**BEFORE THE TARANAKI REGIONAL COUNCIL**

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| *under*: | the Resource Management Act 1991 |
| *in the matter of*: | Resource consent applications by Remediation New Zealand to renew resource consents to discharge waste material, treated stormwater & leachate, and to discharge emissions into the air from composting operations, at State Highway 3 1460 Mokau Road, Uruti ("Applications") |

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Statement of evidence of **Katie Jane Beecroft** for
Te Rūnanga o Ngāti Mutunga
(16 March 2021)

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## STATEMENT OF EVIDENCE OF KATIE JANE BEECROFT

### QUALIFICATIONS AND EXPERIENCE

1 My full name is **Katie Jane Beecroft**. I am a Senior Environmental Scientist based at Lowe Environmental Impact (LEI) in Palmerston North.

2 I have the following qualifications and experience relevant to the evidence I shall give:

a. Master of Science (Honours in Earth Science);

b. Bachelor of Science (Earth Science);

c. Advanced level Certificate in Sustainable Nutrient Management (required for use of Overseer®) from Massey University.

3 I am a member of a number of relevant associations including:

a. New Zealand Society of Soil Science;

b. Water New Zealand; and

c. New Zealand Land Treatment Collective.

4 I have experience in the management and discharge of organic waste products to land including:

a. I represent the New Zealand Land Treatment Collective (NZLTC) on the Steering Group for the Guidelines for Beneficial Use of Organic Materials on Productive Land.

b. I have been involved in a WasteMinz funded project to develop a collective biosolids management strategy for 11 lower North Island Councils. This project included a programme of research and development of protocols for composting of biosolids.

c. I have prepared Overseer® model scenarios for a range of discharges for wastewater irrigation and for organic waste discharge.

d. I have prepared consent applications for a number of sludge and biosolid discharges to land, developed district biosolids options for evaluation and provided advice on sludge management.

e. I have undertaken preliminary and detailed site investigations and have been involved in the development of remediation and management plans for a number of contaminated sites.

5 I am presenting this evidence for Te Rūnanga o Ngāti Mutunga ("TRONM") in relation to an application to Taranaki Regional Council (TRC) by Remediation New Zealand Limited (RNZ) for discharges to land and water at the Uruti Composting Facility, Taranaki.

**CODE OF CONDUCT**

6 I have read and agree to comply with the Code of Conduct for Expert Witnesses produced by the Environment Court 2014 and have prepared my evidence in accordance with those rules. My qualifications as an expert are set out above.

7 I confirm that the issues addressed in this brief of evidence are within my area of expertise.

8 I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed. I have specified where my opinion is based on limited or partial information and identified any assumptions I have made in forming my opinions.

9 In preparing my evidence I have read the following:

a. Application documents dated June 2020 – Appendices were referred to when referenced in the AEE.

b. TRC Annual Monitoring reports 2012-2013, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019.

c. Section 42A TRC Officer's Report dated 2 March 2021.

d. Applicants evidence dated 9 March 2021, in particular:

i. Evidence of Colin Kay.

ii. Evidence of Hayden Easton.

iii. Graphics and Data bundle provided by the Applicant.

**SCOPE OF EVIDENCE**

10 My evidence will cover the following:

a. Executive Summary.

b. Background

c. Site Layout and Activities

d. Sources of Nutrients, Contaminants and Water for Land Discharge.

e. Reception and Composting.

f. Placement of Compost Outside Composting Pads.

g. Monitoring of Soil Quality.

h. Site nutrient balance.

i. Assessment of Effects to Soil and Groundwater.

j. Volume of Material on Site.

k. Plans for Exiting Site.

**EXECUTIVE SUMMARY**

11 I have been asked to comment on whether mitigation measures proposed by Remediation (NZ) Ltd ("RNZ") are in line with good management practices, and would achieve confidence that adverse effects on the environment can be appropriately avoided, remedied or mitigated. I address the following proposed discharges:

a. Discharge of stormwater and leachate from composting operations and from stockpiled material to land by irrigation.

b. Discharge of solid organic material to land for composting.

c. Discharge of material stored on Pad 3 to land for use as a 'soil conditioner'.

12 The evidence of Ms McArthur addresses direct discharges from the site operation to the Haehanga Stream and its tributaries.

13 My evidence is provided from the perspective of 'Western science' and does not assess cultural issues with the proposed discharges to land.

14 I visited the RNZ Uruti site on 26 August 2020.

15 RNZ receives a number of high risk waste streams. Operating a vermiculture and composting facility of this type requires a robust set of consent conditions and management plans above and beyond a typical greenwaste composting facility. At the Uruti site, failing to comply with consent conditions and/or management plans creates a relatively high risk to the environment, due to the potential contaminants, soil types and indications of connectivity between soils, groundwater and the Haehanga Stream.

16 In particular, there is a risk of nitrogen entering surface and groundwaters. Risks from phosphorus and other contaminants leaving the site also exits.

