BEFORE THE TARANAKI REGIONAL COUNCIL

IN THE MATTER	of an application by Remediation (NZ) Limited for resource consents under Part 5 of the Resource Management Act 1991
AND	
IN THE MATTER	applications to obtain replacement consents for Consent Numbers 5838-2.2 and 5839-2 as summarised below: Consent 5838-2.2 – to discharge of a) waste material to land for composting; and b) treated stormwater and leachate, from composting operations; onto and into land in circumstances where contaminants may enter water in Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream at Grid Reference (NZTM) 1731656E-5686190N, 1733127E-5684809N, 1732277E-568510N, 1732658E-5684545N and 1732056E-5684927N Consent 5839-2 – to discharge emissions into the air, namely odour and dust, from composting operations between (NZTM) 1731704E-5685796N, 1733127E-5684809N, 1732277E-5685101N, 1732451E-5684624N and 1732056E-5684927N

REPLY FOR REMEDIATION (NZ) LIMITED
DATED 6 APRIL 2021

Environmental Consultancy:

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Introduction

[1] The purpose of this reply is not to re-hash the issues fully canvassed in the hearing. Instead, it is to look forward and provide a sound basis for operating the Uruti site as an organic waste management facility for Taranaki to a high level of environmental performance using estimable conditions.

[2] This memorandum does the following:

(a) Provides an update on the 1 Billion Tree contract between MPI and Remediation (NZ) Limited (RNZ);

(b) Provides a revised set of offered conditions with an eye to the following:

(i) Weaving into the conditions of consent an influential role for Ngati Mūtunga to ensure cultural monitoring and cultural preferences are contained in the management regime;

(ii) Management plans that have clear outputs;

(iii) Adaptative management planning that flexibly respond to unanticipated environmental conditions that arise.

[3] Attached to this memorandum is the following.

(a) Appendix 1 – Amended Table of Conditions;

That is a table showing the conditions proposed by TRC at the hearing with the modifications now proposed by RNZ. The third column contains some explanation.

(b) Appendix 2 – NZS 4454:2005;

That is the New Zealand Standard for composting referenced in condition 8 in Appendix 1. The Panel will see that it is a detailed document.

(c) Appendix 3 – PDP's Ammoniacal Nitrogen Management and Adaptive Management Capability Assessment following TRC's idea of shortening the period to achieve the NPSFM 2020 level;

(d) Appendix 4 – Memorandum on Condition 28 from PDP;

(e) Appendix 5 – 1 Billion Tree Contract between RNZ and MPI.

[4] Also attached is a clean Word version of the offered conditions by RNZ.

1 Billion Tree Programme

[5] David Gibson for RNZ attached to his primary Statement of Evidence, the 1 Billion Tree Programme Funding Agreement Map showing the approved areas for planting in exotic and indigenous species within the Uruti site. Mr Gibson explained that MPI had submitted a contract to RNZ, but it was yet to receive Board approval.

[6] The Board has approved the contract and the contract is signed. It is attached as Appendix 5.

[7] That afforestation programme is part of the broader trajectory described in the evidence of improving the site's ecology alongside more extensive riparian planting. The programme is a significant ecological opportunity, and RNZ is willing to partner with Ngati Mutunga in some way to implement that project. Long-term, it will provide benefits to the Haehunga catchment. It is part of the broader strategy for remediation and restoration of the site.

Offered Conditions

Overview

[8] The Applicant listened closely to the concerns expressed by Submitters. Three key lessons were obtained as a result of hearing that evidence.

[9] First, there is considerable value in providing opportunities for Ngati Mūtunga through monitoring and cooperation (according to cultural preferences) as a vehicle for contributing to the restoration of the Mimitangiatua catchment. The Māori Compass

Report commissioned by Te Rūnanga O Ngāti Mutunga & Te Wai Māori Trust provides an basis to perform baseline monitoring and the assessment of trends and improvements over time and consequently their contribution to the freshwater priorities of Ngati Mūtunga. The site is a good case study in trend analysis and adaptive management to restore the catchment's Maūri.

[10] The second lesson is that the conditions do not provide sufficient detail about the management plans' outputs. Further, it is not clear from the original conditions how the environmental management regime 'circle' is closed by the Adaptative Management Plan so that appropriate management responses occur to correct unfavourable trends.

[11] Finally, there appears to be a disconnect between the aims of the conditions and management plans and their implementation on site, demonstrated by past operating performance. While the proposed conditions will undoubtedly provide appropriate reference material that will, if implemented appropriately, minimise effects so that they are no more than minor, the 'devil' lies in the detailed implementation of the plans. Implementation can fail through a lack of appropriate management oversight and a lack of proper resourcing with appropriate human resources.

[12] These three matters and how they are addressed in the conditions are set out below.

The role of Ngati Mutunga

[13] The first point is that the Environmental Monitoring Plan addressed in condition 35 has an additional subparagraph (j) that provides for "Contracted cultural monitoring by Ngati Mutunga including to monitor progress and achieving iwi management plans and Te Rūnanga O Ngāti Mutunga & Te Wai Māori Trust: Māori Compass assessment".

[14] This condition is a central aspect of the monitoring programme to ensure use of cultural indicators using culturally preferred tools.

[15] Condition 3 provides for the AEE referenced Management Plans explicitly. These are to be reviewed annually, and in that review under condition 3(c)(vi) and (vii), engagement with Ngati Mutunga is required.

[16] Condition 10 provides for an Accountable Person who is responsible for operating the site. That Accountable Person must consult with Ngati Mūtunga and Ngati Mūtunga are consulted on that person's approval to ensure that person can develop a constructive relationship with Ngati Mūtunga.

[17] The Adaptive Management Plan at condition 20 records that the Management Plan results will be reported to the Regional Council and Ngati Mutunga. Ms McArthur acknowledged the cultural framework could be embedded in the management plan.

[18] A similar provision applies in condition 32 regarding odour monitoring.

Management Plans and Adaptive Management Plans

[19] The Panel will see that condition 3 expressly requires compliance with the Management Plans promoted in the AEE. Further, these must be annually reviewed fand re-certified every two years. For each Management Plan, there is a requirement to demonstrate compliance with that Management Plan within a period following the grant of consent. The Management Plans state the outcomes to be achieved. For example, condition 17 provides explicit matters that the Irrigation Management Plan must address, including how the dissolved oxygen standard in condition 15 will be maintained.

[20] Concerning the Adaptive Management Plan, condition 20 requires that the Adaptive Management Plan identify any further baseline monitoring and identify trigger levels and thresholds where changes to processes and procedures must be incorporated into Site Management Plans. That is the explicit closing of the circle to create an effective feedback mechanism.

[21] Condition 12 provides for a Pond Management Plan that specifies the operating procedures required for all ponds on site together with records of maintenance work.

An Accountable Person

[22] A significant new feature of the conditions is a requirement under condition 10 for an Accountable Person to be on site. The Accountable Person must be on site for a

minimum of four hours per day, four days per week. That person must demonstrate to the TRC their capability to ensure compliance with the Management Plans and Conditions of Consent. Each year that person must be recertified and demonstrate that proper management of the site occurs with consequences if it is not. It is a condition with considerable 'teeth' that will incentivise appropriate management and resourcing of the site. By being the nominated person, that person exposes themselves to significant criminal liability under the Resource Management Act for non-compliances on the basis that they are an identified person who *permits* the activities.

Other Matters

[23] The Applicant proposes a hotline for complaints concerning odour to ensure that the Applicant is aware of the events causing distress. The Applicant will keep a complaints register. Also, a community liaison condition is proposed (condition 40), providing detail about how the information will be conveyed to interested parties on a regular cycle.

[24] The Panel will also note a specific requirement concerning Pad 3 whereby it must be remediated to the standard contained in condition 33 or otherwise removed. RNZ must not receive any other drilling waste because of the way condition 4 operates. Ms Beecroft acknowledged the feasibility of remediating that stockpile.

Technical Advice

[25] Mr Curtis provides technical advice on condition 28 in Appendix 4.

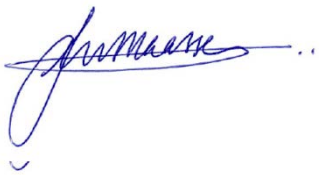
[26] TRC suggested immediate achievement of the Ammoniacal Standard in the NPSFM 2020. Mr Easton reports on that matter in Appendix 3 and demonstrates that TRC's idea is not achievable, and the original date of 2026 is ambitious and appropriate.

Conclusion

[27] The Panel will see that these conditions are a step-change that will involve significant operating overhead and CAPEX for the Applicant to meet the Submitters'

environmental aspirations and achieve the Applicant's desire for improved environmental performance.

[28] These, alongside other matters, will involve such significant investment that the Applicant still seeks a consent of 24 years recognising the power of the review condition and the amended conditions that move the activities to a point where effects will, as the Council officers said, be minor. That outcome demonstrates conformity to the ethic of Te Mana o te Wai.



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J W Maassen
Counsel for the Applicant

Appendix 1 – Amended Comparative Table of Conditions

Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
a	*General condition* The consent holder must pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of these consents, fixed in accordance with section 36 of the Resource Management Act 1991.	*General condition* The consent holder must pay to the Taranaki Regional Council all reasonable administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.	Consent reference made singular. Reasonableness test added.
General Conditions			
1	These consents authorise the discharge of: (a) stormwater and leachate from vermiculture operations, after treatment in the Wetland Treatment System, directly to an unnamed tributary of the Haehanga Stream; (b) stormwater and leachate from composting operations by irrigation to land; (c) solid organic material to land for composting; (d) material stored on Pad 3 as at the date of commencement of these consents ('stockpiled material') to land for use as a soil conditioner; (e) stormwater and leachate from stockpiled material to land via irrigation; and (f) contaminants to air associated with site operations.	This consent authorises the discharge of: (a) stormwater and leachate from vermiculture operations, after treatment in the Wetland Treatment System, directly to an unnamed tributary of the Haehanga Stream; (b) stormwater and leachate from composting operations by irrigation to land; (c) solid organic material to land for composting; (d) material stored on Pad 3 as at the date of commencement of this consent ('existing stockpiled material') to land for use as a soil conditioner; (e) stormwater and leachate from stockpiled material to land via irrigation; and (f) contaminants to air associated with site operations.	The word 'Existing' has been added to the description for stockpiled material to be consistent with subsequent conditions. Consent reference made singular.
2	The exercise of these consents must be undertaken in general accordance with the information provided in support of the application for these consents (prepared by Landpro Ltd, dated 26 June 2020). Where there is conflict between the application and consent conditions, the conditions prevail.	The exercise of this consent must be undertaken in general accordance with the information provided in support of the application for this consent (prepared by Landpro Ltd, dated 26 June 2020). Where there is conflict between the application and consent conditions, the conditions prevail.	Consent reference made singular.
Management Plans			
3		a) All activities on site shall be carried out in general accordance with the management plans required by the conditions of this consent. These are; i. Site Practices Plan (SPP); ii. Stormwater Infrastructure Management Plan (SIMP); iii. Pond Management Plan (PMP); iv. Irrigation Management Plan (IMP); v. Adaptive Management Plan (AMP); vi. Storage Capacity Management Plan; vii. Wetland Management Plan (WMP); viii. Nitrogen and Phosphorous Management Plan (N&PMP); ix. Odour Management Plan (OMP); x. Stockpile Remediation Plan (SRP); xi. Environmental Monitoring Plan (EMP); xii. Site Contingency Plan (SCP); and, xiii. Site Exit Plan (SEP); b) All personnel involved with management of the site shall be made aware of, and have access to, all conditions and management plans applicable to site operations, including any amendments to the	NEW CONDITION PROPOSED This conditions provides clarity around the list of management plans required, requirements for their implementation and review processes. This avoids needing to repeat this wording for all management plan conditions throughout the consent.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		management plans. Copies of these documents shall be kept on site at all times. c) The Consent Holder shall undertake an annual review of all management plans in 3 a). This review shall include, but not necessarily be limited to: i. Compliance with the management plans; ii. Success of the management plans in ensuring compliance with the consent conditions; iii. Reviewing any significant changes to activities or methods and/or unanticipated adverse effects resulting from the activities or methods to give effect to the consent conditions; iv. Any changes to roles and responsibilities of personnel responsible for site operations and management; v. Any changes to the location and/or layout of site infrastructure; vi. Reviewing the results of all inspections, monitoring and reporting associated with the management of the site, including TRC inspection notices, internal and external inspections, audits and investigations, and any cultural monitoring or investigations undertaken by Ngati Mutunga; vii. Reviewing responses to any comments or recommendations from TRC, Ngati Mutunga, neighbours or the wider community in relation to site operations or management, including a review of responses documented in the complaints register required under condition 36 and any matters raised at the community liaison meetings required under condition 40; The findings of this review shall be provided to the Chief Executive, TRC annually, on or before the anniversary of commencement of this consent, for the lifetime of the consent. A copy shall be provided to Ngati Mutunga and to parties attending the community liaison meetings . d) Management plans must be updated to reflect the findings of the review where appropriate, and changes to management plans proposed as part of the annual review must be provided to the TRC for re-certification at the time of providing the findings of the review under c). e) All Management plans listed in a) must be provided to the Chief Executive, Taranaki Regional Council for re-certification at a minimum of every two years on the anniversary of commencement of this consent. f) Re-certification by the Taranaki Regional Council may include independent peer review by a suitably qualified and experienced person.	
Receipt, recording and management of waste			

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
~~3~~ 4	Subject to condition 5 below, the raw materials accepted on site must be limited to solid compostable organic material, consisting of the following: • Paunch grass; • Animal manure from meat processing plant stock yards, and dairy farm oxidation pond solids; • Green vegetative wastes; • Mechanical pulping pulp and paper residue (excluding any pulping wastes that have been subject to chemical pulping or treated or mixed with any substance or material containing chlorine or chlorinated compounds); • Vegetable waste solids (being processing by-products); • Fish skeletal and muscle residue post filleting (free from offal); and • Poultry industry waste (eggs, macerated chicks and chicken mortalities); • Untreated sawdust; • Molasses; • Solid dairy industry waste (cheese, milk powder, casein); • Sausage waste; • Domestic household and commercial food scraps from the New Plymouth kerbside collection (bones, fruit, vegetables, meat, bread, dairy, cooked food, paper towels, cut flowers, coffee grounds, tea leaves/bags, eggshells and seafood shells); • Palm kernel; • Prolick; • Food scraps from Powerco and Fonterra; • Diatomaceous earth mix; • Activated carbon; • Ox tails; • Organic waste from Brooklands Zoo; • Sheep and lamb skins.	Subject to condition 5 below, the raw materials accepted on site must be limited to solid compostable organic material, consisting of the following: • Paunch grass; • Animal manure from meat processing plant stock yards, and dairy farm oxidation pond solids; • Green vegetative wastes; • Mechanical pulping pulp and paper residue (excluding any pulping wastes that have been subject to chemical pulping or treated or mixed with any substance or material containing chlorine or chlorinated compounds); • Vegetable waste solids (being processing by-products); • Fish skeletal and muscle residue post filleting (free from offal); and • Poultry industry waste (eggs, macerated chicks and chicken mortalities); • Untreated sawdust; • Molasses; • Solid dairy industry waste (cheese, milk powder, casein); • Sausage waste; • Domestic household and commercial food scraps from Council kerbside collection (bones, fruit, vegetables, meat, bread, dairy, cooked food, paper towels, cut flowers, coffee grounds, tea leaves/bags, eggshells and seafood shells); • Palm kernel; • Prolick; • Food scraps from Powerco and Fonterra; • Diatomaceous earth mix; • Activated carbon; • Ox tails; • Organic waste from Brooklands Zoo; • Sheep and lamb skins.	'New Plymouth' changed to 'Council' in the event that material from other Taranaki Councils becomes available.
~~4~~ 5	Subject to 5(d) below, solid organic compostable material not listed in condition 3 may be accepted on a 'one-off' or temporary basis with the prior approval of the Chief Executive, Taranaki Regional Council ('Chief Executive'). Approval may only be given after the consent holder has made a specific request for authorisation to accept material pursuant to this condition, and provided the Chief Executive with full details of the material including: (a) the type of material and its origin; (b) the volume; (c) the timing/duration of the discharge; and (d) any other information that the Chief Executive may reasonably request in order to determine the likely effects of the discharge including chemical analysis.	Subject to 6(d) below, solid organic compostable material not listed in condition 3 may be accepted on a 'one-off' or temporary basis with the prior approval of the Chief Executive, Taranaki Regional Council ('Chief Executive'). Approval may only be given after the consent holder has made a specific request for authorisation to accept material pursuant to this condition, and provided the Chief Executive with full details of the material including: (a) the type of material and its origin; (b) the volume; (c) the timing/duration of the discharge; and (d) any other information that the Chief Executive may reasonably request in order to determine the likely effects of the discharge including chemical analysis.	No Change other than cross references
~~5~~ 6	The following materials must not be allowed on site: (a) material produced as a result of a dissolved air flotation process; (b) biosolid waste;	The following materials must not be allowed on site: (a) material produced as a result of a dissolved air flotation process; (b) biosolid waste;	

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
	(c) any waste that may contain human faecal material or body fluids; (d) contaminated soil; or (e) any oil and gas related waste.	(c) any waste that may contain human faecal material or body fluids; (d) contaminated soil; or (e) any oil and gas related waste.	
~~6~~ 7	The consent holder must record the following information for all material accepted onto the site: (a) the date and time that the material arrives; (b) the type of material with reference to the list of authorised materials in condition 3; (c) the weight of each type material; and (d) the origin of the material. The information required by this condition must be provided to the Chief Executive, Taranaki Regional Council, within 24 hours of the material arriving on site.	The consent holder must record the following information for all material accepted onto the site: (a) the date and time that the material arrives; (b) the type of material with reference to the list of authorised materials in condition 3; (c) the weight of each type material; and (d) the origin of the material. The information required by this condition must be provided to the Chief Executive, Taranaki Regional Council, within 24 hours of the material arriving on site.	No Change It is noted that the requirement to provide the information within 24 hours of the arrival of the waste implies that an electronic system which is accessible to the TRC will be required.
~~11~~ 8	Within 3 hours of raw waste material being received, it must be mixed with greenwaste on Pad 1 in the appropriate proportions for composting, and windrowed so that the composting process begins.	At all times, composting activities onsite shall be managed in accordance with best practice to minimise odour, leachate, vermin and pathogens, including but not limited to the following; a) Within 3 hours of raw waste material being received, it must be mixed with greenwaste on Pad 1 in the appropriate proportions New Zealand Composting Standard NZS 4454 for composting, and windrowed so that the composting process begins. b) Under no circumstances must there be any discharge of waste material to the 'collection pond', or to the material stockpiled on Pad 3; c) The consent holder must measure and record the temperature and oxygen level in all compost piles in accordance with NZS 4454; d) The Consent Holder must not turn the compost piled before 8AM or after 6PM on any day unless the wind is from a northerly direction.	Moved this condition up from a latter section so it is in a more logical place within the consent document. Added reference to the correct standard. A copy of this standard is ATTACHED to demonstrate how comprehensive it is and its applicability. Added a purpose to the condition. Amalgamated with TRC condition prohibiting discharge to pad 3 or the collection pond.
9		**Site Practices Plan (SPP)** a) To demonstrate compliance with 4-8 the consent holder shall submit to the Chief Executive, Taranaki Regional Council a **Site Practices Plan (SPP)** within two months of the commencement of this consent for certification. This plan must include, but not be limited to; i. Procedures to ensure only the materials authorised by this consent are received; ii. Procedures to prevent unauthorised dumping of material at the site; iii. Procedures to be followed in the event of inadvertent receipt/ dumping of unauthorised materials; iv. Procedures for recording the received materials and ensuring the information required under condition 7 of this consent is reported to the Taranaki Regional Council within 24 hours; v. Details on how compliance with NZS 4454 is achieved; vi. Details on how the temperature and oxygen levels in the compost piles is measured and recorded, and; vii. Procedures to ensure the wind direction is taken into account when undertaking site activities, including how complaince with 8(e) is achieved.	NEW CONDITION PROPOSED New condition added requiring a management plan addressing site practices. There is an existing site management plan which will be updated to reflect the requirements of this condition.
Site Operations			

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
10	N/A	**Accountable Person** a) Within 2 months of commencement of this consent, the Consent Holder must engage an Accountable Person to be responsible for compliance of all conditions of this consent; b) The Accountable Person must be based onsite for a minimum of 4 hours per day, for four days per week, unless otherwise agreed by the Chief Executive, Taranaki Regional Council who may consult Ngati Mutunga prior to agreeing to reduced hours; c) The Accountable Person must; i. Prepare, review, submit and ensure compliance with all management plans listed in condition 3 above; ii. Ensure there is another person who can provide cover in the event they are sick or unavailable, and to provide for succession ('Nominated Cover Person'); iii. Be the point of contact for Taranaki Regional Council, Ngati Mutunga and the community and pro-actively engage with these parties as required under this consent. d) The Accountable Person and the Nominated Cover Person must be approved by the Chief Executive, Taranaki Regional Council, who may consult with Ngati Mutunga prior to approval of the person. e) In the event that the Accountable Person or Nominated Cover Person change, the new persons for these roles must also be approved as per c) above. f) The Accountable Person must be re-approved every 12 months by the Taranaki Regional Council	NEW CONDITION PROPOSED The purpose of this condition is to address the management concerns that were evident at the hearing. The Accountable Person will require back up and support, therefore provision is allowed for a nominated cover person.
~~7~~ 11	The site must be constructed and maintained to ensure that, at all times: (a) stormwater runoff is prevented from entering Pad 1, Pad 2, Pad 3, the Paunch Maturation Pond, and any other area used for vermiculture activities; and (b) all stormwater and/or leachate from Pad 1, Pad 2, Pad 3, the Paunch Maturation Pond, and any other area used for vermiculture activities must be discharged to land or directed through the Wetland Treatment System unless the material is covered. Note: For the purposes of this condition, the location and extent of Pads 1- 3, the Paunch Maturation Pond, and the worm beds are shown on Figure 1, attached as Appendix 1 of these consents.	At all times the Consent Holder shall ensure that potentially contaminated stormwater is directed to the appropriate treatment systems onsite. a) The site must be constructed and maintained to ensure that, at all times: i. stormwater runoff from clean areas of the site is prevented from entering Pad 1, Pad 2, Pad 3, the Paunch Maturation Pond, and any other area used for vermiculture activities; and ii. all stormwater and/or leachate from Pad 1, Pad 2, Pad 3 and the Paunch Maturation Pond, must be directed to the irrigation pond and discharged to land via irrigation or directed through the Wetland Treatment System, iii. Any other area used for vermiculture activities must be directed to the irrigation pond and discharged to land via irrigation or directed through the Wetland Treatment System unless the material is covered. b) Pad 1, Pad 3 and all worm bed areas must at all times be constructed, compacted and maintained, including by having a positive grade and low permeability, to ensure that runoff flows directly from them without ponding.	The condition is now split into two sections, a) and b). The additional wording proposed at part a) makes it clearer that runoff from pad 1, 2 3 and the paunch maturation area must be directed to an appropriate treatment system. Item iii) under part a) is separated to allow for the fact that stormwater from the vermiculture beds does not entrain significant contaminants, because these windrows are covered. Part b) of the condition is to address concerns raised about the lack of detail on the stormwater channels, and concerns raised about management of the channels, bunds and drainage systems. A management plan is considered the appropriate mechanism to achieve this. Consent reference made singular.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		c) To demonstrate compliance with 7 a) and b) the consent holder shall submit to the Chief Executive, Taranaki Regional Council a **Stormwater Infrastructure Management Plan (SIMP)** within one month of the commencement of this consent for certification. This plan must include, but not be limited to; i. a plan showing the locations of all stormwater drains, bunds and channels onsite, including their location and elevations in relation to a defined datum and Reduced Level (RL); ii. details on how frequently stormwater drains and channels are inspected, and the standard against which they are inspected, and; iii. details on the process and timeframes for reporting and addressing any incursions, breaches or non-conformances. Note: For the purposes of this condition, the location and extent of Pads 1- 3, the Paunch Maturation Pond, and the worm beds are shown on Figure 1, attached as Appendix 1 of this consent.	
~~8~~	Pad 1, Pad 3 and all worm bed areas must at all times be constructed, compacted and maintained, including by having a positive grade and low permeability, to ensure that runoff flows directly from them without ponding.	~~Pad 1, Pad 3 and all worm bed areas must at all times be constructed, compacted and maintained, including by having a positive grade and low permeability, to ensure that runoff flows directly from them without ponding.~~	Incorporated into condition 7 (as condition 7 b)
~~9~~ 12	From a date no more than 60 days following the commencement of these consents the Truck Wash Pond, Irrigation Pond, Paunch Maturation Pond and any pond that may contain stormwater and/or leachate, must be lined with material that has a permeability not exceeding $1x10^{-9}$ ms^{-1} to prevent leakage through the bed or sidewalls.	There must be no discharge or leakage of contaminants to water, or onto or into land in circumstances that may enter water, from any pond containing contaminants on the site. a) From a date no more than 2 months following the commencement of this consent the Truck Wash Pond, Irrigation Pond, Paunch Maturation Pond and any pond that may contain stormwater and/or leachate, must be lined with material that has a permeability not exceeding $1x10^{-9}$ ms^{-1} to prevent leakage through the bed and/or sidewalls. b) From the commencement of this consent, at intervals not exceeding 24 months, the consent holder must engage a suitably qualified and experienced person to certify the permeability of the ponds required in a), and provide a report to the Chief Executive, Taranaki Regional Council, that demonstrates compliance with that condition. c) At least once per month, the Consent Holder must inspect all ponds used to store contaminants for breaches, cracks, incursions, holes or defects. The Consent Holder must take photographs of the ponds during the inspection which show all aspects of the structure and make these available to the Chief Executive, Taranaki Regional Council, on request. d) The Consent Holder must notify the Chief Executive, Taranaki Regional Council within 48 hours if the certification required by b) or the inspections required by c) above, or if any other inspection or testing identifies that; i. Any pond is not structurally sound (which may be identified through the presence of slumping, hollows, bulges or defects, or visible leakage from the pond; ii. Any pond structure has visible holes, cracks or defects that could allow contaminants to leak from the structure. e) Within one week of undertaking notification in accordance with d) above, the Consent Holder must advise the Chief Executive, Taranaki	Certification from an appropriate person added (as opposed to just a check). Conditions 10 and 12 amalgamated with this condition for coherency. Additional wording included to make the expectations around pond maintenance clear. 2 months instead of 60 days for consistency. Consent reference made singular.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		Regional Council in writing of the steps that will be undertaken to ensure that the structure is made suitable for ongoing use, including (but not limited to): i. Any additional monitoring or testing to be undertaken; ii. An outline of the proposed works to be undertaken to remediate the structure; iii. The timeframe for completion of the works, which shall be no longer than 2 months; iv. The additional mitigation measures that will be employed to minimise the adverse effects of the leaking structure prior to the remediation works in iii) being completed; v. Testing, certification and/or inspections to be completed following the remedial works to demonstrate the structure is able to comply with the conditions of this consent. f) To demonstrate compliance with 12 a)-e), the Consent Holder must submit a **Pond Management Plan (PMP)** within two months of the commencement of this consent. This plan must include, but not be limited to; i. Operational procedures relating to all ponds onsite; ii. Emergency Response procedures; iii. Monitoring and reporting and the maintenance of records of these activities; iv. The undertaking of visual inspections and recording, documentation and reporting of these; v. Records of any maintenance work undertaken (including photographs)	
~~10~~	From the commencement of these consents, at intervals not exceeding 24 months, the consent holder must engage a suitably qualified and experienced person to check the permeability of the ponds referred to in condition 9, and provide a report to the Chief Executive, Taranaki Regional Council, that demonstrates compliance with that condition.	~~From the commencement of these consents, at intervals not exceeding 24 months, the consent holder must engage a suitably qualified and experienced person to check the permeability of the ponds referred to in condition 9, and provide a report to the Chief Executive, Taranaki Regional Council, that demonstrates compliance with that condition.~~	Incorporated into condition 12 above.
13	Within 90 days of these consents commencing the Duck Pond, the Collection Pond and other ponds associated with Pad 3 must be filled with inert solid material and remediated. Note: For the purposes of these consents, the 'Collection Pond', the Duck Pond and Pad 3 are shown on Figure 1, attached as Appendix 1 of these consents.	Within 3 months of this consent commencing the Collection Pond must be filled with inert solid material and remediated. Note: For the purposes of this consent, the 'Collection Pond', the Duck Pond and Pad 3 are shown on Figure 1, attached as Appendix 1 of this consent.	Moved up from section below. No change to wording. 3 months instead of 90 days for consistency. The Collection pond will be removed. All other ponds must demonstrate compliance with condition 12 above if they are retained. The existing ponds may be required to achieve the levels of treatment necessary to achieve ammonia toxicity levels in condition 19, and the duck pond may be required to provide fire water for forestry activities that will occur on site. Therefore provision to retain these ponds (Subject to condition 12) is sought. Consent reference made singular.
~~12~~	Under no circumstances must there be any discharge of waste material to the 'collection pond', or to the material stockpiled on Pad 3.	~~Under no circumstances must there be any discharge of waste material to the 'collection pond', or to the material stockpiled on Pad 3.~~	Incorporated into condition 12 above
Irrigation			
14	From a date no later than 60 days after these consents commencing, the consent holder must measure and record the rate and volume of discharge from the Irrigation Pond at intervals not exceeding 1 minute to an accuracy of +5%.	The Consent Holder must keep records of the volume and location of all wastewater irrigated to land under this consent. a) From a date no later than two months after this consents commencing,	Amalgamated with condition 15 and 16 for coherency. 2 months instead of 60 days for consistency. Consent reference made singular.

