

River Avon Project

protecting the natural environment and supporting the economic growth & development of one of the UK's fastest growing areas

by Mark Keast

The River Avon has played a part in the ever changing face of central Scotland. It flows into the Forth near Grangemouth, on its way criss-crossing the Antonine Wall, built by Emperor Antonius Pius in 140AD as the north-western frontier of the Roman Empire, which was in 2008 inscribed as a Unesco World Heritage Site. In more modern times, heavy industry has played its part in the moulding of West Lothian and the River Avon. Coal mining, paper mills, brick works and indeed paraffin, which chemist James Young found could be distilled from Cannel coal mined near Bathgate, have all played a part in shaping the Avon. However, in providing economic prosperity, the environment of the river suffered from decades of pollution. Scottish Water's £10 million investment to deliver the next phase of the transformation of this winding watercourse, will improve the natural environment of the Avon for many years to come.



Armadale WwTW - Courtesy of Brian Carral © Scottish Water

Background

With the collapse of much of the heavy industry in the 1980s the River Avon has been able to naturally recover and it is now home to a number of species of trout.

To further protect the natural environment of the Avon for future generations across West Lothian, one of the UK's fastest growing areas, Scottish Water has invested in significant upgrades at five waste water treatment works (WwTW) in a year long programme of work that will deliver significant long-term benefits.

Bathgate WwTW

At Bathgate, the former industrial capital of West Lothian, the wastewater treatment works is located to the north-west of the town and sits on the Barbauchlaw Burn, a tributary of the Avon.

The project drivers included meeting tightened standards for treated effluent with respect to BOD (8mg/l) and ammonia (3mg/l) as well as a first time phosphorus standard (2mg/l based on annual average). The project scope included a new sand filter to work on a duty/duty basis in conjunction with the existing filter, which itself was refurbished.

Analysis of the effluent from the works as part of the design stage determined that no chemical dosing was required for phosphorus removal due the solids capture rate across the existing sand filters.

Sampling undertaken following completion of the works has validated the decision to exclude the chemical dosing, ensuring operational expenditure is minimised and avoiding the H&S risks associated with handling ferric sulphate.

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Linlithgow WwTW

In the royal burgh of Linlithgow, the birthplace of the kings and queens of Scotland, Scottish Water has already helped to improve the natural environment of Linlithgow Loch, the SSSI reserve which is home to protected plant, wildlife and water fowl. Looking down from the derelict castle with its 21st century spire, the wastewater treatment works is located to the north of the town off Mill Road, just a short distance from where the iconic railway viaduct and Union Canal aqueduct stride majestically across the Avon.

Here, the project drivers included meeting tightened standards for treated effluent with respect to BOD (10mg/l) as well as a first time phosphorus standard (2mg/l based on annual average). A chemical dosing plant for the addition of ferric sulphate has been installed for the removal of phosphorus and tertiary disc filters, operating on a duty/duty basis to ensure the solids capture rate is sufficient for compliance with the tightened BOD consent. The promotion of tertiary disc filters as opposed to sand filters was driven by the available footprint.

Armadale WwTW

At Armadale, the former mining and brick manufacturing town, the wastewater treatment works also sits on the Barbauchlaw Burn, having given the tributary its name in a former guise. Nowadays, best known for its speedway track, Armadale is among the fast growing communities in West Lothian.

The Armadale project drivers included a first time phosphorus standard (2mg/l based on annual average) to be met through the operation of an existing chemical dosing plant delivered in the previous investment period.

Torphichen WwTW

The picturesque village of Torphichen, which sits just outside Bathgate takes its name from the Gaelic for Raven's Hill, no doubt famed for the woods which once surrounded it. The village is steeped in history and is thought to date back to the 5th century when St Ninian established a church there. It is thought the Knights Hospitaller of St John also made Torphichen their headquarters in the 12th century.

Here the project drivers included meeting tightened standards for treated effluent with respect to BOD (20mg/l) and ammonia (2mg/l) as well as a first time phosphorus standard.

