Ruru Homes Ltd
54 Green Lane
Motueka

SURFACE WATER CONTROL AND ONSITE WASTEWATER & LAND APPLICATION SYSTEM INVESTIGATION FOR 54 GREEN LANE MOTUEKA

Ref: 21130

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1. Situation

a) I have been employed to assess appropriate outfalls for surface water control and sewer disposal for a proposed development at 54 Green Lane, Motueka.

b) The property has a construction business and residential dwelling with plans to expand the business and therefore alter the land to provide construction pads for building small homes. There currently is no piped stormwater system however an existing onsite wastewater & land application system providing treatment and discharge for the existing dwelling to be used as offices.

c) The existing dwelling has an occupancy of 2 permanent residents and 4 office staff. The proposed business expansion will increase staffing up to 60 persons between business hours.

d) The intention is to service the site with onsite wastewater and land application solution for sanitary facilities for staff and soakaway solutions being soak-pits designed compliant with E1/VM1 NZBC for all proposed buildings and hardstand areas.

Services Overlay for the area around 54 Green Lane

2. Onsite Wastewater & Land Application System

a) The property is in a rural 1 zone as located on Map 52 Tasman Resource Management Plan therefore shall comply with rule 36.1.2.4. Based on the requirements of the rule onsite wastewater and land application will be a permitted activity and shall comply with the following requirements:

(a) Any discharge first commencing after 19 September 1998 is not in any Special Domestic Wastewater Disposal Area.

(b) Any discharge first commencing after 20 December 2003 is not within the Wastewater Management Area.

(c) The volume of effluent discharged is not more than a weekly averaged flow of 2,000 litres per day.

(d) There is no discharge or run-off of effluent into surface water.

(e) The disposal field is located not less than:
- (i) 20 metres away from any surface water body, or the coastal marine area;
- (ii) 20 metres from any bore for domestic water supply;
- (iii) 1.5 metres from any adjoining property.

(f) The design and operation of the system must result in the depth of unsaturated soil between the effluent disposal field and the average winter level of groundwater or of the basement rock being no less than 500 millimetres or sufficient to ensure that the discharge does not result in any bacterial contamination of groundwater beyond the property boundary.

(g) The septic tank must be regularly desludged so that the liquid volume (excluding sludge and scum) is maintained at not less than one-third of the tank volume.

(h) The discharge does not create an offensive or objectionable odour discernible beyond the property boundary.

(i) An access point to allow sampling of the effluent being discharged to the disposal field must be provided with any on-site wastewater disposal system installed after 19 September 1998.

(j) The quality of the effluent being discharged into the disposal field does not exceed the following standards:

BOD-5: 150 milligrams per litre
Total suspended solids: 150 milligrams per litre

Notes:

(a) Compliance with the New Zealand Standards for on-site domestic wastewater management will help ensure compliance with the above standards.

(b) The use of garbage grinders is not recommended for use with septic tank treatment units. Both the current NZS 4610 and the proposed AS/NZ standards also note that these appliances are unsuited to use with septic tank systems, and the standards do not account for their use in the design of on-site wastewater disposal systems. Therefore, for any new building where it is proposed to have this appliance installed, Council may require evidence that the design of the effluent treatment disposal system takes into account its effects.

b) The existing discharge from the dwelling/office calculated at 600L/day will remain and is a permitted activity. The proposed discharge for the new business expansion will increase the volume of discharge by 3000L/day to 3600L/day therefore becomes non-compliance and requires discharge consent.

c) An onsite site and soil investigation was completed on 1 July 2021 where 3 x test pits were excavated to between 1.9m to. 2.5m. soil category was identified as category 3 sandy loam above gravels with good percolation and filtration layers.

d) Setback distances as required by AS/NZS1547:2012 are all compliant and there are no actual or potential limitations identified.

e) It is proposed that an AES single pass sand filter secondary treatment system will be installed to cater for the sanitary fixtures for the construction staff. Site & soil assessment was completed and design report prepared and attached at Appendix B.

3. Surface Water control

a) A review of pre and post development surface water run-off from overland and modified catchment areas being roof and paved areas was carried out. A comparison with the surface water run-off from the proposed development will used to confirm the actual impact of surface water on this property.

b) The review will propose whether soakage is an appropriate solution for the surface water control compliant to Nelson Tasman Land Development Plan.

c) The total pre and post development areas:

I. Predevelopment

Roof area (dwelling + sheds, outbuildings): 248m²
Hardstand/accessway Areas 270m²
Grassed/garden area: 12652m²
Total 13170m²

II. Post development

Roof area (existing & proposed):1488m²
Construction hardstands 6760m²
Carpark/accessway Areas 1100m²
Grassed/garden area: 3822m²
Total 13170m²

d) Scaled site plan was provide by Allure Architectural for measurement and location purposes.

4. Predevelopment Catchment and Surface Water Run-off

A review of predevelopment catchment areas for 54 Green Lane are as follows:

a) Predevelopment overland surface water catchment excluding modified catchment being roof, paved and hardstand areas is 1.2652ha

Estimation of surface water run-off for 1% AEP event:
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (flat medium soakage grassed areas) 0.3
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112 mm/hr
A = Catchment in hectares 1.2652ha

= 0.3 x 112 x 1.2652
= 42.51 l/s or 0.04251 m^3/s

b) Predevelopment Roof surface water catchment:

Estimation of surface water run-off for 1% AEP event:
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (roof areas) 0.9
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.0248ha

= 0.9 x 112 x 0.0248
= 2.5 l /s or 0.0025 m^3/s

c) Predevelopment Paved surface water catchment within this catchment:

Estimation of surface water run-off for 1% AEP event:
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (paved, hardstand areas) 0.85
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.027ha

= 0.85 x 112 x 0.027
= 2.57 l/s or 0.00257 m^3/s

d) The total predevelopment catchment being overland and modified catchment surface water run-off is 47.58 /s or 0.04758 m^3/s.

5. Post Development Catchment and Surface Water Run-off

The overall changes to post development areas is that the development will increase the modified catchment and reduce overland flow to grassed areas. A review of post development catchment areas are as follows:

a) Post development overland surface water 0.3822ha:

Estimation of surface water run-off for 1% AEP:
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (flat medium soakage grassed areas) 0.3
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.3822ha

= 0.3 x 112 x 0.3822
= 12.84 l/s or 0.01284 m^3/s

b) Post development Roof surface water run-off 0.1488ha:

Estimation of surface water run-off for 1% AEP event
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (roof areas) 0.9
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.1488ha

= 0.9 x 112 x 0.1488
= 15 l/s or 0.015m^3/s

c) Post development parking/accessway surface water run-off 0.11ha:

Estimation of surface water run-off for 1% AEP event
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (paved, hardstand areas) 0.85
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.11ha

= 0.85 x 112 x 0.11
= 10.47 l/s or 0.01047m^3/s

d) Post development unsealed road equivalent surface water run-off 0.676ha:

Estimation of surface water run-off for 1% AEP event
using Q = CIA (LDM 2019)

Where Q in m/s
C = co-efficient value E1/VM1 Table 1 (paved, hardstand areas) 0.5
I = Rainfall Intensity (1% AEP 20 mins RCP8.5 2090) 112mm/hr
A = Catchment in hectares 0.676ha

= 0.5 x 112 x 0.676
= 37.86 l/s or 0.03786m³/s

e) The total post development surface water flow being overland and modified catchment surface water run-off is 76.17 l/s or 0.07617m³/s.

6. Pre and Post Development Surface Water Run-off Relationship

a) The proposed development increases the modified catchment surface water flow being roof & paved areas discharging to the stormwater outfall. The increase is from 5.07 l/s or 0.00507 m³/s to 63.33 l/s or 0.06333 m³/s being a total of 58.26 l/s or 0.05826m³/s.

b) Off set from the increase of modified development there is a decrease in overland surface water flow. The decrease is from 42.51 l/s or 0.04251 m³/s to 12.84 l/s or 0.01284 m³/s being a total of 29.67 l/s or 0.02967m³/s.

c) The total catchment surface water flow increasing from 47.58 /s or 0.04758 m³/s to 76.17 l/s or 0.07617m³/s therefore an increase of surface water flow across the catchment of 28.59 l/s or 0.02859m³/s.

d) Due to the increase in surface water flow the increase in surface water flow has to be addressed to comply with the Tasman Resource Management Plan.

e) It is proposed that on site soakage forms the solution to reduce impact on the stormwater network serving this property.

7. Test Hole Percolation

a) As discussed in 1 d) the intention is use soakage as the appropriate outfall for all surface water control. The soakaway capability will be assessed and designed based on these catchment areas.

b) Based on test pit investigations it is proposed that soakaway is an appropriate solution for all modified catchment that will be produced as part of this development.

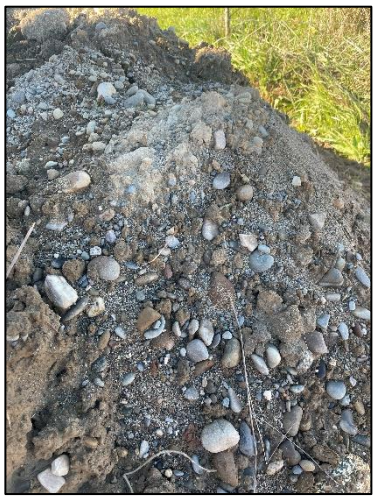
c) Test pits soil identified:

I. 0-350m Organic layer
II. 350-700mm Silty Loam
III. 700-1800mm Sandy Loam
IV. 1800-2500 Gravelly sand

a) A hole was excavated to 2500mm and tested for percolation. 1000L water was discharged to gravel sand base in hole. Water dispersed quickly without holding or ponding fully dispersing within <1.5 minutes. For the purpose of calculating soak-pit volume we will use an estimated soakage rate of 1000L/90 seconds or 64000L/hr.

Test hole percolation = 1000L/60 sec
= 40000L/hr (converted) or 40000 mm/hr

b) Soil identified as a gravelly sand with low plasticity good percolation.



8. Soak Pit Calculation

a) PART A – roofed area (1240m²)

The volume of storage required in the soak pit, Vstor (m3), shall be calculated by:

Vstor = Rc – Vsoak, where Rc = run-off discharged from catchment to soak pit in 1 hour (m3).

Vsoak = volume disposed of by soakage in 1 hour (m3).

And Rc = 10CIA where:

C = run-off co-efficient (roof area 0.9)
I = rainfall intensity based on one (1) hour duration of an event having a 20% probability of occurring annually (51.4mm/hr HIRDS RCP8.5 2090)
A = area (hectares) of the catchment discharging to the soak pit. (m² = 0.124ha)

Vsoak = AspSr/1000 where
Asp = area of the base of the soak pit (Area 2.25m²).

Sr = soakage rate (mm/hr) determined from above.

Rc = (10 x 0.9 x 51.4 x 0.124)
= 57.36m³

Vsoak = $\frac{2.25m^2 \times 40000\ mm/hr}{1000}$
= 90m³

Therefore Vstor = Rc – Vsoak

Vstor = 57.36m³- 90m³
= -32.64m³

Therefore no minimum storage required for proposed roof areas.

b) PART B – parking/accessway (1100m²)

The volume of storage required in the soak pit, Vstor (m3), shall be calculated by:

Vstor = Rc – Vsoak, where Rc = run-off discharged from catchment to soak pit in 1 hour (m3).

Vsoak = volume disposed of by soakage in 1 hour (m3).

And Rc = 10CIA where:

C = run-off co-efficient (sealed paved area 0.85)
I = rainfall intensity based on one (1) hour duration of an event having a 20% probability of occurring annually (51.4mm/hr HIRDS RCP8.5 2090)
A = area (hectares) of the catchment discharging to the soak pit. (m² = 0.11ha)

Vsoak = AspSr/1000 where
Asp = area of the base of the soak pit (Area 2.25m²).
Sr = soakage rate (mm/hr) determined from above.

Rc = (10 x 0.9 x 51.4 x 0.11)
= 50.88m³

Vsoak = $\frac{2.25m^2 \times 40000\ mm/hr}{1000}$
= 90m³

Therefore Vstor = Rc – Vsoak

Vstor = 50.88m³-90m³
= - 39.12m³

Therefore no minimum storage required for proposed parking/accessway areas.

c) PART C – unsealed construction area (6760m²)

The volume of storage required in the soak pit, Vstor (m3), shall be calculated by:

Vstor = Rc – Vsoak, where Rc = run-off discharged from catchment to soak pit in 1 hour (m3).

Vsoak = volume disposed of by soakage in 1 hour (m3).

And Rc = 10CIA where:

C = run-off co-efficient (sealed paved area 0.5)
I = rainfall intensity based on one (1) hour duration of an event having a 20% probability of occurring annually (51.4mm/hr HIRDS RCP8.5 2090)
A = area (hectares) of the catchment discharging to the soak pit. (m² = 0.676ha)

Vsoak = AspSr/1000 where
Asp = area of the base of the soak pit (Area 2.25m²).
Sr = soakage rate (mm/hr) determined from above.

Rc = (10 x 0.5 x 51.4 x 0.676)
= 173.73m³

$$Vsoak = \frac{2.25m^2 \times 40000\ mm/hr}{1000}$$
= 90m³

Therefore Vstor = Rc – Vsoak

Vstor = 173.73m³-90m³
= 83.73m³

Therefore 83.73m³ minimum storage required for proposed unsealed hardstand areas.

9. Required Soakage Solution

a) Though soakage will be utilised for all surfaces, the roof and sealed parking/accessway areas do not require storage within the soakage system. The largest surface area being the unsealed construction areas does require 83.73m³ of storage within the soakage system.

b) It is proposed that 12 gravel pits of 90m³ in storage volume are installed at regular intervals around the perimeter of the unsealed areas to provide the storage volume required. Each gravel pit to be 2.5m x 2.5m x 3m deep *(7.5m³ storage volume)* will also provide surface water entry to the underlying gravels.

c) Surface water channelling around the edge of the unsealed hardstand area will direct flow to the gravel pits. The location of the pits and channelling is shown on GS-01A Surface Water Overlay at Appendix A.

10. Conclusion

a) An onsite site and soil investigation identified soil category 3 with good percolation and filtration layers. To reduce the size of the land application system, secondary treatment through an AES single pass sand filter has been selected for discharge to land.

b) The property is in a rural 1 zone as located on Map 52 Tasman Resource Management Plan therefore shall comply with rule 36.1.2.4. Based on the requirements of the rule onsite wastewater and land application will not be a permitted activity and will require discharge consent.

c) Setback distances as required by AS/NZS1547:2012 are all compliant and there are no actual or potential limitations identified.

d) The proposed development increases the modified catchment surface water flow being roof & paved areas discharging to the stormwater outfall. The increase is from 5.07 l/s or 0.00507 m^3/s to 63.33 l/s or 0.06333 m^3/s being a total of 58.26 l/s or 0.05826m^3/s.

e) Off set from the increase of modified development there is a decrease in overland surface water flow. The decrease is from 42.51 l/s or 0.04251 m^3/s to 12.84 l/s or 0.01284 m^3/s being a total of 29.67 l/s or 0.02967m^3/s.

f) The total catchment surface water flow increasing from 47.58 /s or 0.04758 m^3/s to 76.17 l/s or 0.07617m^3/s therefore an increase of surface water flow across the catchment of 28.59 l/s or 0.02859m^3/s.

g) Percolation testing carried out confirms that due to basal and lateral ground water movement, soakage is appropriate outfall for surface water control of this development.

h) It is proposed that 11 gravel pits are installed at regular intervals around the perimeter of the unsealed areas to provide the storage volume required. Each gravel pit to be 2.5m x 2.5m x 3m deep *(7.5m^3 storage volume)* will also provide surface water entry to the underlying gravels.

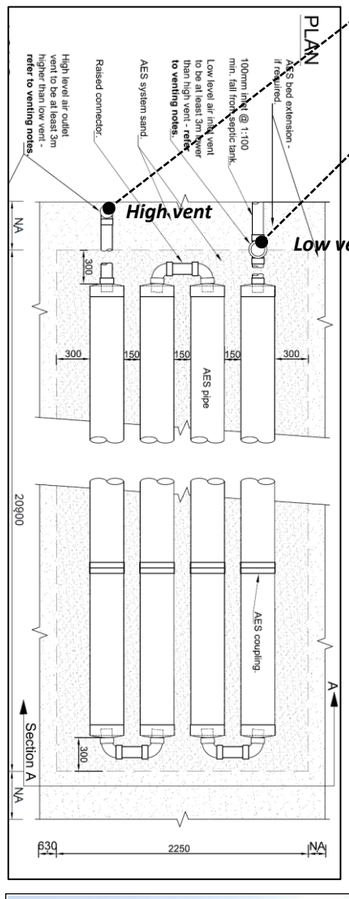
i) Surface water channelling around the edge of the unsealed hardstand area will direct flow to the gravel pits. The location of the pits and channelling is shown on GS-01A Surface Water Overlay at Appendix A.

Please forward any queries direct.

Gary Stevens
Plumbing Drainage Consultant

Attachments:
Appendix A – GS-01 Onsite Wastewater Location Overview & GS-01A Surface Water Control Overview
Appendix B - Onsite wastewater & land application report
Appendix C – HIRDS Rainfall Intensity Chart for 54 Green Lane

Appendix A – GS-01 Onsite Wastewater Location Overview & GS-01A Surface Water Control Overview



Key:

- Wastewater Unit
- Land Application System
- Reserve Area
- Test Pits
- LAS Design Planting
- Surface Water Diversion Channel

SETBACK DISTANCES MINIMUM ACHIEVED
(AS/NZS1547-2012 Appendix R)
Property Boundary >1.5m
Buildings/Houses >2m
Surface Water >20m
Well/Bore if known >20m
Recreational Area >3m
In Ground Water Tank >4m
Retaining Wall/Embankment >3m
Ground water >0.6m
Hardpan >0.5m

Notes:

I. *Install 5000L Alpha precast septic tank without effluent filter.*

II. *Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.*

III. *Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.*

IV. *Septic tank outlet tee to be capped to isolate AES bed venting, See attached AES VC drawing (AES Bed and Septic Tank Air Venting Detail).*

G Stevens
Plumbing & Drainage Consultant
gary.gsconsulting@gmail.com
Ph: 021-222-8410

Drawing Name: GS-01 Onsite Wastewater & Land Application System Location Plan
Client: Ruru Homes Ltd
Project Address: 54 Green Lane, Motueka
Legal Description: Lot 12 DP 1512

Date: 14 August 2021
Scale: 1:1000@A4
Ref: 21130

Key:

Gravel Pits ⊕

Surface Water Channel

Surface Water Control Notes:

I. The proposed development increases the modified catchment surface water flow being roof & paved areas discharging to the stormwater outfall. The increase is from 5.07 l/s or 0.00507 m^3/s to 63.33 l/s or 0.06333 m^3/s being a total of 58.26 l/s or 0.05826m^3/s.

