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Site and Soil Evaluation Report
107 Abrahams Road, South Ripley
Queensland 4306

Date Issued: 10 August 2012
Taylor Environmental No: TE110180

Document Control Table

taylor environmental	**Document Reference:** **TE110180** **Ripley Ventures Pty Ltd** **107 Abraham's Road, South Ripley, Qld 4306** **Site and Soil Evaluation Report**

Revision	Date	Revision Details	Author	Reviewer	Approver
A	10 August 2012	Version 1	C. Taylor	F. Taylor	Chris Taylor

Table of Contents

Table of Figures

Index of Tables

Executive Summary

Taylor Environmental Pty Ltd was engaged by Anthony Schmidt to undertake a Site and Soil Evaluation for 107 Abraham's Road, South Ripley Queensland 4306. The Queensland Urban Utilities reticulated town water or municipal sewerage systems do not extend to this property. Rainwater will be used for potable water and all wastewater is required to be treated and disposed of on-site.

The objectives of this assessment are to provide a wastewater treatment and disposal system that meets the requirements of AS 1547:2012 and the Queensland Plumbing and Wastewater Code (March 2006). A site visit and soil evaluation was undertaken by Chris Taylor (Director, Taylor Environmental) on 6 July 2012. Chris Taylor has 20 years experience in the water, wastewater and civil engineering sectors and has a Masters of Environmental Management (UQ), Bachelor of Applied Science (Chemistry), Associate Diploma of Engineering (Civil) and Certificate IV DWM 003 (Conduct Site Assessments and Design On-site Sewerage Facilities).

The proposed development is an outdoor sport and recreation, paintball adventure course. The property is 16.3369 ha in area that is currently vacant rural land. The facility is designed to cater for up to 50 customers per day from 9:00am to 4:00pm, seven days a week. AS / NZS 1547:2012 Table H4 nominates a typical wastewater design flow for tearooms / lunch bars with restroom facilities on rainwater at 15 / customer / day. The total peak daily flow for this development is 750 L / day.

An alternative solution has been designed for treatment and disposal of wastewater at this property. This alternative solution was designed using the new and innovative product "Advanced Enviro-Septic" (AES). The Plumbing Code of Australia (PCA) sets the requirements for an Alternative Solution based on existing or new innovative building, plumbing and drainage products, systems and designs. This proposed Alternative Solution complies with the Performance Requirements by reason of satisfying the Deemed-to-Satisfy Provisions. A SAI Global review of the AES against the Queensland Plumbing and Wastewater Code found that the AES system has demonstrated compliance with advanced secondary quality characteristics. This system and its design have the consent of the owner.

The wastewater from the amenities block and kiosk are to be initially treated in a 5,000 L concrete all-waste septic tank before further treatment and disposal in an AES system. A grease trap is to be installed at the kiosk. This AES design was assessed and designed in full accordance with all relevant legislation, AS/NZS1547:2012 and the manufacturer's requirements. All supporting documents are attached and other document such as confidential full test data and product warranty are available on request form the Distributor - Chankar Environmental (Ph: 5474 4055).

The soil classification at the land application area site is best described as Category 5.3 with a Design Loading Rate (DLR) of 5 mm / day for Evapotranspiration beds. The AES area required is 150 m^2 or due to the slope, 2 AES Beds, each 26.0 m x 2.9 m. All trees within 3 m of the AES beds are required to be removed and the excavated area re-grassed (stolons or turf). A water balance of the land application area found that this is of sufficient size to safely, efficiently and sustainable dispose of all wastewater generated at this facility.

Diversion drain and cut-off trenches are required to be constructed up slope of each AES bed. This is to prevent storm or ground water entering the disposal beds

The maintenance requirements of the WWTP system are minimal. The AES does not require quarterly maintenance / servicing. Septic tanks are typically required to be pumped out every three to five years or when 1/3 full of solids. The following precautions are to be undertaken by the residence:

- Use low phosphorus and sodium biodegradable soaps and detergents and in accordance with the label

- Paints, solvents, chemicals, food scraps, fats, oils or any other solids are not to be disposed in the system

- Water discharge minimised

1. Introduction

1.1 Background

Taylor Environmental Pty Ltd was engaged by Anthony Schmidt to prepare a Site and Soil Evaluation (SSE) report for a new development proposed to be located at 107 Abraham's Road, South Ripley Queensland 4306 (see Figure 1, below). This proposed development is an outdoor sport and recreation paintball adventure facility. The facility is designed for 50 patrons from 9:00am to 4:00pm, seven days a week and is 16.3369 ha that is currently vacant rural land.

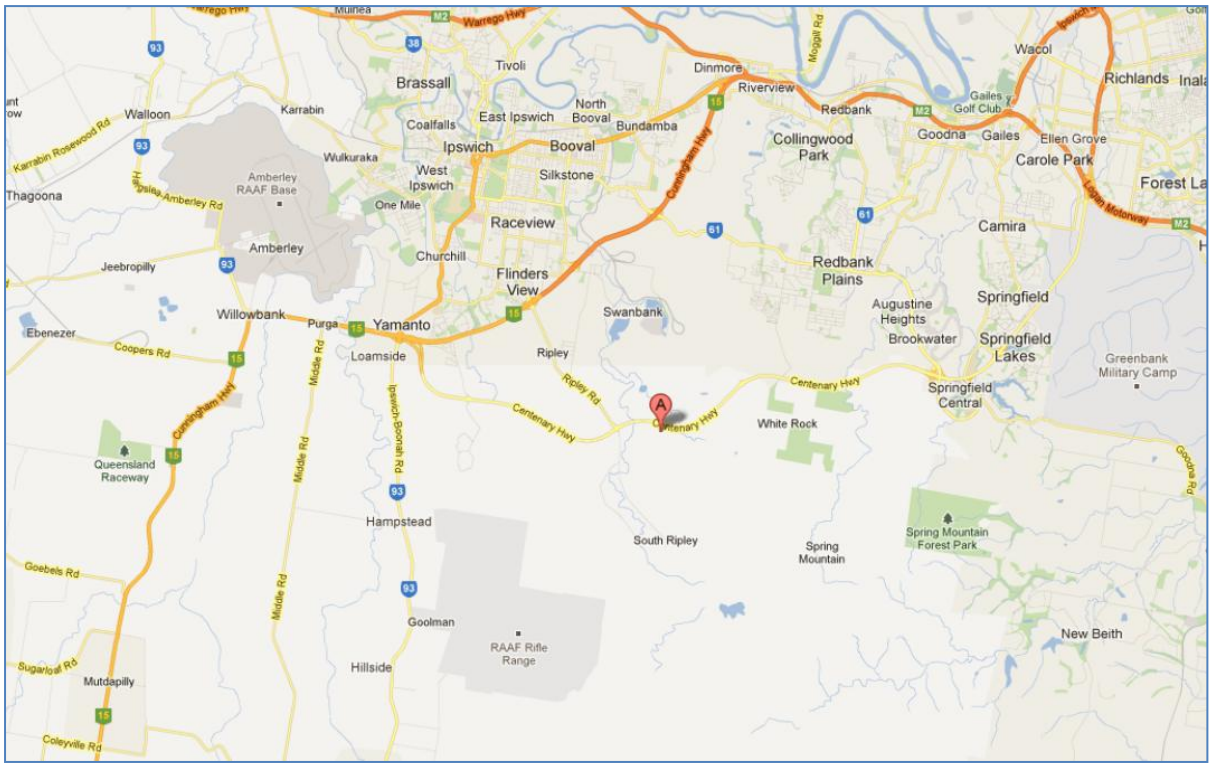


Figure 1: 107 Abraham's Road Locality Plan[1]

A site inspection was undertaken by Chris Taylor (Taylor Environmental Pty Ltd) on 6 July 2012. Chris Taylor has 20 years experience in the water, wastewater and civil engineering sectors. Chris has a Masters of Environmental Management (UQ), Bachelor of Applied Science (Chemistry), Associate Diploma of Engineering (Civil) and Certificate IV DWM 003 (Conduct Site Assessments and Design On-site Sewerage Facilities).

1.2 Objectives

The objectives of this assessment are to design a wastewater treatment and disposal system in accordance with the relevant legislation and standards.

[1] Google Maps

1.3 Legislation and Standards

This report has been completed in accordance with the relevant legislative requirements:

- *Plumbing and Drainage Act 2002*
- *Plumbing and Drainage and Other Legislation Amendment Act 2005*
- *Plumbing and Drainage Regulation 2003*
- Department of Infrastructure and Planning, Queensland Plumbing and Wastewater Code March 2006
- AS/NZS 1547:2012 On-site domestic wastewater management

2. Site Description

2.1 The Premise

The property details of the development are:

- Street Address - 107 Abraham's Road
  South Ripley, Queensland 4306
- Lot and Plan No - Lot 57 on SP 200927
- Local Authority - Ipswich City Council
- Owner - Ripley Ventures Pty Ltd

The proposed layout of the development is shown in Figure 2, below. Site maps and plans are presented in Appendix A.

Figure 2: 107 Abraham's Road Site Plan

The Queensland Urban Utilities reticulated town water or municipal sewerage systems do not extend to this property. Rainwater will be used for potable water and all wastewater generated is required to be treated and disposed of on-site. AS1547:2012 Table H4 states that the design wastewater volume for tearooms/lunch bars with restroom facilities is 15 L / customer / day. The peak design flow for this development is 750 L / day[2].

[2] 50 Patrons @ 15 L / person / day

2.2 Topography and Features

The surface level is complex and steep in areas (see Figure 3, below). The land surface is most appropriately classified as linear divergent in the area of the amenities and kiosk. This area has an estimated slope of approximately 14 % that falls south-east.

