

# Pilcot Mill

## River Restoration Project

### Landowner Information Pack

February 2023



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## **1.0 Background Information**

### **1.1 South East Rivers Trust**

[The South East Rivers Trust](#) is an environmental charity dedicated to the conservation and restoration of rivers in the south east of England, including parts of South London, Hampshire, Berkshire, Surrey, East Sussex and Kent.

Our vision is for healthy, thriving rivers for people & wildlife in the south east of England which we achieve through delivering outstanding river ecosystem enhancement through science-based action, collaboration, education & engagement.

We are a member of the [Rivers Trusts](#) (formerly the Association of Rivers Trusts) – a national movement to protect rivers across the UK and share best practice in their conservation and restoration.

### **1.1 South East Water**

South East Water abstract 540 million litres of groundwater and surface water under licence, issued by the Environment Agency, every day, to provide a source of clean drinking water to our 2.3 million customers in the south east of England.

The water company are required by the Environment Agency to assess the sustainability of our abstractions, and where necessary implement measures to reduce abstraction, or suitably mitigate impacts on the environment.

### **1.2 The Project**

South East Water's Chalk groundwater abstraction at Itchel is located in the headwaters of the Itchel Brook, which forms part of the Hart (Crandall to Elvetham) surface water body (water body reference GB106039017090).

Investigation by South East Water and the Environment Agency identify flow failures on the waterbody associated with groundwater abstraction at Itchel. The abstraction impacts are contributory to preventing the macro-invertebrate community reaching Good Ecological Status. An Options Appraisal undertaken between 2015-2020, identified a requirement to reduce the volume of water abstracted and, in addition, to undertake river restoration works in the catchment.

Earlier this year you were contacted by South East Water and The South East Rivers Trust (SERT) in order to obtain access to the Itchel Brook and River Hart where it flows through your property to assess potential issues at this point in the surface water system. Since undertaking our site visits, The Trust has been in the process of appraising options to improve habitat and geomorphology for your section of river.

At Pilcot, our primary interests are to ensure fish species, such as brown trout and European eels, are able to access the entire river channel, in order to utilise the variety of habitats they require to thrive and become a resilient and sustainable population, as well as improving the overall riverine habitat. Removing barriers to fish passage, such as weirs, helps to build

resilient fish stocks and helps to restore the river to a more natural condition, is one way this is achieved.

We have identified a series of potential improvements to ensure your section of the River Hart fulfills its greatest potential for wildlife and that it can sustain itself naturally without the ongoing need for management or intervention.

The project works to improve the resilience of the River Hart to modern day pressures such as climate change, water scarcity and pollution.

### **1.3 Initial Proposals**

This document presents our initial concept proposals for your consideration. We would like to reach agreement with you to progress the following improvements to the detailed design and feasibility stage of the project.

1. Pilcot Mill fish passage improvement
2. Habitat improvements upstream of Pilcot Mill
3. Habitat improvements downstream of Pilcot Mill

## **2.0 River Improvement Proposals**

### **2.1 Fish Passage Improvement**

#### **2.1.1 Pilcot Mill**

Pilcot Mill is a Grade II listed Corn Mill that was decommissioned in 1928. The mill building has been partially restored by the former owner of the property, who passed away before restoration was complete. The current owner aspires to continue with the restoration of the mill.

The weir itself has a hydraulic head of ~1.5m and comprises of three channels: One former wheel pit, which is now dry and inactive; one sloped channel, of approximately 2m length and 1m in diameter; and one curved channel, of approximately 3m length and 1m diameter, comprising of three ~30cm steps.

The sloped channel and wheel pit are comprised of historic masonry and the curved stepped channel is comprised of more modern concrete, perhaps indicating that the weir was modified at a date prior to its original construction, or after the mill was decommissioned.

The structure is likely to be impassable for all fish species due to; the length and gradient of the sloped channel; step height within the curved channel; adverse water depth and flow velocity at various points across the structure; a lack of fish resting locations; and an absence of suitable climbing substrate for European eels.

