URUTI COMPOSTING & VERMICULTURE FACILITY

Release of Final Product

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Table of Content

0.0 Terms and Definitions

Aerated Static Pile - A composting method whereby a static compost pile or windrow is constructed over a grid of perforated piping and a layer of bulking agent (such as wood chips) and/or compost. Fans are used to force (inject) or draw (induct) air into the pile and support aerobic decomposition. The pile may be topped with a layer of compost and/or wood chips to filter odorous compounds and to provide insulation thereby maintaining a temperature adequate to destroy pathogens.

- Composting conditions characterized by the predominance of micro-organisms that require the presence of oxygen.

Anaerobic - Conditions characterized by the predominance of micro-organisms which thrive in the absence of oxygen.

Biodegradable Material - Organic materials that can be broken down by naturally occurring bacteria and other micro-organisms, usually in the presence of moisture and oxygen, into simple, stable compounds.

Biosolids - Includes:

> Pulp and paper biosolids - solid or semi-solid residue from the treatment of wastewater from a manufacturer of pulp and paper, recycled paper or products such as corrugated cardboard.

Bulk Density - A characteristic of feedstock mix or compost, measured by dividing the mass of the material by the volume of the material.

Bulking Agent - Bulking agent means material, usually carbonaceous, such as wood chips or shredded greenwaste, added to a compost system to maintain airflow by reducing settling and compaction.

Compost - Compost is a stabilized humus that is a solid, mature product produced by an aerobic composting process that meets the compost standards of this document.

Composting - composting" means the treatment of waste by aerobic decomposition of organic matter by bacterial action for the production of stabilized humus.

Contaminant - is also used in this document to refer to foreign materials (such as dirt, heavy metals, plastic scraps, etc.) that make it more difficult to compost a feedstock, or reduce the value of the final compost.

Feedstock - Feedstock means waste that contains the primary biologically decomposable organic materials used for the production of compost. Supplements including additives, amendments and bulking agents are not feedstock.

Fertilizer - Natural or synthetic material used to add nutrients to soil. Most chemical fertilizers contain a defined mixture of nitrogen (N), phosphorus (P) and potassium (K).

Foreign Matter - Any matter resulting from human intervention and made up of organic or inorganic components such as metal, glass, or plastic that may be present in compost. Foreign matter does not

include mineral soils, woody material, and rocks.

Sharp Foreign Matter - Any foreign matter that may cause damage or injury to humans and animals during or resulting from its intended use. Sharp foreign matter may consist of, but is not limited to, the following: metallic objects or pieces of metallic objects, for example utensils, fixtures, electrical wiring, pins, needles, staples, nails, bottle caps, glass and porcelain or pieces of glass and porcelain, for example, containers, dishes, glass panes, electric light bulbs and tubes, mirrors.

Leachate - The liquid which passes through (and, on occasion, out of) a compost pile as the result of rain and other water percolating through the composting material.

Leaf and Yard Waste - Includes waste consisting of plant materials but not tree limbs or other woody materials in excess of 7 centimetres in diameter.

Maturity - A condition of compost that results from the thorough decomposition of the feedstock materials, and as a result exhibits very limited biological activity, which enables the compost to be stored and handled without adverse effect, including offensive odours, and used without risk to plants from residual phytotoxic compounds.

Organic Soil Conditioning – Any composted or pasteurised organic product, including vermicast, that is suitable to adding to soils to improve its characteristics for crop or ground cover growth.

Organic Waste - Waste containing carbon-based compounds. In the context of composting, the term is often used in a more restrictive sense to refer specifically to biodegradable, compostable wastes of plant or animal origin, such as food scraps, grass clippings, yard wastes, etc., but excluding lumber, plastic, rubber, oils and other hydrocarbons, and other organic chemicals.

Pathogens - Organisms, including some bacteria, viruses, fungi, and parasites, that are capable of producing an infection or disease in a susceptible human, animal, or plant host.

