

Ellen's Green Sewage Pumping Station

provide additional storage within the Ellen's Green catchment to compensate for the large increases in flow during winters

by Fezaen Rafiq-Sharif

In 1971 Hambleton District Council built the Rudgwick First Time Sewerage Scheme, linking a number of villages together with their combined flows eventually discharging to Rudgwick STW. When the Water Authorities were formed in 1974, the catchment was split between Southern Water and Thames Water, with the northern parts in the Thames Water area, and the rest (including the STW) in the Southern Water area. Baynards Lane and Furzen Lane are small sub-catchments which pump to the Ellen's Green catchment. Ellen's Green Sewage Pumping Station (SPS) in Horsham, Surrey, was built in the late 1960s and serves an estimated population of 320 people. It pumps to a Southern Water sewer (with a restricted pumped rate of no more than 6l/s) which gravitates to a terminal pumping station for pumping to Rudgwick STW. There is an existing overflow in the catchment at No.1 Wayside Cottages, which comprises a pipe from a head manhole and spills into a (normally dry) field ditch that runs eventually into Cobblers Brook.



Original view of Ellen's Green SPS - Courtesy of MGJV/Mott MacDonald

Background

During times of wet weather and due to increased population, the catchment suffers very large increases in flows, which surcharge the sewer and Ellen's Green SPS wet well. It can take several days before the SPS wet well returns to normal level.

When the SPS is overwhelmed, the foul network surcharges north towards No.1 Wayside Cottages (the lowest point in the network) and spills into Cobblers Brook. The resident of 1 Wayside Cottages reported the overflow, and consequent pollution of the ditch, to the Environment Agency. The owner of the field containing the ditch raised the matter with his Member of Parliament and the EA approached Thames Water to address the unconsented overflow.

The upgrade project (as stated in the project brief and outlined by the Environment Agency) set to provide additional storage within the Ellen's Green catchment to compensate for the large increases in flow during the winter seasons.

Existing equipment

The pumping station consisted of a wet well and dry well arrangement located below the ground floor of the main pump building.

The dimensions of the wet well provided approximately 14m³ of storage before the overflow at the rear of No.1 Wayside Cottages was breached. The dry well contained 2 (No.) pumps operating in a duty/standby arrangement and discharge pipework connecting to a 4" uPVC rising main, approximately 1.7km long discharging to the Rudgwick catchment. The existing pumps were 11.5kW Wilo submersible end suction pumps.

Other equipment located within the main pump building included:

- 1 (No.) Motor control centre (MCC).
- A 203 x 133 Universal lifting beam for pump removal.
- Ventilation fan for the dry well and pump building.

The site also contained a small Nutriox chemical dosing plant to prevent septicity which was located outside the main pump building and within a fenced compound.

There is no direct vehicular access to the pumping station, as the nearest part of the Memorial Hall car park is some 10-15m from the pumping station. The Memorial Hall car park is of light construction, and past attempts to take large tankers into the car park resulted in a need for major repairs to the car park.

When tankers are needed at the station they are parked on the B2128, requiring traffic management and a 'super-sucker' to cope with the very long suction hose required - see existing emergency pumping arrangement photograph below.

Design

The upgrade works to the pumping station were to consist of the following:

- Provision of additional 12m³ (3 hours dry weather flow) of storage to the existing wet well in event of an emergency telemetry/recording of overflow events (current total system storage volume is 14m³).
- A new RC wet well structure proposed adjacent to and integrated with the existing structure wet well.
- Appropriate hardstanding tanker access to be provided to the site.
- Provision for a mobile standby generator
- Installation of new 150mm diameter Bauer-type connection to the 200mm rising main for external pumping facility.
- Installation of new 150mm cat flap on the wall of pumping station to allow connection for a mobile generator.
- Replacement of MCC, instrumentation and telemetry equipment within the existing Ellen's Green SPS building compliant with Thames Water Asset Standards.

A new RC wet well structure would require extensive excavations works to ensure the required storage volume is below the overflow level. There are a number of commemorative trees within the grounds of the Memorial Hall and within close proximity of the SPS which would be a loss to the community if they were to be removed to facilitate the proposed works.

Due to the close proximity of the SPS to the Memorial Hall, any excavation works within the grounds could potentially undermine the structural integrity of the Memorial Hall, which, due to its age, already shows signs of subsidence.

The capacity of the existing dry well was investigated to determine if incorporating the dry well as part of the wet well could achieve the required storage capacity.

