TREATMENT PLANT APPROVAL 12/2023
Plumbing and Drainage Regulation 2019, part 4.

Queensland Government

Approval

1. The **BioSeptic S-TEN** ("the system") described in the Specifications and Drawings in the attached Schedule and manufactured by **BioSeptic Pty Ltd** (ABN 056 461 226) ("the manufacturer") has been assessed in accordance with the Queensland Plumbing and Wastewater Code (QPW Code).

2. Approval is granted for the system as an advanced secondary quality wastewater treatment system, subject to compliance by the manufacturer with the requirements of the *Plumbing and Drainage Regulation 2019*, part 4 and the conditions of approval detailed below.

3. This approval, the conditions of approval and the Schedule comprise the entire Chief Executive Approval document.

4. Any modification by the manufacturer to the design, drawings or specifications scheduled to this approval must be approved by the Chief Executive.

Conditions of approval

5. The manufacture, installation, operation, service and maintenance of the systems must be in conformity with the conditions of this Treatment Plant Approval.

6. The system when tested by a certification accreditation body in accordance with AS1546.3:2017 was found to comply with the advanced secondary 10EP/1500L level with nutrient reduction of 16.2% in Phosphorus and 23.96% in Nitrogen and must continue to meet the following requirements:

TABLE 2.1 (AS1546.3:2017)

TABLE 2.1

EFFLUENT COMPLIANCE CRITERIA FOR AN STS WITH NO NUTRIENT REDUCTION FACILITIES

Parameter	Secondary effluent		Advanced secondary effluent	
	90% of samples	Maximum	90% of samples	Maximum
BOD$_5$	≤ 20 mg/L	30 mg/L	≤ 10 mg/L	20 mg/L
TSS	≤ 30 mg/L	45 mg/L	≤ 10 mg/L	20 mg/L
E. coli *	≤ 10 cfu/100 mL	30 cfu/100 mL	≤ 10 cfu/100 mL	30 cfu/100 mL
FAC †	Minimum 0.5 mg/L ‡	N/A	Minimum 0.5 mg/L ‡	N/A
Turbidity §	N/A	N/A	N/A	10 NTU

* Where disinfection is required.

† Where chlorine disinfection is used.

‡ Minimum level, not 90% of samples.

§ Where UV light is used for disinfection (see Paragraph B3.1).

7. Each system must be serviced in accordance with the accreditation certificate issued by Global Certification Pty Ltd on 25 March 2022, and details supplied in the owner's operation and maintenance manual.

8. Each system must be supplied with —

   (a) a copy of this Treatment Plant Approval document;
   (b) details of the system;

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(c) instructions for authorised persons for its installation;
(d) a copy of the owner's manual to be given to the owner at the time of installation;
and
(e) detailed instructions for authorised service personal for its operation and maintenance.

9. At each anniversary of the Treatment Plant Approval date, the supplier must submit to the Chief Executive a list of all systems installed in Queensland during the previous 12 months. Where the Chie Executive is notified of any system failures the Chief Executive may randomly select a number of installed systems for audit. The Chief Executive will notify the supplier's nominated NATA accredited laboratory which systems are to be audited for BOD^5 and TSS. The sampling and testing of the selected systems, if required, is to be done at the supplier's expense. The following results must be reported to the Chief Executive;

(a) Address of premises;
(b) Date inspected and sampled;
(c) Sample identification number;
(d) BOD^5 for influent and effluent; and
(e) TSS for influent and effluent.

10. The Chief Executive may, by written notice, cancel this approval if the manufacturer/supplier fails —

(a) to comply with one or more of the conditions of approval; or
(b) within 30 days, to remedy a breach, for which a written notice been given by the Chief Executive.

11. This approval may only be assigned with the prior written consent of the Chief Executive.

12. This approval expires on 20 April 2028 unless cancelled earlier in accordance with paragraph 10 above.

Lindsay Walker

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Department of Energy & Public Works
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Director
Plumbing, Drainage and Special Projects
Date approved:

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SCHEDULE

Attachment 1

Specifications & Drawings for the

BioSeptic S-TEN

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PRODUCT CERTIFICATE OF REGISTRATION

BioSeptic Pty Ltd

67 Smeaton Grange Road, Smeaton Grange, NSW 2567, Australia

Product Performance Testing

Advanced Secondary Quality at 1500 L/day (10EP level) with nutrient reduction in nitrogen (23.96%) and phosphorus (16.2%)

AS 1546.3:2017

Model	Disinfection	Average Results over the Test Period	Servicing Frequency	Discharge	Manufactured and assembled
BioSeptic S-TEN NR STS	Yes	TSS 3.54 mg/L BOD5 1.78 mg/L Nitrogen 52.7 mg/L Phosphorus 9.20 3mg/L E coli 1.75CFU/100mL	3 Monthly	Pumped via a disinfection/pump chamber with chlorine dispenser	Manufactured and Assembled: 49C Smeaton Grange Road, Smeaton Grange, NSW 2567, Australia
The system took 1 week to meet the advanced secondary standard. Chlorine was added during the test period for sterilisation.					