Quality Assurance (QA) - A system of activities and procedures that allows the producer of a product (i.e., data) to demonstrate that it is constantly producing a product of definable quality. QA consists of those activities that assure that all necessary QC activities were defined and carried out according to protocol. QA is primarily a supervisory responsibility.

Quality Control (QC) - A description of specific activities conducted for the purpose of maintaining quality in sample collection, analysis, and recording. QC is primarily a scientific or technical function performed by research or technical staff.

Quality Management (QM) - The process of ensuring that a full and complete QA and QC program is established, that proper evaluation of the total program occurs, and that appropriate actions are taken when satisfactory quality is not being achieved. QM involves the specification of what constitutes acceptable quality, the detailing of the means by which it is determined that the specified quality has been achieved, and the defining of what actions will be taken when the desired quality is not met. QM is normally the responsibility of project management.

Soil Conditioner - Any material added to the soil to beneficially enhance the soil's physical or chemical properties or biological activity.

Source Separation - Use of this term in this document refers to the segregation of used organic materials from municipal waste at the point of generation to facilitate composting.

Stability - The term 'stability' is sometimes used interchangeably with 'maturity'. However in it's generally accepted meaning, 'stability' refers only to reduced biological activity. It is a sub-set of maturity. Compost could appear stable as a result of a nutrient imbalance or lack of moisture, and not extensive decomposition, and could become 'unstable' if any of the limiting conditions are removed. All mature compost is stable, but not all stable compost is mature.

Thermophilic Phase - A period in the composting process characterized by the predominance of active micro-organisms that thrive at a temperature range of 45°C to 75°C.

VAR Requirements-Vector Attraction Reduction. The term 'vector' refers to potential carriers of disease, such as flies, mosquitoes, birds and rodents. In order to meet both Grade A1 and B1 stabilisation standards, the organic material must have been treated in such a way as to reduce their attractiveness to these disease carriers; this process is known as vector attractant reduction (VAR). In the context of composting, VAR can be achieved by either: reducing the attractiveness of the composting product to vectors, by biological processes or specific chemical and physical conditions; or by removing access to the composting product from vectors. High-quality compost (A1) are those in which vector-attracting compounds, such as volatile solids, have been reduced or removed.

Windrow Composting - A composting method whereby the material to be composted is stacked into elongated piles with a triangular cross-section. Both turned and static windrow systems are used for composting. In the former, the windrows are periodically torn down and reconstructed or turned mechanically (the outside layer of the original windrow becoming the interior of the rebuilt windrow), to aerate and mix the organic wastes, speed the decomposition process, and reduce odours.

Wood - Wood suitable for composting generally includes lumber, tree trunks, tree branches or other similar woody material. Wood does not include material that is contaminated by glue, paint, preservatives or other materials or attached to non-wood material (e.g., particle board, chip board, plywood).

1.0 Purpose of the Plan

The purpose of this document is to provide the methodology and procedures required to certify compost products produced on the Uruti site are suitable for release from the composting area. Products may be used either on site or off site depending on the standard the product meets.

2.0 General

Products produced on the Uruti site must achieve a specified specification before they are categorised as suitable for release to be transferred off site or used on site. The 'Release of Final Product' documents the specifications the products must achieve before they are permitted to be released and the testing methodology.

This procedure refers to 'Guidelines for Beneficial Use of Organic Materials on Productive Land' (BUOMPL) published by Water New Zealand and the EPA Guide 'Sample Collection and Laboratory Preparation 02.01 Field Sampling of Compost Materials'.

2.1 Product Monitoring[1]

Monitoring of the final product is required to determine the extent of vector attraction reduction, pathogen numbers and chemical contaminant concentrations. When determining the stabilisation grade (either A1 or B1), pathogen monitoring shall be undertaken on both the unprocessed material and the final product to positively confirm pathogen removal.

Verification sampling should occur directly after processing.