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		the consent holder must measure and record the rate and volume of discharge from the Irrigation Pond at intervals not exceeding 1 minute to an accuracy of +5%; b) The consent holder must provide the Chief Executive, Taranaki Regional Council, with a document from a suitably qualified and experienced person certifying that measuring and recording equipment required by a) ('the equipment') has been: i. installed and/or maintained in accordance with the manufacturer's specifications; and/or ii. tested and shown to be operating to an accuracy of ± 5%. c) The documentation in 14 b) must be provided: i. within one month of the installation of any equipment; ii. at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by these consents; and iii. no less frequently than once every five years. d) The consent holder must record the location and area over which wastewater is irrigated and provide the record to the Chief Executive, Taranaki Regional Council, at the end of each calendar month.	
~~15~~	The consent holder must provide the Chief Executive, Taranaki Regional Council, with a document from a suitably qualified and experienced person certifying that measuring and recording equipment required by condition 14 ('the equipment') has been: (a) installed and/or maintained in accordance with the manufacturer's specifications; and/or (b) tested and shown to be operating to an accuracy of ± 5%. The documentation must be provided: (i) within 30 days of the installation of any equipment; (ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by these consents; and (iii) no less frequently than once every five years.	~~The consent holder must provide the Chief Executive, Taranaki Regional Council, with a document from a suitably qualified and experienced person certifying that measuring and recording equipment required by condition 14 ('the equipment') has been:~~ ~~(a) installed and/or maintained in accordance with the manufacturer's specifications; and/or~~ ~~(b) tested and shown to be operating to an accuracy of ± 5%.~~ ~~The documentation must be provided:~~ ~~(i) within 30 days of the installation of any equipment;~~ ~~(ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by these consents; and~~ ~~(iii) no less frequently than once every five years.~~	Incorporated with 14
~~16~~	The consent holder must record the location and area over which wastewater is irrigated and provide the record to the Chief Executive, Taranaki Regional Council, at the end of each calendar month.	~~The consent holder must record the location and area over which wastewater is irrigated and provide the record to the Chief Executive, Taranaki Regional Council, at the end of each calendar month.~~	Incorporated with 14

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
~~17~~ 15	There must be no discharge to water as a result of irrigating wastewater to land. To achieve this, practices to ensure there is no discharge to water must include, but not necessarily be limited to, ensuring that: (a) no irrigation occurs closer than 10 metres to any surface water body; (b) the discharge does not result in surface ponding that lasts longer than 30 minutes; (c) no spray drift enters surface water; (d) the discharge does not occur at a rate at which it cannot be assimilated by the soil/pasture system; and (e) pasture cover within irrigation areas is maintained at all times.	There must be no discharge to water as a result of irrigating wastewater to land. To achieve this, practices to ensure there is no discharge to water must include, but not necessarily be limited to, ensuring that: (a) no irrigation occurs closer than 10 metres to any surface water body; (b) the discharge does not result in surface ponding that lasts longer than 30 minutes; (c) no spray drift enters surface water; (d) the discharge does not occur at a rate at which it cannot be assimilated by the soil/pasture system; and (e) pasture cover within irrigation areas is maintained at all times.	No Changes
~~NEW TRC~~ 16	At all times the irrigation pond shall achieve a Dissolved Oxygen level of 1mg/L or more.	At all times the irrigation pond shall achieve a Dissolved Oxygen level of 1mg/l or more. To achieve this the consent holder must; a) undertake weekly monitoring of the dissolved oxygen levels in the irrigation pond, and; b) retain an aerator on site and have the ability to aerate the irrigation pond whenever dissolved oxygen levels drop to 1.5 mg/l or less.	This condition is accepted. Aeriation of the ponds will likely be required to achieve this and therefore additional clarity on aeriation is required, as is the provision for weekly monitoring of the DO, to ensure aeriation responds to the DO levels. The aeriation on the ponds is also important to avoiding odour emissions from the pond.
17		**Irrigation Management Plan (IMP)** To demonstrate compliance with conditions 13 - 15 the Consent Holder must submit to the Chief Executive, Taranaki Regional Council for certification an **Irrigation Management Plan (IMP)** within two months of the commencement of this consent. This plan must include, but not be limited to; i. Procedures ensuring the ongoing maintenance and management of monitoring equipment on the irrigation pond; ii. Procedures for identifying when/if the equipment is not working correctly; iii. Procedures and protocols for retaining, reviewing and providing records of discharge from the irrigation pond; iv. Procedures to ensure compliance with a)-e) of condition 14 are complied with, including but not limited to timing and rate of application, servicing of irrigation equipment, weather monitoring, monitoring and investigation of soil suitability and the provision and maintenance of bunds; v. How personnel responsible for the system are trained in the procedures required under the IMP; vi. The undertaking of visual inspections of the irrigation areas and recording, documentation and reporting of these inspections; vii. Records of any maintenance or soil enhancement work (i.e. aeration) undertaken on the irrigation areas or the pond discharge monitoring equipment; viii. Details on how the Dissolved Oxygen standard required under condition 15 is maintained and monitored.	
18	Except within a mixing zone extending 30 metres downstream of the Wetland Treatment System discharge (monitoring location HHG000103), the discharges allowed by these consents must not give	Except within a mixing zone extending 30 metres downstream of the Wetland Treatment System discharge (monitoring location HHG000103), the discharges allowed by this consent must not give	The applicant proposed to change the hydrocarbon standard in this condition to a limit of 15 g/m^3. Reverting to the

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
	rise to any of the following effects in the Haehanga Stream or any of its tributaries: (a) a rise in carbonaceous biochemical oxygen demand of more than 2.00 gm^{-3}; (b) a concentration of unionised ammonia greater than 0.025 gm^{-3}; (c) the presence of total recoverable hydrocarbons; (d) a concentration of chloride greater than 150 gm^{-3}; (e) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; (f) any conspicuous change in the colour or visual clarity; (g) any emission of objectionable odour; (h) the rendering of fresh water unsuitable for consumption by farm animals; and (i) any significant adverse effects on aquatic life	rise to any of the following effects in the Haehanga Stream or any of its tributaries: (a) a rise in carbonaceous biochemical oxygen demand of more than 2.00 gm^{-3}; (b) a concentration of unionised ammonia greater than 0.025 gm^{-3}; (c) the presence of total recoverable hydrocarbons; (d) a concentration of chloride greater than 150 gm^{-3}; (e) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; (f) any conspicuous change in the colour or visual clarity; (g) any emission of objectionable odour; (h) the rendering of fresh water unsuitable for consumption by farm animals; and (i) any significant adverse effects on aquatic life	original wording of 'presence of total recoverable hydrocarbons' is accepted by the applicant. Consent reference made singular.
19	After 1 June 2022 the discharges allowed by these consents must not give rise to a concentration of: (g) ammonia exceeding 0.4 mg/L (annual maximum) or 0.24 mg/L (annual median); or (h) nitrate nitrogen exceeding 3.5 mg/L (annual 95th percentile) or 2.4 mg/L (annual median); in the Haehanga Stream or any of its tributaries.	After 1 June 2026 the discharges allowed by this consent must not give rise to a concentration of: (a) ammonia exceeding 0.4 mg/L (annual maximum) or 0.24 mg/L (annual median); or (b) nitrate nitrogen exceeding 3.5 mg/L (annual 95th percentile) or 2.4 mg/L (annual median); in the Haehanga Stream or any of its tributaries.	The original date of 2026 is maintained. See technical note from Mr Hayden Easton explaining why this period is necessary. Consent reference made singular.
20	-	Within 2 months of the commencement of this consent, the Consent Holder must submit to the Chief Executive, Taranaki Regional Council for certification, an **Adaptive Management Plan (AMP)** which documents the steps that will be taken to achieve compliance with 18 above within 2 months of commencement of this consent. This plan must be prepared by a suitably qualified person in mitigating and managing the effects of nitrogen toxicity in freshwater. It must document a process that identifies; a) Any additional baseline monitoring that is required before commencing with management interventions; b) The management practice(s) that are to be used; c) Monitoring requirements and trigger levels, thresholds and timeframes to demonstrate the management practices that are described in b) are effective; d) Changes to processes and procedures that are to be incorporated into any of the site management plans listed at condition 3, and; e) How the results will be reported to the Chief Executive, Taranaki Regional Council and Ngati Mutunga and the frequency of this reporting.	New Condition documenting how compliance with condition 19 is to be achieved.
Treatment Systems			
~~20~~ 21	The Irrigation Pond and the Paunch Maturation Pond must include storage facilities that can contain a volume of wastewater adequate to manage the volume of stormwater and leachate produced, and achieve compliance with the conditions of these consents.	The Irrigation Pond and the Paunch Maturation Pond must include storage facilities that can contain a volume of wastewater adequate to manage the volume of stormwater and leachate produced, and achieve compliance with the conditions of this consent. a) To demonstrate compliance with this condition, the Consent Holder	TRC's original b) has been deleted as this is addressed in condition 14 and 16 above, as overloading is inherent in ensuring 'the discharge does not occur at a rate at which it cannot be assimilated by the soil/pasture system'.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		must submit to the Chief Executive, Taranaki Regional Council for certification a **Storage Capacity Management Plan (SCMP)** for certification within two months of the commencement of this consent. This plan must address, but not necessarily be limited to, the following matters: i. how the build-up of sediment and/or sludge will be managed within the pond treatment systems, ii. how the level of build-up will be monitored including factors that will trigger active management, and the frequency of undertaking the identified measures or procedures; iii. how available storage in the Pond Treatment System will be managed to ensure there is capacity during rainfall events.	Discharges to land (irrigation) are managed by conditions above, therefore this condition has been changed to refer to management of capacity within the ponds only. 2 months used instead of 60 days to be consistent with other conditions. Wording has been tidied up for clarity. Wetland requirements are separated into a separate condition for clarity. Plural wording relating to consents changed to singular.
~~21~~22	From a date no later than 60 days after commencement of these consents, the discharges to land and water must be managed and operated in accordance with a Pond System Management Plan (the 'PSMP') that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The PSMP must detail management practices undertaken to ensure compliance with the conditions of these consents and maximise treatment capabilities of the two systems. It must address, but not necessarily be limited to, the following matters: (a) how the build-up of sediment and/or sludge will be managed within the treatment systems, how the level of build-up will be monitored including factors that will trigger active management, and the frequency of undertaking the identified measures or procedures; (b) how overloading of each system will be prevented; (c) how available storage in the Pond Treatment System will be managed; (d) how plant die-off within the Wetland Treatment System will be managed, and the frequency and/or timing of undertaking the identified measures or procedures; and (e) how the effectiveness of the Wetland Treatment System in removing Nitrogen is to be demonstrated annually.	The Wetland Treatment System must be managed to ensure that the discharge from the system will achieve compliance with the conditions of this consent. a) The discharge from the Wetland Treatment System must meet the following standards (at monitoring site IND003008): i. the suspended solids concentration must not exceed 100 g/m³; and ii. the pH must be between 6.0 and 9.0. b) To demonstrate compliance with this condition, the Consent Holder must submit to the Chief Executive, Taranaki Regional Council f a **Wetland Management Plan (WMP)** for certification within two months of the commencement of this consent. This plan must address, but not necessarily be limited to, the following matters: i. How the build-up of sediment and/or sludge will be managed within the wetland, ii. How the level of sediment build-up will be monitored including factors that will trigger active management, and the frequency of undertaking the identified measures or procedures; iii. How plant die-off within the Wetland will be managed, and the frequency and/or timing of undertaking the identified any measures or procedures identified for this management; and iv. How the effectiveness of the Wetland Treatment System in removing Nitrogen is to be demonstrated annually.	New condition building on the existing condition which incorporates a management plan.
~~22~~	The discharge from the Wetland Treatment System must meet the following standards (at monitoring site IND003008): (a) the suspended solids concentration must not exceed 100 g/m³; and (b) the pH must be between 6.0 and 9.0.	~~The discharge from the Wetland Treatment System must meet the following standards (at monitoring site IND003008):~~ ~~(a) the suspended solids concentration must not exceed 100 g/m³; and~~ ~~(b) the pH must be between 6.0 and 9.0.~~	Incorporated into condition 22 above.

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how the build-up of sediment and/or sludge will be managed within the treatment systems, how the level of build-up will be monitored including factors that will trigger active management, and the frequency of undertaking the identified measures or procedures;¶
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how available storage in the Pond Treatment System will be managed;¶

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<tr><td colspan="4">Soil Quality</td></tr>
<tr><td>23</td><td>The discharges must be managed to ensure that no constituent in the soil in any irrigation area exceeds the maximum value shown in the following table:
<table>
<tr><th>Constituent</th><th>Maximum value (mg/kg unless otherwise stated)</th></tr>
<tr><td>Arsenic [1]</td><td>17</td></tr>
<tr><td>Barium – Barite [2]</td><td>10,000</td></tr>
<tr><td>Extractable Barium [2]</td><td>250</td></tr>
<tr><td>Cadmium [1]</td><td>0.8</td></tr>
<tr><td>Chromium [3]</td><td>600</td></tr>
<tr><td>Copper [3]</td><td>100</td></tr>
<tr><td>Lead [1]</td><td>160</td></tr>
<tr><td>Nickel [3]</td><td>60</td></tr>
<tr><td>Mercury</td><td>1</td></tr>
<tr><td>Zinc [3]</td><td>300</td></tr>
<tr><td>Sodium</td><td>460</td></tr>
<tr><td>Conductivity</td><td>290 mS/m</td></tr>
<tr><td>Chloride</td><td>700</td></tr>
<tr><td>Sodium adsorption ratio</td><td>8 (ratio)</td></tr>
<tr><td>TPH C7-C9</td><td>120</td></tr>
<tr><td>TPH C10-C14</td><td>58</td></tr>
<tr><td>TPH C15-C36</td><td>4000</td></tr>
<tr><td>Naphthalene</td><td>7.2</td></tr>
<tr><td>Pyrene</td><td>160</td></tr>
<tr><td>Benzo (a) pyrene</td><td>0.027</td></tr>
<tr><td>Benzene</td><td>1.1</td></tr>
<tr><td>Toluene</td><td>68</td></tr>
<tr><td>Ethylbenzene</td><td>53</td></tr>
<tr><td>Xylenes</td><td>48</td></tr>
<tr><td colspan="2">[1]SCS – Rural Residential MfE 2011b; [2] Alberta Environment 2009; [3] NZWWA 2003, lowest of protection of human health and ecological receptors. (Biosolids to land)</td></tr>
</table></td><td>The discharges must be managed to ensure that no constituent in the soil in any irrigation area exceeds the maximum value shown in the following table:
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</table></td><td>No Change. The certainty this conditions gives is supported.</td></tr>
<tr><td colspan="4">Groundwater Quality</td></tr>
<tr><td>24</td><td>The consent holder must maintain all groundwater monitoring wells on site.</td><td>The consent holder must maintain all groundwater monitoring wells on site in a condition that enables samples to be obtained and access for monitoring purposes to be achieved.</td><td>Extra wording added for clarity.</td></tr>
<tr><td>25</td><td>The Total Nitrogen discharged to any hectare of land must not exceed:
(a) 400 kilograms in any 12-month period for ‘cut and carry areas’; or
(b) 200 kilograms in any 12-month period for any other land (including grazed pasture).</td><td>The Total Nitrogen discharged to any hectare of land must not exceed:
(a) 400 kilograms in any 12-month period for ‘cut and carry areas’; or
(b) 200 kilograms in any 12-month period for any other land (including grazed pasture).</td><td>400 kg is agreed to by the applicant.</td></tr>
</table>

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<tr><td>26</td><td>From a date no later than 90 days after these consents commence, irrigation of effluent must be managed in accordance with a Nitrogen Management Plan (the ‘NMP’) that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The NMP must detail how effluent irrigation will be managed to ensure compliance with condition 25 above.</td><td>The Consent Holder must submit to the Chief Executive, Taranaki Regional Council a Nitrogen and Phosphrous Management Plan (N&PMP) for certification within two months of the commencement of this consent. This plan must be prepared by a suitably qualified person[1] and must address, but not necessarily be limited to, the following matters:

i. How compliance with the limits in condition 25 will be demonstrated to the Taranaki Regional Council;
ii. How ‘cut and carry’ operations will be managed around irrigation of effluent;
iii. How the volume of material that is cut and carried will be reported to the Taranaki Regional Council and verified, and;
iv. How the site is managed to minimise Phosphorous and Nitrogen losses to groundwater.</td><td>This condition has been reworded to address some of the matters raised at the hearing - i.e. How much grass is cut and carried, how is this demonstrated, and how cut and carry is worked around the need to irrigate effluent. The requirement that it be prepared by a suitably qualified person is added for robustness.
Phosphorous added to this condition as a result of concerns raised at the hearing.</td></tr>
<tr><td colspan="4">Riparian Planting</td></tr>
<tr><td>27</td><td>The consent holder must undertake (and maintain) fencing and riparian planting for the entire stream length of the streams on the property, in accordance with the Riparian Management Plan for the property (RMP 90383). The additional fencing and/or riparian planting required, must be carried out in accordance with the following programme:
<table><tr><th>Length of stream bank to be fenced and/or planted (m) (in addition to that existing on 1 March 2021)</th><th>Completion date</th></tr><tr><td>At least 1000</td><td>1 August 2021</td></tr><tr><td>At least 2000</td><td>1 August 2022</td></tr><tr><td>All remaining</td><td>1 August 2023</td></tr></table></td><td>The consent holder must undertake (and maintain) fencing and riparian planting for the entire stream length of the streams on the property, in accordance with the Riparian Management Plan for the property (RMP 90383). The additional fencing and/or riparian planting required, must be carried out, as a minimum, in accordance with the following programme:
<table><tr><th>Length of stream bank to be fenced and/or planted (m) (in addition to that existing on 1 March 2021)</th><th>Completion date</th></tr><tr><td>At least 1000</td><td>1 August 2021</td></tr><tr><td>At least 2000</td><td>1 August 2022</td></tr><tr><td>All remaining</td><td>1 August 2023</td></tr></table>For the avoidance of doubt, if the land adjoining the waterway is to be retired and planted in indigenous species, this will constitute riparian planting.</td><td>Additional wording indicates this is the minimum expected.
The additional wording is to reflect that in some areas currently identified for riparian planting (i.e. fencing and planting of the riparian zone only), the entire paddock/land mass adjacent to the waterway is intended to be completely retired and forested.</td></tr>
<tr><td colspan="4">Dust</td></tr>
<tr><td>28</td><td>The discharges authorised by these consents must not give rise to suspended or deposited dust at or beyond the boundary of the site that is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:

(a) dust deposition rate 0.13 g/m2/day; and/or
(b) suspended dust level 4 mg/m3.

Note: For the purposes of this condition, the consent holder’s site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD</td><td>The discharges authorised by this consent must not give rise to suspended or deposited dust at or beyond the boundary of the site that is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:

(a) dust deposition rate 0.13 g/m2/day; and/or
(b) Total suspended particulate concentrations 100 µg/m3 as a rolling 24 hour average.</td><td>This condition reflects the higher suspended dust level proposed by the TRC at the hearing (4mg/m3 - the original conditions stated 3mg/m3 however the TRC’s air quality scientise suggested 4 mg/m3 was appropriate given the rural nature of the site).
TRC also rejected the insertion of the wording ‘Total suspended particulate concentrations 100 µg/m3 as a rolling 24 hour average’.
Attached is a memo from the applicants expert, Mr A Curtis, explaining why the applicants wording is more</td></tr>
</table>

[1] E.g. a Certified Nutrient Management Adviser, or person with an Advanced Sustainable Nutrient Management certificate, or similar qualification.

Deleted: From a date no later than 90 days after these consents commence, irrigation of effluent must be managed in accordance with a Nitrogen Management Plan (the ‘NMP’) that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The NMP must detail how effluent irrigation will be managed to ensure compliance with condition 25 above.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		Note: For the purposes of this condition, the consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD	consistent with normal practice in NZ. Accordingly, the applicant seeks to retain the original wording proposed as Attachment A to Ms Hoopers evidence in chief. Consent reference made singular.
Odour			
29	The discharges authorised by these consents must not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable. Note: For the purposes of this condition: • The consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD; and • Assessment under this condition will be in accordance with the Good Practice Guide for Assessing and Managing Odour, Ministry for the environment (2016)	The discharges authorised by this consent must not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable in the opinion of an Officer of the Taranaki Regional Council or other suitably qualified or experienced person authorised on behalf of the Taranaki Regional Person to make this assessment. Note: For the purposes of this condition: • The consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD; and • Assessment under this condition will be in accordance with the Good Practice Guide for Assessing and Managing Odour, Ministry for the environment (2016)	Consent reference made singular. Added a frame of reference for who makes the decision on offensive/objectionable.
~~32~~ 30	The consent holder must maintain a monitoring device that continuously records wind speed and direction in the area of the composting activity. The data must be provided telemetrically to the Taranaki Regional Council. If this method is not at first technically feasible, the data must be provided to the Taranaki Regional Council at a frequency and a form advised by the Chief Executive, Taranaki Regional Council until such a time it is technically feasible to telemetric the data.	The consent holder must maintain a monitoring device that continuously records wind speed and direction in the area of the composting activity. The data must be provided telemetrically to the Taranaki Regional Council. If this method is not at first technically feasible, the data must be provided to the Taranaki Regional Council at a frequency and a form advised by the Chief Executive, Taranaki Regional Council until such a time it is technically feasible to telemeter the data.	Pasted from below for flow of conditions, as now included in the OMP condition.
31		The consent holder must undertake monthly monitoring of odour at the boundary of the site. The monitoring shall be a) Undertaken during the normal operation of the site including irrigation activities; b) Be undertaken using a methodology agreed in writing with the Taranaki Regional Council; c) Occur when wind speeds are less than 3 metres per second; d) Occur: i. At the site entrance ii. at least one location to the north of the site entrance iii. at least one location to the south of the site entrance	New condition recommended by applicants air quality expert
~~30~~ 32	Within 90 days of the commencement of these consents, the site must be operated in accordance with an 'Odour Management Plan' (the 'OMP') that has been approved the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The OMP must be prepared by a suitably qualified and experienced person and must detail the practices undertaken to ensure that odour is avoided as far as practical and there is no offensive or objectionable odour beyond the site boundary. It must address, but not necessarily be limited to, the following matters:	The Consent Holder must submit to the Chief Executive, Taranaki Regional Council an **Odour Management Plan (OMP)** for certification within three months of the commencement of this consent. This plan must be prepared by a suitably qualified person and must address, but not necessarily be limited to, the following matters: (a) identification of all activities on site which have the potential to	3 months used instead of 90 days for consistency. Wording changed to be consistent with that for other management plans.

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Deleted: Within 90 days of the commencement of these consents, the site must be operated in accordance with an 'Odour Management Plan' (the 'OMP') that has been approved the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The OMP must be prepared by a suitably qualified and experienced person and must detail the practices undertaken to ensure that odour is avoided as far as practical and there is no offensive or objectionable odour beyond the site boundary. It must address, but not necessarily be limited to, the following matters:¶

<table>
<tr><th>Condition Number</th><th>TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1</th><th>Proposed condition - Remediation NZ (Applicant) - Post Hearing</th><th>Comments on Condition/explanation of changes proposed</th></tr>
<tr><td></td><td>(a) identification of all activities on site which have the potential to generate odour (e.g. turning compost piles, removing sludge from ponds);
(b) the conditions and/or time of day when activities identified under (a) above should be undertaken (e.g. during favourable weather conditions and the identification of those conditions) and/or measures that must be implemented to avoid odours arising (e.g. containment measures);
(c) measures undertaken to minimise odours during receiving and storing material, and throughout the composting and vermiculture processes (e.g. method(s) used to cover material once received, how anaerobic conditions are maintained);
(d) measures undertaken to minimise odours arising in the Wetland Treatment System, and identification of the time of year and/or frequency when undertaken;
(e) measures undertaken to minimise odours arising in the Irrigation Pond and associated treatment measures and identification of the time of year and/or frequency when undertaken; and
(f) an assessment of alternate treatments or methods available that could further minimise odour, and the reasons that they have not been adopted.
(g) Provision for Cultural Monitoring

Certification by the Chief Executive, Taranaki Regional Council may include, at the consent holder’s cost, a peer review by a suitably qualified and experienced person.</td><td>generate odour (e.g. turning compost piles, removing sludge from ponds);
(b) the conditions and/or time of day when activities identified under (a) above should be undertaken (e.g. during favourable weather conditions and the identification of those conditions) and/or measures that must be implemented to avoid odours arising (e.g. containment measures);
(c) how data obtained from onsite monitoring of wind speed and direction is incorporated into daily decisions;
(d) how onsite windspeed and direction equipment is calibrated, monitored and maintained to ensure the data is accurate;
(e) measures undertaken to minimise odours during receiving and storing material, and throughout the composting and vermiculture processes (e.g. method(s) used to cover material once received, how anaerobic conditions are maintained);
(f) measures undertaken to minimise odours arising in the Wetland Treatment System, and identification of the time of year and/or frequency when undertaken;
(g) measures undertaken to minimise odours arising in the Irrigation Pond and associated treatment measures and identification of the time of year and/or frequency when undertaken;
(h) an assessment of alternate treatments or methods available that could further minimise odour, and the reasons that they have not been adopted;
(i) Details of the odour monitoring required under condition 30, including how the results of this monitoring are communicated to Ngati Mutunga, TRC and the wider community, and;
(j) How provision is made for Cultural Monitoring associated with odour emissions.

Certification by the Chief Executive, Taranaki Regional Council may include, at the consent holder’s cost, a peer review by a suitably qualified and experienced person.</td><td></td></tr>
<tr><td>~~31~~</td><td>The consent holder must review and update the OMP required by condition 30 and provide it to the Chief Executive, Taranaki Regional Council for recertification before 31 December 2023 and at 2-yearly intervals thereafter. Recertification may include peer review by a suitably qualified and experienced person.</td><td>~~The consent holder must review and update the OMP required by condition 30 and provide it to the Chief Executive, Taranaki Regional Council for recertification before 31 December 2023 and at 2-yearly intervals thereafter. Recertification may include peer review by a suitably qualified and experienced person.~~</td><td>Deleted as now covered by general condition 3.</td></tr>
<tr><td colspan="4">Discharge of existing stockpiled waste</td></tr>
<tr><td>33</td><td></td><td>a) The existing stockpiled waste material must be remediated on site to achieve the standards shown in the table below, within three years of commencement of this consent.

<table><tr><th>Constituent</th><th>Maximum value (mg/kg unless otherwise stated)</th></tr><tr><td>Arsenic [1]</td><td>17</td></tr><tr><td>Barium – Barite [2]</td><td>10,000</td></tr></table></td><td>This condition reflets that all or part of the stockpile may be remediated and it is intended that any of the material that does NOT achieve the criteria in the table within 3 years is removed from the site.</td></tr>
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Deleted: The consent holder must review and update the OMP required by condition 30 and provide it to the Chief Executive, Taranaki Regional Council for recertification before 31 December 2023 and at 2-yearly intervals thereafter. Recertification may include peer review by a suitably qualified and experienced person.¶

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed

Extractable Barium [2]	250
Cadmium [1]	0.8
Chromium [3]	600
Copper [3]	100
Lead [1]	160
Nickel [3]	60
Mercury	1
Zinc [3]	300
Sodium	460
Conductivity	290 mS/m
Chloride	700
Sodium adsorption ratio	8 (ratio)
TPH C7-C9	120
TPH C10-C14	58
TPH C15-C36	4000
Naphthalene	7.2
Pyrene	160
Benzo (a) pyrene	0.027
Benzene	1.1
Toluene	68
Ethylbenzene	53
Xylenes	48
Pathogen	
E-coli	Less than 100 MPN/g
Campylobacter	Less than 1/25g
Samonella	Less than <2 MPN/g
Human adenovirus	Less than 1 PFU/0.25g
Helminth ova	Less than 1 PFU/0.25g

[1]SCS – Rural Residential MfE 2011b; [2] Alberta Environment 2009; [3] NZWWA 2003, lowest of protection of human health and ecological receptors. (Biosolids to land)

b) The consent holder must provide to the Chief Executive, Taranaki Regional Council for certification, a **Stockpile Remediation Plan (SRP)** for the existing stockpiled waste within 2 months of the commencement of this consent. This plan must be prepared by a suitably qualified person and must address, but not necessarily be limited to, the following matters:

i. The treatment and processes that will be engaged by the consent holder to remediate the waste;
ii. How the waste will be monitored to demonstrate compliance with a), including details of the sampling procedure showing that the test sample is representative of the wastes.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		c) Any existing stockpiled waste that is unable to achieve compliance with a) must be removed from the site by the consent holder and at the consent holders cost and disposed of at a facility that is authorised to receive the waste within 3 months. d) Prior to disposal offsite, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, details of the facility that will receive the waste, and confirmation from the waste management facility that the waste will be able to be lawfully disposed of at that facility. e) This condition may be applied to all or part of the stockpiled waste.	
~~33~~ 34	~~The discharge of stockpiled material to land for use as a 'soil conditioner' must not occur within 10 metres of any surface water.~~	Any existing stockpiled waste material that is certified by the Chief Executive, Taranaki Regional Council as compliant with condition 33 a) may be discharged to land onsite as a soil conditioner, subject to the following conditions. a) The discharge of stockpiled material to land for use as a 'soil conditioner' must not occur within 10 metres of any surface water. b) The consent holder must the Chief Executive, Taranaki Regional Council with the following information: i. The volume of material to be discharged; ii. a map or aerial image identifying the specific area where the discharge is to occur; iii. a calculation of the Nitrogen loading of the discharge proposal; c) the Chief Executive, Taranaki Regional Council, having assessed the information provided advises that the discharge may occur.	
~~34~~	~~The discharge of stockpiled waste to land must only occur after:~~ ~~(a) the consent holder has provided the Chief Executive, Taranaki Regional Council with the following information:~~ ~~the volume of material to be discharged;~~ ~~(i) a map or aerial image identifying the specific area where the discharge is to occur;~~ ~~(ii) a calculation of the Nitrogen loading of the discharge proposal;~~ ~~(iii) test results from a representative sample of the waste to be discharged showing that it meets the standards shown in the table below;~~ ~~(iv) details of the sampling procedure showing that the test sample is representative of the wastes; and~~ ~~(b) the Chief Executive, Taranaki Regional Council, having assessed the information provided advises that the discharge may occur.~~	~~The discharge of stockpiled waste to land must only occur after:~~ ~~(c) the consent holder has provided the Chief Executive, Taranaki Regional Council with the following information:~~ ~~the volume of material to be discharged;~~ ~~(i) a map or aerial image identifying the specific area where the discharge is to occur;~~ ~~(ii) a calculation of the Nitrogen loading of the discharge proposal;~~ ~~(iii) test results from a representative sample of the waste to be discharged showing that it meets the standards shown in the table below;~~ ~~(iv) details of the sampling procedure showing that the test sample is representative of the wastes; and~~ ~~(d) the Chief Executive, Taranaki Regional Council, having assessed the information provided advises that the discharge may occur.~~	The TRC proposed that this condition be deleted in favour of complete removal of the material from the site. Given the alternative proposed put forward to remediate the material in situ over short period, the applicant proposes that the original wording be retained, and this is now included under condition 33.

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<tr><td>~~Zinc [3]~~</td><td>~~300~~</td></tr>
<tr><td>~~Sodium~~</td><td>~~460~~</td></tr>
<tr><td>~~Conductivity~~</td><td>~~290 mS/m~~</td></tr>
<tr><td>~~Chloride~~</td><td>~~700~~</td></tr>
<tr><td>~~Sodium adsorption ratio~~</td><td>~~8 (ratio)~~</td></tr>
<tr><td>~~TPH C7-C9~~</td><td>~~120~~</td></tr>
<tr><td>~~TPH C10-C14~~</td><td>~~58~~</td></tr>
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<tr><td>~~Naphthalene~~</td><td>~~7.2~~</td></tr>
<tr><td>~~Pyrene~~</td><td>~~160~~</td></tr>
<tr><td>~~Benzo (a) pyrene~~</td><td>~~0.027~~</td></tr>
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</table>
</td><td></td></tr>
<tr><td>NEW TRC</td><td>All material stockpiled on pad 3 is to be removed form site within 90 days of commencement of this consent.</td><td>Not agreed by applicant.</td><td>See alternative solution to manage the stockpile provided above by the applicant. The applicant does not agree that the material needs to be removed from the site immediately.</td></tr>
<tr><td colspan="4">Environmental Monitoring Plan</td></tr>
<tr><td>35</td><td>Within 90 days of the commencement date of these consents, the consent holder must ensure a Monitoring Plan is prepared. The purpose of the Monitoring Plan</td><td>Within 3 months of the commencement date of this consent, the consent holder must ensure an Environmental Monitoring Plan (EMP) is prepared. The</td><td>90 days changed to 3 months for consistency.
Added ability for involvement of Ngati Mutunga in development of the EMP.</td></tr>
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	is to identify the techniques, methodologies and procedures that will be employed to acquire data in relation to, and to monitor compliance with the conditions of these consents, and the effects of the discharges authorised by these consents. The plan must include at least the following: (a) provision for site inspections to be undertaken at least once every week; (b) installation of an in-situ water quality monitoring sonde to measure real-time water quality of the Haehanga Stream; (c) camera surveillance of the site with images transmitted to the Council in real time; (d) requirements for sampling and testing to ensure compliance with the conditions of these consents; (e) groundwater sampling and testing to determine the risk that groundwater quality may present for surface water; and (f) annual reports that record the information that has been collected in accordance with the consent conditions and compliance with those conditions. (g) Provision for cultural monitoring. (h) Monitoring for e-coli. Note: The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes, however RNZ representatives must also be involved in preparation of this document.	purpose of the EMP is to identify the techniques, methodologies and procedures that will be employed to acquire data in relation to, and to monitor compliance with the conditions of this consent, and the effects of the discharges authorised by this consent. The plan must include at least the following: (a) provision for site inspections to be undertaken at least once every week; (b) installation of an in-situ water quality monitoring sonde to measure real-time water quality of the Haehanga Stream at a point agreed to with the Chief Executive, Taranaki Regional Council; (c) camera surveillance of the site with images transmitted to the Council in real time; (d) requirements for sampling and testing to ensure compliance with the conditions of this consent; (e) groundwater sampling and testing to determine the risk that groundwater quality may present for surface water; and (f) annual reports that record the information that has been collected in accordance with the consent conditions and compliance with those conditions. (g) Provision for cultural monitoring and reporting and assessment against cultural health indicators; (h) Monitoring for e-coli, and; (i) Herbage testing of cut and carry crops taken from the irrigation areas. (j) (j)Contracted cultural monitoring by Ngati Mutunga including to monitor progress in achieving iwi management plans and Te Rūnanga o Ngāti Mutunga & Te Wai Māori Trust: Mauri Compass Assessment Note: The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes, however RNZ representatives must also be involved in preparation of this document and representatives of Ngati Mutunga may also be invited to assist in development of the EMP.	Consent reference made singular.
Contingency Plan			
36	The consent holder must develop and regularly update a 'Contingency Plan' that details measures and procedures that will be undertaken to prevent and remedy any environmental effects from a spillage or any discharge of contaminants not authorised by these consents. The plan and any amended versions must be provided to the Chief Executive, Taranaki Regional Council.	Within 2 months of the commencement date of this consent, the consent holder must provide a **Site Contingency Plan (SCP)** to the Chief Executive, Taranaki Regional Council for certification. The purpose of the SCP is to detail the measures and procedures that will be undertaken to prevent and remedy any environmental effects from a breach, spillage or any discharge of contaminants not authorised by this consent. The plan must include at least the following: (a) A risk assessment process that identifies all potential sources of breaches/unauthorised discharges and assesses the risk associated with each source;	

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Deleted: <#>Contracted cultural monitoring by Ngati Mutunga including to monitor progress in achieving iwi management plans and Te Rūnanga o Ngāti Mutunga & Te Wai Māori Trust: Mauri Compass Assessment¶

Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		(b) How the consent holder will prevent and remedy any environmental effects from a breach, spillage or any unauthorised discharge of contaminants; (c) Steps the consent holder will take to notify affected parties (including downstream users of surface water) and keep these parties informed as to the status of the breach; (d) Steps the consent holder will take to notify Ngati Mutunga (e) Monitoring that will be undertaken to demonstrate the breach has been remediated, including any cultural monitoring requested by Ngati Mutunga.	
37		**Complaints Hotline** Within 2 months of the commencement of this consent the consent holder must provide details of a 24 hour complaints hotline to all landowners and occupiers within 3km of the site, and to Ngati Mutunga, and maintain a complaints register, which includes: a) Date, time location and nature and details of the complaint; b) Details of the complainant - neighbour, Tangata Whenua, member of the public, Regional Council, and contact details if these are provided; c) Steps taken to respond to and address the complaint; d) How the results of the steps taken as a result of the complaint are communicated to the complainant. e) Any changes to site management that are made as a result of a specific complaint or series of complaints. The complaints register must be made available to the Taranaki Regional Council, on request.	Was omitted from the consent but part of previous consents and is considered appropriate after hearing submissions at the hearing.
Site Reinstatement			
~~37~~ 38	Within 3 months of the commencement date of these consents, the consent holder must engage a suitably qualified and experienced person, approved by the Chief Executive, Taranaki Regional Council, to prepare and submit a Site Exit Plan (SEP) which details how the site is going to be reinstated at the end of its life. A bond is required under condition 38, in relation to performance of the SEP. The SEP must address, but is not necessarily limited to, the following matters: (a) how the site will be reinstated so that no raw materials listed or approved under conditions 3 or 4 of these consents remain on site after the consent expires; (b) how the site will be reinstated so that no partially decomposed material remains on site after the consents expire; (c) how all stockpiled waste will be removed and appropriately disposed of; (d) how any remaining leachate or sludge, resulting from the operation, will be either removed from the site, buried, treated or otherwise to avoid any adverse effects on groundwater or surface	Within 3 months of the commencement of this consent, the Consent Holder must submit to the Chief Executive, Taranaki Regional Council for certification, a **Site Exit Plan (SEP)** which details how the site is going to be reinstated at the end of its life. This plan must be prepared by a suitably qualified person who must be approved by the Chief Executive, Taranaki Regional Council in writing prior to the preparation of the SEP. A bond is required under condition 39, in relation to performance of the SEP. The SEP must address, but is not necessarily limited to, the following matters: (a) how the site will be reinstated so that no raw materials listed or approved under conditions 3 or 4 of this consent remain on site after the consent expires; (b) how the site will be reinstated so that no partially decomposed material remains on site after the consents expire; (c) how all stockpiled waste will be removed and appropriately disposed of; (d) how any remaining leachate or sludge, resulting from the operation, will be either removed from the site, buried, treated or	Review dates removed as these are now all incorporated with condition 3, including the provision for Ngati Mutunga to review the plans. Consent reference made singular.

