

Langford Weir Fish Pass

reconnecting rivers: the construction of a dedicated fish and eel pass on the River Blackwater to re-connect river channels

by Stonbury Ltd

According to the European Commission, scientists estimate less than 1% of UK rivers are free from barriers to fish and eel migration. There has been a concerning decline in eel populations in recent years, and although the exact reasons for this are unknown, the government's Water Industry National Environment Programme (WINEP) aims to help restore populations by requiring water companies to create vital passages for fish and eels at sites of obstruction. This project involved the construction of an 18m-long fish and eel pass at Langford Weir on the River Blackwater, about 50m downstream of an abstraction point used to abstract around 160 megalitres of water per day. The project enables aquatic species to migrate past the weir that was built to maintain the river's water level to maximise abstraction availability.



Aerial view of the completed fish and eel pass - Courtesy of Stonbury Ltd

Site description

The River Blackwater is an Environment Agency (EA) designated main river and runs through the centre of Langford in Essex. The Blackwater intake, operated by Essex & Suffolk Water (ESW) provides raw water for transfer to Hanningfield Reservoir. A smaller abstraction, which feeds the Langford Water Treatment Works (WTW), takes place at the Langford Mill intake approximately 150m downstream.

The River Blackwater splits into two channels at Langford Weir. The main River Blackwater flows westwards over the weir to a pond and continues to its confluence point with the River Chelmer, at Beeleigh, just north of Maldon Golf Club. Flows around the Langford Mill intake are conveyed in an eastern Blackwater channel to Beeleigh. The site is in a designated Conservation Area.

Project scope

A summary of the works undertaken is as follows.

- Survey and design (by Stantec UK).
- Site preparation and groundworks.

- Construction of retaining wall to the River Blackwater.
- Construction of an in situ cast concrete fish pass structure including stop log isolation to both ends of the structure.
- Fish baffle and eel tile installation.
- Flow restrictor installation (in conjunction with the Environment Agency).
- Bespoke camera box installation.

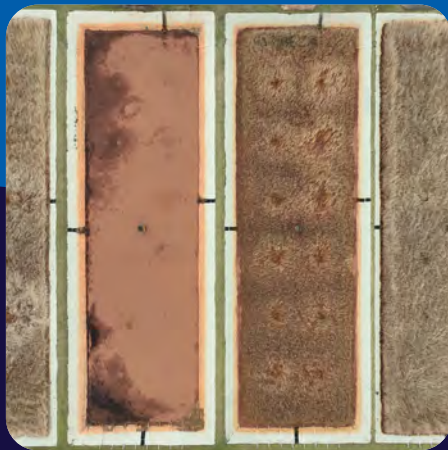
Design

Prior to Stonbury's involvement in the programme, Stantec UK undertook the detailed design of the structure for ESW. A design was selected to suit both the asset geography and the species likely to use the pass. The pass design featured two specialised channels: one with multi-sized eel tiles and the other with Larinier fish baffles, featuring a resting pool halfway along the fish side. The tiles in both channels of the gravity-fed system were engineered to optimise water flow and facilitate easy passage for aquatic species.

Environmental management

A project site environmental assessment sought to register and mitigate site-specific environmental impacts such as noise, land

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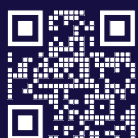
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and watercourse pollution, waste materials and damage to local ecology. Identified environmental risks were controlled through measures detailed in risk assessments and method statements.

A preliminary ecological appraisal was undertaken during the pre-construction phase to determine the presence of dedicated nature conservation sites and protected species in proximity to the site. During assessment, the toxic plant hemlock water dropwort was identified, and specific H&S protocol was put in place to protect workers.

The Client worked closely with the EA during the flood risk activity permit (FRAP) application and continued a close dialogue throughout the project. This included a collaborative visit by several EA staff to view project progress and discuss potential improvements and initiatives.

Site preparation

As the site is in a conservation area which has a high potential for archaeology, the programme methodology included special measures to avoid breaking ground unless it was essential. Therefore, to install a safe access route to the working area, timber bog mats were laid to create a firm access road without excavating the ground. Suppliers with a specialist machine were mobilised for the removal of two large tree stumps that were obstructing the location of the new pass.

To dewater the site and create a dry working area, a temporary Portadam system from OnSite Central Ltd was installed. One dam was installed on the river side at the top end of the pass, and a second in the pond at the lower end of the pass. Temporary pumping was used to drain the area behind the Portadams and maintain drainage throughout the programme. Once the working area was dry, a piling mat was laid to allow access for the installation of steel sheet piling to prevent water from undermining the pass structure and provide additional foundation support.

