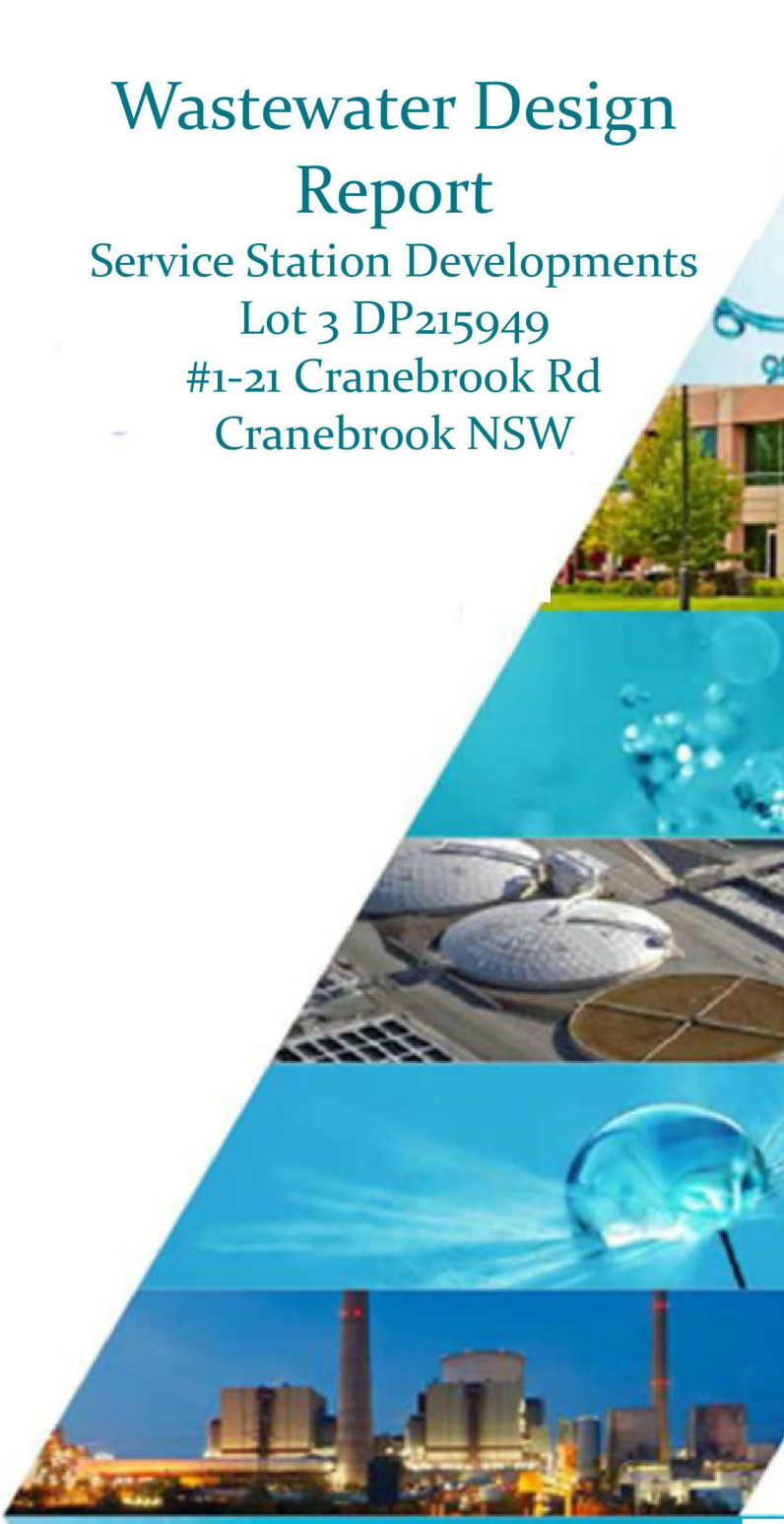
Wastewater Design Report

Service Station Developments
Lot 3 DP215949
#1-21 Cranebrook Rd
Cranebrook NSW



aquamax

ecomax

UltraClear
Wastewater Treatment Systems

Proposal No: 10802/17

Date: 8/06/17

On-Site Waste Water / Effluent Treatment Using Septic Tank & Ecomax "Ecomax Amended Soil Mound (ASM)" Technology

Prepared by: Stuart Crockart

Australian Environmental Wastewater

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Prepared for: Service Station Developments
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Document Control Sheet

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Author:	Stuart Crockart
Client:	Service Station Developments
Client Contact:	
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Purpose:	Application to Install On-Site Wastewater Treatment Plant
Date:	8 June 2017

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1 Introduction

This Wastewater Design Report has been prepared by Australian Environmental Wastewater Solutions for Service Station Developments for the purpose of providing a design for a suitable SMF and EMA (on-site waste management effluent application) to service the proposed Service Station inclusive of convenience store, workshop, take away restaurant.
This report outlines the proposed SMF and EMA (on-site wastewater management effluent application system /area) for this project, which involved referencing the site and soil assessment, climate data, design loading rate and wastewater loading rate as provided by Geotechnique (Geotechnical Investigation – Waste Management) on the 21 October 2010 and cross referenced with the Local Government (General) Regulation 2005, NSW Health Advisory Note 4. And Best Practicable Option (BPO).

