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Ellon WWTW

Scottish Water and our capital project delivery partner ESD completed a £10 million upgrade of the Waste Water Treatment Works (WWTW) that serves Ellon in May 2022.

The project involved the refurbishment and upgrade of each stage of the treatment process, which cleans the waste water that our customers have used so that it can be safely returned to the environment. The aim was to renew the equipment within the site and increase its capacity by around one third, responding to the needs of Ellon's growing community.



- Ellon Waste Water Treatment Works following its upgrade in May 2022. Clockwise from top-left: screw pumps which lift incoming waste water to the top of the site; blowers which oxygenate the site's aeration lanes; tanks store sludge for collection; the site's Final Settlement Tanks.





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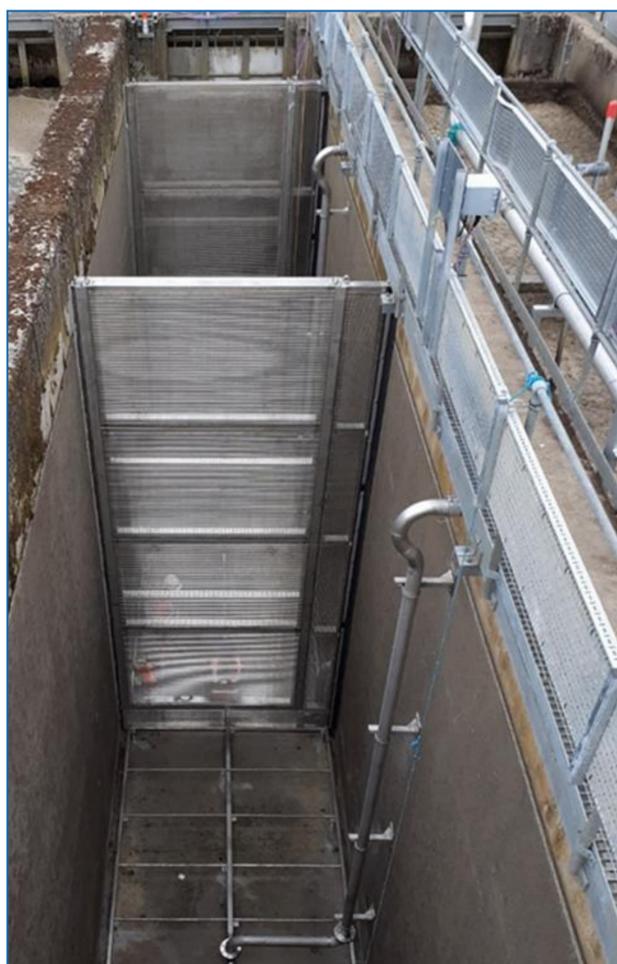
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IFAS technology

An innovative technology called IFAS (Integrated Fixed Film Activated Sludge) was used within the site's upgraded aeration lanes.

This technology was used by Scottish Water for the first time at Ellon, as it enabled a higher standard of treatment without the need for larger aeration tanks or a larger area of land than is available at the WWTW site.

Small plastic bio-filters, designed to increase the surface area on which 'good' bacteria can grow, are suspended in the aeration lanes. In this oxygen-rich environment, these bacteria play a key role in breaking down the nutrients in waste water so that it can be safely returned to the environment.



- Left: the deep aeration lanes and the screens which divide them into cells before entering operation. Middle: the plastic biofilters which are associated with the IFAS technology and host communities of bacteria to rapidly break down nutrients in the waste water. Right: the IFAS aeration lanes in operation.



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November 2022 incident

A serious environmental incident occurred in November 2022, which Scottish Water has been responding to since.

Initial fault - 12th November 2022

There was an initial fault affecting the IFAS aeration lanes on 12th November, when blowers within the tanks shut down due to a problem. This resulted in biofilters blinding the screens within the tanks, some of which overtopped the screens and entered the Final Settlement Tanks.