17 A groundwater preliminary conceptual site model (CSM) was completed by BTW in 2015. Recommendations to further calibrate that model do not appear have been acted upon by RNZ. However, those preliminary investigations, TRC monitoring, and the evidence of Ms McArthur, indicate that there is connectivity between the relatively 'shallow' groundwater table and the Haehanga Stream. This may vary at different times of the year, for example, depending

on rainfall and stream flows. This information is needed to assess the impact of the discharge to the irrigation areas (and potentially the composting pads and ponds) on the groundwater and the subsequent effect due to contaminated groundwater entering surface water.

18 An initial review undertaken by LEI identified a number of deficiencies and inconsistencies in the AEE and 28 attachments. Deficiencies remain and I comment on some of these in my evidence.

19 The provision of new site management plans and procedures that are proposed in the Applications, would help to manage adverse effects on the environment. However, many of these are 'generic' and do not appear to have been adapted for the site.

20 The following particular issues result in a high level of uncertainty in the scope and scale of effects that have been assessed in the AEE:

a. the lack of characterisation of feedstocks and final product;

b. limited characterisation of wastewater quality for discharge; and

c. incomplete accounting of nutrient losses from the site.

21 Although, if managed correctly, the proposal has the potential to remediate materials into products that are safe and beneficial for use, there remain significant gaps in the information provided. In my opinion, there is insufficient information to support the conclusion in the AEE that the effects are able to be managed so that they are less than minor.

22 The Officer's Report has, in some instances, recommended more appropriate consent conditions. The Officer's Reports conclusions that effects can be managed appears to rely upon standards to be achieved in the 'receiving environment', such as Table 15 - for discharges in the irrigation area no constituent in the soil in any irrigation area shall exceed the values in that Table (proposed condition 23).

23 Currently, there is insufficient information to provide a basis for concluding the operation of the site can achieve standards proposed for the receiving environment. Although this may be intended to be provided in improved management plans, this raises doubt as to whether the Applicant can achieve the relevant conditions. Further certainty would be achieved by:

a. Characterisation of waste streams intended to be accepted onto the site and sample reception process detail.

b. Nutrient balance with full accounting of nutrients and other contaminants entering the environment including from composting and vermiculture pads or wetland seepage together with other contaminant loads across the site (the

Applicant is currently relying on nitrogen loss from the land to describe nutrient loss from the site).

c. Technical support for impermeability of composting pads and vermiculture pad, and confirmation of stormwater falls and flowpaths. This may include a permeability standard as given in Condition 9 (TRC Officer's report) for ponds.

d. Description and modelling of future wastewater quality to demonstrate how nutrient and contaminant limits for irrigation areas can be achieved. No characterisation of future wastewater quality has been provided.

e. Characterisation of stormwater flows at and above design rainfall event (RNZ propose a 10 year annual recurrence interval rainfall event (Condition 7)).

f. Insufficient characterisation of soils, particularly the Anthropic Soils identified in the upper irrigation areas, to determine the suitability of the irrigation rates and proposed irrigation regime.

24 The Officer's Report proposes Condition 37, which details the requirements for a Site Exit Plan (SEP). Condition 37 proposes a start date for preparation of the SEP (within 3 months of the commencement date of these consents). I recommend the inclusion of a date that the plan must be submitted to TRC.

25 Provisions for the SEP proposed as 37(a) to (h) describe the information required to demonstrate how the site will be managed to hand-over for a new land use. I agree that these provisions are suitable for a SEP and recommend the inclusion of the following:

a. Characterisation of contaminants for remediation.

b. Groundwater investigations to determine flow paths and travel time of groundwater and entrained contaminants.

c. Expected site life for applied contaminants in groundwater and programme for monitoring of groundwater and surface water across that time period.

d. Involve Ngāti Mutunga in monitoring of the site.

e. Require approval for SEP to be sought from Ngāti Mutunga.

**BACKGROUND**

26 RNZ states that it specialises in the production and sale of products such as compost and vermicompost. RNZ operates the Uruti Composting facility located on approximately 2 kilometres south of Uruti Village. The composting operation at Uruti holds 6 resource consents with the Taranaki Regional Council ("TRC") and two of these expired on 31st May 2018:

a. R2/5839-2 Discharge to air - odour/dust; and

b. R2/5838-2.2 Discharge of waste material/treated stormwater and leachate to land.

27 An application for renewal of these consents was submitted to TRC in November 2017, and subsequently revised in June 2020.

28 I visited the site on 26 August 2020 accompanied by Mr Kerry O'Neill and Mr David Gibson from Remediation New Zealand. I also attended the pre-hearing meeting on 31 August 2020.

29 LEI was first approached to provide advice to TRONM on the Applications in November 2019. LEI did not undertake its review of the Applications until the completed Assessment of Environmental Effects was (finally) accepted by TRC (AEE of June 2020).

**SITE LAYOUT AND ACTIVITIES**

30 I have reviewed Item 4 of the Graphics and Data bundle and am relying on the site layout as shown.

31 The AEE gives a total area for the discharge property of 637 ha and notes that the property comprises almost the entire catchment of the Haehanga Steam. The evidence of Mr Kay (Attachment C) notes that areas of the site not included in the composting and discharge activities are used for regenerating native indigenous forest (407 ha) and cattle grazing (191 ha). There are plans to retire the grazed area.

