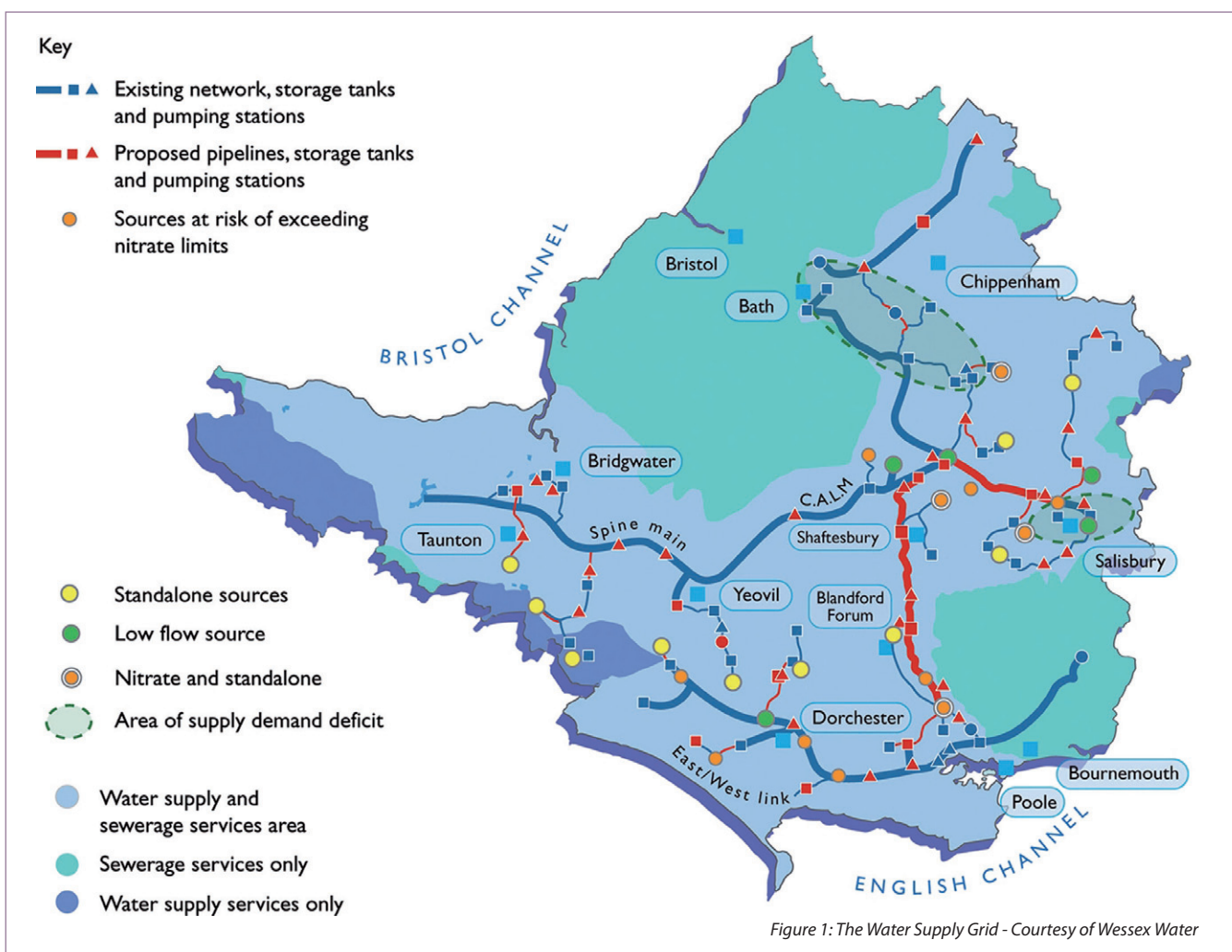


The Water Supply Grid Project

Wessex Water's 8-year programme to resolve resilience issues within the water supply network

by Drummond Modley FICE FCIWEM, Martin Wood BSc & Lynne Elford MRICS

Wessex Water provides drinking water to an area of south west of England, covering approximately 7,500km² including Dorset, Somerset, Wiltshire and parts of Gloucestershire and Hampshire. During an average year, Wessex Water produces approximately 350Ml of potable water each day. The water supply grid is the largest scheme ever undertaken by Wessex Water. The eight year £225m programme of works, spans two AMP periods between 2010-2018 and comprises more than 50 individual projects designed to resolve resilience issues within the water supply network. It will improve inter-connectivity within the existing water supply system to enable water to be moved from areas of surplus to areas of need and hence improve resilience to drought and unforeseen events. The whole programme will be constructed and commissioned by 2018.



