



**Project Info**

-  01 / 06 / 20
-  CCH8™ Custom Bulk Rolls
-  900m<sup>2</sup>
-  Transverse layers
-  Logan Reservoir, Lanarkshire, Scotland
-  George Leslie Ltd & Sean Carr Lining Technology
-  CCH Hydro™ used to line a by-wash channel at the Logan Reservoir to reduce leakage and mitigate further erosion



*Completed CCH channel lining installation at Scottish Water's Logan Reservoir in Scotland*

In June 2019, Mott MacDonald conducted a site walkover of the by-wash channel at the Scottish Water Logan Reservoir and as part of the drawdown assessment undertaken by the consultant engineer, it was identified that the by-wash channel could play an important role in diverting flows away from the reservoir in the case of an emergency.

During the site walkover substantial leakage was observed flowing from the downstream toe of the embankment into the reservoir. The leakage was located over an approximately 50m length of embankment.

The leakage flow appeared to have been ongoing for some time with established leakage paths and had caused erosion of the downstream face of the by-wash embankment. There was a risk that as the leakage continued through the embankment erosion may continue and cause the embankment to become unstable.

It was likely that the leakage path started from the invert of the by-wash channel and to mitigate the risk of continued erosion, leading to possible collapse of the by-wash embankment and uncontrolled inflows in to the reservoir, it was recommended that remedial works were carried out to reduce the leakage.

One option was to lay and bury a large 1000mm diameter pipe along the invert of the by-wash to carry flows past the section prone to leakage. However, this would be required along an approximately 100m section to tie the pipe in and would involve extensive excavation and preparation works.



Therefore, it was decided to line the invert of the by-wash channel with an impermeable barrier over a 50m length and in January 2020 900m<sup>2</sup> of Concrete Canvas Hydro (CCH) GCCB\* material was specified to reduce the leakage and mitigate the risk of continued erosion.

CCH combines the concrete filled geotextile technology of Concrete Canvas® (CC) GCCM\*\* with a highly impermeable, chemically resistant geomembrane liner. The liner incorporates a hi-visibility welding strip which allows joints to be thermally welded with a double-track or triple-track air channel for on-site testing. CCH removes the need for protective top cover, dramatically reducing installation times and simplifying logistics.

George Leslie Ltd were appointed as the main contractor for the remedial works on site with the CCH installation carried out by Sean Carr Lining Technology (SCLT) on behalf of the contractor.

The site conditions and inclement weather presented several challenges for the contractor. The Logan Reservoir is located in a very remote area with difficult track conditions and a steep topography. The by-wash channel was located 1km distance from the access road at the dam which made access extremely difficult.



*Leakage at the downstream toe of by-wash embankment*



*Draining & excavation of by-wash channel*



*Regading the by-wash channel*



*CCH transverse layout*

\* Geosynthetic Cementitious Composite Barrier

\*\*Geosynthetic Cementitious Composite Mat





CCH terminated into 150mm anchor trenches prior to backfill



Thermal welding of CCH overlaps



Completed joint detail



Hydrating the CCH material

The 8mm thick material variant (CCH8™) was delivered in custom 50m<sup>2</sup> bulk rolls, which measured 1m wide by 50m in length, to allow for easier transportation on site. In total 18 custom bulk rolls were delivered to site and staggered along the channel prior to installation.

Gravel and cobble alluvial deposits at the confluence of the by-wash channel with the Blaeberry Burn were observed to have altered the profile of the by-wash channel.

To prepare it for installation, the channel was dewatered and re-profiled to achieve a constant fall, graded and then compacted using plate compactors. 150mm anchor trenches were then prepared on both sides of the channel for the CCH termination. The CCH was then deployed transversely across the channel and cut to length with the leading and trailing ends captured within the anchor trenches and secured to the substrate using steel ground pegs.

After laying a section of CCH, the PVC backing of the layers were wiped clean and the joints thermally welded with a double-track air channel with a speed setting of 1.8m/min and temperature of 500°C. A hand-held heat gun fitted with a perforated slot nozzle was then used to bond the concrete surfaces together which provided additional protection to the CCH membrane from environmental exposure and resulted in a neater finish. The edges of the CCH were then captured in the pre-dug anchor trenches, which were backfilled to prevent water ingress and provide a neat edge termination.





*Facing upstream prior to poured concrete backfill*



*Backfilling anchor trenches with poured concrete*



*Completed CCH lined channel*

The material was hydrated using a pump and hose with a diffused spray nozzle from a local watercourse. When the CCH had set, the anchor trenches on the leading and trailing edges were filled with poured concrete to ensure no water ingress and provide a smooth transition from the CCH lined channel into the unlined section of channel.

900m<sup>2</sup> of CCH8™ was installed within 2 weeks with an installation crew of 4 people despite the difficult to access site and inclement weather conditions. The material will provide long-term erosion control for the by-wash channel, reducing leakage which could have potentially led to the possible collapse of the by-wash embankment. The CC Hydro™ material is being considered by the consultant and client for similar schemes in the future.