32 The AEE notes that a quarrying operation occurs at the site which has Consent 16063-1.0 to discharge stormwater from the quarry area into an unnamed tributary of the Haehanga Stream. No further information about cumulative effects from this site are given.

33 Mr Kays evidence (Attachment C) lists the areas associated with the composting activities for inclusion in Overseer® modelling as:

a. The irrigation area of 13.18 ha.

b. The constructed wetland of 1.09 ha.

c. Pads, roads, ponds, and workshop areas of 29 ha.

34 There is a small disparity between the total area given in the AEE (637 ha) and the evidence of Mr Kay (641.27 ha) however I do not consider this will materially impact the assessment of effects for the site.

35 The AEE indicates that pads and ponds are constructed from the native papa material which has been compacted to provide an impermeable layer. I note that it is difficult to achieve an impermeable (seepage not exceeding 1 x $10^{-9}$ m/s) layer in natural

clay liners.[1] I have not viewed any information regarding testing to demonstrate that these permeability levels have been achieved for ponds and pads. There is a risk that pads and bunds created from the native papa could result in discharge to land via seepage which is unaccounted for in the site nutrient balance. I discuss this further below in relation to Officer's Report proposed conditions 8 and 9.

36 The Applicant notes that clean stormwater is diverted from the "active site area" and discharged directly to the stream. Stormwater and leachate from Pads 1 and 3 flow overland to the irrigation pond system and are subsequently discharged to land via irrigation. Pad 2, the paunch pond, discharges to the wetland system and subsequently the stream. It is not clear where stormwater from the vermicomposting pad is directed.

37 I have not reviewed details of the stormwater management design including contouring and falls. Ms McArthur notes in her evidence that stormwater "*appeared to be almost completely uncontrolled in all areas*" and further observes that "*Heavy rain fell prior to and during the site visit.*" Mr Easton notes in his evidence "*Stormwater sheet flow from key contaminant risk areas are controlled and directed to dedicated stormwater treatment devices*" and further proposes that condition 7(a) (Officers Report) be amended to apply "*up to a given design rainfall condition i.e. the 10 year annual recurrence interval rainfall event.*" I consider that further information is required to characterise the stormwater flows at and above a design rainfall event in order to confirm Mr Easton's assertion that stormwater is adequately controlled.

**SOURCES OF NUTRIENTS, CONTAMINANTS AND WATER FOR LAND DISCHARGE**

**Waste stream characterisation and volumes**

38 The AEE provides a list of waste streams received to the site. The Officer's Report provides an updated list as Table 1 (page 7). There are a wide range of wastes included.

39 I consider the waste streams identified have the potential to be composted for beneficial use.

40 Each waste will have a specific risk profile that should drive the composting process and testing requirements. This is required to identify potential effects and quantify effects to be expected due to the activity. Insufficient detail is provided on:

a. Assessment of risks associated with each waste stream.

b. How waste streams are to be received and handled.

[1] BTW Report Haehanga Catchment Preliminary Groundwater Analysis BTW 2015 indicates that within the Haehanga Catchment "clay soils form a semi-impervious shallow groundwater table overlain by more porous silty loamy-clays" (page 7). Therefore, the assumption that the clay soils are impermeable seems questionable.

c. Proposal for monitoring waste streams.

41 The Applicant has removed biosolids from the list of acceptable wastes in line with the outlined cultural considerations. For other feedstocks, the Applications contain limited characterisation. While some effort has been made to outline waste streams accepted on site, the characterisation of these is vague.[2] The Applicant has not detailed the composition, contaminants of concern and potential risks associated with all materials received to the site (other than drilling mud which the Applicant states is no longer received at the site).

42 Effects assessed are based on the values in Table 2 in the AEE ("Anticipated Waste Streams Uruti Composting Facility"). Neither the Officer's Report nor the Applications propose these values be placed as limits in conditions of consent. Some materials are labelled as 'commercially sensitive' in Table 2 and contain no volumetric values.

43 TRC notes in the 2017-2018 monitoring report that the Applicant inadequately characterised the waste streams and that this was an ongoing issue.[3]

44 Wastes of unknown origin and/or composition should be landfilled in an appropriately engineered facility.

**Proposed composting material discharged to land**

45 Adequate characterisation of waste streams is vital in order for determining the potential contaminants for consideration where compost is applied to the site (irrigation area, bunds, land contouring).

46 During my site visit I observed what appeared to be compost material placed outside of the composting area, possibly for the purpose of land building or contouring. A depth significantly greater than would occur for agronomic or soil conditioning purposes appeared (but is not verified). This use of compost, other than within irrigation areas, has not been described or accounted for in nutrient balances for the site. This has the potential to be a significant source of nitrogen and phosphorus within the catchment.