Deleted: The consent holder must develop and regularly update a **'Contingency Plan'** that details measures and procedures that will be undertaken to

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
	water; (e) how irrigated soils and groundwater will be remediated; (f) timeframes for undertaking the activities identified in association with (a) to (e) above; (g) estimates of costs of reinstating the site; and (h) a recommended initial bond quantum. Note: this recommendation is not final, and is subject to the process set out at condition 38 (d)(i) – (iii) below. (i) Responds to concerns raised by Ngati Mutunga The first time the SEP is drafted it must be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The SEP must be reviewed by Ngati Mutunga, a suitably qualified and experienced person approved by the Chief Executive, Taranaki Regional Council, and submitted to the Chief Executive, Taranaki Regional Council for re-approval at 5-yearly intervals. The consent holder must implement the approved SEP upon expiry of these consents.	otherwise to avoid any adverse effects on groundwater or surface water; (e) how irrigated soils and groundwater will be remediated; (f) timeframes for undertaking the activities identified in association with (a) to (e) above; (g) estimates of costs of reinstating the site; (h) a recommended initial bond quantum. Note: this recommendation is not final, and is subject to the process set out at condition 39 (d)(i) – (iii) below; and (i) How the SEP responds to concerns raised by Ngati Mutunga The consent holder must implement the approved SEP upon expiry of this consent.	
	Bond		
~~38~~ 39	Within 6 months of the commencement date of these consents, the consent holder must enter into an enforceable written agreement (bond agreement) to provide and maintain in favour of the Taranaki Regional Council, a cash bond or bank bond pursuant to sections 108(2)(b) and 108A of the Resource Management Act, on terms and conditions satisfactory to the Taranaki Regional Council in all respects. The following terms apply in respect of the bond: (a) the bond quantum must be sufficient to ensure compliance with condition 37 above in the event of any default by the consent holder; (b) any bank bond must be in a form used by a bank registered to conduct business in New Zealand and approved by the Taranaki Regional Council; (c) the bond agreement must include the terms and conditions on which the bond will be established, maintained, changed, transferred or surrendered. In the event of the Taranaki Regional Council not agreeing with the consent holder on the terms of the bond agreement, then the dispute must be resolved through an agreed disputes resolution process or referred to arbitration; (d) the initial bond quantum must be determined as follows: (i) Upon preparing the SEP, and in accordance with condition 37(g) and (h) above, a suitably qualified and experienced person (approved by the Chief Executive of the Taranaki Regional Council) who has been engaged by the consent holder must make a recommendation as to the initial bond quantum;	Within 6 months of the commencement date of this consent, the consent holder must enter into an enforceable written agreement (bond agreement) to provide and maintain in favour of the Taranaki Regional Council, a cash bond or bank bond pursuant to sections 108(2)(b) and 108A of the Resource Management Act, on terms and conditions satisfactory to the Taranaki Regional Council in all respects. The following terms apply in respect of the bond: (a) the bond quantum must be sufficient to ensure compliance with condition 38 above in the event of any default by the consent holder; (b) any bank bond must be in a form used by a bank registered to conduct business in New Zealand and approved by the Taranaki Regional Council; (c) the bond agreement must include the terms and conditions on which the bond will be established, maintained, changed, transferred or surrendered. In the event of the Taranaki Regional Council not agreeing with the consent holder on the terms of the bond agreement, then the dispute must be resolved through an agreed disputes resolution process or referred to arbitration; (d) the initial bond quantum must be determined as follows: (i) Upon preparing the SEP, and in accordance with condition 38(g) and (h) above, a suitably qualified and experienced person (approved by the Chief Executive of the Taranaki Regional Council) who has been engaged by the consent holder must make a recommendation as to the initial bond quantum;	Consent reference made singular. Cross references updated.

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The SEP must be reviewed by Ngati Mutunga, a suitably qualified and experienced person approved by the Chief Executive, Taranaki Regional Council, and submitted to the Chief Executive, Taranaki Regional Council for re-approval at 5-yearly intervals.

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
	(ii) The Taranaki Regional Council will then engage a suitably qualified and experienced person to peer review the bond quantum recommended under condition 37(h); and (iii) In the event of the consent holder and the Taranaki Regional Council not reaching an agreement on the initial bond quantum, it must be assessed by an independent bond assessor appointed by the Taranaki Regional Council, and the decision of that person will be final and binding. (e) the bond quantum may be reviewed and reassessed every two years from the date the initial bond quantum is lodged until a date two years after the date on which these consents have been given effect to. The purpose of the adjustment is to reflect changes in the risk profile of the activity at the site. After that, the bond quantum may be reviewed and reassessed by the consent holder and the Taranaki Regional Council at five yearly intervals for the duration of these consents. The method of review must follow the same procedure set out in condition 38(d) above. (f) the bond terms and quantum may also be varied or cancelled or renewed at any other time by agreement between the consent holder and the Taranaki Regional Council using the methodology described in condition 38(d);if at any time the amount of the bond is varied under conditions 38(e) or 38(f), then the consent holder must, within five (5) working days of the replacement bond agreement being executed, put in place a new bond for the varied amount or the additional amount required in excess of the existing bond; (g) if the consent is transferred to another party or person, the bond lodged by the transferor must be retained by the Taranaki Regional Council until a replacement bond is entered into by the transferee to ensure compliance with conditions of the consents unless condition 37 has already been complied with; (h) at all times the consent holder must comply with the terms of the bond or varied bond; (i) the consent holder must reimburse the Taranaki Regional Council for all reasonable costs incurred in developing the bond agreement and any subsequent reviews or reassessments; (j) for the avoidance of doubt, the bond agreement may provide for the bond to be held after the expiry of these consents if the SEP is not given effect to and condition 37 not complied with.	(ii) The Taranaki Regional Council will then engage a suitably qualified and experienced person to peer review the bond quantum recommended under condition 38(h); and (iii) In the event of the consent holder and the Taranaki Regional Council not reaching an agreement on the initial bond quantum, it must be assessed by an independent bond assessor appointed by the Taranaki Regional Council, and the decision of that person will be final and binding. (e) the bond quantum may be reviewed and reassessed every two years from the date the initial bond quantum is lodged until a date two years after the date on which this consent has been given effect to. The purpose of the adjustment is to reflect changes in the risk profile of the activity at the site. After that, the bond quantum may be reviewed and reassessed by the consent holder and the Taranaki Regional Council at five yearly intervals for the duration of this consent. The method of review must follow the same procedure set out in condition 39(d) above. (f) the bond terms and quantum may also be varied or cancelled or renewed at any other time by agreement between the consent holder and the Taranaki Regional Council using the methodology described in condition 39(d);if at any time the amount of the bond is varied under conditions 39(e) or 39(f), then the consent holder must, within five (5) working days of the replacement bond agreement being executed, put in place a new bond for the varied amount or the additional amount required in excess of the existing bond; (g) if the consent is transferred to another party or person, the bond lodged by the transferor must be retained by the Taranaki Regional Council until a replacement bond is entered into by the transferee to ensure compliance with conditions of the consents unless condition 38 has already been complied with; (h) at all times the consent holder must comply with the terms of the bond or varied bond; (i) the consent holder must reimburse the Taranaki Regional Council for all reasonable costs incurred in developing the bond agreement and any subsequent reviews or reassessments; (j) for the avoidance of doubt, the bond agreement may provide for the bond to be held after the expiry of this consent if the SEP is not given effect to and condition 38 not complied with.	
Community Liaison			
40	**Not proposed**	The consent holder shall hold community meetings every 3 months or at other such interval as parties may agree. Requirements for these meetings are as follows: i. All parties who submitted against applications for consent shall be invited to attend the meetings, and the invitation must be extended to	

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Condition Number	TRC wording from Hearing incorporating agreed changes to RNZ officered conditions version 1	Proposed condition - Remediation NZ (Applicant) - Post Hearing	Comments on Condition/explanation of changes proposed
		all households, businesses, schools and other community facilities within a 3km radius of the site. ii. Notice of the meetings must be provided at least one month prior to the meeting date; iii. the meetings must be held at a convenient location to the community. iv. The meetings must be chaired by the Consent Holder, and minutes must be kept and circulated. v. Minutes must include a log of any concerns or suggestions made by the community, and document any agreed actions including timeframes.	
Review			
~~39~~ 41	In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June each year, for any of the following purposes: (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; or (b) setting of specific groundwater quality standards if testing indicates that it is reasonably required to avoid adverse effects on surface water.	In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June each year, for any of the following purposes: (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; or (b) setting of specific groundwater quality standards if testing indicates that it is reasonably required to avoid adverse effects on surface water.	

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Appendix 1 of consents 5838-3.0 and 5839-3.0:

Figure 1: Identification of operational components

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Appendix 2 – NZS 4454:2005

New Zealand Standard

Composts, Soil Conditioners and Mulches

COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the P 4454 Technical Committee for the Standards Council established under the Standards Act 1988. The committee consisted of representatives of the following nominating organisations:

Committee Member	Nominating Organisation
Neil Barton	Federated Farmers of New Zealand
Andy Black	Bio Dynamic Farming and Gardening Association
George Fietje	Living Earth
Brian Gallagher	Timaru District Council
Dave Hanan	Delta Utilities Ltd. for South Island Organic Recycling Training Group
Jonathon Hannon	Massey University (Observer)
Chris Keenan	Ministry for the Environment (Ex-officio)
Margaret Leonard	Institute of Environmental and Scientific Research Ltd. on behalf of the Ministry of Health
Mike Lord	Perry Environmental Ltd.
Ian Mason	University of Canterbury
Patricia Naidu	New Zealand Earthworm Association
Miljenko Pavlinic	HG Leach & Co. Ltd.
Cherryle Prew	Soil Foodweb Institute
Craig Ross	Landcare Research
Bruce Smith	Yates New Zealand Ltd.
Michael Spiers	HortResearch

ACKNOWLEDGEMENT

Standards New Zealand gratefully acknowledges the financial support of the Waste Management Institute of New Zealand and the contribution of time and expertise from all those involved in developing this Standard.

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Website: www.standards.co.nz

AMENDMENTS

No.	*Date of issue*	*Description*	*Entered by, and date*

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NZS 4454:2005

New Zealand Standard

COMPOSTS, SOIL CONDITIONERS AND MULCHES

ISBN 1-86975-034-9

NOTES

CONTENTS

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Table

REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 8410:2003	Organic production
NZS ISO/IEC 17025:2005	General requirements for the competence of testing and calibration laboratories

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 9001:2000	Quality management systems – Requirements
AS/NZS ISO 9004:2000	Quality management systems – Guidelines for performance improvements
SAA/SNZ HB 18----------	Guidelines for third-party certification and accreditation
Part 2:2003	Standardization and related activities – General vocabulary
Part 22:2003	General criteria for supplier's declaration of conformity
Part 28:1991	Guide 28 General rules for a model third-party certification system for products

AUSTRALIAN STANDARDS

AS 1199:- - - -	Sampling procedures and tables for inspection by attributes
Part 0:2003	Introduction to the ISO 2859 attribute sampling system
Part 1:2003	Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
AS 4454:2003	Composts, soil conditioners and mulches

OTHER DOCUMENTS

NZWWA	Guidelines for the safe application of biosolids to land in New Zealand (New Zealand Water and Wastes Association), 2003
NZEA	Best practice guidelines and standards (NZ Earthworm Association), 2002
SWAP	Solid waste analysis protocol (Ministry for the Environment), 2002

NEW ZEALAND LEGISLATION

Consumer Guarantees Act 1993

Hazardous Substances and New Organisms Act 1996

Health Act 1956

Health and Safety in Employment Act 1992

Resource Management Act 1991

Weights and Measures Act 1987

LATEST REVISIONS

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards and referenced overseas Standards are the latest revisions or include the latest amendments. Such amendments are listed in the annual *Standards New Zealand Catalogue* which is supplemented by lists contained in the monthly magazine *Standards Update*, issued free of charge to committee and subscribing members of Standards New Zealand.

REVIEW OF STANDARDS

Suggestions for improvement of this Standard are welcome. They should be sent to the Chief Executive, Standards New Zealand, Private Bay 2439, Wellington.

LEGAL STATEMENT

While this Standard is voluntary, the Consumer Guarantees Act 1993 provides protection for consumers. Manufacturers using this Standard may still be liable for any breaches of the Consumer Guarantees Act 1993. The Ministry for the Environment is evaluating options for a quality assurance programme to complement the Standard.

FOREWORD

This Standard is voluntary and was developed by the New Zealand technical group of stakeholders for composts, soil conditioners and mulches. It is based on the equivalent Australian Standard, AS 4454:2003 *Composts, soil conditioners and mulches*, with modifications to suit New Zealand requirements.

This Standard is aligned with the New Zealand Waste Strategy, 2002 and related guidelines, issued by the Ministry for the Environment. New Zealand's solid waste stream consists of approximately 50 % recyclable organic material. There is potential to reduce the burden on landfills by using this organic material beneficially, such as by processing into compost. The use of composts, soil conditioners and mulches helps improve soil properties.

It is important to ensure that the products produced under this Standard do not present a hazard to the environment nor to public health. The Standard prescribes compositional requirements, compliance requirements, sampling and testing methods for composts, soil conditioners and mulches. The health warning labelling requirements have been adopted from current labelling for the potting industry.

During the development of the Standard there were some matters identified that require further consideration during future reviews, with possible inclusion in updated versions. At present the microbiological quality of pathogens in compost is to be determined using an indicator bacteria, *E. coli*, as used for the Guidelines for the Safe Application of Biosolids to Land in New Zealand (hereafter referred to as the Biosolids Guidelines). How this organism relates to the removal of specific pathogens, such as *Campylobacter, Giardia, Cryptosporidium* and *Legionella* in the composting process is unclear at this time and future work is required to confirm that the best indicator is being used to protect public health. The results of this work may require a different microbiological testing regime. In addition, if there was a particular health issue, which could be related to compost, a Medical Officer of Health may require additional microbiological monitoring.

Similarly, testing for microbiological organisms, including bacteria and fungi will be subject to further investigation along with the effects of salt balance of products on plant growth.

Approval under section 54 of the Health Act 1956 relating to offensive trades must be obtained for composting animal mortalities and parts of animals (see defintion of animal waste). Such activity also needs to comply with the Resource Management Act 1991 and its amendments.

At present this Standard does not place limits on aceptable levels of amine herbicides in compost. The Ministry for the Environment is undertaking work to determine appropriate concentration thresholds (for compost products) to safeguard against the potential adverse effects on plants vulnerable to these herbicides, in particular, clopyralid. This matter is likely to be included in the first review of this Standard.

Several changes have been made to this Standard. A plant growth test (Appendix N) has been introduced in place of the toxicity test to assess the biological performance of composts. It is expected that the toxicity test (Appendix D) for pasteurised soil conditioners, etc. will be upgraded in future by including a sand control, or changing to a plant growth test with an index of >1 (less stringent than the stipulated index of >2 for composted products). More definitions have been included. Many test methods and the best practice guidelines have been modified. Guidance notes have been provided on the microbiological profiles that will be valuable for users of this Standard. Limits for chemical contaminants and organochlorines have been included in alignment with the Biosolids Guidelines. ➤

Flexibility has been retained in permitting the use of IANZ- accredited methodology by accredited laboratories for the determination of heavy metals and organic contaminants.

It is recommended that the Standard is revised every five years and also in 2012, in line with the changes to the metal and organic contaminant limits given for biosolids in the Biosolids Guidelines, which are to occur at this time.

NEW ZEALAND STANDARD

COMPOSTS, SOIL CONDITIONERS AND MULCHES

1 SCOPE AND GENERAL

1.1 Scope

1.1.1 Organic products

This Standard applies to organic products and mixtures of organic products that are to be used to amend the physical, biological and chemical properties of natural or artificial soils and growing media. It specifies physical, chemical, biological and labelling requirements for composts, mulches, soil conditioners and related products that have been derived largely from compostable organic materials and which meet the minimum requirements as set out in this Standard. It covers materials marketed or distributed both in bags and in bulk.

1.1.2 Inclusions

This Standard applies to organic products and mixtures of organic products that have been treated by pasteurising or composting procedures as defined by this Standard.

1.1.3 Exclusions

1.1.3.1

This Standard does not apply to home composting end products for self-use, nor does it apply to organic fertilisers such as blood and bone. Also excluded are liquid organic wastes, liquid seaweed products, non-organic mulches (e.g. gravel), non-organic soils and soil conditioners (e.g. gypsum and sand), non-compostable organic materials (e.g. plastics) and various materials described as ‘compost starters’ and ‘activators’.

1.1.3.2

Organic wastes that have not been subjected to either a pasteurisation or composting procedure are specifically excluded from this Standard, mainly because they have a high probability of containing plant propagules and pathogens.

1.1.3.3

Vermicasts that have not been subject to pasteurisation or composting before or after being worked by worms may conform with this Standard if they pass the provisions of Appendices L and M, along with all the other criteria in table 3.1.

1.1.3.4

Feedstocks containing animal mortalities, which are due to notifiable infectious diseases under either the Health Act or MAF 153 Series of Standards issued by the Biosecurity Authority of the Ministry of Agriculture and Forestry Response Programme for Exotic Diseases of Animals (and its amendments), are excluded from this Standard. Disposal of

such animals shall be done under the guidance of the Ministry of Agriculture and Forestry or the Ministry of Health, as appropriate.

1.1.3.5

This Standard does not apply to composts that include feedstocks classed as hazardous wastes. For the purpose of this Standard, a hazardous waste is defined as "a mixture that exceeds any thresholds defined in the Hazardous Substances and New Organisms Act 1996".

NOTE –

(1) Adherence to the criteria given in Appendices K and L describing the 'best practice' guidelines should lead to the production of quality compost or vermicast that will not spread plant propagules or pathogens. Appendix M gives guidance on the determination of compliance with this Standard.

(2) See 2.3.3.

1.2 Application

This Standard is intended for use by producers, distributors and users, of composts, mulches, vermicast and soil conditioners.

1.3 Objective

The objective of this Standard is to provide producers, distributors and users, with an assurance of quality as specified in this Standard.

1.4 Definitions

For the purposes of this Standard, the following definitions shall apply:

AEROBIC CONDITIONS. Process conditions in which the air present contains adequate oxygen to support aerobic biological decomposition.

AGRICULTURAL, FORESTRY, VITICULTURE AND HORTICULTURAL ORGANICS. Any residual organic materials produced as a by-product of operations from the respective industries. Such materials may be derived from a range of sources and may or may not contain residues from chemical applications. This may include but may not be necessarily limited to bark, wood and non-woody fractions for weeds, crop residuals, processing residuals and prunings.

ANAEROBIC CONDITIONS. Process conditions in which the air or gas mixture present does not contain oxygen (New Zealand Earthworm Association (NZEA)).

ANIMAL AND BIRD MANURE. Faeces and urine of animals and birds.

ANIMAL WASTE. Animal manure, mortalities, plus wash-water, bedding, hair, spilled feed and/or soil.

BIOSOLIDS. A sewage or sewage sludge derived from a sewage treatment plant that has been treated and/or stabilised to the extent that it is able to be safely and beneficially applied to land and does not include products derived from industrial wastewater treatment plants (the Biosolids Guidelines or any future regulatory Standards apply).

BUND. A containment wall or levee to prevent the loss of liquids from a specific area (NZEA).

CAPSULE. The oval shaped case containing worm eggs (NZEA).

CASTINGS. The excreta of worms (NZEA).

COARSE MULCH. Any pasteurised or composted organic product (excluding polymers which do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces. Coarse mulch has less than 20 % by mass of material that has passed through a 20 mm sieve and complies with the appropriate criteria in table 3.1.

COMPOST. Organic matter that has undergone controlled aerobic composting to achieve pasteurisation, stability and maturity. Compost has at least 95 % by mass of material that has passed a 20 mm sieve and complies with the appropriate criteria in table 3.1.

NOTE – Optimum process conditions will need to be followed if compost that conforms with this Standard is to be produced (see Appendix K).

COMPOSTING PROCESS. A methodology whereby organic materials are microbiologically transformed under thermophilic aerobic conditions to achieve time-temperature requirements for pasteurisation, stability and maturity to achieve the parameters in table 3.1.

FOOD OR KITCHEN ORGANICS. Food or kitchen organics are described as putrescibles (excluding garden waste) in the Ministry for the Environment Solid Waste Analysis Protocol (SWAP).

Such materials may be derived from commercial or domestic sources and may include: fruit and vegetables, meat and poultry, fats and oils, seafood including shellfish, dairy products, breads and flour, food soiled paper products, (e.g. hand towels, serviettes, pizza boxes etc, biodegradable bags, cutlery, plates etc.).

GARDEN ORGANICS or GREEN WASTE. Garden organics or green waste are described as putrescibles (garden waste) in the SWAP. Such materials may be derived from commercial or domestic sources and may include: grass clippings, woody and non-woody materials, tree and shrub prunings, branches, limbs, stumps and root balls.

MATURATION. The final stage of composting where temperatures remain steady below 45 °C, and the compost becomes safe to use with plants.

MULCH. Any pasteurised or composted organic product (excluding polymers that do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces. Mulch has at least 20 % by mass of material that has passed through a 20 mm sieve and complies with the appropriate criteria in table 3.1.

MUSHROOM SUBSTRATE (COMPOST). The residue from beds of composted organic materials that have supported a crop of mushrooms. The term ‘spent mushroom compost’ can also be used. Neither term can be used to describe materials that have not supported mushrooms.

NOTE – For the confirmation method, see Appendix H.

ORGANIC MATTER. Chemical substances of animal or vegetable origin consisting of hydrocarbons and their derivatives (ROU*).

ORGANIC PRODUCT. A product that has been produced, handled and/or processed, in compliance with NZS 8410.

PASTEURISATION. A process whereby organic materials are treated to significantly reduce the numbers of plant and animal pathogens and plant propagules.

PASTEURISED PRODUCT. An organic product that has undergone controlled aerobic and thermophilic biological transformation to achieve pasteurisation, but is relatively immature and lacking in stability compared to compost.

PLANT PROPAGULE. Plant or part of a plant that could generate a new plant, e.g. a seed, part of a rhizome, corm, bulb, etc.

PRIMARY PACKAGE. Any form of packaging material, i.e. any packet, envelope, box, bag or similar (enclosure) which is in intimate contact with the product and which is not intended to serve solely as a transport package. Also known as 'immediate package'.

SAWDUST, TIMBER AND WOOD PRODUCTS. Sawdust, wood and timber products are defined by the sub-categories from the SWAP which includes; lengths and pieces, pallets and crates, fabricated, sheets, sawdust, shavings and general debris. Such materials may be derived from a range of sources and may be treated or untreated or contaminated by paint, laminates and fasteners.

SOIL CONDITIONER. Any composted or pasteurised organic product, including vermicast, manure and mushroom substrate, that is suitable for adding to soils. This term also includes 'soil amendment', 'soil additive', 'soil improver' and similar terms, but excludes polymers which do not biodegrade, such as plastics, rubber and coatings. Soil conditioners may be either 'composted soil conditioners' or 'pasteurised soil conditioners'. Soil conditioner has at least 95 % by mass of material that has passed through a 20 mm sieve and complies with the appropriate criteria in table 3.1.

VERMICAST. Solid organic product resulting from the transformation of compostable organic materials in a controlled vermiculture process, which complies with the appropriate criteria of table 3.1, ≥90 % passing the 1.18 mm sieve.

NOTE – Best practice guidelines for vermiculture systems are provided in Appendix L.

VERMICOMPOST. Mixture of vermicast and partially unprocessed organic matter (NZEA).

VERMICULTURE. The use of compost worms to process and stabilise organic residues.

1.5 Notation

The following unit is used in this Standard as the unit for conductivity:
dS/m decisiemens per metre (1 dS/m = 1 mS/cm)

1.6 Interpretation

1.6.1 The word "shall" identifies a mandatory requirement for compliance with the Standard. The word "should" refers to practices which are advised or recommended.

1.6.2 The terms "Normative" and "Informative" have been used in this Standard to define the application of the Appendix to which they apply. A "Normative" Appendix is an integral part of a Standard, whereas an "Informative" Appendix is only for information and guidance. Informative provisions do not form part of the mandatory requirements of the Standard.

1.6.3 Notes to tables form part of the requirements of this Standard whereas notes appearing elsewhere are for information and guidance only.

REFERENCE

* Recycled Organic Unit (ROU) (2002). "Recycled organics dictionary and thesaurus", (2nd edition). University of New South Wales, Australia.

2 GENERAL REQUIREMENTS

2.1 Containment of pathogens and propagules

2.1.1 Compliance with public health requirements

All products shall comply with the current Biosolids Guidelines or equivalent Standard or guideline (Grade Aa. interim values or equivalent) with regard to contaminants and microbiological indicator concentrations for *E. coli* or faecal coliforms) when sampled and tested according to the Biosolids Guideline or current equivalent standard or guideline. The exceptions are chlordane and PCBs which have been amended to reflect levels found in green waste.

NOTE – Products that are not for retail sale, may be labelled as meeting the requirements of this Standard, if they also meet the requirements of legislation such as the Health Act, the Resource Management Act and the Health and Safety in Employment Act. Producers and users should consult the relevant ministries/departments for guidance on these matters.

2.1.2 Plant propagules (weeds)

Products shall be free of plant propagules when tested in accordance with Appendix J.

NOTE – Producers are advised that the most effective way of ensuring minimal contamination of their products with plant propagules is by adherence to the best practice guidelines given in Appendices K and L.

2.2 Product classification

2.2.1 Major classification

Products shall be classified as one or more of the following:

(a) Compost;

(b) Soil conditioner;

(c) Mulch;

(d) Coarse mulch;

(e) Vermicast;

(f) Vermicompost.

2.2.2 Requirements for major and minor classifications

A product classified or described with the following terms shall comply with the relevant requirement as follows:

(a) Product described as ‘mushroom substrate’, ‘mushroom compost’ or similar shall comply with the test method in Appendix H;

(b) Product described as ‘pasteurised’ shall have undergone the pasteurisation requirements as described in 2.3.1;

(c) Product described as a ‘compost’ or ‘composted’ shall have undergone the composting requirements as described in 2.3.2;

(d) Product described as ‘vermicast’ shall have undergone controlled vermiculture and shall comply with the requirements for vermicast in 2.3.3 and be tested in accordance with Appendix Q.

2.3 Process criteria

2.3.1 Pasteurisation

Any product supplied or described as 'pasteurised' shall have had the whole of its mass subjected to either of the following:

(a) During the composting process (see Notes 3 and 4), the temperature of all the compost is maintained as follows:

(i) In-vessel: T≥ 55 °C for ≥ 3 days;

(ii) Windrow: T≥ 55 °C for ≥ 15 days with a minimum of five turnings during this period for specified products (see Note 4 and limits for pathogens in table 3.1). Time/temperature profiles shall be monitored and documented during the verification period for specified products (see table 3.1 and 2.6.3.2); and

(iii) Garden organics or green wastes: T≥ 55 °C for ≥ 3 days with a minimum of three turnings;

(b) An alternate process that can be verified and maintained as achieving the pathogen reduction levels in table 3.1 (also see Note 4).

NOTE –

Pasteurisation

(1) Organic materials and vermicast that have processed for 3 days in a suitable vessel (see Appendix K) or which have been processed for 2 – 3 weeks in turned windrows are likely to meet pasteurisation criteria.

(2) See also 2.3.3.

(3) All compost requires 30 days maturation pre-use.

(4) The maximum dimension for composting animal mortalities or animal parts is 40 cm, and it must be demonstrated that all parts of the compost have reached 55 °C. Animals and animal parts (including catering and kitchen waste) must be less than 40 cm. An alternate process that can be verified and maintained as achieving the pathogen reduction levels using time-temperature process requirements and approved under section 54 of the Health Act relating to offensive trades, would be acceptable.

2.3.2 Composting

The composting process should be based on best practice guidelines given in Appendix K. The process must comply with 2.3.1 as well as include periods of composting and curing such that the product can meet the stabilisation requirements of the Biosolids Guidelines and shall be non-phytotoxic. Documentation shall be provided to demonstrate that the product has undergone the process prescribed.

NOTE – Appendix K gives guidelines on alternative but equivalent processes as permitted in 2.3.1(b) or that will produce a product with minimum pathogen and plant propagule content.

2.3.3 Vermicast

The vermi-composting process should be based on the best practice guidelines issued by the New Zealand Earthworm Association such that the product produced by this process meets the pathogen and plant propagule requirements of this Standard (see 2.1.1, 2.1.2 and table 3.1). It shall meet the contamination requirements for pasteurised product and vermicast in table 3.1 when tested in accordance with Appendix J.

2.4 Sampling of material

For all product testing it is important that a representative sample is obtained. It is important to maintain the integrity of these samples prior to testing. Table 2.1 details each of the required tests, the size of sample to be tested, suitable sample containers and the time frame for completion of the tests.