Routine sampling of the final product should occur for pathogen content just prior to use (or sale) as pathogenic organisms may regrow after treatment has taken place.

When products are to be mixed with another material before sale, monitoring should be undertaken on the final product, after the mixing is complete. For batch production e.g. composts and vermi-composts all product batches shall be tested. Records should be kept of the results, and of results of any other testing conducted on the final product (e.g. percentage solids, reduction in volatile solids, pH, etc).

Records are used to demonstrate compliance with the VAR requirements, pathogen requirements and chemical contaminant concentrations.

2.2 Sampling Regimes[2]

The sampling frequency in a product monitoring programme depends on the sampling objectives. There are two types of sampling:

verification sampling; and

routine sampling.

Note that for any organic material or product sample returning >LOD (lower than the limit o0f detection), the value of 0.5 x LOD is to be used for statistical purposes.

Verification sampling demonstrates whether a treatment process is producing a final product of consistent quality and is typified by a high-frequency sampling regime. Verification

[1] From 'Beneficial Use of Organic Materials on Productive Land-Volume 1 Guide

[2] From 'Beneficial Use of Organic Materials on Productive Land-Volume 1 Guide

monitoring should occur whenever there could be a possible change to the quality of the final product, including:

when a new process is commissioned;

when changes are made to an existing process;

and when any of the routine samples exceed the limits set for pathogens or chemical contaminants.

Routine sampling is required to demonstrate continued compliance with the product standards. Table 6-1 and Table 6-2 detail the frequency and number of samples required in relation to the product Type (Grade), and whether the samples are being taken for verification or routine sampling.

Table 6-1 Stabilisation grade sampling frequencies

Grade	Monitoring type	Sampling regime	Parameters to be monitored
A	Product verification[1,2]	≥ 7 evenly dispersed grab samples per month for a 3-month period with ≤ 3 failures. If > 3 failures then the 7 following consecutive grab samples must comply.	*E. coli* *Salmonella* *Campylobacter* *Human adenovirus* *Helminth ova* VAR
	Routine sampling	≥ 1 grab sample per week	*E. coli* VAR
B	Product verification[2]	Not applicable for pathogen testing	VAR[3]
	Routine sampling	Not applicable for pathogen testing	VAR[3]

[1] No more than 3 samples should be taken per day during this period. The number of verification samples has been reduced from 15 in the Guidelines for the Safe Application of Biosolids to Land in New Zealand, 2003, to 7 samples which is in line with the Western Australian guidelines for biosolids management (2012).

[2] In the case of manufacturing facilities in existence prior to the publication of this document, it is acceptable to use data up to 12 months old for the purposes of *product verification*.

[3] If a barrier is to be used for VAR e.g. soil incorporation, no monitoring is required at the production stage.

Table 6-2 Contaminant grade sampling frequencies

Grade	Sample type	Number of samples
Compliant	Product verification[1]	Metals: 1 composite[2]/week over a 3-month period Organics: 1 composite sample[2]/month over a 3-month period
	Routine sampling[1,2]	Metals: a) For metals ≥ half the guideline limits 1 composite/ 2 month. b) For metals ≤ half the guideline limits 1 composite/4 months. Organics: a) For organics ≥ half the guideline limits 1 composite/6 months. b) For organics ≤ half the guideline limits 1 composite/12 months.

[1] In the case of manufacturing facilities in existence prior to the publication of this document, it is acceptable to use data up to 12 months old for the purposes of *product verification*. For the purposes of determining compliance at the 95 percentile for *routine sampling*, the age of the data set shall be no more than 2 years for

3.0 Definition Finished Product

3.1 Vermicast

Vermicast is the end process of vermiculture. Vermicast is produced using the Bio-gro standards for the production of vermicast and is ready for release after one year.

The vermiculture process is described in RNZ Organic Production Protocols – RW-P-751-001-B.