Our proposal provides for treatment of wastewater by means of an NSW Approved AWTS treatment tank together with an Ecomax Amended Soil Mound (ASM) for effluent land base disposal, the use of this combined technology provides a more sustainable and environmental option producing extremely high-water quality levels, we consider there to be no risk to health or the environment and is referenced to the NSW Health Advisory Note 4.

We have conducted a full assessment and consider the proposed wastewater treatment system can be sited and utilized in this application taking into account any and all the restraints that maybe applicable with this property.

1.1 Site Information

Table 1-1

Allotment Size	TBC
Water Supply	Town Water
No. of bedrooms	Nil
Description of Site	New facility
Sewer Availability	None
Council Area	Penrith City Council

1.2 Design Summary for the proposed Wastewater Management System

Table 1-2

System	Design
On-site wastewater management system	AWTS CT50 Treatment Tank (SMF) to Ecomax Amended Soil Mound (ASM). (Land Application System)
Facilities serviced by the wastewater management system	Service Station inclusive of convenience store, workshop, take away restaurant
Design Wastewater Flow profile (average daily inflow)	4,000L per/day maximum
Wastewater Treatment System	AWTS CT50 (SMF) to Ecomax Amended Soil Mound (ASM). (Land Application System)
Effluent Land Application Area	5284m² EMA- Amended Soil Raised Mound
Monitoring / Alarms	Applicable

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1.3 Site Location Plan 1

2 Site Assessment

A site and soil assessment was undertaken on the 21 October 2010 by Geotechnique and in direct reference to NSW Government Health Advisory Note 4 and AS/NZS 1547:2012 Table4.2A1 Design Loading Rate (DLR) Secondary Treated Effluent. (*Design Loading Rate DLR- The long-term acceptance rate (LTAR), reduced by factor of safety, expressed in L/m²/day or mm/day as applied to the horizontal design area of land-application system.)*

2.1 Soil Assessment

Referenced Geotechnique Soil Analysis

Subsurface Profile	Depth meters	Soil Category	DLR Secondary AS/NZS
Sandy Silty Clay	0.0-1.2	3	50mm / day AS/NZS1547:2012

Reference to minimum soil depths requirements under NSW Government Health Advisory Note4

Minimum sub-soil depths for Ecomax utilizing primary un-disinfected treated effluent *"The position of NSW Health in regard to disposal / utilisation of effluent is expressed in* **Advisory Note 4** *and is based on a risk management approach. The higher the level of treatment then the less risk to public health and therefore more utilisation is encouraged. The depth of soil in the Ecomax should be commensurate with Advisory Note 4 depending on the level of effluent pre-*

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treatment. As such a DLR (mm/day) of 50mm/day AS/NZS1547:2012 can be applied but reduced to a DLR of 19mm / day for a factor of safety.

3 Legislation & Policies, Standards and Guidelines

This report forms part of the approval process expressed through the *Local Government (General) Regulation 2005* to approve of the installation of the SMF and related effluent application area and approve of the operation of a system management.

As advised by NSW Health, the performance objectives set out in the *Local Government* (General) Regulation (2005) are:

The role of the local authority, expressed through the Local Government (General) Regulation 2005, is to approve of the installation of the SMF and related effluent application area and approve of the operation of a system of sewage management. In fulfilling this role, the local authority needs to be aware of authoritative publications such as:

- *Environment and Health Protection Guidelines: On-site Sewage Management for Single Households; Department of Local Government*
- *Australian Standard AS/NZS 1547:2012 Onsite domestic wastewater management*
- *Designing and Installing On-site Wastewater Systems; Sydney Catchment Authority*
- *On-site Wastewater Management Training Course: Centre for Environmental Training*

4 Design Basis - Wastewater Flows and Loadings

The design loading wastewater allowance for this facility is based on a maximum daily loading of 4,000 litres with an expected maximum of 160 EP with and the property been on town water supply, this formula will be used in the design calculations and applied in the water balance calculations and are outlined in the table below.

Table 4-1 Daily Wastewater Flow used in Wastewater System Design

Total Number of Bedrooms	Total Number of EP	Daily Wastewater Flow
nil	160 maximum	4,000 L / day

5 Waste Management System Design & Land Application Design and Sizing

Water balance calculations are used to determine the size of the required land application area based on the criteria provided within Geotechnical Report- weather data, loading rates, soil category and DLR and been applied to determine the required minimum size of the land application system/area. Weather data in this instance has been selected from the Bureau of Meteorology –from the following weather stations- *rainfall calculation: - Richmond, evaporation data: - Richmond.*

Based on the water balance calculation, an EMA area utilizing an ASM will require an application area of 528 m² or say 88m x 6.0m and the internal cell dimensions are 85.6m L x 3.6m W x 1. A boundary absorption area inclusive of sand bed and grave trench of 188m x 1,200mm x600mm (total 225.6sqm will apply to this application and is included within the water balance calculation, the land base application area is designed to dispose a maximum 4,000 L / day and provides a zero-overflow outside of the nominated EMA based on normal weather conditions. In certain weather conditions, such as the typical summers as experienced in NSW, evapotranspiration is the dominant process and depending on the hydraulic loading, the Ecomax cell may have zero discharge due to evapotranspiration take-up.