47 The Officer's Report identifies a list of contaminants at Table 15. Compost applied to areas outside of the composting area should be tested for the contaminants given in Table 15. No compost should be discharged for soil replacement at a rate that exceeds any of the proposed limits.

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[2] AEE 2.5.3 Volume of material currently onsite & 2.5.4 Description of Material.
[3] TRC "*Remediation NZ Ltd Uruti Waitara and Pennington Road Monitoring Programme Annual Report 2017-2018*" Technical Report 2018-79 Executive Summary: *"Administration requires additional attention as the Company failed to provide adequate analysis of waste streams as defined by the consent. This is the second year in succession where this has not been provided".*

**Proposed wastewater discharge to land by irrigation**

48 Wastewater for irrigation is derived from leachate and stormwater collected from Pad 1, Pad 3 and the washdown area. The AEE provides data from one sampling event for wastewater quality leaving the irrigation pond. TRC monitoring reports give the results of two-monthly testing. The wastewater is relatively high strength having undergone little more than flow balancing (minimal treatment) through the pond treatment system.

49 It is expected that the volume of wastewater for irrigation will be similar to that generated over the previous consent period since it is related to the amount of rainfall and surface area of the stormwater catchment which is not proposed to be changed.

50 No characterisation of future wastewater quality has been provided. The Applicant has noted changes to the composition of the source material, notably the exclusion of drilling mud wastes and a possible increase in organic material. Further information on future discharge quality is needed in order to assess the effects of the activity.

**RECEPTION AND COMPOSTING**

51 Details of the reception process and composting operations are needed to confirm that the material produced complies with the New Zealand Composting Standard (NZS 4454). A number of appendices to the application are provided which outline procedures to be followed on the site. In general, specific detail about how best practice is achieved is not supplied. Examples are as follows.

a. 2.5.5 of the AEE makes mention of a series of Standard Workplace Instructions for the acceptance of waste streams, however a reference to these or appendix number is not provided.

b. It is not clear how the various organic materials received for composting are managed i.e. quarantining, chain of custody, tracking through facility, or if different materials have different composting protocols. i.e. chicken carcass v vegetable waste.

c. RNZ has company procedures and uses generic advice from the relevant standards/guidelines. Due to the range of materials received onto the Uruti site I would expect (as a minimum) details on how temperature and soil moisture is monitored to comply with composting standards for the specific materials, so as to provide sufficient certainty that the composting process has progressed as described in the AEE to produce material safe for use. Table 15 as given in the Officer's Report should be complied with as a minimum. The information is currently insufficient to verify that the 'limits' in Table 15 can be achieved.

## PLACEMENT OF COMPOST OUTSIDE COMPOSTING PADS

52 As noted in Mr Kay's evidence, it is proposed that 1,000 $m^3$ (500 tonnes) or 2,000 $m^3$ per year of compost may be applied to irrigation areas for the purpose of soil conditioning over a term of consent. The AEE also notes that 4,000 tonnes has already been applied to irrigation areas. 10,000 tonnes for cold air bunds and 1,000 tonnes is intended to be applied around the site.

### Cold air bunds

53 The Officer's Report (paragraph 69) summarises how the cold air bunds are expected to operate. I note that the description indicates that these bunds will effectively operate as a site monofill for materials which do not meet relevant standards for sale as compost. I consider that the presence of these bunds has implications for the site that are likely to extend beyond the operational site life. No proposal has been put forward by the Applicant for how the monofill will be managed to avoid a legacy issue.

### Soil 'conditioner'

54 Use of compost as soil conditioner requires the material to be placed at a rate that amends soil carbon levels, and that does not exceed an agronomic rate of nutrient application. The *Draft Guidelines for the Beneficial Use of Organic Material on Productive Land* (WaterNZ, 2017) gives a rate of 200 kg of nitrogen per hectare per year for soil conditioning.

55 I consider that discharge beyond the rate given in Water NZ (2017) should be treated as soil replacement, not as soil conditioning.

56 It is my opinion that insufficient detail regarding the composition of the compost for discharge has been provided to enable the effects of the discharge of compost to irrigation areas to be assessed.

57 No evaluation of the material composition is given in the AEE. The assessment of effects due to compost placement provided by the Applicant is that the discharge will comply with the permitted activity. I note that Rule 29 cannot be complied with since the material which is to be applied has been generated from materials brought to the site. Nevertheless the comparison with the contaminant limits given for the permitted activity is appropriate.

58 Some of the Guidelines identified for contaminants for Rule 29 have been superseded. The Officer's Report gives an updated list of guidelines (paragraph 311). I agree that the identified guidelines are appropriate for a controlled application of compost for use as soil conditioner.

59 Table 15 of the Officer's Report gives contaminant limits. I consider that the chemistry limits in Table 15 should not be exceeded in the soil. The pathogen limits in Table 15 should not be exceeded in the compost for placement as soil conditioner.

**MONITORING OF SOIL QUALITY**

60 Consent 5838-2.2, which the site currently operates under, requires soil sampling to occur. TRC has undertaken this monitoring and I have reviewed data from Monitoring reports and the summary of results provided in the AEE.