II. Off set from the increase of modified development there is a decrease in overland surface water flow. The decrease is from 42.51 l/s or 0.04251 m^3/s to 12.84 l/s or 0.01284 m^3/s being a total of 29.67 l/s or 0.02967m^3/s.

III. The total catchment surface water flow increasing from 47.58 /s or 0.04758 m^3/s to 76.17 l/s or 0.07617m^3/s therefore an increase of surface water flow across the catchment of 28.59 l/s or 0.02859m^3/s.

IV. Percolation testing carried out confirms that due to basal and lateral ground water movement, soakage is appropriate outfall for surface water control of this development.

V. It is proposed that 11 gravel pits are installed at regular intervals around the perimeter of the unsealed areas to provide the storage volume required. Each gravel pit to be 2.5m x 2.5m x 3m deep *(7.5m^3 storage volume)* will also provide surface water entry to the underlying gravels.

VI. Surface water channelling around the edge of the unsealed hardstand area will direct flow to the gravel pits. The location of the pits and channelling is shown on GS-01A Surface Water Overlay at Appendix A.

G Stevens
Plumbing & Drainage Consultant
gary.gsconsulting@gmail.com
Ph: 021-222-8410

Drawing Name: GS-01A Surface Water Control Overview
Client: Ruru Homes Ltd
Project Address: 54 Green Lane, Motueka
Legal Description: Lot 12 DP 1512

Date: 14 August 2021
Scale: 1:1000@A4
Ref: 21130

Appendix B - Onsite wastewater & land application report

ONSITE WASTEWATER & LAND APPLICATION REPORT FOR 54 Green Lane Motueka (Ruru Homes)

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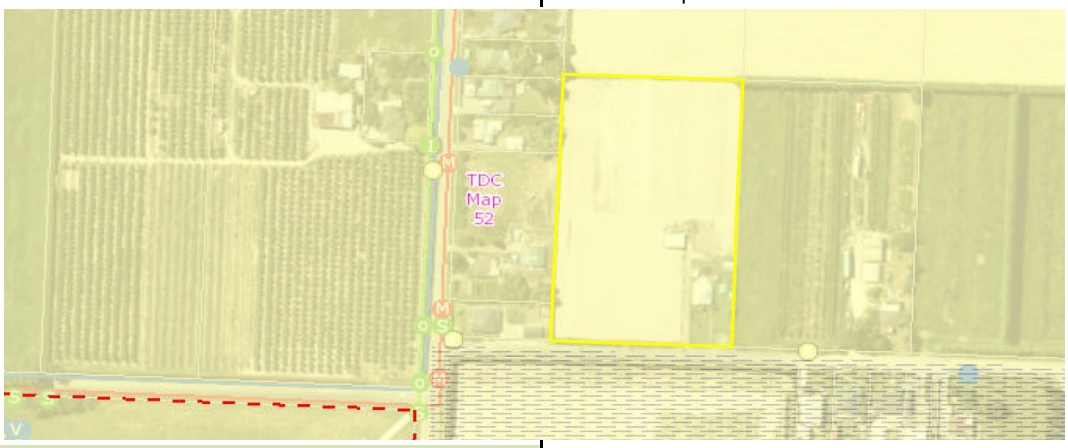
gary.gsconsulting@gmail.com
mobile 021-222-8410

ONSITE WASTEWATER DESIGN REPORT SITE/SOIL EVALUATION

Date: **Ref:21130**

1.0 PROJECT	PROJECT LOCATION	**54 Green Lane Motueka**
	LEGAL DESCRIPTION	Lot 12 DP 1512
	SIZE OF LAND (ha)	1.3170ha
	SITE OWNER	Ruru Homes Ltd
	CONTACT NUMBER	TBC
	EMAIL ADDRESS	franziska@huelsmeyer.co.nz
	ARCHITECT/DESIGNER	TBC
	BC/RC REFERENCE	TBC
	PROJECT DESCRIPTION	Proposed Construction business with bathroom facilities and proposed isite wastewater & land application system, and existing altered dwelling to offices with existing wastewater & land application system.
2.0 SYSTEM CAPACITY	**WATER SUPPLY**	Bore
	Existing Offices	
	AS/NZS1547-2012 Table H4	
	Permanent Residents	2 x 200L/person/day
	Day Staff	4 x 50L/person/day
	FLOW ALLOWANCE RESIDENTIAL (L/day)	600L/day *(existing system to remain in service)*
	Proposed Commercial Business Staff	
	AS/NZS1547-2012 Table H4	
	Number of Persons	60
	Flow Allowance per Person (L/person)	50L/day
	TOTAL FLOW ALLOWANCE RESIDENTIAL (L/day)	3000L/day *(proposed new system)*
	RECOMMENDED WATER REDUCTION MEASURES	No water reduction measures considered.
	SPECIFIED WATER RE-USE MEASURES	None Specified for this project.
3.0 DESKTOP	RESOURCE MANAGEMENT PLAN	TRMP
	RELEVANT SECTION	36.1.2.4
	MAP	52 Motueka
	NOTES	Rural WW requirements



	GEOTECH REPORT	No report reviewed as part of this design
	REPORT AUTHOR	n/a
	REPORT REFERENCE	n/a

	RAINFALL (NIWA)	
	Rainfall intensity (mm)	90mm
	Rainfall annual - previous 12 months (mm)	<1000mm
4.0	DATE	1/07/2021
SITE VISIT	Site Exposure	all directions
	LAND USE	
	Previous if known	pasture/orchard
	Ground cover	grass
	Existing Vegetation near LAS Area	None
	Any Proposed Landscaping	None
	SURFACE WATER	
	Directional channelling required?	No
	Potential for flooding of LAS Area?	No
	Highest seasonal groundwater level?	>1.9m
	Groundwater level determined how?	excavation to 2.5m
	IDENTIFIED LAND APPLICATION AREA	
	Slope average (˚ OR %)	<5%
	Slope Reduction	n/a
	Slope shape Potential LAS Area	flat
	SETBACK DISTANCES MINIMUM ACHIEVED	
	(AS/NZS1547-2012 Appendix R)	
	Property Boundary >1.5m	1.5m minimum
	Buildings/Houses >2m	2m minimum
	Surface Water >20m	20m minimum
	Well/Bore if known >20m	20m minimum
	Recreational Area >3m	3m minimum
	In Ground Water Tank >4m	4m minimum
	Retaining Wall/Embankment >3m	3m minimum
	Ground water >0.6m	0.6m vertical minimum
	Hardpan >0.5m	0.5m vertical minimum
	DESCRIPTION OF ADJACENT WWLA SYSTEM	Existing primary treated wastewater system and effluent trench system on site.
5.0	TEST PIT ONE	
SOIL	Type of Test Pit	excavation
TESTING	Depth of Test Pit (m)	2.0m
see soil logs for	Depth of Topsoil (m)	0.35m
detail	Recommended Depth of Land Application System	0.9m
	Soil type	SL
	Category	3
	TEST PIT TWO	
	Type of Test Pit	excavation
	Depth of Test Pit (m)	2.5m
	Depth of Topsoil (m)	0.35m
	Recommended Depth of Land Application System	0.9m
	Soil type	SL
	Category	3
	TEST PIT THREE	
	Type of Test Pit	excavation
	Depth of Test Pit (m)	1.8m
	Depth of Topsoil (m)	0.35m
	Recommended Depth of Land Application System	0.9m
	Soil type	SL
	Category	3

	SOIL PROFILE PHOTO	
		
	RECOMMENDED DESIGN LOADING RATE (mm/day)	50mm/day secondary treatment
6.0 Design Calculations	**SYSTEM CAPACITY (New System)**	
	Number of Persons	60
	Flow Allowance/Person (L/Day)	50L/day
	Daily Flow Allowance (L/Day)	3000L/day
	LAS AREA	
	Daily Flow Allowance (L/Day)	3000L/day
	Design Loading Rate (mm/day)	50mm/day
	Total Land Application Area (m^2)	60m^2
7.0 LAND APPLICATION SYSTEM	**SYSTEM TYPE**	AES single pass sand filter
	NOTES:	
	LOADED BY	trickle
	NUMBER OF DOSES	n/a
	SIZE OF DOSE (litres)	n/a
	LAS INSTALLATION	
	Average Depth of LAS (m)	0.9m
	Diameter of effluent lines (mm)	300mm
	Distance between effluent lines (m)	0.15m
	Distance between emitters (m)	n/a
	Emitter Flow Rates (l/hr)	n/a
	Flush Caps/Valves Rqd (Y/N)	n/a
	Air Inlet/Release Mechanism Rqd (Y/N)	low & high vents installed
	Land Application Area calculated at (m^2)	60m^2
	Reserve Area (m^2)	60m^2
	RA Notes:	100% reserve area available
	Compliance with AS/NZS1547:2012 5.5.3.7	Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.
	Land Application Area to be planted (Y/N)	No
	Plant density (per m^2)	n/a

8.0 WASTE WATER SYSTEM	**WASTE WATER SYSTEM**		
	PRIMARY TREATMENT		5000L Alpha Precast septic tank
	SECONDARY TREATMENT		AES single pass sand filter
	TERTIARY TREATMENT		n/a
	DESIGN DAILY FLOW RATE (L/DAY)		3000L/day
	EFFLUENT QUALITY EXPECTED		
		BOD_5 mg/L	<30mg/L
		TSS mg/L	<45mg/L

9.0 AEE

A description of the sensitivity of the receiving environment, in particular the potential for the proposed system to have any impact on ground and surface water and/or Identify the location of any downstream bores and any potential adverse effects coastal water quality.

The effects of discharging domestic wastewater to land will be no more than minor given the wastewater management system has been designed to comply with the requirements of AS/NZS 1547:2012. The no waterbody is within 100 metres, no bore identified within 20 metres of LAS area and groundwater at >1.9 metres. The soil depth and characteristics are sufficient to allow for the breakdown of the wastewater without actual or potential accumulated adverse effects.

Details of seasonal fluctuations in flows and how this may affect the seasonal or long term performance or capacity of the system

Normal seasonal fluctuations will be experienced with visitors more frequent in warmer months. The system as designed is capable with coping with these varying flows and conditions and will maintain design parameters in regard to effluent treatment and quality.

Details of any proposed mitigation/contingency measures to be undertaken to help prevent or reduce the actual or potential effect

NO mitigation measures considered necessary as no actual or potential issues identified as part of site and soil investigation.

Any possible alternative methods of discharge, including discharge into any other receiving environment

No alternative methods considered as best land application for the land has been identified.

Where the scale or significance of the activities effect are such that monitoring is required a description of how, once the proposal is approved effects will be monitored and by whom

This system only requires an annual health check though should be checked at 3 month & 6 month intervals in it's first year of operation to ensure steady bio-mass growth on any installed effluent filter and any odour or surface ponding issues. These checks can be completed by the owner (as directed by designer) or the owner's contractor.

10.0 INSTALLATION SUMMARY

Install 5000L Alpha precast septic tank without effluent filter. Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter. Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.

11.0 OPERATION & MAINTENANCE SUMMARY

Operate and maintain as per manufacturers recommendations and in accordance with AS/NZS1547:2012 and GSC manual.

12.0 REFERENCES

AS/NZS 1546.1:2008 Onsite Domestic Wastewater Treatment Units Part 1: Septic Tanks

AS/NZS 1546.3:2008 Onsite Domestic Wastewater Treatment Units Part 3: Aerated Wastewater Treatment Systems

AS/NZS 1547:2012 Onsite Domestic Wastewater Management

Onsite Wastewater Systems: Design and Management Manual Third Edition ARC Technical Publication TP58

USEPA Onsite Wastewater Treatment Systems Manual 2002

New Zealand Building Code

13.0 PHOTOGRAPHS

TOP PHOTO:	looking south over existing septic tak and land application system
BOTTOM PHOTO:	looking south over land available for proposed land application system

Gary Stevens Consultant

ATTACHMENTS:

APPENDIX A Soil Logs
APPENDIX B Floor Plan, Site Plan, Wastewater System Layout
APPENDIX C Technical information & LAS System Cross Section
APPENDIX D System Operation & Maintenance , Maintenance Contract

APPENDIX A

Soil Logs

SSE: G Stevens

Client name: Ruru Homes Ltd

Project Location: 54 Green Lane Motueka

Date of inspection: 1/07/2021

Pit/borehole no: 1

Legal Descr. Lot 12 DP 1512

Grid reference if known: E N

Surface level if known: R L

Slope: <5 % **Slope shape:** flat **Ground cover:** grass **Surface condition:** soft

Vegetation: None

Groundwater depth (m): >2m

Verified by: excavation

Indicative drainage: good

Layer	Lower depth mm	Horizon	Moisture condition*	Colour (moist)	Field texture	Coarse fragments % volume	Structure	Modified Emerson	Soil category	Sample taken (Y/N)	Consistency	Permeability	Ribbon Length
1	350		dry		L	<3%	0	NT	3	N	weak	NT	20mm
2	700		dry		ZL	<2%	moderate	NT	3	N	firm	NT	30mm
3	1600		dry		SL	<5%	moderate	NT	3	N	firm	NT	25mm
4	2000		dry		S	<40%	single	NT	2	N	0	NT	<5mm
5													

**Describe moisture condition as: dry, moist, very moist, saturated.*

Overall Soil Category assigned: Category 3

Maximum depth of system: 1.3m to maintain 600mm setack to GW

Soil appears favourable for (List system types): effluent trench/bed, AES single pass sand filter

Notes/comments/observations: Plasticity is low. Hard pan was not discovered at 2.5 metres. Gravels evident at 0.2-2.5 metres being 5-100mm and up to 40%. No vegetation near identified LAS Area is established trees and shrubs bordering stream.

Soil Colours	
Pale	*may develop from pale rocks, maybe leached from darker minerals, maybe anaerobic*
Dark	*may develop from dark rocks (basalts), may indicate high levels of decomposing organic materials*
Bright Reds	*usually well aerated soil, high in iron or aluminium oxide*
Dull Yellows	*formed when iron rich soils have a higher water content over a long period*
Grey Soils	*maybe leached off dark minerals, low organic matter levels or maybe anaerobic for long periods*
Bleached Soils	*usually formed by severe water logging when minerals become soluble and move out of the horizon*

SSE: G Stevens

Client name: Ruru Homes Ltd

Project Location: 54 Green Lane Motueka

Date of inspection: 1/07/2021

Pit/borehole no: 2

Legal Descr. Lot 12 DP 1512

Grid reference if known: E N

Surface level if known: R L

Slope: <5 % **Slope shape:** flat **Ground cover:** grass **Surface condition:** soft

Vegetation: None

Groundwater depth (m): >2.5m

Verified by: excavation

Indicative drainage: good

Layer	Lower depth mm	Horizon	Moisture condition*	Colour (moist)	Field texture	Coarse fragments % volume	Structure	Modified Emerson	Soil category	Sample taken (Y/N)	Consistency	Permeability	Ribbon Length
1	350		dry		L	<3%	0	NT	3	N	weak	NT	20mm
2	700		dry		ZL	<2%	moderate	NT	3	N	firm	NT	30mm
3	1800		dry		SL	<5%	moderate	NT	3	N	firm	NT	25mm
4	2500		dry		S	<40%	single	NT	2	N	0	NT	<5mm
5													

**Describe moisture condition as: dry, moist, very moist, saturated.*

Overall Soil Category assigned: Category 3

Maximum depth of system: 1.3m to maintain 600mm setack to GW

Soil appears favourable for (List system types): effluent trench/bed, AES single pass sand filter

Notes/comments/observations: Plasticity is low. Hard pan was not discovered at 2.5 metres. Gravels evident at 0.2-2.5 metres being 5-100mm and up to 40%. No vegetation near identified LAS Area is established trees and shrubs bordering stream.

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Bleached Soils	*usually formed by severe water logging when minerals become soluble and move out of the horizon*

SSE: G Stevens

Client name: Ruru Homes Ltd

Project Location: 54 Green Lane Motueka

Date of inspection: 1/07/2021

Pit/borehole no: 3

Legal Descr. Lot 12 DP 1512

Grid reference if known: E N

Surface level if known: R L

Slope: <5 % **Slope shape:** flat **Ground cover:** grass **Surface condition:** soft

Vegetation: None

Groundwater depth (m): >1.9m

Verified by: excavation

Indicative drainage: good

Layer	Lower depth mm	Horizon	Moisture condition*	Colour (moist)	Field texture	Coarse fragments % volume	Structure	Modified Emerson	Soil category	Sample taken (Y/N)	Consistency	Permeability	Ribbon Length
1	350		dry		L	<3%	0	NT	3	N	weak	NT	20mm
2	700		dry		ZL	<2%	moderate	NT	3	N	firm	NT	30mm
3	1600		dry		SL	<5%	moderate	NT	3	N	firm	NT	25mm
4	1900		dry		S	<40%	single	NT	2	N	0	NT	<5mm
5													

**Describe moisture condition as: dry, moist, very moist, saturated.*

Overall Soil Category assigned: Category 3

Maximum depth of system: 1.3m to maintain 600mm setack to GW

Soil appears favourable for (List system types): effluent trench/bed, AES single pass sand filter

Notes/comments/observations: Plasticity is low. Hard pan was not discovered at 2.5 metres. Gravels evident at 0.2-2.5 metres being 5-100mm and up to 40%. No vegetation near identified LAS Area is established trees and shrubs bordering stream.

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Bleached Soils	*usually formed by severe water logging when minerals become soluble and move out of the horizon*

APPENDIX B

I. **Floor Plan *(to be provided)***
II. **Site Plan**
III. **Wastewater & Land Application System Layout**

SITE NOTES:

ALL WORKS SHALL CONFORM WITH ALL STATUTORY AND LOCAL AUTHORITY REQUIREMENTS, NZS 3604 AND NEW ZEALAND BUILDING CODE

ALL MATERIALS TO BE SUPPLIED AND INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.

ALL PLUMBING PIPE WORK CAST INTO AND BELOW THE FLOOR SLAB SHALL BE WRAPPED IN DENSO TAPE TO ENSURE ADEQUATE THERMAL MOVEMENT.