Table 2.1 – Sample size, container type and testing time frames

Reference to test method table 3.1	Sample size	Sample container	Time frame within which testing should occur after receipt of sample at the laboratory
A and B	2 L for mulch 1 L for fine mulch/compost	Plastic bag	Within 48 hours
C	100 mL	Plastic bag	Within 7 days
D	500 ml	Plastic bag	Within 7 days
E	500 mL for compost and soil conditioners 1 L for coarse mulch 500 mL for vermicast	Plastic bag	Within 7 days
F	1 L	Plastic bag	Within 24 hours
H	1 L or 1 kg	Plastic bag	Within 7 days
J	10 L	Plastic bag	N/A
N	5 L	Plastic bag	Within 7 days
P	500 mL for compost 3 L for mulch	Plastic bag	N/A
Q	1 L	Plastic bag	Within 7 days
Organic contaminants	250 mL	Sterile glass jar	Within 24 hours
Heavy metals	250 mL	Plastic bag	Within 7 days
Testing of limits for pathogens *E. coli* or faecal coliforms (grab sample)	500 g	Sterilised glass container and tools	It is recommended that samples are received at the laboratory for analysis within 6 hours of sampling. Delivery to the laboratory shall not exceed 24 hours after sampling. Samples shall be kept at 4 °C in transit and analysed immediately upon receipt.

2.4.1 Composite sampling

Except for microbiological samples, all samples are composed of subsamples of 50 g each (composite sample). This is achieved by taking at least ten samples throughout the pile (at varying depths and heights) and combining to form the representative sample. ➤

Generally a sample of 5 L is required for a full range of tests.

Time frames denoted N/A can be undertaken easily by manufacturers themselves and therefore laboratory time is not applicable.

2.5 Microbiological sampling

Grab samples should be used for microbiological sampling and determinants that deteriorate or change quickly. This method of sampling is suitable for pathogen testing as outlined in 2.6.3. The following must be taken into account:

(a) Containers and sampling tools shall be sterilised;

(b) Lids should have seals, and the seal should be broken just before taking the sample;

(c) The use-by date of the container, if applicable, should be adhered to;

(d) The neck of the container or inside the lid should not be touched. The lid must not be placed on any surface that is likely to be contaminated with the sample;

(e) During transportation, the microbiological samples should be kept separately from other samples and stored in ice. Samples must not be exposed to direct sunlight and must reach the laboratory within 6 hours of collection (modified from the Biosolids Guidelines).

2.6 Product testing

Product testing for pathogens, heavy metals and organic contaminants shall be carried out according to accredited test methodology in laboratories accredited to NZS ISO/IEC 17025 and/or recognised by IANZ (International Accreditation New Zealand, formerly TELARC). Other tests shall be carried out according to the test methodology prescribed in this Standard or according to alternate accredited test methodology in accredited laboratories.

2.6.1 Storage before testing

2.6.1.1 The product shall be tested as soon as possible after receipt at a laboratory and within the appropriate time frame recommended in table 2.1. If it must be stored after receipt, a sub-sample shall be taken for as-received moisture determination. If the sample is dry, water shall be added to bring it into a consistency for testing, and this added water shall be recorded. The samples shall be stored in a large container, which shall be loosely sealed (e.g. with plastic film) to minimise water loss but to allow oxygen entry, at 18 – 25 °C.

2.6.1.2 This information shall be recorded in the test report.

2.6.2 Physical and chemical testing

Ordinarily products shall be tested within 7 days prior to distribution and shall comply with the physical and chemical requirements for the classification as set out in table 3.1.

NOTE –

(1) If instructions are given on the primary package or information sheet to mix the product with other materials, it is advisable to produce the product with levels that are more stringent than either the minimum or maximum requirement, depending on the particular characteristic listed in table 3.1.

(2) Suppliers and their customers are advised to agree on an acceptable maximum level of visual contamination of lightweight plastics.

2.6.2.1 Verification testing

For verification of metals, a weekly sample shall be composited over a three-month period.

2.6.2.2 Routine testing

Routine monitoring for metals shall be carried out annually on an annual sample composited from samples taken every two months.

2.6.3 Pathogen testing

Pathogen testing shall apply to high risk sources such as animal manures, parts of animals or animal mortalities, kitchen/food residuals, meat processing residuals and fish/shellfish (see table 3.1). See 2.6.3.1.1 and 2.6.3.1.2 for verification and routine testing frequencies.

2.6.3.1 Testing frequency

Manufacturers shall establish a testing programme at a frequency suited to the scale of manufacture, local conditions and the operating environment to ensure that the quality of products are consistently in compliance with this Standard.

2.6.3.1.1 Verification testing

For pathogen testing, verification is required to ensure that the temperature-time control is adequate. This requires 15 grab samples to be taken over a month (individual samples shall be sent to the laboratory immediately). There shall be 15 consecutive results that meet the value given in table 3.1.

2.6.3.1.2 Routine testing

After verification, routine testing shall be carried out weekly on grab samples, or more frequently under the manufacturer's testing programme as described in 2.6.3.1. If there are any changes to the process or any failures to meet the stipulated value, the verification process must be repeated.

2.6.3.2 Time and temperature

Time and temperature shall be recorded daily to demonstrate that 55 °C is achieved for the whole pile for three days.

2.6.3.3 Failures

If the criteria specified in table 3.1 for microbiological indicators are not met, the product must be reprocessed.

2.7 Product analysis

The following guidance is provided:

(a) Check that the type of product falls within the scope of this Standard (see 1.1);

(b) Determine whether it is a pasteurised product, a composted product or unpasteurised vermicast (see definitions in 1.4, and process criteria in 2.3);

(c) If the product is a composted product, determine whether it meets the minimum criteria for effective composting (see 1.4, 2.3 and Appendix K). If the product is unpasteurised vermicast and is tested according to Appendix Q, check if it satisfies the contamination requirements of table 3.1;

(d) Check if the product to be sold as a compost, soil conditioner, a fine mulch, a mulch, vermicast, manure or mushroom substrate;

(e) Where claims are made to enhance plant nutrition in any manner, these claims shall ➤

be verified by testing for the nutrients claimed to be enhanced. Claims relating to N, P, K, and S shall be tested as given in 3.3 and table 3.1, and additional tests carried out as appropriate;

(f) If the product is specified or recommended for use with phosphorus-sensitive plants, both water-soluble and total phosphorus concentrations shall be determined;

(g) If there is no gypsum, seaweed or seagrass or coal fly ash (see Note 2 to table 3.1) in the product, the boron content is unlikely to be above 100 mg/kg. After an initial check, repeated analysis for boron will not be necessary;

(h) The biology of compost is vitally important for the release of the nutrients contained within the compost. Development of a methodology to determine how to measure this is subject to further work.

NOTE – When reporting on the results of tests for chemical and physical characteristics specified in this Standard, laboratories should state this on the test report as follows: 'Test results apply to the sample(s) submitted for analysis and do not necessarily imply that the product meets all the requirements of this Standard.'

3 PACKAGING, MARKING AND DOCUMENTATION

3.1 Packages and bulk products

3.1.1 Health warning – packaged materials

3.1.1.1 Bags

CAUTION

Ordinary garden soil and products like compost and potting mix may contain a variety of living micro-organisms, some of which, on rare occasions can cause illness in humans.

Serious infection is rare. However, for older people or those with reduced immunity, infection can be life threatening. We recommend the following precautions:

- AVOID OPENING BAGS IN ENCLOSED AREAS
- AVOID INHALING THE MIX
- ALWAYS WEAR GLOVES AND WASH HANDS AFTER USE

See your doctor if you develop high fever, chill, breathlessness or cough.

3.1.1.2 Bulk

CAUTION

Ordinary garden soil and products like compost and potting mix may contain a variety of living micro-organisms, some of which, on rare occasions can cause illness in humans.

Serious infection is rare. However, for older people or those with reduced immunity, infection can be life threatening. We recommend the following precautions:

- AVOID OPENING BAGS IN ENCLOSED AREAS
- AVOID INHALING THE MIX
- ALWAYS WEAR GLOVES AND WASH HANDS AFTER USE
- WHILE WORKING AROUND BULK STOCKPILES WEAR A MASK TO PREVENT INHALING THE WATER VAPOUR

See your doctor if you develop high fever, chill, breathlessness or cough.

3.1.2 Health warning – bulk materials

The following words shall be conspicuously displayed on free-standing signs placed near bulk outlets (see 3.2.2(e)):

While working around bulk stockpiles wear a mask to prevent inhaling the steam or vapour.

3.1.3 Volume – packaged materials

3.1.3.1 All products shall be packaged in multiples of a litre, and the volume shall be measured in accordance with the method in Appendix G.

3.1.3.2 When measured in accordance with this method, the actual volume of packaged product shall be not less than the volume stated on the primary package at the time of packaging.

3.1.4 Volume – bulk materials

3.1.4.1 Details on the determination of volume in bulk product are subject to agreement between the supplier and the purchaser, e.g. loose or settled volume, or weight at a specified moisture content.

3.1.4.2 A method that might allow the use of a small sample (say 10 L) and the mass of a load of product as a quantitative basis for checking loads is under investigation and will be considered for inclusion in a later edition of this Standard.

NOTE – Parties need to be aware that settling will occur during transport.

3.1.5 Protection

Both packaged and bulk product should be protected so that, under normal conditions of handling, storage and transport, the contents do not become contaminated by extraneous matter (e.g. plant propagules, pathogens and pests (such as *Phylloxera*)), and the contents of packages are not released unintentionally. Packaging shall contain perforations to allow for pressure equalisation, and ease and safety of handling.

3.2 Required marking or documentation

3.2.1 The primary package or information sheet shall be permanently and legibly marked with the information listed below.

NOTE –

(1) The term 'information sheet' when referred to in this Standard can be an invoice or other document which provides the information. The information should be located where the consumer is most likely to read it.

(2) Additional requirements for conditional marking are set out in 3.3.

3.2.2 On packages, the marking shall be made with letters no less than 9 point in size and in a prominent position. This information shall accompany the product in order to verify compliance with this Standard and include the following:

(a) Name, or registered trademark and full street address of the manufacturer, packer or distributor;

(b) Net volume of contents, in litres (to the nearest litre), printed in letters a minimum of 18 point in size. The only statement of volume shall be the volume determined according to method specified in Appendix G.

NOTE – Packages should not be marked with codes such as 'No. 1 pack', or similar, as a substitute for stating the actual number of litres of contents in the package. Mass of contents should not be marked as a substitute for stating the actual volume in litres, although the mass may be provided in addition to volume, when tested according to Appendix G.

(c) The classification of the product, complying with 2.2.1 and as defined in 1.4, as well as its grade based on the maximum particle size given under physical requirements in table 3.1;

(d) A statement as to whether the product is not suitable for phosphorus-sensitive plants (see also 3.3(c)). For example:

(i) 'This product is not suitable for use with phosphorus-sensitive plants', or

(ii) 'The phosphorus content of this product is such that it is not suitable for application to phosphorus-sensitive plants'.

NOTE –

(1) See table 3.1 (chemical requirements) for differentiation between the two categories.

(2) Products that are not specified as being suitable for phosphorus-sensitive plants do not need to carry information about total or extractable phosphorus content, unless this is required by government regulations. However, producers of compost or soil conditioners are encouraged to quote a range into which the total phosphorus content falls (e.g. 0.5 – 1 %).

(3) The term 'information sheet' when referred to in this Standard can be an invoice or other document which provides the information. The information should be located where the consumer is most likely to read it.

(4) Additional requirements for conditional marking.

(e) A health warning label (see 3.1.1) and information providing instructions for the safe handling of products on the package for bagged product or the information sheet/ invoice/signage in the case of bulk product (see 3.1.2), marked permanently and legibly as follows:

(i) *Appearance*. The warning specified in item (e) shall be printed in a bold type (minimum size of 12 point) with a border in bold and shall appear in accordance with items (A), (B) or (C) as appropriate:

(A) On 25 L or larger packages, in 16 point arial bold or another similar distinctive font;

(B) On packages of less than 25 L, in 12 point arial bold or another similar distinctive font;

(C) On the information sheet/invoice, in 10 point arial bold or another similar distinctive font.

NOTE –

(1) Each point should be separated by a space, dot or other indication that a new point is being made.

(2) As well as the requirements in this clause, attention is drawn to relevant government regulations which may require either additional or different marking or documentation.

(ii) *Health warning information label.* A warning shall be printed on the reverse side or back of the package for bagged product or for bulk product, after the health warning in 3.2.2(e) on the information sheet/invoice. The actual words on the label are optional, but the example gives guidance on the type and extent of information to include on the label. The title "HEALTH WARNING" shall be printed in a font size no less than twice the size of the general text.

3.2.3 The primary package or information sheet shall also carry the following information:

(a) A statement about the organic components from which the product has been produced and a caution when packaged about settling of the product during transport;

(b) A list of ingredients as follows but not limited to:

(i) Animal manure/waste e.g. poultry manure or other animal waste as defined in 1.4

(ii) Animal mortalities

(iii) Biosolids (as defined in the Biosolids Guidelines)

(iv) Crop residues (includes straw, hay)

(v) Food processing residuals (non-meat)

(vi) Garden trimmings

(vii) Kitchen/food residuals (domestic or commercial; may contain meat)

(viii) Meat processing residuals (e.g. freezing works wastewater treatment sludges; paunch; abattoir waste; poultry waste)

(ix) Paper waste

(x) Wood residuals (includes sawdust, bark woodchips)

(xi) Other specific additives.

NOTE – Manufacturers may be more specific if desired, e.g. a compost may contain grape marc or brewery solids, the presence of which the producer may wish to highlight, rather than simply including under the broad classification 'Food processing residuals (non meat)'.

(c) Instructions on the most appropriate method of application of the product, such as digging into soil or application to its surface (see also table 3.2);

(d) A statement that the pH of the product falls within the range 5.0 to 8.5 (see 3.3(a), when information about pH is required to be provided);

(e) Documentation that demonstrates the product has undergone one of the processes listed in 2.3.1 and 2.3.2.

NOTE – Manufacturers making a statement of compliance on a product, packaging, or promotional material related to a product are advised to ensure that such statements are capable of being verified.

3.3 Required marking – conditional upon product claims or test results

The primary package or information sheet shall be permanently and legibly marked in a prominent position and in letters no less than 10 point in size, with the following information, depending on the conditional statement for that particular component set out as follows:

(a) The pH, if pH is less than 5.0 or is greater than 8.5;

(b) Instructions on the rate of application, based on the salinity of the product (see table 3.2 for information);

(c) The total phosphorus level and information about soluble phosphorus, if a claim is made that the product is not suitable for phosphorus-sensitive plants;

NOTE – An application of a product in the upper concentration should not cause problems if it is applied to established plants at a rate of 50 L/m^2.

(d) The soluble nitrogen level (nitrate and ammonium) if a contribution to plant nutrition is claimed;

(e) The total nitrogen content, if a contribution to plant nutrition is claimed;

(f) The phosphorus, potassium and sulphur contents, in nutritionally available form, if a contribution to plant nutrition is claimed;

(g) Instructions on the restricted rate of application of product to 50 L/m^2 or to 20 % by volume of a potting mix if the total boron level is in the range of 100 – 200 mg/kg. If boron exceeds 200 mg/kg it is recommended that a hot water test is carried out for determining the boron content;

(h) A statement of the appropriate amount of gypsum to apply with the product to balance the sodium content, depending on the sodium content of the product and the requirement prescribed in table 3.1;

(i) Instructions to use compost at a low rate, if the toxicity index is less than prescribed in table 3.1.

Table 3.1 – Physical, chemical and biological requirements for composts, mulches and soil conditioners

Characteristic and unit of measurement	Requirements				Test method Appendix	Conditional marking clause
	Composted product		Pasteurised product and vermicast			
	Compost, soil conditioners and mulch	Coarse mulch	Soil conditioners, mulch and vermicast/ vermicompost	Coarse mulch		
PHYSICAL REQUIREMENTS						
Particle size grading using a 20 mm sieve (1.18 mm sieve for vermicast/ vermicompost) (% by mass)	Compost and soil conditioner: Not more than 5 % by mass to be retained by the sieve. Mulch: Less than 80 % by mass to be retained by the sieve	Equal to or more than 80 % by mass to be retained by the sieve	Soil conditioner: Not more than 5 % by mass to be retained by the sieve. Mulch:Less than 80 % by mass to be retained by the sieve. Vermicast: Less than 10 % by mass to be retained by a 1.18 mm sieve. Vermicompost: Equal to or more than 10 % by mass to be retained by a 1.18 mm sieve.	Equal to or more than 80 % by mass to be retained by the sieve	E	—
CHEMICAL REQUIREMENTS						
pH max. pH units	5.0 to 8.5	5.0 to 8.5	5.0 to 8.5	5.0 to 8.5	A	3.3(a)
Electrical conductivity	No limit (See table 3.2)	No limit (See table 3.2)	No limit (See table 3.2)	No limit (See table 3.2)	A	3.3(b)
Phosphorus, soluble mg/L in solution (No limits unless claimed as suitable for phosphorus-sensitive plants)	≤ 5 If a contribution to plant nutrition is claimed	≤ 5 If a contribution to plant nutrition is claimed	≤ 5 If a contribution to plant nutrition is claimed	≤ 5 If a contribution to plant nutrition is claimed	A	3.3(c)
Phosphorus, total % dry mass. (No limits unless claimed as suitable for phosphorus-sensitive plants),	≤ 0.1 If a contribution to plant nutrition is claimed	≤ 0.1 If a contribution to plant nutrition is claimed	≤ 0.1 If a contribution to plant nutrition is claimed	≤ 0.1 If a contribution to plant nutrition is claimed	C	3.3(c)
Ammonium-N plus nitrate-N mg/L in extract	> 10	No requirement	> 10 If a contribution to plant nutrition is claimed	No requirement	A	3.3(d)
Nitrogen, total (Note 1) % dry matter	≥ 0.6 If a contribution to plant nutrition is claimed	≥ 0.6 If a contribution to plant nutrition is claimed	≥ 0.6 If a contribution to plant nutrition is claimed	≥ 0.6 If a contribution to plant nutrition is claimed	B	3.3(e)
Organic matter content % dry matter	≥ 25	≥ 25	≥ 25	≥ 25	B	—

Table 3.1 – Physical, chemical and biological requirements for composts, mulches and soil conditioners (continued)

Characteristic and unit of measurement	Requirements				Test method Appendix	Con-ditional marking clause
	Composted product		Pasteurised product and vermicast			
	Compost, soil conditioners and mulch	Coarse mulch	Soil conditioners, mulch and vermicast/ vermicompost	Coarse mulch		
Boron (see Note 2) mg/kg dry mass	< 200 If feedstocks are listed in Note 2, then test for boron. Products with a total B of < 200 can have unrestricted use. If the boron level exceeds 200, then actual levels shall be displayed on the bag.	< 200 If feedstocks are listed in Note 2, then test for boron. Products with a total B of < 200 can have unrestricted use. If the boron level exceeds 200, then actual levels shall be displayed on the bag.	< 200 If feedstocks are listed in Note 2, then test for boron. Products with a total B of < 200 can have unrestricted use. If the boron level exceeds 200, then actual levels shall be displayed on the bag.	< 200 If feedstocks are listed in Note 2, then test for boron. Products with a total B of < 200 can have unrestricted use. If the boron level exceeds 200, then actual levels shall be displayed on the bag.	C	3.3(g)
Chemical contaminants (heavy metals) expressed as mg/kg (See Note 5)					See 2.6 and Note 6	—
Cadmium (Cd)	3	3	3	3		
Chromium (Cr)	600	600	600	600		
Arsenic (As)	20	20	20	20		
Lead (Pb)	250	250	250	250		
Nickel (Ni)	60	60	60	60		
Mercury (Hg)	2	2	2	2		
Zinc (Zn)	600	600	600	600		
Copper (Cu)	300	300	300	300		
Organic contaminants expressed as mg/kg (see Note 3)					See 2.6 and Note 6	—
DDT/DDD/DDE	0.5	0.5	0.5	0.5		
Aldrin	0.02	0.02	0.02	0.02		
Dieldrin	0.05	0.05	0.05	0.05		
Chlordane	0.05	0.05	0.05	0.05		
Heptachlor and Heptachor expoxide	0.02	0.02	0.02	0.02		
Hexachlorobenzene (HCB)	0.02	0.02	0.02	0.02		
Hexachlorocyclo-hexane (Lindane)	0.02	0.02	0.02	0.02		

Table 3.1 – Physical, chemical and biological requirements for composts, mulches and soil conditioners (continued)

Characteristic and unit of measurement	Requirements				Test method Appendix	Conditional marking clause
	Composted product		Pasteurised product and vermicast			
	Compost, soil conditioners and mulch	Coarse mulch	Soil conditioners, mulch and vermicast/ vermicompost	Coarse mulch		
~~Benzene hexa-~~chloride (BHC)	0.02	0.02	0.02	0.02	—	—
Total PCBs	0.5	0.5	0.5	0.5		
Moisture content, %	Minimum 25	No requirement	Minimum 25	No requirement	F	—
BIOLOGICAL REQUIREMENTS						
Toxicity (mm)	Not required – refer Plant growth index	No requirement	≥ 20 for all products except those labelled as manure, mushroom substrate or vermicast, for which the EC criteria are more appropriate	No requirement	D	3.3(i)
Plant propagules	Nil after 21 days	Nil after 21 days	Nil after 21 days	Nil after 21 days	J	—
Plant Growth Index	≥ 2	No requirement	No requirement	No requirement	N	—
Biology	See Note 4	See Note 4	See Note 4	—	—	—
LIMITS FOR PATHOGENS						
These requirements are applicable only to products containing: animal manures; parts of animals or animal mortalities; kitchen/ food residuals; meat processing residuals and fish/ shellfish as ingredients.						
E.coli or Faecal coliforms	<100 MPN/g	<100 MPN/g	<100 MPN/g	<100 MPN/g	See 2.6 and Note 6	—
CONTAMINANTS						
Glass, metal and rigid plastics > 5 mm % dry matter, w/w	≤ 0.4	≤ 0.4	≤ 0.4	≤ 0.4	P	—
Stones and lumps of clay ≥ 5 mm % dry matter, w/w	≤5	≤ 15	≤5	≤ 15		
Plastics – light, flexible or film > 5 mm, % dry mass	≤ 0.04	≤ 0.04	≤ 0.04	≤ 0.04		
Suppliers and their customers are advised to agree upon an acceptable maximum level of visual contamination by lightweight plastic.						

Table 3.1 – Physical, chemical and biological requirements for composts, mulches and soil conditioners (continued)

NOTE –

(1) The provisions for a high total nitrogen content with some nitrate and soluble nitrogen are designed to ensure that products labelled with claims that they will 'feed' plants will, in fact, be capable of supplying soluble nitrogen rather than acting as a sink for it. Users and specifiers of composts should be aware that these requirements do not guarantee that a product will not cause nitrogen deficiency when dug into a soil or placed on its surface. As a general rule, a source of plant-available nitrogen (e.g. urea) should be applied along with composts of low nitrogen content, so that plants are not harmed through nitrogen deficiency.

(2) Testing for boron will generally only be necessary for products that are based on gypsum, seaweed, seagrass or unseparated municipal solid wastes that have a component of cardboard packaging or coal fly ash (see also 2.7(g)).

(3) For determination of organic contaminant levels, products should be collected in glass jars and be refrigerated to avoid inadvertent secondary contamination.

(4) The biology of compost is vitally important for the release of the nutrients contained within the compost. Development of a methodology to determine how this is to be measured is subject to further work.

(5) Compliance with the Biosolids Guidelines – "Grade a" interim values for heavy metals and organic contaminants in table 4.2 of the Biosolids Guidelines until December 2012 (see Foreword). Composts with biosolids as an ingredient shall also comply with "Grade A" of table 4.1 of the Biosolids Guidelines for pathogens.

(6) No test methods have been specified for metals, persistent organochlorine pesticides, PCBs or dioxins since there are a number of methods that can be used. It is recommended the USEPA methods are used (modified from the Biosolids Guidelines) or determined using IANZ/AOAC accredited methods. The method used shall be described in the test report.

Table 3.2 – Maximum application rate of product with different salinities for plants of different sensitivities to salinity

EC range (see Appendix A) (dS/m)	Sensitive plants ($L/m^{2)}$)	Tolerant plants ($L/m^{2)}$)
0 – 1	Unlimited	Unlimited
1 – 2	<15	<60
2 – 4	<8	<32
4 – 8	<4	<16
8 – 12	<2.5	<10
>12	<2	<8

NOTE –

(1) These rates are for mulches or for incorporation into soil to a depth of 5 cm. When incorporated into the soil to a depth of at least 10 cm these amounts can be doubled.

(2) The rate of application of product is to be stated on the primary package or information sheet (as per 3.3(b)) based on the electrical conductivity result as in the following example:

The concentration of soluble plant nutrients in this product is such that the maximum rate of application on one occasion should be no more than 4 L/m^2 for sensitive plants and no more than 16 L/m^2 for tolerant plants. Repeat applications may be made after several weeks.

APPENDIX A METHODS FOR DETERMINATION OF PH, ELECTRICAL CONDUCTIVITY, AND AMMONIUM (NH_4^+), NITRATE (NO_3^-) AND SOLUBLE PHOSPHORUS CONTENT

(Normative)

A1 SCOPE

This Appendix sets out methods for determining the pH, electrical conductivity, and nitrate, ammonium and soluble phosphorus content of products by water extraction.

NOTE – Table 3.1 specifies the compliance requirements.

A2 PRINCIPLE

A sample of the product is shaken with water and the characteristics of the extract are measured.

A3 EXTRACTANT

Distilled or deionised water.

A4 APPARATUS

The following apparatus is required:

(a) Plastic extraction vessel with close-fitting lid. The volume should be sufficient to hold the sample plus 1.5 times its volume of extractant, with sufficient airspace for easy shaking;

(b) Plastic vessel marked at the height corresponding to the chosen sample size;

(c) Mechanical end-over-end shaker, optional;

(d) Filtration equipment, including low-ash fast filter papers;

NOTE – Whatman No. 41 papers have been found to be suitable for fast filtration, and No. 42 for slow filtration.

(e) Centrifuge having a maximum speed of not less than 3000 r/min;

(f) pH meter, accurate to 0.1 pH unit;

(g) Conductivity meter, accurate to 0.05 dS/m;

(h) Means of determining the nitrate ion concentration in the extract to an accuracy of 5 mg/L N;

NOTE – Suggested instruments are an auto-analyser, ion chromatograph, other colorimetric methods or nitrate strips. Nitrate strip readers may be used provided they are correctly calibrated on each occasion of use. Nitrate ion electrodes have been found to give inaccurate results where soluble organic matter exists.

(i) Means of determining the ammonium ion concentration in the extract to an accuracy of 5 mg/L N;

NOTE – Suggested apparatus includes distillation plus titration apparatus, distillation plus a spectrophotometer and an auto-analyser. Ammonium analyser strips may be used to indicate the presence of ammonium ions but they are not acceptable for determining their concentration.

(j) Means of determining the orthophosphate-P concentration in the extract to an accuracy of 1 mg/L.

A5 PROCEDURE

The procedure shall be as follows:

(a) Take a test sample that is representative of the product and approximately 200 mL to 2 L in volume depending on the coarseness of the product;

NOTE – Do not dry the sample before analysis. Use it straight from the package or sample container. Approximate amounts could be 2 L for mulch and 1 L for fine mulch.

(b) Moisten the test sample with distilled or deionised water (see A3) until it is just feasible to manually squeeze water from it. The pressure should be that of a firm handshake and the water should just seep through the fingers as the pressure is applied;

(c) After applying the water, remix so that any salts leached from the top of the mix are again fully incorporated. If water flows from the hand during squeezing, discard the test sample and return to step (b);

NOTE – This method is not appropriate for coarse mulches. They should be moistened until all particles are just coated with water.

(d) Remove from the moistened test sample a volume sufficient to give between 50 mL and 100 mL of firmly packed material.

Place the material loosely into a plastic vessel (see A4(b)) marked at the height corresponding to the chosen sample size. Gently apply a pressure of 10 kPa (0.102 kg/cm^2) above atmospheric pressure;

NOTE – Results will be most consistent if the amount of material added to the container is close to the required volume. If after the application of the pressure, the volume is found to be considerably more than required, it is best to start again with a smaller amount of material.

(e) Place the compressed material into the extraction vessel (see A4(a)) and add a volume of deionised or distilled water (see A3) that is 1.5 times the volume of material;

(f) Seal the vessel and shake by hand to disperse the material through the water. Shake on an end-over-end mechanical shaker (see A4(c)) rotating at less than 10 r/min, for 90 min. If a mechanical shaker is not available, shake the vessel at least four times at evenly spaced intervals during the 90 min;

(g) Determine the pH of the suspension (see A4(f));

(h) If filtration gives a separation within a few minutes, filter the solution through a low-ash, fast filter. Otherwise, centrifuge the suspension at about 3000 r/min for 5 min and then filter through a low-ash fast filter;

(i) If the filtrate has no discernable turbidity, it can be used as the test solution. Cloudy filtrates should be re-filtered through slow filter paper (see A4(d)) or centrifuged;

(j) The clear filtrate or centrifugate is the test solution;

(k) Determine the electrical conductivity of the test solution to the nearest 0.05 dS/m;

(l) Determine the nitrate-nitrogen and ammonium-nitrogen concentrations of the test solution to the nearest 5 mg/L by standard laboratory procedures. Dilute the test solution if necessary to give a solution with nitrate (NO_3^-) and ammonium (NH_4^+) ion levels in the working range of the instrument. Adjust the measured nitrate and ammonium ion concentrations to compensate for any dilution made to the test solution.

Calculate the nitrogen concentration present in the test solution in milligrams per litre as nitrate and ammonium ions by multiplying by 0.226 and 0.78 respectively to convert to NO_3-N and NH_4-N equation;

NOTE – Any pink or purple colour present on the upper patch of the nitrate test strip indicates the presence of nitrite ions. Plant operators should be warned that this might indicate anaerobic conditions or immature compost.

(m) If required, determine the orthophosphate-P concentration of the test solution to the nearest 1 mg/L using an appropriate colorimetric method.

A6 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) pH to the nearest 0.1 unit;

(c) Electrical conductivity to the nearest 0.05 dS/m;

(d) Concentrations of nitrate and ammonium-N in mg/L of test solution, to the nearest 5 mg/L;

(e) Concentration of orthophosphate-P in the test solution, to the nearest 1 mg/L;

(f) Reference to this test method, i.e. Appendix A of NZS 4454.

APPENDIX B METHOD FOR DETERMINATION OF CARBON AND NITROGEN CONTENT

(Normative)

B1 SCOPE

This Appendix sets out methods for determining the organic carbon (and hence organic matter) and total nitrogen contents of a product.

NOTE – Table 3.1 specifies the compliance requirements.

B2 PRINCIPLE

A dried and ground sample of the product is analysed by means of an instrument such as a carbon/nitrogen furnace or by wet chemical methods.

B3 APPARATUS

The following apparatus is required:

(a) Means of determining carbon

NOTE –

(1) Suggested methods:

By an Induction Furnace method using an instrument, such as a LECO CNS-2000 or equivalent, or by a Wet Chemical method using oxidation and a spectrophotometer or equivalent such as that described by Rayment and Higginson [B.1]. Wet Chemical methods are not suitable for products with more than 20 % carbon.

(2) Induction Furnace methods measure total carbon (i.e. organic and inorganic carbon), including carbonates. Correction should be made for carbonate content as required. Wet Chemical methods measure organic carbon.

(b) Means of estimating organic matter

NOTE – Suggested method:

By a Loss on Ignition method such as described by Page et al [B.2], suitable for products with more than 20 % carbon (about 40 % organic matter). It is assumed that Loss on Ignition = Organic Matter.

(c) Means of determining total nitrogen

NOTE – Suggested method:

By an Induction Furnace method using an instrument such as a LECO CNS-2000 or equivalent, or by a Wet Chemical method using digestion plus distillation and titration such as the Total nitrogen-semimicro Kjeldahl, steam distillation method described by Rayment and Higginson [B.1].

B4 PROCEDURE

B4.1 Carbon/organic matter

Determine the carbon in the product sample using an appropriate method, such as Induction Furnace or Wet Chemical (see B3(a)) or estimate the organic matter using an appropriate method such as Loss on Ignition (see B3(b)).

B4.2 Total nitrogen

Determine the total nitrogen in the product sample using an appropriate method, such as Induction Furnace or Wet Chemical (see B3(c)).

B5 CALCULATION OF ORGANIC MATTER

Where carbon has been determined by Induction Furnace or Wet Chemical methods, calculate organic matter with one of the following equations:

Organic matter = 1.7 x % total C (however obtained);.....(Eq. B1)

NOTE – The relationship between carbon and organic matter varies according to organic matter type and soil type if soil is present in the product. Commonly used conversion factors range from 1.65 to 2.2.