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This Certificate of Conformance to the Product Certificate Scheme for "Domestic Wastewater Treatment Units (AWTS)" remains the property of Global Certification Pty. Ltd. and is granted subject to the terms and conditions of the Contract Application, in respect of the Product certified on this page and the attached schedule to the Certification of Conformance, bearing the same number as this certificate.

Managing Director

JAS-ANZ

CERTIFICATION DATE:	DATE OF ISSUE:	EXPIRY DATE:	CERTIFICATE #:
18 March 2022	25 March 2022	18 March 2027	3563-2824-03

THE OPERATION AND PERFORMANCE OF THE BIOSEPTIC S-TEN Sewage Treatment System

The numbering follows section 2 of Schedule 5 of the Plumbing and Drainage Regulation 2019.

2 (a) The Purpose and Process overview of the BioSeptic S-TEN STS

The BioSeptic S-TEN STS is an Advanced Secondary Sewage Treatment System contained in a single concrete tank. It treats all the wastewater from a domestic house by an aeration process to reduce pollutants in the water. The treated water is disinfected by chlorine before disposal through surface or subsurface irrigation. The vegetation in the disposal area completes the water cycle by transpiring the water to the atmosphere and utilising the residual nutrients for vegetative growth.

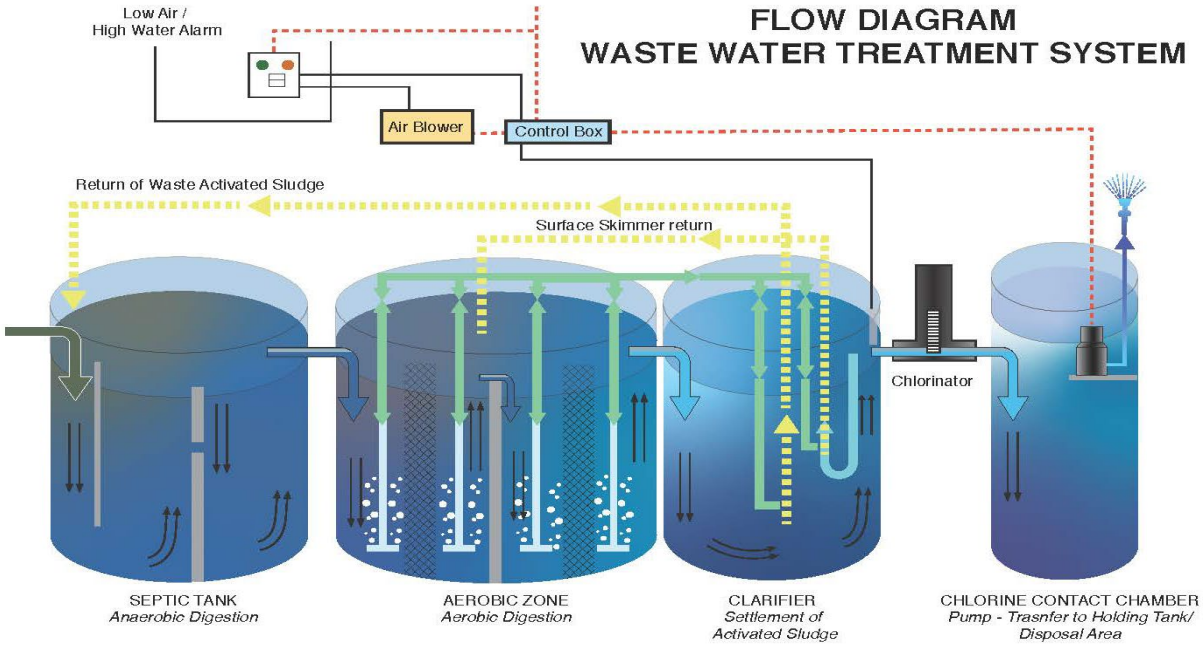
The S-TEN was tested by B Smith Pty Ltd to the Advanced Secondary treatment level of AS1546.3:2.17 between May 2021 and January 2022 at the Jimboomba Sewage Treatment Plant.