#### **2.1.2 How does the weir affect the River Hart?**

- The weir impedes fish migration, preventing resident and migratory fish from completing their life cycles and reaching valuable habitats upstream and downstream.
- The structure fragments fish stocks meaning that The Hart's fish population is less resilient to disturbance and will take longer to recover following fish kills.
- The structure artificially raises water levels and slow flows upstream resulting in a canalised section of river that is prone to sedimentation.
- The structure restricts the movement of the river's gravels resulting in an absence of clean and mobile gravel that could otherwise be utilised by fish for spawning or by oxygen loving aquatic invertebrates and plant species.

#### **2.1.3 What is the proposed solution?**

In most situations our primary option would be to remove a weir in its entirety, to provide a free flowing and dynamic section of river that is accessible for all fish species and wildlife. In this instance, this is not possible due to the heritage value and Grade II listing of Pilcot Mill.

There is also a significant head difference between water levels upstream and downstream which means that weir removal can prove problematic. In situations such as this, a technical fish pass is recommended in order to provide fish with the means of passing over the weir.

Technical fish passes are bespoke prefabricated structures that are retrofitted onto a weir in order to provide the correct depth and flow conditions to allow most fish species to swim upstream and downstream.

In addition to the technical fish pass, an eel pass is also required. European eels are a critically endangered species that enter our river systems from the sea to live out the majority of their juvenile and adult life phases. Continuous unobstructed habitat is essential for their survival. Unlike species within the carp and salmon families, eels are not the strongest swimmers and require climbing substrate to pass over an obstacle obstructing the main flow of a river, thus an eel pass is required in addition to the technical pass.

Eel passes are comprised of prefabricated eel tiles that provide climbing substrate for a variety of sizes of eel. Eel tiles can be discretely attached to the bed of walls of a weir to provide a continuous passage route over the structure, thus allowing the species to pass upstream and downstream.

Landowners are obliged to make provisions for eel passage under UK Eel Regulations should they ever undertake repairs to a structure they own. The proposed project will ensure this legislative requirement was facilitated at no expense to the landowner.

#### **2.1.4 What are the benefits of installing a fish passage?**

- Free passage for coarse fish, salmonids and European eels, providing resilient fish stocks with access to the diverse range of habitats they require to complete their life cycles.
- With consideration for aspiration to further restore the structure; this project will support the landowner in ensuring compliance with UK Eel Regulations.

#### **2.1.5 How will this be achieved?**

1. Topographical survey(s) of the weir to inform the design and production of detailed construction drawings.
2. SERT will produce detailed designs for the technical fish pass in order to inform the construction process.
3. Consultation with the landowner to provide updates and opportunity to feedback.
4. Hydraulic modelling for the preferred design option to demonstrate the correct conditions could be provided for fish passage and to demonstrate that the pass will not increase flood risk.
5. A Flood Risk Activity Permit (FRAP) will be obtained from the Environment Agency to confirm that the works can go ahead and pose no increased risk to flooding or bring ecological damage.
6. The fish pass design will be approved by the Environment Agency's National Fish Pass panel approval.
7. A specialist contractor will be procured to prefabricate and install the pass.
8. South East Rivers trust will supervise the construction of the project.



### **2.1.6 How will the Grade II Listing of Pilcot Mill be considered?**

The weir associated with the mill is referenced within Historic England’s list entry for the building as “Brick walling arranged to provide sluices and boundary to the mill dam near the mill”.

As a first port of call, SERT will seek pre application advice from Hart District Authority regarding the proposed fish passage improvement. This will enable us to design an improvement that is in keeping with the listing and heritage value of the site.

### **2.1.7 How might the improvements look once complete?**

The installation of the fish pass will not result in any significant change to the existing weir structure. The fish pass will be installed in one of the existing channels of the weir and will be designed to be discreet.

The passes themselves are constructed from metal and are usually housed between two brick walls. The fish pass is likely to be faster flowing than the existing weir channels. The flow discharging from the outlet of the pass will also be visible in the weir pool downstream, which currently is slow flowing.

The illustrative images below demonstrates a potential location for the pass on the existing weir and how it may look once installed.

### **2.1.7 How long might the installation take?**

Following sign off of planning applications, flood risk modelling and regulatory permissions, the fish pass will take approximately 1-2 weeks to install.



