

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

### PERFORMANCE CERTIFICATE

**BioKube Venus On-site Domestic Wastewater Treatment System,  
OSET NTP Trial 9, 2013/2014**

#### System Tested

The **BioKube Venus system** is a submerged aerated filter wastewater treatment unit. The manufacturer's rated design capacity is 1,000 litres/day. Total liquid volume is 1,843 litres plus 2 chamber septic tank (primary treatment) 3200 litres. The treatment plant comprises a single tank system with 5 chambers: (primary clarifier 220 litres; aeration tank 1 975 litres; secondary clarifier 118 litres; pump chamber 450 litres). Emergency storage is 450 litres, plus the volume in the septic tank above operational level. No tertiary treatment (such as UV disinfection) is incorporated. The manufacturer's nominated service frequency is annual.

#### Test Flow Rate

The **BioKube Venus system** was tested at 1,000 litres/day (equivalent to servicing a 3-bedroom 5 to 6 person household) over an 8 month (35 week) period November 2013 to July 2014 followed by a 1 month (4 week) high load effects test involving 5 days at 2,000 litres per day then 1,000 litres/day over the following 3 weeks.

#### Testing and Evaluation Procedures

The locally supplied plastic septic tank utilised by the manufacturer split and was replaced on the 3 April. Inspection of the results shows that only two sets of results (1 April and 6 April) were significantly impacted during the period of failure between 22 March to 5 April. With the manufacturer's agreement these two results were substituted for replacement tests undertaken on 20 and 25 May (same week days). These results were adopted for the AS/NZS 1547 technical analysis and OSET Benchmarking performance evaluation with the approval of SWANS-MAG.

The plant appeared to suffer an internal equipment failure which impacted upon power and TSS and slightly upon nitrification from mid February to the end of June. SWANS-MAG consider the failure may have been a clogged airlift recycle pump. TSS levels were initially very low until the internal failure commenced, after which they climbed and became somewhat unstable. As a consequence it is not possible to provide a definitive assessment of the plant's power usage.

A total of 37 treated effluent samples of organic matter (BOD<sub>5</sub>) and 36 treated effluent samples of suspended solids (TSS) at generally six day intervals during weeks 9 to 35 were tested and evaluated against the secondary effluent quality requirements of the joint Australia/NZ standard AS/NZS 1547:2012.

A total of 16 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 23 through 35 were tested and the results benchmarked and rated on their median values. In addition, the energy used by the treatment system was assessed on the mean of consumption levels over the benchmark period.

#### 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 **BioKube Venus** plant had 100% of BOD<sub>5</sub> results for both the 90%ile and maximum limits within the AS/NZS 1547 secondary effluent quality performance requirements (based on the full set of 37 test results in weeks 9 to 35) as well as 94% of TSS results within the 90%ile limits and 100% of TSS results within the maximum limits set out in the AS/NZS 1547 secondary effluent quality performance requirements (based on the full set of 36 test results in weeks 9 to 35), and thus achieved the AS/NZS 1547:2012 secondary effluent quality performance requirements, even though the electrical fault impacted on the TSS results.

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### Benchmark Ratings

The **BioKube Venus system** achieved the following effluent quality ratings for the sixteen benchmarking results in weeks 20-35. The electrical readings were suspect and although they showed an 'A' grade compliance the Management and Audit committee consider that 1.3kWh/day was more likely to be correct giving an electrical compliance grade of 'B'

| Indicator Parameters              | Median                 | Std Dev | Rating             | Rating System |      |         |          |          |
|-----------------------------------|------------------------|---------|--------------------|---------------|------|---------|----------|----------|
|                                   |                        |         |                    | A+            | A    | B       | C        | D        |
| BOD (mg/L)                        | 5.5                    | 2.3     | A                  | <5            | <10  | <20     | <30      | ≥30      |
| TSS (mg/L)                        | 20.9                   | 8.6     | C                  | <5            | <10  | <20     | <30      | ≥30      |
| Total Nitrogen (mg/L)             | 33.3                   | 3.4     | D                  | <5            | <15  | <25     | <30      | ≥30      |
| NH <sub>4</sub> - Nitrogen (mg/L) | 8.3                    | 6.6     | B                  | <1            | <5   | <10     | <20      | ≥20      |
| Total phosphorus (mg/L)           | 2.8                    | 0.3     | B                  | <1            | <2   | <5      | <7       | ≥7       |
| Faecal Coliforms (cfu/100mL)      | 30,000                 | 44,000  | C                  | <10           | <200 | <10,000 | <100,000 | ≥100,000 |
| Energy (kWh/d) (mean)             | 0.4 <sup>1</sup> (1.3) |         | A <sup>1</sup> (B) | 0             | <1   | <2      | <5       | ≥5       |

1: Internal equipment failure is believed to have impacted upon the energy readings. This grading is suspect and is considered more likely to be around 1.3kWh/day

This Performance Certificate is specific to the **BioKube Venus** model as specified above when operated at a flow rate of 1,000 litres/day, and is valid for 5 years from the date below. For the full OSET NTP report on the performance of the **BioKube Venus system** contact:

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### Authorised By:

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