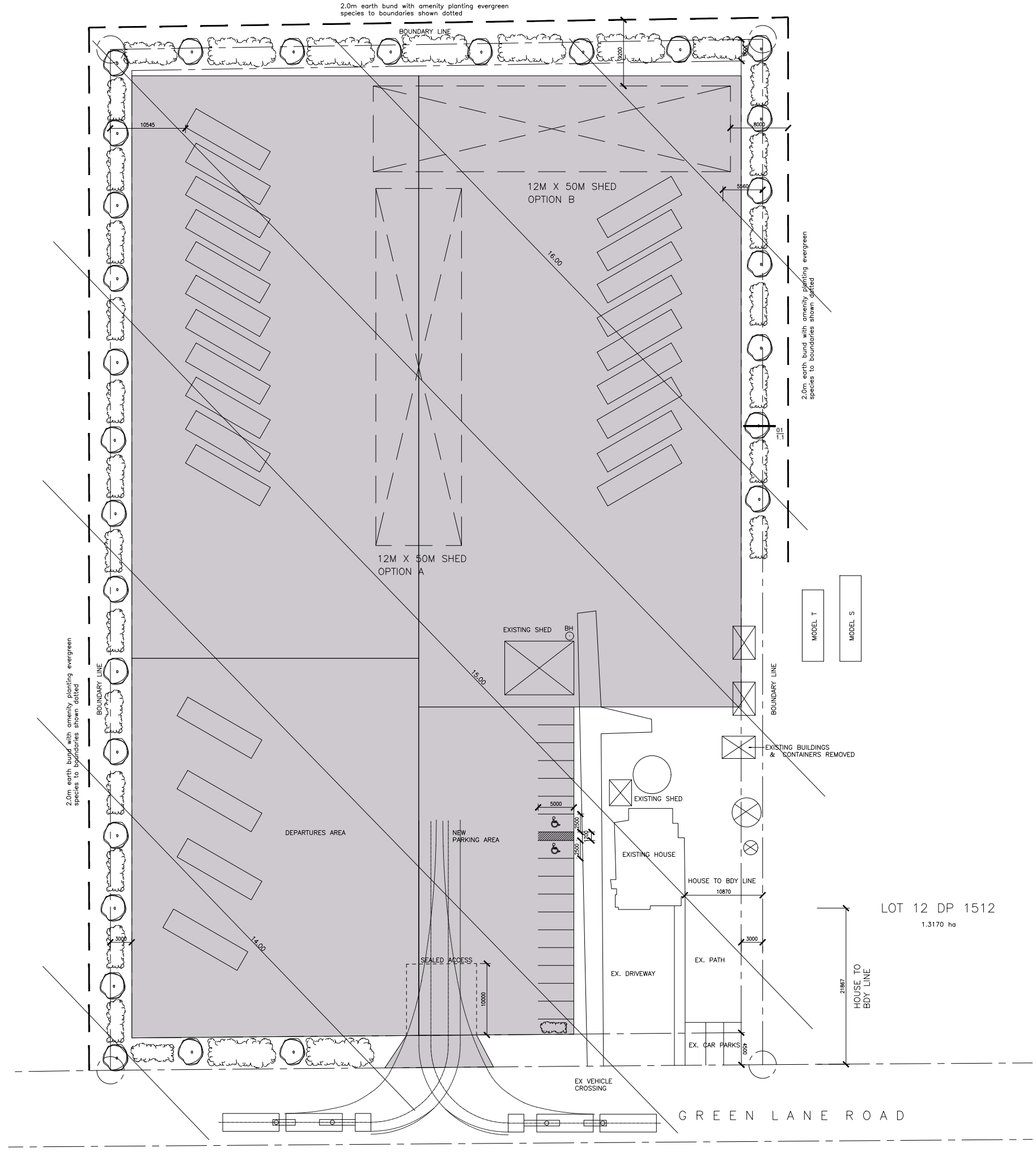
FLOOR LEVELS AND BUILDING SETOUT TO BE CONFIRMED TO CONTOURS ON SITE.

DEVELOPMENT SCHEDULE

SITE:	54 Green Lane, Motueka
DP:	Lot 12 DP 1512
CT:	NL3D/643
SITE AREA:	1.370 HA
TERRITORIAL AUTHORITY:	TASMAN COUNCIL
EXISTING BLDG COVERAGE:	248 sq m
EXISTING TOTAL:	248 sq m – 1.8%
PROPOSED SHED:	1240 sq m
PROPOSED TOTAL:	1488 sq m – 10.5%

LOCATION PLAN

NTS



SITE PLAN

SCALE 1:300 @ A1, 1:600 @ A3

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING ANY WORK.
DO NOT SCALE.

NOTES:

NOTES:

GENERAL NOTE:
Alterations from systems or details shown on the attached documents without express approval from the designer shall void any liability to the designer.

SITE DIMENSIONS:
The Contractor is to verify all dimensions on site before ordering or manufacturing.

FITTINGS AND ITEMS:
The Contractor is to check and obtain copies of the manufacturers and suppliers installation and dimension details for all products and items to be used prior to installation and or use.

ASSOCIATED DRAWINGS:
Contractor is to confirm with the designer that he has copies of all relevant drawings and specification so as to make a complete set. Any inconsistencies between drawings and speaks to be brought to the designers attention for clarification.

CLADDING
All building cladding works including roofing shall confirm strictly with the requirements of NZBC–E2/AS1.

REV.	DATE	
4	13.8.21	Consultant Issue
3	6.8.21	Consultant Issue
2	26.7.21	Consultant Issue
1	12.5.21	RC Issue

ALLURE architectural
architectural design prefab modular homes custom build
Jarrod@allurearchitectural.co.nz - 0278453121

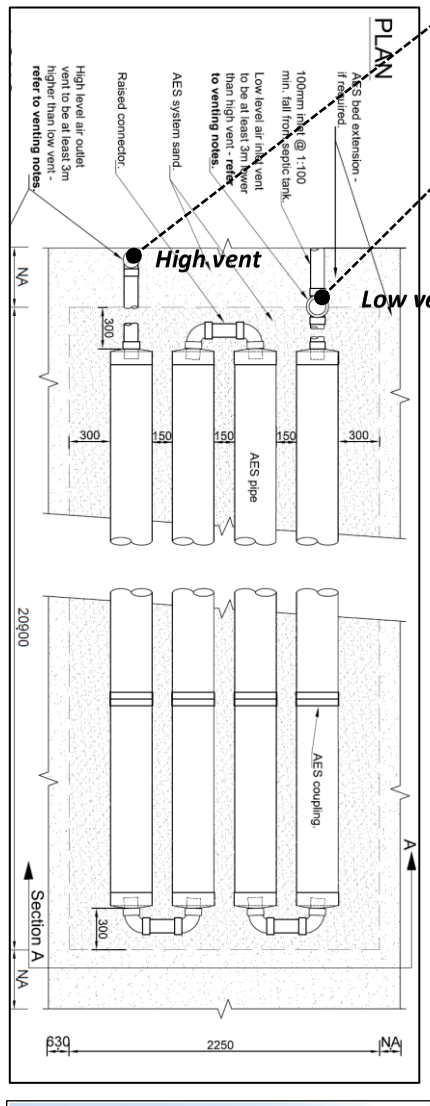
Project
RURU HQ
New Site Layout
54 Green Lane
Motueka 7120

Title
Site Plan
Proposed

Design: Jarrod
Drawn: Jarrod
Checked:
Date: Feb 2021
Scale A1: 1:400
Scale A3: 1:800
Job No: 21–003
Rev: 4

Dwg: Ac 0.1

Status: Resource Consent



Key:

- Wastewater Unit
- Land Application System
- Reserve Area
- Test Pits
- LAS Design Planting
- Surface Water Diversion Channel

SETBACK DISTANCES MINIMUM ACHIEVED
(AS/NZS1547-2012 Appendix R)
Property Boundary >1.5m
Buildings/Houses >2m
Surface Water >20m
Well/Bore if known >20m
Recreational Area >3m
In Ground Water Tank >4m
Retaining Wall/Embankment >3m
Ground water >0.6m
Hardpan >0.5m

Notes:

I. *Install 5000L Alpha precast septic tank without effluent filter.*

II. *Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.*

III. *Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.*

IV. *Septic tank outlet tee to be capped to isolate AES bed venting, See attached AES VC drawing (AES Bed and Septic Tank Air Venting Detail).*

G Stevens
Plumbing & Drainage Consultant
gary.gsconsulting@gmail.com
Ph: 021-222-8410

Drawing Name: GS-01 Onsite Wastewater & Land Application System Location Plan
Client: Ruru Homes Ltd
Project Address: 54 Green Lane, Motueka
Legal Description: Lot 12 DP 1512

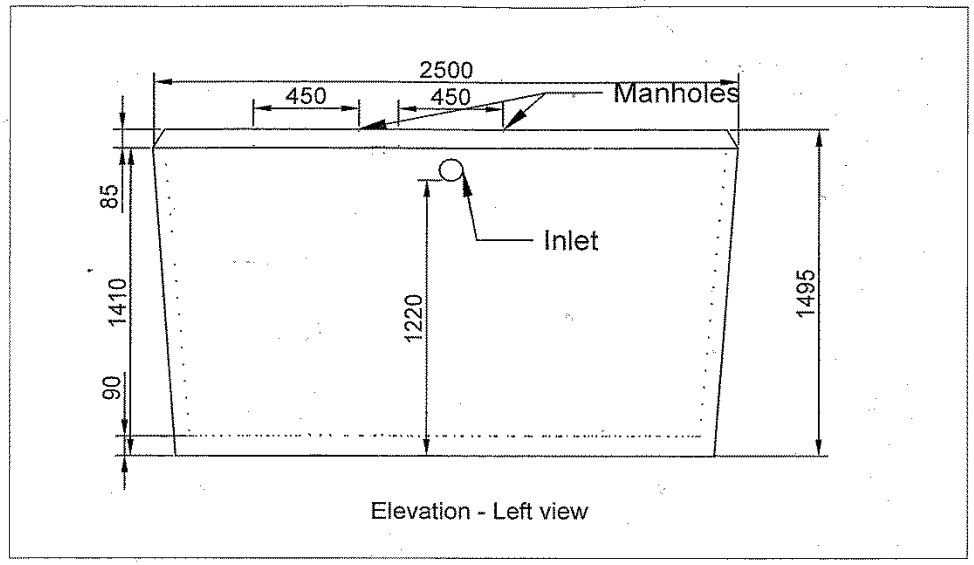
Date: 14 August 2021
Scale: 1:1000@A4
Ref: 21130

APPENDIX C

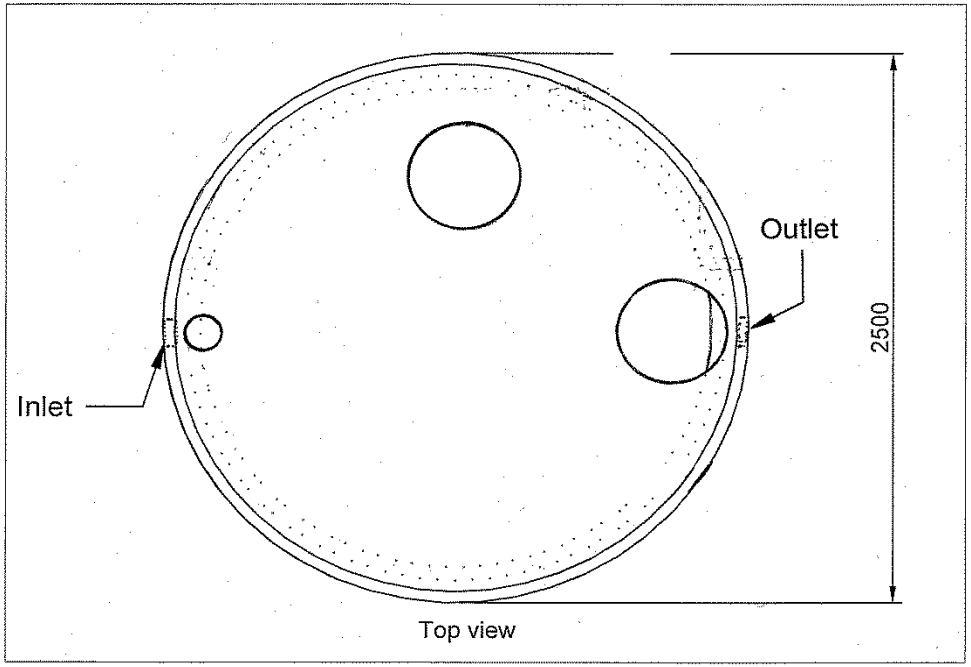
I. Wastewater System Technical Detail

II. AES Bed Land Application Detail

ALPHA 5000 Septic Tank

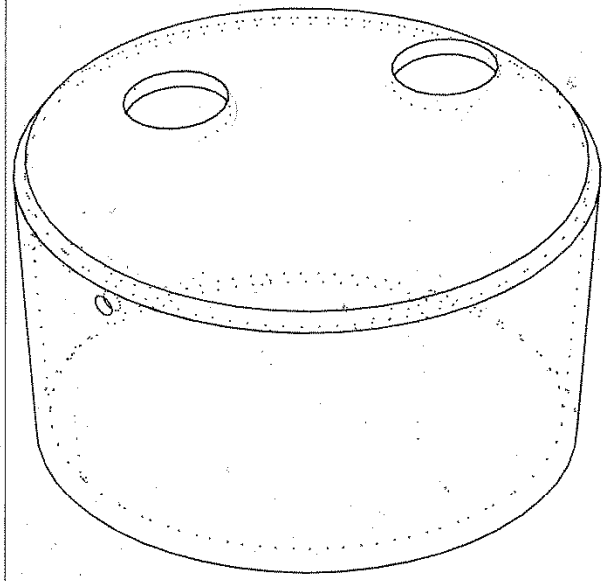


Elevation - Left view



Top view

Shown without manhole risers and lids
Lids come with tanks but risers are available separately if needed
Optional antiflotation flange can be cast onto the base of the tank – this would make the overall diameter 2700mm
Manhole configuration can be altered to suit specific requirements



3D view

Standard weight	3700Kg
Weight with antiflotation flange	4300Kg

Lift with 4 x 2.5T Swiftlift lifting eyes

See also ALPHA 5000 Septic Tank information sheet

01 December 2011

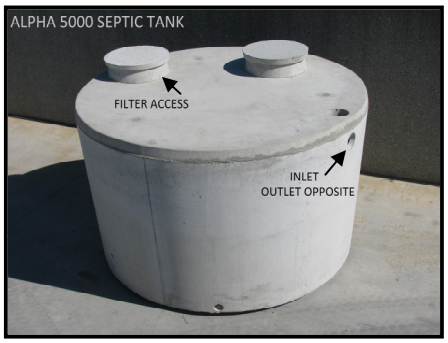
ALPHA 5000 Septic Tank – Single Chamber

4600 Litre Operating Capacity

The ALPHA 5000 Septic tank is robust and of a well proven design.
All ALPHA Tanks are manufactured only from high quality materials.

* Walls and floor are integral and made in one continuous casting which is inherently waterproof (as required by AS/NZS 1546.1).
* Specific structural design as required to comply with AS/NZS 1546.1.
* Tank and lid components are made from high strength reinforced concrete from a certified plant to NZS 3104.
* The Standard Precast concrete lid will support up to 800mm of soil cover (no vehicle loading).
* The access hole configuration enables the tank to accept most effluent filters.

Basic Tank dimensions:
Total Internal Capacity is 5500Litres
Total Working Capacity (as set by invert levels) is 4600 Litres
2500mm diameter x 1495mm high (+ manhole risers)
Base of tank to invert of inlet is 1220
Base of tank to invert of outlet is 1170
Weight of the Tank is approximately 3700Kg



The tank is lifted by 4 x 2.5tonne Reid Swiftlift anchors externally near the base of the tank.

All Septic Tanks should be installed by a suitably experienced Registered Drainlayer to the appropriate local authority regulations. See also ALPHA Septic Tanks – Installation Instructions and Guidelines.

The ALPHA 5000 Septic Tank is generally supplied bare (without pipework or access risers). These are available separately and should be sealed into the tank to prevent stormwater ingress as required by AS/NZS 1546.1.

The tank should be filled with water immediately after installation to resist any likelihood of the tank floating.

Vehicle traffic over septic tanks should not be permitted. Tanks should be fenced off or sited to prevent this occurring.

Optional antifloatation lugs should be specified when ordering the septic tank if high groundwater conditions on the site are a possibility.

23 King Edward Street Motueka New Zealand
Phone (03) 528 1018
Fax (03) 528 9362
Email info@alphaprecasts.co.nz

01 December 2011

Environmenttechnology wastewater treatment

Environment Technology (Et) Ph: 03 970 7979
Email: info@et.nz www.et.nz

Et Nelson warehouse: 105 Pascoe St, Annesbrook, Nelson 7011

PS2

AES Design Calculator - Residential* Schedule of Materials

AES

For use by wastewater system designers for sizing of AES wastewater treatment systems receiving residential strength wastewater. To be supplied to ET with Design / Construction drawings for peer review, then for a digital signature by ET and your submission to Consenting Authorities for construction consent.

Supply of AES components is based on an ET reviewed and digitally signed Calculator and construction drawings. Any changes to the design during the consent process must be reviewed by ET.

