

Tikitere Zeolite Trial

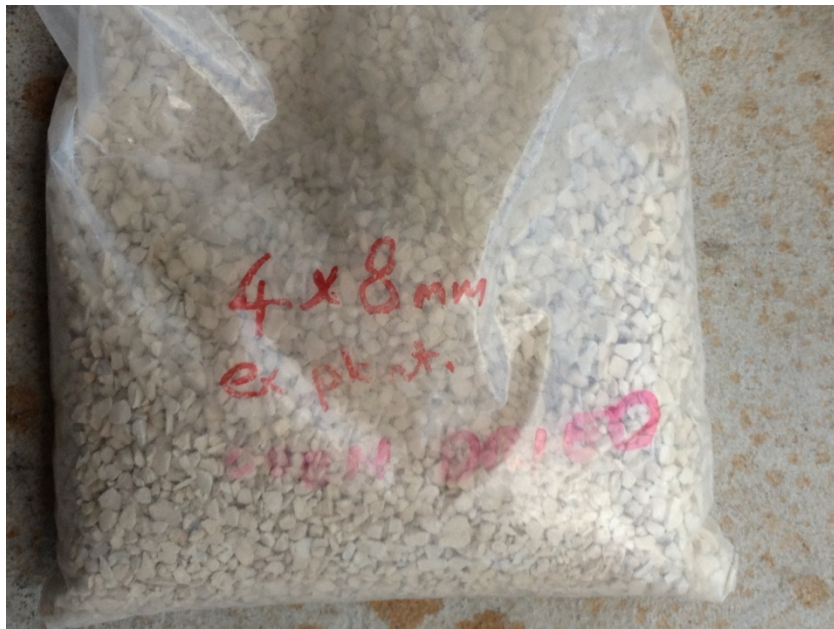
Dec 2012 – February 2013

Trial to assess the ability of zeolite to remove ammonia from a geothermal stream within the Lake Rotorua Catchment

