



AES (Advanced Enviro-septic) is a passive aerated textile/sand wastewater treatment system that treats primary effluent to secondary and advanced secondary levels.

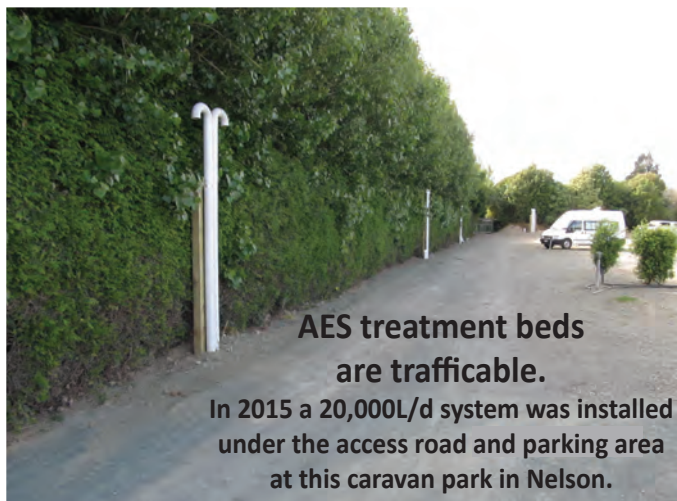
Used in municipal and small scale installations, AES has been in operation in the USA where it was developed for over 20 years, and in New Zealand since 2012. AES pipes are 300mm diameter fabric wrapped pipes that support an aerobic habitat and passively disperse treated effluent either directly into the ground or to a discharge chamber.

The AES wastewater treatment system has been tested and certified to US, Canadian, European and Australian standards. The results and certification have rated AES systems at either secondary or advanced secondary treatment according to the levels on offer at each.

Most recently the product was tested in a field trial against the Queensland Plumbing and Wastewater Code – Part 1 – On Site Waste Water Management Systems, QPW 2013, and certified by SAI Global and JAS/ANZ. This system was intentionally designed undersized. With the exception of two results this system achieved advanced secondary levels of treatment. Due to these two results, secondary treatment accreditation was achieved. The AES system is currently participating in the 2016/17 OSET trials in Rotorua.

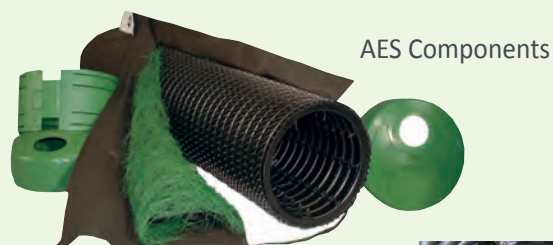
Town of Newbury, New Hampshire, US

A 189,000L/d treatment plant was upgraded to an AES treatment system. See page 2.

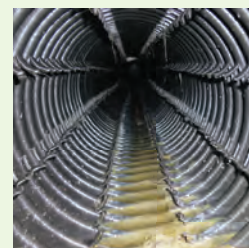


AES treatment beds are trafficable.

In 2015 a 20,000L/d system was installed under the access road and parking area at this caravan park in Nelson.



AES Components



Inside of AES pipe nine months after commissioning - 360L/d office/residential installation.