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Ecomax Amended Soil Mound Water Balance Calculation

Australian Environmental Wastewater Solutions Pty Ltd
Ecomax Australia
water management solutions

ECOMAX
Waste Water Technology
86 King Road, Wahroonga NSW 2076
Phone: 02 99431081
ABN: 26159292074

Parameters:

Household Data:

Number of Persons	0	[6 for standard house, otherwise justify value]
Daily Flow per Bedroom (L)	0	[From HDWA]
Average Daily Flow	4000	[Number of Persons x Daily Flow per Person]

Planting and Soil Data:

Planting Selection:	Grass	[As selected by Client/Designer]
Surface Runoff Coefficient[ROC]	0.2	[Variable and Site dependent on locality, suggest 0.2[conservatively] to 0.4]
DLR - Soakage [mm/day]	19	[Determined by SSE/permeability testing and AS/NZS1547:2012 Appendix H3]

Ecomax Unit data [single cell only]

Evapotranspiration Area

Perimeter Evapotranspiration Area - Single Cell [m^2]	219.84	[Area to perim. subsurface soakage sand,from Ecomax Unit selection]
Internal Evapotranspiration Area - Single Cell [m^2]	308.16	[Amended Soil Area - Single Cell only]
Total Evapotranspiration Area - Single Cell [m^2]	528	[Perimeter Evapotranspiration Area + Internal Evapotranspiration Area

Soakage Area and Storage Volume:

Total Sandbase Soakage Area [m^2]:	219.84	[Total subsurface sand area available for soakage]
Sandbase Depth [m]:	0.2	[From Ecomax unit selection]
Void Ratio:	0.5	[From Ecomax]
Void Storage Volume [L]:	21984	[Volume available for storage = Sand base area x Depth x Void Ratio]

Climatic and Planting Data:

			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Average Monthly Rainfall:	[mm]	[From Bureau of Meteorology]	44	60	54	73	65	65	52	28	41	32	24	34	572
Average Monthly Evaporation:	[mm]	[From Bureau of Meteorology]	164.3	183	235.6	201.5	156.8	142.6	108	68.2	54	68.2	96.1	129	1607
Planting Selection Crop Factor:		[From Irrigation data Sheets of Dept of primary Industries]	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.7	

Water Balance:

			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
System Inflow:															
Household Inflow:	[L]	ADF x days	124000	120000	124000	124000	116000	124000	120000	124000	120000	124000	124000	120000	1464000
Average Monthly Rainfall:	[mm]		44	60	54	73	65	65	52	28	41	32	24	34	572
Retained rainfall:	[mm]	Average Monthly rainfall x [1-ROC]	35	48	43	58	52	52	42	22	33	26	19	27	458
Retained Rainfall:	[L]	Retained rainfall [mm] x Total Evapotranspiration Area	18586	25344	22810	30835	27456	27456	21965	11827	17318	13517	10138	14362	241613
Total Inflow:	[L]	Household Inflow + Retained Rainfall	142586	145344	146810	154835	143456	151456	141965	135827	137318	137517	134138	134362	1705613
Perimeter Surface Evapotranspiration Loss of Rainfall and Effluent:															
Crop Take-up:	[mm]	Evaporation x Crop factor - Retained rainfall [>O]	80	98	145	103	73	62	34	19	0	15	48	63	741
Perimeter Surface Evapotranspiration Loss of Rainfall and Effluent:	[L]	Crop Take-up[mm] x Perimeter Evapotranspiration Area	17545	21632	31938	22600	16145	13648	7475	4071	0	3368	10568	13872	162862
Internal Surface Evapotranspiration Loss of Rainfall only:															
Maximum Monthly Crop Take-up:	[mm]	Evaporation x Crop Factor - Retained rainfall [>O]	80	98	145	103	73	62	34	19	0	15	48	63	741
Retained Monthly rainfall:	[mm]	Average rainfall x [1 - ROC]	35	48	43	58	52	52	42	22	33	26	19	27	458
Actual Monthly Crop Take-up:	[mm]	Minimum of Maximum Crop Take-up and Retained Rainfall	35	48	43	58	52	52	34	19	0	15	19	27	403
Internal Surface Evapotranspiration Loss of Rainfall only:	[L]	Actual Crop Take-up x Internal Area	10847	14792	13313	17997	16024	16024	10477	5707	0	4721	5917	8382	124201
Total Subsurface Sand Area Seepage Loss:															
Total Subsurface Sand Seepage Loss:	[L]	DLR[mm/day] x Total Subsurface Sand Area [m^2] x days	129486	125309	129486	129486	121132	129486	125309	129486	125309	129486	129486	125309	1528767
Monthly Gain or Loss:															
Stored Volume in Void Area of Sand Base at Start of Month:	[L]	Equal to Stored Volume at end of Previous Month	0	0	0	0	0	0	0	0	0	12010	11952	119	
Nett Gain[+] or Loss[-]:	[L]	Total Inflow - Perim E/T Loss - Internal E/T Loss-Soakage	-15293	-16389	-27927	-15247	-9845	-7702	-1296	-3437	12010	-58	-11833	-13201	-110217
Void Storage Volume at End of Month:[≥ O, ≤ Max. Void Storage]	[L]	Stored Volume at Start of Month ± Nett Gain or Loss	0	0	0	0	0	0	0	0	12010	11952	119	0	
Overflow from System:[≥O]	[L]	Start Void Storage Volume ± Nett Gain or Loss - Max.Void Vol	0	0	0	0	0	0	0	0	0	0	0	0	0
Required Sizing for Overflow System:	[L]	Maximum Monthly Overflow from System													0

7 SMF Process and Specifications

- Wastewater enters the equalization tank from the facility
- Flows into the baffled septic tank inclusive of first aeration chamber
- Into the aerobic treatment tank for further treatment
- After treatment wastewater is disinfected and transferred to the EMA for dispersal
- An overflow collection well will be installed, should a failure occur within the treatment tanks effluent will be transferred via gravity to the collection well for pump out off site – the collection well will be installed with a high-level water alarm to indicate the requirement to pump off site. An over flow will also be installed within the EMA, should loading exceed the specified daily loading rate effluent will backflow to the collection well.