B6 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Organic matter content;

(c) Total nitrogen content;

(d) Reference to this test method, i.e. Appendix B of NZS 4454.

REFERENCES

B[1] Rayment, G.E. and Higginson, F.R., "Australian laboratory handbook of soil and water chemical methods" (1st edition) 1992, Melbourne Inkata Press.

B[2] Page et al., "Methods of soil analysis (Part 2) Chemical and microbiological properties" (2nd edition) 1982, Published by Soil Science Society of America, Inc.

APPENDIX C METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS, BORON, CALCIUM, MAGNESIUM AND SODIUM CONTENT

(Normative)

C1 SCOPE

This Appendix sets out a method for determining the total elemental content of a product.

NOTE – Table 3.1 specifies the compliance requirements.

C2 PRINCIPLE

A sample of the product is digested in concentrated nitric acid and the diluted liquor analysed for the required elements.

C3 APPARATUS AND REAGENT

The following apparatus is required:

(a) Digestion apparatus capable of programmed heating of batches of 100 mL digestion tubes to 110 – 120 °C;

(b) Digestion tubes, made from low-boron glass;

(c) Concentrated analytical grade nitric acid;

(d) Oven for drying samples capable of maintaining a temperature of 105 °C, preferably forced-draught;

(e) Analytical balance accurate to 0.01 g;

(f) Fume cupboard;

(g) Volumetric flasks of 50 or 100 mL capacity;

(h) Filter papers and filter funnels;

NOTE – Whatman No. 54 papers have been found to be suitable.

(i) ICP, AAS or other apparatus set up to determine the required elements.

C4 PROCEDURE

The procedure shall be as follows:

(a) Dry at 105 °C and grind a representative sample of the product of not less than 100 mL volume;

(b) Weigh 1.00 g of the dried, ground sample into a 100 mL digestion tube (see C3(b));

(c) Add 10 mL nitric acid (see C3(c));

(d) Digest the sample at 110 – 120 °C until the volume is 1 to 2 mL;

(e) Transfer the digest quantitatively to a 50 or 100 mL volumetric flask (see C3(g)) and make to volume. Shake;

(f) Allow to settle overnight or for at least 2 h;

(g) Filter;

(h) Analyse the digest for all required elements using inductively coupled plasma spectroscopy, atomic absorption spectrometry or any other standard laboratory methods for elemental analysis.

C5 TEST REPORT

The test report shall contain the following:

(a) Sample identification including sufficient details to show the time period between manufacture and testing of the product;

(b) Reference to this test method, i.e. Appendix C of NZS 4454.

APPENDIX D METHOD FOR DETERMINATION OF TOXICITY TO PLANTS

(Normative)

D1 SCOPE

This Appendix sets out a method for determining whether a product is sufficiently toxic to inhibit the growth of roots.

NOTE – Table 3.1 specifies the compliance requirements.

D2 PRINCIPLE

Seeds are germinated on a sample of the product and the early growth of roots is assessed against a minimum length requirement.

D3 APPARATUS AND MATERIALS

The following are required:

(a) Radish cultivar Long Scarlet seeds, with a germination percentage of at least 80 %. The germination percentage of each batch shall be verified before it is used.

NOTE – It is preferable to purchase fresh seeds every year.

(b) Deionised or distilled water;

(c) Nursery pots or other containers at least 150 mm tall;

(d) Seed germinating cabinet or an enclosure capable of being maintained at a temperature of 25 ±2 °C and providing a 12 h day/night cycle. If an enclosure is used, a fluorescent light for illuminating the enclosure from a height of about 250 mm shall be used to provide the 12 h day/night cycle.

(e) Means of measuring in millimetres;

(f) Container greater than 300 mm tall;

(g) Sieve with apertures of 10 mm;

(h) Dalton sand as control.

D4 PROCEDURE

If the test sample is dry, it should be moistened at least eight days before testing. The procedure shall be as follows:

(a) Screen the product to remove all particles that do not pass a 10 mm sieve (see D3(g)). The <10 mm fraction is the test sample.

(b) Moisten the sample until water can just be squeezed from it. On measurement, the moisture content (water mass/wet sample mass) shall be greater than 40 % and preferably between 50 – 55 %;

(c) If the electrical conductivity (EC) is not over 2.5 dS/m, proceed to D4(d). If the EC is over 2.5 dS/m proceed to D4(e);

(d) Fill two nursery pots (see D3(c)) with the test sample to within 1 cm of the upper rim, to form replicates;

(e) Fill the soil into two containers that are at least 300 mm tall (see D3(f)) to form replicates. Apply deionised water (D3(b)) to the surface of both replicates until there is a small amount of drainage from each container (no more than about 50 mL per litre of soil).

(f) Sprinkle 10 radish seeds (see D3(a)) onto the surface of each of the replicates. Lightly press the seeds into the surface to ensure rapid uptake of water. Cover loosely with plastic sheeting and place the containers close to one another in the germination cabinet (see D3(d)) for four days, maintaining the samples at an appropriate moisture level.

(g) Remove the containers from the germination cabinet, and the seedlings from the containers. Measure the average length of the roots in millimetres, for each replicate separately.

(h) An average root length of 20 mm or greater, in both replicates, indicates that the product is not toxic to plants. However, where EC is over 2.5 dS/m, customers shall be advised of the need to apply the product in accordance with the provisions of table 3.2.

NOTE –

(1) Laboratories should ensure that adequate incubation conditions are maintained through appropriate calibration of equipment.

(2) Good contact of the seed with the test sample is vital to encourage both germination and seedling growth. This is generally achieved by pushing the seed into the surface to a depth of about 2 mm.

(3) The root length is averaged over the number of seedlings obtained, not over the number of seeds (i.e. 10) used. If fewer than 7 seeds germinate in both or either replicate, or where the difference in average root length between replicates is greater than 20 mm, the test should be repeated, after investigating seed viability, seed/sample contact and incubation conditions.

D5 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Whether the product passes or fails the tests (see D4(g) and (h));

(c) Reference to this test method, i.e. Appendix D of NZS 4454.

APPENDIX E METHOD FOR DETERMINATION OF PARTICLE SIZE GRADING

(Normative)

E1 SCOPE

The Appendix sets out a method for determining the particle size grading of a product and the classification of the product based on this.

NOTE – Table 3.1 specifies the compliance requirements.

E2 PRINCIPLE

Soil conditioners, mulches and fine mulches are assessed using a sieve with 20 mm apertures. Vermicast and vermicompost are assessed using a sieve with 1.18 mm apertures.

E3 APPARATUS

The following apparatus is required:

(a) Sieve with apertures of 20 mm;

(b) Sieve with apertures of 1.18 mm (only required for vermicast / vermicompost);

(c) Balance accurate to 0.5 g;

(d) Means of measuring in millimetres.

E4 PROCEDURE

E4.1 Soil conditioners and mulch

The procedure shall be as follows:

(a) Select a representative sample of at least 500 mL from the bag or batch of product being assessed. Air/oven dry at no higher than 40 °C;

(b) Determine its mass to the nearest 10 g;

(c) Place the sample as collected on the sieve (see E3(a)) with 20 mm apertures;

(d) Shake in a horizontal plane for 1 min;

(e) The material complies with the particle size grading requirement (see table 3.1) for soil conditioners if not more than 5 %, of its particles by mass of product are retained on the sieve, or for mulch if not more than 80 % of its particles by mass of product are retained on the sieve.

E4.2 Coarse mulch

The procedure shall be as follows:

(a) Select a representative sample of at least 1 L from the bag or batch of product being assessed. Air/oven dry at 40 °C;

(b) Determine its mass to the nearest 20 g;

(c) Place the sample as collected on the sieve (see E3(a)) with 20 mm apertures;

(d) Shake in a horizontal plane for 1 min;

(e) The material complies with the particle size grading requirement (see table 3.1) for coarse mulch if the mass of material retained by the sieve is not less than 80 % of the total mass.

E4.3 Vermicast / vermicompost

The procedure shall be as follows:

(a) Select a representative sample of at least 500 mL from the bag or batch of product being assessed. Air/oven dry at 40 °C;

(b) Determine its mass to the nearest 10 g;

(c) Place the sample as collected on the sieve (see E3(b)) with 1.18 mm apertures;

(d) Shake in a horizontal plane for 1 min;

(e) The material complies with the particle size grading requirement (see table 3.1) for vermicast if the mass of material retained by the sieve is less than 10 % of the total mass, otherwise the material is classified as vermicompost.

E5 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Whether the material meets the requirements of step E4.1(e) for soil conditioners and mulch or step E4.2(e) for coarse mulch or step E4.3 (e) for vermicast, thus achieving a pass for that grading;

(c) If the material fails to meet the requirements of step E4.1(e) for soil conditioners and mulches or step E4.2(e) for coarse mulch, report the percentage mass of oversized or undersized material;

(d) Reference to this test method, i.e. Appendix E of NZS 4454.

APPENDIX F METHOD FOR DETERMINATION OF MOISTURE CONTENT

(Normative)

F1 SCOPE

This Appendix sets out methods for determining the moisture content of a product.

NOTE – Table 3.1 specifies the compliance requirements.

F2 PRINCIPLE

The mass of a portion of the product is determined before and after it is dried in an oven.

F3 APPARATUS

The following apparatus is required:

(a) Oven capable of heating to a temperature of at least 105 °C, preferably forced draught;

(b) Balance accurate to 0.5 g;

(c) Weighing dishes (cleaned and dried) that are large enough to hold 200 mL (fine product) or 500 mL (coarse product).

F4 PROCEDURE FOR DETERMINATION OF MOISTURE CONTENT

The procedure shall be as follows:

(a) Determine the mass of a dish (see F3(c)) (m_1);

(b) Place a representative sample of the product (as received) of about 200 to 500 mL volume in the dish and determine the combined mass of dish and product (m_2).;

(c) Place the dish of moist product in an oven (see F3(a)) set at 105 °C. Leave it there until its mass is constant.

NOTE –

(1) Constant mass is achieved when, after the initial drying period, successive drying over 1 h periods gives rise to a weight loss of not more than 1 % of the initial weight loss.

(2) Ovens vary considerably in the rapidity with which they dry moist materials. Also, different areas in a given oven can vary in drying ability. Analysts should check their ovens and set test methods according to how long it takes drying to occur, also taking into account how the product is spread and the size of the dishes.

(d) Determine the mass of the dish plus dried product (m_3).

F5 CALCULATION

Calculate the moisture content expressed as percentages, from the following equation:

Per cent by mass moisture in the product as received =

$$((m_2 - m_3) / (m_2 - m_1)) \times 100\% \quad \text{(Eq. F1)}$$

F6 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between manufacture and testing of the product;

(b) Report the percentage moisture in the product to the nearest 1 %.

NOTE – Balls or clods of material may be broken up during sieving, however their presence indicates high moisture content. This should be reported to the manufacturer and discouraged.

(c) Reference to this test method, i.e. Appendix F of NZS 4454.

APPENDIX G METHOD FOR THE MEASUREMENT OF VOLUME AND MASS

(Normative)

G1 SCOPE

This Appendix sets out the method for measurement of a volume and mass of packaged product.

NOTE – Table 3.1 specifies the compliance requirement.

G2 PRINCIPLE

The product is poured into a rigid, calibrated container and the contents levelled.

G3 APPARATUS

Rigid, straight-sided pails (the size of the package may require more than one pail to be used) made from translucent plastic, calibrated in litres from the bottom and having the following nominal capacities:

(a) For packages of 11 L or more..... 10 L to 20 L

(b) For packages of 6 L to 10 L ..... 10 L

(c) For packages of 2 L to 5 L ..... 5 L

(d) Verified scales;

(e) Density measurement equipment.

G4 PROCEDURE

G4.1 Volume

The procedure shall be as follows:

(a) Calibrate the pail by pouring into it, water to the nominal volume of the smallest package to be measured. Include a small amount of detergent in the water to allow wetting of the container. Allow the water in the pail to come to rest then mark the container at the surface of the water. Continue adding further water to the nominal volumes of other packages whose volumes are to be measured.

(b) Select one package at random from a batch of packages. Sit the package upright on the floor. Completely cut off the upper end of the package to expose the contents.

(c) Empty the package loosely into the chosen pail and allow its contents to flow out. Use more than one pail if necessary.

(d) Level off the surface of the product and read the volume.

NOTE – A possible method is to gently rest on the surface of the product, a flat object with a diameter about 2 cm smaller than that of the pail and with a previously calibrated indicator projecting upwards out of the pail. This indicator is marked so that a reading taken from it at the position level with the top of the pail corresponds to the volume of product in the pail. The volume of product in the pail is derived from the reading taken from this inner indicator.

(e) Add the volume for each pail used if more than one pail was required for a single package of product.

G4.2 Mass

The procedure shall be as follows:

(a) Choose a bag of compost with known correct volume of product in it;

(b) Monitor the density of the product due to changes in the moisture content;

(c) Tare the weight of the packaging to obtain the net mass;

(d) Obtain the tared weight product, to the nearest g, and obtain volume based on the volume/mass/density relationship obtained.

G5 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) The volume for the package;

(c) Reference to this test method, i.e. Appendix G of NZS 4454.

APPENDIX H METHOD FOR CLASSIFYING A PRODUCT AS SPENT MUSHROOM SUBSTRATE (COMPOST)

(Normative)

H1 SCOPE

This Appendix sets out methods to identify a compost sample as having supported a mushroom crop, i.e. spent mushroom substrate (compost).

NOTE – The compliance requirement (i.e. classification as spent mushroom compost/substrate) is the presence of mycelia and calcium oxalate crystals.

H2 PRINCIPLE

A sample of the product is examined microscopically to determine the presence of calcium oxalate crystals.

H3 REAGENT

Suitable mounting medium for microscopically observing fungal hyphae.

NOTE – Recommended reagent: Lactophenol cotton blue. Phenol pure crystals 20 g; lactic acid (of specific gravity 1.21) 20 g; glycerol 40 g; water 20 g; cotton blue 0.05 g. Heat phenol to 50 °C, add cotton blue and lactic acid to dissolve, then add glycerol and add water.

H4 APPARATUS

The following apparatus is required:

(a) Sieve with 2 cm apertures;

(b) Microscope with 400 x magnification;

(c) Microscope slide and cover slips;

(d) Mounted needles to tease sample apart.

H5 PROCEDURE

The procedure shall be as follows:

(a) Sort the product intended for testing:

  (i) For compost material matured for up to four months with clumps greater than 3 cm follow the test procedure in steps H5(b) to (g)

  (ii) For compost material matured less than one to two months proceed directly to step H5(g) provided mycelial strands can be observed throughout material of this age;

(b) Sub-sample approximately 1 kg in total from lots taken at five different positions, approximately 0.3 m in from the surface of the pile. For packaged material take a sample after thoroughly mixing the contents;

(c) Mix and bulk the sub-samples;

(d) Sieve through a 2 cm aperture sieve (see H4(a));

(e) Retain clumps of compost greater than 3 cm;

(f) Break open series of clumps to observe mycelial strands, which may be mushroom mycelium ramifying through the compost; ➤

(g) Select material containing white mycelium, mount in lactophenol cotton blue and tease apart with needles. Examine under the microscope (see H4(b)) for the presence of calcium oxalate crystals adhering to, and radiating (generally at right angles) from the mycelium. The crystals are oblong shaped and vary in length from about half to three times the diameter of the individual threads of the mycelium, i.e. the hyphae.

H6 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Whether the compost was bulk or packaged;

(c) Presence or absence of mycelium with calcium oxalate crystals together with a statement identifying that the product is spent mushroom substrate (compost) if mycelia and crystals are present;

(d) Reference to this test method, i.e. Appendix H of NZS 4454.

APPENDIX J METHOD FOR INDICATING THE LIKELY PRESENCE OF PLANT PROPAGULES IN PASTEURISED PRODUCTS AND VERMICAST

(Normative)

J1 SCOPE

This Appendix sets out a method for indicating the likely presence of plant propagules that are capable of easily germinating or sprouting in samples of pasteurised products.

NOTE –

(1) Table 3.1 specifies the compliance requirements.

(2) It should be noted that no test can guarantee the complete absence of plant propagules. The protocol provided here gives a method that will show the presence or absence of propagules of many of the worst environmental weeds. Those with hard seed coats or other dormancy mechanisms that are not deactivated during processing will not always be detected.

(3) Producers are encouraged to use this test to assess the efficiency of their production systems.

J2 PRINCIPLE

Viable plant seeds and plant parts in a product shall be germinated or sprouted under optimum conditions.

J3 APPARATUS AND MATERIALS

The following are required:

(a) Sieves with apertures of 20 mm;

(b) Planter bags of PB5 size for testing compost. For testing mulch, flat tray or trays constructed of wood or plastic that is sufficiently large to hold 10 L so that the maximum depth is no greater than 5 cm. (More than one container may be used for each sample.) The base of the tray(s) shall have drainage holes drilled or cut into it.

J4 PROCEDURE

The procedure shall be as follows:

(a) Pass sufficient product through a sieve (see J3(a)) to provide a <20 mm screened sample for testing of about 10 L;

(b) Add sufficient water to the sample to bring it to its optimum moisture content. Mix thoroughly;

(c) Fill 3 planter bags (see J3(b)), with the sample. Alternatively for mulch, spread it evenly in the germination tray or trays (see J3(b)), such that the depth is no more than 5 cm. Cover the planter bags and/or tray(s) loosely with plastic sheeting and set them out in the area chosen for the incubation;

(d) Daily or as required, spray the surface of the sample with water so as to maintain its moisture content in the optimum range for seed germination or propagule sprouting. It is essential that the surface of the sample not be allowed to dry down to below this optimum range at any time;

(e) If after 28 days, there are plants in the sample, the product fails, conduct a further test, in duplicate, on the sample.

J5 TEST REPORT

The test report shall contain the following:

(a) Sample identification;

(b) Whether the sample has passed the test or failed;

(c) Reference to this test method, i.e. Appendix J of NZS 4454.

APPENDIX K BEST PRACTICE GUIDELINES FOR COMPOSTING SYSTEMS

(Normative)

K1 PREAMBLE

K1.1 This Appendix outlines 'best practice' guidelines for compost processing to ensure minimum contamination of the end-product by pathogens (including human, animal and plant), plant propagules, chemical residues and inorganic matter. This Appendix has been based upon Appendix N from AS 4454 and has been modified to reflect best practice for New Zealand. Best practice guidelines are aimed firstly at the compost facility operator, by outlining the requirement to consider factors such as ingredients, type of compost processing, care with mixing, dimensions of the composting mass, composting duration, moisture content, temperature and oxygenation throughout the composting process. Secondly, these guidelines are designed to assist others in monitoring and assessing composting operations and composted end-products.

K1.2 Odour production shall be considered by both compost manufacturers and monitoring personnel which could affect nearby residents. Odours can be minimised by correct compost processing as indicated in these best practice guidelines.

K1.3 It must be noted that the requirement for composting to achieve pathogen reduction tends not to favour an optimum rate of composting. Time-temperature requirements for sanitation are generally that the whole of the composting mass must reach at least 55 °C for a minimum of three consecutive days, but operators may opt for higher maximum temperatures to ensure that cooler zones in the compost mass where temperature gradients exist, reach the required 55 °C for the prescribed time. Care must be exercised to ensure that appropriate moisture levels are maintained otherwise there is potential for self combustion. Alternatively, other temperature and time-related options may be adopted depending upon the technology being used. For example, for in-vessel systems composting animal products and catering waste, it is recommended in the United Kingdom Defra BSE Division Guidelines [K.1] that processing takes place at 60 °C for 2 days or 70 °C for 1 hour. It has been demonstrated that temperatures in the range of 40 – 50 ℃ produce a stable compost more rapidly than do higher temperatures. Microbiological populations will be affected by ranges in temperature.

K1.4 Compost facility operators shall make individual judgements on their compost system of choice and the processing regime to achieve both a safe, hygienic product and a good quality compost which meets the physical, chemical and microbiological requirements of this Standard.

K1.5 Each facility will need to consider site-specific conditions for health and safety, noise, fire, dust, odour, leachate, vermin and security.

These best practice guidelines are directed at four commonly used composting systems – turned pile, aerated static pile, windrow and in-vessel.

K2 TURNED PILE

The following guidelines shall be followed:

(a) *Ingredients.* Details of all types of feedstock used for composting shall be recorded to ensure traceability from delivery through to release of end-product. Ingredients containing high levels of toxic and inorganic contaminants shall be excluded. Inorganic contaminants shall be removed prior to processing and depending upon quantities may be removed after composting by screening. If ingredients are to come from waste sources, it is important that these organic materials are collected separately from other waste items, e.g. rubbish and recycling streams. Maximum permissible levels of toxic chemicals are dealt with elsewhere in this Standard (see 2.1). Stockpiling of ingredients will need to be controlled to avoid potential issues with personal health, odour, leachate, and vermin.

High levels of nutrients, e.g. C:N ratio of less than 15:1, result in rapid microbiological activity and possible oxygen deficiency. Odours, including NH_3 emissions, can occur. The optimum C:N ratio is between 30:1 and 40:1. Miller and Macauley (1989) [(K.2)] point out that high N ingredients tend to be high in available C and also the final compost can have high NH_4^+ which means it can be unstable and sometimes toxic. The final C:N ratio shall be approximately 22:1. High available energy on a volume basis can be reduced by the addition of plant-based bulking agents, e.g. straw, wood shavings or fine chips, of a high C:N ratio. This material shall be uniformly mixed with the other ingredients.

(b) *Shredding or chipping.* To enable good structure for aeration during the compost process and to assist decomposition of "woody" material it is necessary to shred or chip this material prior to composting. There are a range of various machines that should perform this task. The type and size of machine should be suited to site-specific parameters and processing options. Shredded material may range in diameter from 12 mm to 40 mm and up to 400 mm in length.

(c) *Initial mixing.* Good mixing of ingredients minimises gradients in the composting mass and results in consistent processing. Adverse effects of inadequacies of the initial mix can be minimised by frequent turning during processing. This frequency is determined by the need to balance adequate aeration and high temperature maintenance. Mixing by front-end loader generally gives satisfactory results.

(d) *Dimensions.* Heights of less than 3 m for low available energy (carbon) ingredients (e.g. green wastes) and 1.5 – 2 m for higher energy ingredients (e.g. animal manure mixes) are recommended. Oxygen deficiencies resulting in odour production are more apparent in larger masses, but lessened insulation and thus limited self-heating is characteristic of smaller masses, in which survival of pathogens is more likely.

(e) *Turning.* The frequency of turning is determined by the parameters for moisture, temperature and oxygen (in K2(f), (g) and (h)). The type of machinery for turning varies and is site-specific.

(f) *Moisture content.* For turned piles, dry mixes are best, e.g. 45 – 65 %. Higher moisture contents reduce O_2 diffusion rates. This increases the possibility of foul odour production, a slower processing rate and allows a higher rate of survival of pathogens because of lower temperature. Too low a moisture content can minimise evaporative cooling so that the pile overheats, unless it is so dry that microbiological activity is inhibited (e.g. 30 – 35 % at starting). The method for measuring moisture content is described in Appendix F.

(g) *Temperature.* High temperature achievement is a function of pile dimensions, moisture content and available nutrient levels. Pasteurising temperatures of 55 °C for three consecutive days or equivalent shall be achieved for the whole composting mass. Feachem et al., suggest 45 – 50 °C for about 12 days shall destroy the pathogens *Ascaris, Salmonella* and enterovirus (see Farrell [K.3]). With organic materials that pose a potential pathogen risk, the temperature for turned piles shall be maintained at equal to or greater than 55 °C for at least 15 days with a minimum of 5 turnings (Biosolids Guidelines [K.4]). For garden waste and materials that pose a lesser pathogen risk, the temperature shall be maintained at equal to or greater than 55 °C for at least 15 days with a minimum of three turnings [K.5]. Thorough mixing during turning ensures that colder, outer zones are turned into the pile, where higher temperatures are achieved. Covering with insulating mesh cloth or finished compost (approximately a 30 cm deep layer) maintains higher temperatures in outer zones. When measuring temperature, a profile of the pile shall be obtained, e.g. at 30 cm below surface then every 30 cm to the centre. The temperature profile shall be recorded.

(h) *Oxygenation.* As well as being influenced by frequency of mixing, oxygen depletion is due to high microbiological activity (because of high nutrient levels), compactness of mass (related to size of particles), the ratio of air-to-water-filled spaces (depending on moisture content), bulking agent size and length of diffusion pathway (related to dimensions of pile). Oxygen concentrations of at least 12 – 14 % (and never less than 5 %) shall be maintained throughout the pile.

(i) *Duration.* Temperature decline due to reduced microbiological activity following available nutrient (e.g. carbon) depletion indicates the completion of composting. Premature temperature decline can occur where high nutrient ingredients give rapid processing and high water loss to the point at which water limits microbiological activity. Water addition will renew activity. Generally, duration will be between 6 – 10 weeks. This shall ensure that sufficient mixing (between 2 – 3 times each week) introduces the whole composting mass to regions of the pile where pasteurising conditions are achieved. A curing period of a minimum of two months shall follow to ensure that compost is mature.

(j) *Screening.* There is a range of various machines to screen compost. The particle size to be screened is determined by the type of end-product to be produced as specified in table 3.1.

(k) *Blending.* Other products may be blended with the composted end-product. The types and quantities of materials to be blended are specific to suit various market uses. Details of materials shall be recorded to ensure traceability from delivery through to release of the end-product.

K3 AERATED STATIC PILE (ASP)

The following guidelines shall be followed:

(a) *Ingredients.* Details of all types of feedstock used for composting shall be recorded to ensure traceability from delivery through to release of end-product. Ingredients containing high levels of toxic and inorganic contaminants shall be excluded. Inorganic contaminants shall be removed prior to processing and depending upon quantities may be removed after composting by screening. If ingredients are to come from waste sources, it is important that these organic materials are collected separately from other waste items, e.g. rubbish and recycling streams. Maximum permissible

levels of toxic chemicals are dealt with elsewhere in this Standard (see 2.1). Stockpiling of ingredients shall be controlled to avoid potential issues with personal health, odour, leachate, and vermin.

Higher nutrient contents (e.g. C:N 25:1 – 35:1) than with the turned pile are possible because aeration lessens the chance of O_2 deficiency, but too rapid microbiological activity and thus the need for increased aeration can dry out the compost too quickly and limit processing, resulting in pathogen survival and an unstable compost which reheats following water addition. Under good processing conditions, odours are minimised because large areas within the composting mass are processed at optimal temperatures (40 – 50 °C). Also, NH_3 losses are minimised.

(b) *Shredding or chipping.* See K2(b).

(c) *Initial mixing.* Inadequate mixing must be avoided. A homogenous mix is of paramount importance to ensure consistent processing throughout the composting mass (minimum gradients of water, aeration, nutrient distribution and temperature). Because of the configuration of piles there may be limited opportunity to redress initial poor mixing in a static pile. Screw auger blenders provide good mixing but many other blending systems can be used.

(d) *Dimensions.* Because of the aeration, piles that are slightly larger than turned piles are satisfactory, but composters shall aim for 1.5 – 3 m height, depending on whether high or low energy ingredients are used. Aeration minimises the extent of anaerobic zones so that odour production is reduced, but aeration can also cool and dry out smaller masses, thus limiting self-heating and resulting in pathogen survival.

(e) *Turning.* The concept of the static pile is that it is not turned during the composting process. There are some static pile technologies however whereby the material is turned during the composting process. The frequency is determined by the type of technology and composting methods that are adopted.

(f) *Moisture content.* The initial moisture content can be near the water-holding capacity (WHC) of the ingredients (70 % – 75 % w/w). The method for measuring moisture content is described in Appendix F.

(g) *Temperature.* Because the compost is not turned, pasteurising temperatures of 55 °C are difficult to achieve for the outer zones. Insulation with mesh cloth or finished compost can overcome this problem and with this approach the static pile may replicate conditions of an enclosed system. Pereira et al (1987) [K.6] notes that pathogen survival, however, is always possible, but can be less than 100 cfu g^{-1} after 10 – 30 days. The entire mass of the pile shall reach 55 °C+ for at least 3 days. A time/temperature profile (see K2(g)) shall be recorded to ensure that optimal processing has occurred.

(h) *Oxygenation.* By the installation of either aerated concrete floors in the compost yard or perforated pipes installed at the base of the pile, oxygenation can be achieved by either positive pressure (blowing in at base), negative pressure (sucking through pile) or alternating pressure ('suck' then 'blow'). Reports on investigations of these systems can be found in Leton and Stentiford [K.7]. The mechanism of aeration can be further modified by manual temperature monitoring and regulating by a fan-on, variable rate (e.g. 3 – 10 min on every 15 – 20 min) or by a temperature feedback system to maintain compost temperatures at the predetermined level (controlled by single or multiple temperature sensors). All systems can provide adequate oxygenation and the choice of system depends on such factors as user preference and the physical and chemical characteristics of the raw materials.

(i) *Duration.* Processing times will be in the order of 6 – 10 weeks depending on nutrient levels and moisture content. Curing of the finished product shall be for 2 – 3 months.

(j) *Screening.* See K2(j) for comments.

(k) *Blending.* See K2(k) for comments.

K4 WINDROW

The following guidelines shall be followed:

(a) *Ingredients.* See turned pile (see K2(a)) for non-aerated windrows and ASP (see K3(a)) for aerated windrows.

(b) *Shredding or chipping.* See K2(b).

(c) *Initial mixing.* Thorough mixing is important (particularly for aerated systems) as described for turned pile and ASP, but periodic turning during processing can redress initial mixing problems.

(d) *Dimensions.* Can be horizontally-extended piles, formed by a front-end loader, or rectangular windrows formed by a turner. Extended piles are generally 1.5 – 3 m high, and rectangular windrows are generally 1.5 – 2 m high and wide, with the length of both being limited only by the composting area available.

(e) *Turning.* Frequency of turning is determined by the following parameters for moisture, temperature and oxygen. With organic materials that pose a potential pathogen risk (see table 3.1), the temperature for turned piles shall be maintained at equal to or greater than 55 °C for at least 15 days with a minimum of 5 turnings [K.4]. For garden waste and materials that pose a lesser pathogen risk, the temperature shall be maintained at equal to or greater than 55 °C for at least 15 days with a minimum of 3 turnings [K.5].

(f) *Moisture content.* See turned pile (K2(f))for non-aerated windrows and ASP (see K3(f)) for aerated windrows.

(g) *Temperature.* Similarly to the turned pile and ASP methods, temperature gradients exist within windrows. Cooler temperatures occur both in the outer zones and the inner, anaerobic zones (when present) in non-aerated windrows, and in aerated windrows, cooler temperatures occur in the inner aerated core and higher temperatures (up to 80 °C) in the middle zones[K.7]. Turning can re-introduce pathogens, which survive in the cooler zones, into the pasteurised compost which must then once more achieve pasteurising temperatures. If the turning procedure is not efficient, pathogens will survive[K.3]. A temperature profile (see K2(g)) shall be recorded to ensure that optimal processing has occurred.

(h) *Oxygenation.* See turned pile (see K2(h)) for non-aerated windrows and ASP (see K3(h)) for aerated windrows. Forming windrows over air channels (no forced air) in the floor of the compost yard also reduces the formation of anaerobic cores and so minimises odour production.

(i) *Duration.* Composting for 4 – 6 weeks with 1 – 2 turns per week shall ensure that all the composting mass reaches the prescribed temperature/time conditions for sanitisation and compost stability. Curing for one month is recommended.

(j) *Screening.* See K2(j) for comments.

(k) *Blending.* See K2(k) for comments.

K 5 IN-VESSEL OR ENCLOSED CONFIGURATION

Many types of patented processes using a wide variety of vessels or various enclosed systems are suitable for use, provided that the following conditions are met:

(a) *Ingredients.* See turned pile (see K2(a)) for non-aerated windrows and ASP (see K3(a)) for aerated windrows.

High nutrient ingredients can be used providing the high heat output can be controlled by aeration. Depending upon the type of system temperature, gradients in the composting mass can be virtually non-existent (1 – 2 °C), temperature regime and recirculating airflow ensure minimum odours and optimal NH_3 incorporation.

(b) *Shredding or chipping.* See K2(b). The particle size of the material to be composted should be suited to the type of in-vessel system. Systems with larger cross-sectional areas require a coarser grading of material for composting to assist with aeration.

(c) *Initial mixing.* A homogenous uniform mix is essential before the composting process commences as for ASP (see K3(a)). Some systems enable further mixing within the vessel during the composting process, however the quality of the end product is determined by the initial mix.

