

Bullhouse Mill and Millhouse Green Hydro Power

An Initial Assessment of Fisheries Impacts

Client: Charles Booth

September 09

Background

Booth Bothers are proposing to install an Archimedes turbine on each of two weirs on the upper River Don. The turbines would be small with a maximum draw of less then 1 cumec each.

At both sites, the outflow is positioned within a few metres of the base of the weir and hence the derogated reach is restricted to the weir structure. There is no potential impact on spawning and juvenile habitat. It is likely that a small aesthetic flow would be sufficient for the weir face.

Upstream migration

The main potential impact of the scheme is a reduction in upstream migration due to reduced depth of water on the weir face. This assumes that fish are currently able to ascend the weirs during certain flow conditions.

Bullhouse Mill Weir

The apron is very long at over 50m and consists of three distinct sections.

- The top section is 15m long with a slope of >5%.
- The central section is over 25m long with a slope of <5%.
- The final section is 10m long with a coarse stone face and slope>5%.

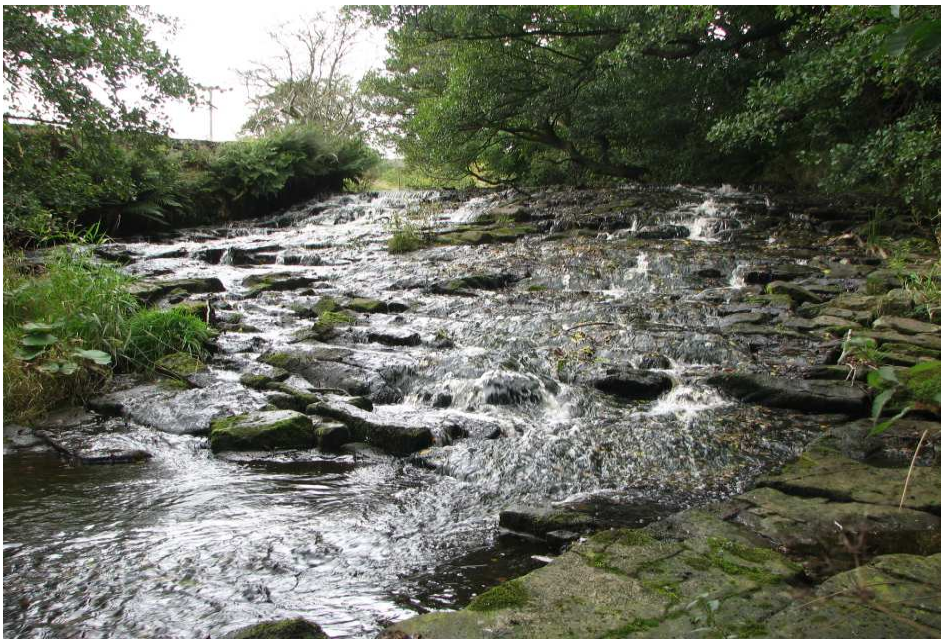
The weir is 9.7m wide resulting in a shallow depth on the weir crest and apron. At Q10 (approximately 1.5 cumecs) the depth on the crest would be <10cm, reducing to nearer 5cm as water accelerated down the apron. The shallow depth combined with high velocities (2-3m/s) would make it difficult for fish to ascend. At very high flows (>Q5) the depth on the face would increase, although velocities would be excessive, preventing smaller fish from ascending. Larger fish would require a depth of at least 10cm to achieve sufficient propulsion from tail beats. It would seem unlikely that fish could ascend: if they can, the migration window would be very small and restricted to high flow events.



Bullhouse Mill (upper weir)

Millhouse Green Weir

This weir is steeper (>20%) with a head drop of 3m and a 15m long apron. The weir is 9.5m wide resulting in a shallow depth of water on the face at flows below Q10. The greater angle would increase velocities and reduce depth further. The coarse stone face of the weir increases bed roughness and helps to reduce velocities, although probably not enough for fish to ascend. At low flows, depth on the face would be insufficient; at high flows, velocities would be excessive.

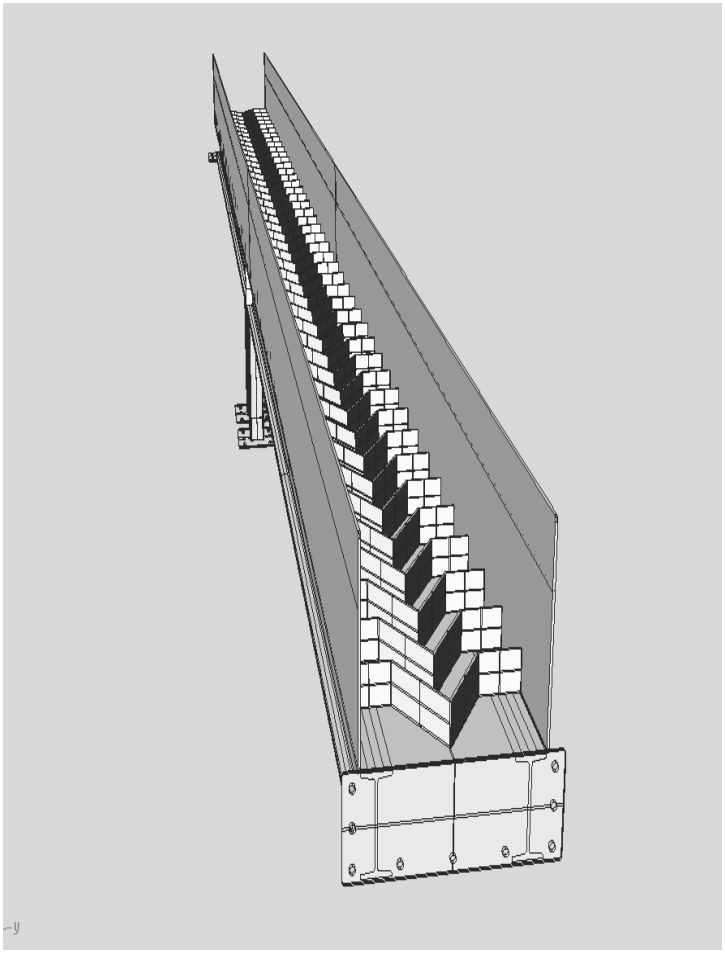


Millhouse Green (lower weir)

Conclusion and Recommendations

Upstream migration is unlikely at Millhouse Green during any flow conditions and at Bullhouse Mill during flows below Q10. Migration may be possible at Bullhouse Mill above Q10 for stronger swimming species (salmonids). Because migration is only possible during high flow events, abstraction of up to 1 cumec would effectively displace the migration window from Q10 to Q5 and above. Further analysis in the form of velocity/depth data across high flows and a Winstone type assessment would provide a robust evaluation.

The upper River Don is not currently a high priority for improved fish passage. However by setting a Hands Off Flow at a level that would provide enough water for a fish pass (130-180 l/s), the Environment Agency would retain the option of installing one in the future. A Larinier Super Active Baffle pass, drawing relatively little water (130 l/s) is shown below.



Larinier Super Active Baffle Pass