3.2 Compost

Compost is the end product of the composting process. Compost is produced to the NZ Standards NZS 4454:2005 – Compost, Soil Conditioners and Mulch.

Two grades of compost are produced on site A1 and B1 (consistent with the 'Beneficial Use of Organic Materials on Productive Land).

A1 grade compost is fully compliant with NZS4454:2005 Composts, Soil Conditioners and Mulches. This compost is able to be used of site.

B1 grade compost is compost that can be used around site for bunding. This material is then covered with top soil or A1 grade material. The discharge of B1 grade compost on site will be compliant with Rule 29 of the Taranaki Regional Council Regional Freshwater Plan.

Before compost can be released for use on site it must pass/meet the following specifications as shown in table 1 below.

Further testing of compost will be required for release of product off site. This testing will be against the 'Guidelines for Safe Application of Biosolids to Land in New Zealand'

Table 1: Uruti Site Minimum Guidelines for release of Product

		Guidelines NZS 4454:2005	Guildlines for assessing & Managing Petroleum Hydrocarbon Contaminated Sites in NZ – MfE August 1999	BUOMPL Standard		Uruti Site Minimum Guidelines for Release
Organic Matter	%	>25				
Total Carbon	%					
Total Nitrogen	%	>0.6				
C/N Ratio						
Total Arsenic				30		
Total Cadmium				10		
Total Chromium				1500		
Total Copper				1250		
Total Lead				300		
Total Mercury				7.5		
Total Nickel				135		
Total Phosphorus	mg/kg	>0.1				
Total Sulphur	mg/kg					
Total Potassium	mg/kg					
Total Calcium	mg/kg					
Total Magnesium	mg/kg					
Total Sodium	mg/kg					
Total Iron	mg/kg					
Total Manganese	mg/kg					
Total Zinc	mg/kg	<600		1500		
Total Copper	mg/kg	<300				
Total Boron	mg/kg	<200				
C7 – C9	mg/kg		<2,700			<2,700
C10 – C14	mg/kg		<58			<58
C15 – C36	mg/kg		<4,000			<4,000
Total Hydrocarbons	mg/kg					

Pathogen Standards

The pathogen analysis standards to achieve Grade A1 are provided below in Table 3.

Table 3 Product pathogen standards - Beneficial Use of Organic Material on Production Land

Pathogen	**Standard**
E-coli	(less than 100 MPN/g)
Campylobacter	(less than 1/25g)
Salmonella	(less than <2MPN/g)

Human adenovirus Helminth ova	(less than 1PFU/0.25g) (less than 1/4g)

3.2.1 Compost Sampling Plan

3.2.1.1 Quality Assurance

- Personnel collecting samples will be familiar with the sampling plan and have been certified as competent to collect samples by the QA Manger (GM-Consents)/Site Manager
- A list of certified samplers will be held by the QA Manager/Site Manager

3.2.1.2 Health and Safety

- Personnel collecting samples will be familiar with the Uruti Site Health & Safety Plan and are required to follow the procedures in the plan while carrying out the sampling
- Wear Hi vis vest during sampling
- Assure secure footing when sampling on slopes or near water

3.2.1.3 Equipment

- Sample containers supplied by the Laboratory-for pathogen and hydrocarbon testing use glass container
- Chain of custody form supplied by the Laboratory
- 20 litre mixing pails
- Water proof pen
- Field note book
- Sampling probe-small trowel high density polypropylene
- Tarpaulin-clean plastic, canvas or other type of mixing surface
- Cold packs-chemical ice packs-one ice pack per compost sample sent
- Polystyrene container for courier
- Recording Sheet

3.2.1.4 Sampling Locations

Two types of sampling will be completed-one type during the composting process and further sampling at maturity before release of the composted product from the composting pad.

Sampling of final product will be taken from mature windrows that are deemed to have completed the composting process.

3.2.1.5 Timing & Frequency of sampling

Sampling will be undertaken during the composting process and at maturity.