Why is the scheme needed?

The Water Supply Grid will allow Wessex Water to meet future demand for water and:

- Improve the security of supply for customers - even in the event of a catastrophic failure.
- Meet reductions in abstraction licenses required by the Environment Agency to improve flows in some rivers and protect their ecology.
- Deal with seasonal or occasional deteriorating raw water quality - particularly increasing concentrations of nitrates at some groundwater sources.

It is required so the company meets the following legal and regulatory obligations:

- The legal obligations in National Environment Programme issued by the Environment Agency, specifically associated with reductions in the amount of water that Wessex Water can extract from certain underground water sources from 2018 onwards, as required under the EU Habitats Directive.
- The legally binding undertaking agreed with the Drinking Water Inspectorate, to ensure compliance with Water Supply (Water Quality) Regulations 2000, associated with high levels of nitrates in certain untreated water sources



Innovative ideas from Saint Gobain

*"If you always do what you always did,
you will always get what you always got."*

Albert Einstein



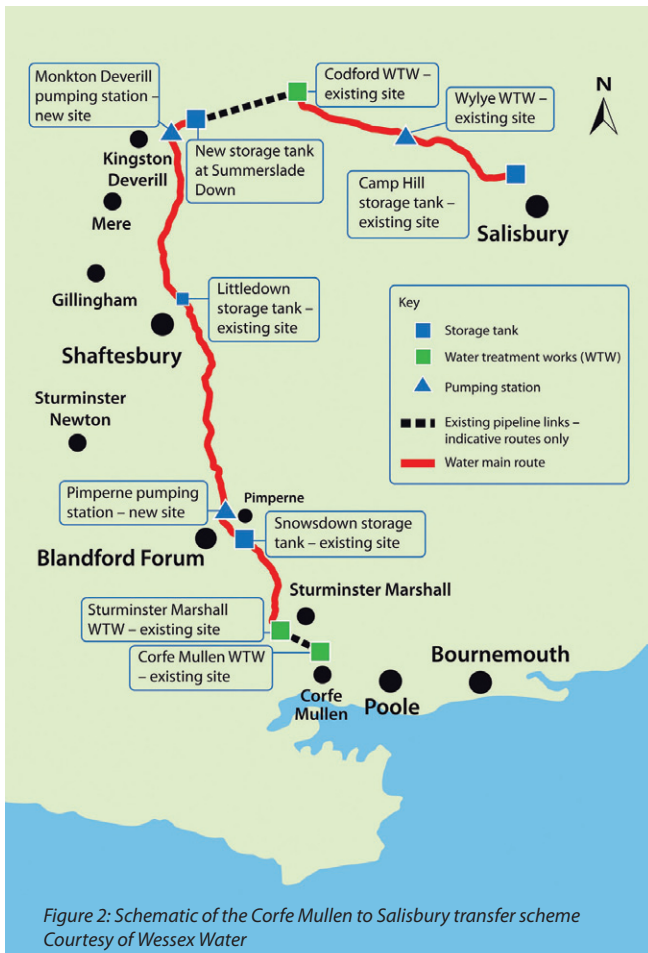
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largely from agricultural fertiliser.

- The regulatory outputs set by Ofwat, associated with the security of water supply to their customers served by a single source of water only.
- The statutory duty to balance the supply of and demand for water up to the year 2035 as set out in the Water Resources Management Plan approved by Defra in 2010.

New infrastructure required

The eight year programme of work includes the construction of more than 200km of new pipelines, 24 major new or refurbished pumping stations and 12 new storage tanks ranging in capacity from 2 to 8 million litres.

For the new pipelines there are more than 120 crossings required that include major trunk roads, major rivers and main railway lines.

There are 12 schemes that eliminate standalone sources, so that customers have security of supply in the event of their normal local supply sources failing, due to potential contamination of the supply or mechanical failure of equipment.