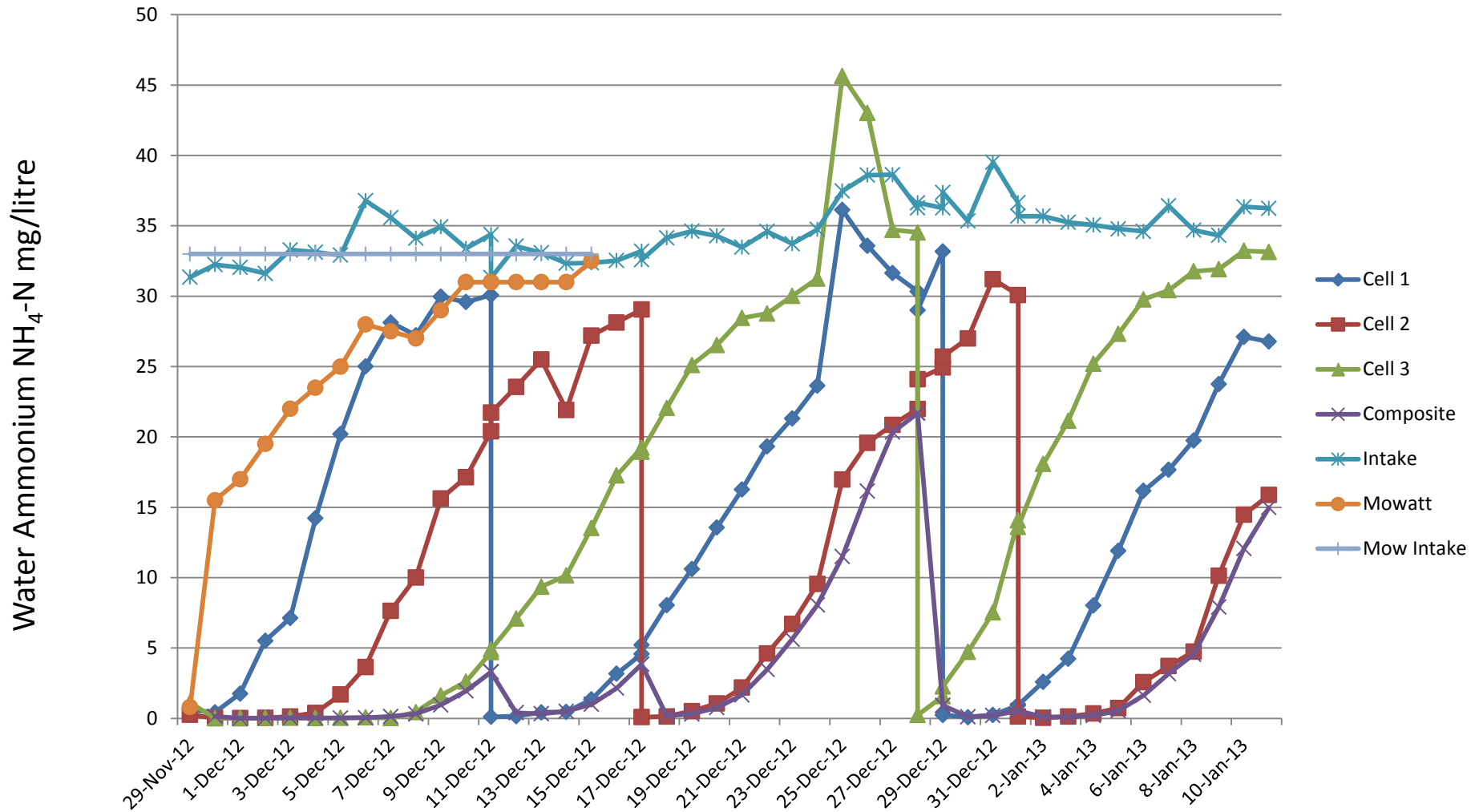
Andy Woolhouse EMTS Ltd





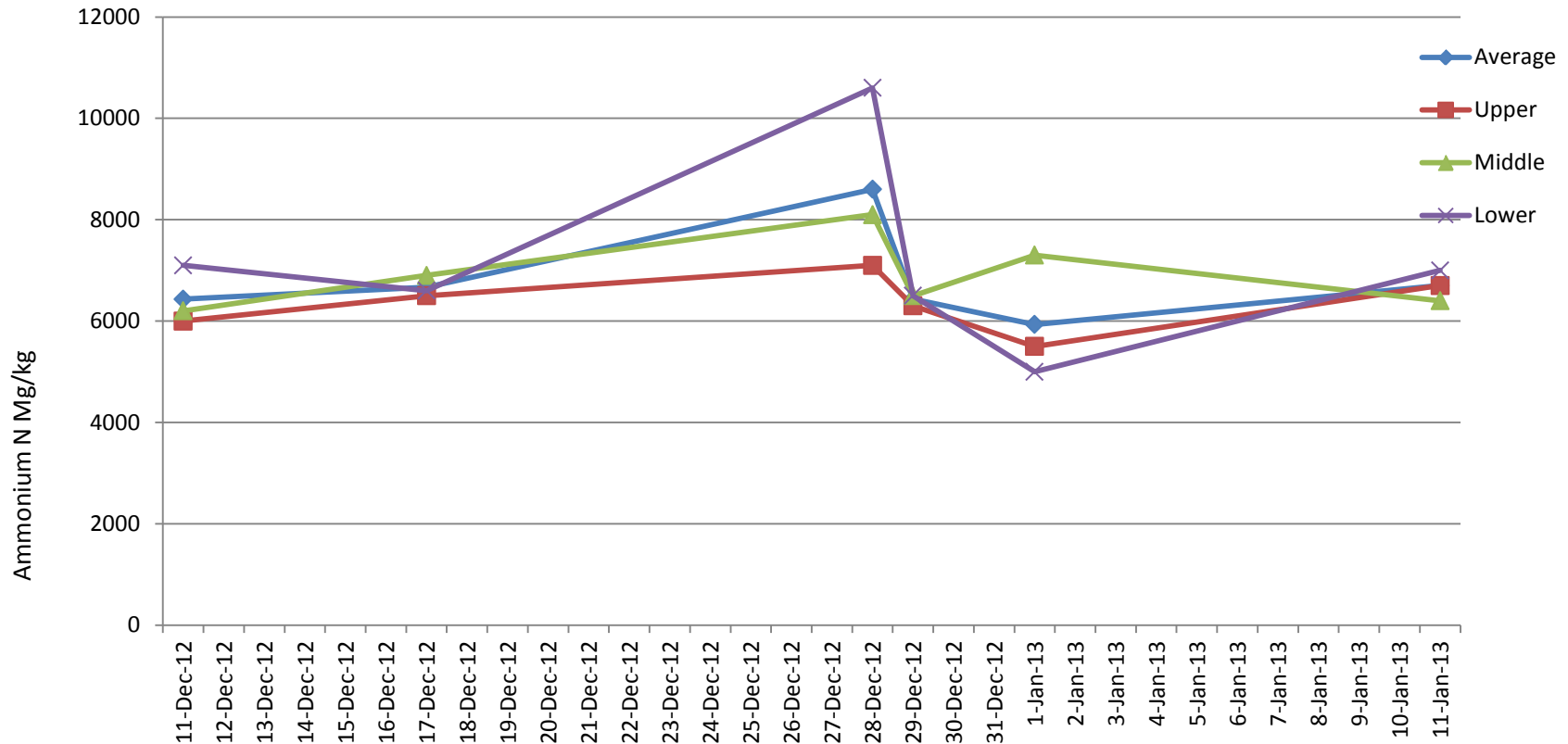


Phase 1 Graph 1 Water Ammonium $\text{NH}_4\text{-N}$ Levels. Cells in series



