

# Ballymore Eustace WTP

## filter upgrade project: reviews, assessments, upgrading and replacement of operationally critical equipment at a major water treatment plant

by James McKenzie

**B**allymore Eustace Water Treatment Plant (WTP) is the largest treatment plant in Ireland. The current average daily output of the plant is approximately 308 ML/d supplying potable water to approximately 1,000,000 people. Water is abstracted from the River Liffey and is then dosed with aluminium sulphate, sodium hydroxide when necessary, and polymer before being distributed to 12 upward flow clarifiers. Settled water then flows to first stage filtration process consisting of thirty-six rapid gravity filters (RGFs). The filters are segregated into multiple galleries where the filters are collectively grouped; Filters 1-10, Filters 11-20, and Filters 21-36. Under Uisce Éireann's Early Contractor Involvement (ECI) Programme, Glanua Ltd completed the review, assessment and upgrade of Filters 1-10 in December 2024.



Completed repairs along filter walkway - Courtesy of Uisce Éireann



Anthracite placed - Courtesy of Uisce Éireann

### Uisce Éireann's Early Contractor Involvement (ECI) Programme

The ECI programme was established in 2019 with the aim of delivering water infrastructure projects in a more collaborative and cost-effective manner. In partnership with industry specialists, Uisce Éireann are delivering numerous projects nationwide as part of this programme up to and including the year 2025.

The Ballymore Eustace WTP project was a part of '1A' region, which encompasses numerous water treatment sites in the southern half of Ireland. Glanua Ltd is the main contractor for the ECI 1A Projects Framework.

### Project background

Filters 1-10 are the oldest of the thirty-six filters on site; constructed circa 1940s or 1950s. Due to the condition of these filters, only five were operational, of which Filters 1 and 7 were refurbished in 2013.

Over time, these filters had deteriorated and this project aimed to bring all filters in filter bank 1 to 10 back into operation and extend


the life of these assets. This essential upgrade was required to assist with reliability at the WTP, boost resilience to the Greater Dublin Area (GDA) Water Resource Zone, and reduce the risk of further deterioration, asset failure, treatment losses and HSQE issues at the plant.

### Project scope

Deficiencies relevant to these works that required intervention were:

- **Physical treatment process for removal of microbial, organic and inorganic contaminants:** Filters 1-10 are a key component of the first stage filtration. They were in poor condition and consequentially five of the ten filters had been removed from service. The condition of the filters was likely to continue to deteriorate which would likely result in more filters being removed from service. The following works were required to ensure continuity of, and resilience to supply.



An aerial photograph showing a large, calm lake in the background, surrounded by green and brown fields. In the foreground, there is a wastewater treatment plant with several large circular tanks and industrial buildings. The sky is clear and blue.

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- **Interruption to supply:** The risk of elevated turbidity could result in reduction of throughput through the plant to manage loading rates. Electrical upgrades to process and building components within the Filter 1-10 gallery to address outdated and redundant electrical equipment. These electrical works were required to also maintain resilience at the plant and must conform to WIMES 3.02 standards.
- **Health & Safety:** On-going HSQE issues relating to inadequate of handrails, unsafe steps and lack of lifebuoys.
- **HVAC:** The filter gallery building had ineffective ventilation and heating systems with the previous oil heating system not in service and on-going issues with condensation.
- **Ageing assets:** The building was in poor condition and required upgrade works to the building fabric and doors and windows. A BCAR certificate was not possible to obtain due to the age of the building (i.e. it was constructed before building regulations were introduced).

### Solution

The preferred solution to remedy the above issues included the following works:

- Installation of new Uisce Éireann specification compliant proprietary false floor, laterals and underdrain system, with dual media filtration media.
- Refurbishment of Filters 1-10 and associated systems such as run-to-waste and backwashing facilities.
- Provision of all civil works required.
- Provision of all new mechanical, electrical, instrumentation, control and automation work meeting current Uisce Éireann standards and specifications, capable of interfacing with existing systems, to achieve backwash flow rates and air scour flow rates required.
- Provision of electrical upgrades to electrical systems and control systems within the Filter 1-10 building.
- Upgrade of building general electrical services to address HSQE risks.
- Provision of Filter 1-10 building works and replacement of building services.
- Replace windows and doors.
- Provision of civil and mechanical works to facilitate HSQE improvements within the filter building.