New transfer main

A new 74km transfer main is currently being constructed from a new major pumping station at Sturminster Marshall in Dorset to a new storage tank at Camp Hill just west of Salisbury. This transfer main provides the key link between the existing infrastructure in the south and the north.

The transfer main is shown in Figure 2 (left). The final route of the new transfer main has been strategically chosen to cover existing Wessex Water supply areas that require additional resilience and minimises the change in water characteristic that will be experienced by customers. The route has been established in close liaison with local groups including landowners and other planning stakeholders to finalise exactly where it will be laid. The transfer main will be constructed from Dorset, to Salisbury in Wiltshire via Blandford, Shaftesbury, Monkton Deverill and Codford.

The route, between Corfe Mullen in Dorset and Salisbury has been developed to avoid environmentally sensitive areas wherever possible including Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), Count Wildlife sites (CWS) and Scheduled Ancient Monuments (SAM).

The pipeline also passes through the Cranborne Chase and West Wilts Area of Outstanding Natural Beauty (AONB).

Managing environmental impacts

At the end of April 2013, the 74km transfer main was granted full planning permission, following the submission of the planning application and full Environmental Statement to three planning authorities, Wiltshire Council, East Dorset District Council and North Dorset District Council, as the scheme crosses all three administrative areas.

Environment Impact Assessment: This reviewed potential impacts and concluded that the majority of impacts from the scheme will be temporary during construction and of negligible or minor significance. Best practice site construction techniques will minimise these impacts during construction. Residual permanent impacts are limited to minor adverse impacts on ecology (from washout discharges to watercourses), the historic environment and the landscape.

The permanent impacts on ecology will be managed through controlled use of the pipeline and storage tank washouts. The temporary impacts on ecology will be managed through suitable construction techniques, habitat reinstatement and enhancement where possible.

The impacts that have been identified on the historic environment will be managed through targeted excavation and cataloguing along with careful routing of the pipeline within the 50m planning corridor to accommodate unforeseen areas of archaeological significance.

Benefits: There are major positive benefits in terms of a long term improvement in the security of regional water supply and reduced groundwater abstractions for public supply from the more sensitive upper reaches of the river catchment areas for the river Wylde and Bourne, which will help improve in-river ecology.

With measures in place to mitigate the temporary and permanent impacts, any adverse impacts identified are outweighed by the more widespread benefits from the provision of a reliable water supply for the future and the reduced abstractions from the upper reaches of the River Avon catchment.

Procurement Strategy

Wessex Engineering and Construction Services (WECS) is responsible to Wessex Water for delivering the programme of work safely, to the right quality, on time and cost effectively. To achieve this, WECS established an external project workstream in 2010, dedicated to the delivery of the programme of work. The team setup a co-located office in the centre of the Wessex Water region at Yeovil, where staff of all disciplines could work alongside each other for part of a typical week.

The team also adopted the use of a new sharepoint based, collaborative document management tool to allow all staff working on the scheme access to the same documents wherever they were located in the UK or overseas. The workstream includes the internal construction partners such as WECS Civils and WECS Mainlaying to undertake a substantial part of the construction work required.

WECS itself has also provided the delivery teams with wide ranging in-house expertise from programme and project management, P6 planning, purchasing, commercial, contractual, technical, operational, environmental science, estates and ICA support.

- **Commercial:** WECS has contracted with the external designers using the Professional Services Contract (PSC)

Option C target cost contract. The external contractor partners have been engaged using the NEC ECC Option C target cost contract. Where elements of the work have been tendered, to bench mark delivery, the NEC ECC Option A contract has been used.

- **Design:** To secure delivery, WECS has engaged a range of designers to carry out the optioneering studies, complete outline and detailed designs and provide construction support services to the inhouse and external contractors. The majority of this work has been undertaken by Atkins.

However, since 2013, the detailed design of more than 100km of new pipelines has been undertaken by WECS own in-house pipeline design team.