Page 1

SPECIFICATIONS
ULTRA CLEAR WASTEWATER TREATMENT SYSTEMS
ABN 93 090 907 725 ACN 090 907 725

MODEL	CT50 THREE TANK SYSTEM Suitable to deal with WC's and all wastewater on premises for up to 50 persons, i.e. up to 7500 litres per day. Calculation design using 40 hour retention.
SEPTIC TANK	8100 litre capacity (including baffle volume) reinforced concrete tank manufactured by Highland Concrete Tanks AS/NZS 1546.1:2008
COLLECTION WELL 1	8100 litre capacity reinforced concrete tank baffled 3000 litre primary two; 5000 litre aeration one
COLLECTION WELL 2	8100 litre capacity reinforced concrete tank - 5000 litre aerobic chamber two 1650 litre settling chamber 800 litre combined settling, disinfection & pump chamber HCT Australian Standards AS/NZS 1546.1:2008
BAFFLES	Steel fibre or mesh reinforced concrete baffles. Fixed in place with concrete mix and/or two part mega epoxy. Manufactured by Highland Concrete Tanks. Primary tank - single baffle 2:1. Treatment tank - * baffle 1 - main baffle to lid. - partitions installed to create settling & disinfection pump chambers. - base tapered to accommodate sludge returns.
LIDS	Primary tank lid constructed of 80mm thick reinforced concrete. 2530mm diameter with 2 x manhole openings and over inlet & outlet. Treatment tank lid constructed of 80mm thick reinforced concrete. 2530mm diameter with 3 manholes and lids.
AEROBIC CHAMBER 1	First treatment tank using aerobic bacteria, containing 250 square metres of media pack and six air diffusers.
AEROBIC CHAMBER 2	Second treatment chamber using aerobic bacteria, containing 250 square metres of media pack and two air diffusers.
SETTLING CHAMBER	Solids settle to bottom of chamber to be picked up by venturi operated sludge return and returned to primary inlet of septic tank. Scum skimmer to return floatable matter to aerobic chamber two.
CHLORINATOR	Effluent flows through 100mm sewer pipe at a controlled rate, where the water passes through the chlorine inside the two chlorinator tubes, through flow slots, controlled by end cap for disinfection strength. The chlorinator is situated above the water level of the disinfection chamber. Trichloroisocyanuric acid is the disinfectant agent used, with 2 kg in each tube, to be regulated by service technician.

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DISINFECTION CHAMBER	Disinfection & pump chamber allows a retention time of greater than 30 minutes where chlorine destroys any final bacteria not previously removed.
PUMP CHAMBER	Treated effluent is contained until water levels rise and activate irrigation pump for automatic disposal onto irrigation area.
AIR LINES	20mm Class 15 Pressure Pipe PVC connecting lines between air diffusers, situated at eight points at bottom of tank, controlled by 20mm ball valve taps.
DIFFUSERS	20mm x 150mm nylon micro air diffusers, to diffuse air into aerobic chambers one and two.
SLUDGE RETURN	25mm PVC SWV pipe situated in sediment chamber.
SCUM RETURN	20mm PVC pipe situated in sediment chamber.
MEDIA	10 packs of BTM200 Code 60022IR Bio Tube .50 cubic metre with total surface area of 500 square metres, to contain bacteria growth in both aerobic chambers.
MEDIA FIXINGS	Aluminium brackets and megapoxy. 40mm pipe work for legs to contain media pack in place, to provide free flow of air diffused water.
BRACKETS	Plastic brackets and non-corrosive steel pins to hold pipe work in place.
FLOAT SWITCH	15mm pipe fixed in pump chamber to activate pressure switch when water level is high.
COVER BOX	Concrete or plastic cover box situated on top of tanks to house blowers and electrical control panels.
ELECTRICAL CONTROL PANEL	Mounted inside cover box on top of tank for irrigation pump and air blower (electrician to connect).
ALARM PANEL	Mounted inside building by electrician in visible location. Provides audible and visible indication of electrical, blower or pump failure. With 24 hour reset muting device.
AIR BLOWER	2 x Hiblow HP-100 air pump producing a nominal 100 litres air per minute each blower. Located in concrete box on top of tank.
IRRIGATION PUMP	35 metre head submersible irrigation pump with automatic pump control. 250 litre variable water flow cycle dependent on flow adjustment. Located in pump chamber.

