



Use Terraseeding™ under the following conditions:

- Where topsoil is scarce or deficient
- Where establishment of seed is required quickly
- Where certain seeds are difficult to establish
- Where land has been remediated
- For moderate erosion control on slopes up to 3H:1V

## Terraseeding™ Specification Sheet

### 1.0 Scope

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Specification covers the requirements for the application of perennial seeding with a pneumatically blown mixture of composted organics provided by Groundcover™, Albany, Auckland 1330, Phone 09 414 7560 (fax 09 414 7561) or equivalent. Contractor must have proven track record in the application of TerraSeeding™ using a Blower Truck as described in Section 3.1 of this specification.

### 2.0 Materials

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#### 2.1. *Seed – Grade standards*

All seed, supplied either as single seed species, or as a seed mix shall comply with all current New Zealand regulations and the grade standards for that particular seed kind.

#### 2.2. *Seed Packaging, Labeling and Storage*

All seed and seed mixes shall be in the original sealed package with the original legible label securely attached.

Labeling shall conform to all current New Zealand regulations regarding seed labeling. Each package shall be labeled to show:

- The name and address of the seed supplier.
- The seed species, or the name of the seed mix and the various individual seed species that comprise the seed mix and the percentage by mass.
- The grade of the seed or seed mix.
- The supplier's lot designation number, corresponding to the Seed Analysis Certificate.
- Mass in kilograms.

All seed and inoculants shall be stored in cool, dry location until use.

### 2.3. *Permanent Seed Mixes*

Permanent seed mixes as per consultant.

### 2.4. *Annual Nurse Crop Seed*

Nurse crop seed shall be a cereal grain such as Annual Ryegrass, Fall Rye Grain, Annual Oats or Winter Wheat Grain unless otherwise approved by the Contract Administrator.

### 2.5. *Fertilizer*

Fertilizer shall comply with current provisions required under New Zealand regulations. Fertilizer shall be supplied in original bags bearing the manufacturer's original label indicating mass and analysis.

Fertilizer may be added to the compost materials during mixing of compost and other materials (including 7mm aggregates, coarse sand, bark fines pumice)

Fertilizer may or may not be required by the consultant

### 2.6. *Composted Organics*

Composted organics shall be pre-mixed and shall consist of 100% composted materials. The composted organics may be amended. Amendments shall be added at the discretion of the Contractor to ensure that the composted organics meets the material specification and is suited for distribution by a pneumatic blower.

Once mixed, composted organic material shall consist of particles where 100% of the material is able to pass through a 25 mm sieve.

### 2.7. *Compost*

The compost shall be derived from well-decomposed green waste organic matter produced by controlled aerobic (biological) decomposition that has been sanitised through the generation of heat and stabilised to the point that it is appropriate for this particular application. Compost material shall be processed through proper thermophilic composting, for a 'process to further reduce pathogens' (PFRP). The compost portion shall meet the chemical, physical and biological properties (as outlined in the chart below)

### 2.8. *Aggregates*

Coarse sand, pumice and other aggregates able to pass through a 7mm sieve may be added at up to 30% of the content.

## 3.0 Equipment

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### 3.1. *Pneumatic Blower Truck*

The pneumatic blower truck shall be a custom manufactured, fully integrated, truck-mounted unit. The blower truck shall be equipped with a PLC-calibrated seed injection system and shall be capable of uniformly applying materials and seed at a rate greater than 0.25 cubic meters of material per minute. The blower truck shall also be equipped with an application hose capable of extended 90 meters from the blower truck unit.

## 4.0 Construction

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### 4.1. *Operational Constraints*

The composted organics and seeding operation shall not commence until the Contract Administrator has approved the surface preparation and the layout of permanent seed mixes.

The composted organics and seeding application and/or re-application shall not be carried out under adverse field conditions such as high wind, frozen soil or soil covered with snow, ice or in areas of standing water or a concentrated flow of water.

The surface to be seeded shall be prepared not more than 7 calendar days before the seeding operation.

### 4.2. *Surface Preparation for Composted Organics and Seeding*

At the time of seeding, all surface areas designated for seeding shall be free of erosion and shall have a fine graded uniform surface and shall not have surface stones greater than 50 mm in diameter, weeds or other unwanted vegetation.

Soil must be loose, friable and appropriate for easy root penetration of the seeded species.

### 4.3. *Layout*

The locations of the different, permanent seed mixes and composted organics shall be staked out on the ground surface in accordance with the contract drawings. Stakes shall be used to indicate the limits of each type of seed mix.

### 4.4. *Composted Organics and Seeding*

#### 4.4.1. **Application Rates for Composted Organics**

Depending on slope gradation, depth of composted organics shall be as follows:

3:1 slopes and less - 25mm minimum application

3:1 - 2:1 slopes – 50mm minimum application

#### 4.4.2. Composted Organics and Seed Application

Prior to the application of the composted organics and seeding, the Contractor shall ensure that the pneumatic blower has been properly calibrated to provide the specified amounts of seed and that the blower can uniformly apply composted topsoil and seed at a rate greater than 0.25 cubic meters of material per minute.

Once the PLC has been calibrated, the Contractor shall apply composted organics and seeding uniformly at specified depths to all areas identified for cover in the contract drawings or as directed by the Contract Administrator.

Composted organics and seed shall overlap the adjoining ground cover by 300 mm.

### 5.0 Quality Assurance

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#### 5.1. Performance Measure

All composted organics and seeded areas will be inspected by the Contract Administrator to ensure compliance with this specification at thirty, sixty and ninety day periods following the composted organics and seeding operation.

At the thirty day inspection within the seeded earth area; the composted organics shall be visually intact and shall form a uniform cohesive mat; germination of the nurse crop shall be visually evident.

