



## On-site Effluent Treatment National Testing Programme (OSET NTP)

### PERFORMANCE CERTIFICATE Environment Technology AES-38 R & AES-38 R/UV OSET NTP Trial 13, 2017/2018

#### System Tested

The Environment Technology AES-38 R & R/UV treatment plant comprising a passive aerobic proprietary bed treatment system with treated effluent recirculation through the septic tank, plus a phosphorus reduction filter and UV disinfection (turned on from Week 20 of the testing program) participated in Trial 13 of the On-site Effluent Treatment National Testing Programme (OSET NTP). This commenced on 23 October 2017 and ran over ten months (44 weeks) during which the treated effluent discharge was monitored generally every six days. The Environment Technology AES-38 R & R/UV treatment system tested had a rated capacity of 1,026L/day (38L/m/day of AES pipe) and a maximum capacity of 2,025/day (75L/m/day of AES pipe). The plant comprised a 5,000L septic tank, a 2.25m wide x 8m long x 0.9m deep AES bed configured as a Combination System comprising two lines supplied via a distribution box, with each line comprising a Basic Serial Pipeline in accordance with ET's installation manual, followed by a 630L recirculation tank with a Waste-180VA 2,000L/h recirculation pump (operated 144 min/day discharging to the septic tank), plus a 200L phosphorous reduction chamber, a Salcor UV-3G unit and a 45L effluent pump station. The emergency storage below the bed and in the pump station is 1,307L.

The service requirement is annual for the R/UV plant and 4 yearly for the R plant for septic tank cleaning.

#### Test Flow Rate

The Environment Technology AES-38 R & R/UV treatment system was tested at 1,000L/day (equivalent to servicing a 3-bedroom 5 to 6 person household) over an 10 month (40 week) period November 2017 to August 2018 including a 1 month (4 week) high load effects test involving 5 days at 2,000L/day then 1,000L/day over the following 3 weeks. Note that the manufacturer's advised design capacity for this plant is 1,400L/day.

#### Testing and Evaluation Procedures

A two-month (8 week) media development and settling-in period was initially proposed, but this was extended to 12 weeks due to an unscheduled geothermal waste influent flow on 23 November, followed by extreme weather events in Rotorua, resulting in widespread flooding and high infiltration into the sewerage system, along with an electrical storm impacting on the testing facility control system in early December. Ten samples were taken during this period (Weeks 4 to 12). The Environment Technology AES-38 R & R/UV treatment system did not appear to be affected by either the geothermal influent or weather events.

The performance evaluation testing programme followed involving a three-month pre-benchmarking period (20 samples over Weeks 13 to 28), and a three-month benchmarking period (19 samples over Weeks 29 to 40). Within each block, a five-day consecutive sample period occurred (Weeks 25 and 34). A one-month high load assessment period followed in Weeks 42 to 44 (three samples).

The 39 samples taken through the pre-benchmarking and benchmarking periods were used to assess treatment performance against the **Secondary Effluent Quality** requirements for biochemical oxygen demand (BOD<sub>5</sub>) and total suspended solids (TSS) defined by AS/NZS 1547:2012 as set out in AS/NZS 1546.3:2008

A total of 19 treated effluent samples of organic matter (BOD<sub>5</sub>), total suspended solids (TSS), total nitrogen (TN), ammonia nitrogen (NH<sub>4</sub>-N), total phosphorus (TP) and faecal coliforms (FC) at generally six day intervals during weeks 28 through 40 were tested and the results benchmarked and rated on their median values.



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### General Performance

There were no equipment failures (apart from a discharge pump replacement prior to commencement of testing) or attendance other than an inspection in Week 20 to turn the UV system on and clean the UV Teflon tube, during which neither plant nor control settings were modified.

In terms of effluent quality, the Environment Technology AES-38 plant performed consistently well overall, with low and stable BOD, TSS, and TN results throughout, including through the geothermal influent event. There was no impact upon performance due to varying influent concentrations, cold winter temperatures, or the high flow test, apart from a minor increase in TN for the first week after high flows, which immediately returned to normal. Overall, the plant achieved total nitrification with no NH<sub>4</sub>-N throughout, and low levels of TOXN, resulting in low Total Nitrogen of <12mg/L, and a mean of only 7.8mg/L.

