

# Denaby, Mexborough & Burcroft 'three into one' wastewater treatment project

by

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**T**his £14 million scheme combines three existing wastewater treatment works into one new efficient works at Denaby, South Yorkshire. This allows the works at Mexborough and Burcroft to be decommissioned and the sites released, with the potential for environmental improvements in both areas. The flows from each site have been transferred via four kilometres of pipeline to one new large site at Denaby. Each transfer route had a number of challenges including crossings over the River Don, the Leeds/Doncaster Canal the East Coast railway line and the busy A6023.



Photo shows Site Manager, Simon Dunwell, overlooking the Denaby Site

courtesy of Yorkshire Water

## Original plan

The original plan was to build three new treatment works to replace the existing three outdated and inefficient works at Denaby, population 6,500. Burcoft, population 11,400 and Mexborough, population 17,600. After detailed optioneering Yorkshire Water and contractors Watermark agreed on the innovative, more efficient and cost effective three-into-one solution. This approach has minimised the footprint and significantly reduced the amount of materials and man-hours required for construction. Valuable land at the two outlying sites will be available for other uses and the impact of the old works on local communities and the environment has been minimised.

The £14m combined Wastewater Project has been designed and constructed by *Watermark*, a joint venture between *MWH* and *Black & Veatch*, on behalf of the client *Yorkshire Water*.

## New works efficiency

Once completed in August 2008, the new works will be energy efficient, low maintenance and capable of treating 214 litres of wastewater a second or 18,558 cubic litres of wastewater a day at full flow. It will serve a combined population of 35,000. The more

advanced treatment facilities will ensure the site meets and exceeds the Freshwater Fisheries Directive, improving the quality of the River Don by removing ammonia. The project is future proofed to meet population growth and development in the area.

The large combined scheme is Yorkshire Water (South's) flagship project. At Burcroft and Mexborough, the main construction activity was two pumping stations, variable speed pumps, four hours DWF storage, four kilometres of transfer pipeline 480mm in diameter, and the abandonment of the two existing works. The construction work at Denaby was a new wastewater treatment plant to deal with the flows from the three existing sites.

## Technically challenging

The project has been technically challenging with issues around the confined nature of the site at Denaby and the complex challenges associated with the construction of the pipelines which had three rail, one river, one canal and one busy road crossing. This kept the third party team busy dealing with 23 different landowners and agencies. There were issues of poor access and geological problems. Archaeologists were employed because Burcroft is a site of archaeological interest. Ecologists were called in to assess the impact



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*Inlet works at Denaby*

*photo Courtesy of Yorkshire Water*

of the project on local wildlife. At one stage, construction work at Denaby was organised to ensure a nest of grass snakes was undisturbed. Structural surveys were carried out on homes that stood within as little as ten metres of the pipework.

### **Micro-tunnelling & boring**

The team used 'micro-tunnelling' techniques to take pipework under road and a canal when the ground conditions precluded more traditional tunnelling methods. This involved using a 1,200-millimetre diameter tunnelling machine drawing the pipeline through a concrete lining pipe. An auger bore method was used to take the pipework beneath a railway, with a steel liner used to hold the ground and prevent settlement. Network rail carefully monitored the work and is happy that there was no detrimental effect on the rail assets.

### **A challenge**

The high water table posed a challenge at the Mexborough canal. A de-watering system was used to keep water out of the shaft. The river crossing also posed a challenge because the pipework needed to cross at a deep section of the River Don. A pipe bridge provided the best solution. The second railway crossing presented an opportunity to save money and resources. The team was able to take the pipework through an existing underpass once used by miners crossing from the pit to the shower blocks.

At Burcroft, poor access along a narrow track did not deter the team from efficiently constructing a shaft of 10.5 metres in diameter, sunk to a depth of 10.5 metres close to the river, with alluvial silt and running sand. Bringing the pipework into the Denaby site involved negotiating a steep banking with rock close to the surface. The design solution was to have the pipework surface mounted using a concrete plinth. The Denaby site itself is very compact and is on a significant slope with bedrock within two metres of the surface. The challenge for the team was to work within the restrictions imposed by the bedrock whilst retaining the hydraulic profile.

At Denaby, a complete new works has been constructed including inlet works, primary settlement tanks, new activated sludge process

including anoxic tanks, extended storm tanks and sludge treatment facilities, with the construction of a new Gravity Belt Thickener building. Every new asset has been built off-line without disrupting any existing processes over the period of the contract. Sectional commissioning of the new works has been undertaken while maintaining statutory discharge consents.

### **Key to Success**

**Key to the success of the project has been the Joint Commissioning Team (JCT) comprising Watermark and Yorkshire Water, which has enabled seamless handover of the plant and equipment during the course of commissioning.**

The project team has made best use of existing assets wherever possible. For example, at the Denaby site the existing storm tanks were too small but rather than demolish them and build new, they were extended to create larger storm tanks. Full use is being made of all the latest technology. Intelligent Motor Controlled Centres will ensure that all processors at the new plant are fully automated for maximum efficiency.

As well as being an engineering success, the Denaby three-into-one scheme has also been a community friendly project. Local people have been kept in the loop from the outset when hundreds of letters were sent out and an open forum was organised at the local leisure centre to give people an opportunity to have their questions answered and their concerns allayed. The project team also ensured that their presence has left a lasting legacy - the team gave up a weekend to take part in Yorkshire Water's inspiring community initiative, One Million Green Fingers. They helped to create three garden areas in the grounds of Denaby Main Primary School for pupils to plant and grow their own vegetables as a learning and recreational resource.

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Primary Settlement tank at Denaby site

photo Courtesy of Yorkshire Water

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