### Project works

The project objectives were to address risks to Physical Treatment (Barrier 4), Interruption to Supply (Barrier 5), and general works to address risks relating to building works, building services and HSQE issues. The works ensured that the treated water complies with regulatory standards, maintains serviceability to customers, and ensures the safe operation of the plant.

The majority of the filter upgrade works were undertaken in filter cells only and were sequenced to ensure minimal disruption to operations.

### Filter upgrade

The backwash rates for up-to-specification requirements could not be achieved due to air blower infrastructure. UÉ-TEC-900-04-01 requirements are set at  $45\text{m}^3/\text{m}^2/\text{h}$  for air scour and  $30\text{m}^3/\text{m}^2/\text{h}$  for upwash in the case of dual media with 0.56mm ES silica sand and anthracite. Achieving these standards would have required significant upgrades that were not in the scope of this project.

However, the total volume of dual filter media could be increased by approximately 8-10% at an up-flow rate of  $18\text{-}20\text{m}^3/\text{m}^2/\text{hr}$  by:

- Installing a new proprietary Uisce Éireann-compliant Tetra LP Block underdrain system from De Nora which ensures even distribution of both backwash air and water.





- Upgrading the air scour line into the filters from 150mm to 250mm, which effectively reduced velocities to acceptable values of 20 m/s,
- Increasing the height of overflow weir by 600mm.
- Maintaining the existing backwash pipework, flow rates and velocity.

This option increased the filter performance and provided an UÉ compliant filter cell. It also provided a future-proofed solution whereby if future pipe and pump upgrades were undertaken, then the filter cell upgrade would integrate seamlessly to provide a fully UÉ specification-compliant solution.

The Process Proving Period was formed by 28 days of online turbidity analysis of each filter with accredited laboratory sampling ongoing throughout this period.

### Mechanical design

An extensive assessment of the equipment and instrumentation required for the upgraded filters was undertaken in order to achieve a much more robust mechanical set up in the filter gallery as referenced below.

**Filter gallery pipework:** During an assessment of the filter gallery pipework, it was noted that there was corrosion at the tapping points for the filtered water outlet sample point, pressure transmitter points and flow probes points. Leaks were present at several of the tapping points. To negate further corrosion, these sections of pipework were replaced throughout with DN400 Schedule 10 304 stainless steel pipework.

Any remaining existing pipework was repainted in the filter gallery with industry standard colour coding. New stainless-steel pipework was labelled with colour-coded labelling.

The majority of the pipework was replaced in the filter gallery, i.e. new 250mm stainless steel air scour header pipework and drops

to air scour flooring, new filter water outlet stainless steel bespoke sections of pipe, existing run to waste pipework with the exception of a few stainless steel 'T' pieces and all painted in coordination with Dublin County Council colour code at Ballymore Eustace.

All valves, ductile iron pipe fittings, gaskets, tapers, etc had WRAS approval and comply with the relevant standards in *IW-TEC-300-01 (General Civil Engineering Specification)*.

**Valves & actuators:** A DN250 manual butterfly valve was installed at each filter, upfront of the air scour inlet valves enabling manual isolation of air to each filter during maintenance of the actuated air scour inlet valve.

The filter drain valves were beyond their design life and were replaced at each filter with DN100 gate valves.

On each of the ten filters, the inlet penstocks and all the backwash outlet penstocks were beyond their design life and were replaced with actuators from Rotork Controls.

**Sample pumps:** The turbidity sample pumps for the filtered water outlet on all filters have been replaced with Esybox Mini 3 pumps equipped with pressure controllers. Additionally, these pumps were supplied for the filtered water quality mains sample.

**Instrumentation & monitoring equipment:** Continuous on-line monitoring equipment was incorporated to provide a comprehensive plant automation and process monitoring, of which information is logged to the SCADA system.

1. **Flow metering:** On the filter water outlet pipe, all filters were fitted with new electromagnetic type Siemens Mag 5100W flow meters. The installation of the flow meter followed the rule to flow stabilisation, so the flow meter was installed at five times the pipe diameter upstream, and three times the diameter downstream.



