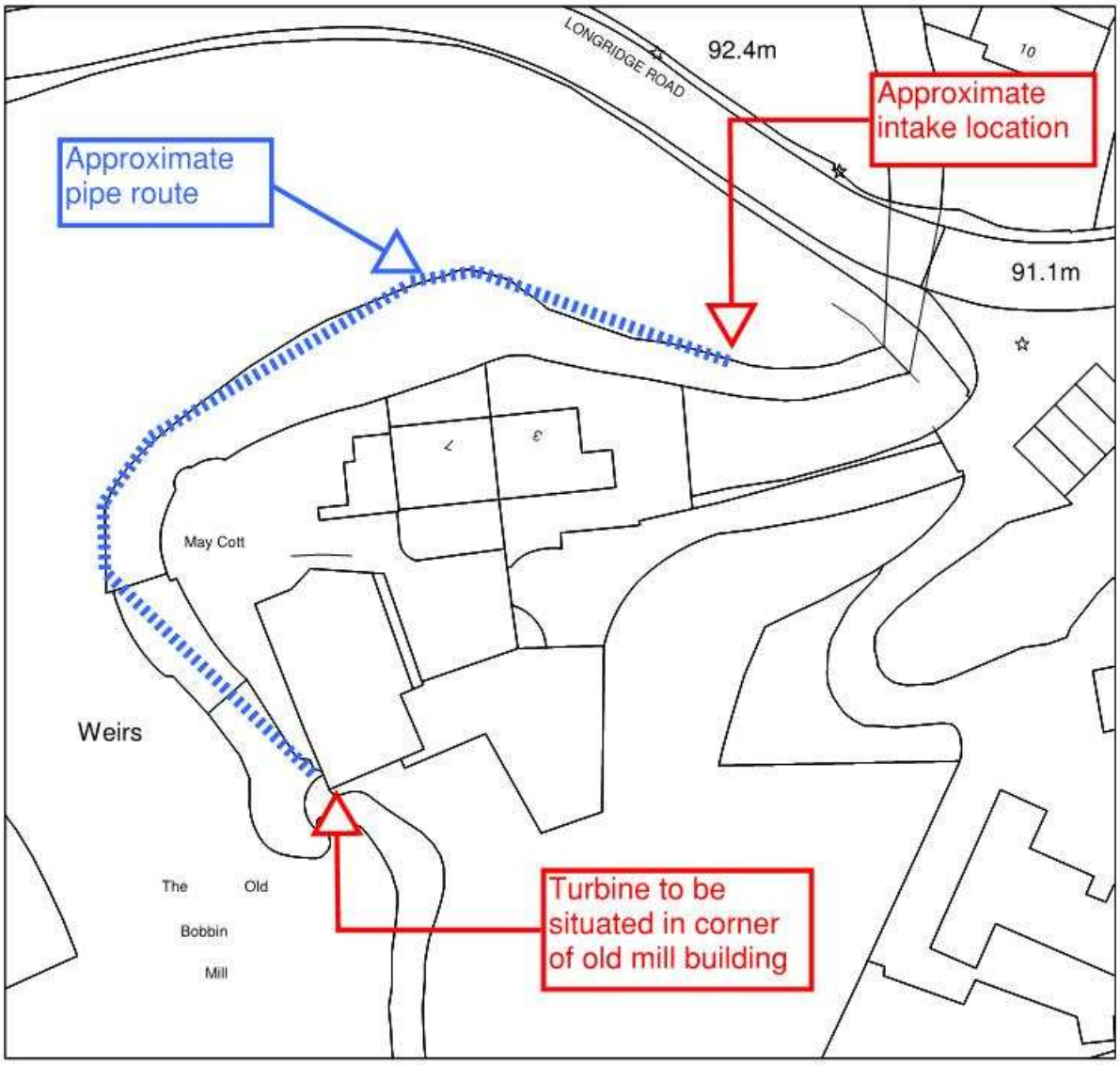
Site 12: Bobbin Mill, Hurst Green

Site Assessment

Figure 1 Map showing general layout



This mill is in the process of being repaired and rebuilt by the owner as a private dwelling. As part of this rebuild the owner is interested is harnessing the power of the beck which flows in a meander around his property. The majority of the historical infrastructure has gone, but the site still holds potential. It is proposed that an intake is installed at the eastern corner of the site from where a pipeline will run round the meander to the south-west corner of the old Bobbin Mill building where a turbine can be housed and the water returned back to the beck.