Blodgett Landing Treatment Plant, Town of Newbury

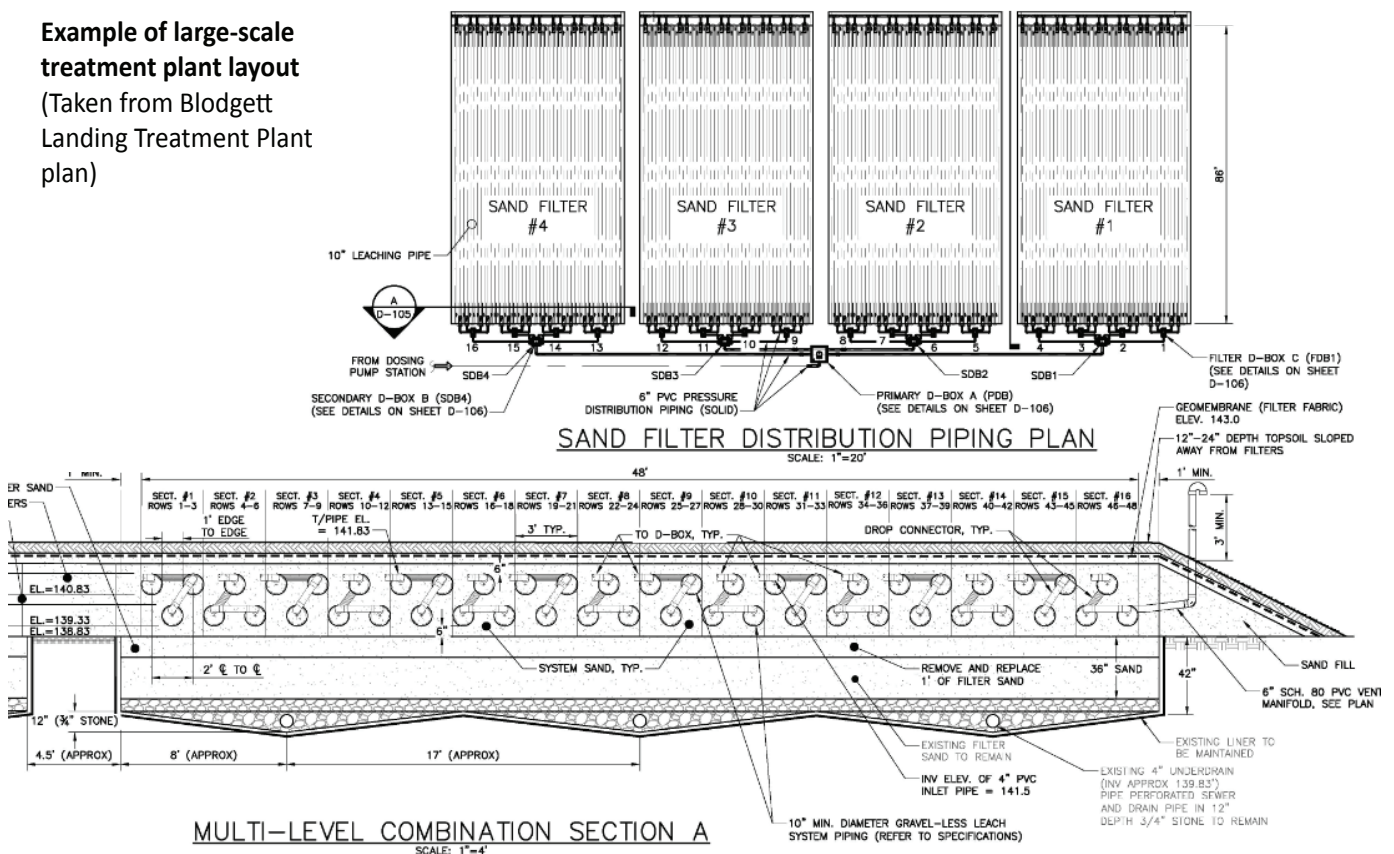
The town of Newbury in New Hampshire, USA has a wastewater discharge of 189,000 litres/ day design load and 330,000 litres/ day peak. Elevated levels of nitrogen were detected in the effluent and ground water and following an unsuccessful plant upgrade, the AES system was installed in 2011. The old sand filters, and packaged suspended growth denitrification systems with methanol dosing were replaced with a series of AES beds with effluent recycling of 75-100%. The system layout is now initial screening, sedimentation in Imhoff tanks, AES treatment system, 19,000 litre recirculation tanks and infiltration basins back to groundwater. Both effluent and groundwater nitrogen levels have improved and the operational and maintenance costs for the wastewater treatment plant have reduced.



