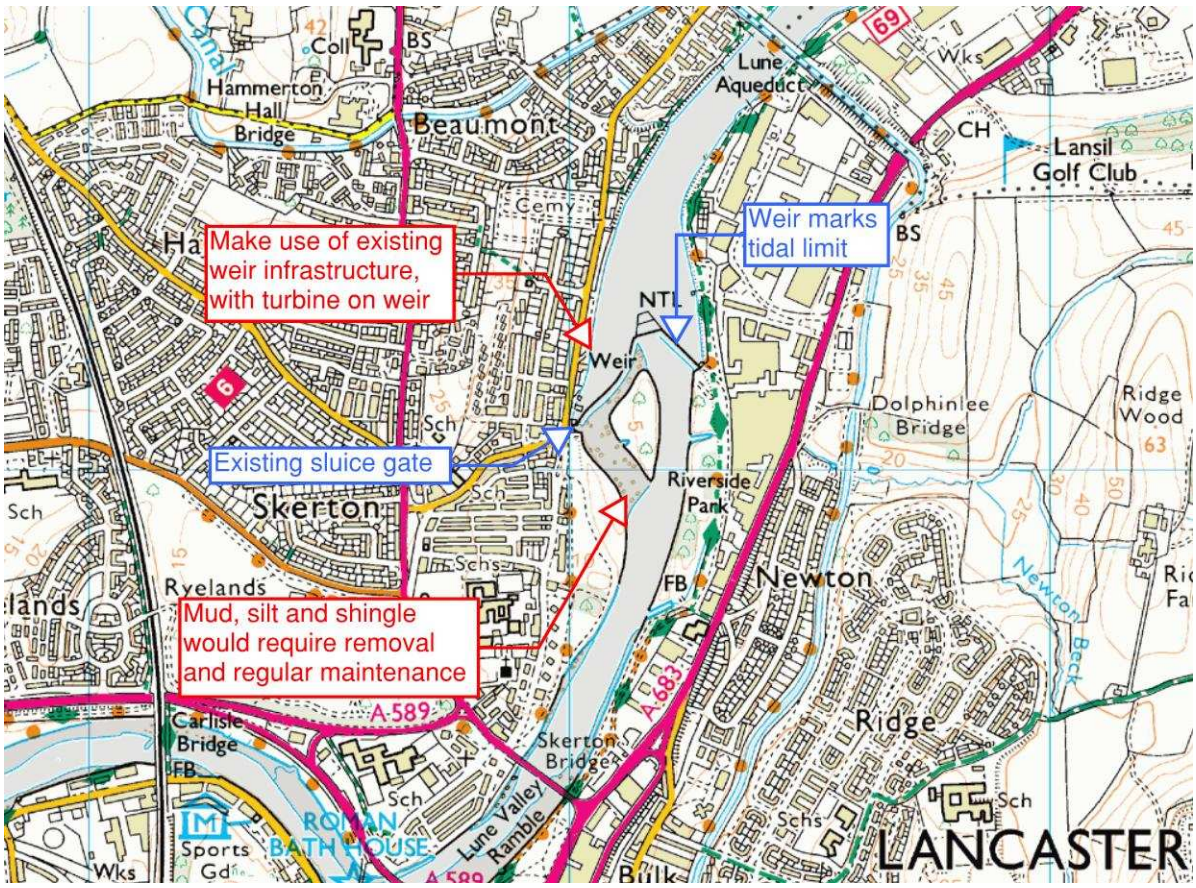
Site 10: Skerton Weir, Lancaster

Site Assessment

Figure 1 Map showing general layout



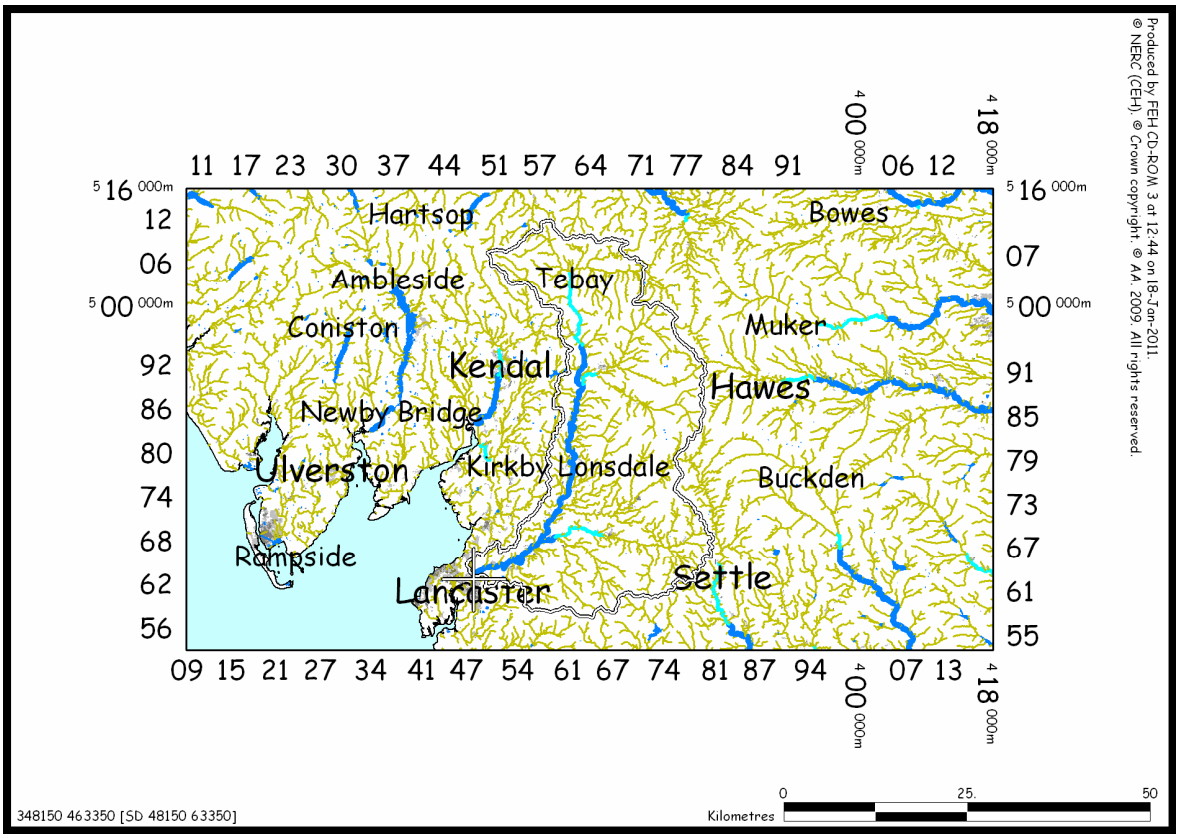
Skerton weir has historically been used to help to control the supply of freshwater to mills and for fishing upstream. The history is not known, but it is thought that there has been a weir here for hundreds of years. The present layout is thought to have been constructed in the mid to late 20th century. United Utilities own the structure.

Due to the existing weir structure, there is potential to install a turbine on the weir to make use of the head difference. Due to the very large flows available, it is recommended that multiple turbines are used in parallel.

Figure 2 The sluice gate

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	348150 463350
Powerhouse Grid Reference	348150 463350
Catchment Area	1008 km^2
Annual Rainfall	1512 mm

From information provided by the Environment Agency, it is not thought that there are any significant abstractions on this stretch of the Lune.

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 [m³/s]	Flow Rate at Q_{95} [m³/s]
Annual	36.27	3.430
January	56.13	7.734
February	40.34	5.269
March	38.55	7.356
April	29.62	4.930
May	19.82	3.119
June	14.67	2.404
July	18.61	2.674
August	26.14	2.309
September	32.44	2.913
October	44.02	4.962
November	53.45	7.519
December	61.41	8.766

Table 2 Annual flow duration data

Exceedance Probability	Flow Rate [m³/s]
5	131.0
10	88.95
20	52.04
30	34.79
40	24.14
50	17.49
60	13.38
70	10.18
80	7.501
90	4.921
95	3.430
99	2.303