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MODEL CT50 SITE SPECIFIC DESIGN

AERATED WASTEWATER TREATMENT SYSTEM

SUITABLE TO DEAL WITH WC'S AND ALL WASTE UP TO 7,500 LITRES PER DAY

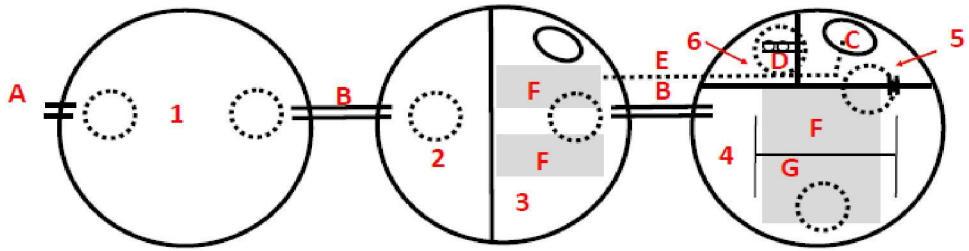
Ultra Clear Wastewater Treatment Systems ABN 93 090 907 725
PO BOX 1158, MITTAGONG NSW 2575 Phone: 02 4871 2156 Fax: 02 4872 4109
www.ultraclear.com.au

All internal and sundries supplied and installed by

3 x 10,000 litre collection wells approved by NSW Health
COLLECTION WELLS manufactured by **Highland Concrete Tanks.**
All Septic Tanks & Collection Wells are manufactured to comply with Australian Standards AS/NZS 1546.1:2008 Licence No. SMKB20582

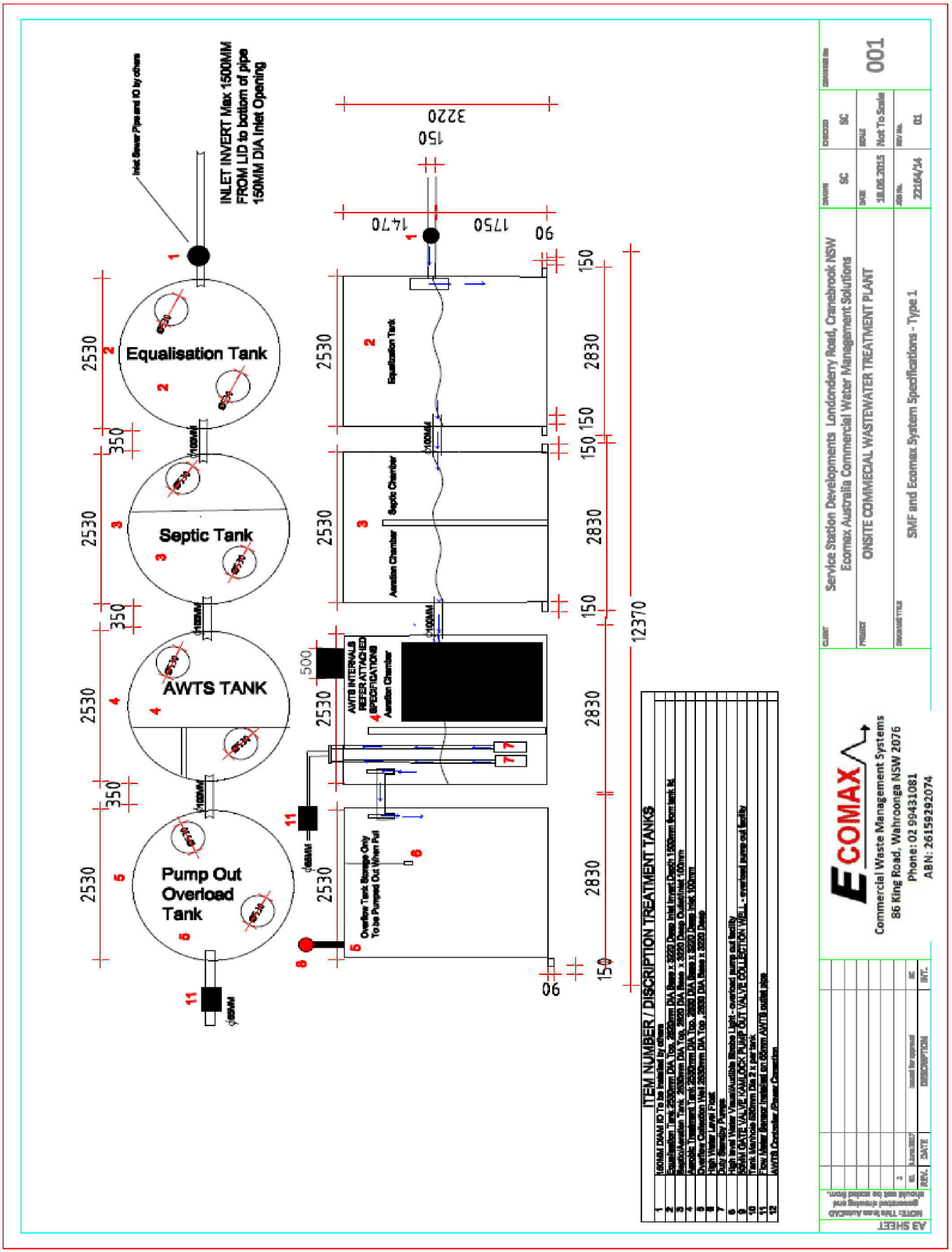
www.highlandtanks.com.au
FACTORY: 16 Gantry Place, BRAEMAR NSW 2575
Phone: 02 4871 2156 Fax: 02 4842 4109

Drawing ID: UCSCT50M 112 5/11/2015 Revision 1



No.	*Capacity*	*Description Chamber*
1	8,100 litres	Primary Chamber 1
2	3,000 litres	Primary Chamber 2
3	5,000 litres	Aeration Chamber 1
4	5,200 litres	Aeration Chamber 2
5	1,650 litres	Settling Chamber
6	800 litres	Disinfection Pump Chamber

No.	*Description Parts*	*No.*	*Description Parts*
A	Inlet	F	Media Pack—250 square metres Bio Blok in each aeration chamber: total 500 square metres
B	Flow Pipe	G	Air Diffuser Line
C	Blower & Electrical Cover Box	H	Air Blower— 2 x HP100 air blowers
D	Chlorinator	I	Total Primary 1 & 2—11,100 litres, allowing for 3,600 litres of sludge accumulation and 7,500 litres for retention
E	Sludge Return Pipe		



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8 Related EMA -Effluent Application Area –Ecomax Amended Soil Mound (ASM)

This phase of treatment would utilize an Ecomax Amended Soil Mound (ASM) for land base application and provides additional "polishing" to the pre-treated effluent, the process once treated primary effluent enters the Ecomax is best described as "solid matrix filtration" with effluent renovation by processes which include sorption, oxidation/reduction, volatilization, filtration, biological uptake and detention.

