

Technical Note

Document Control Sheet

Project Name:	TRU W1 Drainage – Clayton Bridge
Project Number:	P01.1
Report Title:	Clayton Bridge Drainage Statement
Report Number:	TN001

Clayton Bridge Drainage Statement

1.1. Introduction

- 1.1.1 The Clayton Bridge drainage scheme falls into Project W1 of the Transpennine Rail Upgrade project. The drainage scheme is Circa 200m of filter drain installation to alleviate a saturated track foundation problem. The scheme also incorporates the installation of a cellular attenuation system and outfall to watercourse ditch via a concrete head wall in Clayton Vale Nature Reserve.

1.2. Drainage Statement

- 1.2.1 There is a need to improve drainage provision at the scheme location due to the railway on the low mileage (west) side of Clayton Bridge level crossing experiencing a wet track bed, and construction of a track drain between the two running lines (known as the six-foot) is considered the best option. The proposed track drain has been designed to Network Rail standard NR/L2/CIV/005/09 Module 9 "Drainage Design", to ensure compliance with minimum cover depth and self-cleansing velocity requirements.
- 1.2.2 A drainage system will be installed within the railway track zone, an under-track crossing (UTX) will be installed from the six-foot to the south of the railway to allow the new track drain to continue towards the proposed watercourse outfall. The UTX will enter the site boundary and connect to the concrete manhole prior to the online storage system.
- 1.2.3 The online storage system will be constructed in the grass area to the south of the railway to provide attenuation for stormwater during high rainfall events up to and including the 50-year return period. The storage system shall consist of modular geocellular "crates" arranged such that the system measures 19.2 x 1.6 x 1.32m (l, w, d) providing 38.5 m³ storage volume. The geocellular modules shall be Stormblock Optimum by Hydro International (or similar Network Rail approved equivalent) providing 95% void ratio.
- 1.2.4 The storage system shall be entirely wrapped with an inner layer of impermeable membrane to prevent direct outflow of water from the tank, and an outer layer of filtration membrane as protection to the crate components from puncture.
- 1.2.5 Flow to the outfall shall be limited to 5 litres per second by a HydroBrake vortex flow control device. During high rainfall events, the HydroBrake will restrict flow, causing it to back up into the geocellular attenuation system. As rainfall subsides, the storage system will empty at the rate of 5 l/s.
- 1.2.6 Downstream of the HydroBrake chamber, the proposed outfall continues southwards through Clayton Vale via a 225mm diameter carrier pipe. The steep drop in the landscape between the railway and the tributary of the River Medlock requires a pipe with a gradient of 1:4. This significant gradient results in high velocities through the pipe, and so a baffle chamber is included in the design, immediately upstream of the proposed point of outfall. The baffle chamber reduces velocity to less than 1.5 l/s to prevent scour.
- 1.2.7 Hydraulic design of the proposed drainage has been carried out using the MicroDrainage 2018.1 design tool.

