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Aerated Static Pile Compost Management Process

- CLS is proposing to replace the current "turned pile" composting process with an Aerated Static Pile (ASP) system for the active composting stage. The ASP uses forced and static aeration systems to convert a mixture of high nitrogen by-products, blended with high organic carbon sources, into compost. The ASP system follows the practices as outlined in the New Zealand Standard for Composts, Soil Conditioners and Mulches (NZS4454:2005), Appendix K3.

- High Nitrogen material is blended with organic carbon material (bark fines and sawdust) to achieve a Carbon to Nitrogen (C:N) ratio between 25:1-35:1; and a moisture content of 65%, though this can be higher (up to the water holding capacity of the ingredients – 70-75%) due to the aeration process having a higher drying effect on the material than other compost systems. As stated in NZS4454:2005 K3: *"Higher nutrient contents (C:N ratios of 25:1-35:1) than with turned pile composting are possible because aeration lessens the chance of oxygen deficiency"; "Odours are minimised because large areas within the composting mass are processed at optimal temperatures. Also, NH3 losses are minimised."*

- The mixture is then placed on a concrete aeration pad. The pad consists of a graded concrete slab with channels containing 150NB drilled PVC pipes, with a layer of 20 mm stones over them. A 300 mm layer of coarse bark is laid on top of this then the mixed compost material is added. A 100 mm covering layer of finished compost is added as a thermal blanket. Any runoff or leachate from the piles flows down the concrete pad and is collected at an impermeable collection/retention point; where it can be re-used in the mixing process or re-introduced into the piles undergoing composting to maintain the correct moisture content.

- The 100mm layer of finished compost is used over the piles as a thermal blanket. This thermal blanket ensures that pasteurising temperatures are achieved throughout the whole pile, including the outer zones; which can be difficult to achieve otherwise due to the compost not being turned through the decomposition process. The thermal blanket layer also assists with any potential odour suppression, , protects the surface from drying, discourages flies, filters ammonia, and contains all microbial activity within the pile, minimising any potential for discharge for any airborne microbial activity. NZS4454:2005 K3 (g) mentions *"Insulation with mesh cloth or finished compost can overcome this problem (pasteurisation temperatures to the outer zones), and with this approach the static pile may replicate conditions of an enclosed system."*

- The compost material is placed on the aeration pads in piles that are the width of the loader bucket (approximately 4 metres) and 3 metres high. The piles can be slightly higher than the turned pile compost system as aeration minimises the extent of anaerobic zones, so that odour production is reduced; and aeration provides a good diffusion pathway for oxygen to enter the rows for the beginning of the Mesophilic stage of composting.

- Pressure fans running on timers aerate the piles. These keep the piles aerated by blowing oxygen into the pile at a measured length of time, without introducing too much air and cooling the pile. The material is held on the aeration bed for a minimum of 6 weeks, or until temperature sampling indicates the completion of the active composting phase. . Over this time the temperature is monitored, with it initially rising to 60°C+, and gradually cooling after the Thermophillic phase of decomposition to about 35 °C. Pasteurising temperatures of 55 degrees+ must be reached for at least 3 days.

- Temperature monitoring is conducted continuously through the use of temperature probes in each pile of compost undergoing aeration. The temperatures are constantly recorded and can be linked to a temperature feedback system to maintain compost temperatures within a predetermined range (i.e ensuring that once the compost temperature reached 65 degrees the fans can introduce oxygen and cool the compost to 50-55 degrees). This way any fire risk within the pile is controlled by ensuring that the pile cannot become too hot, but the temperature is always maintained around the level where pasteurisation and sterilisation occurs to ensure any weed seed and pathogens are eliminated.

- Maintaining a consistent and controlled oxygen content and temperature throughout the full volume of the pile optimises the compost process and minimises the risk of anaerobic conditions developing and the generation of unpleasant odours.

- During the active composting phase the piles do not need to be turned or disturbed, thus eliminating the potential odour emissions that are associated with the regular turning of compost made using the "turned pile system". The piles will not be disturbed until the active composting phase is complete.

- Once pasteurising conditions have been achieved and decomposition is complete (as indicated by a temperature decline due to reduced microbial activity), composting is complete. The compost material will be removed from the concrete static pile pad and stored in larger windrows of 4.5 metres high, on a 500mm "bed " of bark or sawdust with sawdust "aprons" to capture stormwater run-off, and undergo a curing period of a minimum of 2 months to ensure that compost is mature. At this stage the compost will undergo a compost analysis test via Hills Laboratories to ensure the finished material complies with the requirements of NZS4454:2005.