Installing scaffolding Filter 10 for shrink wrap installation  
Courtesy of Uisce Éireann



Filter 9 scaffolding and shrink-wrapping installation  
Courtesy of Uisce Éireann

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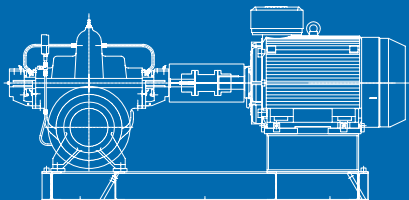
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2. **Level monitoring:** All filters were fitted with new Pulsar Ultrasonic dB 3 type level transmitter and Pulsar level controller type Ultra 4.
3. **Pressure sensors:** All filters were fitted with new Siemens type P200 pressure transducers.
4. **Turbidity monitors:** All filters were fitted with new Hach turbidity transmitters type TU5300 on the filter water outlet pipework and run to waste pipework.

#### Innovations, cost savings & carbon reduction

All equipment used was state of the art, energy efficient as best as possible due to the nature of the project. All ten filters are now fully automated reducing manual intervention except for preventative maintenance and cleaning.

Carbon reductions were achieved by refurbishing the existing building and the filter civil infrastructure. For example, the inefficient oil heating system was replaced with thermostatically controlled energy efficient electric heating system. The single glazed steel framed windows and doors were also replaced, with thermally broken aluminium windows and doors with low U-values of 1.3W/m<sup>2</sup>K.

Each filter throughput increased from approximately 100m<sup>3</sup>/hr to design flow throughput of 400m<sup>3</sup>/hr giving a much higher flow throughput available to the plant operators, lending to the availability and flexibility of taking other filters out of service for cleaning and preventative maintenance works without any loss to plant throughput.

#### Conclusion/summary

Uisce Éireann's main driver for Ballymore Eustace Water Treatment Plant Filters 1-10 Upgrade Project was to ensure the continued supply of high quality drinking water to customers throughout Dublin through efficiency upgrades and equipment replacement.

The collaborative efforts of Uisce Éireann and Glanua Ltd led to the project's successful completion slightly ahead of programme and below budget. This represents a major milestone in ensuring the long-term resilience, safety, and efficiency of Ireland's largest water treatment facility with a specific focus on the Greater Dublin Area Water Resource Zone.

All ten filters were refurbished to modern standards, incorporating proprietary underdrain systems, dual media, upgraded instrumentation, and improved mechanical and electrical infrastructure. Although certain limitations (such as backwash and air scour capacities) remained outside the project scope, significant performance improvements were achieved, enabling 8–10% bed expansion and enhanced operational consistency.

Filters 1-10 now have a throughput of 4,000m<sup>3</sup>/hour, compared to the previous throughput for the five filters that were in service of less than 1,000m<sup>3</sup>/hour

The works not only restored the operational capacity of a critical filtration asset, but also modernised the infrastructure to meet current regulatory, safety, and operational standards. The adoption of advanced monitoring and automation systems, combined with sustainable design choices such as reusing existing civil structures, also contributed to reducing the project's carbon footprint.

This project strengthens the resilience of supply, safeguards public health through improved water quality management, and sets a strong precedent for future upgrades across Uisce Éireann's national infrastructure portfolio.

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#### Ballymore Eustace WTP Supply chain - key participants

**ECI Framework contractor:** Glanua Ltd  
**Project management consultants:** AtkinsRéalis  
**Civil & structural designers:** Jennings O'Donovan  
**Tank cleaning & media installation:** Oak Enviro  
**Filter relining:** Beltech Industrial Ltd  
**Tetra LP Block underdrain system:** De Nora  
**ESYBOX Mini 3 pumps:** DAB Pumps Ltd  
**Actuators:** Rotork Controls  
**Turbidity monitors:** Hach  
**Flow meters & pressure sensors:** Siemens  
**Level monitoring:** Pulsar Measurement  
**Control & automation:** CSL Environmental Solutions  
**Mechanical installation:** Callan Precision Engineering  
**Electrical works:** BKES  
**Heating design:** CEL Building Services Consultants  
**Fabrication works:** Cross Fabrications Ltd  
**Civil works:** FRA McLoughlin Civils Ltd  
**Building works:** Goodfixers Construction Ltd  
**Scaffolding:** Johnson Scaffolding Services Ltd