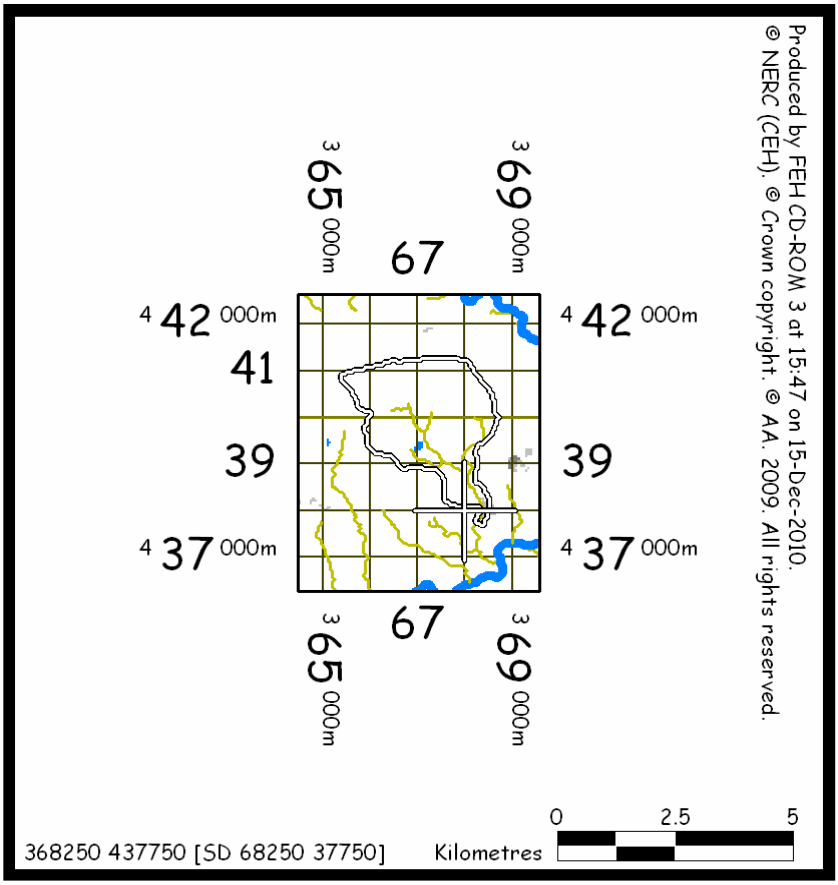
Figure 2 The weir

Figure 3

The Old Bobbin Mill from the opposite river bank

Catchment Analysis

Figure 4 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	368250, 437750
Powerhouse Grid Reference	368240, 437740
Catchment Area	6.6 km^2
Annual Rainfall	1353 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	0.178	0.0252
January	0.310	0.0558
February	0.218	0.0468
March	0.243	0.0510
April	0.129	0.0318
May	0.0844	0.0246
June	0.0610	0.0189
July	0.0647	0.0207
August	0.102	0.0222
September	0.150	0.0314
October	0.224	0.0393
November	0.249	0.0417
December	0.301	0.0454

Table 2 Annual flow duration data

Exceedance Probability	Flow Rate [m^3/s]
5	0.616
10	0.412
20	0.245
30	0.167
40	0.121
50	0.0900
60	0.0690
70	0.0540
80	0.0410
90	0.0300
95	0.0250
99	0.0200