Refer to the Engineering drawings and specification sheet for further details of all components.

2(b) Model name

BioSeptic	S-TEN STS
Capacity	1500L/day
Treatment level	Advanced Secondary Treatment with Nutrient Reduction

2(c) Flow diagram



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2(d) Treatment Process

Septic Chambers

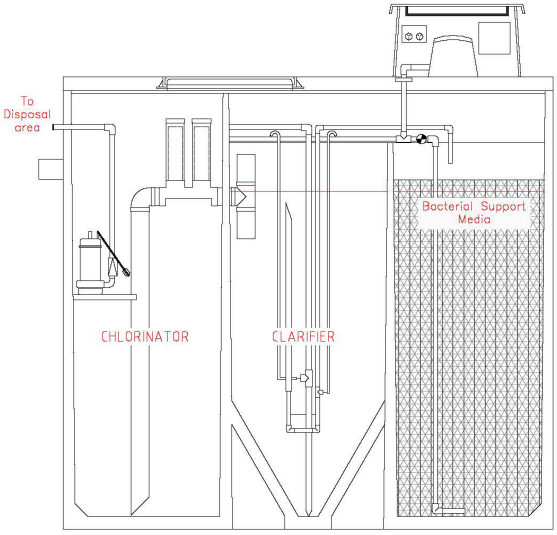
The S-TEN receives all the wastewater from the house toilets, bathrooms, laundry and kitchen. The S-TEN's two primary chambers create a baffled septic tank to ensure good primary settling. A concrete baffle creates a 2:1 division in the two chambers. The baffle makes the tank into a giant grease trap and prevents the overflow of scum from the tank. The wastewater (influent) from the house flows into the septic tank through an inlet square junction. The square junction is a vertical pipe that directs the influent down to the middle depth of the tank, preventing splashing that will disturb the surface crust. There is a second vertical square junction in the baffle that prevents floating solids transferring into the second septic chamber.

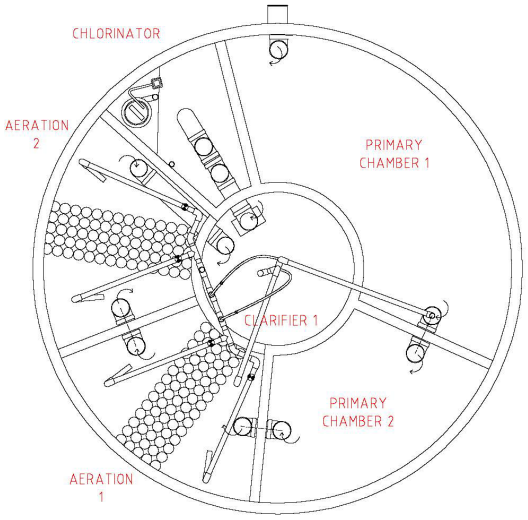
The heavier fraction of the wastewater sinks to the bottom of the tank and the lighter fraction of oils and fats, floats to the surface to form an airtight scum to reduce the transfer of atmospheric air into the water. An anaerobic condition develops in which anaerobic bacteria commence the degradation of the organic matter that settles out of the influent. Anaerobic bacteria are slow acting bacteria that in the absence of free oxygen digest the complex organic compounds into simple soluble compounds that are used by the bacteria for energy and food. The process can be described in simple terms as:

Organic matter + anaerobic microorganisms → anaerobic microorganisms + water
+ carbon dioxide + methane + nitrogen & phosphorous compounds

The settled sludge forms a layer in the bottom of the two chambers. The floating scum is retained on the inlet side of the baffle.

Figure 1: The BioSeptic S-TEN.





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Aeration Chambers

An air blower pumps 80 litres of air per minute into the two discrete aeration chambers to increase the dissolved oxygen concentration. Aerobic bacteria use the oxygen to oxidise the complex compounds in the organic matter into simple compounds that are used as energy and food for their survival. The aerobic process does not generate the noxious gases such as methane that are produced in the anaerobic process. The reduction of the organic matter is also known as Biochemical Oxygen Demand (BOD_5) reduction. The process can be described in simple terms as:

Organic matter + aerobic microorganisms $\rightarrow$ aerobic microorganisms + water + carbon dioxide + nitrates & phosphorous compounds

It can be seen in Figure 1 that the media is placed transversely to the flow path so that the water must pass through the media for treatment by the biomass. The media divides each aeration chamber into two sections with each section containing an air diffuser to provide good oxygen transfer to the water.