Built-in safeguards worked to screen out the filters from the treated effluent, returning most to the start of the treatment process, where skips collect debris and grit from the incoming waste water. Other biofilters were contained by filters called copa-sacs at the outlet.

Pollution event - 17^h November 2022

A similar problem recurred on 17th November, in the midst of a period of very wet weather, which caused an major river spate on the Ythan - with a similar magnitude to Storm Frank in January 2016.

The river water overwhelmed the inlet well at the lowest part of the site and parts of its surface water drainage system, resulting in a significant quantity of biofilters being released to the environment.

How many biofilters were released?

It is not possible to quantify the number of biofilters released with a high degree of accuracy. We know that 380 cubic metres of biofilters were originally added to the aeration lanes. The great majority were recovered from the lanes or within the WWTW and stored on the site. We estimate that around 10 cubic metres were released – and recognise this resulted in a significant impact once these were dispersed in the Ythan Estuary and along the coast.



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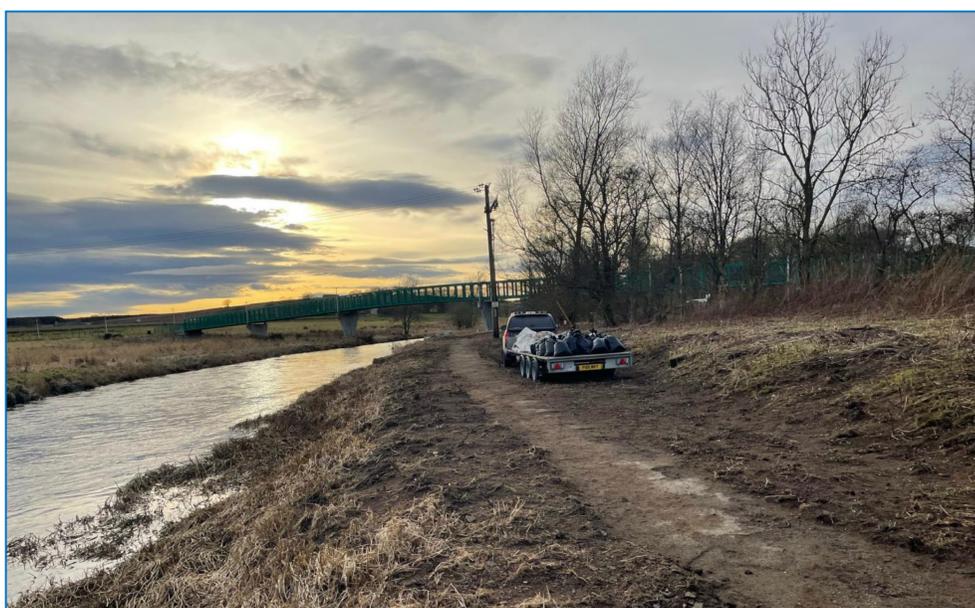
Clean-up and recovery

Clean-up and recovery work began immediately, both within the WWTW and beyond the site as the impact on the Ythan and the surrounding coastline was understood; and conditions became safe.

Approximately 60 people, from Scottish Water's local team and our supply chain partners have been engaged in clean-up and recovery work, at a cost of over £315,000.

Clean-up activity has varied from the use of tractors and chain rakes in the weeks following the incident, to maximise recovery of filters from local beaches at low tide, to much slower work by hand in environmentally sensitive locations around the Ythan Estuary.

We recognise that the nature of the filters and the dynamic coastal environment mean we are not able to recover all. The efforts of local volunteers and other partners with recovering and disposing of as many as possible are invaluable and hugely appreciated.



- Locations covered by clean-ups carried out by Scottish Water and our supply chain partners have included Newburgh Beach, the banks of the River Ythan, Forvie Nature Reserve, Forvie Beach and Balmedie Beach. Significant work was also needed within the WWTW to remove the biofilters from the process and ensure the site could continue to serve the local community without risk of recurrence.





