

## Stage 2 Report, Site 1: Higherford Mill, Barrowford

### Introduction

This study follows on from a pre feasibility report produced by Inter Hydro Technology on behalf of the Forest of Bowland AONB, this is published at [www.forestofbowland.com](http://www.forestofbowland.com). This stage two study has focussed on some of the main unresolved items at this site. They include: land ownership; repairs to the intake; and reinstating the mill race. A plan of the site is included.

This site is ideal for refurbishment with extensive existing historical infrastructure.

### Proposal

#### Landownership and existing abstractions

The development will need the consent of multiple landowners. The true left or north half of the weir, the north bank and the pond (or lodge) are in private ownership. The land on the true right or south half of the weir, the south bank and most of the mill race are owned by another party. Negotiations with the owners of this infrastructure are in progress.

It is apparent that the weir is in poor condition and will need significant repair. It will be important to involve the owners of the mill race through the farmland to the mill, as this will need some restoration.

There is an existing abstraction license held for Pendle Water at this location. The current abstraction feeds the mill pond via the mill race and is home to established tame fish species. The license allows the abstraction of up to 50.92 cubic metres an hour, but not more than 4,546 m<sup>3</sup> a year (this assumes that the maximum of 14 litres/second are being abstracted 10% of the year). A variation to this licence will be needed as part of the hydro power scheme and a legal agreement between the developer and the existing licence holders is likely to be necessary. The current abstraction is unlikely to have a significant impact on the feasibility of the proposed scheme at Higherford, as this is only a small proportion of flow in the river. However, before water can be abstracted for the hydro scheme, the minimum residual for the river (Q85) will need to be present, plus this existing abstraction to the mill pond.

It is understood that Barrowford Anglers own the fishing rights to this section of river.

#### The intake

Although there is an existing weir at this site, it is in poor condition and will require extensive repairs and the addition of a fish pass. An estimate of cost for this is included in the Costs section.

It is proposed that a fish pass is installed on the true left of the weir. Although there is not currently a fish pass on the weir, fish could pass as it exists, due to the current disrepair of the structure. It is recommended that a fish pass specialist such as FishTek is consulted in order to optimise the proposed fish pass design, particularly as this water course is of high ecological value. Trout and eel are present and salmon and sea trout will also now be approaching this weir since the recent removal of significant downstream barriers. It is understood that Ribble Catchment Conservation Trust are supportive of the weir repair and fish pass installation in principle.

It will be necessary to provide a compensation flow of at least Q85 in order to sustain the river at acceptable water levels. The conventional minimum compensation flow of Q95 or Q90 is unsuitable for this scheme due to the relatively long depleted reach (500 metres). Any depleted reach over 200m is classified as an 'extensive' depleted reach by the Environment Agency. This classification alone will dictate that a Q85 compensation flow is required.



The owners of the mill are happy with this flow split as the primary function of a hydro scheme at the mill is as an educational and demonstration tool rather than maximising the power or energy output. However, the ultimate aim of the Trust is to become carbon negative.

## The mill race and pond

The reinstatement of the mill race will be a combination of piped section and open channel. We have assumed that the millrace set up will be refurbished or replaced like for like. i.e. sections that are currently culverted underground will remain so; the rest of the mill race will remain as open channel. However, this may change, depending on the landowner's requirements.

The total existing length of underground mill race is approximately 160 metres. If the *lower* millrace to the mill pond is included, then the total underground mill race length increases to 327 metres.

The total existing length of open-channel mill race is approximately 430 metres. If the *lower* millrace feeding the mill pond is included, then the total open channel mill race length increases to 535 metres.

The breakdown of costs for the re-instatement of this channel is detailed in the costs section. The outfall culvert from the mill back into the river has not been surveyed at this stage.

It is understood that the mill pond is too small to be affected by the revised reservoirs act.

## The waterwheel

The site requires further study by a millwright specialist to determine an accurate prediction of annual energy and price, as well as the technical set up in the mill building. The engineering of the wheel itself needs to be further considered. Pico Energy has been contacted for this information in order to maximise efficiency and demonstrate how the wheel will fit into the existing infrastructure.

## Costs

It has been assumed that all existing culverted sections of the mill race are in poor condition and hence we have produced budget costs for replacement or re-lining. The underground sections of the mill race are estimated to cost approximately £250 per metre length. Assuming that a like for like situation will occur, this will involve approximately 160 metres of culverted mill race, and 500 metres of above ground mill race (£60 per metre length). The repairs to the mill race are estimated to cost approximately £70,000 in total.

The repairs to the weir and the installation of a fish pass are estimated to cost £50,000-£65,000.

The preliminaries required are estimated to take eight weeks of work and this is likely to cost £24,000.

With this revised cost estimate the professional fees are likely to be in the region of £39,000 to £50,000. The total estimated budget cost is therefore between £358,000 and £478,800. This includes a preliminary cost of £30,000-£38,000 for the turbine and associated machinery and equipment (yet to be confirmed).

Pico Energy has provided a quote for this site of €178,900 for the technical package. At this stage they have not been able to provide a predicted annual average energy for the scheme. With further study it will be possible to make a prediction of this with help from a millwright specialist.



## Planner and Environment Agency Feedback

It is understood that there are no pressing planning issues at this site. As already mentioned, the Environment Agency have requested that a flow greater than the conventional minimum is considered at this site. Further discussions with the Environment Agency are needed regarding the works to the weir. An impoundment licence and Flood Defence Consent are likely to be needed for these works.

Ecological surveys of the watercourse will need to be undertaken. Otters are known to be present on Pendle Water so an assessment of whether otters and their habitat will be affected should be included in the report.

Under the Water Framework Directive this stretch of Pendle Water is classified as being at Good Ecological Status. Any scheme must not result in the deterioration of this classification.

Any proposed fish pass will require approval from the National Fish Pass Panel.

## Public consultation

Any development at Higherford Mill and on Pendle Water weir will require thorough public consultation with residents, anglers and other users and stakeholders to ensure all viewpoints and issues are considered prior to any further proposals for development.

## Next Steps

The next steps at Higherford Mill are to:

- Establish land ownership and negotiate with landowners
- Source further quotes for millwheel and associated equipment
- Make further investigations to source a quote for annual average energy predictions
- Confirm the extent of environmental investigation required and undertake ecological surveys

