# River Ashop & River Noe Silt Issues

## improving the transfer of raw water to Bamford WTW in the Peak District

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Severn Trent Water treats 150Ml/d of raw water at Bamford WTW to provide potable water to large parts of the East Midlands. Raw water is also used to power turbines at Ladybower dam. Water for this plant is drawn from three reservoirs - Ladybower, Derwent and Howden - supplied directly by the River Derwent catchment in the upper Derwent Valley. Water cascades into Derwent and Ladybower reservoirs from Howden. The water supply is of major strategic importance, and subsequent to a detailed review, the need for significant maintenance investment on the assets was identified. This project involved maintenance of the weirs and aqueducts to extend their life and to improve the transfer of raw water.

*River Noe extraction weir completion - Courtesy of NMCNomenca*

### The reservoirs

The Derwent and Howden Reservoirs were built in the early 20th century. To provide an additional source of water, flows from the River Ashop, above Ladybower, are diverted into the Derwent Reservoir via an aqueduct from a weir higher up the Ashop valley.

Ladybower Reservoir was constructed during the Second World War. To increase the supply of raw water, flows from the River Noe were transferred in a similar manner via an aqueduct from a weir in the River Noe Valley. An additional pipe was constructed - Jaggers Clough, to ensure a minimum compensation flow into the River Noe during dry periods.

### Project background

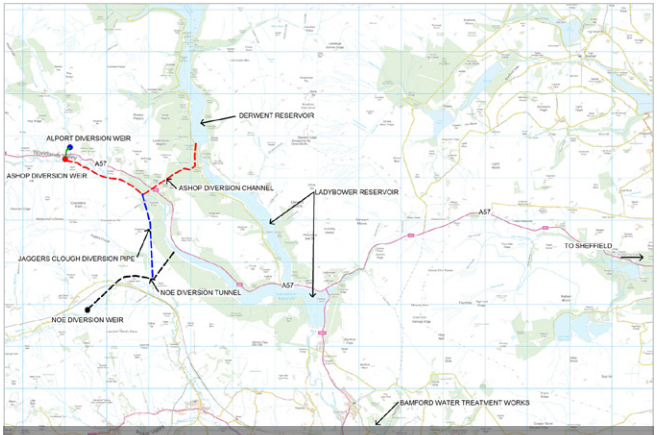
The project is divided into two sections:

**River Ashop slope stability works:** The aqueduct carrying the abstracted flows from the River Ashop contours along the valley side from the weir maintaining its elevation as the river follows its natural course along the valley. As a result the level difference between the aqueduct and the river increases downstream with the aqueduct supported at the top of a steep slope up to 20m high.

Over time the river has eroded the bottom of the slope causing problems of stability and threatening the integrity of the structure.

**River Noe de-silting:** The River Noe weir was constructed in the 1950s to create a head of water to allow abstraction from the river and to divert into the new Ladybower reservoir. The weir was designed to include flushing penstocks that were to be opened at intervals to flush through silt in order to prevent large accumulations from developing upstream.

In recent years the flushing through of the silt was not done due to concerns about pollution downstream. This had resulted in a build up of approximately 30,000m$^3$ of silt immediately upstream reducing the rate of abstraction from the weir. Last year it became necessary to stop abstracting at this point completely as it was not



*Location map for the aqueducts - Courtesy of Atkins & Ordnance Survey*


*River Ashop slope slippage - Courtesy of NMCNomenca*


*River Ashop slope stabilisation - Courtesy of NMCNomenca*


*Completed stability works - Courtesy of NMCNomenca*

possible to maintain compensation flows due to problems with the silt accumulations. This caused the loss of a strategic resource of water to the upper Derwent reservoirs and also reducing revenues from the generation of hydro-electricity at Ladybower.

## Design solution

The site is positioned in a remote part of the Peak District in North Derbyshire and is an ecologically sensitive area. When designing a solution it was essential to minimise the impact to the local environment. Salix RW were employed for their experience of river erosion protection along with sub-contractor CAN Geotechnical for the rope access soil nailing works. The approach adopted to improve the slope stability at the river Ashop diversion aqueduct was to construct a lump stone revetment at the toe of the slope to prevent further river erosion. Above this where shallow slips had occurred, a system of soil nailing and surface structural mesh installed using rope access techniques was deployed.

This method of working provided the following ecological benefits:

- The rope access techniques allowed the use of small items of plant particularly on the slopes resulting in little impact on the local flora and fauna.
- The use of an open structural mesh meant that the existing vegetation was retained and would grow up through.
- In areas where disturbed ground had resulted in the loss of surface vegetation new growth was promoted by hydra-seeding using specially selected seed.