Phase 1 Trial Mowatt = 2005 trial using coarse zeolite. 2013 trial using medium zeolite
Both use same flow rate of 300 litres per hour

Phase 1 Graph 2 Zeolite Analysis*



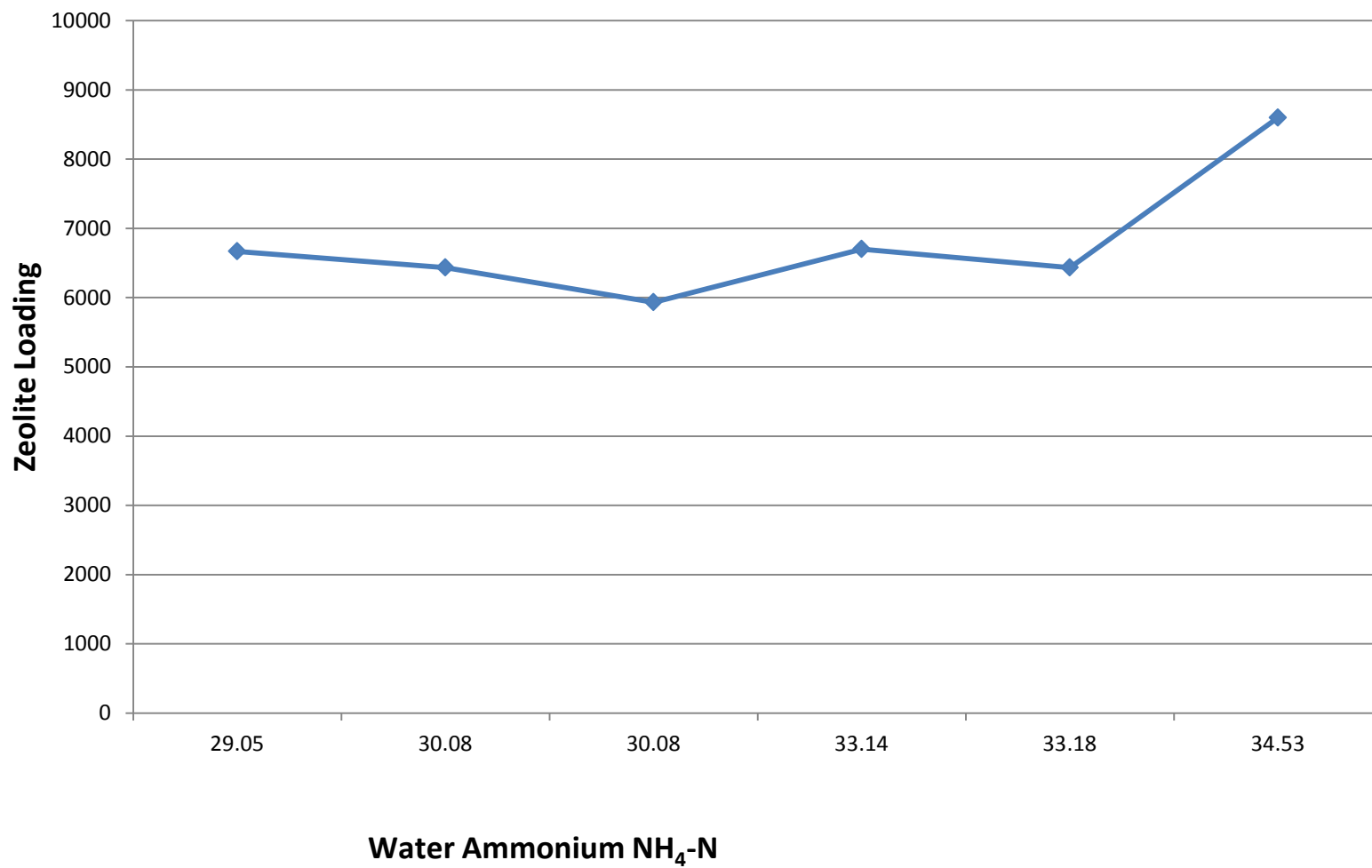
*Ammonium content of loaded zeolite carried out by Hills Laboratories when each cell was changed (fully loaded state)