(d) *Dimensions.* There is a range of systems and technologies which determine the dimensions of in-vessel systems.

(e) *Turning.* Some in-vessel systems enable turning of material within the vessel. The amount of turning and mixing depends upon the duration and type of process. Some aerated piles or windrows with covers may be classified as enclosed and these can be turned and mixed if required or as determined by the moisture, temperature and oxygenation parameters in K3 and K4.

(f) *Moisture content.* Water can be added to the maximum water holding capacity of ingredients. The amount of moisture is be determined by the respective processing systems. Typical moisture contents may range from 50 % up to 78 %. Excess moisture may drain off and need to be collected by leachate drains. Aeration can dry out the compost however, resulting in premature temperature decline, and thus pathogen survival and heating, following pre-wetting. Very fine particulate ingredients may require a bulking agent, e.g. straw or wood chips depending on fan capacity.

(g) *Temperature.* The bioreactor construction and aeration system shall ensure temperatures can be maintained. The temperature profile within compost vessels shall achieve the temperature ranges as shown in K2(g). For enclosed or covered piles and windrows it may be necessary to turn the material to achieve the temperature profiles. Temperature feedback control, generally monitoring outlet air, is used to adjust aeration and thus temperature modification.

(h) *Oxygenation.* The volume of air required to control temperature is far in excess of that required to maintain oxygen concentrations at greater than 12 – 14 %. Forced air shall ensure adequate and even oxygenation throughout the composting mass. Monitoring provisions shall be implemented to control aeration.

(i) *Duration.* The duration time shall depend upon the type of process and whether the maturation area is enclosed. Longer duration within the vessel reduces potential odour during the maturation phase. Some in-vessel systems may have an initial 3-day pasteurisation phase with 5 weeks for maturation in an enclosed building with appropriate odour extraction and treatment. Alternatively other systems may have a

6 – 28 day process with outdoor maturation. The outdoor maturation requirements shall be site-specific.

(j) *Odour control system.* With in-vessel or enclosed systems it is most likely that materials with high moisture and nitrogen levels will be composted. Typical wastes with these characteristics may include food wastes, bio-solids, "soft" vegetation, animal by-products, manures etc. The materials have the potential to cause odours whilst stockpiled, if not mixed appropriately and if aeration and temperature levels are not managed appropriately. The type of odour treatment shall be determined by the type and size of the system and site-specific parameters. Odour is an issue that may arise from anaerobic conditions during the compost phase that may impact on overall end-product quality. Similarly odour issues will need to be managed so as to not impact on neighbours

(k) *Screening.* See K2(j).

(l) *Blending.* See K2(k).

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APPENDIX L BEST PRACTICE GUIDELINES FOR VERMICULTURE SYSTEMS

(Informative)

L1 PREAMBLE

L1.1 This Appendix is a summary of best practice guidelines for vermiculture processing to ensure minimum contamination of the end-product by animal (including human) and plant pathogens and plant propagules. The best practice guidelines set out are generic in nature and equally apply to a range of vermiculture systems, whether they be windrows or beds, stackable trays, batch flow containers or continuous flow containers. In managing such systems, the objective is to create the most natural environment for the worms.

L1.2 All vermiculture systems comprise a bedding layer of moist, mature vermicast which provides a medium for worm habitation, and a feeding layer where the raw ingredients are applied, invariably occurring on the upper surface of the bedding. The feeding layer is usually covered with hessian or like protective layer material to minimise moisture loss, excessive temperature gradients and to reduce accessibility to pests and vermin.

L1.3 Best practice guidelines are aimed firstly at the vermiculture facility operator, by outlining the need to consider factors such as the preparation of raw ingredients, care with mixing, dimensions of the vermiculture mass (principally depth), moisture content, temperature and oxygenation throughout the vermiculture mass, and duration of the vermiculture operation. Secondly, these guidelines will aid the product certification organisation in that the type of processing determines the potential problems likely to be encountered with the finished product, thus indicating the relevant monitoring required for that product.

L1.4 Pasteurising temperatures cannot be achieved during vermiculture processing as worms are sensitive to thermophilic temperatures. Thus, raw ingredients used in vermiculture systems shall be relatively free of plant pathogens and plant propagules unless pre- or post-pasteurisation is performed. This can be achieved through a composting process as described in Appendix K, or by an alternative thermal treatment process (e.g. steam injection or an alternative validated process as described in this Standard). Records of time and temperature during pasteurisation are needed to demonstrate the final product has been adequately sanitised according to criteria as specified in table 3.1.

L1.5 Human and animal pathogen reduction through processing under mesophilic conditions in vermiculture systems is documented (Brown and Mitchell, 1981 [L.1]; Amaravadi et al., 1990 [L.2]; Pedersen and Hendriksen, 1993 [L.3]). In well-managed systems, vermicast produced from organic materials containing these pathogens can achieve an adequate level of sanitation. The risks associated with transmitting human (including animal) pathogens, plant pathogens and plant propagules in a vermicast product, however, can be reduced if pre- or post-pasteurisation is performed. Product that did not undergo such treatment needs to demonstrate sufficient pathogen reduction and absence of plant propagules as specified in table 3.1.

L1.6 Odour generation from vermiculture facilities is usually minimal. However, odour can be produced if high nutrient (low C:N ratio) organic materials (e.g. food organics) are not properly contained on-site, or if they are applied in excess to vermiculture systems. Highly degradable organic materials, therefore, need to be added in moderation to the systems and quickly processed to minimise impacts on air quality.

L1.7 Other factors which shall be considered by both vermicast manufacturers and monitoring personnel include physical contaminants, chemical contaminants and pesticides. If raw ingredients are to come from waste streams, it is preferable that these organic materials are collected separately from other waste items. Maximum permissible levels of toxic chemicals and physical contaminants are dealt with elsewhere in this Standard (see 2.1).

L2 VERMICULTURE PROCESSING

The following guidelines shall be followed:

(a) *Mixing and feedstock preparation.* A homogeneous mix of feedstock material is of paramount importance to ensure consistent processing throughout the organic material.

(b) *Dimensions.* A minimum bed depth of mature vermicast of 0.3 to 0.4 m is recommended to be maintained for most vermiculture systems as a worm habitation medium. The amount of fresh material added to the surface shall not result in anaerobic conditions and heat generation. See (f) for oxygenation requirements.

(c) *Ingredients.* High levels of nutrients in the feed material (i.e. C:N ratio of less than 15:1) can result in rapid oxygen depletion, leading to the development of anaerobic conditions (Edwards, 1988[L.4]). Under those conditions worm activity may be inhibited and odour generation can occur. The optimum C:N ratio is approximately 20 – 25:1. Organic material high in available energy (low C:N) shall be mixed with materials which are low in available energy (high C:N, e.g. cardboard). This material shall be uniformly mixed with the other ingredients. Size reduction of the various components of the feed mix assists in decomposition of the material and facilitates worm access. The resulting feed mix shall be within a pH range of 5.5 to 8.5 and its electrical conductivity shall not exceed 3 dS/m (Edwards, 1988[L.4]). See Appendix A for testing methodology.

(d) *Moisture content.* Optimum moisture levels vary between 80 – 90 % in the active layer of the vermiculture system (where feedstock is supplied) and between 30 – 70 % in the bed material (Venter and Reinecke, 1988 [L.5]; Dominguez and Edwards, 1997 [L.6]). Too low a moisture content can inhibit the worms ability to process organic material, too high a moisture content can result in oxygen deficiency. The method for measuring moisture content is described in Appendix F.

(e) *Temperature.* Vermiculture systems operate best in a mesophilic bed temperature range of between 5 to 35 °C (Reinecke et al., 1992 [L.7]). Bed temperature range of between 5 °C to 25 °C (Edwards, 1988 [L.4]) may result in worm migration out of the feedstock layer, leading to a cessation in processing and possible system failure. Excessive application of fresh organic material to the surface can result in unacceptable temperature increases.

(f) *Oxygen.* Worms require an aerobic environment of not less than 10 % free oxygen in the active layer of the system.

(g) *Duration.* A minimum processing time of not less than 6 weeks is recommended to produce stabilised material complying with the criteria set out in table 3.1. Depending on the feedstock, a sufficient amount of biomass (5 – 15 kg of biomass/m^2 of processing surface) must be present to produce such material. An additional maturation step of between 4 – 6 weeks may be required after removing the material from the system to achieve a greater level of maturity.

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APPENDIX M MEANS OF DEMONSTRATING COMPLIANCE WITH THIS STANDARD

(Informative)

M1 SCOPE

This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

(a) Evaluation by means of statistical sampling;

(b) The use of a product certification scheme;

(c) Assurance using the acceptability of the supplier's quality system;

(d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

M2 STATISTICAL SAMPLING

M2.1 This procedure is only valid if the sampling plan has been determined using table 3.1 for microbiological indicators and metals and the following requirements are met:

(a) The sample shall be drawn randomly from a population of product of known history. The history needs to enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control. Sampling shall be in accordance with the Biosolids Guidelines, or current equivalent guideline or Standard. For each different situation, a suitable sampling plan needs to be defined and shall be representative. More sampling may be required for larger processes or where feedstocks change frequently. Sampling may also be undertaken during processing in order to ensure that the product meets the criteria in table 3.1, rather than waiting until the end of the process.

(b) Any product that does not meet the criteria in table 3.1 shall be reprocessed.

M2.2 In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199.1, guidance to which is given in AS 1199.0.

M3 PRODUCT CERTIFICATION

M3.1 The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

M3.2 The certification scheme should meet the criteria described in SAA/SNZ HB 18 series in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

M3.3 The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

M4 SUPPLIER'S QUALITY MANAGEMENT SYSTEM

M4.1 Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality management system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

M4.2 Information on establishing a quality management system is set out in AS/NZS ISO 9001 and AS/NZS ISO 9004.

M5 OTHER MEANS OF ASSESSMENT

M5.1 If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed from the results of testing coupled with the manufacturer's guarantee of product conformance.

M5.2 Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform to the full requirements of the Standard.

APPENDIX N METHOD FOR DETERMINATION OF PLANT GROWTH INDEX

(Normative)

N1 SCOPE

This Appendix sets out a method for determining whether a product supports plant growth, based on the HortResearch in-house procedure (2005).

N2 PRINCIPLE

Tomato seedlings are planted in a 1:1 mix of the product and sand and grown until the first truss of flowers form. Plant fresh weight is compared to the weight of plants grown in pure sand.

N3 APPARATUS AND MATERIALS

The following are required:

(a) Tomato seedlings at first true leaf stage, preferably cultivar Moneymaker, but any cultivar can be used;

(b) Daltons No. 1 washed sand (available in 20 L packs from Daltons Ltd., Matamata, or stockists of Daltons products);

(c) A plant growth room such as a glasshouse, plastic house or any room with sufficient light for plant growth;

(d) Planter bags, size PB5 (3 L volume);

(e) Container, about 5 L volume;

(f) Balance or scales capable of weighing to the nearest gram.

N4 PROCEDURE

If the test sample is dry, it should be moistened at least 8 days before testing. The procedure shall be as follows:

(a) Fill the container (see N3(e)) with the test sample and empty onto a clean surface;

(b) Fill the same container with sand (see N3(b)) and add to the measured test sample;

(c) Mix well until homogeneous;

(d) Fill three planter bags (see N3(d)) with the sample-sand mix;

(e) Fill another three planter bags with sand;

(f) Transplant a tomato seedling (see N3(a)) into each planter bag and water;

(g) Grow until the first truss of flowers form (about four weeks in summer, up to eight weeks in winter), watering as required;

(h) Cut off each plant at the mix surface and weigh on the balance or scales (see N3(f));

(i) Average the three weights for the sample-sand mix plants (W_{sample}) and the three weights for the sand only plants (W_{sand});

(j) Calculate the plant growth index by dividing W_{sample} by W_{sand}. An index of at least two is required to demonstrate that the product supports plant growth.

NOTE – If one plant dies during the test, the weights of the remaining two plants in that set of three can be averaged. If more than one plant dies, the test must be repeated.

N5 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Whether the sample passes or fails the test (see N4(j));

(c) Reference to this test method, i.e. Appendix N of NZS 4454.

APPENDIX P METHOD FOR DETERMINATION OF LEVEL OF VISIBLE CONTAMINATION

(Normative)

P1 SCOPE

This Appendix sets out methods for determining the level of visible contamination with glass, plastics and metal in compost and mulch.

NOTE – Table 3.1 specifies the compliance requirements.

P2 PRINCIPLE

The amount of visible contamination in compost and mulch is determined by mass from a sieved, dried product sample.

P3 APPARATUS

The following apparatus is required:

(a) Oven capable of heating to a temperature of at least 105 °C, preferably forced draught;

(b) Balance accurate to 0.5 g;

(c) Weighing dishes (cleaned and dried) that are large enough to hold 3 L of product;

(d) Tweezers;

(e) Sieve with 5 mm aperture.

P4 PROCEDURE FOR DETERMINATION OF VISIBLE CONTAMINANTS

The procedure shall be as follows:

(a) Place 3 L of moist product (as received) into the dish in an oven (see P3(a)) set at 105 °C. Leave it there until its mass is constant.

(b) Record dried weight of product (see P3(b)).

NOTE –

(1) Constant mass is achieved when, after the initial drying period, successive drying over 1 h periods gives rise to a weight loss of not more than 1 % of the initial weight loss.

(2) Ovens vary considerably in the rapidity with which they dry moist materials. Also, different areas in a given oven can vary in drying ability. Analysts should check their ovens and set test methods according to how long it takes drying to occur, also taking into account how the product is spread and the size of the dishes.

P5 PROCEDURE FOR DETERMINATION OF VISIBLE CONTAMINANTS

The procedure shall be as follows:

(a) Screen the dried product through a sieve (see P3(e)) with 5 mm apertures. Discard the fine fraction.

(b) Remove by hand or tweezers from the >5 mm fraction all visible pieces of glass, hard plastic and metal. Determine their mass (m_4).

(c) Remove by hand from the >5 mm fraction all visible pieces of light plastic, or plastic film. Determine their mass (m_5).

(d) Remove by hand from the >5 mm fraction, all visible stones and clods of clay. Determine their mass (m_6).

P6 CALCULATION

Calculate the contamination of the product, expressed as percentages, from the following equations:

Per cent by mass contamination by glass, metal and hard plastic $= \frac{m_4 \times 100}{P3(b)}$ ..... (Eq. P1)

Per cent by mass contamination by light plastic $= \frac{m_5 \times 100}{P3(b)}$ ..... (Eq. P2)

Per cent by mass contamination by stones and clods of clay $= \frac{m_6 \times 100}{P3(b)}$ ..... (Eq. P3)

P7 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between manufacture and testing of the product;

(b) Report the percentages of contaminants to two significant figures;

(c) Reference to this test method, i.e. Appendix P of NZS 4454.

APPENDIX Q METHOD FOR DETERMINING IF A MATERIAL DESCRIBED AS VERMICAST IS SUFFICIENTLY UNCONTAMINATED WITH LARGE PARTICLES

(Normative)

Q1 SCOPE

This Appendix sets out a method for determining whether or not a product labelled as vermicast is sufficiently uncontaminated with material other than worm castings to be considered for further testing within the Standard.

NOTE –

(1) Table 3.1 specifies the compliance requirements.

(2) It is recommended that manufacturers carry out this test on a routine basis to test the validity of their systems. It should be noted that no test can guarantee the complete absence of plant propagules from these materials.

Q2 PRINCIPLE

A sample of the product is pre-wetted and washed through a 1.18 mm sieve and the percentage by volume not passing through is determined. Products derived from a composting process will not pass due to the quantity of woody oversized particles present.

Q3 APPARATUS AND MATERIALS

The following are required:

(a) A 1.0 L clear graduated plastic beaker with 20 mL graduations[Q.1], an internal diameter of 123 mm and height 126 mm, and having 25 holes of 2.5 mm size drilled into the bottom to allow free draining of water;

(b) A 200 mm sieve with aperture size of 1.18 mm;

(c) A 100 mL measuring cylinder with 1 mL graduations;

(d) Metal dish, at least 200 mm x 200 mm;

(e) Running water;

(f) Metal spoon.

Q4 PROCEDURE

The procedure shall be as follows:

(a) Select a representative sample of not more than 1 L from the bag or batch of product being assessed;

(b) Place approximately 600 mL of the sample as collected into the beaker (see Q3(a)) and add approximately 400 mL of water to ensure the entire mix is saturated. Gently mix with a metal spoon to ensure the entire mix is wet.

(c) Allow the mix to free-drain under gravity until water stops exiting the bottom of the beaker;

(d) Carefully remove excess vermicast with a metal spoon until the 500 mL mark of the beaker is reached;

(e) Empty the entire contents of the beaker onto the sieve (see Q3(b)) with 1.18 mm apertures over a sink with a collection tray;

(f) Apply a gentle flow of running water at a rate of 3 L/min from a tap onto the vermicast in the sieve, and work the sample with the fingers so the lumps are broken up. Continue this action for up to a maximum of 10 minutes, until no further fine particles flow through the sieve.

(g) Empty the contents of the sieve onto a dish (see Q3(d)) and transfer the particles into a clean 100 mL measuring cylinder (see Q3(c)). Tap the measuring cylinder gently on a bench five times to consolidate the sample. Measure the volume of particles remaining (v) in millilitres (mL) by referring to the graduations on the measuring cylinder.

(h) Calculate the percentage, by volume of particles >1.18 mm in the sample as follows:

Percentage volume of particles >1.18 mm = $v/5$ ..... (Eq. Q1)

where

v = volume of particles remaining on the 1.18 mm sieve (mL)

(i) The product can be claimed to pass as a vermicast if less than 10 % by volume of the product consists of particles greater than 1.18 mm.

Q5 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time period between the manufacture and testing of the product;

(b) Percentage volume of particles >1.18 mm (see Q4(h));

(c) Reference to this test method, i.e. Appendix Q of NZS 4454.

Q6 REFERENCE

Q[1] Beakers that have been found to be suitable are available from Crown Scientific, Private Mail Bag 4, Moorebank, NSW 2170. Product name and code: Beaker, graduated, PMP (TPX), Cat. No. BDB340P.

NOTES

Approved by the Standards Council on 25 November 2005 to be a New Zealand Standard pursuant to the provisions of section 10 of the Standards Act 1988.

First published: 15 December 2005

The following SNZ references relate to this Standard:

Project No. P 4454
Draft for comment No. DZ 4454
Typeset and printed by: Standards New Zealand

Appendix 3 – PDP Letter on Ammoniacal Nitrogen Management and Adaptive Management Plan Capability Assessment by PDP

PATTLE DELAMORE PARTNERS LTD
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Hamilton Central, Hamilton 3204
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Web **www.pdp.co.nz**
Auckland **Hamilton** Tauranga Wellington
Christchurch Invercargill

solutions for your environment

6 April 2021

Kathryn Hooper
Landpro
57 Vivian Street
PO Box 8235
NEW PLYMOUTH 4342

Dear Kathryn,

AMMONIACAL NITROGEN MANAGEMENT AND ADAPTIVE MANAGEMENT PLAN

Pattle Delamore Partners Limited (PDP) have been asked by Remediation New Zealand Limited (RNZ) and RNZ legal representatives to provide a discussion regarding potential timelines and milestones that could be achieved to reduce total ammoniacal nitrogen (TAN) concentrations within Uruti site discharges to comply with New Zealand Policy Statement: Freshwater Management (NPS:FM) (2020) guidelines. To achieve this, PDP proposed via expert evidence that an adaptive management plan would be required.

The Taranaki Regional Council (TRC) s42a report originally specified that NPS:FM (2020) TAN targets would have to be achieved by June 2026. However, during the resource consent hearing, TRC revised this date to June 2022. This letter report firstly discusses why this proposed timeline is technically unfeasible, but also inappropriate when trying to inform an adaptive management plan approach.

1.0 June 2022 Timeline

TRC have presented at the hearing that TAN concentrations must comply with NPS:FM (2020) guidelines by June 2022.

Technically this is unachievable for the following reasons:

- The onsite Uruti wetland is a primary tool to treat TAN discharges from the paunch pad. The wetland was also identified as the primary source of TAN discharges from the Uruti site. As discussed within my evidence in chief, wetlands are biological treatment systems that will require time to adapt to new conditions (after the wetland has been remediated). Specifically, a key treatment process that I believe the wetland is failing to provide at present is nitrification/denitrification processes. This is due to the forebay being incorrectly designed, which has allowed increased sedimentation within the main wetland body. This increased sedimentation has reduced/eliminated anoxic zones within the wetland thereby restricting denitrification processes from occurring. Preferential water flow paths are likely to have also formed within the wetland due to the increased sediment volumes, thereby restricting interaction of water with wetland plants.

- The existing wetland was constructed well before any NPS:FM guidelines, i.e. even before the NPS:FM 2014 guidelines were operative. As discussed in my evidence in chief, there has been a significant reduction in NPS:FM (2020) TAN guidelines when compared to previous NPS:FM versions. Whilst I do not have any design drawings or sizing calculations for the existing wetland, it would be very understandable to realise that the existing wetland was not designed to achieve the water quality standards required by NPS:FM 2020. As such, it has to be acknowledged that the existing wetland will require significant redesign in order to achieve these new standards. Through this redesign, water levels may be altered and dredging of sediment will be required. Either way during this redesign process, the microbial populations and the existing wetland plants will likely be affected/lost during the required physical works. Sufficient time for microbial populations to become re-established and plants to grow will therefore be required to improve the water quality of discharges from the wetland. I consider that the proposed timeframe of one year (also incorporating the time the undertake the physical works) will not be sufficient time to allow these biological processes to become established.
- If the proposed TRC timeline were to progress, RNZ would be forced to undertake physical works during winter (i.e. this is also in addition the above point, where there will be limited probability of getting microbes and anoxic zones re-established in the wetland). As discussed above, dredging of accumulated sediments within the various stormwater devices at the site will be a key priority to achieving the NPS:FM 2020 guidelines. Contaminants (including nutrients) within these accumulated sediments are likely to be re entrained during this dredging process. If physical works are forced to be undertaken during winter to meet TRC's proposed timeframe, an increased risk of contaminant discharges into the environment will likely occur. This is because during winter, the site will also be experiencing increased stormwater flows thorough the devices. This is the very reason why stormwater dredging operations throughout the country are undertaken in summer not winter.

In addition to the above technical reasons, I also consider that a timeline of achieving NPS:FM (2020) water quality guidelines by June 2022 will also undermine the purpose of the proposed adaptive management plan.

To obtain an understanding on the effective performance of the proposed remediation, it is critical to evaluate the performance under a range of environmental conditions. In the proposed timeline, the approach has provided no monitoring or device evaluation for climatic/hydrological or biological processes across all seasons. Specifically, wetland treatment performance reduces during winter. This is due to plant die-back, but also due to a suppression of microbial activity during colder climatic conditions. The proposed TRC timeframe restricts the adaptive management plan approach to effectively evaluate the performance of initial actions during winter climate conditions (as in the previous winter, physical works would be carried out), and whether additional remedial actions would be required to meet the NPS:FM 2020 guidelines. I also note that any additional remedial actions (if required), would also require a similar evaluation process that accounts for seasonal and hydrological effects to be considered, which is not allowed for in the proposed TRC timeframe. The proposed TRC timeframe would be forcing RNZ to confirm that water quality performance is being achieved (on a long-term basis) on limited datapoints using data from sub-optimal wetland performance seasons only. This evaluation approach is considered to be inappropriate and would not follow any typical stormwater device performance assessment, which would require a minimum of three years of monitoring to establish device treatment performance.

In summary, RNZ recognise that water quality needs to be improved from their site to meet NPS:FM 2020 guidelines. In my opinion however, the proposed timeframe is not feasible as there will be insufficient time for wetland treatment systems to become established and effective (as we are proposing remedial options that need to consider both biological processes and seasonal responses), but also forces RNZ to make unqualified decisions to determine if proposed remedial actions are sufficient due to a lack of monitoring data. Furthermore, the forced proposed timeline could cause an exacerbation of environmental effects (via the enforcement of RNZ to do winter works). It is for the above reasons that I believe the proposed TRC timeframe of one year should be rejected, and the originally proposed timeframe of meeting NPS:FM 2020 guidelines by June 2026 should be maintained.

2.0 June 2026 Timeline

TRC originally proposed a timeframe that RNZ site discharges were to achieve NPS:FM 2020 guidelines by June 2026. I consider that this timeframe is more appropriate than the June 2022 timeframe. This is why no evidence or comment in my evidence in chief opposed this condition.

Appendix A presents a Gantt chart which demonstrates how a timeframe to June 2026 would be implemented. In summary, the proposed timeline would allow for:

- Adequate time to prepare a consulted adaptive management plan including well thought out monitoring strategies.
- Physical works to be undertaken during summer when most optimal corrective actions should be undertaken.
- A full year for wetland treatment functions and wetland vegetation to become re-established.
- Water quality monitoring of the discharge would have then commenced in year 2022 once the wetland has been re-established. Monitoring would be ongoing to 2026.
- Trends in water quality data would have been determined in years 2024 and 2025 to identify if water quality improvements were trending towards required NPS:FM (2020) guidelines.
- If water quality trends were not anticipated to not achieve NPS:FM (2020) guidelines, additional remedial actions would have been designed and implemented in years 2024 and (if required) 2025.
- Continued monitoring (including improvements from any additional water quality remedial actions), that allowed for climatic and hydrological variability would have then be able to be confirm achievement of NPS:FM 2020 guidelines by June 2026.

3.0 Proposed Additional Resource Consent Conditions

During the resource consent hearing, submitters stated that RNZ do not have a historic track record on delivery of promised actions. The following therefore presents suggested deliverables and timeframes which could be implemented as consent conditions or incorporated into an Adaptive Management Plan which could be required as a condition of consent:

- By September 2021, RNZ are to have completed technical assessments to support proposed corrective maintenance actions described in the Pattle Delamore Partners Limited report titled ‘Uruti Compositing Facility – Water Quality Management’ dated March 2021. Evidence of completion of these actions are to be submitted to the TRC.

- RNZ are to prepare an adaptive management plan in consultation with the Taranaki Regional Council and Ngāti Mutunga representatives. The adaptive management plan shall be submitted to the Taranaki Regional Council no later than November 2021 for certification. The adaptive management plan must include, but not be limited to, the following content:

  i) A water quality monitoring strategy to demonstrate how improvements to water quality are going to be assessed. This must include, but not be limited to the following content:

     (1) Location of monitoring sites.

     (2) List of parameters monitored.

     (3) Frequency of data collection.

     (4) QA/QC procedures to ensure robust data collection.

  ii) Methods for determining how water quality trends are going to be assessed, and what triggers are going to be used to determine if additional water quality treatment measures are going to be required.

  iii) Discussion on how Ngāti Mutunga can be actively involved in the implementation of the adaptive management plan.

- RNZ are to prepare and submit progress monitoring reports to the Taranaki Regional Council and Ngāti Mutunga no later than August 2024, August 2025, and June 2026 demonstrating progress towards achieving NPS:FM 2020 total ammoniacal nitrogen guidelines. For the reports submitted in August 2024 and August 2025, and if required, the report must discuss what additional water treatment methods will be implemented to further improve water quality discharges from the site.

4.0 Conclusion

During the Remediation New Zealand hearing for the Uruti Composting Facility, the Taranaki Regional Council amended proposed resource consent conditions, stating that NPS:FM (2020) total ammoniacal nitrogen guidelines are to be achieved by June 2022.

Based on significant experience, Pattle Delamore Partners Limited concludes that this proposed timeframe is technically unachievable as there is insufficient time to technically support for wetland treatment systems. We also conclude that this proposed June 2022 timeline would also force RNZ to make unqualified decisions to determine if proposed remedial actions are sufficient based on a lack of monitoring data that supports climatic (seasonal) and hydrological (water flows) influences.

The original timeline to achieve NPS:FM (2020) total ammoniacal nitrogen guidelines by June 2026 is supported by PDP. A proposed Gantt chart which demonstrates how this timeframe could be achieved is provided.

5.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Remediation New Zealand Limited and others (not directly contracted by PDP for the work), including the Taranaki Regional Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Landpro and Remediation New Zealand Limited for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by

Hayden Easton

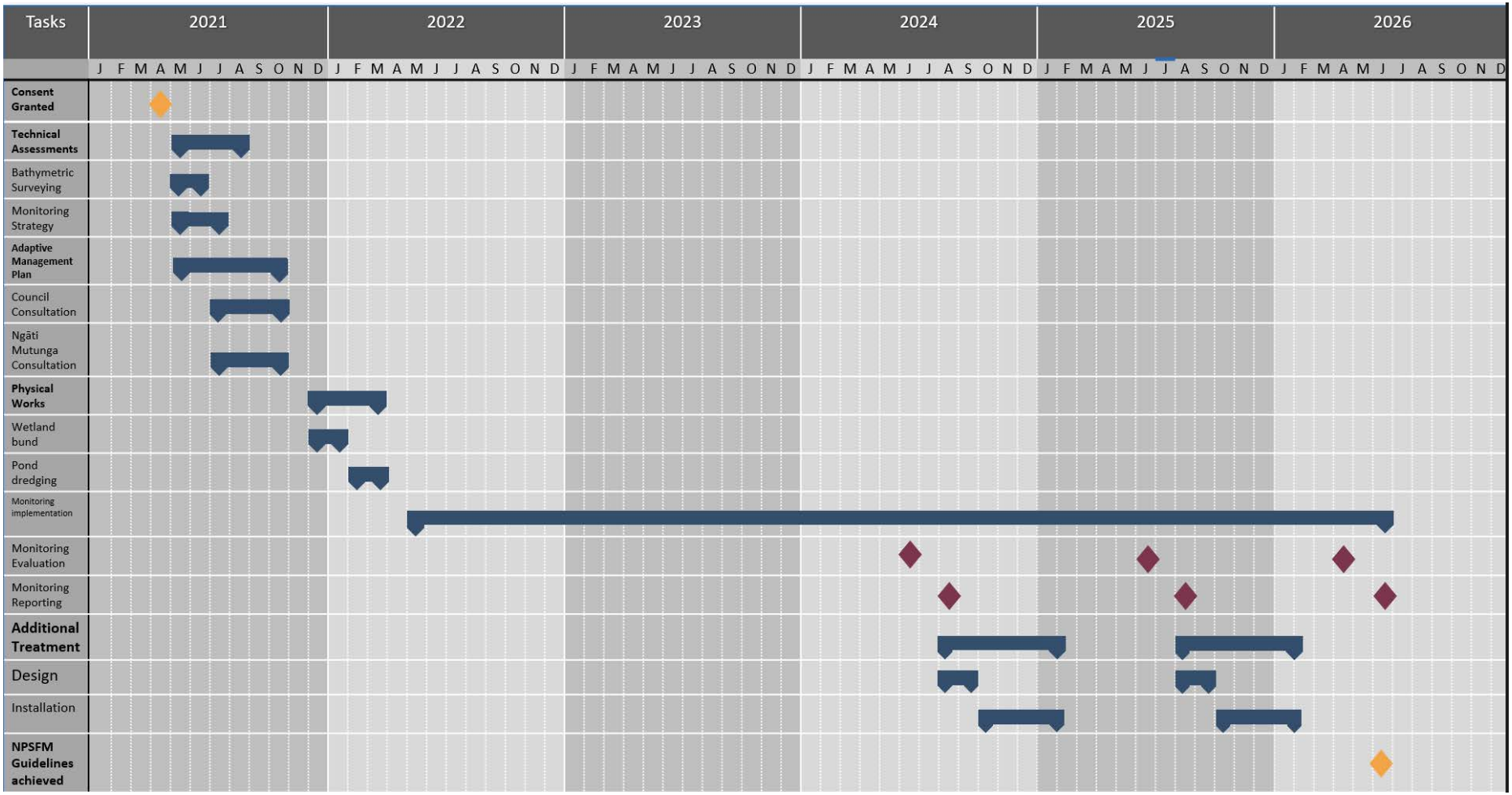
Technical Director

Reviewed and Approved by

Andrew Curtis

Technical Director

APPENDIX A – Proposed Timeline


Tasks
2021
2022
2023
2024
2025
2026
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Consent Granted
Technical Assessments
Bathymetric Surveying
Monitoring Strategy
Adaptive Management Plan
Council Consultation
Ngāti Mutunga Consultation
Physical Works
Wetland bund
Pond dredging
Monitoring implementation
Monitoring Evaluation
Monitoring Reporting
Additional Treatment
Design
Installation
NPSFM Guidelines achieved

Appendix 4 – Memorandum on Condition 28 from PDP

PATTLE DELAMORE PARTNERS LTD
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Web **www.pdp.co.nz**
Auckland Tauranga Wellington Christchurch

memorandum

TO	David Gibson	FROM	Andrew Curtis
	Remediation NZ	DATE	29 March 2021
RE	Comments on Condition 28 in proposed consent for Uruti compost site.		