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- At the completion of the active composting phase, the material within the piles will be moved and disturbed, thus exposing the material to the atmosphere. At this stage of the process the material will have a low potential to generate unpleasant odours as the biological decomposition processes which produce the odorous compounds are close to completed and aerobic conditions will have been maintained throughout the pile during the active composting phase. No pockets of anaerobic material should be present within the piles. Movement of the piles from the active composting area to the curing piles can also be timed to coincide with the most favourable meteorological conditions for the site. This will be in accordance with the Odour Management Plan for the Site.

- Each ASP pad would contain approximately 300 cubic metres of compost undergoing the decomposition process (4m wide x 25 m long x 3m high). It is proposed that 8 x ASP pads will be established on the 25m x 40m concrete pad, containing a total amount of 2'400 cubic metres of compost. Based on a 6 week duration for active decomposition to be complete, the 8 pad ASP system can in theory produce 20'640 cubic metres of compost per annum.

- Installation of the ASP system will depend on weather conditions, in particular earthworks necessary for site preparation and the installation of the concrete pad means that such works cannot take place in either autumn or winter. Accordingly, installation of scheduled ASP is scheduled to commence within the first construction season after the grant of consent i.e. after 01 September 2018. The expected timeframe for completion of installation of the ASP system is 12 weeks.

Design Details

- Design details for the proposed ASP system are included in the Woods Architecture drawings dated 04 April 2018. The drawings refer to a stormwater retention which will be either a lined retention pond with the dimensions of 4m x 25m x 1m = 100m^3, or a series of 25'000 litre plastic water storage tanks connected together to provide 1000'000 litres of water storage to provide an enclosed retention system. A decision on which of these options will be utilised has not been finalised.

- The pond would be constructed by excavating the required area, and placing a base ofAP40 compacted aggregate 100mm deep, with a 25mm layer of sand placed on top of the aggregate. The retention pond would be lined by using an impermeable HDPE geomembrane pond liner, which will prevent leachate from entering into the soil.

- The water storage tanks would be placed above the ground, on a compacted aggregate base. Four 25'000 litre plastic water storage tanks would be placed side by side, and joined together with plumbing fittings at the lowest outlet point to provide a combined storage of 100'000 litres (100m3). The pump is fitted to the bottom outlet of one of the tanks which would allow water to be pumped and drawn from all tanks. If further storage capacity is required, additional tanks can be added and joined to the existing system.

- Stormwater runoff captured in the detention pond will be recycled into the composting process for windrows undergoing the initial ASP process.

- Runoff calculations (Table 1 below) to determine the appropriate sizing of the stormwater detention pond have been undertaken in accordance with standard methodology, with reference to Auckland Regional Council runoff guidelines and NIWA HIRDS calculator, the latter accounting for 2 degrees of climate change. Note that the required depth column of Table uses a 300m^2 flat area and calculates the required depth to accommodate the different storm events in the first column. A 50 year storm event requires a volume of 300x 0.30 which equates to 90m^3. Additional capacity beyond the 1:50 year storm event is provided by sizing the detention pond at 100m^3.

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Table 1. Stormwater Management Estimate (1,000 m^2 (24 x 40 m) Compost Aeration Pad, Varying Storm Events)