The Ecomax Amended Soil Mound (ASM) cell will be loaded with pre-treated secondary disinfected effluent introduced to the leach drain from the AWTS tank where intermediate storage occurs to allow for transfer via infiltration into the surrounding amended soil. The effluent flows radially away from the leach drain and through the amended soil filter medium under a gravity head created by the shape and level of the impervious membrane relative to the infiltration surface of the leach drain.

The treatment processes which applies to the effluent as it is driven through the amended soil include: filtration, PH adjustment, ion exchange, volatilization, biological water and nutrient uptake, oxidation and reduction, sorption, chemical precipitation, detention and evaporation or dilution depending on rainfall/evaporation balance. As a result of this treatment, the final effluent produced by the Ecomax Amended Soil Mound (ASM) has very high quality with particular reference to phosphorus concentration.

Treated effluent exits the cell by flowing over the perimeter wall formed by the membrane from where discharge may be by evapotranspiration and or direct soil absorption. In certain weather conditions, such as the typical summers as experienced in NSW, evapotranspiration is the dominant process and depending on the hydraulic loading, the Ecomax cell may have zero discharge due to evapotranspiration take-up.

The treated effluent existing the mound is clear, colourless and effectively odourless (having a faint earthy aroma to the sensitive nose). Expected Phosphorus removal by Ecomax Mound under correct operating procedures would provide as much as 99% retention rates, this substantially higher than can be achieved by any other practical domestic treatment process. Nitrogen removal is generally very high. High ammonia removal is also a key feature as this contaminant is undesirable in aquatic ecosystems, even at low concentrations and BOD removal is very high. In terms of faecal bacteria, Ecomax effluent meets the national health and medical research council guidelines for "reclaimed effluent" but it is not potable.

The Ecomax (ASM) will be turfed at date of installation by either the installer or by the property owner, the land application area must be mown on a regular basis using a hand mower only, and clippings must be removed from the application area and grass coverage must not exceed 100mm. The land application area must be fenced if land area is accessible to stock and vehicular access so as to avoid compaction of soils which will reduce soil infiltration rates and water holding capacity, potentially leading to inadequate loss of vegetative cover and reduced evapotranspiration and decreased rainfall runoff and soil erosion.

If the topography of the property allows for surface storm water runoff then an upslope diversion banks / berms must be constructed to divert storm water away from the proposed effluent application area, all storm water overflows be from downpipes or drains and surface needs to be redirected away from the effluent disposal area – this assessment is ongoing by the home owner and it's the homeowners responsibility to ensure the land application area is kept free from any storm water be it surface or subsurface.

9 SMF and EMA maintenance and Servicing

1. Clean out (pump out) treatment tank every 12 months or when required or directed.
2. The site facility must be fitted with a suitable grease trap as specified and sized by a specialist and must be cleaned out as directed or required in specifications – no grease or oils are to transfer into the SMF.
3. The EMA is to be mowed regularly (turf must not exceed 100mm) and lawn cuttings are to be removed from the EMA (mound/disposal area), failure to remove cuttings will reduce the effectiveness of the Ecomax and may cause overloading /seepage.
4. Ongoing monitoring by the property owner is required to ensure storm water is not flowing over or through the EMA, entry of storm water into the EMA will cause

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the system to overload and seepage may occur, the property owner must ensure storm water is diverted away from the disposal area and treatment tanks at all times.

5. Environmental AWTS tank friendly cleaning products are only to be used within the facility, please refer to the Department of Local Government Web Page www.olg.nsw.gov.au/sites/default/files/Easy-septic-guide.pdf for correct management practices and procedures. Non-compliant cleaning products or chemical disposed into the SMF will cause damage to the system.
6. An operator's manual will be provided at date of installation.
7. More information on correct management of your AWTS tank can be obtained from the Australian Government Health website : http://www.health.gov.au/internet/publications/publishing.nsf/Content/ohp-enhealth-manual-atsi-cnt-l~ohp-enhealth-manual-atsi-cnt-l-ch2~ohp-enhealth-manual-atsi-cnt-l-ch2.9
8. Check area around the Mound for signs of seepage, if present contact manufacturer immediately or refer to the operator's manual.
9. To check the water levels in the cell, remove the inspection caps – correct operating level should have approx. 250mm at all times depending on the time of day and any additional loading that may applicable to the date of inspection
10. Ensure correct cleaning products are used in the premises, only use septic tank friendly cleaning products (many cleaning products are not septic tank friendly and will have an impact on the biological process of the treatment tank and infiltration bed).
11. The high-level water alarm system must be installed in an appropriate location to indicate high water levels, power outage, pump and blower failure or any other fault in the system the alarm must have suitable visual, audio and maximum 24-hour muting facilities and is critical that its working at all times.
12. Client must read the operating instructions prior to using the SMF and EMA

10 Neutral of Beneficial Effect on Water Quality

(Note although the site may not be in the Water NSW (SCA) zoning, we still apply the same high guidelines as if the site was)

NorBE Guidelines

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (SEPP) has three main aims:

- To support healthy water catchments that deliver high quality water and permit development that supports that goal.
- To ensure that consent authorities only allow proposed developments that have a neutral or beneficial effect on water quality.
- To support water quality objectives in the Sydney drinking water catchment.