PDP has previously provided comments on the wording of proposed condition 28. Specifically, the wording in the draft consent was as follows:

The discharges authorised by these consents shall not give rise to suspended or deposited dust at or beyond the boundary of the site that is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:

(a) Dust deposition rate 0.13 g/m^2/day; and or

(b) Suspend dust level 3 mg/m^3.

PDP was comfortable with the general form and intent of the condition but raised concerns about the proposed suspended dust level, and recommended an amended trigger value in line with the Ministry for the Environment Good Practice Guide of 100 µg/m^3 as a rolling 24 hour average.

At the hearing, the Taranaki Regional Council (TRC) officers explained that they did not support PDP's proposal as the value in the consent was consistent with Section 4.2.3 (b) (a) of the Taranaki Regional Air Plan, but would increase the proposed limit to 4 mg/m^3. While PDP agree that in some instances dust may well be visible at 3 or 4 mg/m^3 the mere fact that dust is visible is not necessarily an indicator that it is causing some form of effect.

Normally air quality trigger values or standards consist of two parts, a value and a time period over which the value must be achieved. For example, the National Environmental Standard for PM_{10} is 50 µg/m^3 over a 24 hour period, while that for nitrogen dioxide is 200 µg/m^3 over a one hour period. The standards have been developed to ensure that exposure to the specific pollutant for the time period specified will not result in adverse effects. The average period also ensures that any brief spikes in concentration that are not likely to cause any effects are averaged out.

Consequently, while the condition proposed by TRC sets a standard, the lack of any averaging period means that it effectively becomes an instantaneous standard, which is extremely difficult for any activity to comply with.

Consequently, PDP consider that it is better to adopt the MfE trigger value which is consistent with normal practice in New Zealand.

Prepared by

Andrew Curtis

Technical Director - Air Quality

Appendix 5 – 1 Billion Tree Contract between RNZ and MPI

Ministry for Primary Industries
Manatū Ahu Matua

ONE BILLION TREES FUNDING AGREEMENT

BETWEEN

MINISTRY FOR PRIMARY INDUSTRIES

AND

Remediation (NZ) Limited

PROJECT: Remediation (NZ) Ltd

AGREEMENT NUMBER: 1BT-02438

TABLE OF CONTENTS

ONE BILLION TREES FUNDING AGREEMENT

PARTIES

HER MAJESTY THE QUEEN in right of New Zealand acting by and through the Ministry for Primary Industries and its authorised delegates at the Ministry for Primary Industries ("**MPI**")

And

REMEDIATION (NZ) LTD, NZBN 9429032685909, a duly registered New Zealand company ~~with~~ ("**Recipient**").

AGREEMENT

The Recipient will perform the Activities in accordance with the attached General Terms and the terms and conditions set out in the following Schedules:

Schedule 1: Specific Terms

Schedule 2: Funding and Milestones

Schedule 3: Reporting

SIGNATURE

SIGNED for and on behalf of **MPI** by the person named below, being a person duly authorised to enter into obligations on behalf of MPI:

Helen Somerville

Digitally signed by Helen Somerville
DN: dc=nz, dc=govt, dc=maf, dc=network, ou=Windows8, ou=Users, ou=Tier1, cn=Helen Somerville, email=Helen.Somerville@mpi.govt.nz
Date: 2021.02.19 14:42:53 +13'00'

Signature

Name: **Helen Somerville**

Title: Manager, Forest Grants

Date:

SIGNED for and on behalf of the **Recipient** by the person named below, being a person duly authorised to enter into obligations on behalf of the Recipient:

Signature

Name: **David Paul Gibson**

Title: Director

Date: 01/04/2021

Signature

Name: **Kerry O'Neill**

Title: Director

Date: 01/04/2021

GENERAL TERMS

1. DEFINITIONS

1.1 In this Agreement, unless the context requires otherwise:

Activities means the activities performed or to be performed by the Recipient as described in the Schedules.

Agreement means this Funding Agreement (including the General Terms, all Schedules, and any attachment referred to).

Applicable Landholding means the Landholding applicable to the Activities and includes the land area specified in the Schedules, on which a Forest will be established and maintained as part of the Activities.

Business Day means any day not being a Saturday or Sunday, a public holiday observed in Wellington, or the period from 26 to 31 December each year.

Commencement Date means the date this Agreement commences as set out in Schedule 1.

Confidential Information includes the terms of this Agreement and any information exchanged during the negotiation of this Agreement, and, in relation to each Party, means information provided by, obtained from, or relating to that Party, that becomes known to the other Party under or in connection with this Agreement, which:

(a) is by its nature confidential;

(b) is marked as 'confidential', 'in confidence', 'restricted', 'commercial in confidence' or with a similar designation;

(c) is provided in confidence;

(d) the other Party knows or ought to know is confidential; or

(e) is commercially sensitive to that Party.

Conflict of Interest in relation to the Recipient means any conflict of the Recipient's interests or obligations with its responsibilities under this Agreement. A conflict of interest means that the Recipient's independence, objectivity or impartiality can be called into question. A conflict of interest may be:

(a) actual: where the conflict currently exists;

(b) potential: where the conflict is about to happen, or could happen; or

(c) perceived: where other people may reasonably think that a person is compromised.

Contract Manager means the Recipient's contract manager or MPI's contract manager, as the case may be, identified as such in Schedule 1.

Control means the power to directly or indirectly manage the operation of the Recipient's business or control the composition of the Recipient's board of directors or board of management.

Control measures has the same meaning as in regulation 3 of the Health and Safety at Work (General Risk and Workplace Management) Regulations 2016;

Default Interest Rate means an interest rate per annum equal to the floating rate usually charged by MPI's bank for first mortgages secured over commercial properties plus 5 percentage points.

End Date means the earlier of the end date set out in Schedule 1, or if applicable the date of effective termination of this Agreement.

Extraordinary Event means an event beyond the reasonable control of the Party immediately affected by the event, including:

(a) acts of God, lightning strikes, earthquakes, tsunamis, volcanic eruptions, floods, storms, explosions, fires, pandemics and any natural disaster;

(b) acts of war (whether declared or not), invasion, actions of foreign enemies, military mobilisation, requisition or embargo;

(c) acts of public enemies, terrorism, riots, civil commotion, malicious damage, sabotage, rebellion, insurrection, revolution or military usurped power or civil war; and

(d) contamination from nuclear substances, including radioactivity contamination, or germ warfare or any other such hazardous properties.

Forest means a forest established or to be established in the Applicable Landholding as part of the Activities.

Funding means the amounts paid or to be paid to the Recipient under this Agreement as specified in Schedule 2.

General Terms means these terms entitled "General Terms".

GST means goods and services tax payable at the applicable rate pursuant to the Goods and Services Tax Act 1985.

HSW Act means the Health and Safety at Work Act 2015.

HSW Legislation means the HSW Act and includes all regulations made under that Act and any other health and safety-related legislation relevant to the Recipient's performance of the Activities.

Intellectual Property Rights includes copyright and all rights conferred under statute, common law or equity in relation to inventions (including patents), registered or unregistered trademarks and designs, circuit layouts, data and databases, confidential information, know-how, and all other rights resulting from intellectual activity.

Key Personnel means the people identified as such in Schedule 1.

Landholding means an estate, right, title or interest of any kind held by the Recipient in or over an area of land, and to avoid doubt includes a lease or a registered forestry right allowing for establishment of a forest on the land over which that lease or right is held, but does not include an interest by way of charge or security.

Licensed Material means all or any of the New Material; and

(a) Pre-Existing Material; and

(b) Third Party Material,

in each case included in, embodied in, attached to, or necessary for the use of, the New Material.

Material means:

(a) property, information, documentation or other material in any form; and

(b) the subject matter of any category of Intellectual Property Rights.

Milestone means the milestones which the Recipient is obliged to complete by a specified date or within a specified period, as described in Schedule 2.

Milestone Report means the report described as such in Schedule 3.

New Material means any Material created:

(c) by, for or on behalf of the Recipient;

(d) during the Term of this Agreement; and

(e) that is delivered, presented or otherwise communicated to MPI by or on behalf of the Recipient as a part, or result, of the Activities.

Parties means MPI and the Recipient.

Personnel of any person, means all individuals directly or indirectly engaged by that person. Examples include directors, employees, contract staff, agents, consultants, specialists, support staff and co-opted or seconded staff.

Pre-Existing Material means Material in existence prior the Commencement Date.

Privacy Act means the Privacy Act 2020.

Tax Invoice means a tax invoice as defined in the Goods and Services Tax Act 1985.

Term has the meaning given in clause 4.

Third Party Material means Material owned by a third party.

2. INTERPRETATION

2.1 In this Agreement, unless the context requires otherwise:

(a) to the extent that there is any conflict or ambiguity between the General Terms and the Schedules, the General Terms will take priority.

(b) headings are for guidance only and do not affect interpretation;

(c) the singular includes the plural and vice versa;

(d) where a word or phrase is defined, its other grammatical forms have a corresponding meaning;

(e) any references:

(i) to this Agreement, means this Agreement as amended from time to time and includes all attachments to this Agreement and any document incorporated into this Agreement by reference;

(ii) to a clause or Appendix, is a reference to a clause or Appendix of the Schedule in which the reference is contained; and

(iii) to a Schedule or attachment, are references to a Schedule or attachment of this Agreement;

(f) subject to clause 26 (Notices), anything that this Agreement requires to be done in writing, may be done by email;

(g) references to Dollars or $ are references to New Zealand dollars;

(h) references to monetary amounts are exclusive of GST (if any);

(i) a reference to any statute, regulation, or expression of government policy includes any amendments, re-enactments or replacements of that statute, regulation, or expression of government policy from time to time;

(j) reference to a person includes:

(i) a company, body of persons (corporate or unincorporate) or any state, regional or local government body or agency; and

(ii) that person's representatives, successors and assigns;

(k) "including", "includes", "in particular", "for example" or similar words do not imply any limitations;

(l) no rule of construction applies to the disadvantage of MPI on the basis that MPI put forward this Agreement or any part of it; and

(m) references to time mean New Zealand standard time.

3. ENTERING THIS AGREEMENT

3.1 Each Party represents and warrants that it is authorised to enter into and perform its obligations under this Agreement.

3.2 The Recipient warrants on its execution of this Agreement that:

(a) it is not insolvent or bankrupt and no action has been taken to initiate any form of insolvency or administration in relation to the Recipient;

(b) all information relating to the Activities that was provided by the Recipient to MPI prior to MPI's execution of this Agreement, including in any proposal or presentation by the Recipient, is accurate, complete and true. The Recipient acknowledges that MPI is entering into this Agreement in reliance on such information;

(c) it is not aware of any information that has not been disclosed to MPI which may, if disclosed, materially adversely affect the decision of MPI whether to provide the Funding; and

(d) the Recipient has obtained and will maintain during the Term all necessary licences, permits, and consents to perform its obligations under this Agreement, including if applicable to establish and maintain the Forest on the Applicable Landholding.

4. TERM

4.1 This Agreement commences on the Commencement Date and, unless terminated or extended in accordance with this Agreement, will remain in force until the close of the End Date at which time it shall automatically expire, provided that:

(a) if the Activities have not been performed to the reasonable satisfaction of MPI by that date; and;

(b) MPI requests the continuation of this Agreement, such that the Activities can be performed to the reasonable satisfaction of MPI,

then this Agreement will continue, at no charge to MPI, until the Activities have been performed to the reasonable satisfaction of MPI ("**Term**").

5. RELATIONSHIP

5.1 The Parties agree to:

(a) act in good faith in all matters relating to this Agreement and, without abandoning their own interests, to demonstrate honesty, integrity, openness, reasonableness, and accountability in their dealings with each other; and

(b) discuss matters affecting this Agreement or the delivery of the Activities, whenever necessary and in a timely manner.

6. PAYMENT

6.1 The Recipient may issue a Tax Invoice to MPI for each payment of Funding once the Milestone relating to that payment has been met to MPI's reasonable satisfaction. The Tax Invoice is to be submitted at the same time as the Milestone Report or Final Report to which it applies.

6.2 If the Recipient fails to provide MPI with a Tax Invoice within 12 months of the applicable Milestone date for invoicing, then the Recipient is deemed to have waived any right to that payment by MPI, unless otherwise agreed in writing.

6.3 In applying for a payment of Funding, the Recipient will submit to MPI:

(a) a Milestone Report;

(b) a Tax Invoice which includes:

(i) sufficient details to enable MPI to identify:

a. the Agreement;

b. the particular Milestone which is the subject of the invoice; and

c. the amount of Funding payable; and

(ii) any other details requested by MPI.

6.4 Subject to clauses 6.5 to 6.8 (inclusive), MPI will pay the Recipient's Tax Invoices by the 20th day of the month following the month in which MPI receives the Recipient's application under clause 6.3, which is satisfactory to MPI in all respects. Payment of Funding by MPI is not evidence that the Milestone or Activities to which the invoice relates have been provided in accordance with this Agreement.

6.5 MPI will only make the payment due under clause 6.4 if:

(a) MPI is reasonably satisfied that the Milestone to which the payment relates has been completed by the due date; or

(b) MPI considers in its sole discretion that sufficient progress has been made toward completing the Milestone to which the payment relates by the due date.

6.6 Each payment of Funding will be in the amount specified in Schedule 2 which corresponds to the relevant Milestone completed, but MPI has the discretion to pay a lesser amount where clause 6.5(b) applies. Where a lesser amount is paid, the balance withheld may be paid by MPI to the Recipient, in its sole discretion, on the date of a future payment of Funding or another date determined by MPI.

6.7 Despite this clause 6, MPI's obligation to pay the Funding is subject to:

(a) MPI continuing to have sufficient funding within its budget for the Activities;

(b) there being no un-remedied breach of this Agreement by the Recipient; and

(c) MPI being satisfied on reasonable grounds that the Funding is being appropriately expended on the Activities in accordance with this Agreement.

6.8 If MPI has a bona fide dispute in relation to all or any portion of any Tax Invoice, whether in relation to the Milestones invoiced, the accuracy of the Tax Invoice, Milestone Report or otherwise, MPI may withhold payment of the amount subject to the dispute, provided that:

(a) MPI will pay any undisputed amount when it becomes due and payable; and

(b) the Recipient will continue to perform its obligations under this Agreement while the dispute is resolved.

7. ACTIVITIES

Performance Standards

7.1 The Recipient will perform the Activities in accordance with the terms of this Agreement.

7.2 The Recipient will ensure that the Activities are performed:

(a) promptly with due diligence, care and skill;

(b) by appropriately trained, qualified, experienced and supervised persons;

(c) in accordance with all Government and MPI internal policies and procedures relevant to this Agreement, as notified in writing to the Recipient at the commencement of this Agreement; and

(d) to MPI's satisfaction as reasonably specified by MPI in writing from time to time.

Publicity

7.3 The Recipient will acknowledge MPI as a source of funding in all publications and publicity regarding the Activities. This acknowledgement will take the form of 'Legal Entity acknowledges the co-funding of this project by the Ministry for Primary Industries' One Billion Trees Fund'.

Information

7.4 The Recipient will:

(a) promptly provide MPI with all information relating to the Activities as requested by MPI from time to time, and provide that information as soon as possible if requested by MPI to comply with its statutory, parliamentary or other reporting obligations; and

(b) ensure that all information it provides under this Agreement is factually correct and contains no material omissions.

Issues

7.5 The Recipient will promptly notify MPI of any:

(a) actual or anticipated matter relating to the Activities or the Funding that could:

(i) materially impact on the Activities or the Funding; or

(ii) in relation to the Activities or the Funding, receive media attention; or

(b) material change in the Recipient's entity registration or financial status.

7.6 **Emissions Trading Scheme**:

(a) If this Agreement includes funding for tree planting then the Recipient agrees that to the extent it is planting *Pinus radiata* using the Funding:

(i) the Recipient will not register or attempt to register the resulting *Pinus radiata* Forest in the New Zealand Emissions Trading Scheme for the period of six years from 30 June in the year the Forest was established;

(ii) the Recipient will not at any time claim or attempt to claim New Zealand Units for the resulting *Pinus radiata* Forest, in respect of the period of six years from the year the Forest was established; and

(iii) the Recipient will not agree to or permit any other party with interests in, or in relation to, the Applicable Landholding or Forest, including any forestry rights holder or lessee, to register or attempt to register the resulting *Pinus radiata* Forest in the New Zealand Emissions Trading Scheme, or claim or attempt to claim New Zealand Units for such Forest, in respect of the period of six years from 30 June in the year the Forest was established.

(b) Without limiting anything else in this Agreement, the Recipient will from time to time promptly make available to MPI such information as MPI requires to ensure compliance with this clause 7.6 and to ensure MPI can determine the extent of compliance with this clause 7.6. The Recipient:

(i) agrees MPI may share any such information with the Environmental Protection Authority and/or the Registrar of the New Zealand Emissions Trading Scheme for any purpose;

(ii) agrees the Recipient will provide any and all information and assistance MPI reasonably requires to obtain information from the Environmental Protection Authority and/or the Registrar of the New Zealand Emissions Trading Scheme on any Emissions Trading Scheme registration, or New Zealand Units claimed, in breach of this Agreement;

(iii) consents, for the purposes of s99 of the Climate Change Response Act 2002 (**the Act**), to the Environmental Protection Authority, and others to whom s99(1) of the Act applies, disclosing to MPI information specified in s99(2)(a) of the Act for purposes of MPI determining the extent of compliance with this clause 7.6.

(c) Without limiting any other right or remedy, if the Recipient breaches this clause 7.6, MPI may at any time recover, and the Recipient shall re-pay, the amount of any Funding paid relating to the applicable *Pinus radiata* Forest, together with interest on all such amounts calculated at the Default Interest Rate from the date the Recipient breached this clause 7.6.

(d) The Recipient will not, at any time during the Term or the period of 4 years from the end of the Term, use or permit any other party with interests in, or in relation to, the Applicable Landholding or Forest, including any forestry rights holder or lessee, to use the Forest as part of any offsetting forest land application under the Climate Change Response Act 2002.

7.7 **No harvesting during the Term**: During the Term the Recipient must:

(a) not clear, cause or permit any loss, damage or destruction to any part of the Forest except with MPI's prior written approval. To avoid doubt, harvesting or clear-felling of the Forest during the Term is not permitted;

(b) take all reasonable steps to protect the Forest from loss, damage or destruction due to any cause.

7.8 **UAVs**: The Recipient consents to MPI and its representatives using unmanned aerial vehicles (**UAVs**) to collect information, including imagery, for the purposes of this Agreement, including inspections under clause 24. The use of UAVs shall be subject to the following terms and conditions:

(a) Imagery captured using the UAV (**UAV Data**) will be stored securely by MPI and retained in accordance with MPI's obligations under the Public Records Act 2005.

(b) To the extent that the UAV Data includes any "Personal information" (as defined in the Privacy Act), subject to sub-clause (c), that information will be held, used and disclosed by MPI in accordance with this Agreement and the Privacy Act.

(c) The Recipient acknowledges that the use of UAVs may result in the inadvertent collection of evidence of conduct and/or activities that may amount to offending (whether criminal or otherwise). If MPI (in its sole discretion) considers that data of this nature has been collected, MPI may disclose such UAV Data to the appropriate administrating authorities in relation to the particular conduct and/or activities.

8. MILESTONES

8.1 The Recipient will complete the Milestones, unless it is:

(a) unable to do so due to an Extraordinary Event or MPI's breach of this Agreement; or

(b) expressly instructed to do otherwise in writing by MPI.

8.2 If the Recipient anticipates any delay (for any reason) in the completion of any Milestone, it will give written notice to MPI of the anticipated delay as soon as is reasonably practicable.

8.3 If MPI reasonably believes that the progress of the Recipient has slipped significantly from the timetable required to complete any Milestone, MPI may give written notice to that effect to the Recipient.

8.4 If:

(a) the completion of any Milestone is delayed; or

(b) a notice is served under clauses 8.2 or 8.3;

then the Parties will, as soon as reasonably practicable, discuss and seek to agree the changes necessary to achieve an expeditious return to meeting the Milestone (including changes to the timetable or any Personnel or other resources provided by either Party under this Agreement). Any failure to agree the matters discussed will be a dispute for the purposes of clause 20 (Dispute Resolution).

8.5 Despite clause 8.4, if the completion of any Milestone is delayed other than as permitted under clause 8.1, then (without prejudice to any other right of or remedy available to MPI):

(a) MPI may withhold any payment due on completion of that Milestone until such time as the Recipient has completed that Milestone; and

(b) the provisions of clause 21.2(a) (Termination) will apply.

8.6 Any changes to the Activities or Agreement agreed under clause 8.4 will be documented as a Variation under clause 13 (Variations).

9. PERSONNEL

9.1 The Recipient must ensure that the "Key Personnel", if any, listed in Schedule 1 undertake such roles in respect of the Activities as may be specified in that Schedule.

9.2 Where any Key Personnel are unable to perform their specified roles, the Recipient must notify MPI immediately. The Recipient must, if requested by MPI, provide replacement Personnel acceptable to MPI without additional payment and at the earliest opportunity.

9.3 MPI may give notice, on reasonable grounds, requiring the Recipient to remove one or more Personnel (including any "Key Personnel" specified in Schedule 1) from involvement in the Activities. The Recipient must, at its own cost, promptly arrange for such removal and the provision of replacement Personnel reasonably acceptable to MPI.

9.4 The Recipient's Personnel are not employees, contractors, subcontractors or agents of MPI, or workers in relation to MPI's undertakings. The Recipient will ensure it complies in full with its duties and obligations under the HSW Act and any associated regulations, including the duties set out in Part 2 of that Act to the extent that they apply to the Activities under this Agreement.

10. SUBCONTRACTORS

10.1 The Recipient may not subcontract any of its obligations under this Agreement, other than:

(a) where it has MPI's prior written approval (MPI will not unreasonably withhold its approval for the use of subcontractors); or

(b) where the subcontracting occurs in the ordinary course of the Recipient's business, and the subcontracted service is not substantially dedicated to the performance of this Agreement.

10.2 The Recipient must ensure that:

(a) each subcontractor is fully aware of the Recipient's obligations under this Agreement to the extent necessary for the subcontractor to properly perform its obligations;

(b) each subcontract it enters into is either approved by MPI in writing or is on terms that are consistent with this Agreement, to the extent relevant and material for the performance of the subcontractor's obligations; and

(c) each subcontract restricts the ability of the subcontractor to further subcontract its obligations without first obtaining MPI's consent.

10.3 The Recipient will not be relieved of any of its liabilities or obligations under this Agreement by entering into any subcontract.

10.4 If a subcontractor has failed to deliver any aspect of the Activities being subcontracted as approved under this Agreement and the failure cannot be remedied, MPI may, by notice to the Recipient, require the Recipient to terminate that subcontract immediately. MPI will not be liable for any losses or costs of the Recipient associated with such termination.

10.5 The Recipient will ensure that its contract with each approved subcontractor will contain the same rights as found in clause 25 (Recordkeeping and Audit), and that those rights are directly enforceable by MPI against the subcontractor pursuant to subpart 1 of part 2 of the Contract and Commercial Law Act 2017.

11. CONFLICT OF INTEREST

11.1 The Recipient:

(a) warrants that as at the Commencement Date, it has no Conflict of Interest; and

(b) must do its best to avoid situations that may lead to any Conflict of Interest arising during the Term.

11.2 The Recipient must immediately notify MPI in writing of any matter, event or circumstance that gives rise to any Conflict of Interest. If a Conflict of Interest does arise the Parties must discuss, agree and record in writing how it will be managed.

11.3 The Recipient will use reasonable endeavours to minimise the impact on MPI of any Conflict of Interest. Each Party must pay their own costs in relation to managing a Conflict of Interest.

11.4 If the Recipient fails to notify MPI of a Conflict of Interest, or is unable or unwilling to resolve or deal with the Conflict of Interest as required, MPI may terminate this Agreement in accordance with clause 21 (Termination).

12. COMPLIANCE WITH LAWS

12.1 The Recipient will ensure that in performing its obligations under this Agreement it complies with all relevant laws, regulations, and codes and standards of practice in New Zealand and any other relevant jurisdiction.

12.2 Except as specified in Schedule 1 or agreed in writing by MPI, the Recipient is responsible for ensuring that every necessary and prudent authorisation (including consents, permits and licences) is obtained to allow the Recipient to perform its obligations under this Agreement, including in relation to performance carried out on MPI premises.

13. VARIATIONS

13.1 No variation to this Agreement (each a "Variation") is effective unless it is agreed in writing and signed by a duly authorised representative of both Parties.

13.2 Unless expressly agreed in writing to the contrary, it will be an implied term in every Variation that the Variation will not prejudice any rights or obligations under this Agreement except to the extent those rights or obligations are expressly amended by the Variation.

13.3 If the Recipient proposes to transfer all or any part of the Applicable Landholding to another person (**the Transferee**) the Recipient must ensure before making the transfer it:

(a) has notified MPI in writing of its intention to transfer; and

(b) procures from the Transferee an executed Deed of Novation of this Agreement in a form acceptable to MPI.

To avoid doubt, where the Applicable Landholding is a lease or forestry right, transfer of the Applicable Landholding includes transfer of all or any part of the lease or forestry right affecting the Applicable Landholding to any person other than the Recipient.

13.4 If the Recipient has not procured a novation of this Agreement on or before transferring the Applicable Landholding, without limiting MPI's rights and remedies:

(a) The Recipient remains fully liable for all obligations under this Agreement unless this Agreement is terminated or the Recipient is otherwise released from those obligations by MPI; and

(b) MPI may immediately terminate this Agreement by notice in writing, and in that event the Recipient will be liable to repay the Funding in full to MPI together with interest and any penalties.

14. CONFIDENTIALITY

14.1 Each Party will keep confidential and secure and not use or disclose to any third party any of the other Party's Confidential Information except as set out in clause 14.6 or:

(a) to its professional advisers or Personnel directly concerned with the implementation or operation of this Agreement and to the extent necessary for performing its obligations under this Agreement;

(b) as required by law, court order, other legal obligation, or parliamentary rules or convention;

(c) under the Official Information Act 1982, provided that in the event of a request under such Act, MPI will endeavour (if practicable in the circumstances) to notify the Recipient and provide an opportunity for the Recipient to comment on the information proposed to be released by MPI;

(d) to the extent necessary to subcontract to parties as approved by MPI in accordance with this Agreement;

(e) where the information subsequently becomes part of the public domain through no fault of the Party receiving the information; or

(f) with the prior written consent of the other Party.

14.2 Should a request be made to either Party for information that is confidential to the other Party in accordance with clause 14.1(c), the Party to whom the request is made will notify the other Party as soon as practicable. Such notice will outline the information subject to the request, and allow the Party being notified a reasonable opportunity to provide comment on whether, in its opinion, there are good (or conclusive) reasons for withholding any or all of the information sought.

14.3 Without limiting any specific privacy obligations specified in Schedule 1, the Recipient will comply with the Privacy Act when performing the Activities under this Agreement, and will not disclose any personal information acquired in the course of performing this Agreement to any person other than MPI, or the individual to whom the information relates, except with MPI's consent or in accordance with the Privacy Act.

14.4 Subject to clause 14.1, the Recipient must not disclose any data, results, research papers, conference papers, reports, promotional material, pamphlets or other documentation relating to the Activities without the prior written consent of MPI.

14.5 Each Party acknowledges that a breach of any obligation of confidence under this Agreement may cause the other Party irreparable damage for which monetary damages would not be an adequate remedy. Accordingly, in addition to any claim for damages and any other remedies available at law or equity, the non-breaching Party may seek specific performance or injunctive relief against any breach or threatened breach by the other Party, its Personnel, agents or contractors of this clause 14. Each Party undertakes to provide the other Party with any assistance possible in any such action against any of that first Party's Personnel, agents or contractors.

14.6 Despite anything else in this Agreement or the Recipient's application for the Funding, MPI may use information about this Agreement, the Recipient, the Funding and the Recipient's use of it, including personal information about the Recipient:

(a) to report on and promote the One Billion Trees Funding programme, including publishing case studies on recipients of funding;

(b) to administer MPI's funding programmes, and supply such information to third parties for this purpose; and

(c) to generate anonymised and aggregated statistical and analytical data, use such data to conduct statistical analysis and identify trends and insights, and supply such information and data to third parties for these purposes.

MPI's rights under this clause 14.6 will survive termination or expiry of the Agreement.

15. MEDIA RELATIONS

15.1 Each party may publicise and report on the awarding of the Funding, including the Recipient's and any of its subcontractor's names, the amount of the Funding and a brief description of the Activities on websites and in media releases, general announcements and annual reports.

15.2 Neither Party may post on websites, social networking sites or publicly display, objectionable or derogatory comments about the Activities, this Agreement, each other, or any of their Personnel.

15.3 The Recipient will refer any enquiries from the media, or any other person, about the terms or performance of this Agreement to MPI.

16. EVALUATION

16.1 MPI may at any time during the Term, or within three years after the End Date, undertake, or engage an expert to undertake, a review or evaluation of the Activities, including any progress reports provided by the Recipient in accordance with Schedule 3 (Reporting).

16.2 In relation to any review or evaluation of the Activities, the Recipient must at its cost within 15 Business Days after a request by MPI or the expert:

(a) provide all reasonable assistance to MPI and the expert;

(b) respond to all reasonable requests from MPI or the expert; and

(c) provide any information reasonably required by MPI or the expert.

17. INTELLECTUAL PROPERTY

17.1 This clause 17 does not affect the ownership of the Intellectual Property Rights in any Pre-Existing Material or Third Party Material.

17.2 Subject to clause 17.3, all Intellectual Property Rights in the New Material vest in the Recipient on creation.

17.3 The Recipient grants to MPI and New Zealand's state sector (as defined in the Cabinet Manual 2008) a perpetual, irrevocable, world-wide, royalty-free, non-exclusive, transferable licence (including the right to sublicense) to use, reproduce, adapt, modify, communicate, broadcast, distribute and publish (i) the New Material and (ii) any Pre-Existing Material and/or Third Party Material necessary to enable MPI to do those things with the New Material.

17.4 The Recipient undertakes, at its own expense, to execute and deliver any documents in respect of matters within its control, so MPI can obtain the full benefit of clause 17.3 according to its true intent, including obtaining any third party consents, registering itself as proprietor of any registerable Intellectual Property Rights in the New Material and to perfect its title to any such Intellectual Property Rights as appropriate.

17.5 The Recipient warrants that no rights, including Intellectual Property Rights, of any third party will be infringed by:

(a) the Recipient's performance of the Activities; or

(b) use of the Licensed Materials in accordance with this Agreement.

17.6 If any third party claims that any Activities or the use of the Licensed Materials by MPI in accordance with this Agreement infringe its Intellectual Property Rights, the Recipient must, in addition to any other right or remedy of MPI, promptly at the Recipient's expense:

(a) use its best efforts to secure the rights for the continued provision of the Activities or the use of the Licensed Materials free of any claim or liability for infringement; or

(b) replace or modify the Activities or Licensed Materials, without any degradation in their functionality, performance or quality, so that use of them in accordance with this Agreement does not infringe the Intellectual Property Rights of any third party.

17.7 The Recipient waives, and will use its best endeavours to ensure its Personnel and subcontractors have waived, all moral rights in any New Material prior to its creation.

18. LIABILITY

18.1 The Recipient will be liable to MPI for the acts, defaults and omissions of its Personnel, agents and subcontractors, as fully as if they were the acts, defaults or omissions of the Recipient.

18.2 Neither Party will be liable to the other Party for: (a) any loss of profit, or loss of revenue; or (b) any indirect, consequential, special or incidental loss or damage arising under or in connection with this Agreement.

18.3 The maximum liability of MPI under or in connection with this Agreement, whether arising in contract, tort (including negligence) or otherwise, is limited to the total amount of Funding payable under this Agreement, less any Funding paid by MPI under this Agreement.

18.4 The maximum liability of the Recipient in respect of any single claim or any series of related claims under or in connection with this Agreement, whether arising in contract, tort (including negligence) or otherwise, is limited to the total amount of Funding payable under this Agreement, together with interest and any penalties.

18.5 Clauses 18.2, 18.3 and 18.4 will not apply to a Party's liability under clause 17.6 or for breach of clauses 14

(Confidentiality) or 17.5.