On completion of the trial (11th Jan) the accumulated sediment at the bottom of the header tank was analysed. The tank sludge contained 116mg/kg ammonium. It also contained large quantities of live bloodworms!

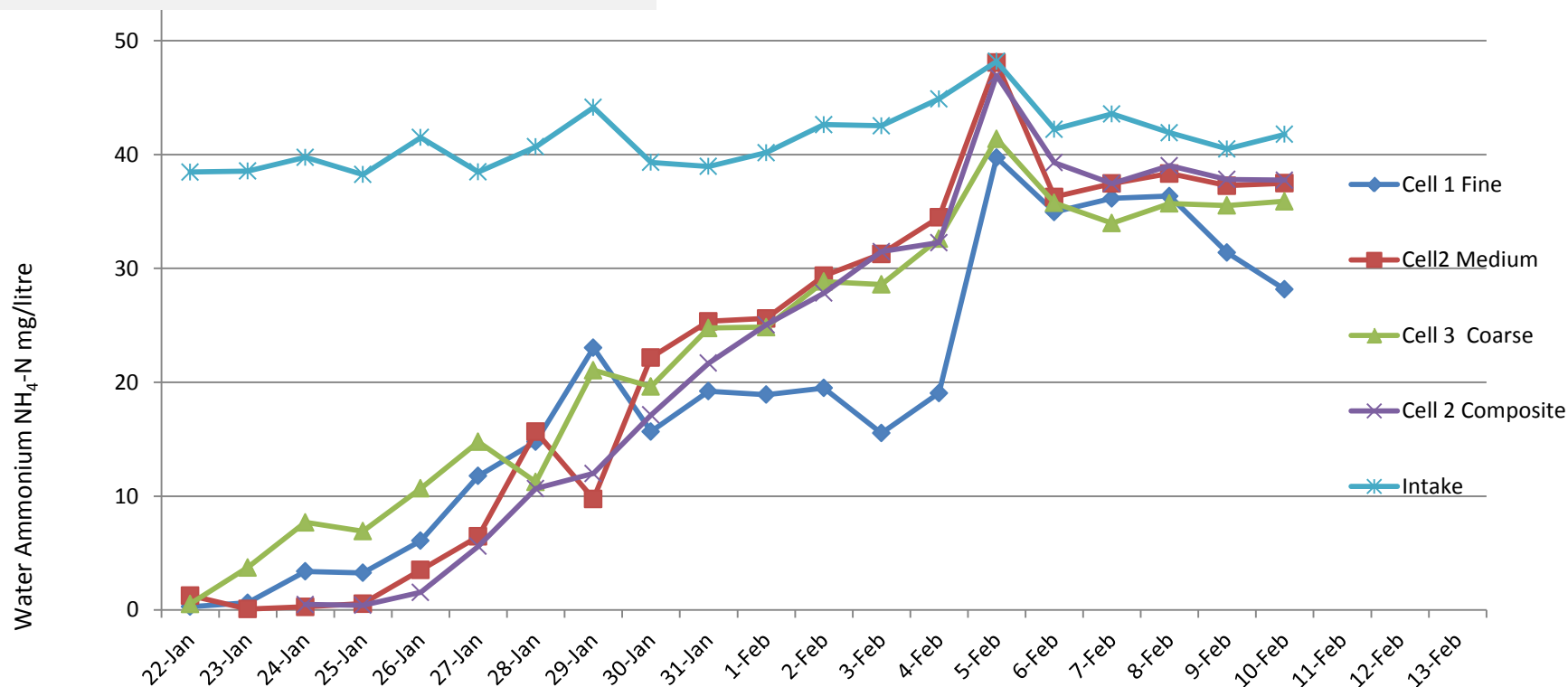
Also the Cell 3 (fully loaded) zeolite was analysed;

