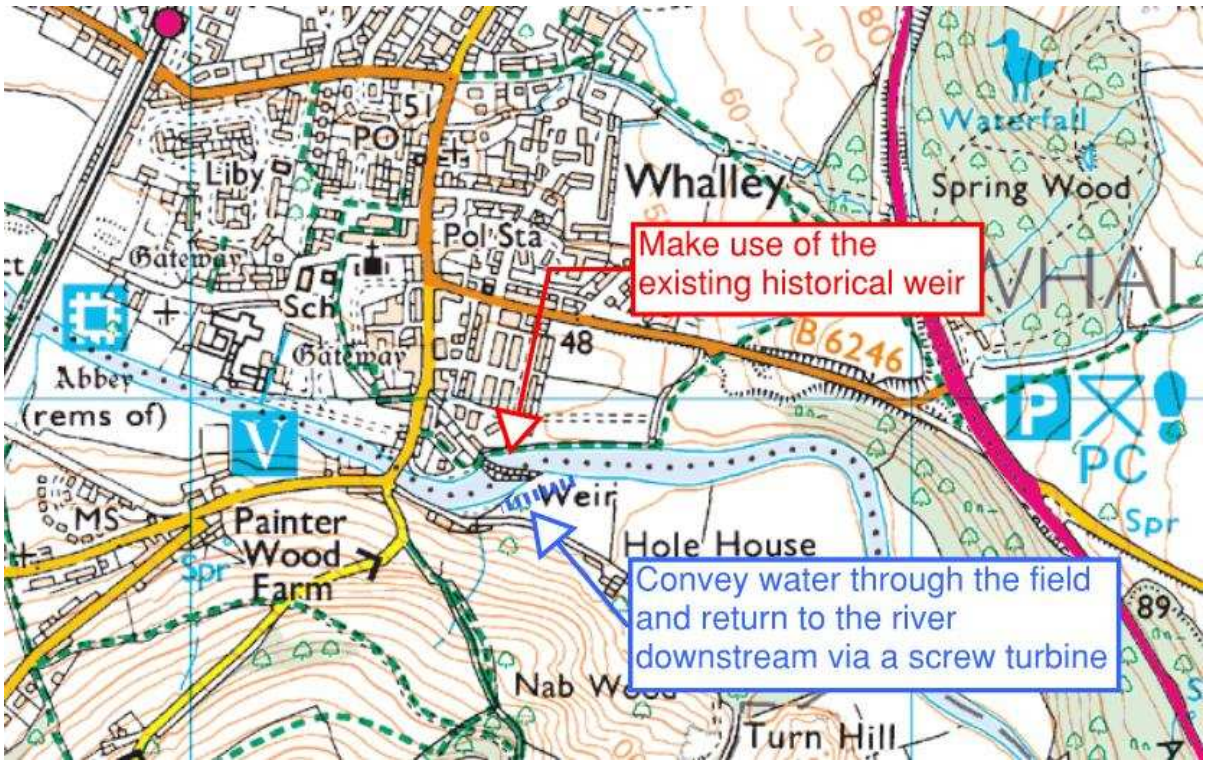
Site 8: Whalley Weir, Whalley

Site Assessment

Figure 1 Map showing general layout



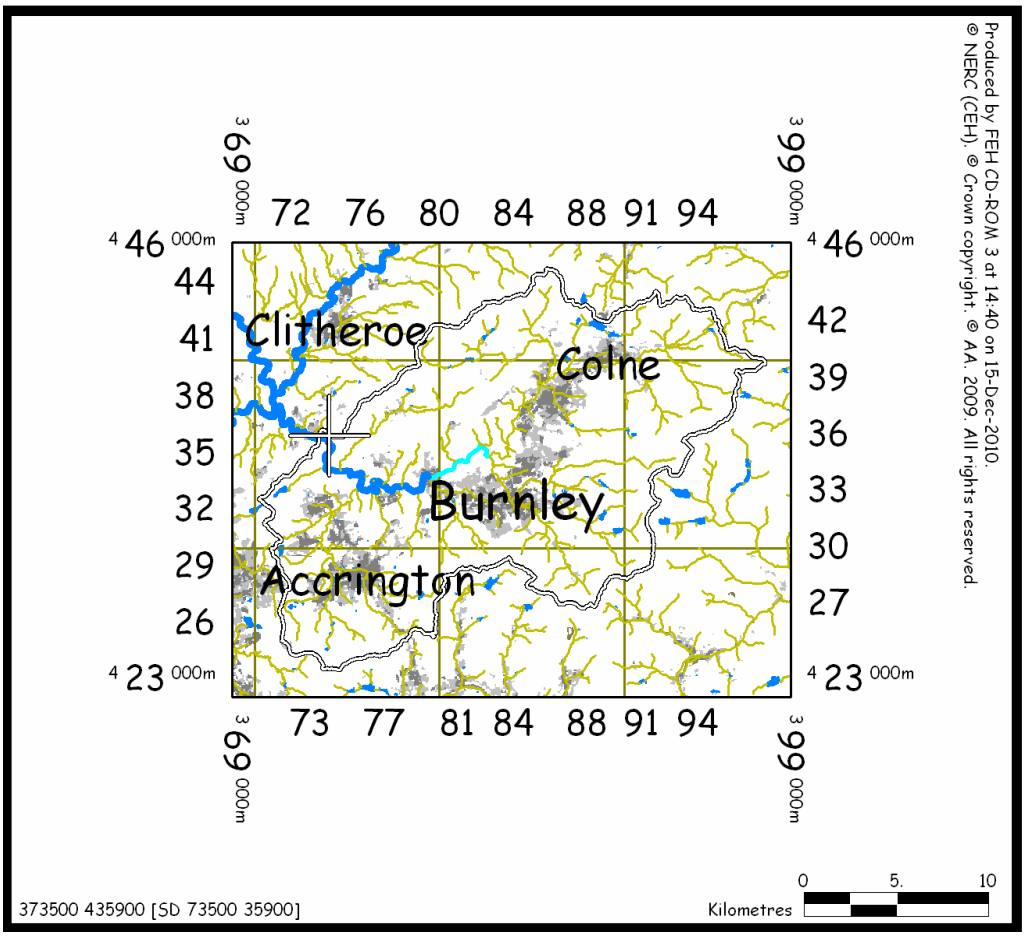
The weir here has a long history, and may date as far back as the Abbey. A scheme here would utilise the existing head provided by this weir, with water abstracted into a short channel within the grazed field on the south side of the river, and back to the river below the weir via a turbine or turbines. It is suggested that a screw turbine will be the most suitable turbine type at this site. Due to the significant flow the screw turbine will have a large diameter, or alternatively, two screw turbines could be used in parallel.

Since the initial investigations, further work has been carried out at this site by a community group, independently of this study. We have incorporated part of their findings into this report.

Figure 2 View of the weir from the south bank

Catchment Analysis

Figure 3 Catchment boundary defined by Flood Estimation Handbook Software



