

Luxulyan STW

FBDA aeration plant upgrade works to meet the new WINEP ammonia consent

by Galliford Try

Luxulyan Sewage Treatment Works (STW) is located just outside the village of Luxulyan, approximately four miles north-east of St Austell in Cornwall. Operated by South West Water, this facility plays a vital role in treating wastewater from the surrounding communities before it is safely discharged back into the environment. The treatment process ensures that the water released into nearby rivers and beaches meets strict environmental standards, safeguarding local wildlife and public health.



The upgraded Luxulyan STW – Courtesy of Galliford Try

Background

In recent years, Luxulyan STW has undergone a series of upgrades to improve how it handles both regular wastewater and stormwater – the latter being rainwater that enters the sewer network during heavy downpours. By boosting the site's stormwater handling capacity and making key process improvements, the quality of surrounding waterbodies such as the Par River and the popular Par Sands Beach has been further protected.

To prepare for expected future demand, a long-term strategy known as a *Design Horizon Document* was created. This document identifies what changes will be needed at the site between now and 2050; accounting for the continued development of around 70 new homes per year in the local area.

The latest round of works falls under the AMP7 investment cycle and is part of the national Water Industry National Environment Programme (WINEP) initiative. The key driver behind the 2025 upgrade is to meet new, stricter limits on ammonia in treated

wastewater. To achieve this, improvements to the site's biological treatment process were necessary; specifically through increasing the aeration within the existing treatment tank, often referred to as the racetrack-style aeration ditch.

Project drivers

Several environmental and regulatory objectives prompted the need for this upgrade. These include:

- **Ammonia consent compliance:** Ammonia in wastewater must be reduced to protect aquatic life. If not properly treated, high ammonia levels can be toxic to fish and other wildlife downstream.
- **Biochemical oxygen demand (BOD) compliance:** BOD refers to the amount of oxygen used by microorganisms when breaking down organic matter in water. If too high, it can reduce oxygen levels in rivers, suffocating aquatic life. This project helps ensure the BOD in treated effluent remains well within safe limits.

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- **Suspended solids compliance:** Particles suspended in the water (known as suspended solids) can affect clarity and quality. Reducing these ensures cleaner discharge into the environment and maintains water conditions that support aquatic ecosystems.

These compliance measures are critical not only for maintaining healthy ecosystems in the Par River but also for keeping Par Sands beach safe and enjoyable for residents and tourists alike.

Luxulyan STW: Supply chain: key participants

- **Delivery, MEICA design & civils:** Galliford Try
- **Civils design:** Eastwood Consulting Engineers
- **Computational fluid dynamics modelling:** Wilde Analysis
- **Specialist temporary works:** Robert Nicholas Limited
- **Concrete works:** D Wall Construction Services
- **FBDA aeration plant:** Eliquo Hydrok
 - ✦ **Blowers:** AERZEN Machines
 - ✦ **AEROSTRIP fine bubble diffusers:** Aquaconsult Anlagenbau GmbH
- **MCC panels:** Lintott Control Systems
- **Flow inducers:** Landia UK
- **Lifting:** Macsalvors Plant Hire
- **Steel fabrication:** Minear Engineering Ltd
- **Scaffolding:** RBS Scaffolding

Design & construction

To meet these environmental goals, South West Water implemented a comprehensive upgrade at Luxulyan STW. The project included advanced engineering, modern equipment, and smart technology to increase treatment capacity and improve system resilience. Key elements included:

- **CFD modelling:** This digital simulation was used during the design stage to model how water and air would flow through the treatment tank. It ensured the new equipment would deliver even oxygen distribution, efficient mixing, and achieve the desired water flow speed, essential for optimal biological treatment.
- **Modern aeration system – fine bubble diffused aeration (FBDA):** The old paddle-style surface mixers were replaced with a much more efficient aeration system from Eliquo Hydrok. The FBDA setup includes:
 - ✦ Three high-output blowers working in a rotation (duty, assist, standby) depending on how much oxygen the water needs.
 - ✦ Six diffuser grids that release tiny air bubbles. These dissolve oxygen more effectively than the old system, which helps bacteria in the tank break down pollutants more efficiently.

This new system improves energy efficiency, is easier to maintain, and supports better biological treatment outcomes.

- **Improved mixing:** To prevent solids from settling and forming “dead spots” in the treatment tank, two submersible mixers were installed. These keep the water constantly moving, ensuring even treatment across the entire aeration ditch.
- **Smart instrumentation:** Modern sensors were fitted to monitor and record dissolved oxygen, ammonia levels, mixed liquor suspended solids (MLSS), and pH levels in real time. South West Water operators can access this data remotely, allowing them to manage treatment processes more proactively and respond quickly to any issues.

These upgrades improve the plant’s ability to treat wastewater and help protect nearby water environments.



The existing final settlement tank - Courtesy of Galliford Try



Aeration ditch after upgrades - Courtesy of Galliford Try



New FBDA diffusers - Courtesy of Galliford Try

Innovations, cost savings, and environmental considerations

What made this project especially impressive was the innovative approach to overcoming construction challenges while the treatment plant remained fully operational; a task that required careful planning and creative thinking.

- **Working on a live process:** One of the main challenges was that the aeration ditch could not be taken offline. The initial plan to modify the old motor control centre (MCC) and run the new equipment using temporary generators was reconsidered. Instead, a new MCC was constructed and commissioned alongside the old system. This allowed for a seamless transition between old and new equipment and provided the site with better resilience during installation.
- **Bespoke temporary works:** To install the new submersible mixers, engineers had to work in a full, live aeration ditch. Emptying it wasn't an option. A specialist structure called a Limpet Cofferdam was custom-designed and built for this task. It allowed workers to install the mixers safely and then remove the structure remotely in two sections; demonstrating excellent engineering problem-solving.
- **Environmental sensitivity:** One part of the site, a disused concrete bund, was initially considered for reuse as a base for a new sludge mixer. However, it had naturally evolved into a small wetland, home to frogs and marsh plants. In a thoughtful and environmentally responsible decision, the team chose to leave this area undisturbed and built a new concrete base elsewhere, preserving the newly formed wildlife habitat.

Conclusion

The 2025 upgrade at Luxulyan Sewage Treatment Works demonstrates South West Water's commitment to environmental stewardship, innovation, and community wellbeing. Through technical excellence and collaborative planning, the project team



Concrete slab turned frog pond - Courtesy of Galliford Try

delivered a resilient and future-ready wastewater treatment solution.

By addressing ammonia, BOD, and solids compliance, the site now provides enhanced protection for sensitive local ecosystems and recreational areas such as Par Sands Beach. In addition to meeting regulatory targets, the project has delivered energy savings, operational improvements, and protected natural habitats.

This investment ensures that the facility is prepared not just for today's challenges but also for those of future generations, safeguarding Cornwall's waterways for years to come.

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