The S-TEN achieved BOD_5 reduction of 99.44%.

Clarifier.

After the aeration process has reduced the organic load the water overflows into the clarifier. All aeration processes create a biomass known as activated sludge and this needs to be removed from the treated water. The S-TEN has a 0.5m2 circular clarifier with a cone at the base to concentrate the settled sludge to a central pick-up point. The large surface area ensures that the activated sludge has sufficient settling time to allow a clarified liquor to overflow into the disinfection stage.

An airlift returns all of the settled activated sludge from the bottom of the clarifier hopper to the septic tank. This is waste activated sludge and the anaerobic processes of the septic tank degrades it. The skimmer removes any floating biomass plus a portion of the clarifier influent water containing the activated sludge and recycles it to the inlet of the first aeration chamber.

The S-TEN achieved a Total Suspended Solids (TSS) reduction of 98.98%.

Disinfection process

The final part of the process is to disinfect the water to kill pathogens. The S-TEN uses chlorine in the form of 200gm tablets of sodium trichloroisocynuric acid. To test the efficiency of the disinfection process the water is sampled and tested for the presence of Escherichia coli (E. coli) as an indicator pathogen. These are bacteria present in the lower intestines of warm bloodied animals. E.coli are always present in sewage and if they are reduced or not detected, it is an indication that other pathogens that are susceptible to chlorine have been removed or reduced.

The S-TEN has a 477 L chlorine contact chamber to ensure that there is sufficient contact time.

The S-TEN 2020 achieved an E.coli reduction of 99.99%.

2(e) Component Specification

Design capacity Design flow	 1500L/day
Septic chamber 1 **Septic chamber 2** Operation	2289L 1150L 2:1 division Reduces BOD_5 & SS by settling solids Anaerobic digestion of solids and scum
Aeration chambers Air blower Dissolved oxygen Operation	Two discrete chambers of 1244L each Four submerged air diffusers 80L/minute >2.0g/m^3 Average during test – 3.69g/m^3 Reduction of complex compounds in the waste to simple compounds for bacterial digestion
Bacterial support media Operation	138m^2 of submerged polyethylene tubular media Substrate for bacteria
Clarifier Operation	Capacity - 623L Surface area - 0.5m^2 Equipped with surface skimmer and waste sludge return Settles SS and recycles and wastes MLSS to maintain CRT
Chlorinator Operation	Erosion tablet type 200gm tablets of Sodium Trichlorocynuric acid. Adds chlorine to stream.
Chlorine contact chamber Operation	Capacity - 477L Provides > 30 minutes of residence time to ensure pathogen kill
Pump chamber Pump	Capacity/pump cycle - 90L Submersible type 20m head
Surcharge provision	Capacity – 2311L prior to overflow into chlorine contact chamber

2(f) Component materials

Tanks and internal chamber	Concrete
Bacterial support media	Polyethylene
Air and water pipes	uPVC
Air blower	Cast aluminium with copper wiring
Water pump	Cast iron, stainless steel with copper wiring
Control box	PVC
Control box and blower cover box	Composite resin