3.2.1.6 Preparation

- Acquire equipment for tests to be carried out.

- You will need a clean auger, soil probe, trowel or spade, 5 clean 20 litre plastic buckets, a clean plastic tarp, and a 1-2 litre sample container (heavy plastic zip-loc bag, or wide mouth plastic bottle), glass sample jars for pathogen and hydrocarbon testing.

3.2.1.7 Field sampling

The sample you collect for analysis must be representative of the entire material being analysed. Piles of compost or feedstock often vary from place to place in the pile or windrow.

Therefore, the sample sent for analysis should be a *composite sample* of material collected from several locations and depths within the windrow or pile being sampled. The number of sampling points will depend on the size and configuration of the pile or windrow. In most situations, material should be collected from *at least* 10 locations around the pile or windrow and from three depths at each location. Separate composite samples should be collected from different windrows or piles.

To collect a composite sample:

The method used to assess windrows of compost through a composite sampling method is shown in Figure 02.01. This sampling technique is based on the US EPA 'Test Methods for the Examination of Composting and Compost'.

B1 grade compost is likely to be from Pad 3 and will be used for cold air bunding. The pathogenic analysis proposed is to provide an indication of potential pathogens of concern, this material is not for sale and will remain within the confines of the Uruti site. The proposed bunding will be sealed with topsoil and planted out, as well as being fenced and be sufficient distance from water courses.

A1 grade compost is likely to be sourced from Pad 1.

Extract from 'Test Methods for the Examination of Composting and Compost-Sample Collection and laboratory Preparation, August 27, 2001 02.01-1'

Note: Some wording in this methodology has been changed to better reflect NZ practices and language.

Sample Collection and Laboratory Preparation

Test Method: Selection of Sampling Locations for Windrows and Piles						**Units:** *NA*		
Test Method Applications								
Process Management							**Product Attributes**	
Step 1: Feedstock Recovery	*Step 2:* Feedstock Preparation	*Step 3:* Composting	*Step 4:* Odor Treatment	*Step 5:* Compost Curing	*Step 6:* Compost Screening and Refining	*Step 7:* Compost Storing and Packaging	*Safety Standards*	*Market Attributes*
		02.01-B	02.01-B	02.01-B	02.01-B	02.01-B	02.01-B	02.01-B

Field Sampling of Compost Materials 02.01
August 27, 2001 *Test Methods for the Examination of Composting and Compost*
02.01-14

02.01-B SELECTION OF SAMPLING LOCATIONS FOR WINDROWS AND PILES

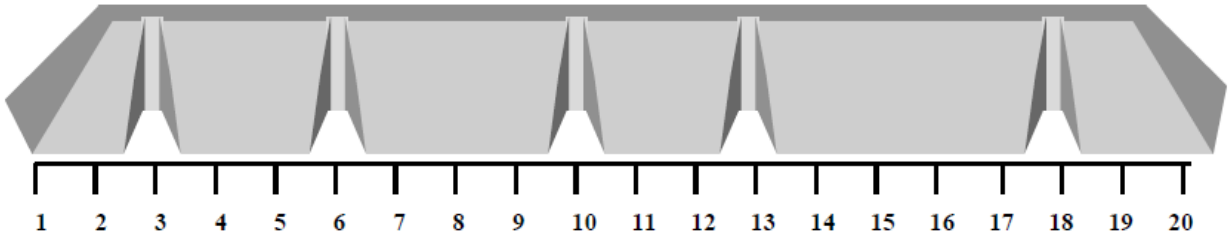

Fig 02.01-B1 Hypothetical sample collection pattern from a compost windrow.

Fig 02.01-B1 Hypothetical sample collection pattern from a compost windrow.

NOTE 1B—In this example, a scale from 1-20 is superimposed on the long dimension of a compost windrow. Five distances (3, 6, 10, 13 and 18 m) are randomly selected to each side of the windrow, (e.g., numbers randomly pulled from a hat), to assign sample collection locations. Point-samples are collected from within three zones at each cutout.