Table of Blodgett Landing Treatment Plant treatment requirements and test results

	Residential Wastewater	Treatment Requirements	Treatment Results (Av. 2013)
BOD5 mg/L	300	Less than 30	5
TSS mg/L	343	Less than 30	4.73
TN (total nitrogen) mg/L	55	Nitrates - less than 10	3.6
TP (total phosphorous) mg/L	8	Less than 4	
FC cfu/100ml			44.9

Example of large-scale treatment plant layout
(Taken from Blodgett Landing Treatment Plant plan)

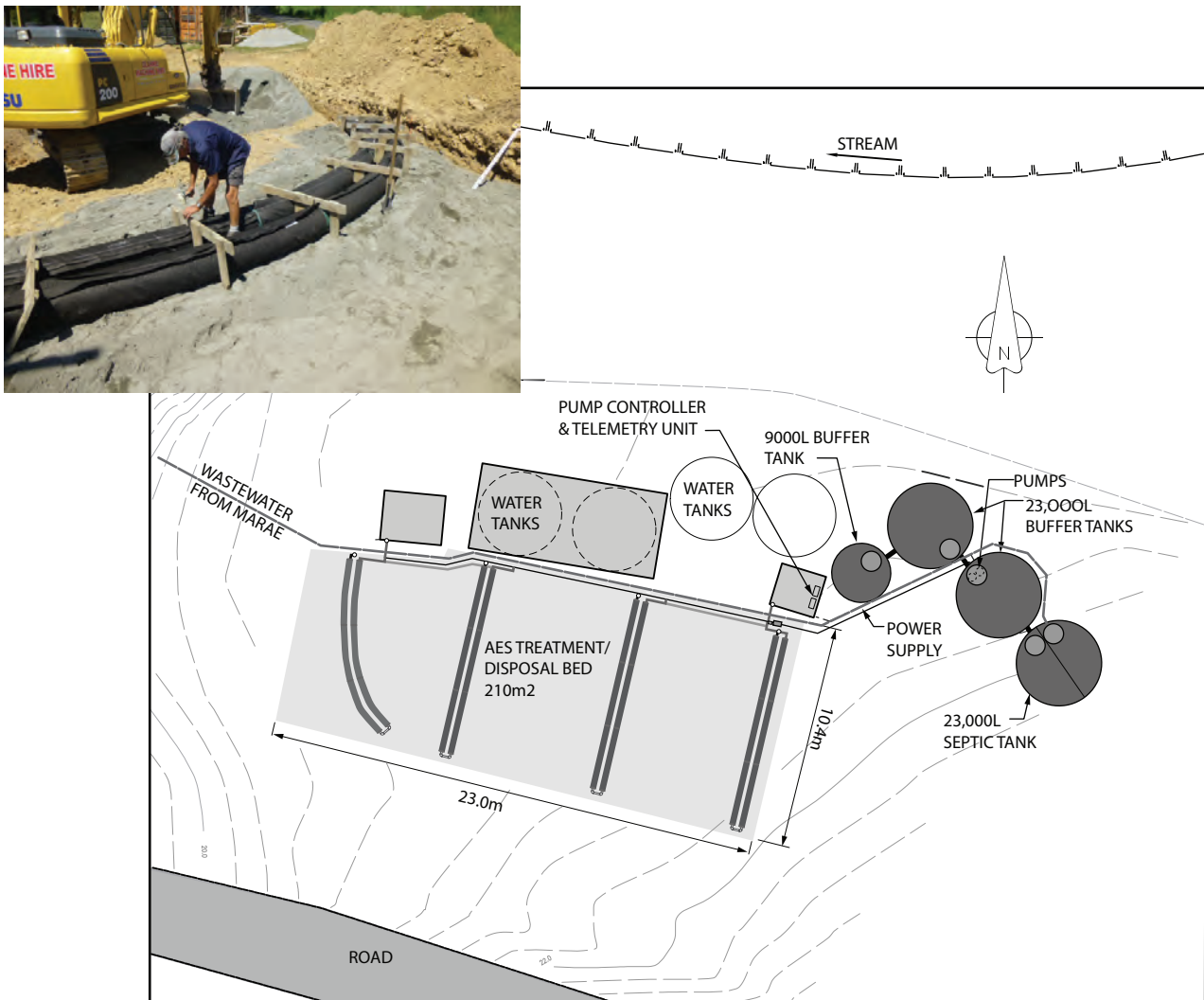


Onuku Marae, Banks Peninsula

55,000 Litre detention tankage; 2,500L/d AES bed.

Onuku Marae hosts the South Island Waitangi Day celebrations every three years, along with tangi and regular gatherings throughout the year. It is an example of intermittent usage combined with occasional heavy loading. After examining other secondary treatment options Lindsay Blakie of E2 Environmental in Christchurch chose to examine an AES solution in conjunction with Wastewater Design Ltd of Nelson. The brief was 55,000 litres over three days, a remote, small disposal site, Category 5 massive clay soil and a nearby stream.