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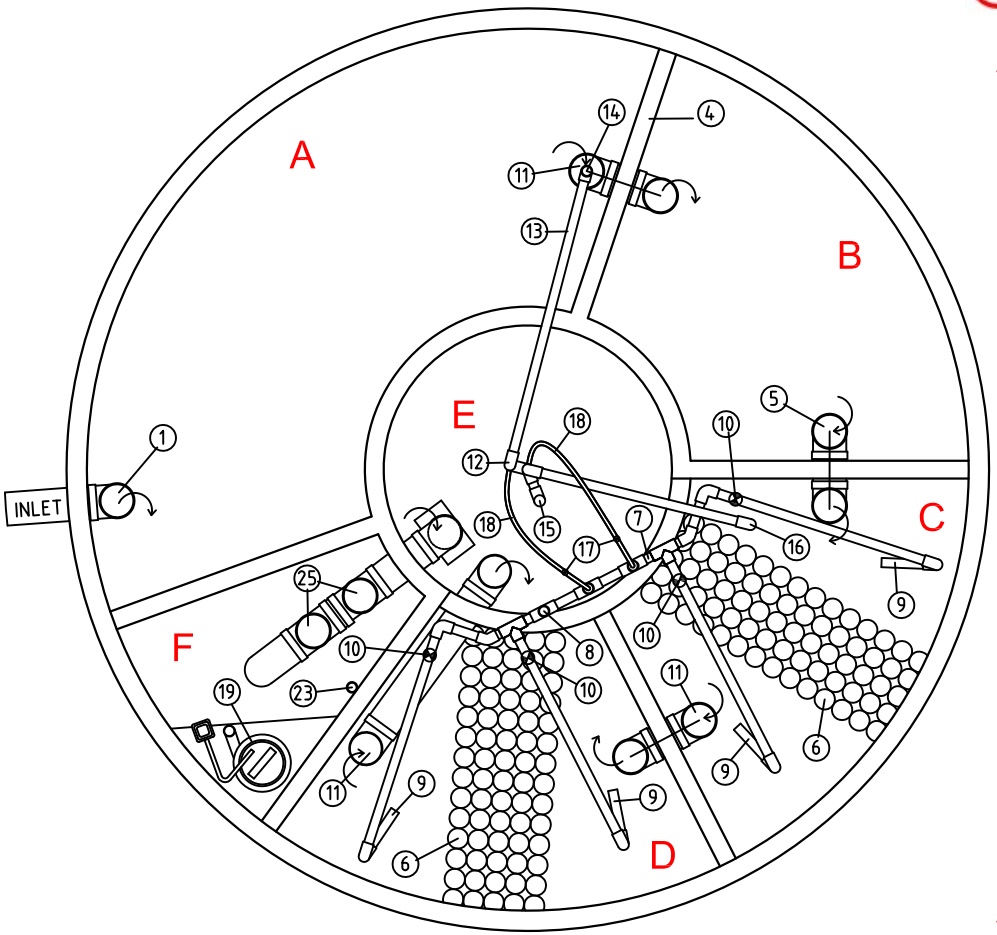

