

Poaka Beck WTW

maximum output needed increase from 13MI/d to 16 MI/d

Poaka Beck Water Treatment Works (WTW) is located in South Cumbria approximately 4.5km north of Dalton-in-Furness. The WTW is supplied from three impounding reservoirs: Poaka Beck, Harlock and Pennington. The existing WTW was upgraded in the 1980's with clarification by Dissolved Air Flotation (DAF) being added to the original filtration through Rapid Gravity Filters (RGF's). Poaka Beck WTW supplies the Poaka Beck Zone which comprises the towns of Askam-in-Furness, Dalton-in-Furness, Marton village and outlying farms. In addition the WTW can export water into Barrow-in-Furness via a connection into the Ulpha trunk mains network at Askham-in-Furness. The existing WTW had a maximum output of 13 MI/d serving an equivalent per capita population of 80,000. The Poaka Beck zone has an average daily demand of 6-8 MI/d with the rest of the 13 MI/d available for export.



Poaka Beck WTW Photo shows Lamella Thickeners installed

photo courtesy of KMI+

The Asset Management Period (AMP) 4 drivers for this project were - cryptosporidium, disinfection and plumbosolvency.

In 2003, a strategic review of the South Cumbria sources and demands was carried out by United Utilities identifying that the WTW maximum output needed to increase from 13 MI/d to 16 MI/d to meet future demands.

The outline design for the project was carried out by Solutions and Engineering (a joint venture between United Utilities and MWH, United Utilities Solutions Service Provider). As part of this outline design a hydraulic study was carried out which revealed that the existing trunk mains downstream of the WTW did not have the capacity to meet the increase in flow whilst maintaining existing levels of service (pressure) to customers within the Poaka Beck zone. Therefore, if the WTW were to achieve a maximum output of 16 MI/d it would require a new outlet trunk main.

Poaka Beck Link Main Design

Several solutions for the outlet trunk main from the WTW were

investigated by Solutions and Engineering and, after analysis of various options the **preferred option** was identified as a new trunk main from the WTW to Highfield Service Reservoir (SR). Highfield SR operates as a break pressure tank on the Barrow Link Main, a large diameter trunk main supplying water into Barrow-in-Furness. A new trunk main between the WTW and Highfield SR (called the Poaka Beck Link Main) would enable water to be exported from the WTW to Highfield SR, meeting the 16 MI/d criteria.

As the design for the new Link Main developed, it became apparent that water from Highfield SR could be gravitated to the WTW via a pressure sustaining valve at the inlet to Highfield SR. The benefit of being able to import water to the WTW is that it could be designed to automatically provide security of supply to the Poaka Beck zone in the event of a shutdown at the WTW.

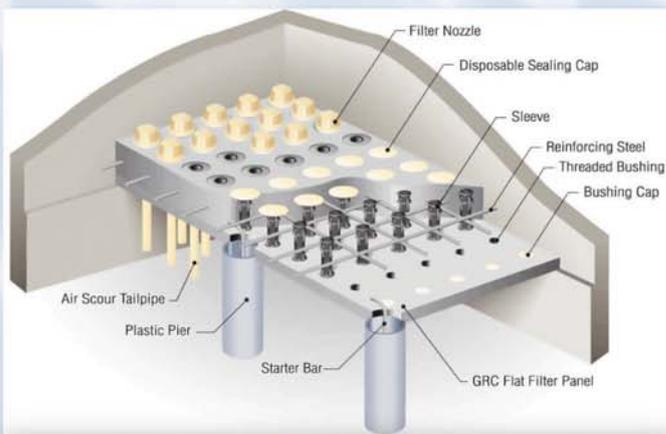
Poaka Beck WTW Design

The WTW site is small, confined, sloping and on the border of the Lake District National Park. Five options for enhancements to the existing WTW were investigated to obtain the optimal layout for the site.



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Poaka Beck WTW; Picture shows First stage filter gallery & second stage filters

courtesy KMI+

United Utilities' Integrated Alliance North construction partner KMI+ (a Kier, Murphy, Interserve and Mouchel Joint Venture) provided valuable detailed design and constructability advice on the options and all three integrated Alliance North partners (UU, MWH, & KMI+) reviewed and agreed a preferred layout.

The new 1st and 2nd stage filter building was developed using 3D modelling techniques, which assisted with the access, lifting and maintenance & health & safety reviews.

The detailed design was carried out by two teams working collaboratively:

- * M & E design was carried out by the KMI+ in house design team;
- * civil design was carried out by GHA Livigunn.

Project Phasing

The overall project was delivered in two phases:

- * Phase 1 the Poaka Beck Link Main;
- * Phase 2 the enhanced WTW.

Once Phase 1 was completed, the existing WTW was shutdown and compliant water was supplied to the Poaka Beck zone via the new Link Main. This allowed Phase 2 to be constructed without having to keep the existing WTW operational, making construction and commissioning of the enhanced WTW much simpler.