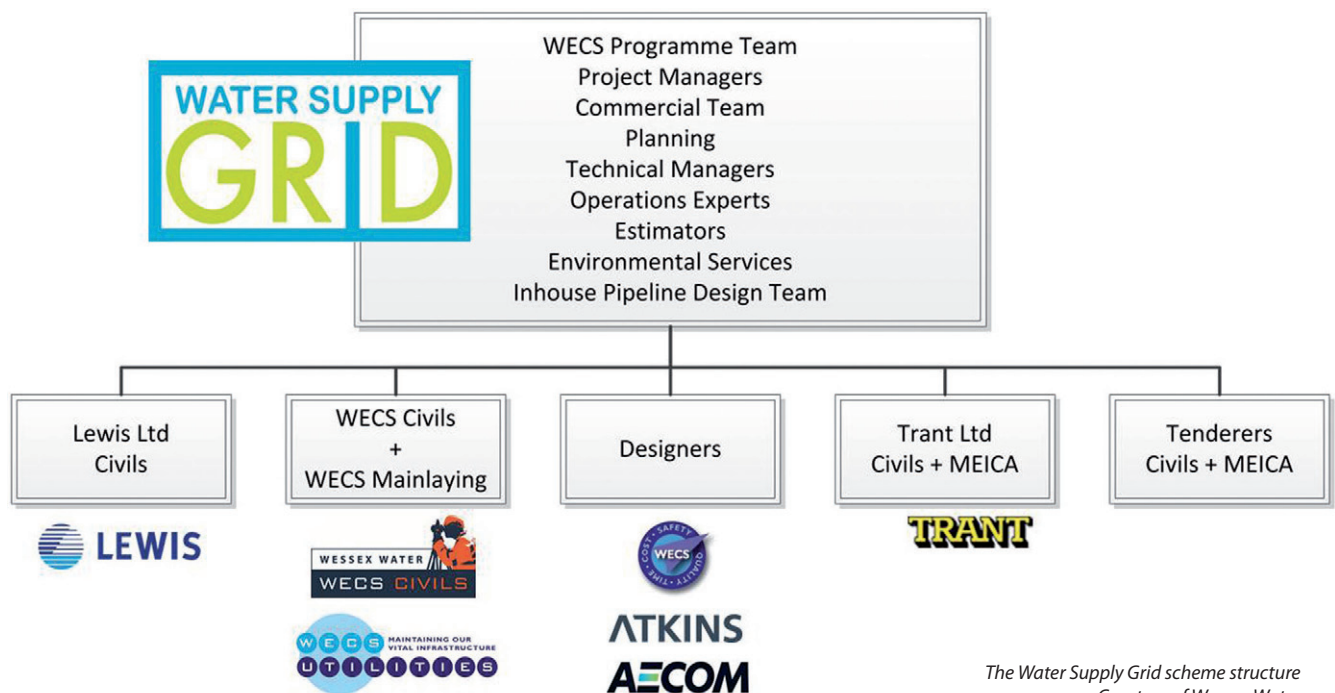
Also, AECOM and Grontmij have also both been recently commissioned to complete outline and detailed design for specific water treatment plant refurbishment projects.

- **Contractors:** WECS has contracted with external partners such as Trant Engineering Ltd, Lewis Civil Engineering and Clancy Docwra to construct the new pipelines, pumping stations and storage tanks required.
- **Suppliers:** WECS has used its agreed framework supply chain contracts and looked to secure savings through bulk purchases of equipment and materials.

Innovation applied

A new Optimiser control system has been developed that will manage and optimise the transfer of water along the new 74km transfer main. The Optimiser will be a centrally controlled and managed system that will schedule transfers in the most efficient way, whilst still operating within the constraints built into the system, to ensure security of supply, minimise any risk of water quality issues and minimise energy costs.

The volumes of the new storage tanks along the transfer main have been minimised by dedicating them as transfer storage allowing the full volume to be used without compromising the existing distribution storage for local customers which are located at the same sites.



The Water Supply Grid scheme structure
Courtesy of Wessex Water

The water supply grid has been designed to allow the existing nitrate removal water treatment works and low nitrate water supply sources to be fully utilised by the targeted blending of the available low nitrate water with sources at risk of exceeding the nitrate standard. This has been done by careful segregation or twinning of pipework to allow for blending at critical points.