The Flood Estimation Handbook software is used to determine the following catchment descriptors, for the proposed intake location, selected during the site visit.

Intake Grid Reference	373500, 435900
Powerhouse Grid Reference	373460, 435870
Catchment Area	315 km^2
Annual Rainfall	1233 mm

Annual Flow Statistics

Low Flows software is used to produce a Flow Duration Curve (FDC), which demonstrates how the river flow varies throughout the year. It presents the percentage time of the year each flow rate is exceeded. A particular notation is used to refer to FDC flow rates; e.g. 'Q_{95}' refers to the flow rate which is exceeded 95% of the year.

Table 1 Mean flow rate and flow rate at Q_{95}

Period	Mean Flow Rate [m^3/s]	Flow Rate at Q_{95} [m^3/s]
Annual	7.921	1.587
January	14.23	2.792
February	9.236	2.482
March	10.09	2.487
April	6.141	1.937
May	3.965	1.589
June	3.512	1.432
July	3.147	1.345
August	4.563	1.335
September	5.326	1.442
October	9.119	1.814
November	11.44	2.160
December	14.29	2.524

Table 2 Annual flow duration data

Exceedance Probability	Flow Rate [m^3/s]
5	26.78
10	18.47
20	11.01
30	7.494
40	5.408
50	4.153
60	3.294
70	2.664
80	2.177
90	1.780
95	1.587
99	1.315