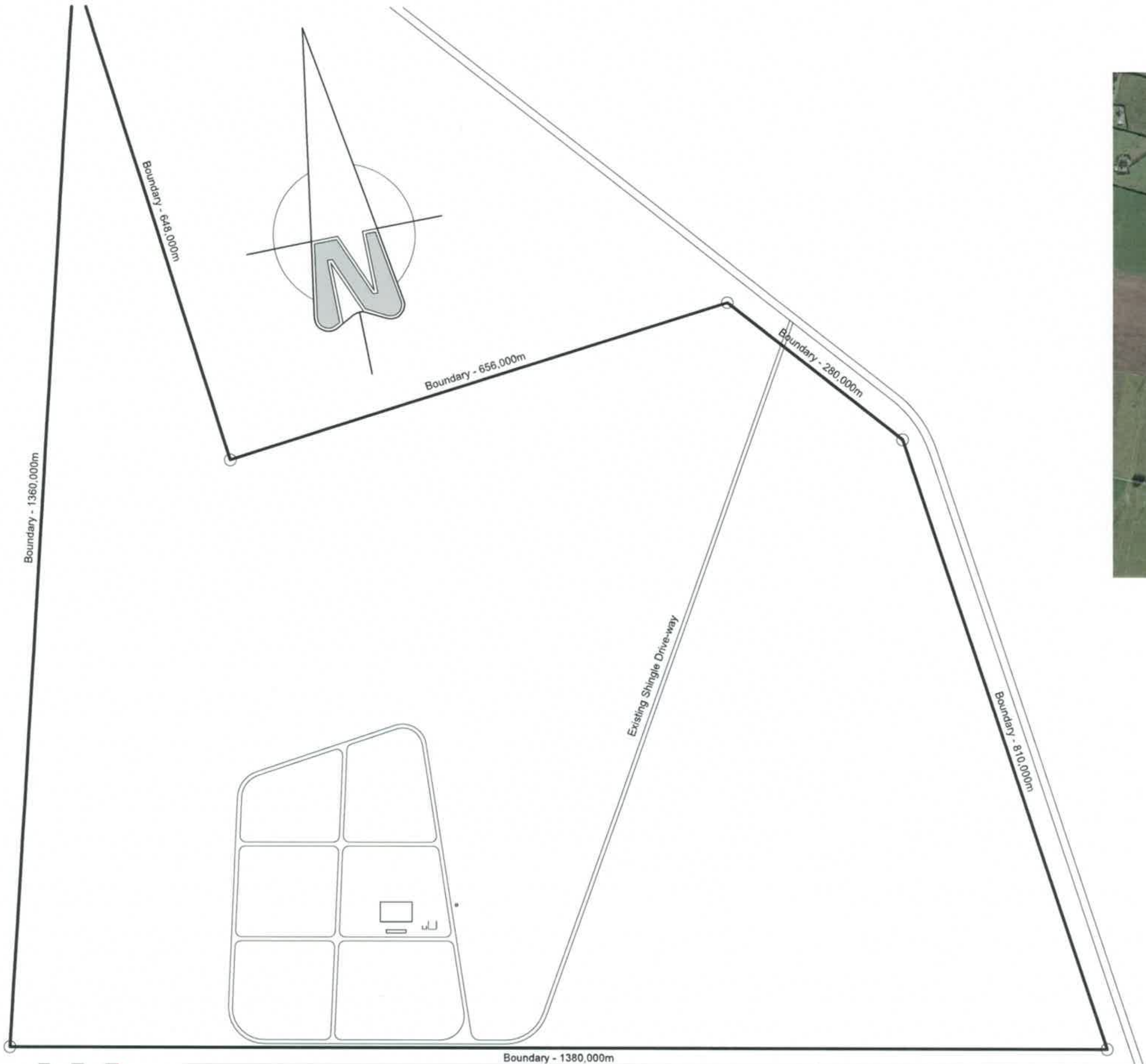
Storm Event	Depth of rainfall[1], (mm)	Runoff after rainfall losses[2], (mm)	Volume of stormwater after rainfall losses[2], (m^3)	Required depth of 300 m^2 flat collection area adjacent to aeration pad (m)
10-year, 24 hour	95.5	48.7	48.7	0.16
20-year, 24 hr	113.9	64.4	64.4	0.21
50-year, 24 hr	142.2	89.4	89.4	0.30

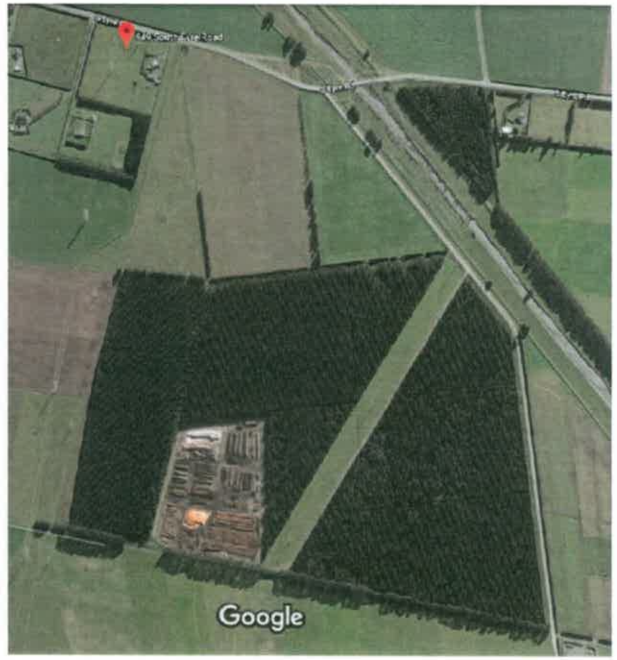
Notes:

[1] NIWA HIRDS calculator, accounts for 2 degrees of climate change

[2] Runoff (mm) calculated assuming an Initial Abstraction Depth (AI) of 5 mm and Curve Number (CN) of 81 (Group B Soil, Alluvial – Crops, straight rows, minimal vegetative cover), Auckland Regional Council Guidelines for stormwater runoff modelling in the Auckland Region, TP 108, April 1999.

