

BC0001501 – PAN-025643

Request for Further Information Schedule 5 Response

Following the AMP7 investment programme at Cross Hands WwTW (BC001501), significant nutrient reduction improvements have been delivered through the installation and commissioning of the new HYBACS (Hybrid Activated Sludge) enhanced biological treatment process (reference paper attached, see page 6 last paragraph), which became operational in August 2025 following commissioning activities in early 2025. The scheme was specifically designed to improve nitrification and overall nitrogen removal performance and to enable compliance with the tighter ammonia discharge requirements associated with the updated permit. The new treatment process includes HYBACS SMART units together with associated anaerobic and anoxic treatment zones, providing enhanced biological nutrient removal capability.

As part of the AMP7 scheme, the ammonia consent standard was tightened from 5 mg/l to 3 mg/l, representing a 40% reduction in permitted effluent concentration. The HYBACS process has delivered a marked improvement in treatment performance and nitrogen removal, with average Total Nitrogen concentrations reducing from 10.04 mg/l (pre-HYBACS) to 6.42 mg/l (post-HYBACS). See sample results within 'Crosshands WwTW Final Effluent Nitrogen Monitoring Data' document attached.

When assessed on a mass-loading basis, the improvements remain evident even when accounting for the increase in permitted Dry Weather Flow (DWF) from 882 m³/d to the requested 1,177 m³/d. The calculations below demonstrate the reduction in nutrient load discharged to the receiving watercourse at the increased DWF limit, demonstrating a net reduction in nutrient load compared to the historic permit and DWF values.

Load Assessment Summary

Parameter	Concentration (mg/l)	DWF (m ³ /d)	Load (kg/day)
Historic Ammonia Permit	5.00	882	4.41
New Ammonia Permit	3.00	1,177	3.53
Total Nitrogen (At old DWF Pre-HYBACS)	10.04	882	8.86
Total Nitrogen (At Increased DWF Post-HYBACS)	6.42	1,177	7.56

Loading Reduction Achieved

Comparison	Load Reduction (kg/day)	Reduction (%)
Ammonia Permit Load (5 mg/l @ 882 m³/d vs 3 mg/l @ 1,177 m³/d)	0.88	19.9%
Total Nitrogen – Historic Load vs Post-HYBACS at New DWF (8.86 vs 7.56 kg/d)	1.30	14.7%

Nutrient Neutrality Conclusion

The AMP7 scheme at Cross Hands has demonstrably reduced nitrogen loading to the receiving environment. Although the permitted DWF request results in an increase from 882 m³/d to 1,177 m³/d, the enhanced treatment performance delivered by the HYBACS process has reduced average Total Nitrogen concentrations from 10.04 mg/l to 6.42 mg/l. Consequently, the post-upgrade nitrogen load remains lower than the historic load discharged prior to implementation of the scheme showing a net reduction of 1.30 kg/day).

The assessment therefore demonstrates that the AMP7 upgrade has achieved a net reduction in nutrient discharge, providing a clear environmental benefit and supporting the principle of nutrient neutrality. In addition, the tighter ammonia consent standard and associated reduction in permitted ammonia load further evidences the overall improvement in effluent quality delivered by the new treatment process.

Calculation used:

Load (kg/day) = Concentration (mg/l) × Flow (m³/day) ÷ 1000.

Assumptions made:

Total nitrogen monitoring data for pre HYBACS implementation is based on three months of monitoring data, considered the minimum for a representative average. Post HYBACS data is based on 9 months of monitoring data but demonstrates a downward trend and accurate reduction average calculation.

Total nitrogen concentrations remain the same at the increased DWF values. This should be the case as the HYBACS system has been designed for the updated flow and FPF limits for the site to meet the requirements of the site permit.