

# Marion WTW Rationalisation

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**M**arion Water Treatment Works, (WTW), is situated in Marion-cum-Grafton, a small village to the north-east of Knaresborough and to the south of Boroughbridge in North Yorkshire. The WTW treats raw water that is sourced from two remote boreholes. One at Lower Dunsforth and the other at Bogs Bridge and supplies an area extending southwards towards York with a peak demand of 5.2Ml/day. The nature of these raw water resources in terms of quality and sustainability is variable and requires the treatment works to operate Kalsep pressure filtration with the additional dosing of a high cost sequestering agent which subsequently masks the high hardness of the borehole waters. As a consequence of these process treatment requirements operating costs are significantly higher than normal. Additionally, the concentration of iron and manganese exceeds or is likely to exceed the prescribed concentrations in the zones fed by Marion WTW and as a consequence the Drinking Water Inspectorate have issued an Undertaking that requires compliance before March 2010.



Booster pumping station at Kirk Hammerton

Photo courtesy of Arup

The works itself comprises a relatively old pressurised system that is in need of considerable investment to maintain both a reliable supply and to meet the requirements of the Undertaking. In addition the site is geographically isolated in terms of access for maintenance, being located within an old disused quarry and feeds a discrete supply area that has no other alternative local resources. Any options to improve the situation would require major extensions to the existing Works, and would generate difficulties in construction and problems in complying with planning requirements.

Consequently, Yorkshire Water Services (YWS) along with technical consultants, Arup, conducted a rationalisation study to

investigate the potential scope for closure of the site. The appraisal process gave particular attention to the operating cost regime applicable to a variety of options especially in terms of the water production costs of power and chemicals.

The outcome of the study indicated that a maining out solution would provide a more cost effective alternative to upgrading the works and providing additional process treatment. This scheme involved the laying of approximately 22 km of pumping main between YWS's Acomb Landing Water Treatment Works at York and a new pumping station located at Kirk Hammerton to convey treated water to the existing service reservoir asset at Marion WTW and was subsequently adopted as the preferred solution.

During the feasibility study of the preferred solution a number of environmental issues were also identified along the pipeline corridor that presented the team with some interesting challenges including ;

- the potential presence of protected species such as nesting birds, great crested newts, badgers and water voles.
- numerous hedgerows and trees providing nesting habitats and foraging opportunities for bats were also identified.
- Japanese knotweed within the East Coast Main Line railway embankment close to which part of the initial route was planned
- significant potential for archaeological remains.

With intrusive construction work planned to commence in early May 2008, a detailed bird nesting survey was undertaken prior to hedgerow clearance in February subsequently paving the way for pipeline construction to commence immediately and thereby capture some significant time savings without detriment to the wider ecology and environment.

The majority of the pipeline consists of a 400mm diameter high performance polyethylene (HPPE) pipe commencing with a section that had to negotiate a constricted and complex route through the existing Acomb Landing WTW whilst also ensuring the potential impact of a potable water main being located within the River Ouse flood plain was effectively mitigated.

The use of HPPE pipe brought significant benefits both in terms of cost and time. Notable benefits included no requirements for thrust blocks as the pipeline was continuously welded, ease of installation, less pipe fittings and ease of handling.

Most of the main is laid in agricultural land adjacent to the A59 main highway route linking York and Harrogate and was installed using predominantly open cut methods.

However along the route there were many road and minor crossings which were negotiated using directional drilling techniques. In

addition there were two major crossings of note, namely;

- the River Nidd crossing which was successfully negotiated using directional drilling techniques and was installed with three separate but permanently installed and valved pipelines providing a high level of security of supply and
- the East Coast Mainline rail crossing which was successfully crossed by utilising an existing culvert which was identified and robustly examined during the design development stages. This approach consequently saved both cost and time and provided a significantly reduced risk profile for this section of pipeline.

The pipeline follows largely agricultural land with large areas of land utilised for arable crops and grazing. During early contractor involvement (ECI) it was considered prudent to engage with private landowners at the earliest opportunity in order to avert potentially serious land issues given the number of land owners (over thirty) likely to be impacted upon by the scheme.

The new pumping station, including four pump sets, was installed at Kirk Hammerton and was required to obtain planning permission in a sensitive area. Although there were some required planning conditions the team successfully gained permission with very few local objections which were allayed through a series of local public meetings and the new pumping station was constructed to represent a barn structure and blend with the local vernacular and rural setting.

The location and identification of great crested newts provided the project team with one of its greater challenges. In consultation with Natural England, a licence for the three identified sections of the route required the erection of newt exclusion fencing and trapping out of newts from these areas for a period of sixty days. In order to minimise the impact of this on the construction activity and programme Yorkshire Water along with Arup and the Contractor (Laing O'Rourke) worked closely with the Natural England team successfully executing the licenses whilst maintaining the programme and minimising cost impacts.



Captured Great Crested Newt

Photo courtesy of Arup



NAA Ltd investigating exposed areas of interest

Photo courtesy of Arup

Equally influential and working in parallel, in the area between York and Marton, were some ten identified hotspots with potential for archaeological remains. The results of a geophysical survey highlighted a concentration of anomalies representing enclosures and pits alongside a possible Roman road near the proposed pumping station. Further detailed investigations in the areas surrounding the pumping station revealed, in addition to the possible road, the remains of at least two round houses and accompanying cultivation plots. In addition evidence of two kilns and three possible oven structures suggested the area was occupied for domestic purposes as early as the end of the Iron Age. All significant artefacts were recovered to ensure protection prior to construction of the pipeline and pumping station.

When coupled with the additional challenges that lay ahead, such as

the impact to customers when changing seamlessly from a chlorinated to a chloraminated treated water supply, the safe mothballing of Marton WTW, the abandonment of the boreholes, one of which is artesian, one may conclude that this project has had its fair share of interest.

Key project participants were Yorkshire Water Services (the client), Laing O'Rourke (principle contractor/designers), Arup (technical consultant) and Turner & Townsend (commercial consultant).

**Note: The editor & Publishers thank Peter Corrigan, Solution Manager with Yorkshire Water Services Limited and Fred Mukonoweshuro, Project Manager with Arup for providing the above article. ■**



NAA Ltd investigating exposed areas of interest

Photo courtesy of Arup