- Total Recoverable Mercury 5.4mg/kg
- Total Recoverable Arsenic 10mg/kg

Phase 1 Graph 3 Zeolite Loading



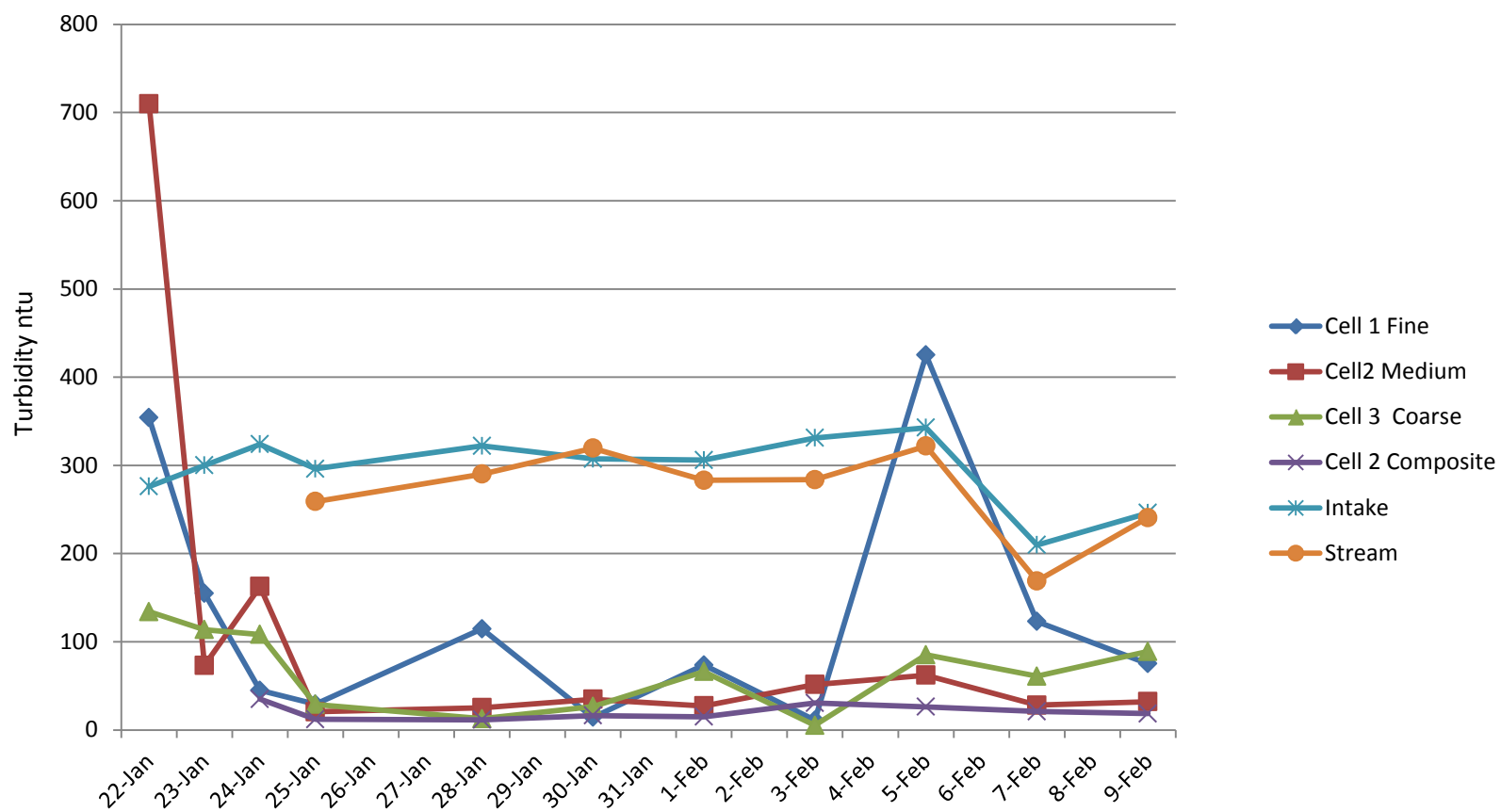
Phase 2 Graph 1 Water Ammonium $\text{NH}_4\text{-N}$ Levels