The River Noe site is close to the picturesque village of Edale, an area served by a minor road network. Access to the site is extremely restricted and is gained via a farmyard and a winding track crossing a narrow bridge over the main Manchester to Sheffield railway. A method needed to be found to remove silt from the weir to allow the abstraction of river water to be re-started whilst minimising the impact on the local environment. Removal off site of 30,000m$^3$ of silt would have been highly disruptive to the local farm and equestrian centre requiring approximately 3,000 HGV movements over the narrow rail bridge.

The solution adopted was to remove only sufficient accumulated silt to allow the river to flow to the abstraction point and to clear the side channel where the compensation flows are returned to the river downstream via a pair of control valves. An area of poor quality pasture close to the weir was identified as likely to benefit from soil improvement and it was agreed that the silt should be spread here.

Benefits of this approach are as follows:

- Reduced vehicle movements via the site access road and local road network.
- Greatly reduced carbon emissions from transportation.
- Improvements to an area of low quality pasture land.
- Retention of the wetland habitat that had developed on the area of accumulated silt.

A revetment detail was designed and constructed to retain the wetland area and prevent migration of the retained material into the cleared water course.

Land and Water Services were employed on the River Noe section because of their experience in river and canal de-silting. They hold the necessary environmental permit for land spreading using mobile plant and their experience of working with the Environment Agency to achieve maximum benefits on the reuse of material was an asset to the project.

In their fleet they also have plant suitable for this type of work and of particular importance here was the 13T amphibious excavator. This item of plant is a long reach excavator with an undercarriage

designed to apply a very low ground pressure. The inclusion of two large ballast tanks enables it to travel over water and dredge silt at shallow depths.

This excavator allowed the majority of the silt excavation to be undertaken in the pool of water upstream of the weir with the river flows passing over the weir. This reduced the carry over of silt to the river downstream. Along with other low ground pressure plant this meant reduced impact on the retained wetland habitat as the need to construct temporary access roads was minimal.

## Stakeholder management

The development work, being in the Peak District National Park, required engagement with a number of important stakeholders in order to ensure that disturbance was kept to a minimum.

***Environment Agency:*** The material removed from the weir is classified as waste and as such would require agreement with the Environment Agency to allow it to be reused to provide agricultural benefits. A standard rules land spreading permit was held by Land and Water Services.

The area identified for the spreading of the material was adjacent to the weir but at an elevation above the river that ensured that it was outside of the flood plain (flood zones 1 or 2). The farmer who owns the land advised of a general shortage of topsoil with rock being found at a shallow depth in places. The material from the weir consisting of peaty silty sand was to be placed over the area at a rate of approximately 5,000 tonnes per hectare and then mixed with the existing topsoil to provide improved pasture land.

In order to approve the deployment of the land spreading permit at this location a benefits statement was prepared by Land and Water detailing how the process would provide the agricultural improvements whilst minimising environmental risks. Detailed analysis of the material was undertaken prior to the deployment to demonstrate that the material could be described as inert. A method statement also needed to be agreed to describe how the removal of the silt from the river and placement on adjacent land could be undertaken without polluting the watercourse.

***Derbyshire County Council:*** DCC are responsible for the issue of the Land Drainage consent for this work and an application including method statement was prepared and issued to the authority detailing the working methods and how the flood risk will be managed.

***Network Rail:*** Were consulted over the suitability of a narrow rail bridge for access to the site for plant. The method adopted greatly reduced the amount of vehicle movements over the bridge.

***Farm and Equestrian Centre:*** Potential disruption to farming activities and to the operation of the Equestrian Centre was inevitable and a package of compensation needed to be agreed with the farmer to reflect this. The farmer was supportive and provided assistance to the project team by making available accommodation, services etc.

## Conclusion

The six month project presented the team with a number of challenges and by collaborative working and innovative methods with their key supply chain partners, solutions were realised whilst minimalizing the impact on the local environment. The significant maintenance investment by Severn Trent Water has secured for the future the water supply for these major strategic reservoirs and the hydroelectric generation, whilst enhancing the local environment.

*The Editor & Publishers would like to thank Tony Heaney, Contracts Manager with NMCNomenca and Severn Trent Water for providing the above article for publication.*

*River Noe extraction at weir - Courtesy of Land and Water Services*

*Completed Lump stone revetment at River Noe Courtesy of NMCNomenca*

*Completed Reno Matress revetment at River Noe Courtesy of Land and Water Services*

*River Noe restricted access - Courtesy of NMCNomenca*