61 Consent 5838-2.2 gives soil parameter triggers through a three tier system. Monitoring shows frequent exceedances of the tier one and two chloride triggers. The Officer's Report notes, and I agree that:[4]

> *"…the tiered system is a methodology developed using landfarm surrender criteria. Landfarms are very different from composting activities in that they are typically undertaken on a one-off application basis, as opposed to long term application of material and fluid. Therefore, it is questionable whether this system is an appropriate means of measuring and mitigating the impact on the receiving environment."*

62 It is expected that exclusion of drilling waste fluid from the site will result in no increase to the soil levels of the monitored parameters. Compost containing drilling mud is proposed to be applied to irrigation area and so I consider that these parameters should continue to be monitored.

63 Soil nitrogen has not been monitored however the applied wastewater has been monitored. The irrigation pond ammoniacal nitrogen concentrations are 320 – 570 g/m$^3$ according to the 2019/2020 compliance report (high) and the total nitrogen concentration in the ponds is made up almost entirely of ammoniacal nitrogen (rather than nitrate or other forms). The TRC compliance report for 2019/2020 estimates loads of total nitrogen (almost entirely ammoniacal-N) applied to land as ranging from 400 to more than 1,200 kg N/ha over the last year (kg/ha/y). The report notes:

> "*The estimated results demonstrate that an exceedingly high concentration of nitrogen has been put to land across the irrigation areas in the 2019-2020 monitoring period. Three irrigation areas received equal to or in excess of 800 kg/ N/ ha, these were L1, U 1, U 2 and U3. In the case of L1 and U3, the estimated loading was close to (in the case of L1) 1,200 kg N/ha. In the case of U3, in excess of 1,200 kg/N/ha.*
>
> *The consent holder proposes to mitigate the elevated nitrogen applications by utilising a baleage cut and carry policy. This is proposed to remove between 287-407 kg N/ha*." [5]

64 Further discussion of the suitability of these rates is given below.

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[4] At paragraph [107] (footnote omitted).
[5] According to the AEE: Table – 24 Land Pro Ltd 2020 - Application to Taranaki Regional Council for Renewal of Resource Consents Revision 17 – Final, 26 June 2020.

65 The soil is the primary receiving environment for discharges to land. Levels of nutrients and contaminants in the soil inform the likely effects to the secondary environments of groundwater and surface water. I consider that a programme of soil monitoring is needed which more closely reflects the nutrients and contaminants generated from the compost feedstock. The Officer's Report provides proposed conditions which includes a list of contaminants (proposed Condition 23). I agree that this list will address the potential for contamination of soils and subsequent transport to groundwater and surface water.

66 In order to predict the potential for nutrients applied to the soil to impact the groundwater and/or surface water, I consider that routine monitoring should include a suite of nutrients including nitrogen (total nitrogen, available nitrogen) and phosphorus (Olsen phosphorus) as a minimum. Soil pH influences the availability or mobility of contaminants in the soil and should be routinely monitored. I consider that monitoring of these parameters should be included as a condition of consent.

**SITE NUTRIENT BALANCE**

67 There are a number of potential sources of contaminants from activities at the RNZ site. Mr Kay provides an update to the whole of site nutrient balance as Attachment C to his evidence.

68 RNZ has proposed or actioned changes to its irrigation scheme and nutrient management protocols, in order to improve contaminant loadings.

69 RNZ acknowledges historic incidents, and breaches to consent limits for contaminants (nitrogen and chloride in surface and groundwater).[6] Therefore RNZ proposes:

a. enlargement of the site irrigation area to accommodate irrigation loads (13.18ha);

b. a reduction in compost addition to irrigation paddocks;

c. the export of N from site via cut and carry crops; and

d. additional groundwater sampling bores (total of seven).

70 I agree that these measures, if diligently followed, will assist to mitigate effects due to the current discharge regime. It is not clear what future irrigation wastewater quantity and quality is and I have assumed that the Applicant intends that no changes to flow and quality of irrigation wastewater will occur over a future term of consent.

71 Mr Kay's evidence (Table 14) indicates 478 kg N/ha/year to be applied to the 13.18 irrigation blocks under the 1,000 $m^3$/year compost application and 584 kg N/ha/year to be applied to the

[6] AEE 7.3.3 Commentary on soil sampling results and specific concerns raised by TRC

13.18 irrigation blocks under the 1,000 $m^3$/year compost application. This level of nitrogen application is high. The Applicant notes that an application up to 600 kg N/ha/year is given for cut and carry operations in Waikato Regional Council rules and should therefore be acceptable for this site.

72 I consider that the ability to achieve nitrogen uptake approaching 600 kg N/ha/y at this location is likely to be limited by the microclimate of the site and by the soil type and landforms. For instance, this location would not support a typical dairy farming operation. No analysis has been provided to support the suitability of this limit for this site.

73 The Officer's Report proposes a limit of 400 kg N/ha/year. I agree that, in the absence of supporting information for a higher limit, 400 kg N/ha/year is more appropriate. In order to support that accumulation and excess leaching is not occurring due to this rate of nitrogen application, soil and groundwater monitoring for nitrogen and phosphorus species is needed.

