

Overseal STW

design & build scheme to treat wastewater in line with consent requirements for phosphorus, BOD and ammonia under the EU Habitats Directive

by Pete Howard

Designed to meet the challenge of regulatory change and population growth, the sewage treatment works at Overseal in Derbyshire has been successfully upgraded by Severn Trent Water. Working with its delivery partner MWH Global, this £2.5m scheme uses the latest technology to treat wastewater to standards required by UK and European legislation. The project was commissioned in 2013 and is an excellent example of collaboration between client, contractor and supply chain. This partnership has delivered a clever technical solution with a clear focus on reducing whole-life costs and carbon.



Early stages of construction of the combined annular oxidation ditch & final settlement tank at Overseal STW - Courtesy of MWH Global

Original works and background to the scheme

Overseal STW is a small-sized biological sewage treatment works in South Derbyshire, about seven miles south of Burton-on-Trent. Serving a PE (population equivalent) of 2201. The original works was at risk of failing to meet Final Effluent consent levels of new environmental legislation.

Final flows from Overseal STW discharge to the River Mease which is classed as 'sensitive' under the Habitats Directive and located in a Special Area of Conservation (SAC).

The existing works comprised:

- 6mm mechanical inlet screen.
- 2 (No.) upward flow primary settlement tanks.
- 4 (No.) rectangular storm tanks.
- 2 (No.) biological filter beds.

- A humus tank.
- A sludge storage tank.

Humus tank effluent was pumped to a chamber which split the flow equally between a tertiary reed bed and four tertiary lagoons.

With effect from 31 March 2013, the discharge consent for Final Effluent at Overseal STW was tightened by the Environment Agency under the Habitats Directive (H3) and (H5), as shown in the table below.

	BOD	SS	NH ₃ N	P	Fe
Original Consent	20	40	15	-	-
Consent from 31/03/13	15	40	5/3	1	4/1



Original plant was at risk from stricter environmental consent levels for final effluent - Courtesy of MWH Global

The new legislation included a consent for phosphorus and iron (set at 1mg/l and 4mg/l respectively) and the Biological Oxygen Demand (BOD) limit was reduced to 15mg. The seasonally varied ammonia consent was set at 5/3 mg/l.

Optioneering to deliver an innovative solution

To help achieve these stringent consent levels on a tightly constrained site, the project team's solution was to replace the existing treatment process with a combined Oxidation Ditch and FST (Final Settlement Tank).

This innovative structure effectively combines secondary and final treatment providing a cost-effective solution to meet the demands of tighter consent levels for Final Effluent.

The existing inlet works at Overseal STW was also replaced with a new combined screen and screening handling plant along with a stainless steel channel. This allows the bypass hand-raked screenings to be washed back into the (upstream) screen inlet channel.

The design of the combined Oxidation Ditch and FST reduced the project's time and cost and helped mitigate the impact of construction on a highly constrained site. Using a combined annular Oxidation Ditch and FST at Overseal STW has:

- Prevented extra land take on a highly constrained site.
- Reduced overall construction times.
- Significantly reduced the potential for odour, noise and other nuisance issues from the works.

Coordinated planning of construction traffic to minimize adverse impacts on local community

The site is close to the centre of Overseal, a popular residential village in the heart of the National Forest. Site access is via a single-track lane which exits onto Lullington Lane, one of Overseal's main roads.

Maintaining public safety and not disrupting village traffic during the construction phases were top priorities for the site team.

A significant part of the project at Overseal Sewage Treatment Works was the construction of the 25m diameter combined annular Oxidation Ditch and FST. A programme requirement was to cast the base of the structure in one working day, using two concrete pumps operating in tandem.

This would require nearly 140 return journeys for concrete wagons to the site. These were all successfully managed with a carefully planned and coordinated traffic management plan.

This plan was developed in close collaboration with key supply chain members and included:

- Up-front site visits from Breedon Aggregates to establish timings and site access parameters for concrete wagons.
- Letter drops to local community informing them about upcoming construction activities.
- Traffic Marshalls in constant radio contact.
- Road sweepers maintaining local routes.
- One-way system on site for concrete wagons.
- Extra staff available and trained for the day's activities.
- 15 minute turnaround time for concrete wagons.

A closely coordinated approach meant that no concrete wagons were ever left standing on Lullington Lane and both concrete pumps were in constant use. This allowed over 500m³ of concrete to be successfully placed 'on the day', with no H&S incidents, zero public complaints and normal village traffic movements maintained.



Innovative design of combined oxidation ditch and FST reduced land take and shortened the construction programme - Courtesy of MWH Global



Groundwater constantly pumped from excavation to a series of settlement tanks in one of the wettest periods on record
Courtesy of MWH Global



All solids 'settled out' in lagoons before clean water was safely discharged in accordance with EA criteria - Courtesy of MWH Global



Easy access for Service Delivery staff
Courtesy of MWH Global



Low level equipment reduces noise and visual impact
Courtesy of MWH Global

Using natural features to provide sustainable solutions

A major constraint on the project was the height of the existing water table and the challenges that this would present during construction of the 7m deep x 25m diameter annular ditch.

The site is in a Flood Zone 3 Environment Agency groundwater protection area. Investigations revealed that the typical standing groundwater levels were between 2m and 2.5m. To manage the groundwater discharge from such a large excavation, the site team used the natural filtration properties of existing settling lagoons, in tandem with conventional 'silt-busting' equipment.

Using a series of pumps, groundwater from the excavation was discharged to a series of settlement tanks from where clean water would discharge into settling lagoons (part of the site's original tertiary treatment). Any remaining solids in the water would dissipate in the lagoons, before clean water would naturally discharge to a tributary of the River Mease.

All discharge was regularly (hourly/daily dependent on weather conditions) monitored to ensure compliance with Environment Agency consent discharge criteria. This innovative filtration arrangement allowed the project team to keep the excavation dry, protecting the construction programme against weather related delay.

Despite suffering one of the wettest periods since records began, the project team's innovative use of the existing lithography to control groundwater allowed the scheme to progress in line with the construction programme.

Project management and procurement

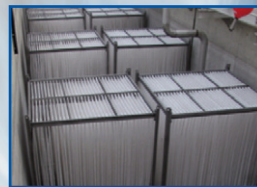
The site at Overseal STW is compact and offered limited storage space. The project team had concerns regarding the efficient delivery, off-loading and, most importantly, the storage of ductile iron pipework. The pipework needed to be delivered and stored in specific areas for re-distribution and installation at a later phase in

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the programme. Early engagement with the supply chain allowed for these concerns to be addressed through:

- All items tagged with item and drawing reference number to allow easy identification by the site team.
- All bundles tagged with total weight to allow the site team to efficiently select the appropriate machinery to re-distribute pipework.
- Suppliers made fully aware of site delivery restrictions & constraints prior to despatch, through communication of the Traffic Management Plan.
- Collaborative and proactive planning to ensure all programmed delivery dates were achieved.
- All off-loading by suppliers and supervised by site staff ensuring excellent H&S standards were maintained.

Delivering a project that has long-term community and environmental benefits

The upgraded works uses the latest technology to ensure a consistently high quality of Final Effluent to a sensitive water course (the River Mease).

The new plant at Overseal STW will also ensure that there is sufficient capacity for local wastewater treatment that caters for any future population growth at Overseal.

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Weather sensitive plant housed in purpose built units
Courtesy of MWH Global



Smart design facilitates Operation and Maintenance
Courtesy of MWH Global