To address this, the project scope included a new nitrifying sand filter, the first time this technology has been utilised by Scottish Water. A chemical dosing plant for the addition of caustic soda has been installed to ensure there is sufficient alkalinity for nitrification after analysis of the treated effluent during the design stage identified a shortfall.

Blackridge WwTW

Blackridge, on the North Lanarkshire border is a rapidly growing community, where significant development is planned for this commuter belt location. Growth is a major factor and investment at the works will see additional capacity for a further 400 homes to be built in the catchment, more than doubling the size of the village.

The Blackridge project drivers included meeting tightened standards for treated effluent with respect to BOD (9mg/l) and ammonia (2mg/l) as well as a first time phosphorus standard (2mg/l based on annual average). To address this, the project scope included the installation of 2 (No.) SAF plants before the secondary filters, and the refurbishment of these secondary filters.

The revised process provides carbonaceous treatment through the SAFs to allow the existing secondary filters to provide nitrification. A chemical dosing plant for the addition of caustic soda has been installed to ensure there is sufficient alkalinity for nitrification,



Linlithgow WwTW - Courtesy of Brian Carral © Scottish Water



Bathgate WwTW - Courtesy of Brian Carral © Scottish Water



Torphichen WwTW - Courtesy of Brian Carral © Scottish Water



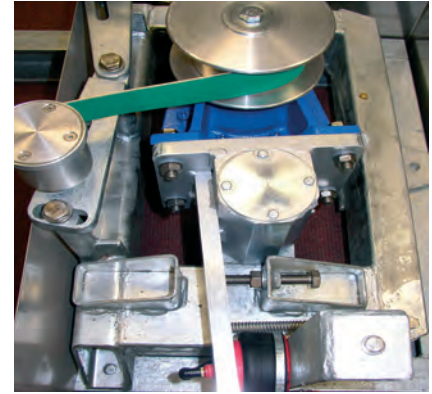
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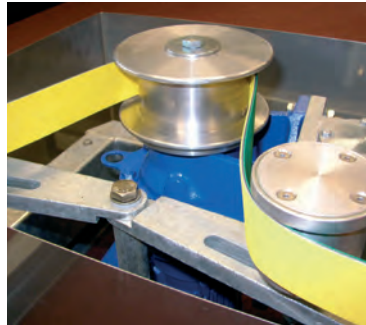
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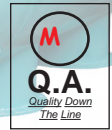
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after analysis of the treated effluent during the design stage had identified that the impact of the addition of ferric sulphate for phosphorus removal would result in a shortfall.

Delivering significant long-term benefits

The banks of the Avon and its many tributaries were once home to the region's strong indigenous papermaking and coalmining industries. They have since moved on and the river is slowly returning to its natural state. The added investment by Scottish Water will result in significant improvements to the water quality and the natural environment of the River Avon for years to come.

Along with the River Almond, the Avon is the lifeblood of West Lothian, and is an important brown trout river, which is also seeing increasing numbers of sea trout, salmon and grayling. A stronger, cleaner River Avon is good for residents and visitors alike, and this investment will ensure that future generations in West Lothian and Falkirk can continue to enjoy the river, whether for fishing, walking or other leisure activities.

Conclusion

The project has been supported by those who know the river best, the anglers who spend their weekends fishing the Avon

as it flows through West Lothian beneath the country's highest canal aqueduct and under the arching railway viaduct, which West Lothian has adopted as its emblem. The Linlithgow Angling Club is probably best aware of the change in the river over the last few years. Speaking at the launch of this suite of projects, the organisation's Harry Millar said:

"Linlithgow Angling Club welcomes this investment by Scottish Water. It should help improve aquatic invertebrate life in the Avon, and consequently populations of fish, birds and other animals that are dependent on the river."

Across Scotland, Scottish Water is listening to communities and delivering the important investment they say is needed. This programme of improvements at wastewater treatment works throughout West Lothian will help to improve the natural environment of one of Scotland's fastest growing communities for many, many years to come.

The Editor & Publishers would like to thank Mark Keast, Senior Construction Manager with Scottish Water Solutions, for providing the above article for publication.



River Avon with viaduct in background - Courtesy of Peter Devlin Photography © Scottish Water