*Above: Pilcot Mill Weir, existing conditions*



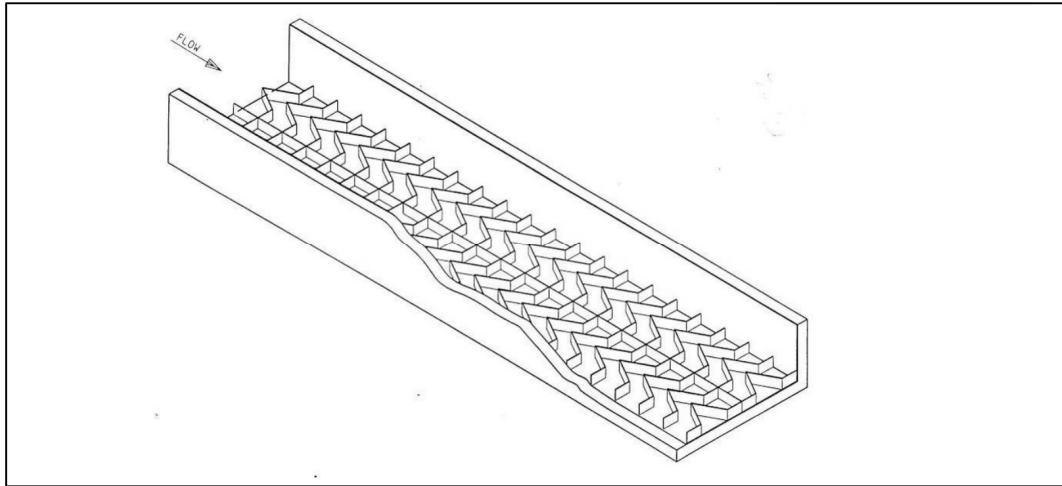


*Above: Pilcot Mill with proposed fish pass*



*Above: Pilcot Mill with proposed fish pass*





*Above: Larinier fish pass diagram*



*Above: Eel tiles providing continuous climbing substrate*

## **2.2 River Habitat Restoration Upstream of the Weir**

Upstream of the mill, the river has near vertical banks that are regularly mown and do not support much botanical diversity nor provide any complex riparian habitat structure.

A number of mature trees are present on the western bank of the river, which help to provide a nice mix of light and shade and some overhanging structural habitat.

The landowner of the eastern bank has installed some areas of soft revetment (spilling), most likely because the exposed, un-vegetated bank is prone to erosion during periods of high flow.

The weir creates slow flowing conditions for around 60 meters upstream of the mill, but surprisingly does not seem to have a pronounced effect on the river when compared to other similar sites.

Generally the river remains shallow, with gravel substrate and only a thin layer of silt, present on its final approach to the crest of the weir.

The riverbed has uniform depth on its approach to the mill with some evidence of sediment deposition in the margins of the river.

No submerged or emergent vegetation was present in the channel at the time it was observed (May 2022), which is unusual, and may be indicative of high water velocity during elevated flows.

### **2.2.1 What are the features of the channel we wish to improve?**

- The flow of the river is uniform and lacks the energy to maintain and create new habitat features. Slow flows lead to silt depositing on the river bed which can kill off fish eggs and aquatic invertebrates.
- The cross section of the channel is enlarged without the presence of a low flow channel meaning that it is prone to drought conditions.
- There is little plant growth in the margins of the river, meaning that there is not sufficient refuge for juvenile fish during their first year of life.
- There is little transitional habitat between the watercourse and the formally managed landscape to the detriment of both aquatic, terrestrial and avian wildlife.
- Steep and bare banks provide poor habitat for other wildlife such as nesting wildfowl and water voles.

### **2.2.2 What is the proposed solution?**

- The installation of marginal berms to provide a narrower, sinuous river channel well suited to the current flow conditions.
- The planting of native plant species to provide riparian buffer habitat for the benefit of aquatic, terrestrial and avian wildlife.

### **2.2.3 What are the benefits of this river restoration?**

- The river will adapt to low flow conditions, providing greater resilience against drought and climate change scenarios.
- The river will have sufficient stream power for natural geomorphological processes to occur freely, providing a self-sustaining watercourse with dynamic habitat.
- The river will clean the gravels for the benefit of fish spawning, oxygen loving aquatic invertebrates and plant species.
- Marginal habitat complexity will increase, providing refuge for juvenile fish, emerging aquatic invertebrates, nesting waterfowl, amphibians, reptiles and potentially water voles.
- The provision of wild flowers will benefit pollinators such as bees and butterflies.