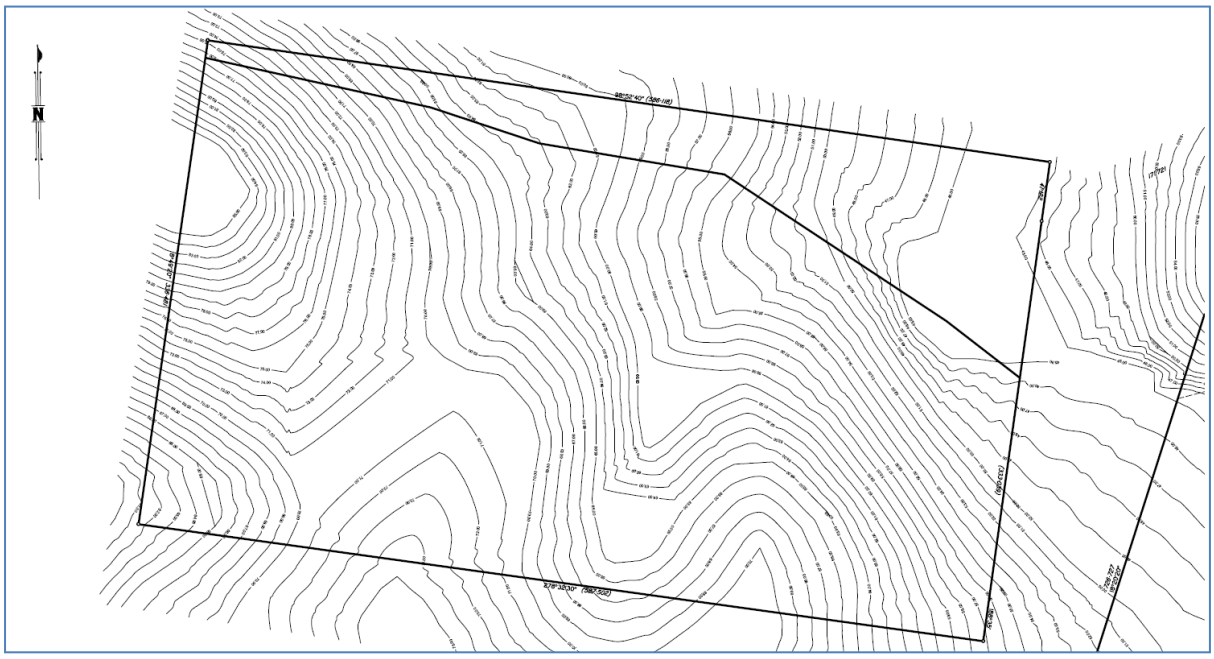


Figure 3: 107 Abraham's Road Contour Plan

There is a drainage path along the northern boundary traversing the site from east to west and there are two small dams (see Figure 4, below).

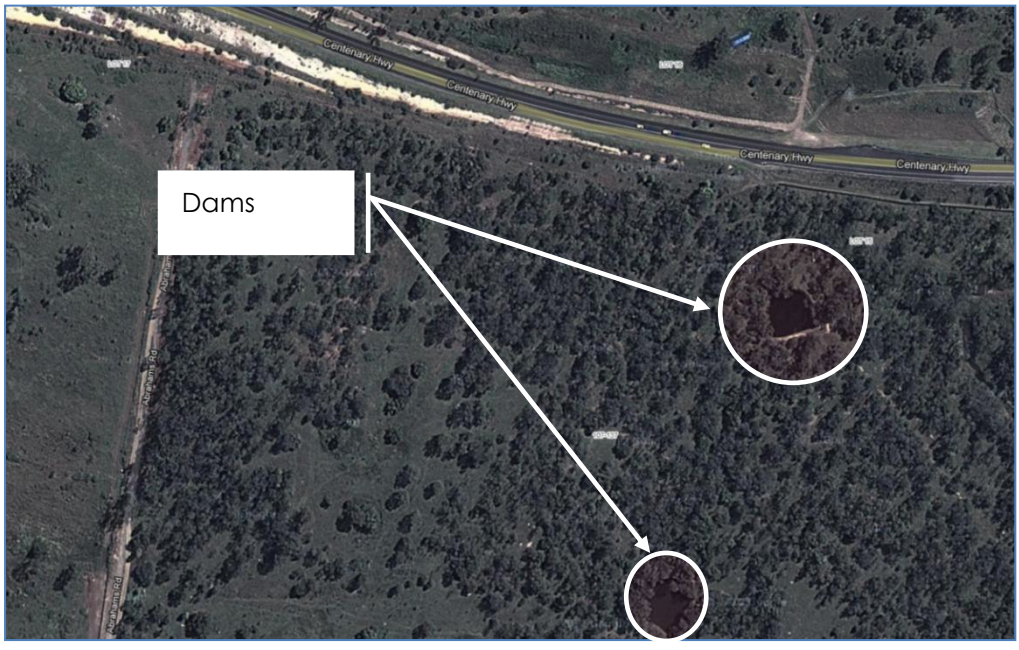


Figure 4: Dam Locations

Rocky outcrops / exposures were observed at the along the top of the ridge (see Figure 5, below). There was no evidence of soil instability at the property.

Figure 5: Rock Outcrop

2.3 Vegetation

The site is re-growth with areas of mixed grasses. The area of the base camp has significant re-growth.

2.4 Soil Properties

There were been three auger holes undertaken in the determination of the soil properties for the disposal of wastewater (see Figure 6, below).

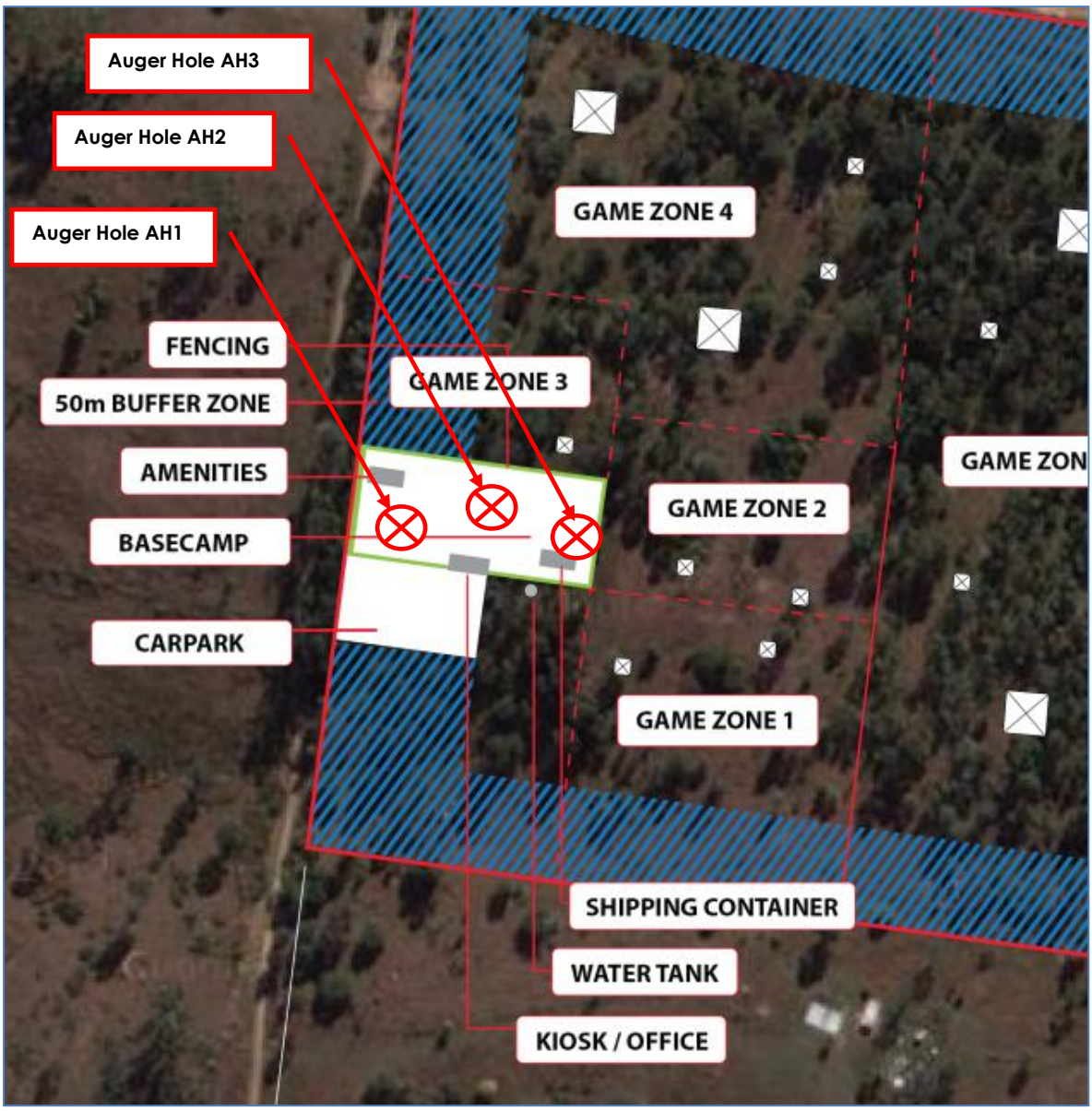


Figure 6: Auger Hole Locations

The typical soli profile for the three auger holes is shown in Figure 7, next page.

Figure 7: Typical Soil of the Site

The soil profile is best described as:

1. 0 to 450 mm moist light brown sandy clay loam (Category 4.3)
2. 450 mm to 750 mm moist orange/brown mottled light clay (Category 5.3)

The land application area soil for the disposal of effluent is best described as Category 5.3 light clay with a permeability (K_{sat}) of 0.01 m/day. Based on AS/NZS 1547:2012 Table L1 Recommended Design Loading Rate (DLR) for Evapotranspiration (ETA) beds is 5 mm / day for this soil classification. The site plans and SSE worksheets are presented in Appendix B.

3. WWTP Design

3.1 WWTP

The all-waste wastewater from the amenities block and the kiosk is to be gravity drained to a new concrete all-waste septic tank. The primary treated septic tank effluent is then further treated in an Advanced Enviro-Septic (AES) system before sub-surface disposal (see Figure 8, below). The kiosk will require a grease trap before the septic tank. A high vent for the AES is required to be installed at the both the amenities block and the kiosk. This must be at least 3m higher than the low vent, which is installed at the AES bed.

The design plans for the recommended wastewater treatment and disposal system are presented in Appendix C.