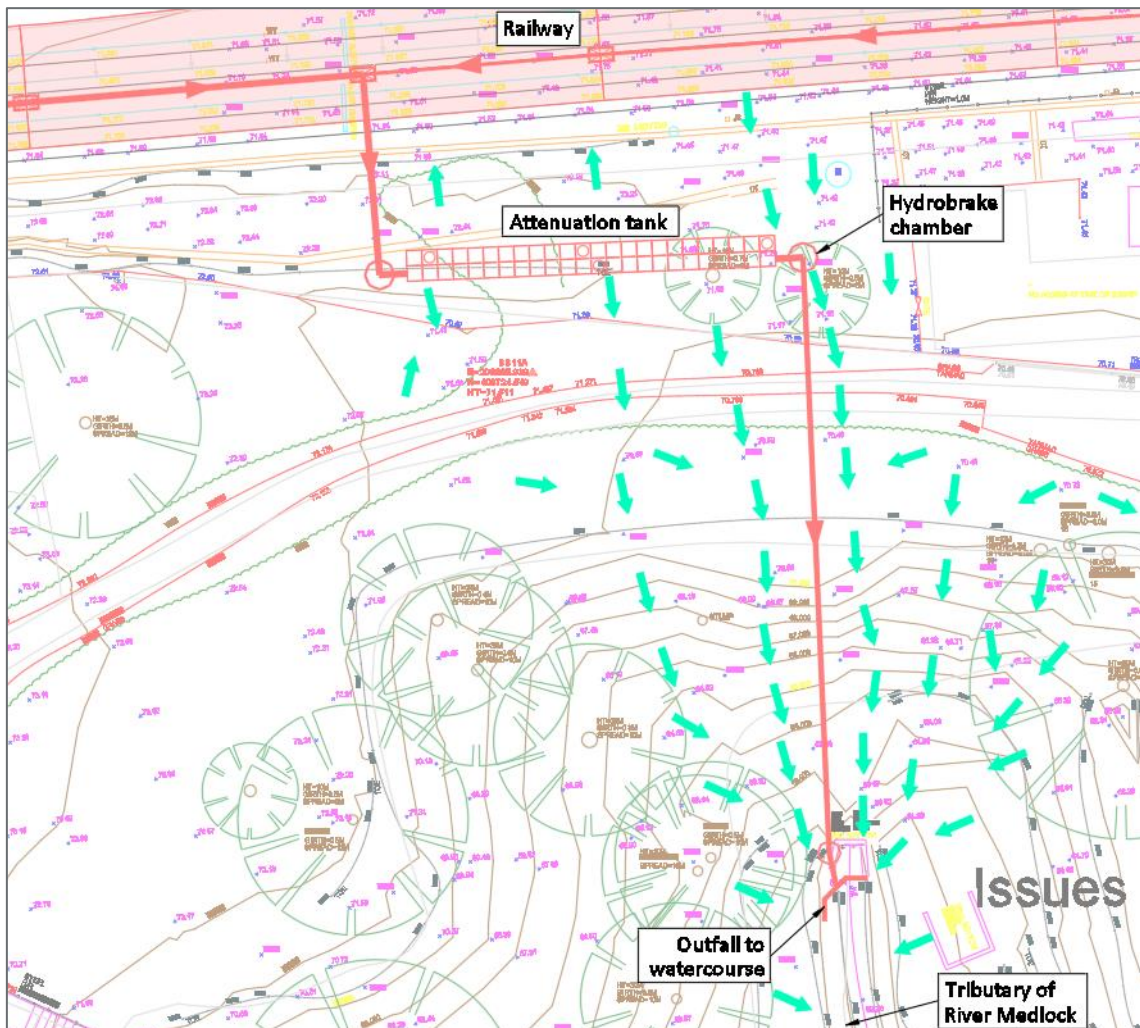
- 1.2.8 Trains will not stand adjacent to the site boundary as there are no station platforms, sidings or signals present, therefore any contaminants from passing trains entering the upstream drainage system will be minimal. Nonetheless, treatment of surface water runoff from the railway will be provided by the proposed filter drain in the six-foot and by the track ballast.