Part 1, three grades of zeolite - Coarse, Medium and Fine using 150 litres/hr per cell flow rate which is 50% of previous (phase 1) flow rate. Cells operate in parallel.

NB The previous trial (Phase 1) used medium grade zeolite at a flow rate of 300 litres/hours

Phase 2 Graph 2 Turbidity



Phase 2 Graph 3 Water Ammonium $\text{NH}_4\text{-N}$ at Different Flow Rates (medium grade size)

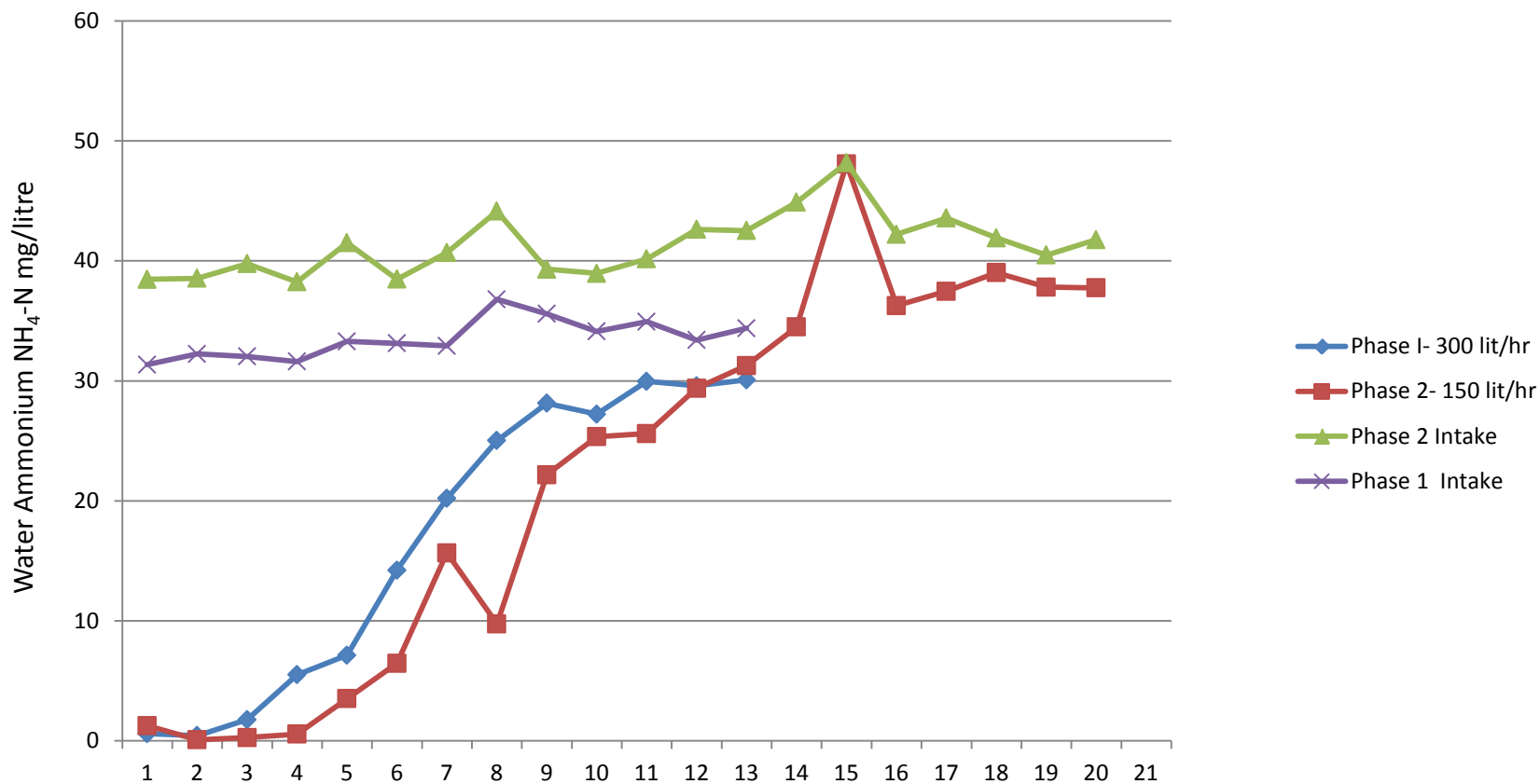


Table 5 Comparison of water ammonium levels at 150 litres/hr and 300 litres/hr.

Comparison of water ammonium is made between two 24 hour periods for the two flow rates
 Periods chosen are Days 6 to 7 and days 10 to 11, with the start and finish values averaged
 for the 24 hour period. Data taken from Table 3 Graph 3

	Flow rate 150 lit/hr	Flow Rate 300 lit/hr
Day 6	6.47	14.22
Day 7	15.66	20.2
Average	11.07	17.21
Intake	39.58	33.03
NH4 removed	28.51	15.82

150 lites/hr. Ammonium removed in 24 hours = $150 \times 24 \times 28.51\text{mg} = 102 \text{ grams}$

300 lites/hr. Ammonium removed in 24 hours = $300 \times 24 \times 15.82\text{mg} = 113 \text{ grams}$

Day 10	25.35	27.22
Day 11	25.61	29.96
Average	25.48	28.59
Intake	39.56	34.54
NH4 removed	14.08	5.95

150 lites/hr. Ammonium removed in 24 hours = $150 \times 24 \times 14.08\text{mg} = 50.69 \text{ grams}$

300 lites/hr. Ammonium removed in 24 hours = $300 \times 24 \times 5.95\text{mg} = 42.84 \text{ grams}$

24 hr period day 6-7. A 100% increase in flow rate reduced adsorbancy to 55.4%

24 hr period day 10-11. A 100% increase in flow rate reduced adsorbancy to 42.3%

Average difference 48.85% ie doubling the flow rate halves the adsorbancy

On balance there is little difference between the efficiency of the two different flow rates
 in terms of total NH4 removed or total ammonium adsorbed onto zeolite.

Phase 1 and 2 Graph 4 Rainfall vs Water Ammonium $\text{NH}_4\text{-N}$ in Stream

