and evaluate the effects of the project (as relevant to soil and rehabilitation).

4. Whether the actual or likely effects in relation to soil and rehabilitation are identified and or appropriately assessed.
 5. The adequacy of the proposed design and mitigation measures, including the design criteria and draft mine rehabilitation and closure plans.¹
 6. Any other matters you identify which you consider relevant within the limits of your expertise.
 7. Any appropriate qualifications or conditions that should be attached to findings or conclusions, such as uncertainties or gravity of threats or impacts.
3. Further to the matters set out at paragraph [2], we request that specific consideration be given to potential impacts on soils and rehabilitation arising from the increased use of flocculants.²

¹ **NOTE:** We anticipate an updated Draft Rehabilitation Mine Plan will be filed by the proponent with the Inquiry and Advisory Committee on 26 February 2021.

² Dr Jasonsmith identifies that polyacrylamides can be broken down into smaller, toxic chemicals called acrylamides in low-air environments (Expert Witness Statement of Dr Julia Jasonsmith, 19 January 2021, 13[40] ([Document 91](#))).

4. As an expert you are able to consider any such material you consider relevant to your enquiry. Please identify in your report any further materials you consult outside of the briefed materials.

Expert Witness Code of Conduct

5. In preparing your Supplementary Statement, please ensure that you comply with the *Guide to Expert Evidence provided by Planning Panels Victoria* (April 2019), including by:

1. setting out all instructions that define the scope of the statement (i.e. attach this letter of brief dated 23 February 2021); and
2. making the following declaration:

'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 Panel.'

Important dates

6. To enable us to meet the Inquiry and Advisory Committee's filing deadline, we request that your Supplementary Statement be provided by **noon on Wednesday 10 March 2021**.

Confidentiality

7. This request for a Supplementary Statement, as well as any correspondence relating to this request, is for the purposes of the Fingerboards mineral sands mine project EES process, including the public hearings before the IAC. It is therefore confidential and is protected by legal professional privilege.

Fees and Terms of Engagement



Please contact Virginia Trescowthick if you have any questions or require further information.

Yours faithfully



Virginia Trescowthick

Lawyer