74 I note that the National Environmental Standard for Freshwater (NES FW 2020) contains a nitrogen cap for the application of synthetic nitrogen as fertiliser which comes into force in July 2021. Although this standard does not apply to the RNZ operation, it provides a useful comparison between nitrogen loads at the RNZ site and loads that the national freshwater regulatory package intends to manage to reduce leaching losses and improve freshwater quality. The NES FW nitrogen cap averaged across a contiguous pastoral land holding is 190 kg N/ha/y, less than half the load proposed as a limit.

75 Routine harvesting of baleage from the irrigation areas has been identified as essential to reduce potential leaching of nitrogen from irrigation sites (also contained in Appendix AA and Overseer® modelling). Although removing nitrogen in this manner is an appropriate means of reducing potential nitrogen movement to groundwater, it is not clear how this practice will be managed or monitored to ensure it is being carried out to the specifications and frequencies listed. For example, it must not be reintroduced to the composting stream.

76 The proposed rate of nitrogen application assumes that the pasture is removed from the site. Recycling of cut pasture to compost piles is not considered to achieve removal of the nitrogen. In order to ensure the nitrogen is removed, I consider that a consent condition or exit plan condition requiring the cut pasture to be exported from the property for the life of the irrigation operation appropriate.

77 The evidence of Mr Kay summarises the use of Overseer® to estimate the distribution of nitrogen from the site. I note that Overseer® was not developed to model the irrigation of wastewater other than farm dairy effluent. Nevertheless, there is a generally accepted methodology for entering data for other wastewater types.

78 Attachment C of Mr Kays evidence summarises the data entry used for the irrigation blocks at the site. The method identified for entry of nutrients is summarised (Table 5) and I agree with the methodology. Details of the irrigation method for data entry have not been given and so I cannot assess the method.

79 Attachment C of Mr Kays evidence concludes (for the higher compost application rate) the following losses of nitrogen to leaching:

TABLE 21: TOTAL NITROGEN LEACHED FROM THE IRRIGATION AREA WITH THE ADDITION OF COMPOST APPLICATIONS ON A WHOLE FARM BASIS - SCENARIO 2 (2000 $M^3$)

| Total Nitrogen leached from the farm blocks | | Kg/yr | Kg/ha/yr |
|---|---|---|---|
| Upper Irrigation Area | 5.12 ha | 1,009 | 198 |
| Lower Irrigation Area | 8.06 ha | 2,079 | 257 |
| Cattle grazing | 191 ha | 2,676 | 14 |
| Wetland | 1.09 ha | 3 | 3 |
| Regenerating forest | 407 ha | 1,222 | 3 |
| Roads, pads, ponds, workshop | 29 ha | 163 | 6 |
| Other sources | - | 27 | - |
| Total Nitrogen leached from the root zone | | 7,179 | 11 |

80 Although I have not viewed the Overseer® model the leaching predicted for the upper and lower irrigation is in-line with my previous experience of the model based on the input data described by Mr Kay. I note that these values are high for a farming system which does not include animal grazing or frequent cultivation and does not represent best practice for the site.

81 As noted earlier, I consider that there are likely to be unaccounted for losses from the area identified as “Roads, pads, ponds, workshop” and “wetland”.

82 Seepage from areas that rely on impermeability (vermicomposting pad, pond, wetland) may have a significant effect on the nutrient site balance. This matter is addressed at [2.3.3.5] of the AEE.[7] I have not seen any information to verify that natural papa material is impermeable at these locations. This comment also applies in relation to the use of the composted drilling-mud material as bunding on an authorised basis on various locations around the site (also an issue for CI).[8]

83 I do note that proposed condition 9 is that no more than 60 days following commencement of the consents any pond that may contain stormwater and/or leachate shall be lined with material that has a permeability of not exceeding 1 x $10^{-9}$ $ms^{-1}$ to prevent leakage through the bed or sidewalls. A similar standard could be applied to Pads as referred to in proposed condition 8.

[7] The Applicant makes reference to the ‘incident’ and suggests that this will be discussed further in 3.8.5.7 of the AEE. That section does not appear to exist.
[8] TRC Monitoring Report 2019 pages 59-60 *“There have been a number of cases where the consent holder has utilised this material, (unauthorised), for bunding of the duck pond. Or by the twin culverts for a cold air drainage bund and also partly in the new lower irrigation area E.”*

84 Overall, the large size of the surrounding catchment results in a low whole of site nutrient loss. The Applicant has relied on this to assess the losses of nitrogen via leaching as minor. However:

a. The influence of activities related to the quarry are not evaluated and included in the nutrient balance.

b. The areas subject to the highest loss also happen to be closest to the surface waterways resulting in a lesser distance for nitrogen attenuation and correspondingly higher potential for adverse effects than is predicted by the whole-of-farm nitrogen loss.

