



KIRKTHORPE HYDROPOWER:

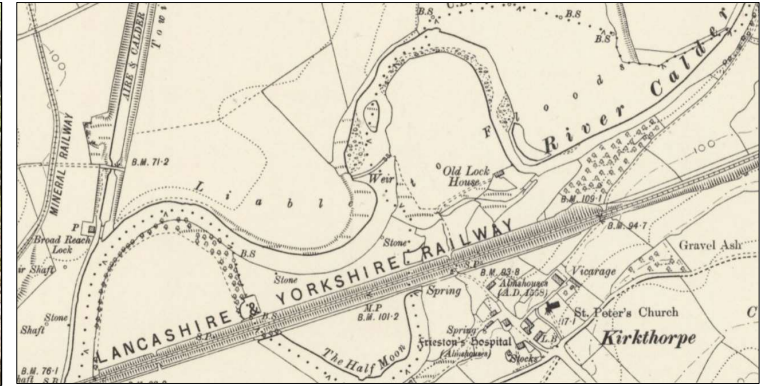
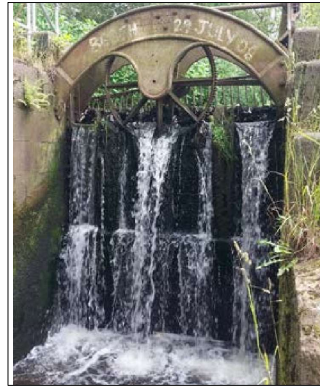
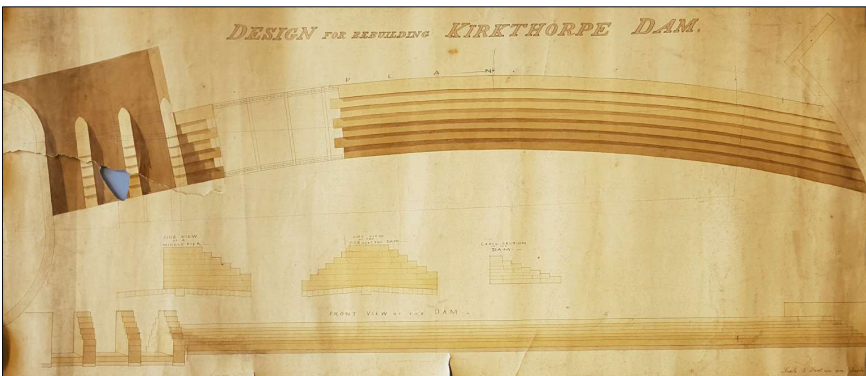
A New Future for Weirs

The Aire and Calder Navigation

The canals of the Yorkshire are part of the network of inland waterways in England and Wales run by the Canal & River Trust. They have a colourful history, evolving from use for irrigation and transport, through becoming the focus of the Industrial Revolution, to use for recreational boating today. As early as 1625, Yorkshire entrepreneurs had sought to improve navigation on the natural rivers Aire and Calder. After a 1699 Act of Parliament, short canals were cut to bypass particularly narrow or tortuous stretches. Improvements continued, with the Knottingley and Goole Canal opening in 1826. The legacy of continual improvement means that the Aire & Calder Navigation is still an active freight artery after 300 years, despite competition from road and rail. With constant demands to carry more in bigger boats, sea-going and coastal vessels, carrying 700 tons or more, pass through locks almost 200 feet (61 metres) long controlled by traffic signals. Over two million tons of freight is carried every year — a figure comparable with many European waterways.

Weirs are dams built across rivers to raise the level of water upstream and regulate its flow. The majority of existing weirs on the River Calder were built to support the local navigational system. Kirkthorpe Weir is the largest weir on the Aire and Calder Navigation system, built to maintain good navigation between Broadreach Lock and Wakefield. It is a Grade II listed structure that was built, in its current design, in 1829. The weir is a segmental curved construction of 8 steps, fabricated from ashlar blocks and topped with timber boards. At the east end of the weir are three sluices. The two sluices closest to the eastern bank include intact timber sluice gates and the original cast iron headworks.

Kirkthorpe Weir provides a stable navigation level for the Wakefield branch of the Aire and Calder Navigation. Yorkshire Hydropower has now added a new renewable and sustainable use that aids the stability of the upstream water level, unique environmental benefits and enough electricity for 800 households.



Low Head Hydropower on UK Weirs

Low Head Hydropower ("LHHP") generates electricity from water flowing over weirs in the "run of the river". As seen at Kirkthorpe Weir, a channel is dug around the weir and a turbine (in some cases a Archimedes screw can be used) is installed within the channel. The majority of the flow can then be diverted through the channel, and combined with the drop in height in the river caused by the weir, significant energy can be generated.

Given reliable UK rainfall patterns, many rivers have been modified to enable navigation and to provide power from water mills since pre-industrial times. LHHP puts these rivers back to work, generating electricity for 11-12 months of the year, slowing down only at the end of the summer when flows are low. LHHP also provides a high level of reliable and non-intermittent supply compared to other renewable sources.

Unlike ancient water mills, LHHP uses modern turbines that can generate electricity efficiently. In this way, LHHP produces distributed power generation that is close to local communities, resulting in low transmission costs while supporting national renewables obligations.

The rivers of England and Wales are strictly protected by legislation to make sure that they flow freely and so that fish (salmonids and eels) are able to pass upstream to spawn. Most weirs do not have fish passages that enable this, so LHHP developers are required to build fish and eel passes by the Environment Agency as a condition of their permissioning. The UK has EU obligations to build these fish passes but the owners of the rivers, and authorities that govern them, including the Environment Agency and the Canal & Rivers Trust, do not have the capital budget available to do so on. The building of LHHP schemes give the Canal & River Trust and the Environment agency the ability to fulfil their obligations while avoiding the costs.

In summary, Low Head Hydropower brings an ideal new future for the UK's navigational weirs. LHHP provides industrial regeneration of run-down waterway assets that are in dire need of it. They provide a source of non-intermittent low carbon electricity, each MW of capacity saving 2,700 tonnes of CO2 annually. Being extremely long lived projects, they will provide permanent renewable additions to the UK's energy infrastructure. They also ensure that vital environmental improvements such as fish passage over these substantial blocks in the river are provided.

