

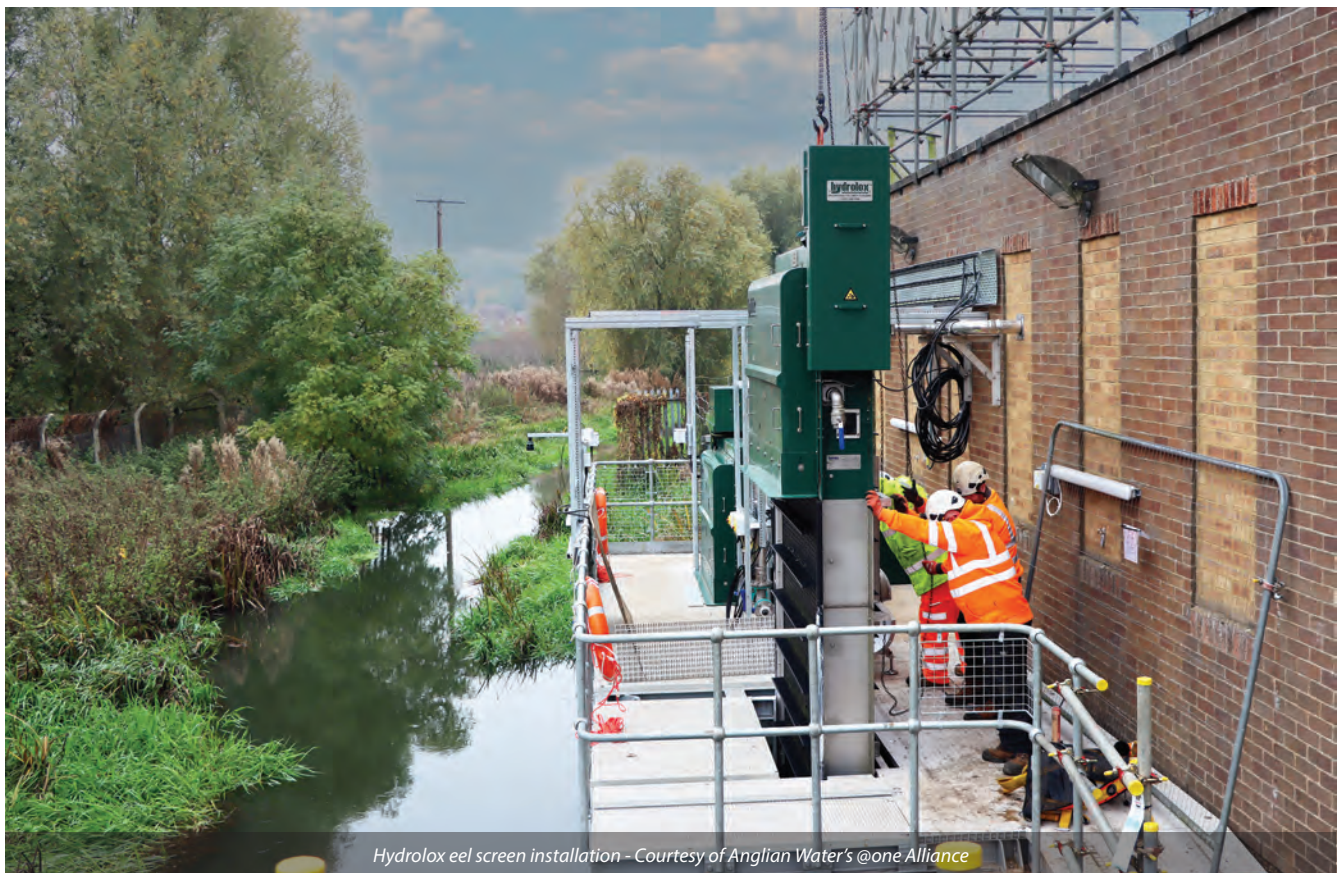
Duston Mill Pumping Station Intake

complying with the Eel (England and Wales) Regulations 2009

at the raw water intake for Pitsford WTW

by Anglian Water's @one Alliance

Duston Mill Pumping Station in Northampton is a critical Anglian Water asset supplying raw water to Pitsford Reservoir, a primary water source for nearby communities and industries. The pumping station plays a pivotal role in water abstraction and distribution, ensuring the consistent and reliable supply of water resources to meet the growing demands of households, businesses, and agricultural operations. Nestled in an area rich in biodiversity, the station's surrounding environment is home to numerous aquatic and terrestrial species. Among these is the European eel (*Anguilla anguilla*), a species classified as critically endangered due to a significant decline in population over the past few decades.