Hydraulic analysis of the network from the pumping station to the overflow at No.1 Wayside Cottages confirmed that 38m³ of storage was available. This equated to an additional 24m³ of storage (12m³ more than required in the project brief) equating to 6hrs DWF.

By converting the dry well into a wet well, all assets within the dry well would need to be removed, the dry well pumps would need to be replaced with submersible pumps and new discharge pipework would be required. The existing access opening had to be increased and positioned above the new pumps for removal.

To utilise the existing lifting beam the pumps were also placed in line with the beam. The use of submersible wet well pumps also reduced the power usage from 11.5kW pumps to 7.4kW pumps.

Due to the modifications to the existing pump building floor for access of pumps and personnel, the MCC was relocated outside the pump building in a new kiosk and within a new fenced compound beside the Nutriox dosing unit. This allowed the wet well to vent



directly into the pumping station building which contained extraction fans to give a minimum 3 ACH reducing the risk of creating an explosive atmosphere.

Cable duct routes from the new pumps and level instruments to the new MCC were also sealed to prevent migration of gases from the well to the MCC.

Construction

In order to carry out the modifications to the existing dry well, overpumping was undertaken by connecting a temporary pump to the existing rising main. This ensured a safe working environment within the wet well and dry well.

Modification of dry well

All assets within the existing dry well were removed and the base of the dry well was re-profiled to house the new submersible pumps and discharge pipework. The ground floor slab was modified to provide a man entry access point and opening for the removal of the new submersible pumps.

The presentation of flows to the new submersible pumps were also assessed to ensure optimum flow conditions to the pumps and maintain the best possible cleansing regime for the newly modified wet well. The presentation of flow to the pumps was achieved by cutting a new opening between the wet well and dry well and benching the floor in the direction of the new pumps.

DSEAR compliance

To ensure full compliance with current DSEAR Regulations, the MCC had to be located in an un-zoned space. To ensure the MCC was within an un-zoned space, the MCC kiosk was relocated outside of the pump building and beside the Nutriox dosing unit. This opened up the clear working space within the pump building making it a safer environment for operatives.

Tanker lay-by

Extreme rainfall events may occur which exceeds the total storage provided. In these instances spills may still occur, and therefore improved tanker facilities were required. A new tanker access facility was provided on common land adjacent to the B2128 Horsham Road to enable removal of sewage by tanker when necessary.

An isolation valve and Bauer coupling located at the lay-by allows operatives to safely empty the contents of the pumping station without the requirement to enter the pumping station site. It was found to be unsuitable to utilise the existing access road into the Memorial Hall due to damage caused to the access road in the past.

The new lay-by allows operatives to safely undertake their work and cause minimal disturbance/nuisance to local residents and drivers travelling along the B2128. The tanker lay-by was constructed by using eco-block surfacing with timber bollards to prevent unauthorised parking/littering.

Environmental concerns

Ellen's Green and the surrounding area is designated as an Area of Great Landscape Value (AGLV). The land between Ellen's Green SPS and the B2128 Horsham Road is densely populated with mature trees and vegetation.

To construct the lay-by and install the new tanker connection between the SPS and the lay-by, an arboricultural assessment was undertaken which identified the location of mature trees and helped design a sustainable route for the pipeline and location for the lay-by.

A bat survey was also undertaken within the adjacent woodland which identified six species of bats utilising the site. No evidence of roosting bats was found. Therefore it was considered that the



View of Ellen's Green SPS and Memorial Hall
Courtesy of MGJV/Mott MacDonald



Original below ground dry well - Courtesy of MGJV/Mott MacDonald



Original pump house arrangements
Courtesy of MGJV/Mott MacDonald



New pump house arrangements - Courtesy of MGJV/Mott MacDonald



impact of the works within the woodland is low; however mitigation measures were undertaken to minimise the adverse impacts on bats as far as possible and reduce the likelihood of an offence being committed under current legislation.

Conclusion

Thames Water customers benefitted as the SPS storage capacity was increased to reduce the risk of further pollution to the local watercourse and the local brook. During the design and construction process, the methods chosen were considerate of the Memorial Hall and surrounding environment, thus leading to minimal impact on residents and visitors of the Memorial Hall.

By providing a radically different design solution, time and money savings were achieved by utilising the existing assets which eliminated the need for extensive construction works and subsequent health and safety risks.

More efficient pumps and control systems were also provided reducing the lifetime cost of the assets as well as improved access and maintenance for operatives by removing the need for regular confined space entry into the below ground dry well.

The asset life of the pumping station has been extended which will help secure the service of the station for the population served for the next 30 years.

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