

Chirton Phase 2 Pipeline

elimination of standalone source

by Martin Wood BSc and Drummond Modley CEng FICE

A significant number of Wessex Water customers in the north and east of the supply area are supplied from either borehole or spring sources. These historically have been relatively small sources, supplying local communities in relative isolation to the rest of the supply area. Over time, the supply network has been expanded to link up most of the sources, but there still remain a number of isolated supply areas like Chirton that, due to their remoteness, have remained as standalone. The Chirton works is a groundwater source located on the northern edge of Salisbury Plain, south east of Devizes. The source pumps up to Chirton distribution reservoir which supplies a local population of around 5,000 people.



Chirton Phase 2 Pipeline - June 2011

Courtesy of Wessex Water

Project need

The Chirton Phase 2 Pipeline is one part of Wessex Water's new major AMP 5/6 water supply grid project, which was in its business plan to resolve four key issues that the company is currently facing. The overall drivers for the supply grid are to address the following:

- Improve the security of supply to customers, even under a catastrophic source failure.
- Meet customers demand for water over the next 25 years.
- Deal with deteriorating raw water quality, particularly increasing concentrations of nitrates at some of the groundwater sources.
- Meet the reductions in abstraction licences required by the Environment Agency to improve flows in some rivers and protect their ecology.

This project addresses both the first, second and third bullet points for customers served by Chirton WTW, which is fed from a borehole.

Issues identified

The average output from the source is around 1.1Ml/d, and the annual and daily licence is 2.27Ml/d. However, the yield of the source is constrained by hydrology, and consequently there is a potential supply/demand deficit under drought conditions.

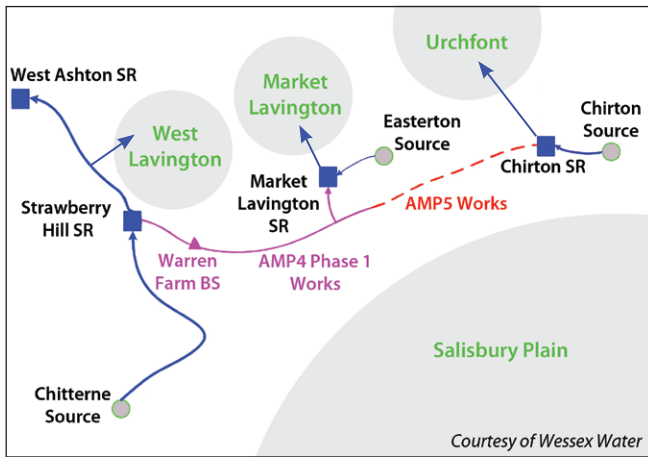
Additionally, with Chirton being standalone, a back up supply was required to improve the security of supply for the area.

The other issue relates to nitrates. As with a number of groundwater sources drawing from unconfined aquifers within rural areas, nitrate levels within the groundwater have been steadily rising over the years. Extensive modelling has been carried out taking into account geology, rainfall and farming practice within the catchment in order to make future predictions of nitrates within the water supply. For the Chirton source, it is predicted nitrates will continue to rise with occasional exceedences likely over the next five to ten years, which will become more frequent to a point that they will become regular seasonal events during winter periods.

The solution

Concerns over the standalone nature of Chirton were identified in AMP4 as the source also has treatment facilities for the removal of iron which is a factor of the aquifer being in green sand.

A more immediate issue had been caused by process issues at another standalone source at Market Lavington, pulling from a similar aquifer. Various options were looked at to back up this source including connecting to local distribution areas, but these were subject to their own supply constraints.



Following a strategic review by Wessex Water, the agreed solution was to connect back to the trunk main system at Strawberry Hill reservoir and provide a strategic link that backed up both Market Lavington and Chirton sources.

To deal with the issues that were being experienced at Market Lavington the scheme was split into two phases. Phase 1 of the project involved the construction of a new 4km 250mm diameter pipeline between the Strawberry Hill and Market Lavington Service Reservoirs, and the installation of a booster pumping station. This was undertaken in AMP4 with the pumping station sized to meet the future requirement of feeding Chirton.

Phase 2 of the project involves the construction of a new 6km 250mm diameter polyethylene pipe between Market Lavington and Chirton reservoir.

Design challenges

Phase 2 of the scheme to connect to Chirton reservoir started in April 2010 with a review of the work done to date under AMP4 and confirmation of flows and how it was proposed to connect into the overall water supply grid. Additional work that was carried out included modelling of the nitrates. As the expected exceedences in the near future are only likely to be marginal, the design incorporates the facility to blend water from the source with water from the trunk mains in order to maximise its use and to allow the source to be turned over during these periods.

As the new pipeline is normally providing a back up, the design needed to take into account the requirement for this main to be available at all times. To achieve this, the control system will ensure the main is operated at its design flowrate on a regular timed basis. As the aggregate volume in doing this will impact on the source output, a sweetening flow is returned back to Strawberry Hill to balance the flows as source neutral.

The pipeline itself has been designed to follow the contours around the ridge of Salisbury plain with air valves and washouts located at field boundaries in agreement with the landowners to accommodate the fact that the land is generally ploughed. It is subject to an archaeological watching brief and crosses an ancient right of way. To minimise the risk of delay during construction, this section was excavated and backfilled with sand by a specialist archaeological framework contractor.

Another concern was ordinance. The pipeline runs just to the north of a military firing range on Salisbury Plain. Following a risk assessment, Wessex Water Engineering and Construction Services engaged the services of a specialist contractor to carry out a ground survey along the route to identify the presence of potential ordinance. Results highlighted a number of hot spots which fortunately on investigation were found to be general metallic waste and not of concern.

The pipe route itself is predominately through chalk and the ground non-aggressive. The selection of PE for this was in order to minimise joints, and provide good flexibility to help keep the use of proprietary bends to a minimum.

Procurement

The project is being delivered by Wessex Engineering & Construction Services (WECS). The project forms part of the water supply grid workstream, which is made up of a WECS project team, Atkins Ltd, May Gurney Ltd and Trant Ltd. The design of this project has been undertaken by Atkins Ltd and the new pipeline will be built by Trant Construction Ltd. WECS is procuring the PE pipe for the scheme under their framework arrangement with GPS.

Construction programme

Construction of the new pipeline started in early May 2011 and is scheduled to be completed by September 2011. The programme takes into account the views of local landowners, and has been developed to minimise disruption to them either when harvesting or planting their next crops.

The work has also been programmed to take place during what is hoped to be the dryer months, as the ground conditions in winter are known to be very poor and would increase the damage to the fields, which would have an adverse impact on overall programme and the level of compensation.

The editor and publishers wish to thank Martin Wood, Design Coordinator, Grid & Zone 21, with Wessex Engineering & Construction Services, (WECS) and Drummond Modley, Programme Manager, Grid & Zone 21, also with WECS, for preparing the above article for publication.



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