85 As noted in Ms McArthur's evidence, nitrogen, in particular ammoniacal nitrogen, measured in the surface waterways indicates much higher nitrogen loss to water is occurring than is predicted by the Overseer® model supplied. This is supported by groundwater monitoring (TRC monitoring reports) which shows the dominant form of nitrogen in groundwater is ammoniacal nitrogen, not nitrate nitrogen. This suggests that irrigated wastewater is draining to groundwater with limited renovation in the soil. This occurs when either the rate of irrigation is too high for the soil type, the soil type is prone to bypass flow (typically due to cracking) or wastewater is applied when the soil is saturated from rainfall.

86 The Applicant has identified changes to the irrigation regime to improve the nitrogen losses. These changes should theoretically result in an improvement. However, the modelled changes (Table above) indicate that nitrogen losses to groundwater will still be high. Further work is needed to assess the acceptability of these leaching values for the irrigation areas and receiving environment.

87 The Officer's Report (paragraph 266) identifies a limit for the nitrogen discharge to be included in conditions of consent. I consider this approach to be appropriate for the site provided that there is sufficient certainty over the nitrogen accounting for the site (see additional discussion of this limit above).

88 No evaluation of the discharge of phosphorus has been provided. The near surface geology of the catchment is expected to be sedimentary (rather than volcanic) and correspondingly may have a low to moderate capacity for retaining phosphorus. Given the high suspended solids recorded in surface water it is considered that risk of effects due to phosphorus should be assessed.

**ASSESSMENT OF ENVIRONMENTAL EFFECTS – SOIL AND GROUNDWATER**

89 As noted throughout this brief, limited information has been provided to characterise the activity that is proposed. In particular:

a. Feedstock characterisation: The Applicant has not detailed the composition, contaminants of concern and potential risks associated with all materials received to the site. The impact is that the potential for effects has not been clearly

identified and therefore the scale of effects cannot be adequately assessed and mitigation proposed.

b. Sample reception process: The management of materials, including the ability to characterise and isolate materials based on risk profile is not detailed.
c. Nutrient balance: Full accounting of nutrients and other contaminants entering the environment including from the composting and vermicomposting pads, and from pond or wetland seepage is needed.
d. Composting site construction: Technical support for impermeability of composting pads is needed.
e. Wastewater characterisation: Monitoring of quantity of wastewater discharged appears to via a pump hour meter. TRC proposes a condition requiring installation of a flow meter including automated recording is needed. I agree that this is good practice. A detailed description of future wastewater quality is needed in order to determine nutrient and contaminant loads to irrigation areas.
f. Avoidance of contaminating site: Limited information about contaminant loads across the site is provided.

90 The AEE is unclear on what the effects to soil are. It notes that improvements in irrigation practices, cessation of high chloride wastewater discharge and incorporation of compost as a soil conditioner will mitigate or avoid adverse effects to soil.

91 I consider that the soil, particularly the Anthropic Soils identified in the upper irrigation areas, are insufficiently characterised to determine the suitability of the irrigation rates and regime. Soil infiltration testing of the most limiting layer is advised.

92 Management of soil structural stability in the constructed soils is imperative to ensure that a reduction in permeability does not occur over time. The inclusion of compost can help with this but if incorrectly applied there is a risk that hydraulic breaks can occur in the soil and exacerbate permeability issues. Details of the soil development methodology are needed.

93 No information about the accumulation of contaminants in the soil has been provided.

94 Overall, there is insufficient information available to provide certainty that the effects to soil quality are acceptable for consenting.

95 The AEE proceeds on the assumption that elevated levels of chloride in groundwater will be addressed by the Applicant ceasing to accept drilling waste onto the site (AEE 2.8.6.3). It is unclear how long this will take and/or if there are significant levels of chlorine remaining in the drill waste compost that remains on the site and whether this still poses a risk to leaching e.g. when that waste is disturbed for re-mixing and turning.

96 Good practice would require some groundwater modelling of the site. As noted above, I have viewed Haehanga Catchment Preliminary Groundwater Analysis BTW 2015.[9] This Report produced a preliminary conceptual site model ("CSM") and states:

> "*At present the CSM is unconfirmed and requires significantly more input to identify other potential contaminate sources and likely downstream receptors, both ecological and human. The preliminary CSM has however, defined the general hydrological setting in terms of hydraulic gradients down the Haehanga Stream, groundwater direction and hydrogeological interactions with the Uruti Composting Facility".*

97 That Report also states (page 7):

> *"The CSM has identified potential hydrogeological 'exposure pathways' for contaminates in the Haehanga Catchment, such as the chloride loaded porous surface soils being in direct contact with the shallow water table, and the reaches of Haehanga Stream 'gaining' water from the groundwater table, adjacent GND 2190 in the lower irrigation zone. However, considerable more information is required to confirm the CSM, in particular the identification of downstream receptors for all contaminates potential leaving the site, not only chloride but also metal and hydrocarbons contaminates."*

98 The AEE relies on the preliminary CSM in its assessment of effects. I consider that additional certainty around groundwater travel times and flow paths is needed to determine the scale and duration of effects to groundwater, and subsequently via seepage to surface water.