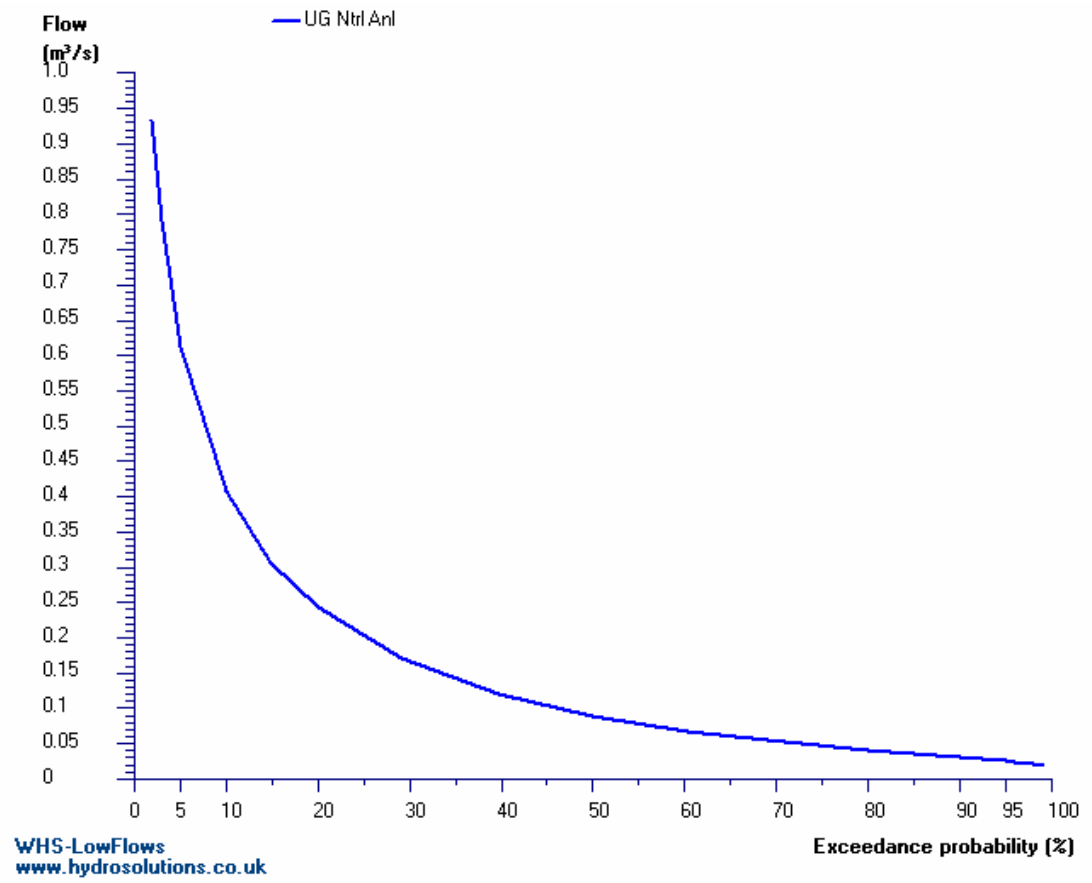


Figure 5 Annual flow duration curve produced using low flows software

Hydropower Analysis

Site: Hurst Green
Run Date / Time: 15 December 2010 at 15:59

Mean Flow: 0.15 m3/s
Provisional Rated Flow: 0.17 m3/s
Residual Flow: 0.020 m3/s
Rated Flow: 0.15 m3/s
Gross Hydraulic Head: 5.50 m
Nett Hydraulic Head: 5.22 m

Applicable Turbines	Gross Annual Average Output	Nett Annual Average Output	Maximum Power Output	Rated Capacity	Minimum Operational Flow
Propellor	18.8	18.6	6.7	6.5	0.12
Crossflow	24.7	24.5	6.2	5.8	0.043
	MWh	**MWh**	**kW**	**kW**	**m3/s**

It is suggested that a propellor or Crossflow turbine is suitable for this site, as shown in the table above.