Hydrolox eel screen installation – Courtesy of Anglian Water's @one Alliance

Background

The river system around Duston Mill is part of a vital migration route for eels, making the preservation of this habitat a key priority for ecological conservation efforts.

In addition to its ecological significance, Duston Mill's location within a dynamic river system presents unique operational challenges. Seasonal variations in river levels, potential flooding events, and the need for uninterrupted water supply create a complex balancing act between operational efficiency and environmental responsibility. These factors make Duston Mill a prime candidate for innovation in water management infrastructure.

The issue

The European eel population has experienced an alarming decline of up to 95% since the 1970s, attributed to a combination of factors including overfishing, habitat loss, climate change, and barriers to migration. These barriers, which include water intake systems and hydropower facilities, are a significant threat as they hinder the eels'

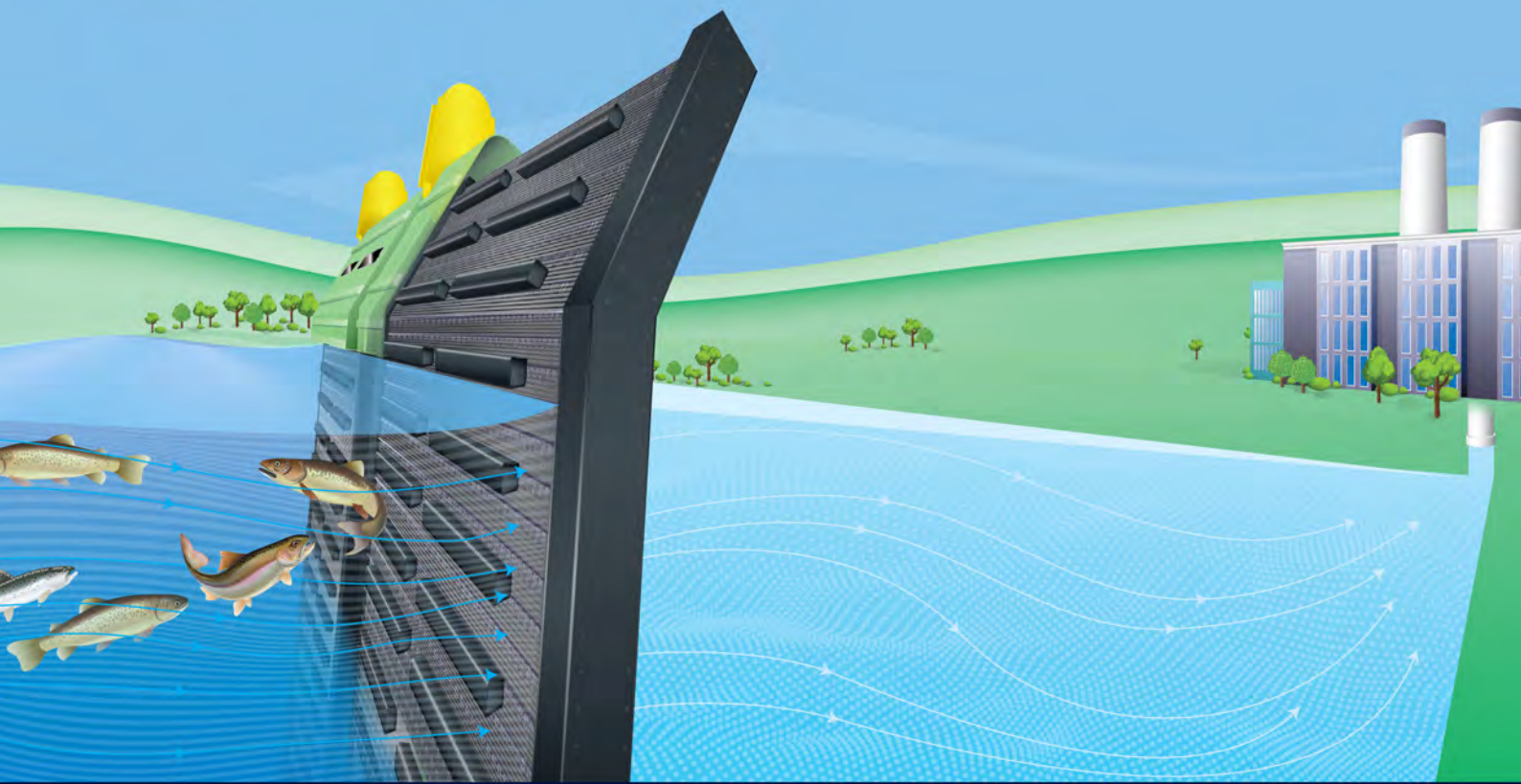
natural life cycle by preventing migration and causing injury or death during intake processes.