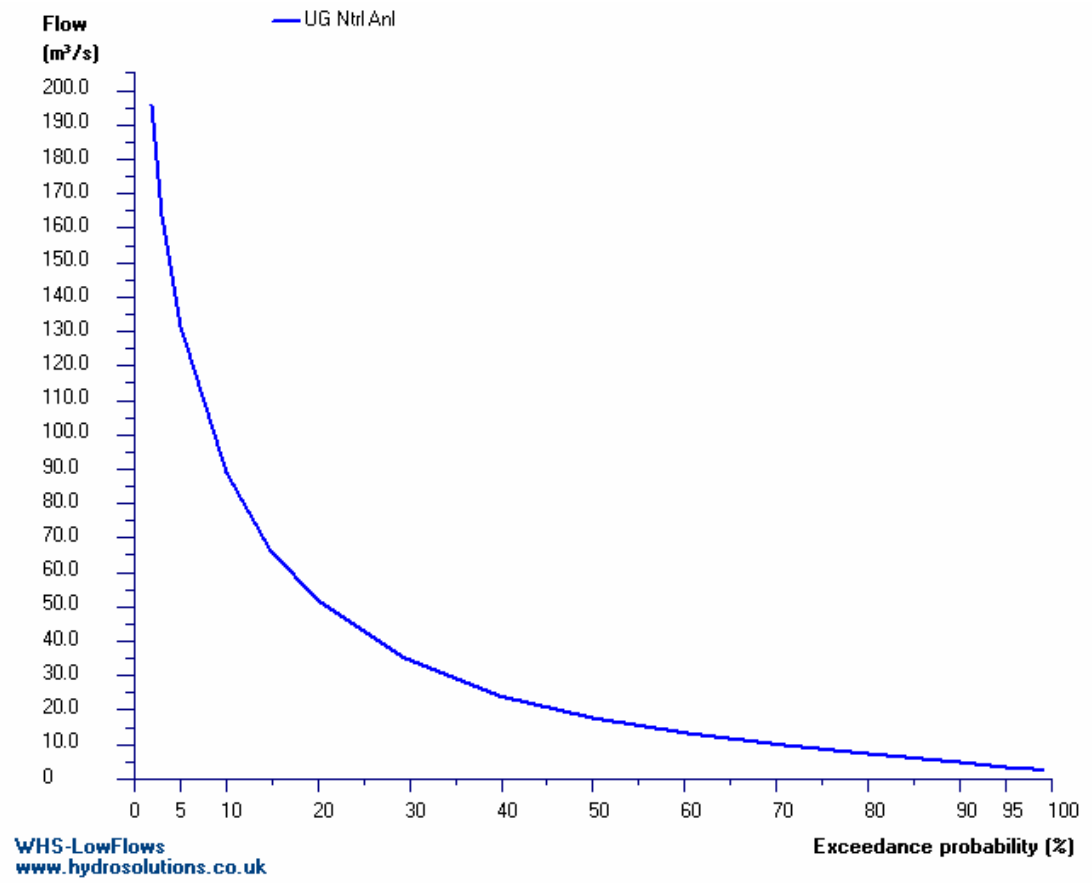


Figure 4 Annual flow duration curve produced using low flows software

Hydropower Analysis

Due to the exceptionally large flow achievable at this site, and the low head, it has not been possible to use the same method of potential hydropower assessment as for the other sites. Instead we have estimated that three Archimedes screw turbines will be required, each with a capacity of 5 m³/s and a rated power of 40 kW each. It is predicted that together these turbines will produce between 600 and 700MWh of energy a year. This will offset approximately 325-380 tonnes of carbon dioxide a year. *An important factor that has not been investigated at this site is the influence of tidal forces on the available head. This may significantly reduce the predicted annual energy and will require further assessment.*

Table 3 Hydropower Analysis

Gross Head [m]	1.5
Net Head [m]	1.3
Design Flow [m³/s]	15 m³/s
Rated Capacity [kW]	120 kW
Average Annual Energy Output [MWh]	600-700MWh
Average Annual Carbon Dioxide offset	325-380 tonnes

Impact Assessment

In order to maximise and then maintain the head level difference for this scheme, it will be necessary to keep the downstream area clear from silt. Initially this will probably require significant removal of silt. If this is to be achieved, it will need to be done in consultation with the Environment Agency and with advice from ecologists. The River Lune corridor is a Biological Heritage Site.

There is an existing fish pass on this weir, however, it is likely that a further fish pass will be required associated with the outflow from the proposed turbines.

The area is classified under Suburban in the Landscape Character Assessment, with an area of Historic Core immediately downstream on the west bank of the river.

Statutory Requirements

The Environment Agency will need to be consulted and an abstraction license will need to be applied for. Planning permission will be required from Lancaster City Council.

The extent of an Environmental Assessment will need to be decided with advice from an ecologist.

Budget Development Cost

The total budget cost for the whole scheme is approximately £1,000,000. 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%.

Revenue and Simple Payback period

The predicted revenue generated from this site is **£84,000**. The estimation of simple payback period is **12 years.**

It is likely that a grid connection for this scheme is the most economical use for this energy. Due to its location within the centre of Lancaster, it is not envisaged that there would be any issue achieving a grid connection.

Conclusion

It is understood that this stretch of the River Lune is popular for water sports including boating, rowing and kayaking. It is recommended that these stakeholders are consulted during the pre-feasibility and feasibility stages of investigation.

Table 4 Development Budget Cost

Budget Scheme Cost Estimate
Skerton Weir

ITEM	UNIT	QUANTITY	MIN	MAX
Turbine				
Turbine Quotation	No	1	£480,000.00	£600,000.00
Grid Connection				
Grid Connection	No	1	£35,000.00	£43,750.00
Civils				
Weir	m^3	40	£20,000.00	£25,000.00
Fish Pass	m^3	0	£0.00	£0.00
Metalwork	m	10	£20,000.00	£25,000.00
Fish Pass Length	m	0	£0.00	£0.00
Conduit	m			
Rock	m	20	£2,200.00	£2,750.00
Gravels	m	20	£800.00	£1,000.00
Soft	m	0	£0.00	£0.00
Pipe Materials	No	1	£0.00	£0.00
Temporary Access	m			
Rock	m	0	£0.00	£0.00
Gravels	m	20	£1,600.00	£2,000.00
Soft	m	0	£0.00	£0.00
Temporary Access on Good Ground	m	0	£0.00	£0.00
Powerhouse				
Powerhouse	kW	150	£50,000.00	£62,500.00
Prelims				
Duration	Months	6	£18,000.00	£22,500.00
Sub Total				
Sub Total			£627,600.00	£784,500.00
Professional Fees				
Professional Fees			£94,140.00	£156,900.00
Sub Total				
Sub Total			£721,740.00	£941,400.00
Contingency				
Contingency			£144,348.00	£188,280.00
GRAND TOTAL			£866,088.00	£1,129,680.00

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