#### **2.2.4 How will this be achieved**

1. SERT will produce detailed designs for the improvement and obtains a Flood Risk Activity Permit (FRAP) from the Environment Agency to obtain permission to work.
2. Consultation with the landowner to provide updates and opportunity to feedback
3. Marginal berms are installed to reshape straightened watercourses and are constructed of brushwood faggots backfilled with topsoil or gravel. Alternatively brush wood can be pinned into the margins of the river to achieve the same effect via aggregating fine sediment over time.

Once installed, an appropriate mix of native plant species will be introduced to provide vegetation in the margins of the river, whilst the centre of the channel stays clear.

The berms will be installed by SERT's in house staff using hand tools and specialist plant and machinery.

4. Native plant species will be acquired from a specialist plant nursery and introduced to the marginal berms, bank face and immediate bank top to create a riparian buffer strip.

#### **2.2.5 How might the improvements look once completed?**

The main aesthetic change will be the narrowing of the watercourse, provision of in-stream and riparian plant life and faster flowing rippled water.

Water levels will not be lowered or raised or lowered. Illustrative images on the following page demonstrates how this may look when completed.





*Above: Upstream of weir (current conditions)*



*Above: Upstream of weir with proposed improvements*



## **2.3 River Habitat Restoration Downstream of the Weir**

Downstream of the Mill Pond the river increases in energy and narrows to approximately two meters before flowing towards Pilcot Road.

The left bank of the river has a steep incline, with the driveway to Pilcot Mill located on the bank top in close proximity to the river. The right bank of the river is enforced (most likely with concrete) and has a vertical profile with a laurel hedge row on the bank top, marking the border of a residential garden.

The river is shallow with rippled flow and clean gravel substrate in this location, with occasional vegetated mid-channel bars indicating a higher degree of morphological activity in comparison to areas upstream.

The banks of the river are regularly strimmed, meaning no mature riparian vegetation was present. There is also very little emergent vegetation in the littoral zone, as the margins of the river are exposed to the rivers flows, with very few protected areas available for macrophyte establishment.

### **2.3.1 What are the features of the channel we wish to improve?**

- The cross section of the channel is enlarged, with no low flow channel, meaning that it is prone to drought conditions.
- There is little variation in depth and limited movement of the rivers gravels.
- There is little plant growth in the margins of the river, meaning that there is not sufficient refuge for juvenile fish during their first year of life.
- There is little transitional habitat between the watercourse and the formally managed landscape to the detriment of both aquatic, terrestrial and avian wildlife.

### **2.3.2 What is the proposed solution?**

- The installation of flow deflectors to provide a variety of flow types, water depths and to mobilise gravel substrate.
- The planting of native plant species to provide riparian buffer habitat for the benefit of aquatic, terrestrial and avian wildlife.

### **2.3.4 What are the benefits of this river restoration?**

- The river will adapt to low flow conditions, providing greater resilience against drought and climate change scenarios.
- Stream power will increase for natural geomorphological processes to occur freely, providing a self-sustaining watercourse with dynamic habitat.
- The river will clean the gravels for the benefit of fish spawning, oxygen loving aquatic invertebrates and plant species.

- The river will offer increased marginal habitat complexity, providing refuge for juvenile fish, emerging aquatic invertebrates, nesting waterfowl, amphibians, reptiles and potentially water voles.
- The provision of wild flowers will benefit pollinators such as bees and butterflies.

### **2.3.5 How will this be achieved?**

1. SERT will produce detailed designs for the improvement and obtain a flood risk activity permit (FRAP) from the Environment Agency to obtain permission to work.
2. Consultation with the landowner to provide updates and opportunity to feedback
3. Flow deflectors will be created by pinning tree trunks to the bed of the river to pinch the channel to provide a variety of flows. These will be installed by SERT's staff using hand tools.
4. Native plant species will be acquired from a specialist plant nursery and introduced behind flow deflectors, and on the face of the river bank.

### **2.3.6 How might the improvements look once completed?**

1. The main aesthetic change will be the narrowing of the watercourse with wooden flow deflectors, the provision of in-stream and riparian plant life and faster flowing rippled water. Illustrative images on the following page demonstrates how this may look when completed.



*Above: Downstream of weir (current conditions)*



*Above: Downstream of weir with proposed improvements*