

Canvey Island Key Drainage Scheme

key to delivering Environment Agency's priority programme

by
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Canvey Island is a low lying, heavily urbanised island on the North side of the Thames Estuary in Essex, covering approximately sixteen square kilometres. This project, which was completed in Autumn 2006, provides improved flood protection to 3,199 residential and numerous commercial properties. The island is below high tide level and is protected from inundation by the Thames Tidal Defences sea wall. Surface water is drained by a series of interconnecting sewers, culverts, natural and artificial dykes and lakes, which are discharged over and through the sea defences by a series of seven main flow pumping stations and low tide gravity sluices. Five 'low flow' pumping stations maintain a low level within the drainage system, giving essential storage capacity in the event of a storm event.



Croppenburg Pumping Station on Northern side of the island

courtesy Atkins

Deficiencies

The existing pumping stations had deficiencies in structural integrity, health and safety and performance capabilities. In order to maintain an acceptable drainage system it was necessary to substantially improve and/or upgrade the pumping stations and controls.

This has included the construction of four new Main Flow Stations and discharge structures along with reconstruction and refurbishment of the other stations.

The project was a key scheme in delivering the Environment Agency's Priority Programme, SDA 27 Houses targets, for Defra. A milestone for the project was the completion of a number of the stations to achieve protection for 1,762 properties by March 2006.

To enable this and to satisfy the consent conditions applicable to a number of sites, the project was carried out utilising a staged design and construction programme. This also allowed the lessons learnt during construction to be fed into the designs of later stations.

The 12 individual pumping station sites, located across the island, together with works on both sides of the sea wall, required multiple consent applications (27 in total), consultations, resolution of a number of land issues and necessitated close liaison with the local community.

The two new pumping stations on the **southern side** of the island, adjacent to the Thames, are located within the seasonal tourist area and work on these stations during the summer months would have caused considerable disruption and discontent from the local traders. These two stations were, therefore, constructed through the winter/spring period.

The two new stations on the **northern side** of the island had greater environmental implications in terms of over wintering and nesting birds. This resulted in a short construction window being available, particularly for the outfall works on the foreshore area. The initial site, at Croppenburg, was selected due to the existing installation's poor reliability. It possessed, however, the greatest risks in terms of



May Avenue Outfall Construction

courtesy Atkins

the number of consents required and environmental issues. Preparation of the other 'summer' construction pumping station at Knightswick was therefore progressed as a potential alternative, should Croppenburg be delayed.

New pumping stations

The new pumping stations have been designed to enable all the new ABS submersible pumps to be interchangeable between the sites. The poor ground conditions, high water table and close proximity of

roads, structures and housing had potential for damage if dewatering of the surrounding area was not carefully controlled during construction of the new sumps.

To minimise the risk, the chosen method of construction was for a wet caisson design with a sealing plug of concrete placed underwater, thereby allowing the existing ground water level to be unaffected until a seal was achieved and the sump could be drained safely without any dewatering of the surrounding area.

The cascade outfall structures for the new pumping stations allow discharge at any tide level, whilst dissipating the flow energy to prevent undesired scouring of the estuaries at low tide, particularly in the environmentally sensitive Tewkes Creek area (Benfleet and Southend Marshes SSSI, SPA and Ramsar site). The construction of the outfalls on the foreshore was carried out within temporary cofferdams to isolate the construction areas and permit uninterrupted working. The integrity of the tidal defences during installation of the new discharge pipelines was a priority.

All the sites are in publicly accessible areas either adjacent to busy roads or amidst residential properties and this required secure unobtrusive designs to be incorporated, whilst ensuring safe maintenance access. Security and safety of both the public and the operational staff were a priority throughout the design and construction process.

Risk area

The location of Canvey Island along the Thames estuary designated it a medium to high risk area for unexploded WW2 ordnance. The soft, silty ground meant that any likely remaining ordnance would be located well below ground level, but potentially within reach of the ground investigation boreholes and construction excavations. Investigations were carried out prior to and during construction to confirm the absence of any potentially hazardous foreign objects within the areas.

The Low Flow pumping stations were originally constructed with sheet pile walls and reinforced concrete floor and cover slabs. Sheet pile corrosion had become an issue at a number of sites and with limited space available to build new stations the solution developed was for new reinforced walls to be created within the existing chambers. To achieve this the existing cover slabs were partially removed to allow works to be carried out within the chambers and new cover slabs cast in-situ complete with openings for the new style access covers and equipment/cablings.

The two screw pump stations at Canvey Island, Hilton and Dutch Village have had a complete mechanical refurbishment comprising three new screws and one refurbished screw, new drives, gearboxes and bearings. Associated works included new covers to ensure security of the sites incorporating openings for easier inspection by maintenance personnel.

Integrated Project team

The integrated Project team led by the Environment Agency comprised Atkins (Design Consultant); J. Breheny Contractors Ltd (Principal Contractor); and Jacobs (ECC Project Manager), with specialist subcontractors Dabbrooks (electrical works); Spaans Babcocks (screw pumping stations); EC Harris (Cost Consultants) and Michael Murphy Associates (Land Agents), have also played key roles within the project team.

The project was successfully delivered 9% under budget and five months early. ■

Note: The Editor & Publishers wish to thank Eric Biggadike, Senior Mechanical Engineer, Atkins Plc., for providing the above article



Spaans Babcock Ltd.

We are pleased to be associated with
The Environment Agency & Atkins in the
refurbishment/replacement of the Screw Pumping
Stations for the Canvey Island Drainage Scheme.

*Other contracts we have been associated with, also
featured in this publication include:
Yorkshire Water FFD Programme as Suppliers
of the Screw Generators at Esholt via J.N. Bentley.*

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