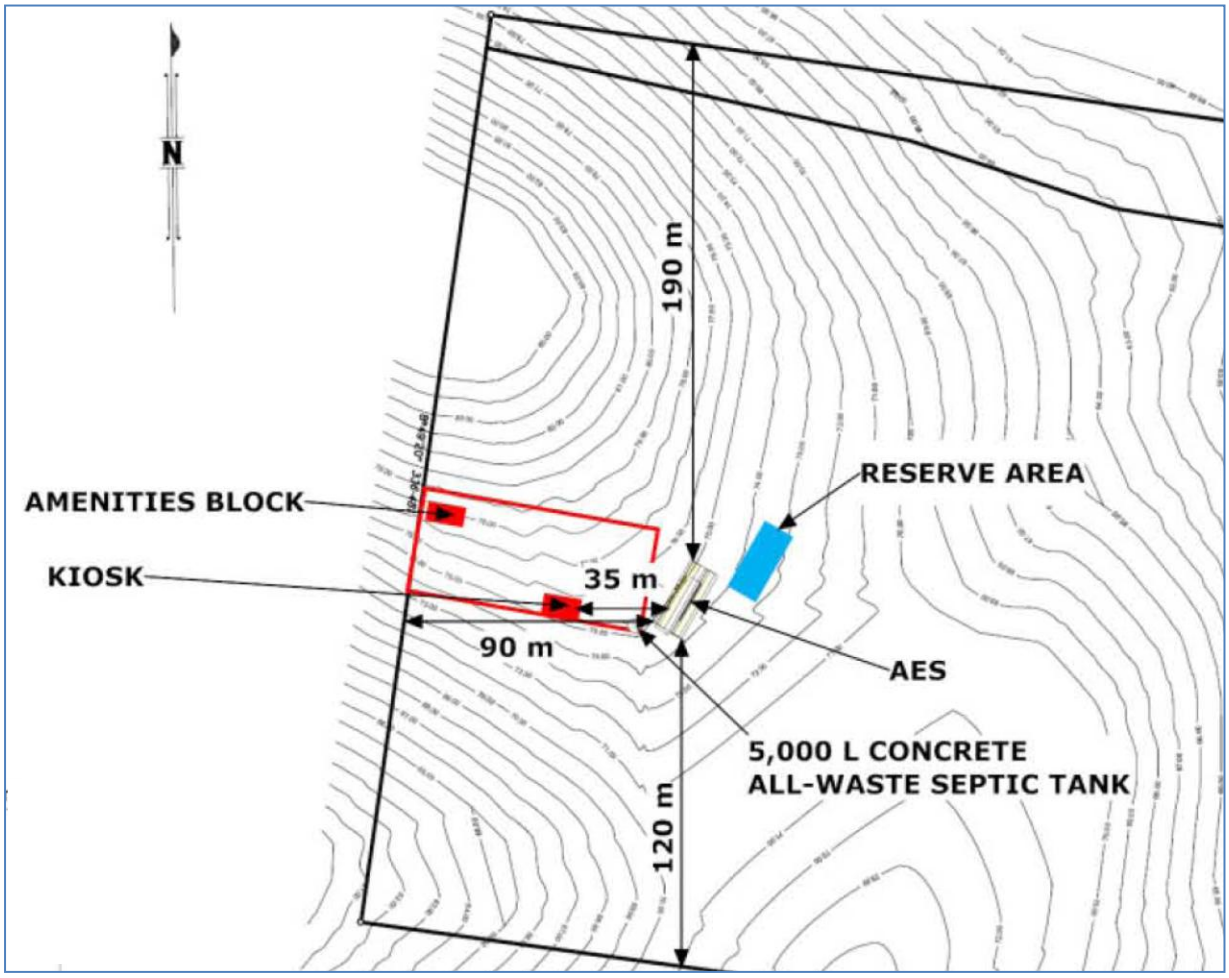


Figure 8: Plan of Wastewater Treatment and Disposal System

All trees within 3 m of the AES bed are required to be removed and the area re-grassed (stolons or turf).

3.2 Primary Treatment Septic Tank

The combined amenities and kiosk grey and black water is initially treated in a 5,000 L concrete all-waste septic tank. AS/NZS 1547:2012 Table J1 shows that a septic tank of this capacity is sufficient for this facility.

This concrete septic tank is to be installed and anchored in accordance with the manufacturer's specification to prevent floating during cleaning. Flexible joints are to be used for the inlet and discharge pipes.

3.3 Advanced Enviro-Septic

AES is an innovative onsite wastewater system, which is passive, non-mechanical and does not use pressure distribution. The primary component is a large diameter perforated pipe installed in a bed of System Sand. The Plumbing Code of Australia (PCA) sets the requirements for an Alternative Solution based on existing or new innovative building, plumbing and drainage products, systems and designs. This proposed Alternative Solution complies with the Performance Requirements by reason of satisfying the Deemed-to-Satisfy Provisions.

The AES system provides a number of advantages for the treatment and disposal of wastewater at this property, including:

- No power consumption
- No pumps, aerators, membranes or other electrical / mechanical equipment
- No chemicals
- No quarterly maintenance with only normal septic tank maintenance required
- This design has a buffer capacity of 2,120 L
- Is able to quickly restart after periods of non-use (e.g. holidays)
- Sub-surface effluent disposal

Figure 9, below shows a generalised cross-sectional view of the wastewater source, septic tank and AES system arrangement.

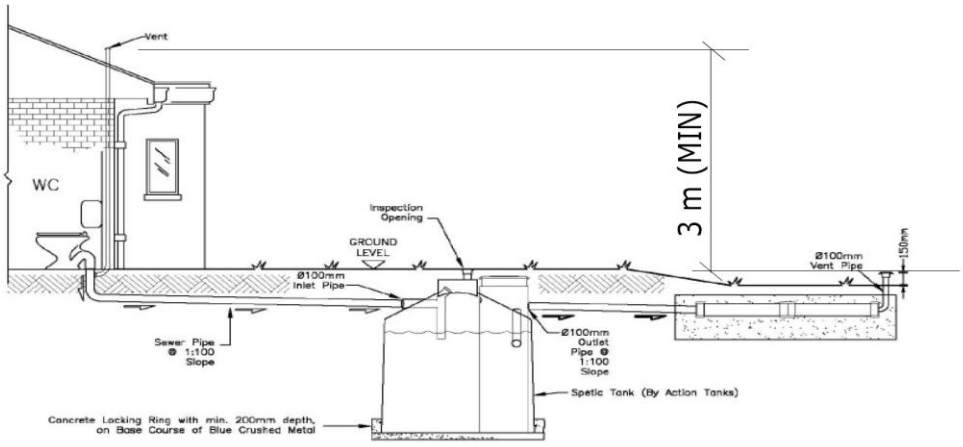


Figure 9: General WWTP System Arrangement

The AES system for this site was designed using the design calculator provided by the system supplier. The outcome of this calculator is presented in Table 1, below and an AES approved copy of the calculator is presented in Appendix C.

Table 1: AES System Calculator Outcomes

AES System Calculator Outcomes		
Total System load - litres / day (Q).	750 L / day	
Min Length of AES pipe rows to treat loading	15 m	
Number of FULL AES Pipe lengths per row	5 lengths / row	
Buffer Capacity of AES System pipe in Litres	2120 L	
AES Dimensions		
	AES System	System Extension
Length m : (L)	2 x 26	2 x 26
Width m :(W)	2 x 0.9	2 x 2.0
Area m^2	150.8	
Sand Depth mm :	2 x 0.75	2x 0.3
Volume m^3	66	
Code	**AES System Bill of Materials.**	
AES-PIPE	AES 3 metre lengths required	**10 lengths**
AESC	AESC Couplings required	**8**
AESO	AESO Offset adaptors	**4**
AESODV	AES Oxygen demand low vent	**1**
AESODV	AES Oxygen demand high vent	**2**
	TOTAL SYSTEM SAND REQUIRED (Guide Only)	**66 m^3**

The detailed plan view of the designed AES system is shown in Figure 10, next page.

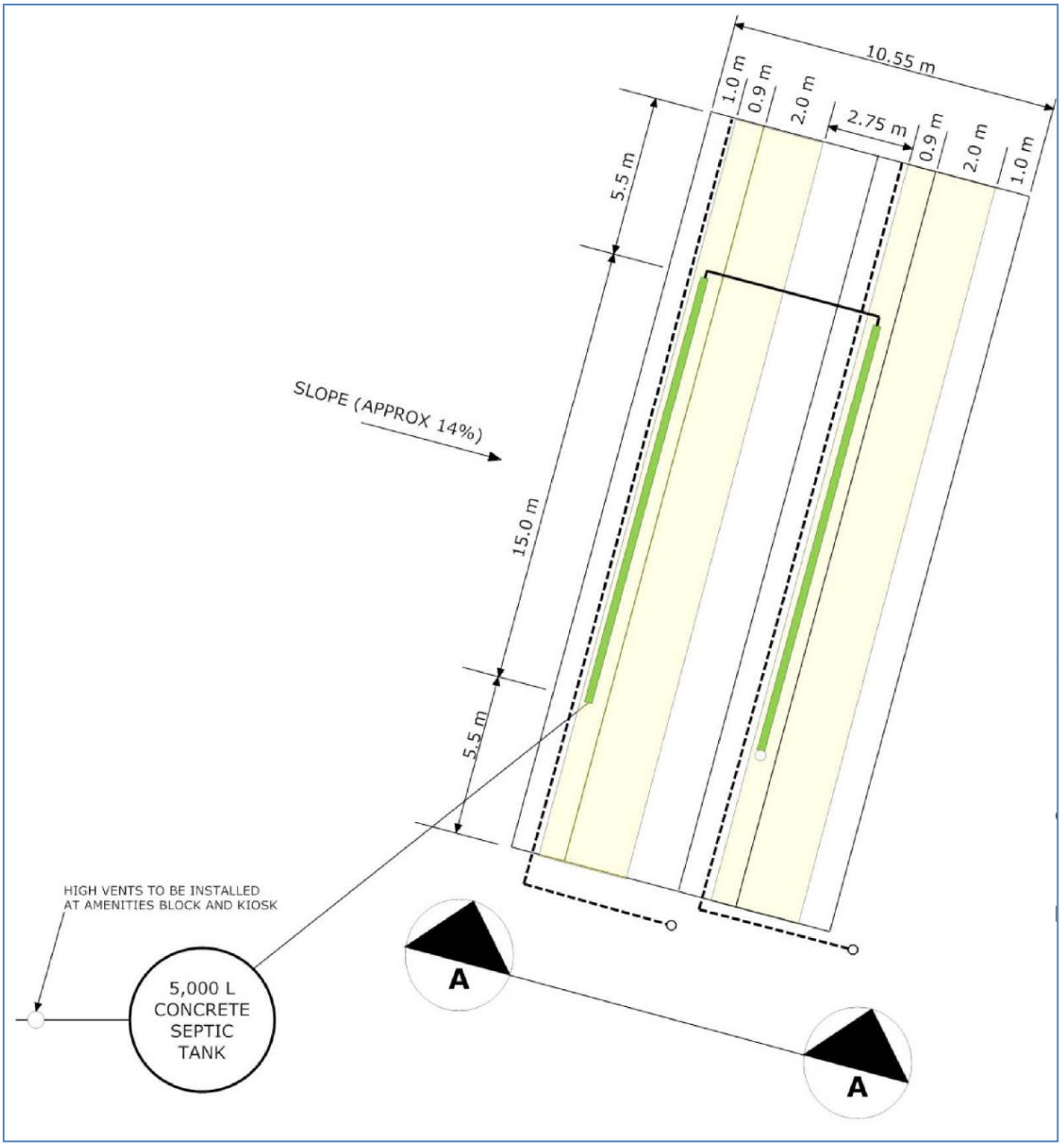


Figure 10: **AES Detailed Plan View**

Cross-sectional views of the designed AES system are shown in Figure 11, below.