At the sixty day inspection within the seeded earth area; - the nurse crop shall be evident at mature height in an evenly dispersed, uniform cover; - germination of the specified, permanent seed species shall be visually evident in an evenly dispersed uniform cover; - there shall not be any significant bare areas, both in terms of quantity and size; - non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

At the ninety day inspection within the seeded earth area the permanent seed species shall be at an average height of 50mm in an evenly dispersed, uniform cover; representative of the specified, permanent seed mixes. There shall not be any significant bare areas, both in terms of quantity and size. Non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

No inspections will be held during the winter dormant period or when site conditions prohibit a visual field inspection. The timing intervals between inspections will be suspended during the winter dormant period.

#### 5.2. Failure to Meet Performance Measure

If the completed work does not meet the Performance Measure after the thirty-day inspection, the Contract Administrator shall document the failure areas, notify the Contractor of those areas, and re-inspect at the sixty day inspection.

If the completed work does not meet the Performance Measure after the sixty or ninety day inspection, the Contract Administrator shall notify the Contractor in writing and

the Contractor shall re-apply the specified materials in accordance with this specification within 14 calendar days of receiving the notification.

The Contractor shall maintain the site and control erosion until conditions permit application or re-application of and composted organics seed.

All replaced composted organics and seed shall be subject to the Quality Assurance section of this specification.

### 5.3. *Dispute Resolution*

Dispute resolution only applies to the germination and growth of the permanent seed mix species.

Disputes arising from the Performance Measure evaluation shall be settled through referee testing using an actual live seedling count of the specified permanent seed mix species within the seeded earth area.

An independent consultant with experience in herbaceous plant identification shall perform the referee testing. Both parties shall agree on the selection of the independent consultant and both parties shall be bound by the consultant's evaluation

The actual count shall be based on minimum germination requirements and minimum levels of acceptability to meet industry standards governing the testing, inspection, quality and sale of seed.

The various seed mixes specified by the Owner are comprised of different individual commercial seed species expressed as a percentage of the overall seed mix by weight. Industry standards list the number of seeds per unit of weight. For this specification, the mid-range number for each seed species shall be used based on these industry standards. Where there is a difference in estimated number of seeds by weight, the lower figure shall be used.

This specification has adopted 70% as the acceptable minimum and has allowed a further 25% reduction to account for variation in seeding application, seedbed quality, seedbed preparation and area cover.

The Contractor and the Owner may agree to use a simplified analysis, where instead of counting each seedling of each individual seeded perennial species of the mix, only the total number of seedlings of the mix is counted. If the parties cannot agree to the simplified analysis, the default method is a seedling count of each seeded perennial species.

The field inspection to determine the number of live plant seedlings should only be performed after the ninety-day inspection. Many of the perennial plants in the various seed mixes take several months to grow to an identifiable and measurable size.

The sampling procedure should be randomized over an area that both parties agree is representative of the seeded contract.

The selection and evaluation process is as follows:

Select a representative area from the average seeded areas, eliminating the thinnest and thickest growth areas from the analysis.

Measure its length and depth. Use a random numbers table to generate five sets of X and Y axis coordinates from the area.

Each axis coordinate is a sampling point. A sampling plot, or quadrant, is set out in a 200 mm by 1000 mm plot with the axis coordinate becoming the lower right-hand corner of each quadrant.

Each quadrant is divided into 20 sub-sampling units, each being 100 mm by 100 mm. The sub-sampling units are numbered from 1 to 20.

Using a random numbers table, two of the twenty sub-sampling units are randomly selected.

Live seedlings of each individual seeded perennial species of the mix are counted in the selected sub-sampling units to determine actual plant densities.

An average seedling density per seeded perennial species, expressed as the number of seedlings per square meter is generated for each sampling plot, or quadrant, based on the data from the two selected sub-sampling units.

The procedure is repeated for the four other sampling points.

The average number of seedlings per square meter for each of the seeded perennial species generated from the five sampling points is evaluated against the minimum industry standard benchmark for the seeded mix.

The results of the referee testing analysis will be binding on both parties, subject to further dispute mechanisms as described in the General Conditions of the contract.

If the results of the referee testing prove that the seed and cover is unacceptable in meeting the minimum industry standard for germination, then the Contractor shall pay all costs associated with dispute resolution process.

If the results of the referee testing prove that the seed and cover is acceptable in meeting the minimum industry standard for germination, then the Owner shall pay all costs associated with the dispute resolution process.

## **6.0 Measurement for Payment**

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### *6.1. Composted Organics and Seed*

Seeding and cover measurement shall be in square metres following the contours of the ground.

## 7.0 Basis of Payment

### 7.1. Composted Organics and Seed

Payment at the contract price for the above tender items shall be full compensation for all the labour, equipment and material to do the work.

Parameters <sup>1,4</sup>	Reported as (units of measure)	Compost to be Vegetated	Compost to be left Un-vegetated
PH <sup>2</sup>	pH units	5.0 - 8.5	N/A
Soluble Salt Concentration <sup>2</sup> (electrical conductivity)	ds/m (mmhos/cm)	Maximum 5	N/A
Stability <sup>3</sup> Carbon Dioxide Evolution Rate	mg CO <sub>2</sub> -C per g OM per day	< 8	N/A
Physical Contaminants (man-made inerts)	% dry weight basis	< 1	< 1

<sup>1</sup> Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (SCC through BNQ)

<sup>2</sup> Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. When specifying the establishment of any plant or turf species, it is important to understand their pH and soluble salt requirements, and how they relate to the compost in use.

<sup>3</sup> Stability/Maturity rating is an area of compost science that is still evolving, and as such, other various test methods could be considered. Also, never base compost quality conclusions on the result of a single stability/maturity test

<sup>4</sup> Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.