

Defra River Improvement Fund Phase 3: Final Report

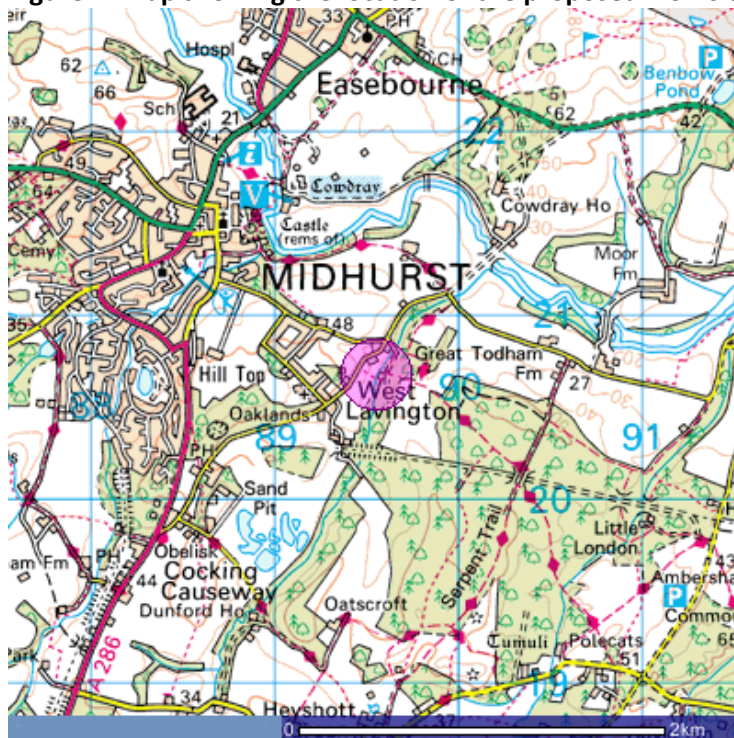
Project Ref	RT320
Rivers Trust	OART
Project Title	Costers Brook Connectivity Project
Period ending	October 2012

Introduction

The Costers Brook is a delightful tributary of the Western Rother, rising from the natural Chalk springs of the South Downs and flowing down towards the town of Midhurst in West Sussex. The Western Rother is failing the European Union (EU) Water Framework Directive (WFD) targets for fish. This is due to a number of issues, including in-channel obstructions, water quality problems and geomorphological limitations. The Costers Brook provides excellent quality habitat for range of fish species, including sea trout, brown trout, eels, river lamprey and other coarse fish species, however, access is limited by two structures located within a couple of kilometres of the confluence of the Brook with the Rother. These obstructions comprise a weir at a mill (now a domestic dwelling) and less than one kilometre upstream of this is a culverted farm bridge. The project proposal was to significantly improve passage for sea trout, brown trout, eel and other coarse fish species over these two structures, opening up several kilometres of watercourse.

In particular, the stretch of Costers Brook proposed to be improved is recognised by the local EA as being critical as the upper part of the brook has concreted gravels due to the natural chemical makeup of the stream, and the lower sections are drowned in sand (another problem facing the Brook), therefore the middle reach that this project addresses provides the best spawning habitat opportunity for the Brook as a whole. The initial overall project plan was to facilitate fish easement at the mill weir by devising a suitable means of improving fish passage (either through a unique design or by installing a section of pre-formed fish pass) and to replace/modify the multi-culverted farm bridge with a clear span bridge or to undertake river modification works to ease fish migration through the culvert pipes.

Figure 1: Map showing the location of the proposed works on the Costers Brook, Sussex, SU8955 2067



Ref: Fishtek Report to OART 2012

Project Delivery

1. Mill Weir on the Costers Brook

A sloping stone weir built into the mill leat when the mill was first operating currently acts as a barrier to fish passage. After preliminary assessments were conducted in December 2011 Fishtek Consulting Ltd where commissioned to undertake a fish pass assessment in order to identify suitable options to improve the passage of upstream migrating fish and to design the most appropriate solution, including the preparation of technical drawings that contractors could use to deliver the works.

Figure 2: Before the works - the sloping weir built within the stone mill leat on the Costers Brook



Photo ref: J. Whiting 2012

Prior to the works the mill weir was regarded as almost a complete barrier to migratory fish, with both brown and sea trout frequenting the catchment. The weir has a total head-drop of 1.5m, is 3m wide, and is set at a 25% gradient. Water flows quickly down the shallow weir face, making it difficult for fish to pass. Furthermore, stop logs upstream of the weir, beneath a footbridge, create a further barrier to fish migration. The stop logs create an approximate 200mm head drop and the water flows across a shallow cill beneath the bridge, likely to be impassable for most fish. Even when there are relatively high flow conditions in the Brook the water is still very shallow across the weir face with depths on the crest of less than 70mm. It is unlikely that migratory salmonids would be able to pass the weir with depths of less than 100-150mm.

The mill is also a Grade II listed building which included the mill leat and weir as part of the 'listed curtilage'. This entailed obtaining formal Listed Building Consent for the proposed works and ensuring that any design was sympathetic to the high aesthetic and cultural heritage value of the site. Furthermore, the landowner stipulated that any fish easement must keep two thirds of the weir face free for recreational purposes.