Scope of Works

Phase 1 comprised a new bidirectional 4.5km trunk main from the existing Highfield SR to the WTW. The trunk main utilised 400 mm NB ductile iron and 500 mm OD Polyethylene (PE) 100. The actuated control valves required for the Link Main bi-directionality were included in Phase 1 as well as new secondary disinfection using Sodium hypochloride at Highfield SR.

Phase 2 comprised new inlet control valves to the existing DAF plant,

which was retained, with an interstage pumping station to pump the clarified water to the new 1st stage (RGFs). Five new 1st stage RGFs were provided as well as four new 2nd stage RGFs. A new contact tank was provided to meet the disinfection driver. A new flow balancing tank balances out instantaneous demands and provides storage to enable changeover between importing and exporting water through the new Link Main. The existing chlorine gas storage and dosing system was replaced by a new sodium hypochlorite system. The existing polymer and ferric sulphate storage and dosing systems were retained. New sulphuric acid and orthophosphate storage & dosing systems were installed.

A new wastewater treatment and re-cycling plant was provided, comprising new lamella thickeners, sludge transfer system, modifications to the existing sludge storage tanks, modifications to the existing 1st stage dirty washwater tanks and new 2nd stage dirty washwater tanks.

Poaka Beck Link Main Construction

KMI+ was appointed Principal Contractor for the new Link Main, which had some significant construction challenges to overcome. Great Crested Newts were identified on the route as well as a badger sett. The majority of the pipeline route also passed through two haematite mining areas.

The pipeline crossed the A590, which is the major trunk road into Barrow-in-Furness. The crossing method agreed with the Highways Agency was open cut using two phased partial road closures to keep one side of the carriageway open at all times. Two tunnels were crossed, one the West Coast Railway Line and the other an old mining tunnel.

Construction of the Poaka Beck Tunnel began in May 2006 and was completed on schedule in April 2007. The Link Main supplied the Poaka Beck zone with potable water from May 2007 until March 2008, when the enhanced WTW was commissioned.



Poaka Beck WTW: Construction of the filter building

courtesy KMI+

Poaka Beck WTW Construction

KMI+ was appointed as Principal Contractor for the enhanced WTW. M & E work packages were awarded to specialist sub-contractors. These were: Boulting Group (electrical installation), Compass Ltd (Process pipework), Lloyd Morris Electrical Ltd (Control Panels), Tata Control systems (Software), Hydroclear Services Ltd (Chemical dosing), AMT Ltd (Filter media installation), Hydro International (Lamella thickeners).

Construction of the main civil elements started in January 2007 with site excavations, a tower crane being erected at the end of January to service the filter building, contact tank, flow balancing tank and the interstage pumping station. The filter building was the most complex of the structures, being of cellular design, and having five different levels.

Some of the civil designs depended on the detail design of items of M & E kit, so early procurement of these items was important. Once the main structures were nearing completion, sections were handed over to allow M & E installations, requiring close co-ordination between the site teams as different disciplines worked alongside each other using the same accesses.

Poaka Beck Commissioning

The Poaka Beck process commissioning required close co-operation between KMI+, their sub-contractors and UU, resulting in seamless

hand-over from commissioning to the end users. UU Operations, as part of the commissioning team, had developed a good understanding of how the plant was controlled as commissioning progressed.

Problems were overcome as they occurred by the team working together and being committed to achieving an end result. Some events could have been show stoppers, but thanks to the team working together they were overcome.

The Poaka Beck project team delivered water into supply on 27th March 2008, four days earlier than the March 31st target and project commission is expected within the £20.3 million budget and ahead of August 2008 target.

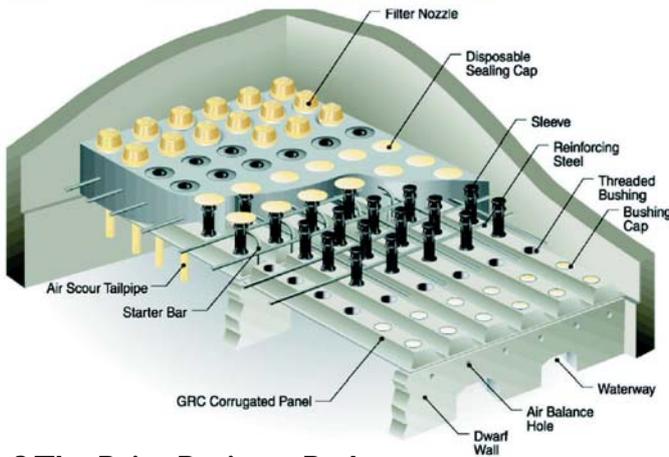
Health & Safety

The project delivered water into supply having completed over 200,000 man hours without a reportable accident. This was a magnificent achievement by all parties concerned and is a model for how a project can be successfully delivered within tight constraints, whilst maintaining a focus on safe working.

Note: The Editor & Publishers wish to thank Mat Bingham, Engineering Delivery Manager at MWH, John Williamson, Site Manager at KMI+ and David Dewar, Project Manager at United Utilities for preparing the above article for publication. ■



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3 The Point Business Park
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