To combat this crisis, the Eel (England and Wales) Regulations 2009 were introduced, mandating measures to protect eel populations, particularly at water abstraction points. Therefore compliance with these regulations are critical, as failure to address the requirements can exacerbate the decline of eel stocks and result in penalties for the water companies.

Existing intake structure

At Duston Mill, the existing intake structure was assessed and found to be non-compliant with these regulations. The intake consists of two channels, each equipped with angled baffles, flat bar coarse screens, and fine mesh cup screens.

While these components provide basic screening functionality, they do not meet the stringent standards required to prevent eel entrainment and impingement.



SOLUTIONS FOR COMPLIANCE **WITH EELS REGULATIONS**



- Compliant with The Eels (England and Wales) Regulations 2009
- Greatly reduces injury, impingement, and mortality
- Verified by independent testing as the best technology available on the market
- Identified by the Environment Agency as a solution for glass eels, elivera, and adult yellow/silver eels
- Can be equipped with or without a proven recovery and return system
- Reduced maintenance, lowest total cost of ownership, and industry-leading warranties

Time-limited exemptions granted by the Environment Agency allowed continued operation while plans for compliance were developed. However, these exemptions are set to expire, necessitating immediate action.

Adding to the complexity, the station is the sole source of water supply to Pitsford Reservoir, requiring that abstraction operations continue uninterrupted during the upgrade. This dual challenge of maintaining operational continuity while implementing a compliant solution underlines the importance of careful planning and execution.

Duston Mill Pumping Station: Supply chain - key participants

- **Project delivery:** @one Alliance
- **Mechanical/electrical PSSC works:** Waveney
- **Eels screens:** Hydrolox
- **Steel access metalwork:** Global Energy Group
- **MCC:** Paktronic Engineering Co Ltd
- **Roof survey:** Claret Civil Engineering Ltd

The solution

To address these challenges and bring the station into compliance, a robust solution was developed by the Anglian Water's @one Alliance. The centrepiece of the project was the installation of a modern positive exclusion screening system, that meets the Eel (England and Wales) Regulations 2009 and supports broader environmental conservation efforts.

The solution involved replacing the outdated coarse and fine screens, with two high-performance Hydrolox traveling band screens. These were designed to operate with a 2mm slot size and an approach velocity of ≤ 0.4 m/s, ensuring optimal protection for yellow and silver eels.

The screens will operate in a duty/duty configuration, allowing each to handle 50% of the design flow and maintaining redundancy and reliability. To support the new screens, a steel structure was constructed on the intake frontage, providing a secure foundation and incorporating access platforms and handrails to facilitate maintenance and inspections. Additionally, an automated wash water system, powered by duty/standby submersible pumps delivering 5.94 l/s of water at 4 bar pressure, will ensure uninterrupted performance by efficiently clearing debris from the screens.