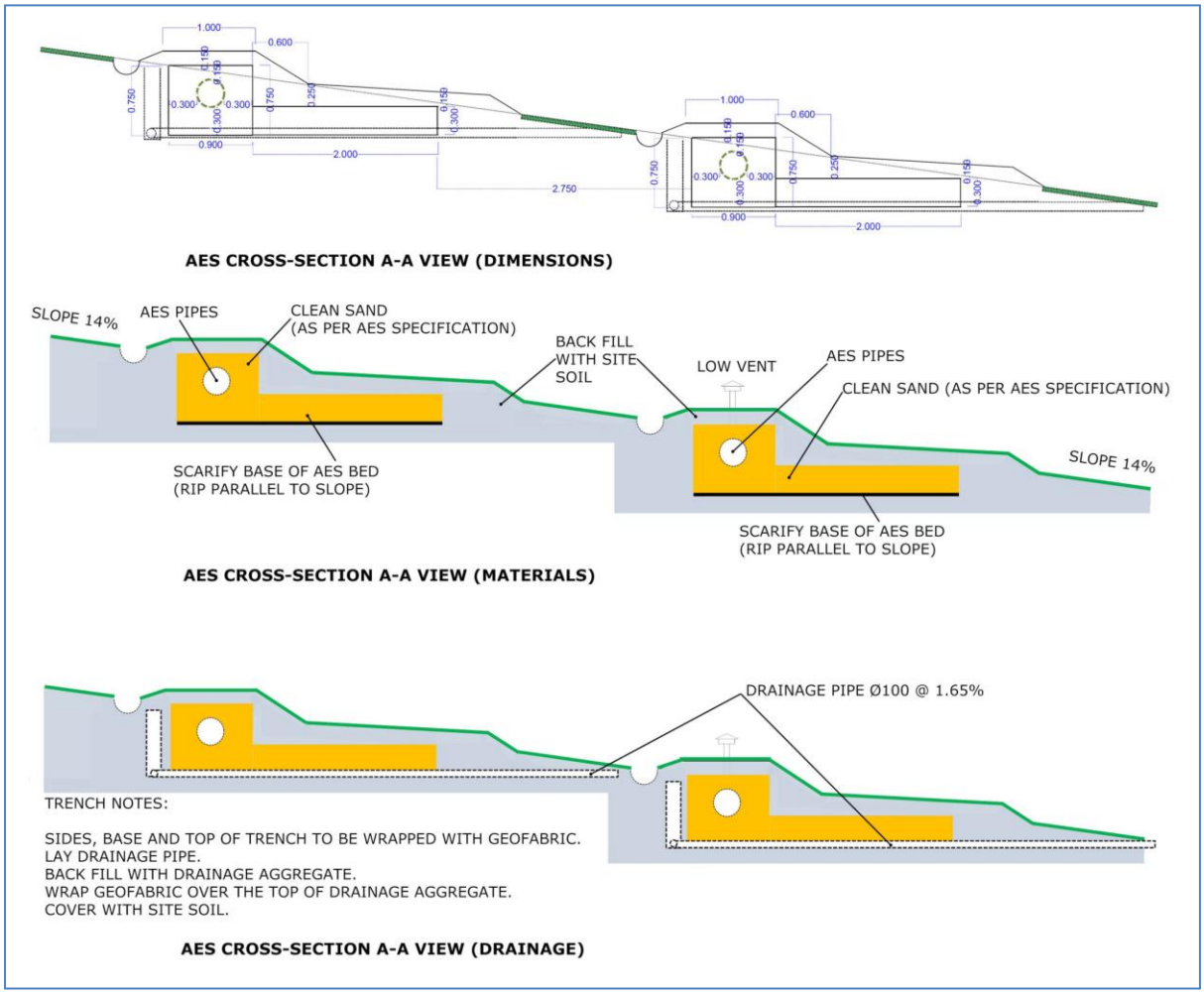


Figure 11: AES Detailed Cross Section

3.4 AS1547:2012 Design Considerations

SAI Global assessed the AES against the requirements of the Queensland Plumbing and Wastewater Code. This review found:

"On review of the available test and design data, the Advanced Enviro-Septic wastewater treatment system should meet the requirements of the relevant sections of the Queensland Plumbing and Wastewater Code : 2011 as an Advanced Secondary Treatment system.

The AES system appears to dramatically improve the quality of treated wastewater from a standard septic system, and offers new solutions for effective land disposal of treated wastewater in Australia."

Table 2, next page shows the published effluent quality results for the AES benchmarked against State and International water quality criteria.

Table 2: Benchmarked AES Effluent Test Results

Testing Parameters	Advanced Enviro-Septic™ Test Results	Qld Secondary	Qld Advanced Secondary	EPA Tertiary	NSF-40 Class 1	BNQ Advanced
CBOD (mg/L)	< 2	20	10	10	< 25	<15
TSS (mg/L)	< 2	30	10	10	< 30	<15
Fecal Coliforms (CFU/100ml)	N/A ** Subsoil Installation	N/A ** Subsoil Installation	N/A ** Subsoil Installation	1000	N/A ** Subsoil Installation	50,000

The full letter from SAI Global and supporting documents is presented in Appendix D. Other documents such as confidential full test data, Design and Installation Manual, Owner's Manual and product warranty are available on request form the Distributor - Chankar Environmental (Ph: 5474 4055).

3.5 Water Balance Calculation

Based on precipitation and evaporation data from the BOM Gatton QDPI Research Station a water balance was undertaken to assess the success of the disposal area sizing of 150 m^2. The water balance shown in Table 3, below demonstrated that this area is of sufficient size to be successful.

Table 3: Disposal Area Water Balance

DISPOSAL AREA WATER BALANCE CALCULATIONS														
Daily Loading	L / day	750	Site Location :- 107 Abraham's Road, South Ripley Qld 4306											
Design Loading Rate (5mm/day)	mm/week	35										Area	150	sq/m
Parameter	**Units**	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Days in month	days	31	28	31	30	31	30	31	31	30	31	30	31	365
Precipitation	mm/month	117	99.8	68.5	54.5	58.6	32.6	36.4	27.8	33.1	69.9	93.6	106.2	798
Evaporation	mm/month	238.7	187.6	189.1	150	111.6	90	102.3	130.2	165	207.7	213	238.7	2023.9
Crop Factor		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Outputs														
Evapotranspiration	mm/month	167.1	131.3	132.4	105.0	78.1	63.0	71.6	91.1	115.5	145.4	149.1	167.1	1416.7
Percolation	mm/month	155	140	155	150	155	150	155	155	150	155	150	155	1825
Total outputs	mm/month	322.1	271.3	287.4	255.0	233.1	213.0	226.6	246.1	265.5	300.4	299.1	322.1	3241.7
Inputs														
Precipitation	mm/month	117	99.8	68.5	54.5	58.6	32.6	36.4	27.8	33.1	69.9	93.6	106.2	798
Possible Effluent irrigation	mm/month	205.1	171.5	218.9	200.5	174.5	180.4	190.2	218.3	232.4	230.5	205.5	215.9	2443.7
Effluent production	mm/month	155	140	155	150	155	150	155	155	150	155	150	155	1825
Total inputs	mm/month	272	239.8	223.5	204.5	213.6	182.6	191.4	182.8	183.1	224.9	243.6	261.2	2623
Therefore Total Outputs =	3242													
Minus Total Inputs =	2623													
Answer must be positive for disposal area to be successful	619													

3.6 Organic Loading Calculation

Organic loading is the amount of organic matter (expressed as BOD) applied to the disposal area. Organic matter is removed through soil absorption.

BOD generated 750 L / day x 10 mg / L x 1 year = 2.74 kg / year
Soil Absorption is 0.05 kg / m^2 / year

Minimum disposal area = $\frac{3.01 \text{ kg / year}}{0.05 \text{ kg / m}^2}$ = 55 m^2 **(Acceptable)**

3.7 Setback Distances

Setback distances relating to the on-site waste water land application area must comply with the Queensland Plumbing and Wastewater Code and is summarised in Table 4, below.

Table 4: Effluent Disposal Area Setback Distances

Feature	Setback Distances
Footings or buildings	From any point of the building footing - 2m down slope - 4m up slope - 2m no slope
Property boundaries, pedestrian paths and walkways, recreation areas	From any point - 2m down slope - 4m up slope - 2m no slope
Retaining wall footings	From any point - 2m down slope - 4m up slope - 2m no slope
In ground swimming pools and potable water tanks	From any point - 2m down slope - 4m up slope - 2m no slope
Horizontal distance to top bank of permanent/intermittent/lake, top water level of a surface water source used for agriculture, aquaculture or stock purposes, easement boundary of unlined open storm water drainage channel or drain, Bore or dam used or likely to be used for human and/or domestic consumption	10m Advanced Secondary Effluent 30m Secondary Effluent 50m Primary Effluent
Vertical distance of unsaturated soil depth to a permanent water table	0.3m Advanced Secondary Effluent 0.6m Secondary Effluent 1.2m Primary Effluent

There is required to be a minimum of 6 m of compacted soil between a wastewater treatment system and any water tank used for human or domestic activities.

3.8 Maintenance

The maintenance requirements of the WWTP system are minimal. The AES does not require quarterly maintenance / servicing. Septic tanks are typically required to be pumped out every three to five years or when 1/3 full of solids. The following precautions are to be undertaken by the residence:

- Use low phosphorus and sodium biodegradable soaps and detergents and in accordance with the label
- Paints, solvents, chemicals, food scraps, fats, oils or any other solids are not to be disposed in the system
- Water discharge minimised

4. Conclusion

Taylor Environmental Pty Ltd prepared a SSE for 107 Abraham's Road, South Ripley, Queensland 4306. A site visit and soil evaluation was undertaken by Chris Taylor (Director, Taylor Environmental) on 6 July 2012. This SSE found that the black and grey water from the proposed development amenities is able to be safely and efficiently disposed of on-site.

The peak volume of wastewater to be treated and disposed of is 750 L / day. The soil classification at the land application area is best described as Category 5.3 with a DLR of 5 mm / day for ETA beds.

The WWTP designed for this property will utilises a 5,000 L concrete all-waste septic tank and an AES system for the treatment and disposal of all wastewater generated at this proposed facilities. An AES system is an enhanced sand filter/land application method. The AES system has an area of 150 m^2 or 2 beds x 26 m x 2.9 m. All trees within 3 m of the AES bed are required to be removed and the area re-grassed (stolons or turf). A reserve area is available at the property as required by AS/NZS 1547:2012.

Diversion drain and cut-off trenches are required to be constructed up slope of each AES bed. This is to prevent storm or ground water entering the disposal beds.

The maintenance of this system is minimal. The AES does not require quarterly maintenance or servicing and the septic tank is required to be pumped out every three to five years under normal use. The following precautions are required to be undertaken:

- Use low phosphorus and sodium biodegradable soaps and detergents and in accordance with the label
- Paints, solvents, chemicals, food scraps, fats, oils or any other solids are not to be disposed in the system
- Water discharge minimised

This SSE complies with the requirements of AS 1547:2012 and the Queensland Plumbing and Wastewater Code (March 2006).