18.6 The Recipient indemnifies MPI against any taxes, levies, penalties, damages or compensation which MPI may be liable to deduct, withhold or pay by reason of the Recipient, or any person used by the Recipient to carry out the Activities, being held to be an employee of MPI.

19. INSURANCE

19.1 The Recipient must effect and maintain insurance sufficient to cover its obligations under this Agreement during the Term and for three years thereafter.

19.2 The Recipient must, on request, provide MPI with sufficient evidence of its insurance cover in relation to this Agreement.

20. DISPUTE RESOLUTION

20.1 Except where a Party seeks urgent interlocutory relief, injunction, or specific performance, or has terminated this Agreement, neither Party may commence court proceedings against the other without the relevant Party using reasonable endeavours to comply with clauses 20.2 to 20.6 inclusive.

20.2 Where any dispute, disagreement, question or difference ("**Dispute**") arises between the Parties on any matter arising out of this Agreement, either Party ("**Initiator**") may notify the other Party ("**Other Party**") in writing of the Dispute ("**Dispute Notice**"). The Dispute Notice must specify the Initiator's:

(a) view of the facts of the Dispute;

(b) legal position on the Dispute;

(c) its suggestion for resolving the Dispute; and

(d) representative authorised to resolve the Dispute.

20.3 The Other Party must respond to the Dispute Notice within five Business Days of receiving it. The Other Party's response must specify its:

(a) view of the facts of the Dispute;

(b) legal position on the Dispute;

(c) its suggestion for resolving the Dispute; and

(d) representative authorised to resolve the Dispute.

20.4 The Parties will enter into negotiations to resolve the Dispute within five Business Days of the Initiator receiving the Other Party's response.

20.5 Where the Parties are unable to negotiate a resolution to the Dispute within 20 Business Days of the Other Party's receipt of the Dispute Notice (or such other time as the Parties agree in writing), then clause 20.6 will apply.

20.6 The Parties will use best efforts to agree on a mediator and a fee for that mediator. However, if the Parties cannot agree within five Business Days of the expiry of the timeframe referred to in clause 20.5, the mediator will be selected, and the mediator's fee determined, by the Chair for the time being of the organisation known as Resolution Institute (or his/her nominee). Mediation will be conducted in all respects in accordance with the Resolution Institute standard mediation agreement, and the Parties will use their best efforts to ensure that mediation is commenced and conducted expeditiously.

20.7 Where mediation does not resolve the Dispute within 10 Business Days of mediation commencing then without prejudice to each Party's right to commence court proceedings, the Parties may agree to commence arbitration proceedings in accordance with the provisions of the Arbitration Act 1996.

20.8 The Parties agree that any mediation or arbitration which the Parties are required to attend shall be conducted in Wellington, New Zealand.

20.9 Pending settlement of the Dispute, the Parties will continue to perform their obligations under this Agreement as far as is practicable as if the Dispute had not arisen. This does not limit either Party's right to terminate this Agreement.

21. TERMINATION

21.1 Either Party may terminate this Agreement, immediately on written notice to the other Party, where the other Party commits a breach of this Agreement that:

(a) is not capable of being remedied and has a material adverse effect on the terminating Party (in the reasonable opinion of the terminating Party); or

(b) is capable of being remedied, but has not been remedied to the terminating Party's reasonable satisfaction within 20 Business Days (or such longer period as the terminating Party may allow in writing) of the non-defaulting Party giving the defaulting Party written notice:

(i) stating the nature of the breach, what is required to remedy it and the time and date by which it must be remedied; and

(ii) which must be given within three months after the non-defaulting Party became aware of the breach.

21.2 MPI may terminate this Agreement immediately by giving written notice to the Recipient, if the Recipient:

(a) fails to complete a Milestone within 10 Business Days after the relevant due date, other than as permitted under clause 8.1 (Milestones);

(b) becomes insolvent or bankrupt;

(c) has an administrator, receiver, liquidator, statutory manager, mortgagee's or chargee's agent appointed;

(d) becomes subject to any form of external administration;

(e) becomes unable to pay its debts as they become due or is presumed to be unable to pay its debts under section 287 of the Companies Act 1993;

(f) is unable to perform its obligations under this Agreement for more than 20 Business Days due to an Extraordinary Event;

(g) ceases to carry on business of the type or within the scope of which the Activities fall, or if MPI is not satisfied that the Recipient's business or any aspect of it remains compatible with performance of the Activities;

(h) fails or is unable to rectify any deficiency in the Activities uncovered by MPI as a result of an audit conducted under clause 25 (Recordkeeping and Audit);

(i) does not secure or use Co-Funding in accordance with this Agreement;

(j) does something, or fails to do something, that, in MPI's opinion, results in damage to MPI's reputation or business, or the reputation or business of the New Zealand Government;

(k) has any Conflict of Interest that:

(i) in MPI's opinion is so material as to impact adversely on the delivery of the Activities, MPI or the New Zealand Government;

(ii) the Recipient failed to notify MPI of; or

(iii) in MPI's opinion, the Recipient is unable or unwilling to resolve or deal with as required by MPI acting reasonably;

(l) fails or is unable to provide acceptable replacement Personnel within 20 Business Days of being requested to do so by MPI under clause 9 (Personnel);

(m) assigns this Agreement other than in accordance with clause 28.7 (Assignment); or

(n) has provided or provides information to MPI that is misleading or inaccurate in any material respect.

21.3 Either party may terminate this Agreement immediately by giving 10 Business Days' written notice to the Recipient if MPI has confirmed in writing to the Recipient that it has insufficient funding within its budget for the Activities.

22. EFFECT OF EXPIRY OR TERMINATION

22.1 Without prejudice to MPI's other rights or remedies (including the rights set out in Schedule 2), on expiry or termination of this Agreement:

(a) MPI may require the Recipient to provide evidence of how the Funding has been spent;

(b) any Funding that has not yet been paid by MPI will not be paid, except in respect of Activities performed in accordance with this Agreement prior to expiry or termination; and

(c) each Party (the **first party**) must promptly return to the other Party all information and property (including Confidential Information) of the other Party in the first party's possession or control.

22.2 Expiry or termination of this Agreement will not:

(a) prejudice any other rights and remedies of the Parties under this Agreement or otherwise provided by law; or

(b) affect any part of this Agreement which expressly, or by its nature, survives termination or expiry, including clauses 7.6, 7.7, 14 (Confidentiality), 15 (Media Relations), 16 (Evaluation), 17 (Intellectual Property), 18 (Liability), 20 (Dispute Resolution), 22 (Effect of Expiry or Termination), 23 (Contact Persons), 24 (Inspection), 25 (Recordkeeping and Audit), 26 (Notices), 27 (Extraordinary Events) and 28 (Miscellaneous).

23. CONTACT PERSONS

23.1 All matters relating to this Agreement (including matters concerning interpretation of this Agreement) will be directed to MPI's Contract Manager or the Recipient's Contract Manager.

23.2 If a reasonable attempt to contact MPI's Contract Manager in accordance with clause 23.1 is unsuccessful, enquiries can be directed to the person for the time being holding the office of MPI Grants' Coordinator.

23.3 If a reasonable attempt to contact the Recipient's Contract Manager in accordance with clause 23.1 is unsuccessful, enquiries can be directed to the chief executive or a director of the Recipient.

23.4 Each Party may from time to time change the person designated as its Contract Manager on 10 Business Days' written notice to the other Party.

24. INSPECTION

24.1 The Recipient will ensure that MPI Personnel, agents and contractors, have access, at any reasonable time and for any reasonable purpose in connection with the Activities (including through the use of UAVs), free of charge, to any of the Recipient's property or premises relevant to this Agreement, including the applicable Landholding, and will ensure that any subcontracts confer on MPI an equivalent right of access for inspection.

25. RECORDKEEPING AND AUDIT

25.1 The Recipient must keep and maintain full, accurate and up to date records, including financial records, in relation to the provision of Activities, the Co-Funding and all money paid and payable by MPI under or in relation to this Agreement, sufficient to enable MPI to:

(a) meet its obligations under the Public Finance Act 1989;

(b) carry out an audit for the purposes specified in clause 25.2; and

(c) carry out a review or evaluation in accordance with clause 16 (Evaluation).

The Recipient must retain such records for at least seven years after termination or expiry of this Agreement.

25.2 At any time during the Term, or after the End Date where the Parties are in dispute, any Personnel or authorised agent of MPI may conduct an audit for the purpose of:

(a) determining the Recipient's level of compliance with this Agreement (including whether there has been a breach of this Agreement);

(b) determining whether Activities and Milestones invoiced for by the Recipient have been performed according to this Agreement; or

(c) assisting in resolving a matter in Dispute between the Parties.

25.3 During an audit conducted under this clause 25, MPI may:

(a) enter any premises of the Recipient or its subcontractors used in connection with provision of the Activities at any reasonable time during usual business hours;

(b) inspect any records held under clause 25.1 in relation to the provision of Activities or any matter in dispute between the Parties; and

(c) meet with and/or contact and speak to any or all Personnel involved with provision of the Activities, provided that this obligation shall be subject to such Personnel being employed by the Recipient at the time of the audit.

25.4 The Recipient will, at its expense, provide appropriately qualified staff to assist MPI to conduct the audit under this clause 25. MPI will pay all other reasonable costs incurred by the Recipient that are directly associated with the audit.

25.5 At least five Business Days prior to commencing an audit, MPI will notify the Recipient in writing of its intention to conduct an audit and of the intended scope and timing of the audit.

25.6 Where an audit conducted under this clause 25 identifies any serious concern or material non-compliance with the terms of this Agreement, MPI may require an additional audit or audits or other reasonable inquiries to be carried out at the Recipient's expense (such expenses including MPI Personnel costs at external charge-out rates).

25.7 MPI will advise the Recipient in writing of the scope and timing of any additional audit or inquiries required.

25.8 MPI will promptly notify the Recipient of the results of any audit conducted under this clause 25. Where any deficiencies are identified in such an audit, the Recipient will promptly take steps to remedy the deficiencies.

26. NOTICES

26.1 Any notice or other communication under this Agreement will be deemed to be validly given if in writing and delivered by hand, registered mail, national post or international post, facsimile, or email (subject to the remainder of this clause 26) to the receiving Party's Contract Manager.

26.2 Unless the contrary is shown, any notice will be deemed to have been given on the date when actually delivered personally or by registered mail, on the second Business Day following posting to a national address, on the seventh Business Day following international posting, on the date sent by facsimile transmission if transmitted before 5:00 pm or on the next Business Day if transmitted after 5:00 pm, and on

the date that receipt of an emailed notice is acknowledged by the recipient personally (that is, not by any automatically generated system email).

26.3 The Parties agree that no notice required or permitted to be given pursuant to clause 20 (Dispute Resolution) or clause 21 (Termination) may be given by email.

27. EXTRAORDINARY EVENTS

27.1 Neither Party will be liable to the other for any failure to perform its obligations under this Agreement by reason of an Extraordinary Event. The benefit of this clause does not extend to any Extraordinary Event if and to the extent that:

(a) the effects of the event could have reasonably been prevented, avoided, overcome or mitigated by implementing reasonable precautions against the event;

(b) the affected Party is or was directly responsible for the event;

(c) the event is caused by:

(i) any failure of a contractor of the affected Party, except to the extent the contractor was itself affected by an event which, if it occurred in relation to a Party, would have been an Extraordinary Event;

(ii) a lack of funds for any reason;

(iii) the affected Party's own breach or negligence; or

(iv) strikes, lockouts, or any other form of labour dispute or delay caused by contractual or labour relations between either Party and any of its Personnel, agents, contractors or suppliers.

27.2 The Party affected by an Extraordinary Event must:

(a) notify the other Party, as soon as practicable after the Extraordinary Event occurs, of:

(i) the nature of the circumstances giving rise to the Extraordinary Event;

(ii) the extent of the affected Party's inability to perform under this Agreement;

(iii) the likely duration of that non-performance; and

(iv) the steps being taken to remedy, or reduce the impact of the Extraordinary Event;

(b) use its best endeavours to avoid or remove the Extraordinary Event and to minimise and mitigate its effects on that Party's obligations; and

(c) continue to perform its obligations under this Agreement as far as practicable.

27.3 MPI is not obliged to pay any Funding for so long as an Extraordinary Event prevents the Recipient from performing its obligations under this Agreement.

28. MISCELLANEOUS

Health and Safety

28.1 The Recipient will:

(a) consult, cooperate and coordinate with MPI to ensure that the Parties comply with their respective obligations under HSW Legislation as they relate to this Agreement;

(b) perform its, and ensure that its Personnel perform their, obligations under this Agreement in compliance with the HSW Legislation, including obligations of a PCBU under ss36–43 of the HSW Act; and obligations relating to the identification of hazards and implementation of control measures under the Health and Safety at Work (General Risk and Workplace Management) Regulations 2016;

(c) comply with all reasonable directions of MPI relating to health and safety from time to time;

(d) maintain a general health and safety policy and practices that are appropriate to the nature of the Activities;

(e) comply with its own health and safety policy and practices, and ensure its Personnel and subcontractors so comply; and

(f) notify all notifiable events occurring during performance of the Activities to MPI to WorkSafe NZ (with a copy to MPI) within the timeframe and in accordance with the requirements of the HSW Act.

Entire agreement

28.2 This Agreement constitutes the entire agreement between the Parties and supersedes all prior agreements, representations, understandings and negotiations, whether written or oral of the Parties. The Parties acknowledge that they are not relying on any term, condition, representation or agreement that is not set out in this Agreement, unless such term or condition is implied by law.

Costs

28.3 Subject to any express provision in this Agreement to the contrary, each Party is to pay its own legal and other costs and expenses relating directly or indirectly to the negotiation and preparation of this Agreement.

Privity

28.4 Only a Party to this Agreement may enforce, and have any benefit of, this Agreement unless specifically provided otherwise in Schedule 1.

Relationship

28.5 Nothing in this Agreement creates an employment, fiduciary, partnership, agency or joint venture relationship between MPI and the Recipient. Neither Party has authority to bind or represent the other Party in any way or for any purpose. This Agreement is not an exclusive arrangement between the Parties, and MPI may enter into contracts with third parties in respect of the same or similar Activities.

Waivers

28.6 No waiver of any rights or benefits arising under this Agreement is effective unless it is in writing and signed by the Party waiving. A waiver of a breach does not prejudice the waiving Party's rights in respect of any other breach. No delay, failure or forbearance by the Parties to exercise (in whole or in part) any right, power or remedy under this Agreement will operate as a waiver.

Assignment

28.7 The Recipient may not assign, transfer or otherwise deal with any of its rights or obligations under this Agreement without MPI's prior written approval. MPI may withhold its approval in its sole discretion.

Change of Control

28.8 The Recipient will notify MPI as soon as reasonably practicable of any expected change of Control of the Recipient, and notify promptly of any actual change of Control of the Recipient. Any change in Control of the Recipient is deemed to be an assignment of this Agreement and the provisions of clause 28.7 will apply.

Severability

28.9 If any provision of this Agreement is held to be invalid, illegal or unenforceable, such provision will be severed and the remainder of this Agreement will remain in full force and effect.

Counterparts

28.10 This Agreement may be executed in counterparts, meaning that execution will be complete when each Party holds a copy (which can be a faxed or emailed copy) of this Agreement signed by the other Party, even though the signatures of both Parties do not appear on the same copy.

Joint and several liability

28.11 Where at any time, the Recipient consists of more than one person, each person shall be jointly and severally liable in respect of the obligations under this Agreement.

28.12 Where any trustee of the Trust acts in an independent capacity and has no interest in the assets of then Trust other than as trustee ("Professional Trustee") then the Professional Trustee is liable under this Agreement only to the extent of an amount equal to the value of the assets of the Trust available from time to time to meet the Professional Trustee's liability, to which shall be added to the sum (if any) by which the value has been diminished by any breach caused by the Professional Trustee's wilful default or dishonestly.

Governing law

28.13 This Agreement and its formation are governed by New Zealand law. Both Parties submit to the non-exclusive jurisdiction of the New Zealand courts.

SCHEDULE 1: SPECIFIC TERMS

1. DESCRIPTION OF ACTIVITIES

The Recipient will plant, establish and maintain a Forest, namely:

141.42 hectare forest planting consisting of: 12.72 hectares of Manuka forest, 44.24 hectares of exotic forest (Redwood and Macrocarpa), 84.46 hectares of native forest on a property in Urenui, Taranaki.

Applicable Landholding (Land legal description):

Certificate of title number
TNA1/1241
Legal description of property
Part Section 4 Block II Upper Waitara Survey District
Address of property to be planted
640 Mokau Road, Urenui 4379
Who is the legal owner of this land?
Remediation (NZ) Limited
Who has signing authority for decisions made about this land?
David Paul Gibson and Kerry O'Neill

(see also the map attached as Appendix 1)

The Recipient must comply with the Management Plan set out in Schedule 2.

2. TERM

(Clause 4 (Term) of General Terms)

Commencement Date: **27 February 2021**

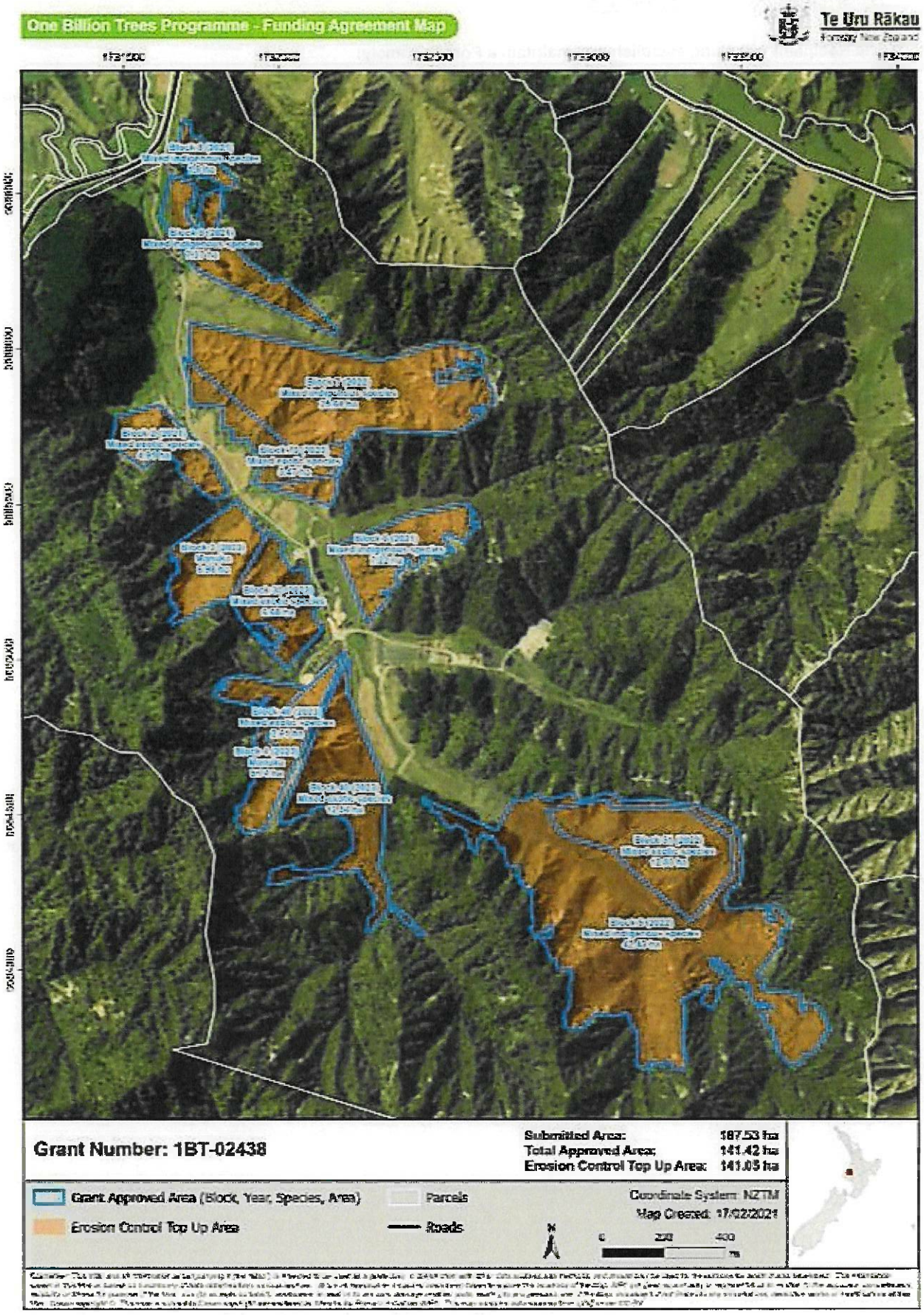
End Date: **26 February 2031**

3. CONTACT DETAILS

The initial contact persons for each Party are below. If a Party's contact persons or their details change, it must notify the other Party in writing in advance in accordance with clause 23.4 (Contact Persons) of the General Terms.

Party	**Contract Manager**
MPI	Manager, Forestry Grants PO Box 1340, Rotorua 3010
Recipient	Name: David Gibson Title: General Manager-Special Projects Email: david@revitalfert.co.nz Phone: +64 27 4712012 Postal address: PO Box 8046, New Plymouth, 4340

Appendix 1 – Map of Applicable Landholding



SCHEDULE 2: FUNDING

1. MPI FUNDING

The total funding available under this Agreement is detailed below in Table 1 (plus GST, if any).

Conditions of Funding: The Recipient must ensure the Forest meets the Minimum Establishment Standards set out below in order to achieve Milestone 2:

Minimum Establishment Standard for Indigenous mixed planting: means at least 750 stems per hectare of which 300 stems per hectare should be tall tree species (capable of reaching 5 metres in height at maturity, excluding Manuka), successfully established and free from weed competition, visually verifiable and at least 30cm in height. Seedling growth and vigour consistent with long term maintenance of the area. Tall tree species are relatively evenly distributed over each hectare enabling the forest definition to be achieved.

Minimum Establishment Standard for Manuka planting: means at least 750 stems per hectare, successfully established and free from weed competition, visually verifiable and at least 30cm in height. Seedling growth and vigour consistent with long term maintenance of the area.

Minimum Establishment Standard for Exotic planting: means at least 750 stems per hectare, successfully established and free from weed competition, visually verifiable and at least 30cm in height. Seedling growth and vigour consistent with long term maintenance of the area.

Minimum Establishment Standard for Exotic (Redwood) planting: means at least 500 stems per hectare, successfully established and free from weed competition, visually verifiable and at least 30cm in height. Seedling growth and vigour consistent with long term maintenance of the area.

Our reference 1BT-02438 Remediation (NZ) Ltd Planting

The table below outlines the funding :

Table 1

Block	Species	Area (ha)	Start Year	Grant rate ($/ha)	Base grant value	Top-Up Funding	Total Funding
2	Other Exotics	4.91	2021	$1,500	$7,365	$2,455	$9,820
3	Manuka/Kanuka	6.98	2023	$1,800	$12,564	$3,490	$16,054
4	Manuka/Kanuka	5.74	2023	$1,800	$10,332	$2,870	$13,202
5	Indigenous mixed planting	42.43	2022	$4,000	$169,720	$21,215	$190,935
6	Indigenous mixed planting	7.22	2021	$4,000	$28,880	$3,610	$32,490
7	Indigenous mixed planting	25.64	2022	$4,000	$102,560	$12,820	$115,380
8	Indigenous mixed planting	9.17	2021	$4,000	$36,680	$4,400	$41,080
30 (3B)	Other Exotics	6.68	2023	$1,500	$10,020	$3,340	$13,360
40 (4B)	Other Exotics	15.15	2023	$1,500	$22,725	$7,575	$30,300
51 (5B)	Other Exotics	12.03	2022	$1,500	$18,045	$6,015	$24,060
70 (7B)	Other Exotics	5.47	2023	$1,500	$8,205	$2,735	$10,940
		141.42			**$427,096**	**$70,525**	**$497,621**

The table below outlines the top up funding :

Table 2

Erosion top-up	**Area (ha)**	141.05
	Value ($)	70,525
Site-prep top-up	**Area (ha)**	
	Value ($)	
Fencing top-up	**Area (ha)**	
	Value ($)	0
		$70,525

2. CLAIMS EVIDENCE AND PAYMENTS

a) Claims for Milestone payments of Funding must be made with 12 months of the milestone due date outlined in table 3 below.

b) Any variation to this claim timeline will need to be discussed with MPI's contract manager. Please email 1bt@mpi.govt.nz

c) Evidence outlined in Final Milestone Report (refer Schedule 3) must be provided with the claim form

Financial Management

The Recipient must:

(a) ensure that any payments of Funding made to third parties in connection with this Agreement (including to subcontractors) are correctly made and properly authorised and that the Recipient maintains proper and diligent control over the incurring of all liabilities;

(b) maintain an appropriate financial management system to ensure that the Funding is separately identified and managed within its accounts;

(c) not use the Funding for the purposes of guaranteeing, or as security for, any loan, credit, payment or other interest, or in the context of any litigation, except with MPI's prior written approval.

STOP / GO Points for Funding

The Activities may identify STOP / GO points where further Funding is dependent on specified criteria being met or Milestones being completed. Where any such criteria are not met or Milestones not completed, MPI is not obliged to provide the further Funding dependent on those criteria or Milestones.

Repayment

Without limiting any other right or remedy, MPI may recover Funding from the Recipient as follows:

(i) **Misspent Funding.** At any time MPI may recover the amount of any Funding that has been spent or used other than in accordance with this Agreement, together with interest on all such amounts calculated at the Default Interest Rate from the date of the misspending to the date the money is repaid.

(ii) **Activities Abandoned.** If the Recipient has abandoned the Activities or stated an intention to abandon the Activities, and does not within 10 Business Days of being requested to do so by MPI demonstrate to MPI's satisfaction that the Recipient will proceed with the Activities, MPI may recover an amount up to the total value of the Funding. MPI may not recover under this sub-clause if the Recipient satisfies MPI that it acted on reasonable grounds in deciding to abandon the Activities.

(a) **Repayment notice.** MPI may give the Recipient a notice requiring the Recipient to pay to MPI an amount which MPI is entitled to recover under this clause. If MPI gives a notice under this clause, the Recipient must pay the amount specified in the notice in full within one month after the date of the notice.

(b) **Interest.** If the Recipient fails to make payment as required by this clause, the Recipient must pay MPI interest calculated at the Default Interest Rate from the date payment is due until the date the money is repaid.

3. MILESTONES

Milestone Payment schedule : Guidance Dates only

Table 3 + 2 years from Planting

Block	Milestone 1 Activity Underway		Milestone 2 Establishment & Maintenance		Totals
	Date (Due)	Amount	Date (Due)	Amount	
2	Jun 2021		Jun 2023		
Other Exotics	30%	$2,946	70%	$6,874	**$9,820**
3	Jun 2023		May 2025		
Manuka/Kanuka	30%	$4,816	70%	$11,238	**$16,054**
4	Jun 2023		May 2025		
Manuka/Kanuka	30%	$3,961	70%	$9,241	**$13,202**
5	Jun 2022		May 2024		
Indigenous mixed planting	30%	$57,281	70%	$133,654	**$190,935**
6	Jun 2021		Jun 2023		
Indigenous mixed planting	30%	$9,747	70%	$22,743	**$32,490**
7	Jun 2022		May 2024		
Indigenous mixed planting	30%	$34,614	70%	$80,766	**$115,380**
8	Jun 2021		Jun 2023		
Indigenous mixed planting	30%	$12,324	70%	$28,756	**$41,080**
30 (3B)	Jun 2023		May 2025		
Other Exotics	30%	$4,008	70%	$9,352	**$13,360**
40 (4B)	Jun 2023		May 2025		
Other Exotics	30%	$9,090	70%	$21,210	**$30,300**
51 (5B)	Jun 2022		May 2024		
Other Exotics	30%	$7,218	70%	$16,842	**$24,060**
70 (7B)	Jun 2023		May 2025		
Other Exotics	30%	$3,282	70%	$7,658	**$10,940**
		$149,287		**$348,334**	**$497,621**

The Recipient will use the Funding to perform the Activities as necessary to complete the Milestones.

As part of each Milestone payment claim the Recipient must certify that it has complied with this Agreement, including clause 7.6 (Emissions Trading Scheme).

If the Funding is being used to establish a plantation forest, the Recipient will be expected to comply with NES-PF requirements. At Milestone 2, the Recipient must provide the following to receive the establishment milestone payment:

- A copy of the notice provided to the local authority before planting (which includes a copy of the WTRC score), and any relevant correspondence; or
- A valid resource consent for the activity.

Rounding: All figures used in, or calculations resulting from, the Milestone payment tables in this schedule have been rounded to the nearest two decimal places, with 0.005 being rounded upwards.

4. MANAGEMENT PLAN

Funding is provided based on the following Management Plans:

Block/stand ID
Block 2, Block 30 (3B), Block 40 (4B), Block 51 (5B), Block 70 (7B)
Pre-planting plan
Gorse removal and spot spraying to be undertaken.
Planting plan
800 stems per hectare of exotic seedlings (Redwoods and Macrocarpa) to be planted.
Post-planting plan
Pruning and post-planting weed removal by hand or spot spray to be undertaken.
Fencing Plan
Fencing already established.
Pest control plan
Weeds to be controlled by spot spraying. A professional culler will be used to cull goats 2 months prior to planting, a further cull 1 week before planting, and then on a monthly basis for the first year. The organisations staff members will be regularly checking for goats whilst on site. If goats are present culler will be contracted immediately to carry out control.

Block/stand ID
Blocks 3 and 4
Pre-planting plan
Gorse removal and spot spraying to be undertaken.
Planting plan
1,120 stems per hectare of manuka seedlings to be planted
Post-planting plan
Pruning and post-planting weed removal by hand or spot spray to be undertaken.
Fencing Plan
Fencing already established.
Pest control plan
Weeds to be controlled by spot spraying. A professional culler will be used to cull goats 2 months prior to planting, a further cull 1 week before planting, and then on a monthly basis for the first year. The organisations staff members will be regularly checking for goats whilst on site. If goats are present culler will be contracted immediately to carry out control.

Block/stand ID
Blocks 5 - 8
Pre-planting plan
Gorse removal and spot spraying to be undertaken.
Planting plan
1,600 stems per hectare of indigenous seedlings to be planted
Post-planting plan
Pruning and post-planting weed removal by hand or spot spray to be undertaken.
Fencing Plan
Fencing already established.
Pest control plan
Weeds to be controlled by spot spraying. A professional culler will be used to cull goats 2 months prior to planting, a further cull 1 week before planting, and then on a monthly basis for the first year. The organisations staff members will be regularly checking for goats whilst on site. If goats are present culler will be contracted immediately to carry out control.

SCHEDULE 3: REPORTING

1. REPORTS

The Recipient will report to MPI as set out in the table below. Subject to the specification below, each report will be consistent with relevant industry standards and best practice for the relevant type of report and be provided in any format reasonably required by MPI. Each report submitted to MPI must be duly authorised by the Recipient.

Report Specification
MILESTONE REPORT A report must be submitted to MPI on completion of each Milestone, and must include: • a description of the Milestone(s) to which the report relates; • evidence that the Milestone has been completed; • a copy of any physical output/deliverable required for the completion of the Milestone; • any other information reasonably requested by MPI concerning the Milestone or the Activities; and; • the Tax Invoice for the applicable portion of Funding for completion of the Milestone.
PROGRESS REPORTS MPI may require from time to time that the Recipient submit a report regarding its overall progress in relation to the Activities, this Agreement, and any other matters advised by MPI.

MPI may request documentary evidence from the Recipient in relation to any item reported against.

	Land Size post GIS/FALU	% erosion prone	Tree Type	Proposed Stems	Planting Year	Stems
Block 2	4.91	100.00%	Exotic	800	2021	3,928
Block 3	6.98	100.00%	Manuka	1120	2023	7,820
Block 4	5.74	100.00%	Manuka	1120	2023	6,428
Block 5	42.43	100.00%	Indigenous	1600	2022	67,888
Block 6	7.22	100.00%	Indigenous	1600	2021	11,552
Block 7	25.64	100.00%	Indigenous	1600	2022	41,024
Block 8	9.17	95.97%	Indigenous	1600	2021	14,672
Block 30 (3B)	6.68	100.00%	Exotic	800	2023	5,344
Block 40 (4B)	15.15	100.00%	Exotic	800	2023	12,120
Block 51 (5B)	12.03	100.00%	Exotic	800	2022	9,624
Block 70 (7B)	5.47	100.00%	Exotic	800	2023	4,376

Year 2021-30,000 stems approx

Year 2022-128,000 stems approx

Year 2023-35,000 stems approx.