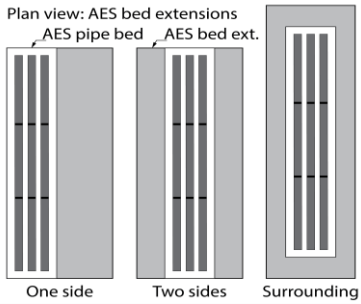
Site Address	54 Green Lane Motueka				
Client Name	Ruru Homes Ltd	Clients Email	franziska@huelsmeyer.co.nz		
Designed By	G Stevens	Designer Phone #	021-222-8410	Designer AES Cert. #	NZ00317
Installer	TBC	Installer Phone #	TBC	Installer AES Cert. #	TBC
Council Area	Tasman District Council	Drainlayer Licence #	TBC	Date	16.08.21

Receiving soil category, surface waters, depth to water tables & all other site constraints are addressed by the Designer in the accompanying information.

from the System designer's site and soil data. Enter data in light blue fields.		NOTES
Number of bedrooms	0	>> Enter "NA" if this design is for a campground, office, cafe etc without bedrooms.
Number of people	60	>> Enter "1" here if entering total daily design flow below and not a per person amount.
Daily wastewater design flow allowance per person (L/d)	50	
Loading rate for AES pipes (L/m AES pipe/d)	38.0	>> Standard rate is 38 L/m AES pipe/d per OSET-NTP testing . Please justify if not using standard rate in Designers notes below
Do you want to use cut AES pipes - eg, 3.5 AES pipes per row? Y or N	Y	>> Use with 1 - 4 rows; for 5 or more rows using cut pipes contact ET.
AES bed - No. of rows of AES pipes	4	>> Longer AES beds increase contact area with surrounding soil.
Soil Category (per AS/NZS 1547) from site & soil evaluation	3	
Design Loading Rate (DLR) based on soil category (mm/day)	50	
Sand depth beneath AES pipes (mm)	300	>> Standard 300mm achieves 3.5Log reduction for FC**; increase sand depth to further reduce FC. Total expected FC reduction through AES system in this design: 3.5Log***
Is there a pump between the septic tank and the AES bed? Y or N	N	>> Ensure there is 50mm min. fall between septic tank and AES pipes, and pipework laid at 1:100 min.
Is this property/ disposal site sloping? Y or N	Y	>> Ensure subsurface & surface water is diverted away from AES bed.
Is this design vented to the building terminal vent (TV)? Y or N	N	
Diameter of high vent (mm)	65	>> 65mm, 80mm or 100mm, to be supplied with AES components.
Is sampling of the treated effluent required? Y or N	N	
Distribution Box required Y or N	N	Number of ports required, including inlet port, and port for air vent if so designed.

Designers notes (Editable)

- All sloping sites require special consideration regarding design of AES bed, sand extensions, surface water and construction methods as per AS/NZS 1547.
- Drainlayers are reminded to practice good construction techniques as per AS/NZS 1547 and as provided on AES installation instructions supplied with components.



AES Bed Design Calculator Outcomes		AES Bed dimensions	AES Pipe Bed	AES Bed Extension
Daily design flow (Q)	3000.00 L/d			
Min. length of AES pipe rows	19.74 m	Length (m)	20.85	20.85
No. of 3m AES pipes per row	6.75 lths	Width (m)	2.25	0.63
Total volume of AES pipes/		Sand Depth (m)	0.75	0.15
total potential buffer capacity	5724.00 L	Area (m^2)	46.91	13.09

For 'Surrounding' extension or to increase bed length/ decrease width, enter "Y", otherwise leave blank.

If 'Y' enter required width (m) of AES bed, otherwise leave blank. Bed length will calculate automatically.

	Length (m)		Width (m)		Minimum AES footprint required 60m2	
The dimensions of this AES bed with side extension/s are:	20.9	x	2.88	=	60.0	m2 total

Total expected FC reduction through AES system in this design: 3.5Log***

AES Bed Schedule of Materials

AES 3m length pipes required	27	lengths
AES couplings required	24	ea
AES offset adaptors	8	ea
100mm vent cap with mesh	1	ea
Vent cowl for high vent	1	ea - 65mm diam.
TV inspection not required		
Sample port not required		
Distribution box not required		
Total AES System Sand **Solid Measure** (guide only)	31.4	m^3

ET Signature box - ET Use Only

Producer Statement PS-2 Design Review - approved by ET.
NOTE: - This design review does not include review of the Site and Soil assessment by the Designer

Reviewed by:		19/08/2021 13:32
Data entry by:		Job:

Open PDF in Adobe Acrobat; hover over signature

Follow link below to download Signature Verficiation macro
www.securedsigning.com/products/signature-verification-service
Click on signature in PDF to view signature validation

To be used as a guide only. This AES Design Calculator is an aid to calculate the AES components and their configuration. (Some single AES row layouts may be over-estimated by one coupling. Et will advise if this has occurred when doing the Design Review. Site and Soil conditions as specified in NZS1547:2012 are calibrated by a **Qualified Designer**. Environment Technology accepts no responsibility for this soil evaluation and the subsequent loading calculations or the DLR entered by the designer in this calculator.

AES pipes can be cut to length on site. AES pipes are supplied in 3 metre lengths only.

* Residential Effluent is classed as having less than 300mg/L BOD5 plus 350mg/L TSS, a combined total of 650mg/L prior to entering the septic tank, or a combined total of BOD + TSS of < 350mg/L prior to entering the AES bed and not including Industrial Effluent. Contact Et for assistance with high strength , abnormal ph or other parameter influent.

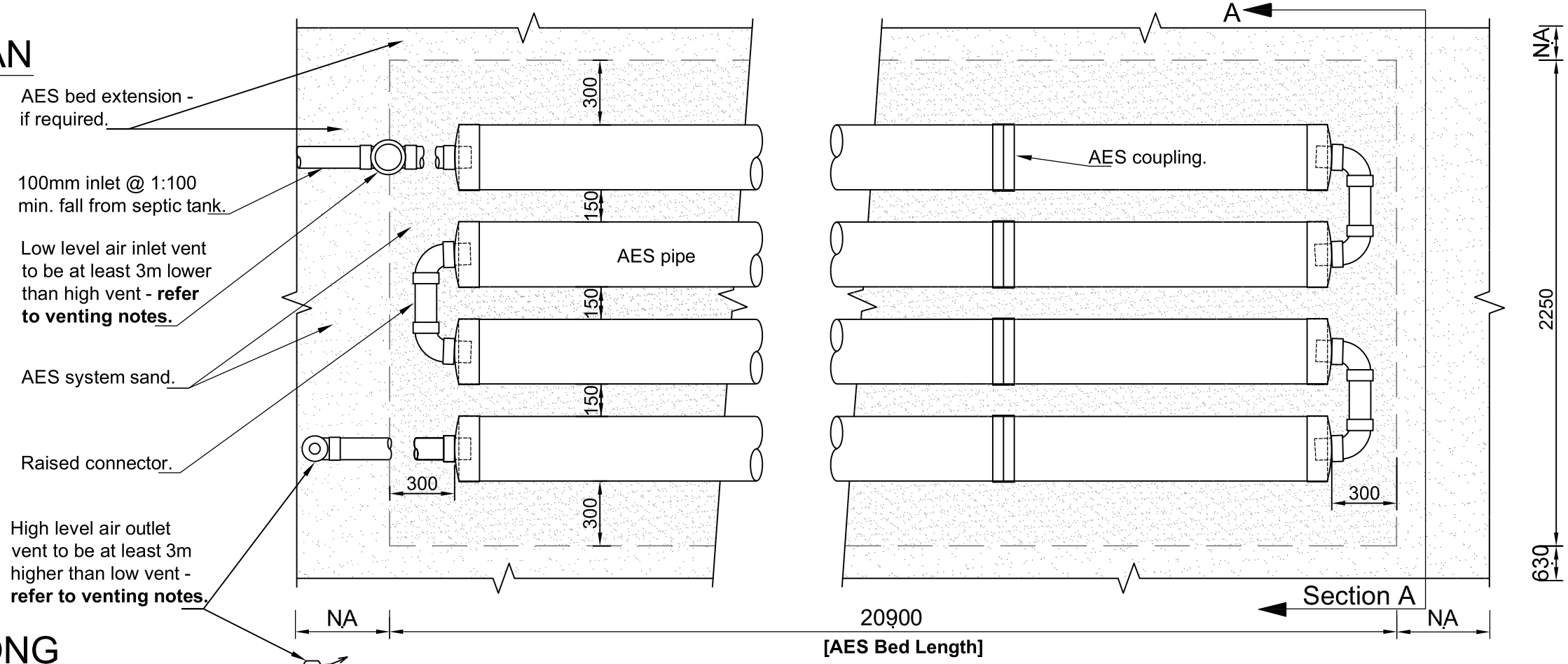
** AES-38 single pass system achieved 3.5 log reduction for Fecal Colliform (FC) in OSET-NTP Trial 12, 2016-17 benchmarking period.

*** Microbial removal rates through medium sand - Pang (2009). *Microbial Removal Rates in Subsurface Media Estimated From Published Studies of Field Experiments and Large Intact Soil Cores*

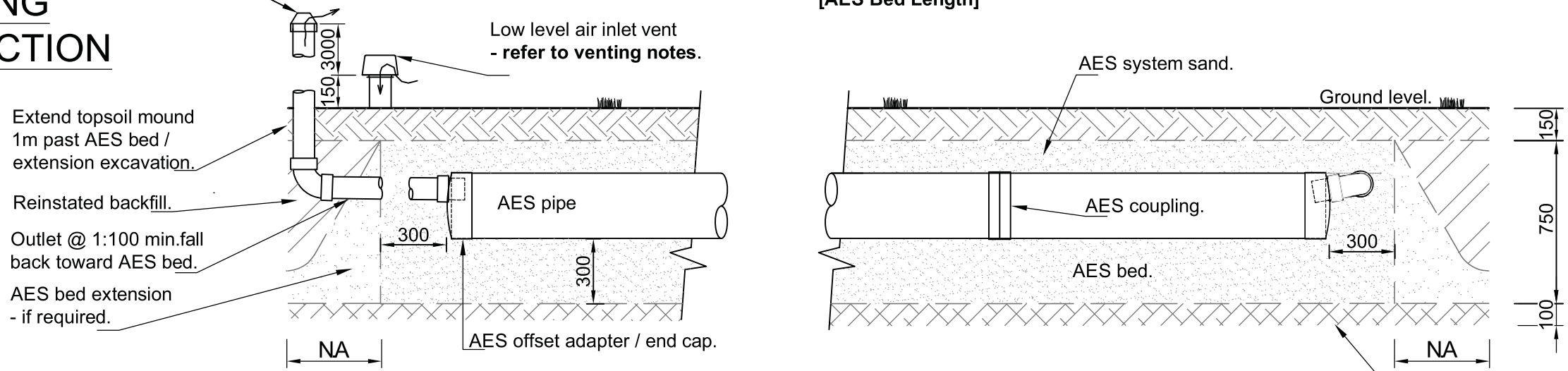
For Design Review: -Email this Design Calculator along with a complete construction drawings to: - **design@et.nz**

AES Components Order- Email a signed AES Design Calculator **and** a copy of the Council Consented Construction plans to: - **info@et.nz**

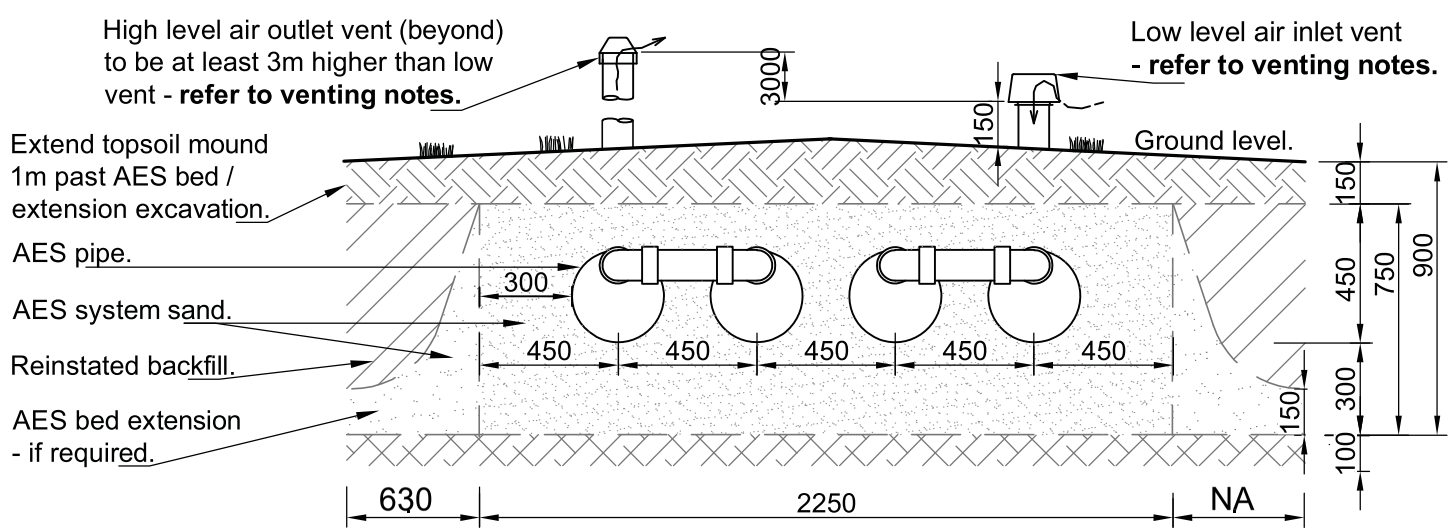
PLAN



LONG SECTION



CROSS SECTION A:A



Dimensions on drawing in millimetres. Table in metres.

Total no. AES pipes	27.066666
Total AES bed, incl. extension:	
Infiltration area	60.19 m2
Width	2.88 m
Length	20.9 m

0 500 1000mm

NOTES

General

· Advanced Enviro-Septic (AES) pipes, fittings and bed to be constructed/installed in accordance with the AES Installation Manual.
· AES pipes and fittings are supplied by Environment Technology Ltd, Et.
· All associated pipework to comply with NZ Building Code G13, Foul Water, Acceptable Solutions, relevant standards and local/regional council requirements.
· Unless otherwise stated all dimensions are in millimetres and all dimensions are minimums except pipe diameters and fittings.

Venting of AES Pipework to Maintain Aerobic Internal Conditions

· The high level air outlet vent to be 100, 80, or 65mm diameter DWV pipe, suitably supported on an adjacent building or post, to be 3m vertically elevated above the low level air inlet vent. 2 x 50mm DWV pipe can be used in internal building framing. Support to be provided to 1 meter below the top of the DWV vent pipe.
· The low level air inlet vent to be 100mm DWV, positioned as close as practical to the AES bed and isolated with respect to air passage wherever practical from upstream influent pipework. Refer to the specific design of each project.
· The location of air inlet and outlet vents can be remote from the AES bed with additional pipework to suit topography, building structures or landscaping. The high level air outlet vent should be positioned considering potential downdrafts or adjacent disturbed air flows.

AES Bed Construction

· An areal extension to the AES bed may be required to suit the permeability of the receiving soil in passive installations. These extensions may be on any or all sides of the bed. Refer to the AES bed dimensions noted on the specific design. N/A or not applicable denotes an extension is not required in this design.
· A minimum of 50mm of fall is required between the septic tank outlet invert and the invert of the inlet to the AES bed or distribution box.
· Trees/large shrubs cannot be planted on the AES bed.
· AES bed 'System Sand' specification is usually met with within the local concrete sand specification. Refer ET website www.et.nz/system-sand-suppliers/ for Et tested AES System Sand suppliers. Et offers cost free sand sieve analysis upon receipt of a two cupful size sample.

Installation Notes:

Install 5000L Alpha precast septic tank without effluent filter.

Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.

Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.

DESIGNED BY	PROJECT	DRAWING TITLE	No.	Revision	Date	Name
G Stevens	Ruru Homes 54 Green Lane Motueka	Standard AES Bed - Four Row	2	Notes altered, inlet/outlet vent pipework detached, and drawing reduced from 1:20 to 1:25	26/08/20	HO

Scale @A3 1:25
Scale @A4 1:50
Dwg: AES SB04

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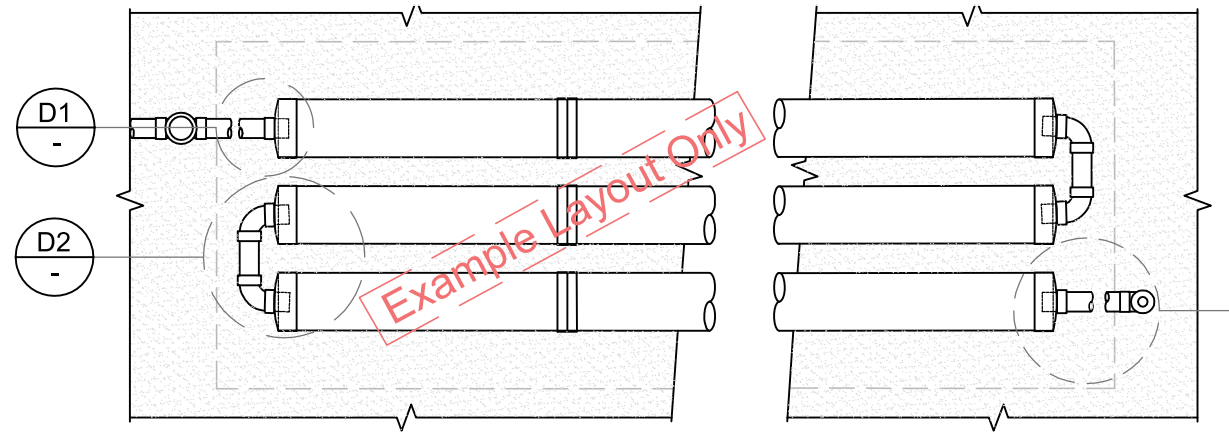
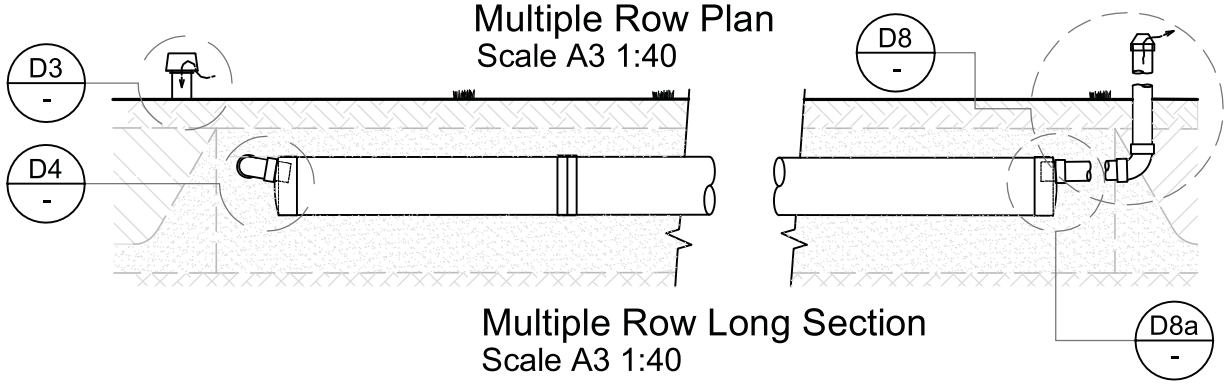
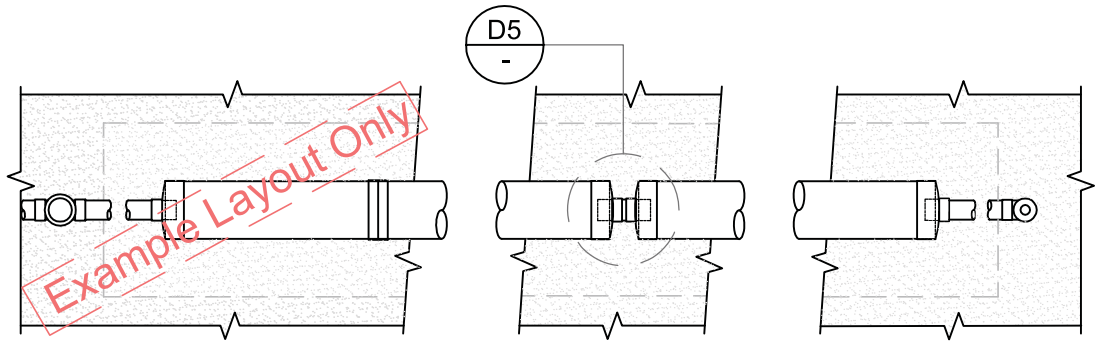