Bacteria reduction was also good, with the AES-38 R plant effluent containing 1,900-18,000cfu/100mL faecal coliforms. After the UV unit was switched on in Week 20, low *E.coli* results were achieved with a median of 2cfu/100mL and 80% <3cfu/100mL.

The plant's power usage was around 0.9kWh/day in the AES-38 R mode, and 2.1kWh/day in the AES-38 R/UV mode.

### AS/NZS 1547:2012 Secondary Effluent Quality Requirements

These requirements are that 90% of all test samples must achieve a BOD<sub>5</sub> of  $\leq 20 \text{ g/m}^3$  and TSS of  $\leq 30 \text{ g/m}^3$  with no one result for BOD<sub>5</sub> being  $>30 \text{ g/m}^3$  and no one result for TSS being  $>45 \text{ g/m}^3$ .

The Environment Technology AES-38 R & R/UV treatment plant had **100% of BOD<sub>5</sub>** results and **100% of TSS** results within the **Secondary Effluent Quality** requirements for both the 90 percentile and maximum limits above. **The AES-38 R & R/UV plants therefore achieved AS/NZS 1547 secondary effluent quality performance requirements** when operated at 1,000 L/day, which is the manufacturer's advised operational flow design capacity.

### AS/NZS 1547:2012 Secondary Effluent Quality with disinfection Requirements

These requirements are additional to the secondary effluent quality requirements and require the plant to achieve *E.coli* levels comprising a median  $\leq 10\text{cfu}/100\text{mL}$ , with 80% of samples  $\leq 20\text{cfu}/100\text{mL}$ , and no sample to exceed 100cfu/100mL

The UV unit was turned on in Week 20 from when the plant performed as an AES-38 R/UV system. Transmissivity, and Turbidity were tested from Week 25 and *E.coli* from Week 28. The results showed that the effluent had high Transmissivity with a median of 72%, and low Turbidity with a median of 2NTU. *E.coli* results varied from 1 to 34cfu/100mL, with 80% of samples  $\leq 5\text{cfu}/100\text{mL}$ , and a mean of 1cfu/100mL. **The Environment Technology AES-38 R/UV plant therefore had 100% compliance with the requirements of this standard for secondary treatment plants with disinfection.**



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### Benchmark Ratings

The Environment Technology AES-38 R & R/UV treatment plant achieved the following effluent quality ratings:

Indicator Parameters	Median	Std Dev	Rating	Rating System				
				A+	A	B	C	D
BOD (mg/L)	2	0	A+	<5	<10	<20	<30	≥30
TSS (mg/L)	1	1.1	A+	<5	<10	<20	<30	≥30
Total Nitrogen (mg/L)	7.7	1.6	A	<5	<15	<25	<30	≥30
NH <sub>4</sub> - Nitrogen (mg/L)	0	0	A+	<1	<5	<10	<20	≥20
Total phosphorus (mg/L)	3.5	0.4	B	<1	<2	<5	<7	≥7
E.coli (cfu/100mL) <sup>1</sup>	2 <sup>1</sup>	16	A+	<10	<200	<10,000	<100,000	≥100,000
Energy (kWh/d) (mean)	1.98 <sup>1</sup>	0.14	B	0	<1	<2	<5	≥5

<sup>1</sup>The E.coli and Power results are whilst UV disinfection was operating.

This Certificate of Performance only applies to the Environment Technology AES-38 R & R/UV treatment plants as described in the 'System Tested' above when operated at 1,000 L/day, which the manufacturers advise is normal flow design capacity.

The certificate is valid for 5 years from the date below. For the full OSET NTP report on the performance of the Environment Technology AES-38 R & R/UV wastewater treatment plant contact Dick Lamb/Hazel Pearson, Phone: 03 970 7979, or Email: [info@et.nz](mailto:info@et.nz)

### Authorised By:

Ray Hedgland, Technical Manager, OSET NTP  
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