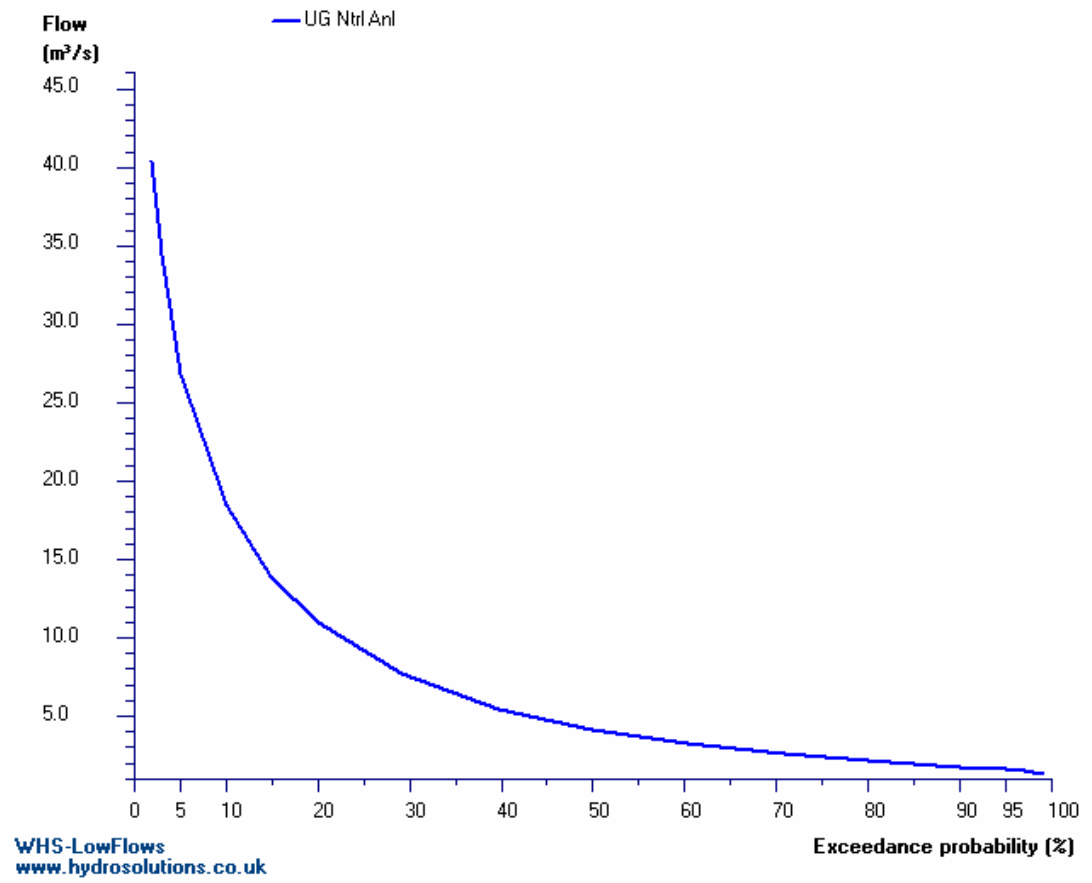


Figure 4 Annual flow duration curve produced using low flows software

Hydropower Analysis

The community group has subsequently commissioned an independent survey of the weir which has suggested that a maximum gross head of 2.7 m is available between an intake upstream of the weir and a turbine location 10 m downstream of the weir. With this setup, a screw turbine has the potential to produce a maximum power of 100kW and an annual average energy output of 400MWh.

Table 3 Hydropower Analysis

Gross Head [m]	2.7 m
Net Head [m]	2.5 m
Design Flow [m³/s]	5.3 m³/s
Rated Capacity [kW]	100 kW
Average Annual Energy Output [MWh]	400 MWh
Average annual Carbon Dioxide offset	200 tonnes

Impact Assessment

The area for development here is within the Green Belt, with the weir and part of the access track belonging to the Whalley conservation area. The site is not within the Forest of Bowland AONB. The landscape character type classification for this site is of Undulating Lowland Farmland on the north side of the river and Farmed Ridges on the south side.

Statutory Requirements

It will be necessary to apply to the Environment Agency for an abstraction licence, and planning permission will need to be granted for any improvements to the weir, the installation of an intake, the channel and the turbines.

It is not known if the weir is a listed structure or if it is on the Historic Environment Record, and it is recommended that this be investigated.

An ecologist will be able to advise on the extent of environmental investigations required. It is likely that a fish pass will be necessary.

Budget Development Cost

Due to the fact that the community group are now carrying out their own extensive investigations into the hydro potential of this site, we have not calculated the cost of development.

Revenue

The best option for this scheme is probably to supply energy to the national grid as a community scheme. There is an active and interested community in Whalley who would be keen to see this project through.

This scheme produces a significant amount of energy and a grid connection is recommended to optimise the revenue. Due to the scheme's proximity to the town of Whalley, problems with grid connection are not envisaged, though this is yet to be confirmed.

Under the current government feed-in tariff regulations, hydropower schemes receive a generation tariff according to their rated capacity. Schemes between 15 kW and 100 MW receive 17.8p/kWh. This generation tariff is received regardless of how the electricity is used. The current base value of electricity per kilowatt hour on top of this has been assumed as 3p/kW. In conclusion, the total value of the generated electricity would be 20.8 p/kWh, giving an average annual value of approximately **£83,200.**

Conclusion

Due to the historic nature of this weir and its importance to the town, it may be necessary to investigate preservation of the structure. It is recommended that it receives an inspection to assess the state of repair, as the existing weir is integral to the success of this scheme. The access track from the end of the bridge down towards the weir on the south

side of the river is narrow and provides the only access to several private dwellings. A road management plan will be required, and this access track will need to be inspected to assess its structural competence for any large plant vehicles.

Further Information

This site report is produced by Inter Hydro Technology on behalf of Forest of Bowland AONB, and funded by a partnership including Lancashire County Council, Lancaster & District Local Strategic Partnership, Pendle Borough Council and Ribble Valley Local Strategic Partnership.

This site report should be read in conjunction with the rest of the Forest of Bowland AONB Hydro Feasibility Study which can be downloaded at

http://www.forestofbowland.com/climatechange#hydro