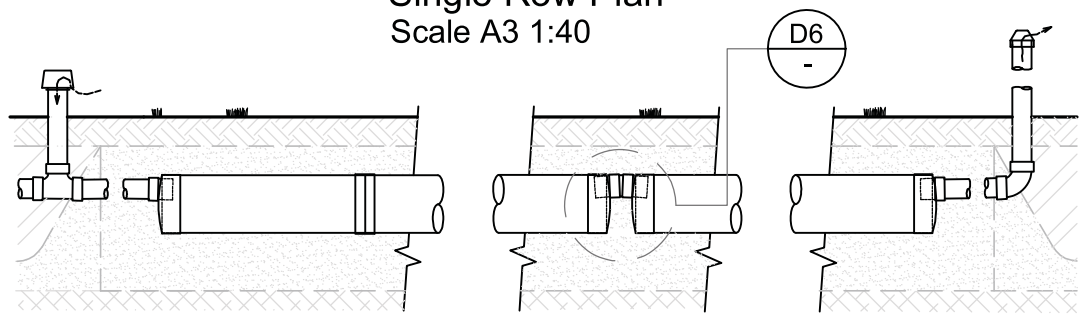
Multiple Row Plan
Scale A3 1:40



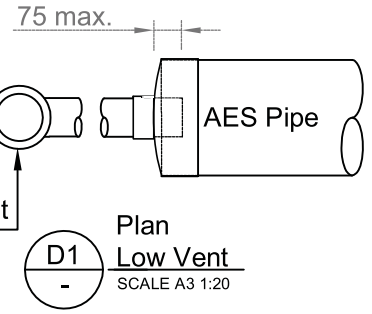
Multiple Row Long Section
Scale A3 1:40



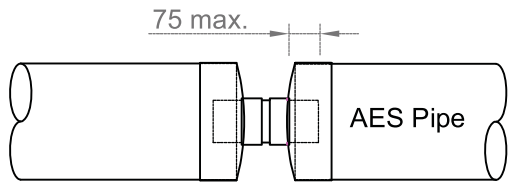
Single Row Plan
Scale A3 1:40



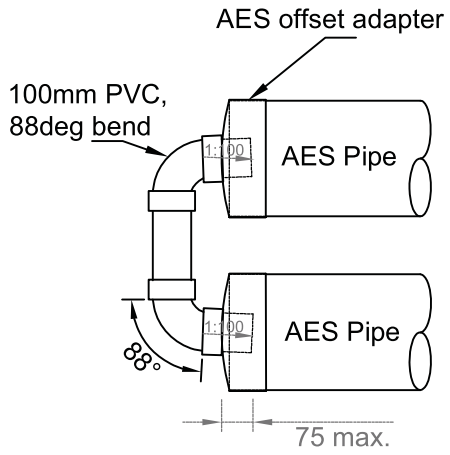
Single Row Long Section
Scale A3 1:40



D1 - Plan
Low Vent
SCALE A3 1:20

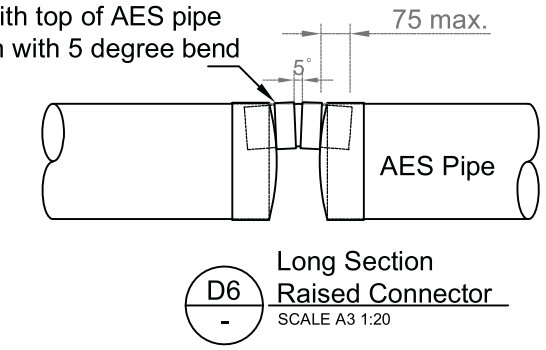


D5 - Plan
Raised Connector
SCALE A3 1:20

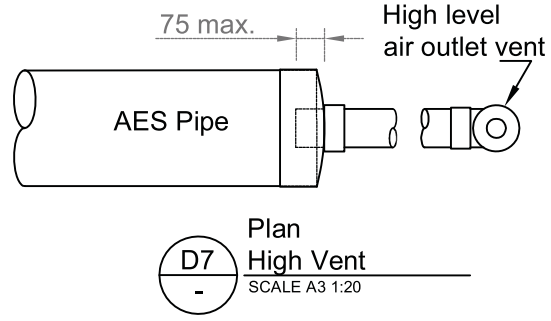


D2 - Plan
Raised Connector
SCALE A3 1:20

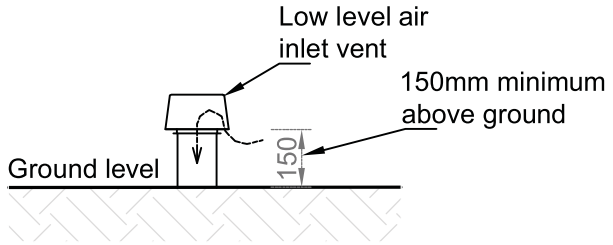
Top of raised connector
level with top of AES pipe
-shown with 5 degree bend



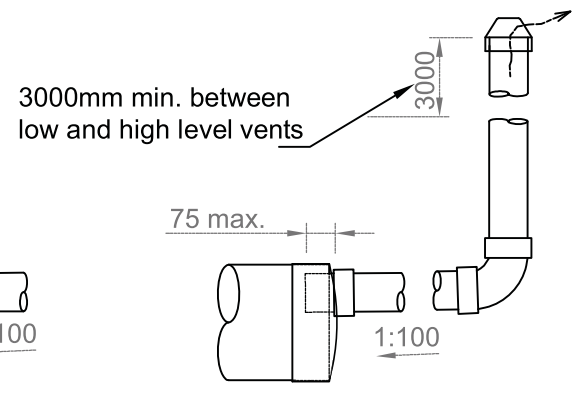
D6 - Long Section
Raised Connector
SCALE A3 1:20



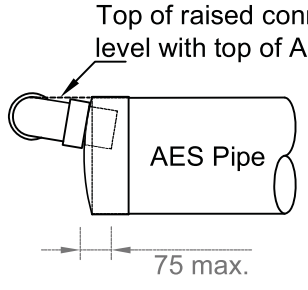
D7 - Plan
High Vent
SCALE A3 1:20



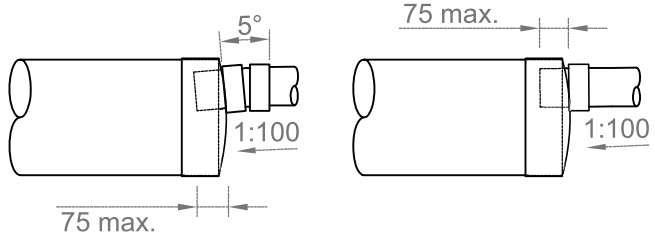
D3 - Section
Low Vent
SCALE A3 1:20



D8 - Section
High Vent
SCALE A3 1:20



D4 - Section
Raised Connector
SCALE A3 1:20



D8a - Section
Alternate Outlet Options
SCALE A3 1:20

0 100 500mm

NOTES

General

· Advanced Enviro-Septic (AES) pipes, fittings and bed to be constructed/installed in accordance with the AES Installation Manual.
· AES pipes and fittings are supplied by Environment Technology Ltd, Et.
· All associated pipework to comply with NZ Building Code G13, Foul Water, Acceptable Solutions, relevant standards and local/regional council requirements.
· Unless otherwise stated all dimensions are in millimetres and all dimensions are minimums except pipe diameters and fittings.

Venting of AES Pipework to Maintain Aerobic Internal Conditions

· The high level air outlet vent to be 100, 80, or 65mm diameter DWV pipe, suitably supported on an adjacent building or post, to be 3m vertically elevated above the low level air inlet vent. 2 x 50mm DWV pipe can be used in internal building framing. Support to be provided to 1 meter below the top of the DWV vent pipe.
· The low level air inlet vent to be 100mm DWV, positioned as close as practical to the AES bed and isolated with respect to air passage wherever practical from upstream influent pipework. Refer to the specific design of each project.
· The location of air inlet and outlet vents can be remote from the AES bed with additional pipework to suit topography, building structures or landscaping. The high level air outlet vent should be positioned considering potential downdrafts or adjacent disturbed air flows.

AES Bed Construction

· An areal extension to the AES bed may be required to suit the permeability of the receiving soil in passive installations. These extensions may be on any or all sides of the bed. Refer to the AES bed dimensions noted on the specific design. N/A or not applicable denotes an extension is not required in this design.
· A minimum of 50mm of fall is required between the septic tank outlet invert and the invert of the inlet to the AES bed or distribution box.
· Trees/large shrubs cannot be planted on the AES bed.
· AES bed 'System Sand' specification is usually met with within the local concrete sand specification. Refer ET website www.et.nz/system-sand-suppliers/ for Et tested AES System Sand suppliers. Et offers cost free sand sieve analysis upon receipt of a two cupful size sample.

Installation Notes:

Install 5000L Alpha precast septic tank without effluent filter.

Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.

Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.

DESIGNED BY	PROJECT	DRAWING TITLE	No.	Revision	Date	Name	Scale @A3	1:40 & 1:20
G Stevens	Ruru Homes 54 Green Lane Motueka	AES System Details Sheet	2	Changed technical format.	31/03/20	HO	Scale @A4	1:20 & 1:10
							Dwg: AES DET01	

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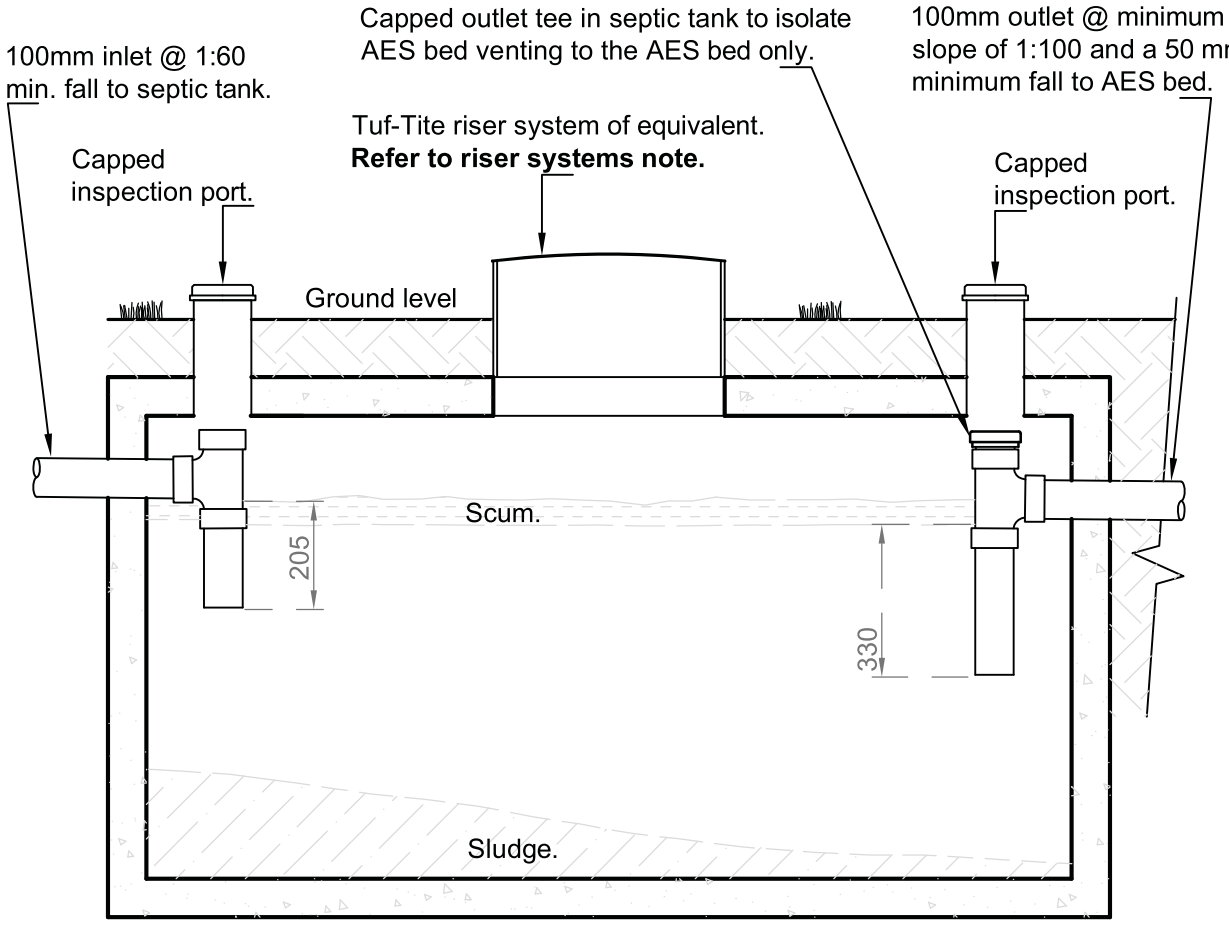
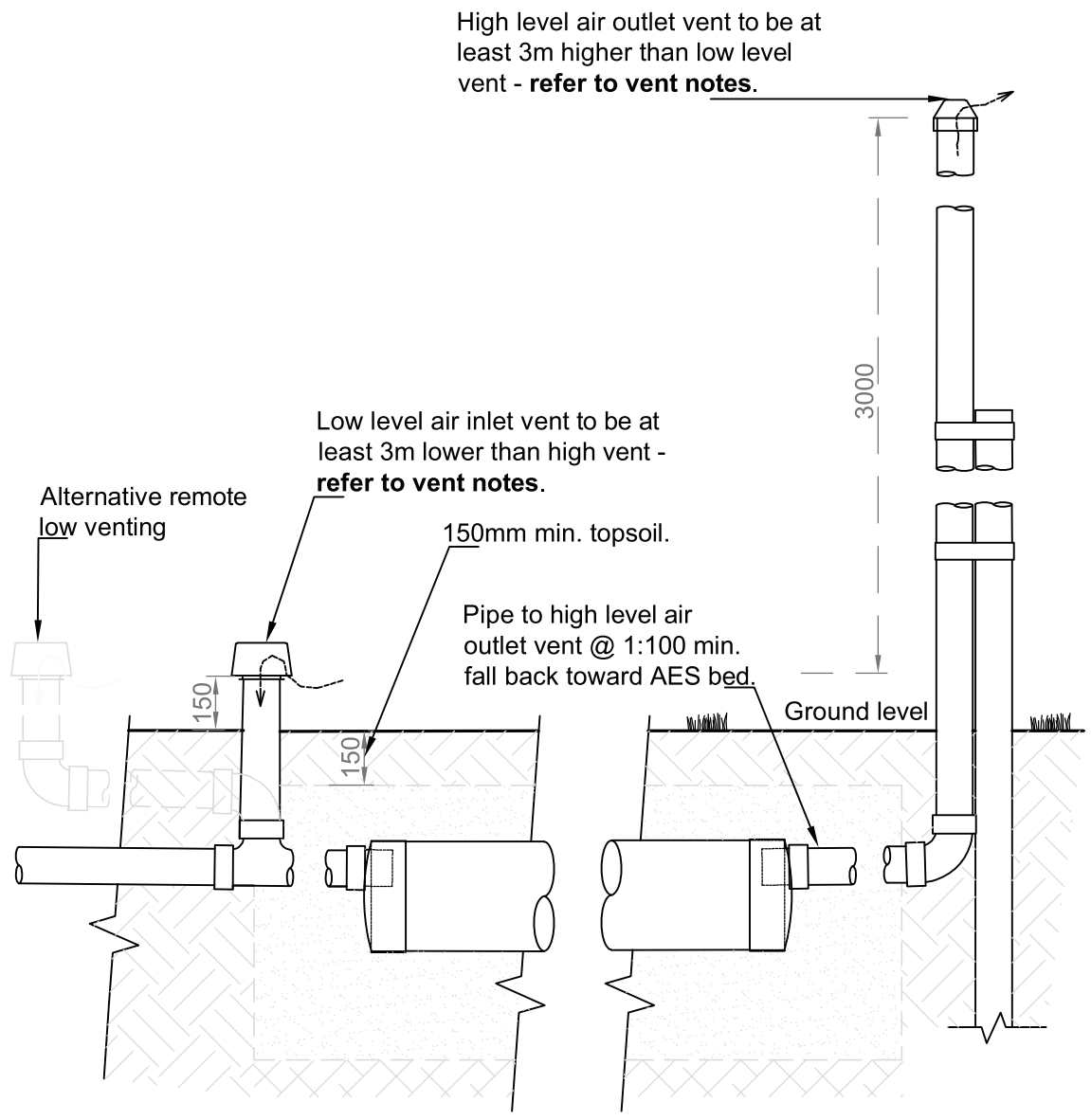


Septic tank and dimensions as specified in AS/NZS1546.1:2008.



AES treatment/disposal bed

LONG SECTION

0 500 1000mm

NOTES

General

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· The low level air inlet vent to be 100mm DWV, positioned as close as practical to the AES bed and isolated with respect to air passage wherever practical from upstream influent pipework. Refer to the specific design of each project.
· The location of air inlet and outlet vents can be remote from the AES bed with additional pipework to suit topography, building structures or landscaping. The high level air outlet vent should be positioned considering potential downdrafts or adjacent disturbed air flows.

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· Trees/large shrubs cannot be planted on the AES bed.
· AES bed 'System Sand' specification is usually met with within the local concrete sand specification. Refer ET website www.et.nz/system-sand-suppliers/ for Et tested AES System Sand suppliers. Et offers cost free sand sieve analysis upon receipt of a two cupful size sample.