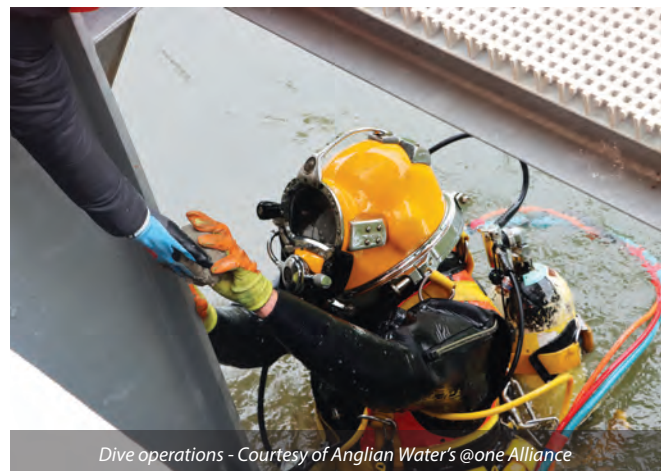
The solution also included integrating the new system with existing automation and telemetry controls through a new motor control center (MCC) and human-machine interface (HMI). The installation was carried out in phases to maintain the continuous abstraction, with one intake channel remaining operational while the other is upgraded, ensuring a steady water supply to Pitsford Reservoir throughout the project.

To minimise disruption to the aquatic environment, environmental safeguards were included like air-lifting localized silt deposits and removing existing coarse screens and baffle plates to prepare the site for installation. These measures ensure that the project aligned with both regulatory compliance and ecological preservation goals.

Environmental & operational benefits

From an environmental perspective, the new screening system will play a critical role in supporting eel population recovery. By preventing the impingement of eels, the from Hydrolox system allows these species to continue their natural migration and life cycles.

Compliance with the Eel (England and Wales) Regulations 2009 will contribute significantly to reversing the severe decline in eel stocks, promoting ecological balance and enhanced biodiversity.



The protection of eels and other aquatic species fosters a healthier river ecosystem, benefiting a wide range of wildlife. Additionally, the project aligns with the goals of the Water Industry National Environment Programme (WINEP), meeting regulatory requirements while demonstrating a strong commitment to environmental stewardship.

Operationally, the project brings improved efficiency, reliability, and adaptability. The advanced design of the new system, combined with automation, will streamline operations by reducing energy consumption and minimising Anglian water's maintenance costs. The automated wash water system ensures debris buildup is efficiently managed by maintaining optimal flow rates. The duty/duty operational configuration offers redundancy, allowing abstraction to continue uninterrupted during maintenance or equipment failures.

The robust design, with a 40-year horizon for civil structures and a 15-year horizon for mechanical components, guarantees long-term resilience and reliability. Furthermore, the system's ability to accommodate peak abstraction flows of up to 1,053 liters per second, and its scalability for higher river levels, ensures adaptability to future demands.

Community & economic benefits

From a community and economic standpoint, the benefits are equally significant. Continuous abstraction during construction ensures an uninterrupted water supply to communities and industries dependent on Pitsford Reservoir. The phased installation approach minimised disruptions, maintaining trust and reliability among customers & stakeholders.

Proactively addressing compliance during AMP7 also provides a cost-effective solution, avoiding the potential for higher expenses and operational constraints in AMP8 and beyond.

The project enhances public perception by showcasing a clear commitment to environmental sustainability, strengthening the organization's reputation among regulators, local communities, and environmental advocates. These collective benefits highlight the comprehensive value of the project in achieving environmental, operational, and societal goals.

Conclusion

The £2m upgrade at Duston Mill Pumping Station represents a landmark initiative in integrating ecological responsibility with operational excellence. By addressing the non-compliance issues and implementing cutting-edge eel protection measures, the project ensures adherence to legal requirements while contributing to the conservation of a critically endangered species. Beyond regulatory compliance, the initiative highlights the broader benefits of sustainable water management, from enhanced biodiversity to improved operational resilience and community trust.

As Duston Mill transitions to this new system, it sets a benchmark for similar projects, demonstrating that sustainable practices and technological innovation can coexist to meet both human and environmental needs. This forward-thinking approach not only safeguards the future of the European eel but also exemplifies the role of modern water management in creating a harmonious balance between development and conservation.

The editor and publishers would like to thank Anglian Water's @one Alliance for providing the above article for publication.

The @one Alliance is a collaboration of eight partner companies that each provide specialist knowledge allowing the Alliance to deliver complex delivery projects in the most efficient way, reducing the cost to Anglian Water's customers. The partners are Anglian Water Asset Delivery, Balfour Beatty, Barhale, Binnies, Mott MacDonald Bentley, Sweco, Skanska, and MWH Treatment.