Langford Weir Fish Pass: Supply chain - key participants

- **Principal contractor:** Stonbury Ltd
- **Principal designer:** Stantec UK
- **Ecological appraisal:** Essex Ecology Services Ltd
- **Archaeologist:** Wessex Archaeology Ltd
- **Civils construction subcontractor:** GMP Projects Ltd
- **Piling contractor:** GM Piling Ltd
- **Portadam:** OnSite Central Ltd
- **Temporary pumping:** Selwood
- **Concrete delivery:** G&B Finch
- **Fish baffles:** Aquatic Control Engineering
- **Eel tiles:** Berry & Escott Engineering Services
- **Stainless steel:** Wickham Engineering

Construction

While the working area was being dried, the team began excavating for the new fish pass. Initial excavations were supervised by the Client's archaeologist, as stipulated in the planning conditions for excavation works. To avoid the necessity for the archaeologist to attend over several separate days, the site team carried out all excavations under one watching brief and backfilled before re-excavating while building the pass.

Sheet piling was installed at both ends of the pass to enable secure anchoring of the finished structure. This was achieved by driving piles into the riverbed at varying depths to create a stepped finish for the base, which was filled with a lean mix concrete to create a suitable foundation for the rest of the structure.

Bespoke steel supports were built and formwork was erected. A new concrete river wall was formed at the top of the pass to integrate with the existing structure. Formwork was then filled with



Site overview prior to construction of the pass - Courtesy of Stonbury Ltd



Tree stump removal as part of site preparation - Courtesy of Stonbury Ltd



Portadam system in place - Courtesy of Stonbury Ltd



Completed concrete channels - Courtesy of Stonbury Ltd

concrete to create the main pass structure which included both fish and eel channels, a resting pool part-way up the fish pass, and cut-outs for stop logs and the new camera monitoring system.

After casting the concrete pass structure, the team installed an engineered wall on the river side of the structure and gabion baskets on the pond side to support the bank and backfilled behind the baskets with clean stone. The lower gabion on the southern side (nearest the bank) was placed to prevent pooling in what would otherwise be a 'dead end' for the fish and eels looking for a way into the pass. The banks and ground around the structure were then reinstated with the previously excavated material.

To complete the pass, the team lined the inside of the channels with bespoke Larinier fish baffles and tiles suitable for eels and elver. On the eel side, GRP mesh flooring was affixed on top of the channel. A handrail was installed around the structure to allow safe access for operatives to maintain the pass and remove debris, and a debris deflector was installed at the head of the eel pass to reduce debris entering the system.

Finally, Principal Contractor, Stonbury Ltd, worked with the Client and the EA to form experimental flow restrictors to control flows on the eel channel to maximise its operation, and with specialist suppliers to fabricate a bespoke waterproof camera box to monitor the number and diversity of fish using the pass.

Challenges

The project posed two main challenges. First were the restrictions caused by the small working area constricted by two water courses and proximity to several protected trees. As there was only one access route to the working area, excavations and sheet pile installations had to be completed in stages, using an excavator with

a Movax attachment, working backwards along the single access route.

Second, persistent heavy rain led to multiple major flood events which breached the Portadam and forced the team to reset the site and reinstate the working area before recommencing work. This was successfully managed by monitoring river and rainfall data to identify opportunities to reset and pump the area dry.

Sustainability

Addressing Stonbury's and ESW's commitment to deliver low-carbon, environmentally restorative infrastructure, each element of the project was completed using the most sustainable method practically available. These included:

- Using low-carbon, or 'low-C' concrete to form the main pass structure.
- Reuse of materials when possible - no excavated material was removed from site.
- Minimising on-site waste.
- Minimising fuel usage by ensuring pumps were switched off when not required.

Conclusion

The team's dedicated persistence achieved delivery despite the site constraints and setbacks due to unprecedented wet weather. The project will help facilitate the successful migration of fish and eels, re-connecting previously isolated populations and enhancing breeding opportunities. These benefits are highly likely to result in a significant increase in biodiversity.

The editor and publishers would like to thank Stonbury Ltd for providing the above article for publication.



Construction components; clockwise from top left: Gabion baskets, specialised fish and eel tiles, soil reinstatement, and safety railings - Courtesy of Stonbury Ltd