NOTE 2B—The illustrated cut-outs are depicted on one side of the windrow; in a real operation, the cut-outs must be randomly assigned to each side of the windrow. Cone-shaped piles have a circular base. Measure around the base of a cone-shaped pile and randomly assign cutout positions along the pile's meridian, or circumference.

10. Apparatus for Method B

10.1 *Sampling Container*—five 16- to 20-L plastic buckets with lids, plastic (HDPP) sample containers, glass sample containers (sample containers supplied by Hills Laboraties).

10.1.1 *Organic Contaminant Tests*—For samples to be analysed for the presence of organic contaminants, please refer to Table 02.01-6 Organic Contaminant Tests: Sampling containers and conditions for compost and source ingredient testing. Modify sample packaging steps presented in this section accordingly.

10.2 *Sampling Device*—tilling spade, or other appropriate sampling device.

10.3 *Digger*—with bucket,

10.4 *Trowel*—high-density polypropylene (HDPP), for stirring and mixing composite sample.

10.5 *Pail*—16- to 20-L (4- to 5-gal) for mixing samples

11. Reagents and Materials for Method B

11.1 *Plastic Bags*—three 4-L (1 gal) durable bags with seal, (e.g., Ziploc® **Freezer** bags).

11.2 *Plastic Gloves.*

11.3 *Tarp*—clean plastic, canvas, or other type of mixing surface if feedstock is liquid sludge.

11.4 *Cold Packs*—chemical ice packs, or 4-L plastic bags (e.g., heavy duty Ziploc® freezer bags) filled with approximately 0.5 L of water and frozen flat. One ice pack per 4-L sample container of

compost to be shipped, (e.g., three ice packs are recommended for three compost 4-L samples).

11.5 *Polystyrene container*—for transporting samples to laboratory

11.6 *Packing Material*—newspaper or other appropriate bulking material to be used as packing or fill to minimize sample movement within the shipping container (square pail) during shipping.

11.7 *Adhesive Tape*—duct tape, 5-cm (2-in.) width for sealing container.

12. Procedures for Method B

12.1 *Cut into Finished Compost*—Using digger, cut into the finished compost pile or windrow at five or more randomly selected positions. Collect samples from the full profile and breadth of the compost windrow or pile. Refer to Fig 02.01-B1.

12.2 *Collect Point-Samples*—Samples of equal volume are extracted from the compost pile at three depths or zones measured from the pile's uppermost surface. Collect no less than five point-samples from each of the three depths or zones illustrated in Fig 02.01-B2. The five point samples for each zone must be collected in a manner to accurately represent the horizontal cross-section of the windrow or pile. Use a sanitized sampling tool (a gloved hand, clean shovel or auger) when collecting samples and when transferring samples to the 5-gal sample collection pail.

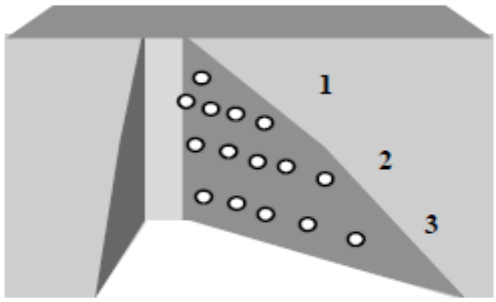

Fig 02.01-B2 Five horizontally dispersed point-samples are collected from each of three depths or zones within each cutout.

NOTE 3B—(1) upper $^1/_3$ of compost profile height; (2) middle $^1/_3$ of compost profile height; and (3) lower $^1/_3$ of compost profile height, where compost pile does not exceed the recommended overall height of 3 m. Create more than three sampling depths or zones within each cutout when the curing pile exceeds a height of 3 m, relative variability is high or the property of interest is found at very low concentrations, near the laboratory detection limit.