Chris Taylor (MEnvMan, BAppSc(Chem), ADCivEng)
Cert IV DWM001 and DWM003
Director | Taylor Environmental Pty Ltd
10 August 2012

Appendix A Site Plans

Appendix B Site and Soil Evaluation

Site and Soil Evaluation Report

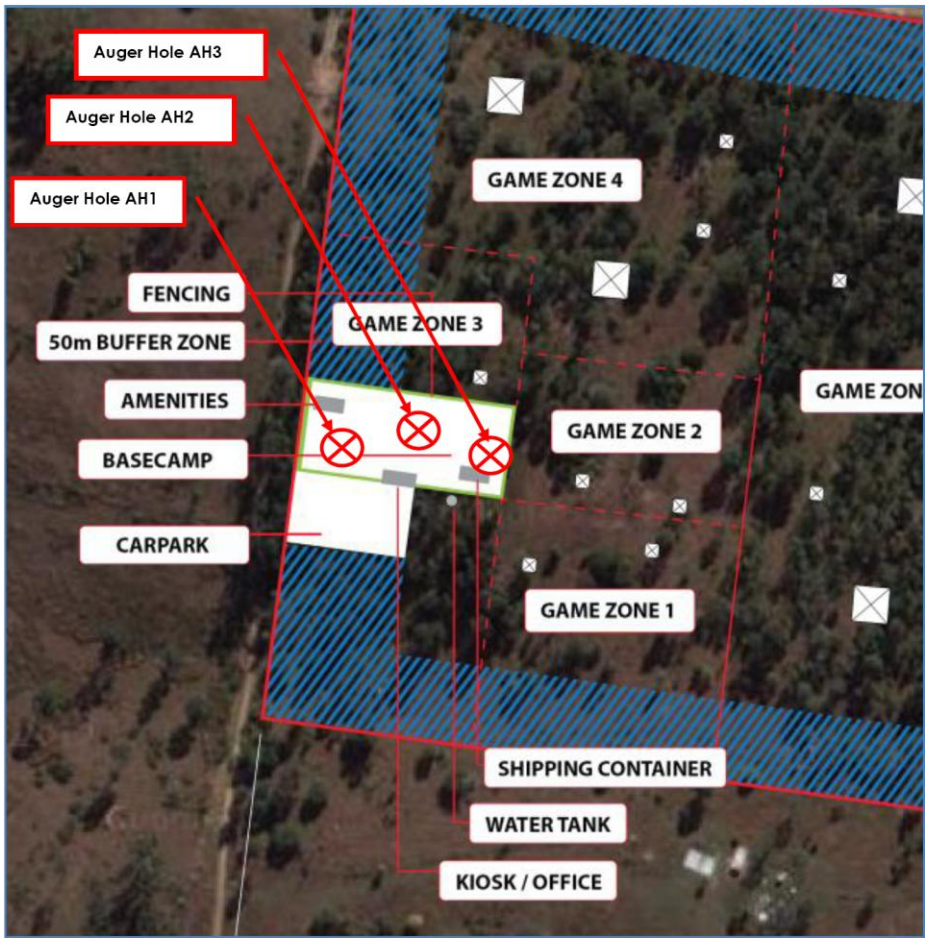
1.0 SITE EVALUATOR		
1.1	Name (Site Evaluator):	*Chris Taylor*
	Designation:	*Director*
	Company:	*Taylor Environmental Pty Ltd*
	Address:	*PO Box 4639, Springfield, QLD 4300*
	Phone:	*0400 301 364*
	Email:	*chris@taylorenviro.com.au*
2.0 SITE EVALUATION		
2.1	**Work Undertaken**	
	Details:	*Site and Soil Assessment* *107 Abraham's Road, South Ripley, Qld 4306*
	Date:	*6 July 2012*
	Details attached:	*Yes*
2.2	**Topography / Slope**	*The surface level is complex and steep in areas. The land surface is most appropriately classified as linear divergent in the area of the amenities and kiosk. This area has an estimated slope of approximately 14 % that falls south-east*
2.3	**Ground cover / vegetation**	*Presently treed.*
2.4	**Soil Landscape**	*The soil profile at the location:* *0 to 450 mm moist light brown sandy clay loam* *450 mm to 750 mm moist orange/brown mottled light clay* *The water table was not encountered any of the 3 auger holes.*
2.5	**Drainage Patterns**	*Linear divergent*
2.6	**Site Plan details attached**	*Yes*
2.7	**Waterways**	*Yes*
2.9	**Bores**	*NA*
2.10	**Embankment**	*NA*
2.11	**Buildings**	*Proposed Development*
2.12	**Site history**	*Rural*
3.0 ENVIRONMNETAL CONSIDERATIONS		
3.1	**Environmental Considerations**	*None identified*
3.2	**Erosion & Sedimentation**	*Site is stable*

4.0	**DRAINAGE CONTROLS**	
4.1	**Depth to seasonal water table**	*Groundwater was not observed.*
4.2	**Need for cut of drains / diversion banks**	*Spoon drain and cut drain required*
5.0	**OTHER SITE EVALUTION CONSIDERATIONS**	
5.1	**Availability of reserve area**	*Reserve area is available for extension*
5.2	**Availability of setback distances**	*Yes*
5.3	**Photographs attached**	*Yes*
6.0	**SOIL INVESTIGATION**	

6.1	**Estimated Soil Category**					
Soil Category		2	3	4	5	6
Site Soil					✓ **(5.3)**	
6.2	**Remarks**	The soil is best described as light clay (Category 5.3). The soil has an average permeability (K_{sat}) of 0.01 m/day. The Design Loading Rate (DLR) for this site is 5 mm/day.				

7.0	**SOIL INVESTIGATION**	
7.1	**Groundwater quality issues**	*None identified*
7.2	**Type of land-application system considered best suited to the site**	*AES*
7.3	**Overall evaluation of minimum land-application area for the site**	*150 m^2*

Hand Auger Locations:



Sample No	1			2			3		
Description	Auger Hole 1			Auger Hole 2			Auger Hole 3		
Horizon	A	B	C	A	B	C	A	B	C
Depth	0-400mm	400 – 750 mm		0-450mm	450 – 750 mm		0-500mm	500 – 750 mm	
Soil Colour	Brown	Brown / mottled orange		Brown	Brown / mottled orange		Brown	Brown / mottled orange	
Soil – wet, moist or dry	Moist	Moist		Moist	Moist		Moist	Moist	
Textural Classification	Sandy Clay Loam	Light Clay		Sandy Clay Loam	Light Clay		Sandy Clay Loam	Light Clay	
Size of Course Fragments	2-6 mm	<2 mm		2-6 mm	<2 mm		2-6 mm	<2 mm	
% Course Fragments	Very Few	Very Few		Very Few	Very Few		Very Few	Very Few	
Structure	Massive	Massive		Massive	Massive		Massive	Massive	
Soil Category	4.3	5.3		4.3	5.3		4.3	5.3	
Indicative Permeability	0.06 to 0.12 m/day	<0.06 m/day		0.06 to 0.12 m/day	<0.06 m/day		0.06 to 0.12 m/day	<0.06 m/day	
Emerson Dispersion	2	2		2	2		2	2	
Design Loading Rate	5 mm/day			5 mm/day			5 mm/day		
Water Table	No			No			No		

Permeameter and Time Readings								
1			**2**			**3**		
Operator		Chris Taylor	**Operator**		Chris Taylor	**Operator**		Chris Taylor
Land Profile		Linear Divergent	**Land Profile**		Linear Divergent	**Land Profile**		Linear Divergent
Vegetation at test site		Grass and regrowth	**Vegetation at test site**		Grass and regrowth	**Vegetation at test site**		Grass and regrowth
Time elapsed		10 minutes	**Time elapsed**		12 minutes	**Time elapsed**		10 minutes
Auger hole radius		75 mm	**Auger hole radius**		75 mm	**Auger hole radius**		75 mm
Time (minutes)	**Level in Tube**	**Drop in Level**	**Time (minutes)**	**Level in Tube**	**Drop in Level**	**Time (minutes)**	**Level in Tube**	**Drop in Level**
0	46	0	0	62	0	0	57	0
5	42	4	5	58	5	5	55	5
10	38	8	10	54	8	10	47	10
Q	0.8 mm / minute		Q	0.8 mm / minute		Q	1 mm / minute	
K_{sat}	0.008 m / day		K_{sat}	0.008 m / day		K_{sat}	0.01 m / day	

Appendix C Wastewater Design

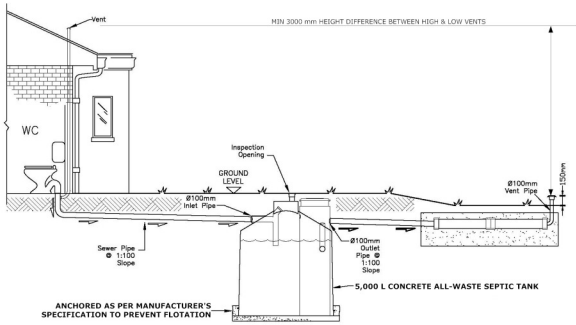
RPD: LOT 57 on SP 200927
ADDRESS: 107 ABRAHAM'S ROAD, SOUTH RIPLEY, QUEENSLAND 4306
OWNERS NAME: Ripley Ventures Pty Ltd

NOTES:
1. PLUMBING & DRAINAGE TO AS/NZS 3500.3 AND 3500.2:2003.
2. ALL PIPE WORK TO AS/NZS 4020.
3. ALL TANKS TO BE INSTALLED AND ANCHORED IN COMPLIANCE WITH THE MANUFACTURERS SPECIFICATION.
4. FLEXIBLE JOINTS USED ON ALL INSTALLED TANKS (AS/NZS 3500.2:2003).
5. MINIMUM DISTANCE BETWEEN TANKS AND BUILDINGS TO BE MAINTAINED (AS/NZS 3500.2:2003).
6. SERVICES ARE TO BE LOCATED PRIOR TO ANY EXCAVATION.
7. INSTALLER TO BE APPROVED BY AES

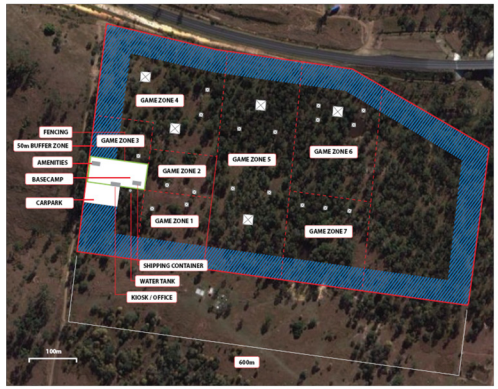
AES SYSTEM CALCULATOR OUTCOMES	
NUMBER OF PERSONS	50
FLOW DESIGN ALLOWANCE (LITRES / DAY / PERSON)	15
TOTAL SYSTEM HYDRAULIC LOAD	750 Litres / Day
NUMBER OF AES PIPE ROWS	2
DESIGN LOADING RATE	5 mm / Day
SLOPE %	14%
IS THIS DESIGN A GRAVITY OR PUMPED SYSTEM	Gravity
LENGTH OF AES PIPE ROWS	15 Meters
NUMBER OF AES PIPE LENGTHS PER ROW	5 Lengths
BUFFER CAPACITY	2120 Litres