Table 3 Hydropower Analysis

Gross Head [m]	5.5
Net Head [m]	5.2
Design Flow [m^3/s]	0.15 m^3/s
Rated Capacity [kW]	6 kW
Average Annual Energy Output [MWh]	20MWh
Average annual Carbon Dioxide offset	10 tonnes

Impact Assessment

Hurst Green Bobbin Mill is not within the Forest of Bowland AONB. The general landscape character assessment is Undulating Lowland Farmland with Parkland, Settlement and Industry.

Any visual impact resulting from the development of this scheme will be minimal due to the existing topography and development.

Statutory Requirements

It will be necessary to apply to the Environment Agency for an abstraction license and any in-river works, which must be completed between May and September. Planning permission will need to be investigated also for the installation of an intake and the laying of a pipeline.

An ecologist will advise on the extent of environmental investigation required.

Budget Development Cost

The total budget cost for the whole scheme is **£125,000**. It should be noted that the civil works costs can vary considerably as material costs fluctuate. Likewise, mechanical and electrical (M&E) equipment costs vary in accordance with demand. Professional fees should be considered subject to change, as the scope of licensing and planning requirements are not yet defined. Consequently the budget estimate at this stage should be considered accurate to plus or minus 20%.

Table 4 Development Budget Cost

Budget Scheme Cost Estimate
Bobbin Mill, Hurst Green

ITEM	UNIT	QUANTITY	MIN	MAX
Turbine				
Turbine Quotation	No	1	£20,000.00	£25,000.00
Grid Connection				
Grid Connection	No	1	£5,000.00	£6,250.00
Civils				
Weir	m^3	15	£7,500.00	£9,375.00
Fish Pass	m^3	0	£0.00	£0.00
Metalwork	m	2	£4,000.00	£5,000.00
Fish Pass Length	m	0	£0.00	£0.00
Pipe Installation	m			
Rock	m	2	£220.00	£275.00
Gravels	m	50	£2,000.00	£2,500.00
Soft	m	48	£2,640.00	£3,300.00
Pipe Materials	No	1	£10,000.00	£12,500.00
Temporary Access	m			
Rock	m	0	£0.00	£0.00
Gravels	m	0	£0.00	£0.00
Soft	m	0	£0.00	£0.00
Temporary Access on Good Ground	m	0	£0.00	£0.00
Powerhouse				
Powerhouse	kW	6	£15,000.00	£18,750.00
Prelims				
Duration	Months	4	£12,000.00	£15,000.00
Sub Total				
Sub Total			£78,360.00	£97,950.00
Professional Fees				
Professional Fees			£11,754.00	£19,590.00
Sub Total				
Sub Total			£90,114.00	£117,540.00
Contingency				
Contingency			£18,022.80	£23,508.00
GRAND TOTAL			£108,136.80	£141,048.00

Revenue and Simple Payback Period

It is unlikely that a grid connection will be required for this scheme, as the energy will be consumed on site. This will provide revenue for the developer according to how much the electricity is worth to the site consumers.

Under the current government feed-in tariff regulations, hydropower schemes receive a generation tariff according to their rated capacity. Schemes less than 15kW receive 19.9p/kWh. This generation tariff is received regardless of how the electricity is used. The owner has indicated that the electricity would be used on site, thereby offsetting import costs. This increases the value of the generated electricity by the import tariff, which we have assumed is 5p/kWh.

In conclusion, the total value of the generated electricity would be 24.9p/kWh, giving an average annual revenue of approximately **£4600**.The simple payback time works out at roughly **27 years.** This assumes that the developer can consume all the electricity on site.

Conclusion

Due in part to the skills set of the developer and the on-going restoration and rebuilding project, this scheme has good potential as the site owner may be able to carry out much of the work. This is despite the fact that the pipe route is relatively challenging. The payback period would not normally be classified as economic, but the costs presented assume the use of external contractors.

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