Riser Systems

· Riser systems come in varying shapes and sizes and can be sourced from a range of manufacturers. Environment Technology stock and recommend Tuf-Tite riser systems.

Installation Notes:

Install 5000L Alpha precast septic tank without effluent filter.

Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.

Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.

DESIGNED BY	PROJECT	DRAWING TITLE	No.	Revision	Date	Name	Scale @A3	1:20
G Stevens	Ruru Homes 54 Green Lane Motueka	AES Bed and Septic Tank Air Venting Detail	2	Additional notes added.	03/04/20	HO	Scale @A4	1:40
							Dwg: AES VC	

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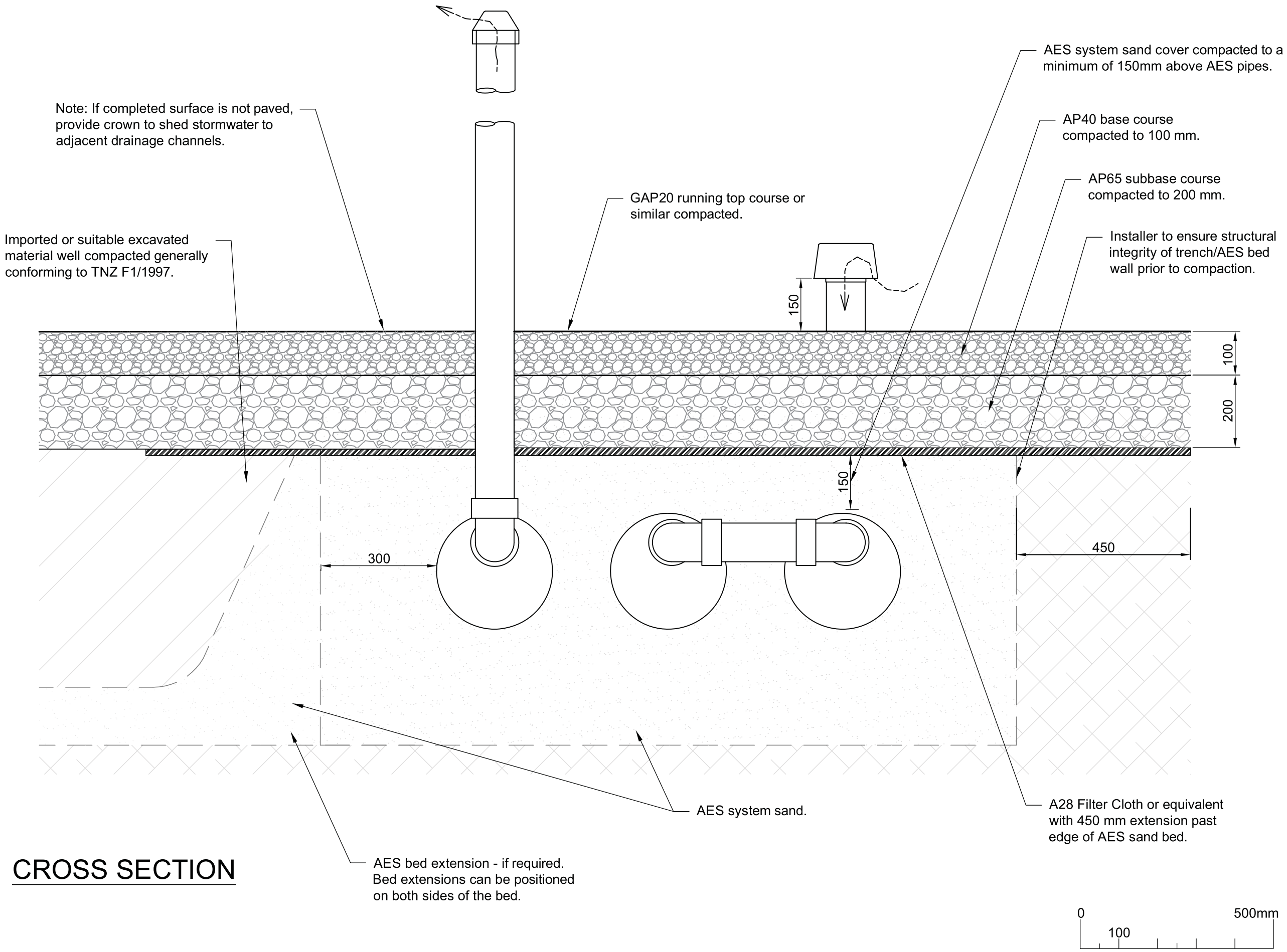

CROSS SECTION

NOTES

General

· Advanced Enviro-Septic (AES) pipes, fittings and bed to be constructed/installed in accordance with the AES Installation Manual.
· AES pipes and fittings are supplied by Environment Technology Ltd, Et.
· All associated pipework to comply with NZ Building Code G13, Foul Water, Acceptable Solutions, relevant standards and local/regional council requirements.
· Unless otherwise stated all dimensions are in millimetres and all dimensions are minimums except pipe diameters and fittings.

Venting of AES Pipework to Maintain Aerobic Internal Conditions

· The high level air outlet vent to be 100, 80, or 65mm diameter DWV pipe, suitably supported on an adjacent building or post, to be 3m vertically elevated above the low level air inlet vent. 2 x 50mm DWV pipe can be used in internal building framing. Support to be provided to 1 meter below the top of the DWV vent pipe.
· The low level air inlet vent to be 100mm DWV, positioned as close as practical to the AES bed and isolated with respect to air passage wherever practical from upstream influent pipework. Refer to the specific design of each project.
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· AES bed 'System Sand' specification is usually met with within the local concrete sand specification. Refer ET website www.et.nz/system-sand-suppliers/ for Et tested AES System Sand suppliers. Et offers cost free sand sieve analysis upon receipt of a two cupful size sample.

Traffic Loading Guidelines

· AP40 base course compacted to 100mm over AP65 subbase course compacted to 200mm over AES system sand cover compacted to a unifrom, dense, stable condition to a minimum of 150mm above AES pipes prior to application of base course. Structural material to extend to a minimum of 450mm beyond AES bed excavation (including bed extension, if required) to provide 'bridging'.
· Surface cover GAP20 or similar acceptable top course or local material free of organics, large stones and building debris.
· All base course and top course to be specified and applied as per Transit NZ TNZ B/02:2005 Specification for Construction of Unbound Granular Pavement Layers.

Installation Notes:

Install 5000L Alpha precast septic tank without effluent filter.

Discharge to 60m² (2.88m x 20.9m) AES single pass sand filter.

Land Application Area will be installed with traffic loading (detail AES TL03) to permit vehicle and foot traffic.

DESIGNED BY	PROJECT	DRAWING TITLE	No.	Revision	Date	Name	Scale @A3 1:10
G Stevens	Ruru Homes 54 Green Lane Motueka	AES Bed Traffic Loading Pavement Detail	2	Filter cloth + single side bed added.	29/01/20	HO	Scale @A4 1:20
			3	Notes fixed and right side taken out.	20/04/20	HO	Dwg: AES TL03

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APPENDIX D

I. **Operation & Maintenance Information**
II. **Maintenance Contract *(to be completed by installer)***
III. **Installation Certificate *(to be completed by installer)***

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www.et.nz

AES
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ADVANCED ENVIRO-SEPTIC™

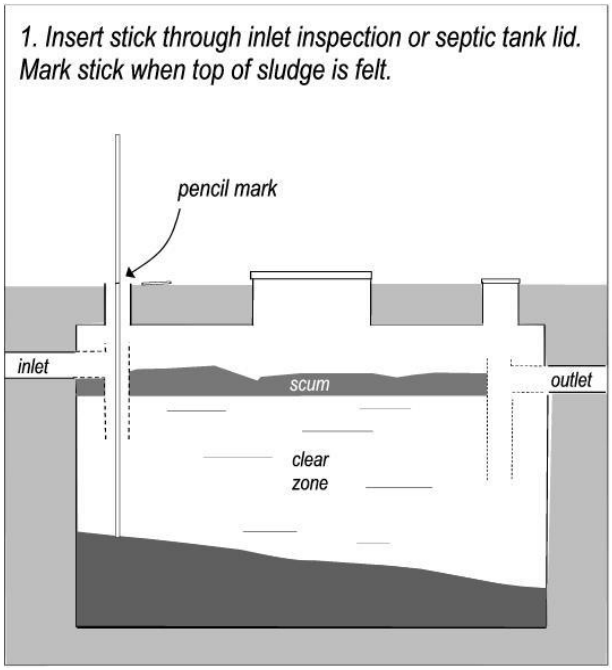
Management & Maintenance of your Septic Tank & AES System

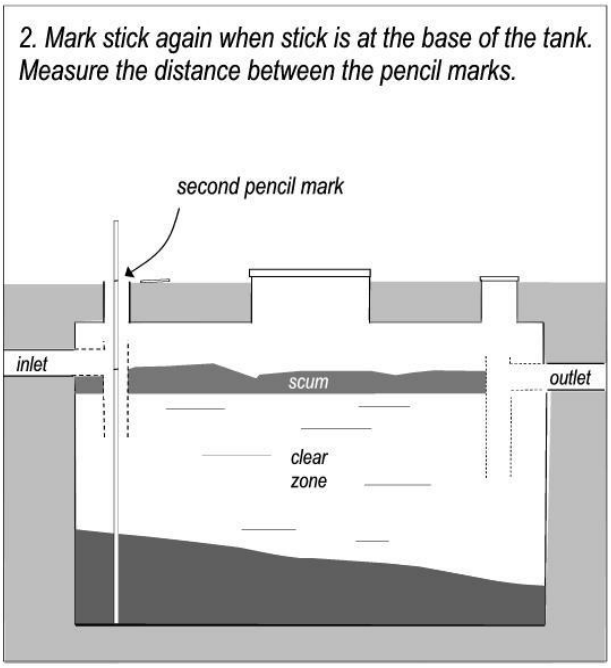
1. **Ensure lids of the wastewater treatment system are readily accessible at all times;**

2. **Visually inspect the proprietary effluent filter if fitted**;
   Clean, repair or replace as required

3. **Check you septic tank sludge level;**

   This can be achieved by inserting a suitable stick into the inlet vent and measuring the level at which resistance is felt as the probe enters the bottom sludge, and again when it stops on the tank base.





4. **Pumping out the septic tank;**

   If solids and scum layers combined are greater than one half the depth of the wastewater treatment tank. Pump-outs should be undertaken only when necessary as they disrupt the efficient working of the bacteria in the tank.

   *As the outlet usually draws from halfway down the tank we recommend the more conservative ½ the tank volume; some literature recommends pumping out when sludge occupies 2/3 the volume of the tank

5. **Air Vent (Low Vent) at AES bed;**

   It is the owner's responsibility to keep vegetation away from the low vent in order to maintain a free flow of air into the vent. Check low level air inlet vent at the AES bed is clear of vegetation and the insect screen inside the vent is clear. Check also that the high level vent at the dwelling is clear.

Water reduction fixtures

The daily wastewater flow has been calculated based on the following water reduction features remaining in place in the house. If any of these features are removed a new wastewater design may need to be completed.

- Dual flush (11/5.5 litre maximum flush volume) toilet/s
- Aerator taps
- Any shower head with a WELS 2 star rating or greater, or any combination of shower head and flow
- Restrictor that produces a flow of 12L/minute or less.
- Water conserving automatic washing mashine.

Indicators of system failure

In the unlikely event that the AES pipes become anaerobic due to a lack of oxygen, a system Rejuvenation will be required to return the system's bacteria to an aerobic state. Contact your AES Certified servicer if you detect the following: A foul odour, or pooling of water at ground level, or if System Sand around the pipes turns a darker colour.

Care of your Septic Tank Wastewater Disposal System

Maintenance of a septic tank system is important. The quantity of sludge in the base of the tank must not exceed 2/3 of the tank working volume. With care in not flushing insoluble material into the wastewater system this level of sludge may take some years to develop. Annual inspection of the level of sludge in the tank is recommended. This can be achieved by inserting a suitable stick into the inlet inspection/ access and measuring the level at which resistance is felt as the probe enters the bottom sludge.

Your wastewater disposal system depends for its satisfactory operation on providing a suitable environment for 2 types of bacteria to live and thrive – anaerobic (without oxygen) bacteria in the primary treatment aspect/ septic tank of your system and aerobic (with air or oxygen) in the secondary treatment aspect/ discharge to land of your system. You **must** consider the effects on this bacterial life when you are choosing cleaning and disinfecting products as all these products will kill the bacteria in your system.

Potential indicators of performance problems are odour, overflow and wet patches on the disposal field.

Below is a table of how to best operate a septic tank and things to avoid:

DO ✓	AVOID / DON'T ✗	NOTE
Minimise Water Use • Install water saving fixtures • Use showers instead of baths • Spread laundry activities across the week • Fix any leaking taps/running toilets immediately	• High organic loading wastewater production fixtures such as garbage grinders • Spa baths and multi-head showers • Ingress of groundwater into septic tank through cracks in the tank or fittings	Surges of wastewater should be avoided as they can stir up settled solids within the septic tank, reduce the quality of treated wastewater flowing to the disposal field and lead to the overloading of the disposal field – which can result in wastewater breakout at the ground surface and increased potential for adverse health and environmental effects.
Use bio-degradable soaps and cleaners • Minimise use of strong toilet cleaners and bleach • Use phosphate free/ low phosphorous based laundry detergents • Use liquid based organic washing liquids in preference to sodium based washing powder	• Pouring toxic/strong chemicals down any drains e.g. paint, oil, grease, pesticides and bleach • Tipping chlorine or disinfectant products into wastewater system • Discarding pharmaceuticals down sink or toilet • Avoid washing powder with significant sodium content	Some soaps and cleaners contain chemicals that can kill the bacteria within the septic tank, greatly impairing treatment quality. Detergents with high sodium content can destroy the effectiveness of your disposal field by altering the composition of clays in the soil
Reduce Fats/Grease Inputs Scrape all plates and dishes to remove as much fat and grease as possible.	• Discharging oils/fats down the kitchen sink	Excess fats and grease in the septic tank can lead to filter blockages or impairment of the disposal field function.
Avoid discharging unnecessary solids to the septic tank • Compost any food scraps for use on the garden	Flushing any products down the toilet except toilet paper • Putting coffee grinds down the sink – they add to the solids level and may affect the bacterial colonies living in the septic tank	The addition of unnecessary solids to the septic tank will result in the faster build up of sludge levels and the need for more frequent pumping out.

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AES (Advanced Enviro-Septic™)
Owners Manual

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info@et.nz

AES
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ADVANCED ENVIRO-SEPTIC™

Table of Contents

Technical support

Environment Technology provides technical support to all individuals and companies using AES and other Presby Environmental products. For questions about products or information in this manual please contact us at 03 9707 979, info@et.nz

Important Safety Information

- Please ensure that the cover/s of the septic tank, the pumping station and sampling device if installed, are always in place and that they remain accessible at all times for periodic inspections and interventions when necessary.
- Ensure you receive an accurate As-Built plan of your system from your installer. Pipes are buried near your septic installation. Please speak to your installer or consult the as-built plan prior to digging or excavating near your septic system.
- It can be dangerous even potentially deadly to open a septic tank, pumping station or any enclosed space that is part of a wastewater treatment system. The action of the bacteria on the organic matter present in the wastewater produces gases such as carbon dioxide (CO_2), methane (CH_4) and hydrogen sulphide (H_2S). The H_2S present in the septic tank or a pumping station can cause the death of an individual in a matter of minutes. A well-maintained ventilation system will reduce the risk of toxic gases build up, however work in this area must be carried out by competent personnel.

Introduction

Thank you for choosing the AES system for your septic installation. This system was developed to efficiently treat domestic wastewater. Instructions must be followed in order to maintain its treatment performance so that you can make use of it for many years. Carefully read through this entire document and retain it in your files for future reference.

The purpose of this document

This user guide explains the proper use, procedures and inspections required in order to ensure the proper operation of your AES system for residential wastewater treatment.

It is the owner's responsibility to ensure that the system is used properly and according to its treatment capacity. It is also their responsibility to respect the rules and regulations in effect regarding associated council and government regulations.

Designation of the AES System

Name: AES Wastewater System

Application Domain: Residential Wastewater (sewage).

Class and treatment type: The AES system meets all the performance criteria requirements of both the Australian/ New Zealand Standard AS/NZS 1546.3: 2008, and the Queensland Plumbing and Wastewater Code: 2011 (for both Secondary and Advanced Secondary treatment). In 2017 AES completed Trial 12 of the Onsite Effluent Treatment System (OSET) National Testing Facility in Rotorua which certified secondary treatment quality.

The system cannot be used to treat wastewater to make it consumable. It is made to treat residential wastewater, and some commercial wastewater to an acceptable level for it to be reintroduced into the environment.

Definition of the AES System

The AES system is composed primarily of two inseparable components: the rows of AES pipe and a layer of system sand.

The AES system must be preceded by a septic tank or equivalent primary treatment system. The treated water is generally drained directly into the soil beneath the treatment system through a soil absorption system.

What to do if a problem occurs?

If in the course of normal use of your septic system you notice any of the following problems:

- Abnormally wet soil, presence of persistent puddles or odours in the area of the septic tank or the AES system,
- Slow flushing toilets or other plumbing in the home,
- Presence of abnormally abundant vegetation on the surface or around the septic tank or the AES system installation,
- Flooding in the area where the AES system is installed,
- Erosion of the land fill on or around the AES system,
- Alarm from the pumping station if such a device is part of your installation.

Please contact your AES certified contractor or Environment Technology. There are often simple remedies.

Customer Service and Technical Support information

Please do not hesitate to contact us if you need further information.
Environment Technology can be contacted at:
Telephone: 03 970 7979
Email: info@et.nz
Website: www.et.nz
Address: 14 Onekaka Iron Works Rd, Takaka 7182

Certified Contractor

The AES System must be installed by a licensed drainlayer with AES certification. Certification is obtained by successfully completing the online AES Certification Course. This course can be accessed at www.et.nz

Environment Technology can provide the name of drainlayers having the proper certification to install AES systems. This information is also available on our website http://www.et.nz/installers/

AES System Capacity

The capacity of the AES System depends on two elements:

- The number of AES Pipes
- The capacity of the underlying soil to evacuate the treated water

The total volume of wastewater fed to the system must not be more than what is shown in the design. The design flow is generally a weekly average.

The system may also be limited by the capacity of the underlying soil to permit the infiltration and evacuation of wastewater. This value is evaluated by the designer who created the plans and estimate for your septic installation. The design should take into account whether the capacity of the soil is a potential limiting factor.