In order to maximise flexibility, most links within the scheme have been designed to be bi-directional. As a result there are some flow reversals that result in a requirement to reduce the water pressure within the pipeline. To utilise this surplus pressure, energy recovery turbines are proposed to be installed within the pipeline and the power generated will be used to offset power usage at the pump stations.

Key risks managed

The key risks that the water supply grid workstream has had to address lie principally with the careful management of third party issues to allow all the project delivery programmes to stay on track.

The typical third party issues included securing land purchases on time, gaining and maintaining public support for the proposals, avoiding the need for environmental impact assessments by careful design and early consultation with statutory and non-statutory consultees, obtaining planning consents on time and preventing environmental pollution through construction activities.

Pipeline construction

Construction of the new projects began in 2011. More than 200km of pipelines will be constructed by 2018. The pipeline material varies between polyethylene, ductile iron and steel and in diameters ranging from 200mm to 600mm.

To lay the new pipelines, a typical working width of 20-25m is required and the trenches will be typically 1.2 wide and 1.5-2.0 metres deep. Topsoil will be reinstated and the ground surface restored to its original condition once the pipe is laid.

Minor roads, byways, footpaths and other rights of way will be crossed using open cut construction meaning that the pipeline will be laid in an open, excavated trench. This means that these rights of way will be subject to temporary closure or traffic management whilst the pipeline is constructed across them.

Smaller watercourses and ditches will also be crossed using open cut techniques where practicable and in agreement with the regulatory authorities. Where more major or very sensitive obstacles are encountered, such as primary roads, railways, major watercourses or ecologically valuable hedgerows, the trenchless techniques will be used. Typically directional drilling or auger boring, where a tunnel or passage is cut under the crossing and the pipe inserted into this.

Use of Interactive water supply grid website

As part of the agreed communication strategy and plan, an interactive website was set-up in 2011 to allow customers and interested parties to find information on the scheme. The website contains interviews and video coverage of staff explaining the purpose of the work and allows customers to input their postcode to find out what is planned in their own area. The website www.wessexwater.co.uk/grid now contains a selection of colour animations that show the construction of a typical pipeline, storage tank and large and small pumping stations. There are also animations that explain the trenchless construction techniques we are using to cross railways and rivers such as auger boring and directional drilling.

These animations have proved very popular at the pre-planning application submission stage and pre-construction public exhibitions and have received many thousands of hits.

Conclusion

When it is fully completed in 2017, the Water Supply Grid will ensure that Wessex Water meets public water supply demand for the next 25 years. Through the new infrastructure links, the company will be able to provide security of supply to its customers by being able to redistribute surplus water to where it is needed across Somerset, Dorset and Wiltshire. Wessex Water is committed to building the new infrastructure in an environmentally sensitive way. This ensures that the environment is protected and appropriate environmental solutions are applied throughout the delivery of all our capital schemes.

The Editor and Publishers wish to thank Drummond Modley, Grid Programme Manager, Martin Wood, Grid Technical Manager, and Lynne Elford, Grid Commercial Manager, all with Wessex Water, for preparing the above article for publication.



Storage tank construction - Courtesy of Wessex Water

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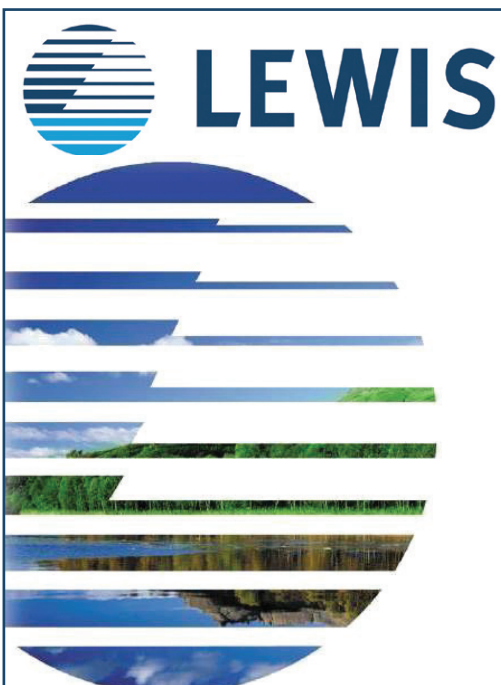
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