1.3. Alternative Drainage Options Considered

- 1.3.1 The following alternative options were considered as potential points of outfall for the proposed track drainage during development of the design.
- 1.3.2 **Option 1** - Connection to an existing culverted watercourse ('Flash Ditch') which historical record plans show flowing from north to south, under the railway before issuing as a tributary of the River Medlock, in Clayton Vale. Extensive CCTV drainage survey was carried out, but the route of this culvert could not be determined. The absence of visible chambers in the third-party land to the north of the railway suggests the culvert could pass beneath the buildings located there. As the route of the culvert could not be determined, this option was not taken further. It should be noted, however, that the preferred drainage proposal outfalls to the same tributary of the River Medlock so the proposed flow from the railway would ultimately emerge in the same place were it possible to utilise the culvert.
- 1.3.3 **Option 2** - Four railway drainage catchpits are located in close proximity to the level crossing at Berry Brow (two on each side of the carriageway). A CCTV survey has taken place to establish the outfall of these catchpits and determine their potential as a point of connection for the proposed track drainage.
- 1.3.4 The survey ruled out any of the existing catchpits as a potential point of connection for several reasons. Firstly, the invert levels of the chambers are incompatible with those of the proposed track drainage which would commence approximately 200 metres west of the level crossing (the existing chambers are too shallow). Secondly, the survey showed that the catchpits discharge to a chamber within the grounds of the private dwelling at 56 Berry Brow via a 100mm diameter, vertical pipe mounted on the rear side of the retaining wall separating the railway from the lower, private grounds. This chamber forms part of the private house drainage system which, in turn discharges to the combined sewer located within the carriageway of Berry Brow. This building is believed to be a former railway building related to the adjacent level crossing, hence the historic drainage connection.
- 1.3.5 Whilst theoretically possible to connect the proposed track drainage to the vertical pipe mounted on the retaining wall at 56 Berry Brow and continuing to utilise an existing outfall for railway drainage, however, access for maintenance of the system (which joins a private drainage system on third party land) would be difficult. Reliance on a 100mm vertical pipe for our increased flow is also undesirable.
- 1.3.6 **Option 3** - A United Utilities combined sewer is present within the level crossing at Berry Brow. We have approached the utility provider with regard to allowing a direct connection to the sewer but UU have confirmed that a new application for track drainage would not be permitted unless we can prove an existing connection. Our CCTV surveys of drainage assets around the level crossing revealed no existing connection with the sewer. This option has therefore been ruled out.
- 1.3.7 **Option 4** - Construction of a soakaway on the south side of the railway was investigated but considered unfeasible due to;
- Unsuitable soil infiltration rate – modelling was carried out using MicroDrainage of a soakaway measuring 50m x 5m. The modelling showed that the soakaway flooded during medium duration winter storms. There is insufficient space within the railway boundary to accommodate a larger soakaway.
 - The available space within railway-owned land is close to the boundary with Clayton Vale. Given that the land falls away sharply within Clayton Vale, it is likely that water infiltrating at a soakaway here could compromise the adjacent land.

1.4. Flood Risk Assessment

- 1.4.1 The Clayton Bridge site falls under Flood Zone 1 as shown on Environment Agency's Flood Map for Planning (Rivers and Seas). Flood Zone 1 equals 'Low Probability' - land having a less than 1 in 1,000 annual probability of river or sea flooding.
- 1.4.2 With the landscape falling sharply from the railway towards the south, analysis of ground contours from topographical survey of the proposed works area and adjacent land within Clayton Vale shows a clear flood path to the River Medlock, as illustrated below.



- 1.4.3 The proposed track drainage improvement measures, and the intended outfall to watercourse, have been simulated using MicroDrainage for return periods up to the 1 in 1,000-year event. The simulation results are summarised in the following table:

Return period (years)	Flooded volume (m ³)
25	0.0
50	0.0
200	0.0
500	1.5
1000	16.0

- 1.4.4 Both instances of flooding occur at the proposed Hydrobrake chamber, located downstream of the attenuation tank to the south of the railway. From here the flood water will follow the flood path illustrated above, towards the River Medlock. The Hydrobrake is the most likely location for flooding to take place as the vortex flow control device functions by introducing a restriction to the flow of surface water through the drainage system.
- 1.4.5 In the event of a blockage occurring at the Hydrobrake chamber, flooding could be experienced at return periods lower than the 1 in 500-year event. In this scenario, flood water would follow the same path. Network Rail will have a Maintenance and Inspection Plan in place to mitigate against any possible blockage or build-up of material through continual routine maintenance and cleaning of their assets by the network maintainer.