12.3 *Composite Point-Samples*—Place all 15 point samples from one cutout together into one sanitized plastic pail. Completely mix the point samples by stirring thoroughly with a sanitized wooden stick or lath, and by covering and shaking the pail to further mix the samples.

- Repeat the blending process at least four times until all point samples are thoroughly blended to form one composite sample that accurately represents the compost for the cutout.
- Proceed to the next compost sample cutout and repeat this process to collect one thoroughly blended composite sample from each of the five cutouts.
- *Composite Sample*—Transfer the five composite samples from the sample collection pails onto a mixing tarp or other appropriately sanitized surface or container, such as into a large pail where all samples can be mixed, blended and then covered to minimize moisture loss. Thoroughly blend the five composite samples to form one large sample that represents the average condition of the entire batch or windrow in question.
- Quarter the composite sample and thoroughly mix and quarter again. Continue to subdivide and split the sample into quarters and mix as described until sample size reaches approximately 12 L (3 gal).

12.4 Stratified Sampling—This sample collection strategy is used to evaluate for the presence of spatial variations or gradients in compost characteristics across and through a windrow or pile.

12.5 Stratified Samples across Cutouts—Use this sampling strategy to test for differences in compost characteristics between sample cutouts and along the longer dimension of a windrow. Do not composite materials from the five separate cutouts when monitoring for the presence of gradients along the longer dimension of a windrow.

Pack and prepare five separate samples (i.e., five separate composite samples, one from each cut out) for shipment as described in step 12.5.

12.5.2 *Stratified Samples within Cutouts*—Use this sampling strategy to evaluate for the presence of spatial variations or gradients that occur with changes in pile depth or distance from the windrow core to its surface.

12.6 Prepare for Shipment and Storage:

12.6.1 Transfer the blended compost to three 4-L (1- gal) sample bags, (e.g., plastic Ziploc® *freezer* bags).

12.6.2 Line the shipment pail with aluminum foil or other reflective material to minimize sample heat-gain.

Place the sample bags containing the compost sample into the polystyrene box and interleave with ice packs for shipping (refer to Fig 02.01-B3).

12.6.3 Seal and secure the lid with a packing tape. Send the sample by one day express delivery service to selected laboratory for analysis. Include a chain of custody information sheet with environmental regulatory samples (Refer to Method 02.01-E).

NOTE 3B—Maintain cool samples at 4°C (39.2°F) to diminish microbial and chemical activity prior to and during sample shipment.

As per the *Beneficial Use of Organic Materials on Production Land Volume 1 Guide* ('The Guide'), the product must undergo a stabilisation process. The accepted process is detailed in the guide. These includes the following:

1. There is a requirement for a documented quality assurance system.
    - This is currently under development by the consent holder.
2. There is also a requirement for a pathogen reduction process.
    - The consent holder undertakes windrow composting (Figure 4). The material has been in storage post composting for longer than 3 years. 'Note that storage can be viewed either as an adjunct to other pathogen reduction or VAR methods, or a treatment in its own right, particularly when further drying takes place'[3].

Organic materials	Composting[1] Either: (i) In-vessel: T ≥ 55°C for ≥ 3 days, or (ii) Windrow: T ≥ 55°C for ≥ 15 days with a minimum of 5 turnings during this period (5 x 3 days at T ≥ 55°C plus time periods to reach 55°C after each turning). All compost must have at least 30 days maturation pre-use.
	High pH – high temperature process

Figure 4 Extracted from Beneficial Use of Organic Materials on Production Land Volume 1 Guide Table 5-2 (Pathogen reduction process)

3. There is a requirement for a Vector Attraction Reduction Method (Figure 5)
    - The material has been composted and stored for over three years. The Pad 3 material will be put to land as a bund, covered and planted out should the pathogenic analysis determine elevated pathogens in the indicative sampling method.
    - The Pad 1 material will initially be mixed with topsoil and used as a soil conditioner on site, in an area not accessible to live stock and fenced.