The evaluation of easement options for the site revealed that both a Larinier fish pass and a low-cost baffle easement would improve fish passage and leave approximately two thirds of the weir face free. The

oak baffle option was considered preferable because it is less conspicuous and blends in better with the surrounding environment. Moreover, the oak baffles can be simply bolted onto the face of the weir without any modification to the weir face, whereas the Larinier pass would require modification of the weir face in order to reduce the gradient to the recommended maximum of a 15% slope, which was likely to conflict with the listed building status of the weir.

Having secured a workable design with technical drawings, formal Listed Building Consent and also the EA Land Drainage Consent (LDC) required for the proposed works a number of potential contractors were contacted to provide quotations for delivery of the works. The work was awarded to Castleford Engineering Limited, which has a good record of implementing river based works. The proposed works were completed over four days in mid-August 2012.

Figure 3: Installation of the oak baffle fish easement over the mill weir



Photo ref: J. Whiting 2012

Figure 4: completed fish easement at the mill weir on the Costers Brook



Photo ref: J. Whiting 2012

An agreed condition of undertaking the fish easement works requested by the landowner involved restoring part of a dilapidated mill leat wall just downstream of the weir, which over time had slumped forward into the channel. This was partly due to a number of fresh water springs located behind the stone wall for which no drainage outlet had been provided, subsequently pushing the wall forward and pinching the channel, the action of which was exacerbated by the erosional forces of the Brook.

Figure 5: Before the works – showing the original (wider) size of the mill leat and how it had slumped forward over time subsequently narrowing the width of the Brook



Photo ref: J. Whiting 2012

While it is debateable whether the re-instatement of the original mill leat wall is desirable from a fish passage point of view, the Listed Building status of the leat meant that any remediation works had to be in-keeping with the cultural heritage value of the site, which was itself in a domesticated garden setting. All the stone needed for the repair works was retrieved from the mill leat, having been buried over time by the sandy sediments; using the original Sussex block sandstone meant the re-instated wall blended in perfectly with the existing surroundings.

Figure 6: Re-instatement of the mill leat wall and the finished work



Photo ref: J. Whiting 2012

2. Multi-culverted bridge fish easement on the Costers Brook

The culverted farm bridge comprises several concrete drainage pipes laid lengthways along the bed of the Costers Brook, with brickwork above to form the sides of the bridge. Under low flow conditions there is often insufficient water through the pipes to allow fish passage. During higher flows the water velocity can be too great to enable all but the strongest migrating fish to navigate the culverted bridge. This is particularly the case if one or more of the culverts become blocked by debris, which increases the velocity through the remaining pipes to the point at which it significantly limits fish passage. The proposal was to either replace the bridge with a clear spanning alternative, or to look into modifications to the site to improve fish passage over a wider range of flows than currently exist.

Figure 7: the multi-culverted farm bridge over the Costers Brook SU 89432 20135



Photo ref: J. Whiting 2012

Considerable work was undertaken to explore the potential for replacing the existing bridge with a free-spanning alternative, however, in conclusion of this work the landowner was happier to keep the culverted bridge in-situ and instead look at other means of improving fish passage. This was addressed by raising the stream bed level at the tail of the plunge pool immediately downstream of the bridge by constructing a rock and gravel ramp. The works were delivered by a local contractor experienced in delivering successful high quality river engineering and restoration projects, in conjunction with Andy Thomas of the Wild Trout Trust (WTT), who has many years' experience in both the design and delivery of river restoration projects. Approximately 20 tonnes of Sussex sandstone (of mixed sizes varying between 200-400mm width and length dimensions) was carefully placed into the Brook, top dressed with 20 tonnes of finer land-dug flint gravel rejects (~40-60mm diameter) to raise the water level of the plunge pool by approximately 200mm. The introduced stone and gravel were strategically located within the Brook, raising the water level through the culverts, creating new spawning habitat for all flow-loving fish species,

improving river morphology and flow, and enhancing and the connectivity between the river and adjoining wet woodland, thus improving biodiversity potential.

Figure 8: work in progress – introducing the flint gravel rejects on top of the larger stone boulders and arranging them to create more diverse channel morphology and improve flow



Photo ref: J. Whiting 2012

Figure 9: The new gravel habitat provides an additional spawning opportunity for a range of flow loving fish species and the higher water level through the culverted farm bridge ensures more fish can move upstream (and down) of the bridge across a wider range of flows



Photo ref: S. Wright 2012

Figure 10: Creating a more diverse flow regime and additional habitats within the existing channel at the site of the new rock and gravel ramp



Photo ref: S. Wright 2012

Acknowledgements

The three river related trusts concerned in the delivery of the Costers Brook Connectivity projects (OART, the Arun & Rother Rivers Trust (ARRT) and the WTT) are very grateful to the respective landowners for consenting to these projects and allowing access across their land for plant and materials; and to the contractors for the successful completion of the projects. Particular thanks should also be paid to John Whiting (OART Trustee) and Andy Thomas (WTT) for their hard work and advice throughout the project, and to the local EA for support and assistance.

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