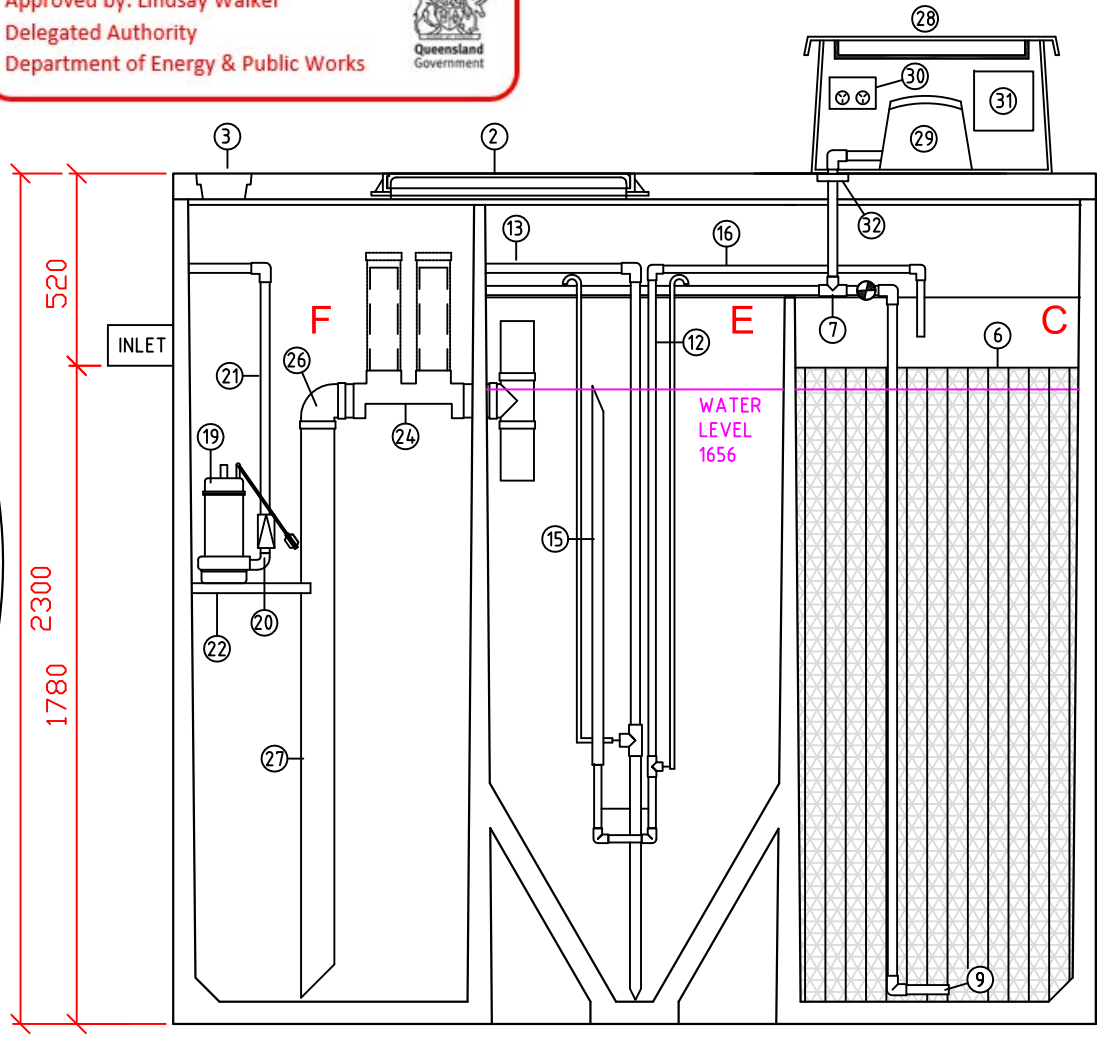

ISSUE	DATE	AMENDMENTS
A	28.03.22	ORIGINAL ISSUE

BIOSEPTIC S-TEN NR AWTS STS

DRAWN	O.Rios	APPROVED BY	DATE:
APPROVED	B.Martin		
ISSUED	28.03.22	NAME:	
RECORD OF ISSUE			
A			
SHEET 1 OF 1		SIGNATURE	

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BIO septic SEWAGE SYSTEMS

BioSeptic model **S-TEN NR STS-AWTS** specification sheet February 2022			
Capacities determined from drawing D21004-TD-001_D by G F Murphy B.E. (Civil), RPEQ 7141			
		Litres	
A	Septic chamber 1	2289	
B	Septic chamber 2	1150	Septic chamber ratio (2289/1150) = 2:1
C	Aeration chamber 1	1244	
D	Aeration chamber 2	1244	
E	Clarifier	623	Surface area - 0.5m2
F	Pump chamber	477	
	Total working capacity	**7027**	
	Surcharge capacity >	2311	Surcharge capacity >1000L
	Total tank capacity	9338	

No	Description	Quantity	Material	Specification
1	Inlet square	1	PVC	100mm per manufacturer's spec.
2	Access cover	3	Composite resin	610mm diameter
3	Inspection opening	3	Concrete	150mm min diameter
4	Chamber walls	6	Concrete	Reinforced concrete
5	Outlet square with filter	1	Stainless steel	700 x 96 dia with 5mm holes
6	Bacterial support media	138m^3	Polypropylene	Surface area 200m2/m3
	Media dimensions			1.71 x .770 x .275 x 2 chambers
7	Air manifold	1	PVC	20mm pressure pipe Sche 40
8	Air inlet	1	PVC	20mm pressure pipe Sche 40
9	Air diffuser	4	Polyethylene	20mm diameter
10	Ball valve	4	PVC	20mm
11	Transfer square	2	PVC	100mm per manufacturer's spec.
12	Sludge return - airlift	1	PVC	25mm pressure pipe
13	Sludge discharge pipe	1	PVC	25mm pressure pipe
14	S R outlet square	1	PVC	25mm pressure pipe
15	Skimmer airlift inlet	1	PVC	25mm pressure pipe
16	Skimmer discharge pipe	1	PVC	20mm pressure pipe Sche 40
17	Air valve	2	PVC	13mm bore
18	Air line	2	Polyethylene	13mm low density pipe
19	Water pump	1	CI/SS	>.25Kw
20	Non return valve	1	PVC	25mm bore
21	Pump discharge pipe	1	PVC	25m pressure pipe
22	Pump shelf	1	Concrete	>20mm thick
23	High water sensor	1	PVC + PE	20mm pipe Sch 40 + 4mm PE tube
24	Chlorinator	1	PVC	Moulded one piece PVC
25	Chlorine canister	2	PVC	90mm stormwater pipe
26	Elbow	1	PVC	90mm stormwater pipe
27	Chlorinator outlet pipe	1	PVC	90mm stormwater pipe
28	Cover box	1	Composite resin	As per BioSeptic drawing Nov 11
29	Air blower	1		Nominal 80 litre/minute
30	Weather proof GPO	1	PVC	Proprietary brand
31	Control box	1	PVC	As per BioSeptic design
32	Sealing plate	1	PVC	90mm stormwater cap

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