Clause 10 of the SEPP requires all development in the Sydney drinking water catchment to have a neutral or beneficial effect on water quality (NorBE).

As specified in the *Neutral or Beneficial Effect on Water Quality Assessment Guideline (2011)*, a "neutral or beneficial effect on water quality" is satisfied if the development:

a. has no identifiable potential impact on water quality, or
b. will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or
c. will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority.

For practical application, a proposed development or activity will have a neutral or beneficial effect on water quality if it complies with one of the following:

There are no factors involved that have any potential to impact on water quality. There will be no changes to site conditions and/or the nature and location of development that could:

a. directly change pollutant loads by introducing or increasing substances into the water cycle (such as waste flows, increased erosion, nutrients and sediments), or
b. indirectly change the quality of water in the hydrological system by changing the bio-physical characteristics of the site in any way that reduces, or significantly threatens to reduce, the capacity of the site and related hydrological/ ecological components to assimilate, treat and otherwise produce water of at least equal quality to the existing systems. Changes relate to the environmental values of the system, and may include:

- significant changes to water flows (reductions or increases in flows)

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- clearing or degradation of watercourses or of riparian corridors, or
- changing the path of water flows through these assimilative systems.

The development will not adversely affect water quality off-site because:

a. pollutant loads from the development / activity can be transported to acceptable downstream treatment and disposal facilities without adverse off-site water quality impacts, or
b. any water quality issues can be effectively managed on-site so that there are no adverse water quality impacts off-site, or
c. there are no indirect adverse impacts on water quality caused, or likely to be caused, by changes to factors that currently affect water quality off-site such as treatment, assimilation of pollutants, or the hydrological cycle (such as changes to flow or flow paths, water courses or riparian corridors).

Pollutant loads or concentrations for each pollutant leaving a site are measured at the site boundary, or at that point where the pollutant enters a drainage depression, waterbody or watercourse.

NorBE assessment for the proposed development

The proposed amended soil wastewater treatment system will provide a beneficial effect on water quality.
The proposed development will not adversely affect water quality off-site because:

1. Pollutant loads from the development will be transported to an acceptable treatment and disposal facility without adverse off-site water quality impacts.

   Reason: The sewage and effluent will be transported to a new AWTS Treatment tank CT50 which has a capacity as per Australian Standards for an average inflow of 4,000 L (AS/NZS 1547:2012). The effluent will be gravity fed to a new and appropriately sized Ecomax Amended Soil Mound (ASM) which further polishes the effluent providing additional treatment and nutrient reduction prior to dispersal.

2. Any water quality issues can be effectively managed on-site so that there are no adverse water quality impacts off-site.

   *Reason: Effluent will be contained by the proposed Ecomax Amended Soil Mound (ASM) system. The AWTS tank together with the ASM has been designed appropriately for a maximum inflow of 4,000 L/pday for this facility with town water supply and with **full** water reduction facilities water saving fixtures.*

3. There are no indirect adverse water quality impacts caused or likely to be caused by changes to factors that currently affect water quality off-site, such as treatment, assimilation of pollutants, or the hydrological cycle (such as changes to flow or flow paths, watercourses or riparian corridors).

   Reason: The changes that affect the sewage and effluent treatment and assimilation of pollutants as a result of the development are favorable. The AWTS tank provides improved storage and effluent treatment. The ASM provides additional effluent polishing and treatment together with nutrient reduction and an overall improved effluent treatment when compared with other effluent treatment options. The SMF and Ecomax Amended Soil Mound (ASM) when used together provides significantly lower levels of biochemical oxygen demand, suspended solids, total nitrogen, total phosphorus and faecal coliforms than a typical septic tank or standard AWTS.

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11 Ecomax Amended Soil Mound (ASM) Specifications