99 It is unclear (2.6.2.2) where the leachate/run-off (if any) from the vermi-composting rows [by Pad 2] will flow and/or be captured. From the diagram provided in the AEE, it is not clear whether there is a risk to the stormwater channel.

100 Overall, I consider that based on the measured groundwater quality and uncertainty regarding its flow path and travel time, it is not possible to conclude that effects from the irrigation and compost discharge to land are minor or less than minor.

**VOLUME OF MATERIAL ON-SITE**

101 The Applicant's effects assessment is carried out on the basis of historic and current site activity. Limited information is supplied to detail how accumulation of material on-site is managed. The site is not engineered as a contaminated material monofil or landfill and, as such, material unable to be remediated should not be retained at the site (see also below under the heading "Site Reinstatement Condition").

[9] An attachment to TRC Monitoring Report 2014-2015 (Technical Report 2015–68).

102 The quantities of material on-site are high, especially for Pad 3 (20,000 t of drilling waste compost). I understand that the volumes allowed on-site are currently only regulated by the area allowed for the composting pads. There should be a maximum permissible quantity of stockpiled product in the consent conditions, and actions that must be taken once this maximum limit is reached.

103 Limited and contradictory information is provided in the AEE as to how accumulation of material on site is managed.[10]

**SITE REINSTATEMENT CONDITION**

104 I have been asked to comment on a suitable site reinstatement condition to ensure that exit from the site would not result in a legacy issue with regard to the contaminants that have been received to the site. My comments are limited to matters pertaining to future land use of the site.

105 A site exit condition should be imposed to provide certainty as to how creation of a 'contaminated site' is to be avoided. This was an aspect raised in the Cultural Impact Assessment provided with the application. That Cultural Impact Assessment document 'response' from Remediation NZ is that:

"*Exit planning was discussed, and a general exit plan has been developed and included as part of overall site management plan. Full detail regarding the exit plan won't be able to be determined until the circumstances of the site at the time of exit are known…*".

106 Sufficient information should be known during the operation of the site, about the site and its operations to enable a site exit plan to be prepared and reviewed regularly.

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| 3.1.1 Background | Contradicting statements refer to the compost material from pad 1 (Greenwaste compost) as being transported off site for sale, then that compost from both pads are not going to leave site. Clarify these statements, make clear whether the intention is for compost from both pads to remain on site or leave site. |
| 3.1.1.2 Sampling method | As above, the statement that "neither assessed compost streams Pad 1 and Pad 3 are to be sold or moved off site and pathogens are therefore less of a concern" is contradictory to previous statements that pad 1 material will be sold off site. Make clear whether the intention is to keep compost material onsite or not. |

107 The Officer's Report proposes Condition 37, which details the requirements for a Site Exit Plan (SEP). Condition 37 proposes a start date for preparation of the SEP (within 3 months of the commencement date of these consents). I recommend the inclusion of a date that the plan must be submitted to TRC.

108 Provisions for the SEP proposed as 37(a) to (h) describe the information required to demonstrate how the site will be managed to hand-over for a new land use. I agree that these provisions are suitable for a SEP.

109 As noted elsewhere in this brief, there are gaps in the Applicant's description of the site, the contaminants of interest and how contaminants are likely to move. Further information would be needed to ensure all parties fully understand the effects and duration of any legacy contamination, or to enable remediation to be usefully targeted.

110 Additional provisions in Condition 37 may include:

a. Characterisation of contaminants for remediation.

b. Groundwater investigations to determine flow paths and travel time of groundwater and entrained contaminants.

c. Expected site life for applied contaminants in groundwater and programme for monitoring of groundwater and surface water across that time period.

d. Involve Ngāti Mutunga in monitoring of the site.

e. Require approval for SEP to be sought from Ngāti Mutunga.

111 The site exit plan in Appendix N remains incomplete. Ms Hooper's evidence states that should the stockpiled material on Pad 2 not meet B1 Grade (confirmed via testing), that 'worst case' it would be stockpiled securely (i.e. revegetated and stabilised) within the site and applied to land as a soil treatment at the end of the site's life.[11] From my conversations with Ngāti Mutunga members, I understand the Runanga still have concerns regarding this stockpile - including the length of time it would take to process this material if it is used around the site and opposition to revegetating and stabilising contaminated material within their rohe. As noted in paragraph 53, I share concerns about the use of capped bunds on the site.

**CONCLUSION**

112 I have reviewed the current Applications and found them to be deficient, providing insufficient confidence that effects on the environment will be managed appropriately so as to avoid more than minor effects. The AEE contains 28 supporting documents. There remain information gaps that lead to uncertainty about the

[11] Ms Hooper's evidence at [82].

scale of effects that have been assessed. Site Management Plans are general and brief in nature.

113 Issues such as shallow groundwater, lack of information about seepage from composting and vermiculture sites, together with the high proposed nitrogen loading, raise significant uncertainty as to assessment of effects.

Katie Beecroft

16 March 2021