Investigation

Following the incident, biofilters were removed from the treatment process to remove any risk of recurrence, while a detailed investigation took place.

Scottish Water's investigation is now complete and our findings have been shared with our environmental regulator SEPA. They have also informed changes which are being made within the WWTW.

We did not find a single root cause of the release of IFAS media from the site, but a number of contributing factors which we need to address:

1. **Lack of loading:** The growth in Ellon that the WWTW was designed to accommodate has only partially occurred to date. The biofilters are intended to remain in suspension within the waste water, rather than floating, but insufficient 'food' to support sustainable growth of biomass may have caused them to become buoyant.
2. **Foaming:** There is some evidence of foaming occurring in the aeration lanes. Foam is likely to have contributed to the buoyancy of the biofilters by forming a layer between the floating media and the wastewater flow below.
3. **Blinding of mesh screens:** Screens between cells within the aeration lanes were partially blinded, causing water levels to increase on the upstream side. During very wet weather conditions, this could have caused screens to overtop, with buoyant media then bypassing the screens that are designed to retain them.
4. **Scum return pipe:** Once biofilters escaped from the aeration lanes and reached the Final Settlement Tanks (FSTs), a pipe from the FST's scum box, which collects any floating residue of things like fats, oils or grease, returned them to the inlet well at the lowest point in the site for pumping back to the start of the treatment process.
5. **River spate:** In the exceptional spate which occurred in the days following 17th November 2022, the inlet well was flooded by the river. This enabled biofilters to escape via a route where no precautionary screening was in place.

The upgraded WWTW has continued to perform well without IFAS media in its aeration lanes. Before any future need to use them again, we are seeking to ensure these factors are addressed.



Long-term action

A range of both short-term and long-term actions were identified to ensure that a similar incident cannot recur.

A number of short-term actions have already been implemented, including the quick transition to operating the aeration lanes without the IFAS media until it is required and any appropriate remedial actions have been implemented. The recovered media have now been removed from the WWTW site for recycling.

Improvements have also been made to the instrumentation on site to ensure that any similar issues affecting the aeration lanes can be detected on a 24 hour basis and our local team alerted.

Longer terms actions include:

1. **Loading:** Scottish Water has reviewed the optimal conditions for use of IFAS and the way in which this technology should be recommissioned on a sustainable basis once the growth of the community requires it.
2. **Foaming:** Plans are in place to ensure that any foaming problems can be managed, with the option to add an antifoam chemical if it is needed.
3. **Replacement of screens:** Construction work to replace the screens within the aeration lanes is now complete. The screens have been replaced with taller screens, including larger mesh which would retain media but be less susceptible to blinding and over-topping. Arrangements have been made to ensure the screens can be cleaned safely.
4. **Diversion of scum return pipe:** While the measures above seek to minimise the risk of biofilters escaping from the aeration lanes, we are also planning to divert the scum return pipe away from the inlet well. This would mean that any material being recycled from the Final Settlement Tanks is not at risk of entering the environment, even in the most extreme river spates.

As well as implementing the changes identified at Ellon, the lessons drawn from the investigation have been shared with teams across Scotland - and are informing the design of current and future upgrade projects.



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Listening to you

We recognise the seriousness of the pollution event which occurred at Ellon and the strength of feeling which it has prompted.

An essential part of Scottish Water's role is to protect the local environment - and that is what WWTWs, and our people who operate them, strive to do every day of the year.

In cases where something goes wrong, our regulators have a role in scrutinising what has happened - and we engage with them openly.

It is also important that we engage with customers and stakeholders about the issues and what we are doing in response.

We regret that we cannot reverse what happened in November 2022 and that even substantial and sustained clean-up efforts cannot recover all of the biofilters lost. We are determined to understand the causes and take action to address them.

Today's event is part of that ongoing process. We appreciate you taking the time to attend and are keen to receive your feedback on any aspect of our response.



- Stakeholders seeing the aeration lanes operating without IFAS media and receiving an update during a site visit in June 2023.