AES SYSTEM FOOTPRINT	Length	Width	Area
AES	26.0 m	0.9 m	2 X 23.4 m2
EXTENSION AREA	26.0 m	2.0 m	2 X 52 m2
TOTAL FOOTPRINT	26.0 m	2.90 m	2 X 75.4 = 150.8 m2

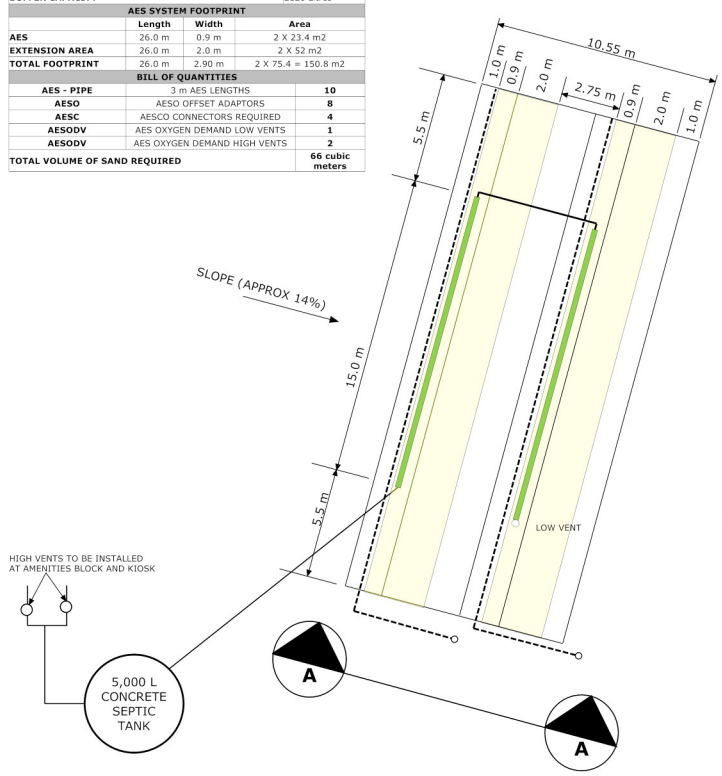
BILL OF QUANTITIES		
AES - PIPE	3 m AES LENGTHS	10
AESO	AESO OFFSET ADAPTORS	8
AESC	AESCO CONNECTORS REQUIRED	4
AESODV	AES OXYGEN DEMAND LOW VENTS	1
AESODV	AES OXYGEN DEMAND HIGH VENTS	2
TOTAL VOLUME OF SAND REQUIRED		66 cubic meters



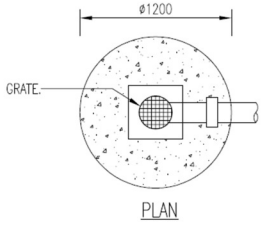
AES AND SEPTIC TANK GENERAL CROSS-SECTION VIEW NTS



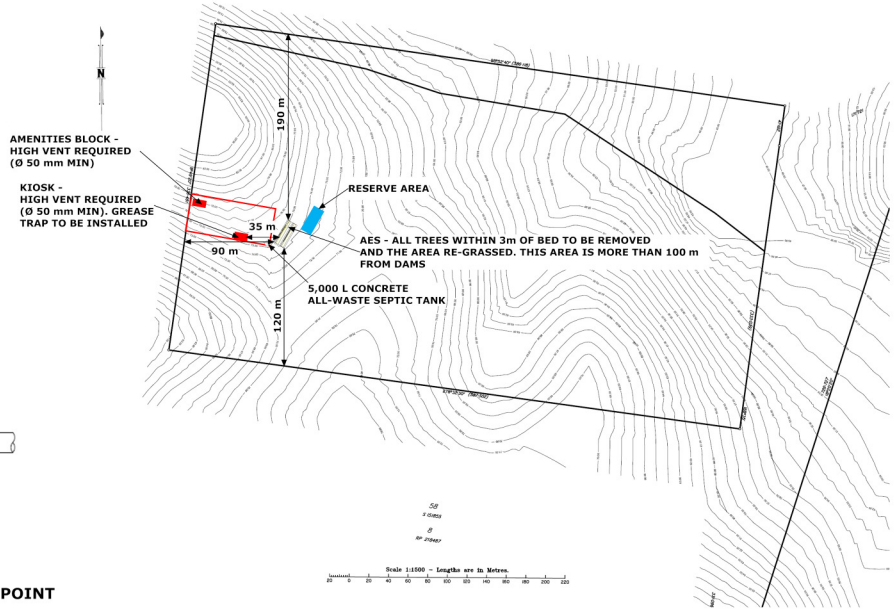
SITE PLAN



WASTEWATER TREATMENT & DISPOSAL PLAN VIEW



DRAINAGE DISCHARGE POINT PLAN VIEW



WASTEWATER TREATMENT & DISPOSAL PLAN

OWNER'S NAME: Ripley Ventures Pty Ltd
LOCATION: 107 ABRAHAM'S ROAD, SOUTH RIPLEY, QLD 4306

LOT 57 on SP 200927

PROJECT No: TE110180
DRAWING No: 1101180_AES_01_A

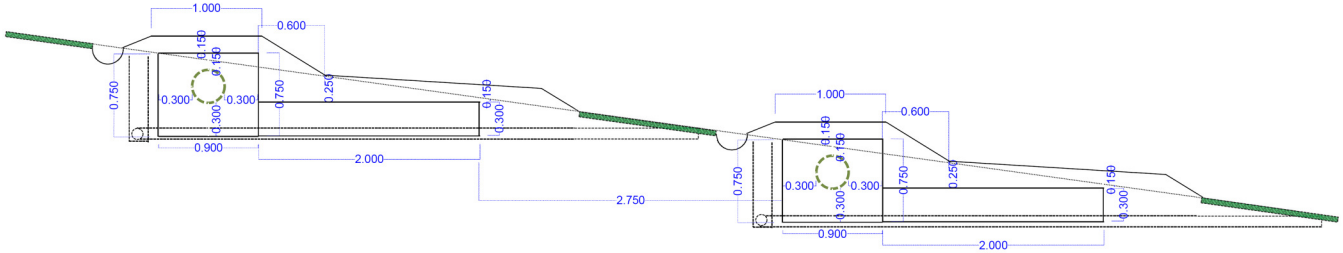
DESIGN & CERTIFIED BY: Chris Taylor MEnvMan BAppSc ADCivEng
Cert IV DWM 001/003
DATE: 9 AUGUST 2012

DISPOSAL AREA REQUIRED

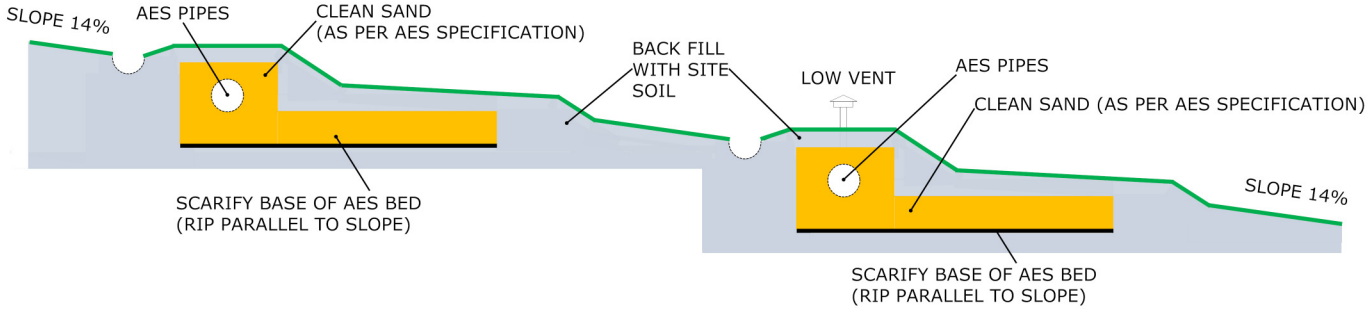
AS/NZS 1547:2012 TABLE H1 RECOMMENDED DESIGN LOADING RATES FOR ETA BEDS
15 (L) X 50 (CUSTOMER) =750 L / DAY
750 (L / DAY) / 5 (mm / DAY) = 150 m^2
ADVANCED ENVIRO-SEPTIC AREA = 2 X 26 m X 2.9 m = 150.8 m^2

SOIL TYPE

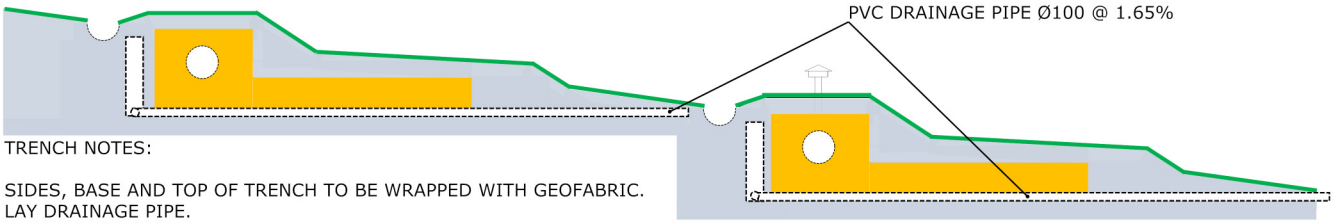
CATEGORY 5.3 LIGHT CLAY
SOIL PERMEABILITY K_{sat} 0.01 m / DAY
DESIGN LOADING RATE (DLR) 5 mm / DAY



AES CROSS-SECTION A-A VIEW (DIMENSIONS)



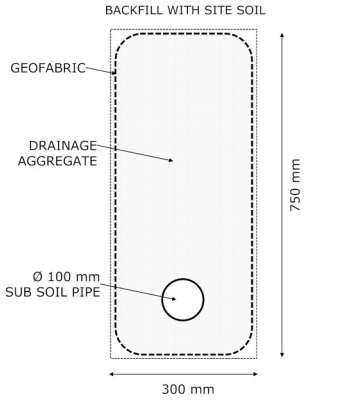
AES CROSS-SECTION A-A VIEW (MATERIALS)



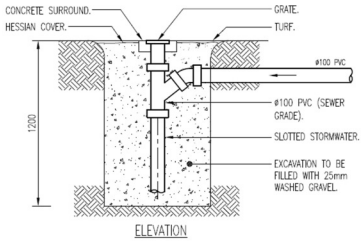
TRENCH NOTES:

SIDES, BASE AND TOP OF TRENCH TO BE WRAPPED WITH GEOFABRIC.
LAY DRAINAGE PIPE.
BACK FILL WITH DRAINAGE AGGREGATE.
WRAP GEOFABRIC OVER THE TOP OF DRAINAGE AGGREGATE.
COVER WITH SITE SOIL.