SYSTEM	ITEM	DESIGN SPECIFICATION
	SUITABLE SOILS TYPE WITH	DLR: 19 mm/day (secondary treated effluent)
	Min 200 mm separation between membrane base and NGL	Use of sand pads to achieve separation sand pad depth is 200mm (either imported sand or indigenous soils with category 1,2,3)
	AREA (PER CELL x 1)	88m x 6.0 m
	TOTAL LAND APPLICATION AREA	528sqm based on WBC
	SCARIFIED/RIPPED AREA	400MM DEEP X 528SQM (88M X 6.0m)
	SOIL BUND ARROUND PERIMETER OF CELLS	300MM HIGH
	Internal BUND	PVC supports
		Ecomax Drains
	Internal BUND HEIGHT	300mm
	MEMBRANE	: AS2B/70-1996
	MEMBRANE EXTENSION	300 – 400mm beyond bund trimmed
	MEMBRANES PROTECT internal. SAND DEPTH	200mm
	MEMBRANE LEVEL	Use of sand pads to achieve separation sand pad depth is generally 200mm (either imported sand or indigenous soils with category 1,2,3 will apply
	LEACH DRAIN LENGTH	1 cells containing 106 modules
	LEACH DRAIN CONSTRUCTION MATERIAL	Ecomax-Drain plastic mesh modules with min. 400mm invert
	INTERNAL STORAGE VOLUME PER CELL (NB-single CELL SYSTEM)	4,000L
	LOAD BEARING CAPACITY OF MODULE	Greater than 7Kpa as required
	LD INVERT HEIGHT	400mm
	GEOTEXTILE	Polytrac as per AS3706/AS2001.2.3
	ABF200 QUANTITY	24 cubic metres
	BLENDING SAND QUANTITY	50 cubic metres
	AMENDED SOIL QUANTITY	74 cubic metres
	Min. PRI – AMENDED SOIL	41.6ml/g
	AM. SOIL BLENDING RATIO	
	AMENDED SOIL PLACEMENT	
	BACK FILLING	Above ground /cut installation
	CLEAN FILL OVER MODULES	300mm Max
	CLEAN FILL BEYOND BUND	Min. 1,200mm x 200mm deep perimeter sand bed
	SCARIFICATION	400mm depth x 528m2
	CLEAN FILL DEPTH OVER BUND	Min. 300mm
	INFILTRATION TESTS Ref – Geotechnical Report	Base of test pit to a depth of 600mm below membrane level.
	Perimeter ETA Trench	188m x 0.6m x 1.2m – 20-40mm aggregate
	CELL SEPARATION	NA
	MONITOR BORES	8 per cell

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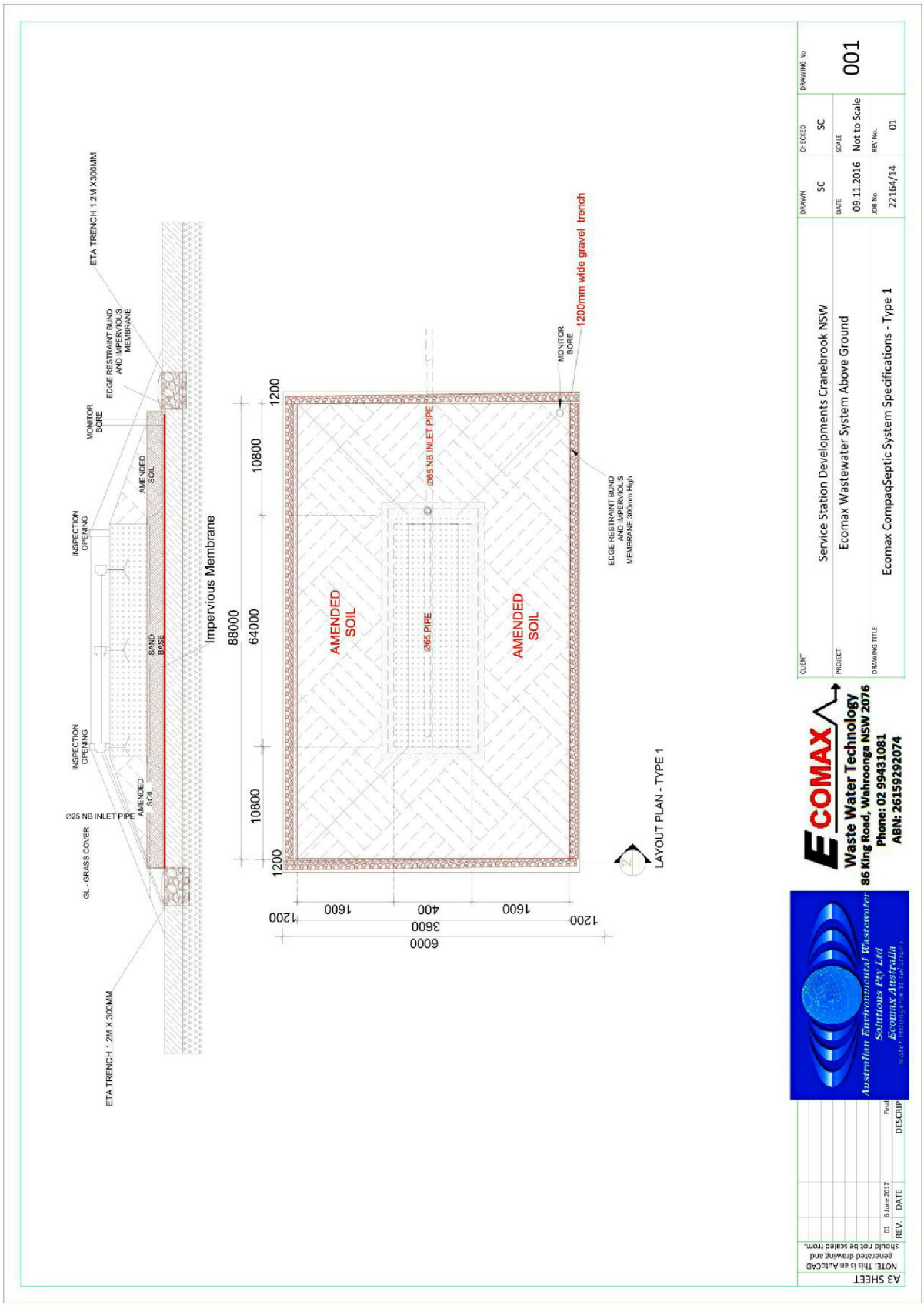
12 Ecomax Amended Soil Mound (ASM) Design and Construction Drawings



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