Warranty certificate

AES comes with a 20 year manufacturer's limited warranty. The warranty details are presented in Appendix A (page 16)

Functioning of the AES System

The AES system is a passive technology which facilitates the proliferation of the aerobic bacteria responsible for wastewater treatment. It is comprised mainly of two inseparable components: the rows of AES pipes and a layer of system sand.

The AES system must be preceded by a septic tank or equivalent primary treatment system.

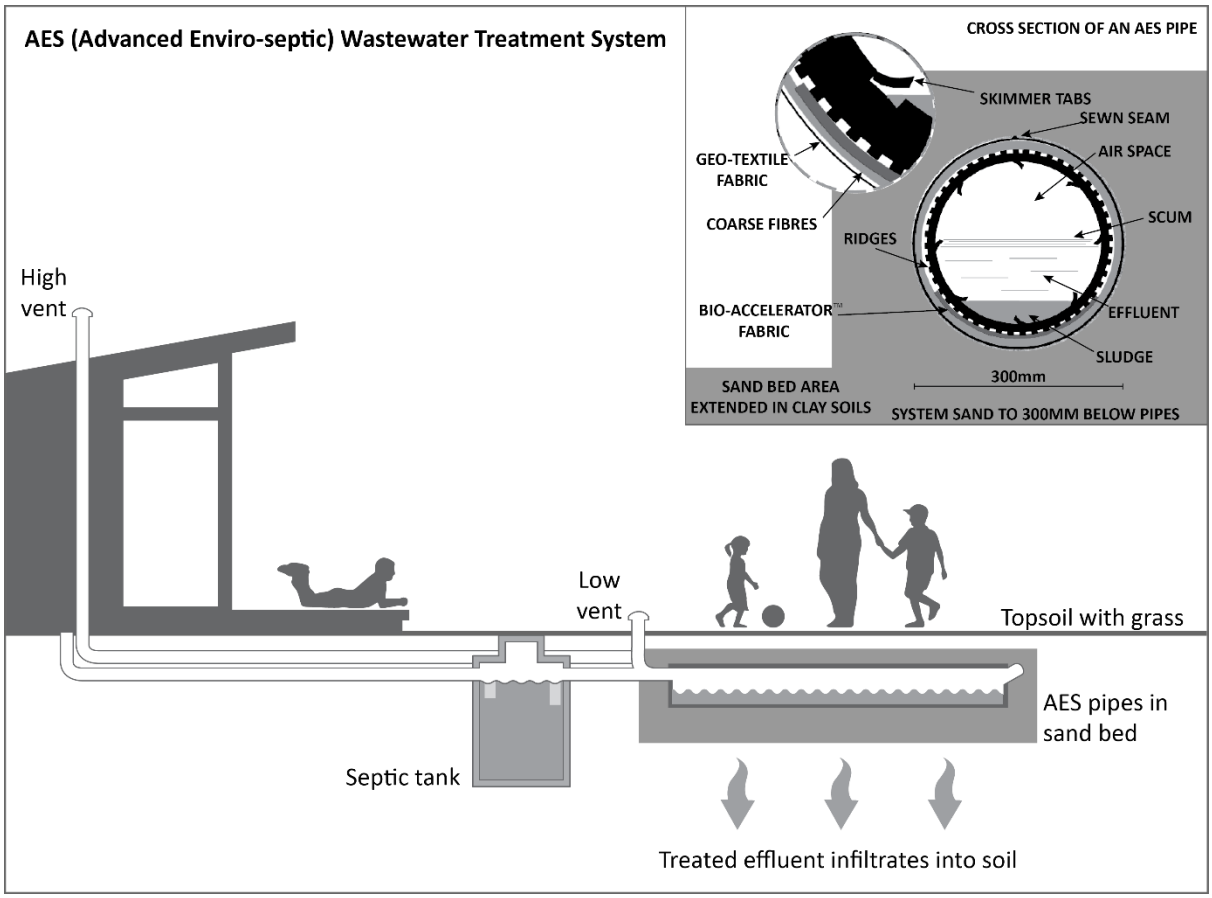
Treatment process of AES

The rows of AES pipes and system sand permit the treatment and distribution of wastewater on the surface of the receiving soil.

The pipes support, first of all, the separation of particles through flotation and decantation. The water is then evacuated through perforations situated around the pipes and through the pores of the two layers of synthetic media covering the pipes. These membranes facilitate the fixation of the microbial cultures which support wastewater treatment, as well as longitudinal distribution of the effluent.

The layer of sand continues the treatment process and helps to disperse the water before it infiltrates into the natural soil.

Diagram of the AES system



AES system components

Your septic installation includes several components. All of these components are parts of the chain of

treatment of your installation. The following table presents a list of these elements. However, it should be noted that some of these are only used when site conditions require them. The table also presents a summary of inspections required for each component. More detailed information on this subject is presented in the sections that follow.

Table: AES System Components

Component of the septic system	Function	Follow-up needed	Frequency	Responsible for follow-up
Septic tank	Primary wastewater treatment	Periodic emptying	According to standards and regulations in effect	Owner is responsible to have work done by qualified person
Septic Tank Effluent Filter*	Retention of solids in low pressure pumped applications.	According to manufacturer's instructions.		
Distribution systems if required for larger dual bed systems. 3 options A) Gravity Distribution box and flow equalizers B) Pressure distribution (pump) system C) Automatic distributing valve	Distributes the septic tank effluent to the rows of AES	A) According to the water level in the inspection port	A) As needed	A) Owner
		B) According to the manufacturer's directions. →		
		C) According to the manufacturer's directions. →		
Rows of AES pipes	Treat and distribute effluent			
Sampling device	To verify the treatment performance of the AES System	Ensure that there is access to this device	Optional	Qualified person
Vent	To allow the circulation of air in the AES System	Ensure that the opening is not blocked	As needed	Owner
System sand	To complete the water treatment process and to improve the drainage	No		
Pumping station (optional)	Lift septic tank effluent to the AES System	According to supplier's specifications		

*The effluent filter is necessary whenever the septic tank is followed by a pump distribution system.

Operating the AES System

Initial Use

At the time of installation the septic tank should be filled with clear water.

If a pumping station is used, the contractor will verify that it is functioning properly at the time of installation. The home owner must make sure that there is adequate electricity to safely operate the equipment as well as the alarm component.

The AES system is now ready for use.

Intermittent Use or Prolonged Absences

The AES system is a passive wastewater treatment system. When properly installed, it requires no particular attention even if you are away for periods of time.

AES System Operating Instructions

The use and maintenance of AES Systems are relatively simple. In general, respecting the following rules will allow you use of your system without problems for years to come.

Wastewater Volume

Excessive quantities of water that leave the house and enter the AES System in a short period of time could have a negative impact on the effectiveness of the treatment and the infiltration of wastewater causing agitation in the septic tank. A quantity of sludge or scum is likely to be put into suspension and be brought towards the system and the infiltration bed.

After the installation, if changes are made to the residence (eg. addition of a bedroom), please contact the designer of the AES System. Make sure that the septic system is inspected by a qualified person to determine that it has the necessary capacity to treat and infiltrate the new daily design flow of wastewater being generated.

In the bathroom

Do:

- Immediately repair any leaking tap or toilet,
- Use a reasonable quantity of toilet paper.
- Minimise or avoid bleach, antiseptic disinfectants, and ammonia acids in the system

Do not :

- Use disinfectant in tablet (puck) form, whether it is placed in the basin or the tank,
- Throw cigarettes, cigarette butts or medication in the toilet,
- Throw paper towels, paper napkins or other personal hygiene products in the toilet.

In the kitchen

Do:

- Repair any leaking tap,
- Use dish soap or dishwasher soap that is low in phosphate (0-5%),
- Use the necessary quantity of soap to do the work. Take note that the necessary quantity is often less than suggested by the manufacturer.
- Use biodegradable soap, low-phosphorus or phosphorus free detergents.

Do not :

- Use a food waste disposal unit in your sink that is connected to your septic installation. If you do have a waste disposal unit, your septic tank may require more frequent pump out to remove sludge build up.
- Dispose of vegetables, meats, fat, oil, coffee beans, citrus products or other products into the septic system.

For the laundry

Do:

- Use phosphate free detergent, preferably in liquid form. If it is not possible, use biodegradable powder detergent,
- Use the necessary quantity of soap to do the work. Take note that the necessary quantity is often less than that suggested by the manufacturer,
- Minimize the volume of water used for the laundry according to the quantity of clothing to wash,
- If possible spread your loads of laundry throughout the week
- Prevent harsh chemicals entering the system (e.g. paint, nappies)

Elsewhere in and around the house

Do:

- Divert drainage and rain water away from the surface of the AES system.
- Roof and surface water should be redirected away from absorption trenches.

Do not :

- Discharge water softener backwash into your septic system,
- Discharge any water from swimming pool filters, spas or other appliances that discharge chlorinated water into your septic system.
- Let water from sump pumps, gutters and drainage pipes discharge into the septic system,
- Dispose of solvents, paints, antifreeze, engine oil or other chemicals in the septic installation. This includes water used to wash brushes or rollers that were used with latex paint (latex paint contains elements that are harmful to septic system),
- Dispose of animal litter in the septic installation.

Chemicals for septic installation

Your AES system does not require any starting chemical, cleaning or other additives. The bacteria that carry out the treatment are naturally present in raw domestic sewage. Any chemicals or additives added to the AES System could possibly kill these bacteria.

Ventilation

It is very important to ensure that good ventilation occurs so that the septic system functions correctly. The vent(s) installed at the ends of the septic system encourage this air circulation. It is important to make sure that the opening is not blocked and that air can circulate freely at all times. Air enters through the low vent, circulates through the rows of pipes and exits through the high vent.

The owner must be sure to have a roof vent and to keep it clear at all times. When a pumping station is used, a bypass pipe or an extra vent must be used to ensure proper ventilation of the system.

Heavy machinery & motorized vehicle traffic

No vehicles or heavy machinery must be driven over a septic tank. Heavy machinery or motorized vehicle traffic on the soil around the AES bed closes the natural pores of the soil which reduces its permeability and allows for ponding and the accumulation of water.

Vegetation

The surface of the AES system must be planted with grass or other vegetation that forms a thick turf. This will encourage surface water runoff from the bed surface. The vegetation must be cut regularly in order to encourage growth without the use of fertilisers. Vegetation cover contributes to the elimination of nitrogen and phosphorus.

It is important ***not*** to plant trees or other plants with invasive roots such as figs, willows, blackwood and many others within 3 metres of the AES system installation footprint.

AES System Maintenance

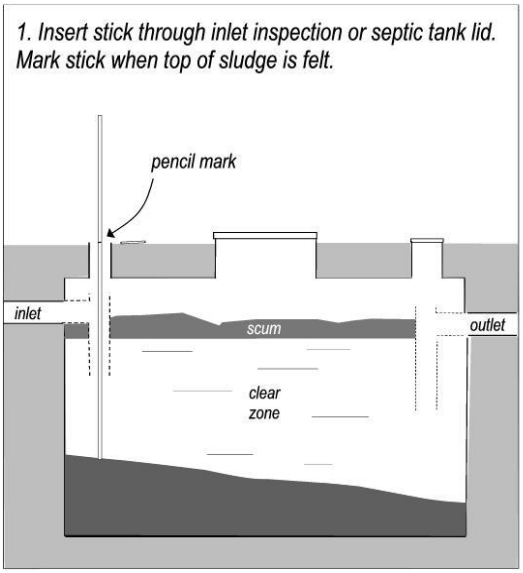
Septic Tank Maintenance

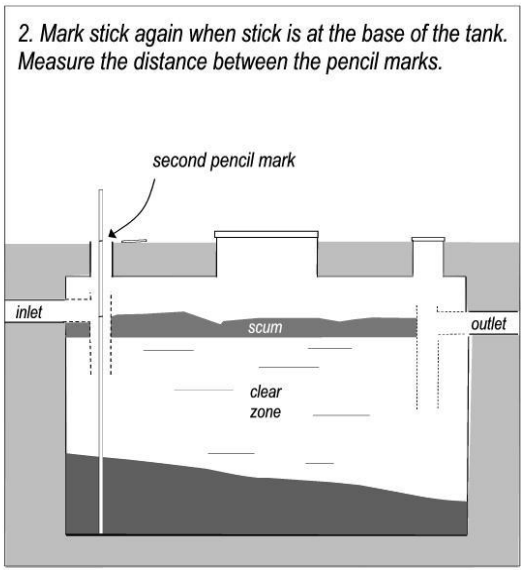
The septic tank preceding the AES System must be pumped out regularly (every 3-5 years for normal residential use or when sludge exceeds 1/3 of the tank volume).

If the septic tank is not emptied regularly, an increasing amount of solids and grease in suspension will leave the septic tank and end up in the treatment system and in time the performance of the AES System may be affected.

The owner must ensure their septic tank is pumped out according to council regulations, if any. This work should always be done by a qualified person.

Note: It is the home owner's responsibility to make sure that at all times the septic tank lids are in their proper position and securely fastened.





Septic tank outlet (effluent filter)

An outlet filter is not necessary at the exit of the septic tank in a gravity system. However it must be installed before a pump, for example when pumped effluent is between the septic tank and the AES pipes.

If installed the effluent filter must be cleaned according to the maintenance and inspection procedures provided by the manufacturer.

AES Pipe Rows

Under normal use, the rows of AES pipe do not require maintenance. It is normal to find fluctuation of the water level in the pipes. In many installations water level in the pipes can be measured by removing the low vent.

Vent	The owner must ensure that nothing prevents the circulation of air. There must also be a difference of at least 3 metres, at all times, between the entry vent situated at the extremity of the AES system and the high vent.
System Sand	There is no maintenance to be done on the system sand during normal use of the AES System.
Pumping station or low pressure distribution system	In certain cases, the site constraints require the use of a pumping station or a low-pressure distribution system to evenly dispose of the treated effluent. The owner is then responsible to comply with the manufacturer's scheduled maintenance requirements of this equipment.
Embankment surface above the AES System	The surface located above the AES system must be covered with herbaceous vegetation. A slight slope must be given to the surface in order to help the drainage of rainwater towards the outside of the system. The grass must also be cut regularly. Finally, any depression that could be created with time must be filled in order to avoid any accumulation of water above the system and to prevent erosion.

Owner's Responsibilities

Owner's Responsibilities

The owner is responsible for:

- Using the AES System according to the instructions presented in this user guide
- Pumping out the septic tank according to the regulations in effect
- Maintaining the effluent filter (if present), the pumping station, the pressure distribution system or the automatic wastewater distributing valve according to manufacturer's specifications and recording the information if this equipment is part of the system
- Ensuring that the vent openings are clear of any obstacle
- Adhering to the requirements of the applicable rules and regulations

Qualified Person

Any maintenance of an AES System must be undertaken by a person trained to carry out the inspections of the system, perform adjustments to the equalizers and/or carry out a rejuvenating procedure.

To obtain the name of a qualified person in your area, contact:

Environment Technology
14 Onekaka Iron Works Rd, Takaka 7182
info@et.nz
03 970 7979

Information on installers is also available on our website
http://www.et.nz/installers/

For maintenance of the pumping station and the low pressure distribution system, if installed, the owner must refer to the user guide specified by the manufacturer of these systems.

The pumping out of the septic tank must be performed by a company specializing in that field.

Maintenance Sheet

AES On-site Wastewater Treatment – Passive system

Address:_____Date:_____

Name of AES qualified servicer:_____Consent No:_____

Septic Tank

Ensure lids of the wastewater treatment system are readily accessible at all times
Measure depth of scum and solids in the septic tank:

Depth of scum: _____

Depth of solids: _____

Depth of tank: _____

Pumping out the septic tank is necessary if solids and scum layers combined are greater than one half the depth of the septic tank.

AES Bed Venting

Ensure low vent and high vent are free of vegetation/ restrictions. Yes No

Notes

_____

_____

_____

Overall condition of wastewater system, including disposal field:

_____

_____

This report shall be kept by the consent holder. In addition, the consent holder shall also keep written records of all repairs made to any part of the wastewater treatment and land application system.

Appendix A- Presby Twenty Year Limited Warranty

PRESBY ENVIRONMENTAL, INC.

INNOVATIVE SEPTIC TECHNOLOGIES

This Twenty Year Limited Manufacturer's Warranty is provided by the Manufacturer, Presby Environmental, Inc., a New Hampshire corporation having a mailing address of 143 Airport Rd., Whitefield, New Hampshire, 03598 (hereinafter called "Presby"). This Warranty applies only to Presby Products sold by or through its duly authorized distributor Chankar Environmental an Australian corporation having a mailing address of Unit 6-62 Rene St, Noosaville, Qld 4566 (hereinafter called the "Distributor"). "Presby Products" means Presby's Advanced Enviro-Septic™ leaching systems and Presby Maze© with the required accessories (couplings, offset adaptor).

Warranty: Presby warrants that Presby Products are free from defect for twenty years from the date of installation but in no event more than twenty-one years from the date of manufacture. Product Defects means defects or damage to the Products caused by or occurring during the manufacturing process. This Warranty does not cover or apply to damages to the Products caused by or resulting from transit or from accident, misuse, abuse, neglect, storage, installation, repair, maintenance or from use other than normal and ordinary use of the Products. This Warranty does not apply to damages to the Products caused by or resulting from failure to install or use the Products in accordance with distributor's instructions which have been approved by Presby or failure to properly inspect and maintain the Products.

Warranty Registration, Claim Process and Remedy: Any claim under the Warranty must be in writing and received by the distributor within thirty days of the date when the facts giving rise to such claim under this Warranty become known or are otherwise discovered. The distributor must be provided with an opportunity to inspect the Products as installed. Failure to comply with these requirements renders the Warranty null and void. If, during the Warranty period, the distributor and Presby find and determine that defects in Products exist, then the distributor and Presby's sole and exclusive obligation is to either repair the Products or provide replacement Products. The distributor and Presby, in their discretion, shall determine whether to repair the Products or provide replacement Products. The distributor and Presby shall have no obligation to remove any defective Products or to install any replacement Products. The distributor and Presby shall not be liable or responsible for any other damages or claims arising from or relating to defective Products, including but not limited to claims for general, consequential, or incidental damages, lost profits, or attorney fees.

Disclaimer: The distributor and Presby otherwise make no express warranty concerning the Products and the distributor and Presby disclaims any and all warranties, express or implied. Except as stated herein, there are no warranties express or implied, and the distributor and Presby do not warrant that the goods are merchantable or fit for any particular purpose. Any claim or controversy relating to this Warranty, or to matters of place of contracting, interpretation, performance or breach thereof, shall be brought in and adjudged in accordance with the applicable laws of state of New Hampshire.