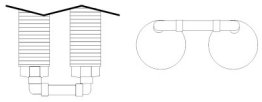
AES CROSS-SECTION A-A VIEW (DRAINAGE)



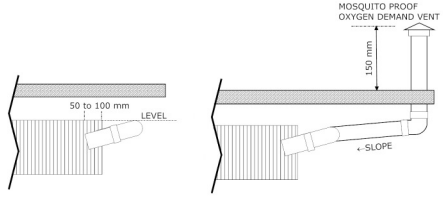
CUT-OFF TRENCH SIDE VIEW



DRAINAGE DISCHARGE POINT SIDE VIEW



TOP VIEW **END VIEW**



SIDE VIEW **SIDE VIEW - VENT**

AES END DETAILS NTS

OWNER'S NAME: Ripley Ventures Pty Ltd **LOCATION: 107 ABRAHAM'S ROAD, SOUTH RIPLEY, QLD 4306**	**LOT 57 on SP 200927**	**DISPOSAL AREA REQUIRED** AS/NZS 1547:2012 TABLE H1 RECOMMENDED DESIGN LOADING RATES FOR ETA BEDS 15 (L) X 50 (CUSTOMER) =750 L / DAY 750 (L / DAY) / 5 (mm / DAY) = 150 m^2 ADVANCED ENVIRO-SEPTIC AREA = 2 X 26 m X 2.9 m = 150.8 m^2	**SOIL TYPE** CATEGORY 5.3 LIGHT CLAY SOIL PERMEABILITY K_{sat} 0.01 m / DAY DESIGN LOADING RATE 5 mm / DAY
PROJECT No: TE110180 **DRAWING No: 1101180_AES_02_A**	**DESIGN & CERTIFIED BY:** Chris Taylor MEnvMan BAppSc ADCivEng Cert IV DWM 001/003 DATE: 9 AUGUST 2012		

ADVANCED ENVIRO-SEPTIC™ "Always The First Option" — Advanced Enviro-septic Design Calculator V4.1

"*Always the BEST Option*" until site and soil conditions rule it out.

Site Address	107 Abrahm's Road , South Ripley Qld 4306				
Client Name	Ripley Ventures Pty Ltd				
Designed By	Chris Taylor	Designers Ph Number	0400 301 364	QBSA Lic Number	
Lic Plumber Name		Plumber Ph Number		Plumb / Drainer Lic Number	
Council Area		AES Certif Number		Date	9/08/12

This Calculator is a guide only, receiving soil classification, surface water, water tables and all other site constraints addressed by the design.

System Designers site and soil calculation data entry		IMPORTANT NOTES
Is this a new home installation Y or N	Y	>> **Minimun single vent size is 80mm.**
Number of person	**50**	**or 2 x 50mm house vents**
Daily Design Flow Allowance Litre/Person/Day	**15**	**a septic tank outlet filter is NOT RECOMMENDED**
Is this a trench extension option? If not. The minimum number of AES rows required is 2	**1**	>> **The maximum lth of a single AES pipe run is 30 meters**
Infiltration surface Soil Category as established by site and soil evaluation. CATEGORY	**4.3**	>> **Catagory may require design considerations. Ref AS1547**
Design Loading Rate based on site & soil evaluation DLR (mm/day)	**5**	>> **Soil conditioning may be necessary. Ref AS1547 & Comments.**
AES FOOTPRINT MUST BE LEVEL WITH TRENCH EXTENSION	**14**	>> **Consideration required for Sloping sites. Ref AS154. refer comment.**
Is this design a gravity system Y or N	**Y**	>> **A House Vent & LOW VENT required on this system**

PLEASE CHECK YOU HAVE FALL FROM TANK TO AES SYSTEM PIPES

COMMENTS :- " *The outcome must be important to everyone.* "

- Ripping of receiving surface is required in clay soil structures in Cat 4,5,6. In addition refer to AS 1547. Always excavate and rip parallel to the site slope/AES pipe.

- Specialist soils advice and special design techniques will be required for clay dominated soil having dispersive or shrink/swell behaviour. Refer AS1547

- All Sloping sites require special consideration and management through design of slope percentage, surface water and construction methods as per AS1547.

- Plumbers are reminded that good construction techniques as per AS1547 are especilly important in these soil types. Refer 1547 & AES installation Instructions

AES System Calculator Outcomes		
Total System load - litres / day (Q).	**750**	l/d
Min Length of AES pipe rows to treat loading	**25.0**	**lm**
Number of FULL AES Pipe lengths per row	**10**	lths
Buffer Capacity of AES System pipe in Litres	**2141**	ltr.
AES Additional infiltration extension required	**122.2**	m2

AES dimensions	AES System	Extension Area
Lth m : (L)	**30.9**	
Width m :(W)	**0.90**	
Sand Depth :	**0.75**	
Area m2	**27.8**	**122.2**

Please ensure your slope percentage figure is 0% & the infiltration footprint is level for a trench extension design

IF YOU WISH TO USE A TRENCH EXTENSION DESIGN OPTION ENTER "Y"	Y	Enter Custom Width m >	2.9	

AES INFILTRATION FOOT PRINT AREA - L = Q / (DLR x W)	**Length**		**Width**		**Minimum AES foot print required .**
The length & width of excavation required for this design is >>	**51.7**	x	**2.9**	=	**150.0** **m2 total**

Single rows have 2 parts with a 200mm strait raised connector. The 1st part would contain the extra pipe if number of pipes are not even. IE 3+2 , 4+3, 5+4. etc

Code	AES System Bill of Materials.			Chankar Environmental Use Only
AES-PIPE	AES 3 mtr Lths required	**10**	lths	
AESC	AESC Couplings required	**8**		
AESO	AESO Offset adaptors	**4**		
AESODV	AES Oxgen demand vent	**1**		
	TOTAL SYSTEM SAND REQUIRED (Guide Only)	**79**	m3	

PLEASE email your AES CALC and Drawings to

DESIGNREVIEW@ENVIRO-SEPTIC.COM.AU

Designreview@enviro-septic.com.au

> The AES Calculator is a design aid to allow checking of the AES components and configuration and is a guide only. Site and soil conditions referencing AS 1547:2000 are calculated and designed by a Quailified Designer

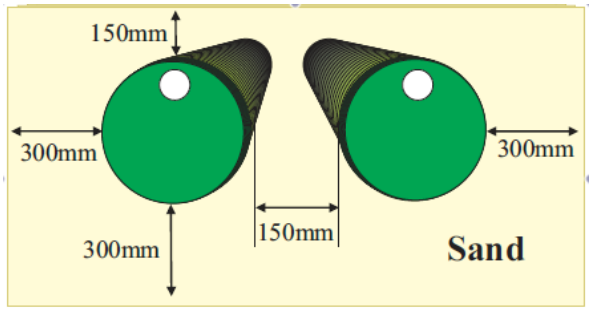
> Chankar Environmental has no responsibility for the soil evaluation, loading calculations or DLR entered by the designer for this calculator.

> AES pipes can be cut to lenght on site. They are supplied in 3 meter lths only.

Appendix D AES Supporting Information

Advanced Enviro-Septic™ Installation Instructions

1. SET OUT



AES Sand Coverage Minimums

i. Set out should be in accordance with the design approved by Council.

ii. The length of each run of AES System pipe must be horizontal

iii. AES calculator footprint dimensions are based upon the DLR of the receiving soil and are the minimum foot print area.

iv. Any system extension must be to the down slope side unless the infiltration footprint is level.

2. EXCAVATION – (track machinery causes less compaction of the soil.)

i. Excavate as required leaving the base of excavation loose to aid infiltration. Strip and separate top soil for covering installation as per AS 1547:2012.
DO NOT damage infiltration area by driving equipment or walking on excavation prior to placement of sand layer. Refer to Appendix L Sec L7 of AS1547: 2012. Construction Techniques. Rip or scarify the infiltration area to a depth of 150 to 200mm minimum parallel to the AES pipe on all systems especially systems in Cat 4,5,6 soil with high clay content. (Refer to the design and report for this onsite installation)

"L7.1 Good construction technique AS 1547:2010
The following excavation techniques shall be observed so as to minimise the risk of damage to the soil:
(a) Plan to excavate only when the weather is fine;
(b) Avoid excavation when the soil has a moisture content above the plastic limit. This can be tested by seeing if the soil forms a 'wire' when rolled between the palms;
(c) During wet seasons or when construction cannot be delayed until the weather becomes fine, smeared soil surfaces may be raked to reinstate a more natural soil surface, taking care to use fine tines and only at the surface;
(d) When excavating by machine, fit the bucket with 'raker teeth' if possible, and excavate in small 'bites' to minimise compaction; and
(e) Avoid compaction by keeping people off the finished trench or bed floor.
In particular for trenches and beds:
(f) If rain is forecast then cover any open trenches, to protect them from rain damage;
(g) Excavate perpendicular to the line of fall or parallel to the contour of sloping ground; and
(h) Ensure that the inverts are horizontal.

CL7.1
Damage can be done by:
(a) Smearing, where the soil surface is smoothed, filling cracks and pores;
(b) Compacting, where the soil porosity is reduced; and
(c) Puddling, where washed clay settles on the base of the trench to form a relatively impermeable layer.
In particular, cohesive soils, or soils containing a significant quantity of clay, are susceptible to damage by excavation equipment during construction.

ii. If using a raised bed configuration ensure you have sufficient soil to cover entire mound or bring in enough sand to fill out batters prior to covering with topsoil etc. as per AS 1547:2012.

3. SYSTEM SAND – Course washed sand with less than 2mm silt (ASTM C-33)

i. Place minimum150mm system sand to extension area and minimum 300mm under AES pipe footprint area.

ii. Place runs of AES System pipe roughly in position (THE FABRIC SEAM MUST BE AT THE TOP AND THE WHITE BIO-ACCELERATOR AT THE BOTTOM.) With 300mm minimum clearance to all footprint edges. Join lengths of AES with AES connectors. To do this slide fabric and fibre back on the 2 pipe ends to be joined and clip AES connector in place. Slide fabric back over connector.

iii. Place offset adaptors on each run with the 100mm hole at the top.

iv. Ensure minimum 150mm between AES system pipes. This can be done with pegs, short pieces of 150mm pvc or reusable AES Spacer Plates. One side provides the 300m spacing required for minimum system sand. The opposite side must have a minimum of 300mm of system sand beyond the edge of the AES System pipe.

v. Place system sand around AES pipes ensuring they stay level and in position. Remove and progressively position spacer plates or PVC pipe until all system pipes are surrounded by system sand to the top. **Walk sand between rows to aid compaction.**

vi. EXTENSION SAND depth is a minimum of 150mm.