[3] Assumes pad with is 40 m long and 25 m wide, and the slope is parallel with the long side of the pad.





CLIENT INFO:
CANTERBURY LANDSCAPE SUPPLIES
949 South Eyre Road, Mcleans Island
Swannanoa

SITE INFO

Site Area =	108.1674Hr

LEGAL DESCRIPTION

Lot No.	Lot 2
DP No.	DP 25643
	Part Rural Section 33406

PLANNING INFO:
Waimakariri District Council

Living Zone:	(RU) Rural
Technical Category:	N/A
Wind Zone:	High
Earthquake Zone:	2
Exposure Zone:	C
Snow Load:	N4
Sea Spray Zone:	No

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CANTERBURY LANDSCAPE SUPPLIES
949 South Eyre Road, Mcleans Island
Swannanoa

SITE PLAN

All work shall comply with NZS 3604:2011
All windows and doors to comply with NZS 4211:2008
Glazing to comply with NZS 4223:2016

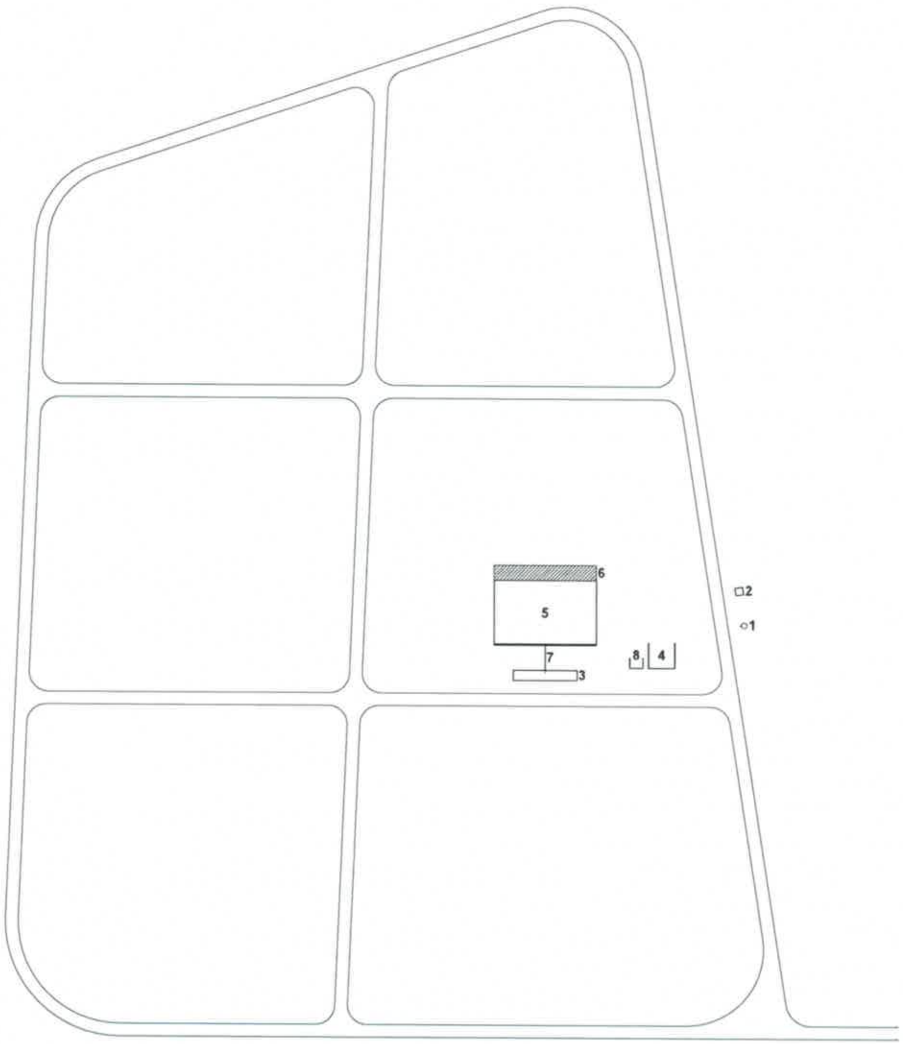
Contractor must verify all dimensions on site prior to commencing any work.