ONSITE WASTEWATER AND LAND APPLICATION SYSTEM MANAGEMENT CONTRACT

OWNER	
ADDRESS OF SYSTEM	
POSTAL ADDRESS (if different from above)	
PHONE CONTACT DETAILS	
TERRITORIAL AUTHORITY	
INSTALLER/MAINTENANCE CONTRACTOR	
DESIGNER	***Gary Stevens Consultant***
MAINTENANCE INTERVAL	***6 Monthly Checks***

1. Inspections as detailed by designer, resource consent and manufacturers operating instructions will be carried out at required intervals by the authorised service agent.

2. The inspections will include but are not limited to the following:

   (a) All components of the installation to have visual inspection.
   (b) Visual inspection of downstream of system.
   (c) Adjustment to any electrical controls and testing for correct operation.
   (d) Check effluent filter and clean where required as per manufacturer's instructions.
   (e) Visual and where required sample analysis of discharged effluent and reporting on the same.

3. Complete any repairs/replacement of system components.

4. All emergency repairs labour and parts outside of warranty period are to be paid for on completion of work.

5. Provide report with compliances and any issues and work completed to owner.

The above Service Contract is hereby AGREED by:

Owners Signature	***Date***
Service Agent Signature	***Date***

MAINTENANCE REPORT

Owner:
Address: ***Date:***

Checked	Not Checked	Component	Maintenance Notes *(Done/Required/Due) additional notes use back of this form*
		Wastewater System ✓ *Filter as required by manufacturer* ✓ *Surrounding Vegetation health* ✓ *Odour* ✓ *Surface Ponding* ✓ *Air Release Valve – operating and clear of obstruction*	
		Land Application System ✓ *Surrounding Vegetation health* ✓ *Odour* ✓ *Surface Ponding* ✓ *Air Release Valve – operating and clear of obstruction*	

Notes to include:

(i) *any maintenance undertaken during the visit or still required, and a timetable for the expected completion of this work;*
(ii) *a description of the appearance of the filter/s and tanks;*
(iii) *the location and source of any odour detected from the system; and*
(iv) *a description of the appearance of the land application area (ponding, vegetation growth, etc).*

Contractor Name:

Signature:

19 August 2021

The producer statement construction does not replace the requirement for any scheduled inspection required by the Territorial Authority. This producer statement construction may be an additional requirement to the scheduled inspection.

Issued to:

Issued by:
(*Contractor*)

Being a suitably qualified person:
(*Registration #)*

Address: _____

_____

Contact No. _____

In respect of: _____
(*Project*)
_____

Location: _____

Building/Resource Consent number: _____

I, _____ **being the**

	Tradesperson;
	Approved installer; or
	Suitably qualified/experienced practitioner.

Responsible for the work's identified above, declare that;

This work has been carried out in accordance with New Zealand Building Code Clause G13 and/or standard NZS AS/NZS1547:2012

Signed by:

(The above named person)

Appendix C – HIRDS Rainfall Intensity Chart for 16 Fairfax Street

HIRDS V4 Intensity-Duration-Frequency Results
Sitename: Motueka
Coordinate system: WGS84
Longitude: 172.9965
Latitude: -41.1177

DDF Mode Parameter	c	d	e	f	g	h	i
Values:	-0.00408	0.558103	-0.02283	-0.00243	0.260792	-0.01052	2.962649

Example:	Duration (h	ARI (yrs)	x	y	Rainfall Rate (mm/hr)
	24	100	3.178054	4.600149	8.731787

Rainfall intensities (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	40.2	30.7	26	19.3	14.1	8.03	5.4	3.49	2.16	1.59	1.27	1.06
2	0.5	44.3	33.8	28.6	21.3	15.5	8.8	5.91	3.82	2.36	1.74	1.39	1.15
5	0.2	58.8	44.6	37.7	27.9	20.2	11.5	7.68	4.94	3.04	2.24	1.78	1.48
10	0.1	69.8	52.9	44.6	33	23.9	13.5	9	5.78	3.55	2.61	2.08	1.73
20	0.05	81.3	61.5	51.9	38.3	27.6	15.5	10.4	6.64	4.07	2.99	2.38	1.97
30	0.033	88.4	66.8	56.3	41.5	29.9	16.8	11.2	7.15	4.38	3.22	2.55	2.12
40	0.025	93.6	70.6	59.5	43.8	31.5	17.7	11.8	7.53	4.6	3.38	2.68	2.23
50	0.02	97.6	73.6	62	45.6	32.8	18.4	12.2	7.82	4.78	3.5	2.78	2.31
60	0.017	101	76.1	64.1	47.1	33.9	19	12.6	8.06	4.92	3.61	2.86	2.38
80	0.012	106	80.1	67.4	49.5	35.6	19.9	13.2	8.44	5.15	3.77	2.99	2.49
100	0.01	111	83.2	70	51.4	36.9	20.6	13.7	8.73	5.33	3.9	3.1	2.57
250	0.004	128	96.3	80.9	59.2	42.4	23.6	15.6	9.94	6.05	4.43	3.51	2.91

Intensity standard error (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	3.5	2.6	2.2	1.5	1.1	0.69	0.53	0.12	0.13	0.075	0.061	0.024
2	0.5	3.8	2.9	2.3	1.7	1.2	0.75	0.58	0.13	0.14	0.08	0.067	0.024
5	0.2	5.9	4.6	3.7	2.5	1.8	1	0.79	0.22	0.2	0.12	0.098	0.05
10	0.1	8.2	6.5	5.4	3.4	2.4	1.4	1	0.32	0.25	0.16	0.13	0.083
20	0.05	11	9	7.7	4.6	3.2	1.8	1.3	0.45	0.33	0.22	0.18	0.12
30	0.033	14	11	9.4	5.5	3.8	2.1	1.5	0.55	0.38	0.26	0.21	0.15
40	0.025	15	12	11	6.2	4.3	2.3	1.7	0.62	0.42	0.29	0.24	0.18

50	0.02	17	14	12	6.9	4.7	2.6	1.8	0.69	0.46	0.32	0.26	0.2
60	0.017	18	15	13	7.4	5.1	2.8	2	0.74	0.49	0.34	0.28	0.21
80	0.012	21	17	15	8.4	5.7	3.1	2.2	0.84	0.54	0.38	0.31	0.24
100	0.01	23	19	16	9.2	6.3	3.3	2.4	0.92	0.59	0.42	0.34	0.27
250	0.004	33	27	24	13	9	4.7	3.3	1.3	0.8	0.58	0.47	0.38

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	43.1	32.8	27.8	20.7	15	8.47	5.65	3.63	2.23	1.64	1.3	1.09
2	0.5	47.5	36.2	30.7	22.8	16.5	9.31	6.21	3.98	2.44	1.79	1.43	1.19
5	0.2	63.2	48	40.6	30.1	21.7	12.2	8.1	5.17	3.16	2.32	1.84	1.53
10	0.1	75.2	56.9	48.1	35.5	25.6	14.3	9.5	6.05	3.7	2.71	2.15	1.79
20	0.05	87.7	66.3	56	41.3	29.7	16.6	11	6.96	4.24	3.11	2.46	2.04
30	0.033	95.4	72	60.7	44.7	32.2	17.9	11.8	7.51	4.57	3.34	2.65	2.2
40	0.025	101	76.2	64.2	47.2	33.9	18.9	12.5	7.9	4.8	3.51	2.78	2.31
50	0.02	105	79.5	66.9	49.2	35.3	19.6	12.9	8.21	4.99	3.65	2.89	2.39
60	0.017	109	82.2	69.2	50.9	36.5	20.3	13.4	8.46	5.14	3.76	2.97	2.46
80	0.012	115	86.5	72.8	53.5	38.3	21.3	14	8.86	5.38	3.93	3.11	2.58
100	0.01	119	89.9	75.6	55.5	39.8	22	14.5	9.17	5.56	4.06	3.21	2.66
250	0.004	139	104	87.4	64	45.7	25.2	16.6	10.4	6.32	4.61	3.64	3.01

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	43.1	32.8	27.8	20.7	15	8.47	5.65	3.63	2.23	1.64	1.3	1.09
2	0.5	47.5	36.2	30.7	22.8	16.5	9.31	6.21	3.98	2.44	1.79	1.43	1.19
5	0.2	63.2	48	40.6	30.1	21.7	12.2	8.1	5.17	3.16	2.32	1.84	1.53
10	0.1	75.2	56.9	48.1	35.5	25.6	14.3	9.5	6.05	3.7	2.71	2.15	1.79
20	0.05	87.7	66.3	56	41.3	29.7	16.6	11	6.96	4.24	3.11	2.46	2.04
30	0.033	95.4	72	60.7	44.7	32.2	17.9	11.8	7.51	4.57	3.34	2.65	2.2
40	0.025	101	76.2	64.2	47.2	33.9	18.9	12.5	7.9	4.8	3.51	2.78	2.31
50	0.02	105	79.5	66.9	49.2	35.3	19.6	12.9	8.21	4.99	3.65	2.89	2.39
60	0.017	109	82.2	69.2	50.9	36.5	20.3	13.4	8.46	5.14	3.76	2.97	2.46
80	0.012	115	86.5	72.8	53.5	38.3	21.3	14	8.86	5.38	3.93	3.11	2.58
100	0.01	119	89.9	75.6	55.5	39.8	22	14.5	9.17	5.56	4.06	3.21	2.66
250	0.004	139	104	87.4	64	45.7	25.2	16.6	10.4	6.32	4.61	3.64	3.01

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	43.8	33.4	28.3	21	15.2	8.59	5.72	3.67	2.25	1.65	1.31	1.09
2	0.5	48.3	36.8	31.2	23.2	16.8	9.44	6.28	4.02	2.46	1.81	1.44	1.2
5	0.2	64.3	48.8	41.3	30.6	22.1	12.4	8.2	5.23	3.19	2.34	1.86	1.54
10	0.1	76.5	58	49	36.2	26.1	14.6	9.63	6.12	3.73	2.74	2.17	1.8
20	0.05	89.3	67.5	57	42	30.2	16.8	11.1	7.04	4.29	3.13	2.48	2.06
30	0.033	97.2	73.4	61.9	45.6	32.7	18.2	12	7.59	4.62	3.37	2.67	2.22
40	0.025	103	77.6	65.4	48.1	34.5	19.2	12.6	7.99	4.85	3.55	2.81	2.33
50	0.02	107	81	68.2	50.2	36	19.9	13.1	8.3	5.04	3.68	2.91	2.41
60	0.017	111	83.7	70.5	51.8	37.1	20.6	13.5	8.56	5.19	3.79	3	2.49
80	0.012	117	88.2	74.2	54.5	39	21.6	14.2	8.97	5.44	3.97	3.14	2.6
100	0.01	122	91.6	77.1	56.6	40.5	22.4	14.7	9.29	5.62	4.1	3.24	2.69
250	0.004	141	106	89.1	65.2	46.5	25.6	16.8	10.6	6.39	4.65	3.68	3.04

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	46	35.1	29.7	22.1	16	8.94	5.92	3.78	2.31	1.69	1.34	1.12
2	0.5	50.9	38.8	32.8	24.4	17.6	9.85	6.52	4.15	2.53	1.85	1.47	1.22
5	0.2	67.9	51.5	43.6	32.3	23.3	12.9	8.53	5.41	3.29	2.41	1.91	1.58
10	0.1	80.8	61.2	51.7	38.2	27.5	15.2	10	6.34	3.85	2.81	2.23	1.85
20	0.05	94.4	71.4	60.2	44.4	31.9	17.6	11.6	7.3	4.42	3.23	2.55	2.11
30	0.033	103	77.6	65.4	48.2	34.5	19.1	12.5	7.87	4.77	3.48	2.75	2.27
40	0.025	109	82	69.1	50.9	36.4	20.1	13.2	8.29	5.01	3.66	2.89	2.39
50	0.02	114	85.6	72.1	53.1	38	20.9	13.7	8.61	5.21	3.79	3	2.48
60	0.017	117	88.5	74.6	54.8	39.2	21.6	14.1	8.89	5.36	3.91	3.09	2.55
80	0.012	124	93.3	78.5	57.7	41.2	22.7	14.8	9.3	5.62	4.09	3.23	2.67
100	0.01	129	96.9	81.6	59.9	42.8	23.5	15.4	9.64	5.81	4.23	3.34	2.76
250	0.004	149	112	94.2	69	49.2	26.9	17.5	11	6.6	4.8	3.78	3.12

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	43.5	33.1	28.1	20.9	15.1	8.54	5.69	3.65	2.24	1.65	1.31	1.09
2	0.5	48	36.6	31	23	16.7	9.39	6.25	4	2.45	1.8	1.43	1.19
5	0.2	63.9	48.5	41	30.4	21.9	12.3	8.16	5.2	3.18	2.33	1.85	1.54

10	0.1	76	57.6	48.6	35.9	25.9	14.5	9.58	6.1	3.72	2.72	2.16	1.79
20	0.05	88.7	67.1	56.6	41.7	30	16.7	11	7.01	4.27	3.12	2.48	2.05
30	0.033	96.5	72.8	61.4	45.2	32.5	18.1	11.9	7.56	4.6	3.36	2.66	2.21
40	0.025	102	77	64.9	47.8	34.3	19.1	12.6	7.96	4.83	3.53	2.8	2.32
50	0.02	107	80.4	67.7	49.8	35.7	19.8	13.1	8.26	5.02	3.67	2.9	2.41
60	0.017	110	83.1	70	51.4	36.9	20.5	13.5	8.52	5.17	3.78	2.99	2.48
80	0.012	116	87.5	73.7	54.1	38.8	21.5	14.1	8.92	5.41	3.95	3.13	2.59
100	0.01	121	90.9	76.5	56.2	40.2	22.2	14.6	9.24	5.6	4.09	3.23	2.68
250	0.004	140	105	88.4	64.7	46.2	25.5	16.7	10.5	6.36	4.63	3.66	3.03

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	48	36.6	31	23.1	16.6	9.26	6.1	3.88	2.36	1.72	1.37	1.14
2	0.5	53.2	40.5	34.3	25.5	18.4	10.2	6.73	4.26	2.59	1.89	1.5	1.24
5	0.2	71	53.9	45.6	33.8	24.3	13.4	8.83	5.57	3.37	2.47	1.95	1.61
10	0.1	84.7	64.1	54.2	40	28.7	15.8	10.4	6.54	3.95	2.89	2.28	1.89
20	0.05	99	74.8	63.1	46.6	33.4	18.4	12	7.53	4.55	3.31	2.62	2.16
30	0.033	108	81.3	68.6	50.5	36.2	19.9	13	8.12	4.9	3.57	2.82	2.33
40	0.025	114	86	72.5	53.3	38.2	21	13.7	8.56	5.15	3.75	2.96	2.45
50	0.02	119	89.8	75.7	55.6	39.8	21.8	14.2	8.89	5.36	3.89	3.07	2.54
60	0.017	123	92.8	78.2	57.5	41.1	22.5	14.7	9.17	5.52	4.02	3.16	2.61
80	0.012	130	97.8	82.4	60.5	43.2	23.6	15.4	9.61	5.78	4.2	3.31	2.73
100	0.01	135	102	85.6	62.8	44.8	24.5	15.9	9.96	5.98	4.34	3.42	2.83
250	0.004	157	118	98.9	72.4	51.5	28.1	18.2	11.3	6.79	4.92	3.88	3.2

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	44.3	33.8	28.6	21.3	15.4	8.67	5.76	3.69	2.26	1.66	1.32	1.1
2	0.5	48.9	37.3	31.6	23.5	17	9.54	6.34	4.05	2.48	1.82	1.45	1.2
5	0.2	65.2	49.5	41.8	31	22.4	12.5	8.28	5.27	3.22	2.36	1.87	1.55
10	0.1	77.5	58.7	49.6	36.7	26.4	14.7	9.72	6.18	3.76	2.75	2.18	1.81
20	0.05	90.5	68.4	57.7	42.6	30.6	17	11.2	7.1	4.32	3.16	2.5	2.07
30	0.033	98.5	74.4	62.7	46.2	33.2	18.4	12.1	7.66	4.65	3.4	2.69	2.23
40	0.025	104	78.6	66.3	48.8	35	19.4	12.8	8.06	4.89	3.57	2.83	2.34
50	0.02	109	82.1	69.1	50.8	36.4	20.2	13.3	8.38	5.08	3.71	2.93	2.43

60	0.017	113	84.8	71.4	52.5	37.6	20.8	13.7	8.64	5.23	3.82	3.02	2.5
80	0.012	119	89.4	75.2	55.2	39.5	21.8	14.3	9.05	5.48	4	3.16	2.62
100	0.01	123	92.8	78.1	57.3	41	22.7	14.9	9.37	5.67	4.13	3.27	2.7
250	0.004	143	107	90.3	66.1	47.2	25.9	17	10.7	6.44	4.69	3.7	3.06

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	52.6	40.1	34	25.3	18.1	9.98	6.51	4.12	2.48	1.8	1.42	1.18
2	0.5	58.3	44.4	37.6	28	20.1	11	7.21	4.52	2.73	1.98	1.57	1.3
5	0.2	78.2	59.3	50.2	37.2	26.7	14.6	9.5	5.94	3.57	2.6	2.04	1.69
10	0.1	93.3	70.7	59.7	44.1	31.6	17.2	11.2	6.98	4.19	3.05	2.4	1.98
20	0.05	109	82.6	69.7	51.4	36.7	20	13	8.04	4.83	3.5	2.76	2.27
30	0.033	119	89.8	75.7	55.8	39.8	21.6	14	8.69	5.21	3.77	2.97	2.45
40	0.025	126	95	80.1	58.9	42	22.9	14.8	9.16	5.47	3.97	3.12	2.57
50	0.02	132	99.2	83.6	61.5	43.8	23.8	15.4	9.51	5.69	4.12	3.24	2.67
60	0.017	136	103	86.4	63.5	45.3	24.6	15.9	9.82	5.86	4.25	3.34	2.75
80	0.012	144	108	91.1	66.9	47.6	25.8	16.6	10.3	6.15	4.45	3.49	2.88
100	0.01	149	112	94.6	69.4	49.4	26.8	17.3	10.7	6.36	4.6	3.61	2.97
250	0.004	173	130	109	80	56.8	30.6	19.7	12.1	7.22	5.21	4.1	3.37