4. CONNECTING ROWS

i. Connect rows with 100mm pipe as required with a maximum 100mm extending into the AES system pipe. (Raised connection – After placing raised connection pipes the top of the PVC pipe must be level with the top of the AES pipe. Lift and pack with sand.) This ensures airflow is not restricted and buffer capacity is maximised.

5. VENTING

i. Ensure the system has a High Vent and a low vent. As per design. Low vent is a minimum 150mm above ground. Vents can be located any distance from the system provide they have no water traps that can block oxygen flow through the system. The High Vent must be 3 meters higher than the low vent.

ii. Pressurised or steep gravity systems will require a **Velosity Diffuser**

6. BACK FILLING

i. Ensure a minimum of150mm System sand covers the AES pipes and PVC pipe work.

ii. Refer to the Onsite design and Council approval and ensure that all diversions drains or site specific requirements are correctly installed.

iii. Back fill with natural soil and compact. System extensions may require compaction in a couple of layers depending on the depth.

iv. On mounds and down slopes strip vegetation and place fill evenly and level to all sides to avoid breakout from low points during high seasonal loadings.

v. Cover excavation area with topsoil creating a finished surface level 50 to 100mm higher than the natural surface level ensuring that water sheds off the land application area and does not pond, compact lightly and seed or grass when completed.

For Installation support phone 0754744055

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SAI Global Limited
13-15 Wadhurst Drive
Boronia, Melbourne VIC 3155
Australia
Phone: +61 3 8669 2316
Fax: +61 3 8669 2399
Email: product@saiglobal.com
Web: http://www.saiglobal.com
SAI Global Limited
ABN 67 050 611 642

May, 2011

Review of the Advanced Enviro-Septic (AES) wastewater treatment system, and its tested performance against the requirements of the Queensland Plumbing and Wastewater Code requirements.

The AES wastewater treatment system has been tested in Canada against the requirements of BNQ (Bureau de Normalisation du Quebec), and NSF 40.

A summary table of these test results is attached (#1).

The results (as received from the manufacturer of the AES system – Presby International) indicate that the AES system can achieve under test, the performance required to meet Class 1 of NSF 40, and Class II of the BNQ requirements.
The AES system subsequently gained certification to both of these standards :
- BNQ Certificate No. 890.
- NSF Certificate No. 3U460-01.

The results indicate compliance to the performance criteria requirements of both the Australian Standard AS/NZS1546.3 : 2008, and the Queensland Plumbing and Wastewater Code : 2011 (for both Secondary and Advanced Secondary treatment).

The Queensland Plumbing and Wastewater Code : 2011.

The AES wastewater treatment system is reviewed below against the relevant QPW requirements, noting that this system will be used for treated effluent disposal after an appropriately designed and installed septic tank :

Definition : an "on-site sewerage treatment facility" – a facility installed on premises for treating sewage generated on the premises, and disposing of the resulting effluent via a "land application area" by sub-surface irrigation.
- *The AES system fits this definition as it both treats and disposes of wastewater.*

Part 1 – On-site wastewater management systems :
P1 requires an on-site wastewater management system to be designed, constructed, installed and maintained to ensure protection of public health, the environment, and to minimise impacts on and maintain and enhance amenity of the built environment, and persons on or nearby the premises.
- *The AES system does this by complying with (a) Part 3 of the QPW Code (see below); and it will be for the Australian agent of the AES to demonstrate compliance with solutions (b) and (c). See attachment #2 for an example of the system design and planning program developed by Chankar Environmental.*

P2 requires an on-site wastewater management system be designed, constructed and installed to meet a range of criteria, which can be met by meeting the appropriate requirements of AS/NZS1546.1; AS/NZS1546.3; AS/NZS3500.2; and AS/NZS1547.

- *The AES system meets the first part of this requirement by utilizing an appropriately designed and installed septic tank. .The AES itself does not meet the design requirements of AS/NZS1546.3 but it does meet the performance criteria requirements.*

Part 3 – Land application systems :

P1 requires a land application system be designed, constructed, installed and maintained to meet a range of criteria, which can be met by meeting the appropriate requirements of AS/NZS1547.

- *Attachment #2, Advanced Enviro-Septic Design Calculator, demonstrates how the AES will meet these requirements, by allowing in the design of a system coverage of factors such as No. of persons; slope of land; footprint required; amount of sand required etc. This, in conjunction with additional review by AES design staff after preliminary calculations should ensure planning and design requirements are met.*

Appendix 1 – Effluent Quality :

Effluent Quality – Secondary

Secondary quality effluent must meet the following effluent compliance characteristics :

(a) 90% of samples must have a BOD_5 less than or equal to 20 g/m^3, with no sample greater than 30 g/m^3.

(b) 90% of samples must have a total suspended solids less than or equal to 30 g/m^3, with no sample greater than 45 g/m^3.

(c) Where disinfection is provided, 90% of samples must have a thermotolerant coliform count not exceeding 200 organisms / 100 mL, with no sample greater exceeding 1000 organisms / 100 mL.

(d) Chlorination – n/a

- *The AES system meets the requirements of (a) and (b) as demonstrated by the Canadian test results reviewed. The system has no disinfection provided as standard, as the treated effluent is disposed of sub-surface.*

Effluent Quality – Advanced Secondary

Secondary quality effluent must meet the following effluent compliance characteristics :

(a) 90% of samples must have a BOD_5 less than or equal to 10 g/m^3, with no sample greater than 20 g/m^3.

(b) 90% of samples must have a total suspended solids less than or equal to 10 g/m^3, with no sample greater than 20 g/m^3.

(c) Where disinfection is provided, 90% of samples must have a thermotolerant coliform count not exceeding 10 organisms / 100 mL, with no sample greater exceeding 200 organisms / 100 mL.

(d) Chlorination – n/a

(e) Nitrogen and Phosphorus reduction – n/a

- *The AES system meets the requirements of (a) and (b) as demonstrated by the Canadian test results reviewed. The system has no disinfection provided as standard, as the treated effluent is disposed of sub-surface.*
- *Nutrient reduction was not examined during these test periods.*

Appendix 2 – Performance Evaluation Testing – Other than AS/NZS1546.3 :

- *Testing reviewed from Canada was over 6 and 12 months for the BNQ tests. Information reviewed does not indicate the influent parameters, but does indicate the wastewater received primary treatment in a septic tank.*

SUMMARY :

On review of the available test and design data, the Advanced Enviro-Septic wastewater treatment system should meet the requirements of the relevant sections of the Queensland Plumbing and Wastewater Code : 2011 as an Advanced Secondary Treatment system.

The AES system appears to dramatically improve the quality of treated wastewater from a standard septic system, and offers new solutions for effective land disposal of treated wastewater in Australia.

NOTE : the test data has not been verified with the relevant testing authorities, but the Certificates of accreditation have, which would indicate their authenticity.

This report has been prepared on behalf of Chankar Environmental Pty Ltd by :

Mark Hazeldine
SAI Global Client Program Manager
Water Treatment Products
Product Certification

Enviro-Septic Test Results Summary

Canada

	BOD_5		Suspended Solids		Disinfection		Cl (if used)	N reduction		P reduction	
	g/m^3		g/m^3		Thermotolerant coliforms (orgs / 100ml)		FAC (g/m^3)	mg / L		mg / L	
STANDARDS REQUIREMENTS	**Allowed Range**	**Max. allowed**	**Allowed Range**	**Max. allowed**	**Allowed Range**	**Max. allowed**	**Allowed Range**	**Allowed / Actual**	**% Reduction**	**Allowed / Actual**	**% Reduction**
QPW - Secondary	90% ≤ 20	No sample > 30	90% ≤ 30	No sample > 45	90% ≤ 200	1000	0.5 to 2.0	n/a	n/a	n/a	n/a
QPW - Advanced Secondary	90% ≤ 10	No sample > 20	90% ≤ 10	No sample > 20	90% ≤ 10	200	0.5 to 2.0	90% ≤ 10		90% ≤ 5	
					E.coli cfu (or MPN) / 100ml						
AS/NZS 1546.3 : 2008	90% ≤ 20	No sample > 30	90% ≤ 30	No sample > 45	80% ≤ 20	100	0.5 to 2.0	to be nominated at time of testing			
BNQ Class ii Standard	< 25		< 30		n/a	n/a					
BNQ Class iii Standard	< 15		< 15		n/a	< 50.000					
NSF 40 Class 1 Standard	< 25		< 30		n/a	n/a					

TESTING RESULTS	**Average**	**Range**	**Average**	**Range**	**Average**	**Range**		**Actual**	**% Reduction**	**Actual**	**% Reduction**
BNQ 2005-2006 Annex A Quebec, Canada	8	< 2 to 22	4	< 2 to 15							
BNQ 2005-2006 AnnexB Quebec, Canada	3	< 2 to 5	4	< 2 to 7							
BNQ 2007-2008 Annex A Quebec, Canada *	2	< 2 to 5	2	< 2 to 5	2900 *	7 to 90,000					
BNQ 2007-2008 AnnexB Quebec, Canada *	< 2	< 2 cont.	< 2	< 2 to 4	218 *	<2 to 30,000					
* No disinfection system											

NSF International

RECOGNIZES

PRESBY ENVIRONMENTAL, INC.

WHITEFIELD, NH

AS COMPLYING WITH NSF/ANSI 40 AND ALL APPLICABLE REQUIREMENTS.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.

Certification Program
Accredited by the
American National
Standards Institute

Certification Program
Accredited by the
Standards Council
of Canada

This certificate is the property of NSF International and must be returned upon request. For the most current and complete information, please access NSF's website (www.nsf.org)

September 22, 2009
Certificate# 3U460 - 01

Thomas J. Bruursema, General Manager
Wastewater Treatment Units

Certificate of Conformity

BNQ
BUREAU DE NORMALISATION DU QUÉBEC

Certificate No.: 890 **Expiry date: 2011-01-31**
Standard No.: NQ 3680-910/2000-06-16 M1 (2004-09-10)
Certification protocol No.: NQ 3680-915/2000-06-16

The Bureau de normalisation du Québec, having recognized the conformity of stand-alone waste water treatment systems for isolated D Wellings

Enviro-septic models ESP-TS, for secondary treatment (class II)
Enviro-septic models ESP-TSA, for secondary treatment (class III)

as well as the capacity of the holder to manufacture these products in conformity with the requirements of the above-mentioned standard and certification protocol, issues this certificate to

DBO EXPERT INC.
1410, route 222, C. P. 265
Saint-Denis-de-Brompton (Quebec) J0B 2P0

This certificate is issued according to the rules specified in the Document NQ 9902-001/2002. In witness whereof, we have signed in Québec, on January 16, 2009