Maintaining a minimum temperature of 40° C for a minimum of 14 days, with an average minimum temperature of 45° C or greater	Compost products
soil incorporation is undertaken as soon as practicable and within at least 24 hours of the product discharge. Where liquids are injected below the soil surface there shall be no significant amount of material visible after 1 hour.	Partially stabilised or unstabilised slurries or sludges

Figure 5 Extracted from Beneficial Use of Organic Materials on Production Land Volume 1 Guide Table 5-3 (Vector attraction reduction techniques)

[3] Section 5.2.1 Beneficial Use of Organic Material on Production Land

3.2.1.1 Contaminant content sampling

Contaminant sampling is undertaken to assess the compost streams. The testing regime has been expanded as the proposed compost streams may contain petroleum origins in the case of drilling mud, contaminated soil, and transformer oil, (noting the transformer oil was tested for PCBs prior to acceptance at Uruti and was found not to contain PCBs). Emerging contaminants of concern was omitted from the testing regime as the proposed analytes are not tested by RJ Hill lab. Acid herbicides are included to the Pad 1 material as this is of greenwaste origin.

The overall objective of this sampling is to ascertain what the likely pathogens and chemical contaminates levels are within these waste streams. No pre-screening analysis has been performed on the Pad 3 material.

The limits from the various guidelines are summarised in Table 1.

Table 1. Summary of Guideline Limits on Contaminants

Parameter	Concentration Limit (mg/kg dry weight)	Source	Compost Stream
Arsenic	30	Beneficial Use of Organic Materials on Production Land Volume 1 Guide Table 5-5	Pad 1 and Pad 3
Cadmium	10		
Chromium	1500		
Copper	1250		
Lead	300		
Mercury	7.5		
Nickel	135		
Zinc	1500		
Boron Total nitrogen	<200	NZS4454:2005	Pad 1 and Pad 3
TPH- C7-C9	120	Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand Module 4 – Tier 1 Soil Screening Criteria	Pad 1 and Pad 3
TPH C10-C14	58		
TPH C15-C36	4000		
TPH C7-C36			
Polycyclic aromatic			
hydrocarbons (PAH's)			
Naphthalene	7.2		
Pyrene	160		
Benzo (a) pyrene	0.027		
Mono cyclic aromatic hydrocarbons (MAH's) Benzene Toluene Ethylbenzene Xylenes	1.1 68 53 48		
Potassium Sodium Barium Conductivity Soluble salts	460 10000 1.9 dS/m 2500	Land application of wastes from oil and gas wells: Landcare research 2015.	Pad 1 and Pad 3

Trace acid herbicides			Pad 1

3.2.1.8 Transport to Laboratory

Local courier company will be used for transport to testing laboratory. Samples are to be sent the same day they are collected.

3.2.1.9 Reporting

- Forward results to GM -Consents

3.3 Product Release

When results are received from the laboratory these will be compared with the limits for contamination within the following standards:

- NZS 4454:2005 Compost, Soil Conditioners and Mulch
- Module 4 Tier 1 soil acceptance criteria (revised 2011) Ministry for the Environment
- Beneficial Use of Organic Materials on Productive Land-Volume 1 Guide

Product will the be either categorised as A1 or B1 product. Product not meeting these standards will be further composted or blended until it meets the acceptance criteria.

3.4 Silage

Silage is harvested from the irrigation areas. This has an additional effect of removing N^2 from the irrigation paddocks. This product is tested for dry matter, % crude protein, Acid Detergent Fibre & Neutral Detergent Fibre Digestibility, Metabolizable Energy, Ph, Ammonia-N/Total N (%), Volatility Fatty Acids and mineral composition.

If the silage is within animal feed acceptable limits it is either fed to stock on site or sold.

Out of limit silage is used in the composting process.