REVISION

designer	G. Woods
job no.	18002
date	04-Apr-18
scale	1:1, 1:5000

SHEET NO **A01 of 04**

+ 32 Bayview Place, Cass Bay 8082, Lyttelton, NZ + Phone: +64 3 27 388 6087 + email: graemetoon@hotmail.com



LEGEND

1 - Existing Water Storage Tank
2 - Existing Utility Shed
3 - Stormwater Retention Pond
4 - Existing Recieving Areas
5 - Aeration Pad
6 - Compacted Aggregate Pad
7 - Water Drain
8 - Existing Water Collection Sump

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CANTERBURY LANDSCAPE SUPPLIES AERATION PAD LOCATION

949 South Eyre Road, Mcleans Island
Swannanoa

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Glazing to comply with NZS 4223:2016

Contractor must verify all dimensions on site prior to commencing any work.

REVISION

designer	G. Woods
job no.	18002
date	04-Apr-18
scale	1:2000

SHEET NO **A02 of 04**

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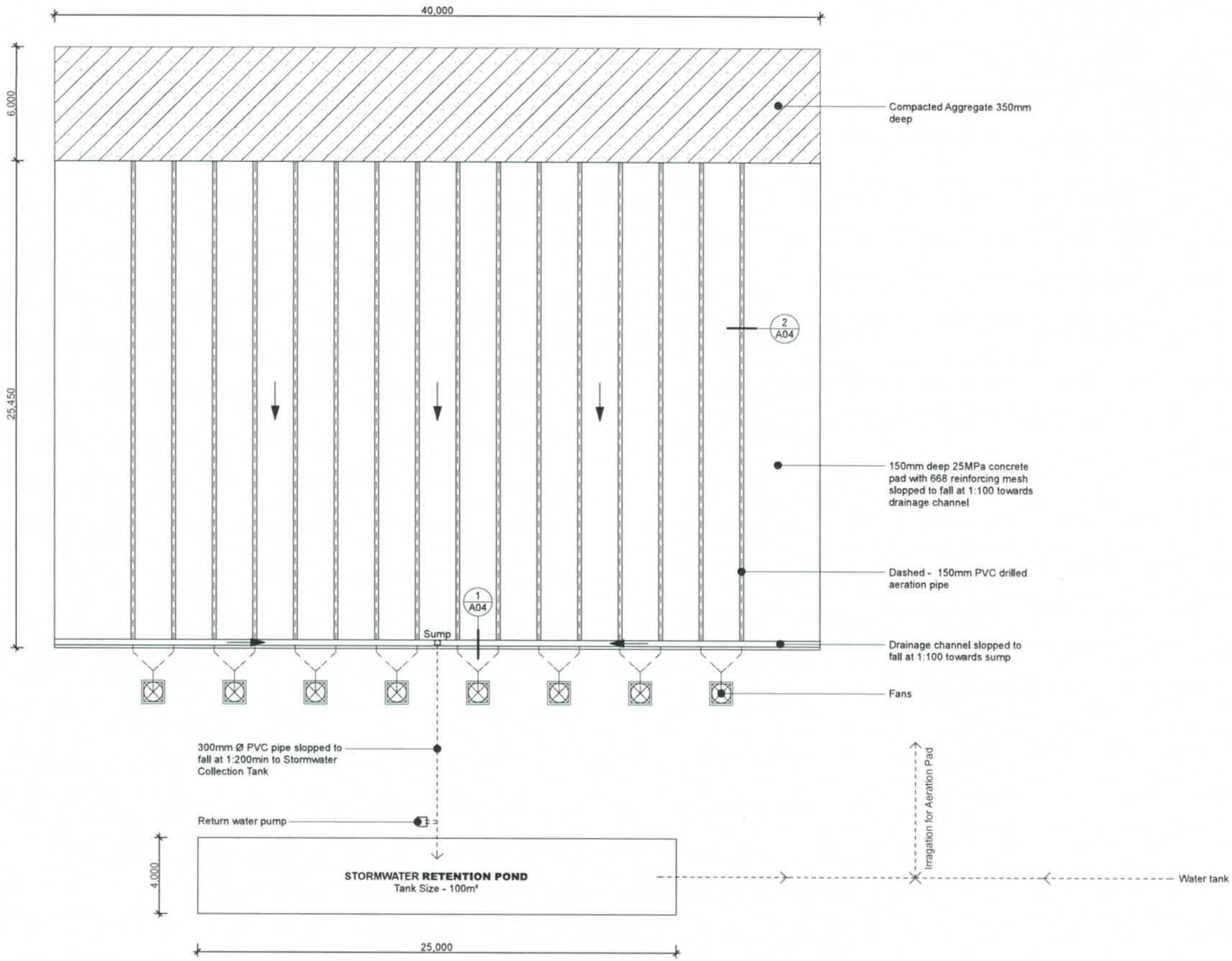