A simple AES 210m² bed provided the resilient passive treatment and dispersal required. The bed was preceded by 55,000L of detention tankage after 23,000L of septic tankage with influent pumped up from the Marae buildings 25 metres below. The primary effluent is moved to the AES bed via flow controlled dosing at a maximum of 2500 litres in 8 x 312 litre doses spread over 24 hours. The flow control per dose to the AES bed is provided by a Krohne inductive unit interfaced with an N2P Controls specifically designed unit which includes the programmable timed control of the 2 submersible single phase pumps in the lowest of the detention tanks. The pumps are set to operate alternately with level control provided by a pressure transducer which allows the pump operation to be controlled to an accuracy of 1% of the detention tankage volume. Alarms are raised if one pump fails to operate, if the filter on the output of the septic tankage becomes partially blocked and if the detention tankage level reaches 75% capacity, when contingency plans are in place to order a suction truck to provide additional reserve capacity. The alarm system includes a telemetry unit to send text messages to the service and management persons.



Six weeks after the system was commissioned in December 2015 1000 attendees at this year's Waitangi celebrations found AES to be an effective solution as the system functioned to plan.

AES (Advanced Enviro-septic) Treatment Process

The treatment is carried out in the wet, oxygen rich environment within the pipes and surrounding textile/sand interface and further treatment takes place as the effluent moves through the sand bed. Microbial action takes place on the large surface area of the pipes and fibres and is assisted by the biofilm that establishes within the base of the pipes in a similar way to biofilm reactors in municipal wastewater treatment plants. The biofilm grows around the fibres and sand, thus reducing the void area between them. This void reduction slows down the percolation rates and ensures that the effluent spreads evenly along the length of the pipe before treatment and percolation through into the sand bed. The 'tidal' movement within the pipes as daily loading varies allows the biofilm to breath and rest, maintaining an aerobic environment throughout the AES pipe, textile layers and sand.

AES Treatment Ramp

BOD5 <20mg/L TSS <30mg/L FC <10,000cfu/100ml		BOD5 <20mg/L TSS <30mg/L TN <15mg/L FC <10,000cfu/100ml	BOD5 <20mg/L TSS <30mg/L TN <15mg/L FC <200cfu/100ml
Standard AES system: Replacement of failed disposal field with AES bed. New primary treatment system and AES bed.		Lined bed AES system: New or existing primary treatment system and lined AES bed, with recirculation for nitrogen reduction.	Lined bed AES system: New or existing primary treatment system and lined AES bed, with recirculation for nitrogen reduction and UV disinfection. Gravity or pumped dispersal.
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SUMMARY OF ADVANCED ENVIRO-SEPTIC AES TEST RESULTS AGAINST OSET-NTP CLASS REQUIREMENTS

Indicator Parameters	Units	OSET-NTP CLASSES					Bidners Road (mean)	BNQ Class II (mean)	BNQ Class III (mean)	Cebedeau (mean)	Blodgett Landing (mean)
		A+	A	B	C	D					
BOD ₅	mg/L	<5	<10	<20	<30	>30	10	8	2	10	6
TSS	mg/L	<5	<10	<20	<30	>30	11	4	2	12.2	5.04
TN	mg/L	<5	<15	<25	<30	>30				55.4	7.14
NH ₄	mg/L	<1	<5	<10	<20	>20				9.4	
TP	mg/L	<1	<2	<5	<7	>7				4.3	1.15
FC	cfu/100ml	<10	<200	<10,000	<100,000	>100,000			2,900		3,632
Energy	kWHrs/day	0	<1	<2	<5	>5	0		0	0	

Standard gravity septic tank to AES bed

Commercial system with 75-100% recirculation for N reduction

Bidners Road - SAI Global - Australia

BNQ-Class II (Secondary) Annex A - Canada

BNQ-Class III (Advanced Secondary) Annex A - Canada

Cebedeau - Belgium

Blodgett Landing. Actual commercial installation USA (75-100% recirculated denitrification)

AES is currently participating in the OSET-NTP Trial 12.

The table above is a summary of the international testing of AES.