CANTERBURY LANDSCAPE SUPPLIES
949 South Eyre Road, Mcleans Island
Swannanoa

AERATION PAD

All work shall comply with NZS 3604:2011
All windows and doors to comply with NZS 4211:2008
Glazing to comply with NZS 4223:2016

Contractor must verify all dimensions on site prior to commencing any work.

REVISION

designer	G. Woods
job no.	18002
date	04-Apr-18
scale	1:200

SHEET NO **A03** of 04

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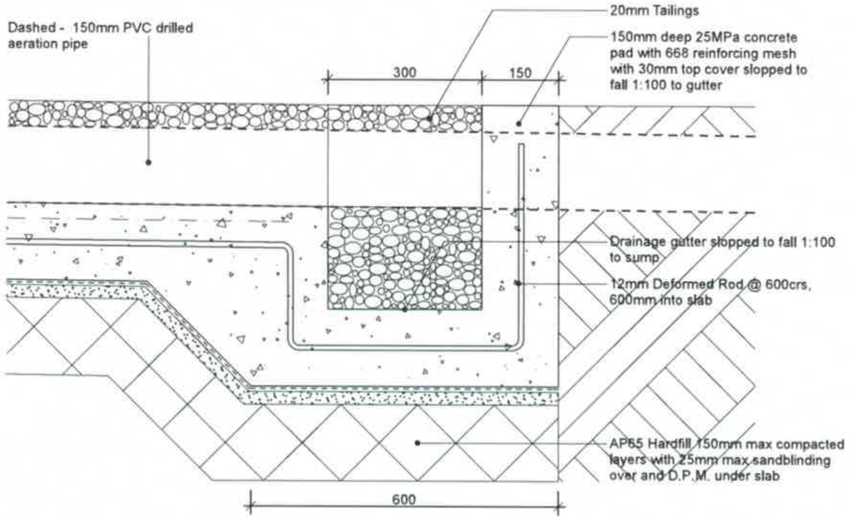
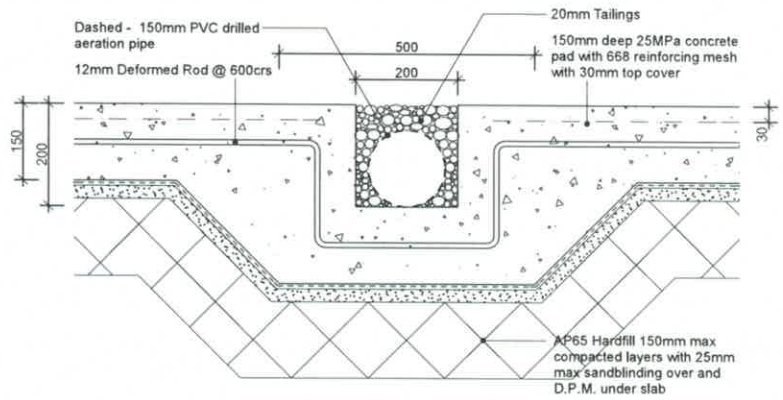


DRAINAGE CHANNEL DETAIL
Scale 1:10
1/A03



PAD / CHANNEL DETAIL
Scale 1:10
2/A03

woods architecture

CANTERBURY LANDSCAPE SUPPLIES
949 South Eyre Road, Mcleans Island
Swannanoa

AERATION PAD DETAILS

All work shall comply with NZS 3604:2011
All windows and doors to comply with NZS 4211:2008
Glazing to comply with NZS 4223:2016
Contractor must verify all dimensions on site prior to commencing any work.

REVISION

designer	G. Woods
job no.	18002
date	04-Apr-18
scale	1:10

SHEET NO **A04** of 04

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