

Crindau Pil Stormwater Sewer, Newport

Project Profile

Client: Morgan Sindall
for Welsh Water

Designer: SWECO

Value: £1.9m



We were engaged by Welsh Water's Capital Delivery Alliance partner Morgan Sindall to carry out the installation of a new 900mm diameter surface water sewer servicing the Sainsbury's supermarket site, outfalling to the tidal Crindau Pil, a tributary of the River Usk in Newport, Gwent.

An initial £50k ECI contract was awarded to undertake further investigations and provide technical input to assist in developing the design, determining methods of construction, mitigate risk and enable confirmation of costs. The ECI activities included;

- Completing trial pits and drilling 4 site investigation boreholes to log ground conditions, complete 2 pumping tests, monitor groundwater levels and flows and determine potential tidal connectivity. The investigations ensured a full understanding of:
 - ◇ Groundwater inflow rates during construction of the new pipeline however the low flow rates measured during the pumping tests ensured dewatering control was achievable using conventional sump pumping techniques.
 - ◇ Ground conditions at the location of the permanent and temporary cofferdams to be constructed in the Pil which allowed pile design and piling methods to be determined.
 - ◇ Soil and groundwater samples from the boreholes and trial pits enabled contamination analysis and disposal costs to be ascertained for the potentially hazardous industrial made ground in which the sewer was to be constructed.
- Production of RAMS for the marine license application to NRW.

The ECI stage allowed the design to be finalised, methods and programme developed and a Target Price agreed.

The main works involved:

- Installation of a 4.8m x 3.6m permanent sheet piled cofferdam within which an in-situ reinforced concrete outfall structure was constructed. The cofferdam was constructed with 20m long Larssen PU32 sheet piles installed using a combination of high frequency vibrator, Tosa Still Worker pile press and an impact hammer used to achieve final toe level. The pile length was determined by the depth of poor ground before founding 2.0m into competent mudstone as well as allowing a freeboard above maximum tide level.
- The cofferdam piles formed the foundation for the outfall structure with shear studs welded to the piles cast-in to the base slab. The outfall was completed by installing a Tideflex Valve to allow maintenance-free backflow prevention.
- A 20m long x 2.6m wide contractor designed temporary sheet piled cofferdam was constructed between the outfall structure and the sheet piled river wall using 19.0m long Larssen PU32 piles installed using the same piling techniques and founding in the Mudstone strata. The poor ground encountered within the cofferdam at formation level required a design change, the cofferdam piles became permanent support for the pipeline by installing a 300mm thick reinforced concrete support slab, secured to the piles by cast-in shear studs, supporting the 20m of 900mm dia concrete pipes which were then laid with granular bed & surround from the outfall to the landward side of the river wall.



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- Design & construct a 40 x 40m crane pad behind the river wall for piling contractor SPI to accommodate the 170T crawler crane and 300T mobile crane for installation and removal of cofferdam piles and spud piles.
- The opening formed in the river wall piles for the pipe required 3 steel beams to be installed, 2 above and 1 below the opening, to maintain structural integrity.
- We used a long reach excavator to service the works within the cofferdams.
- 60m of 900mm dia concrete pipes in open cut, 2 no 2.7m and 1 no 2.1m dia manhole in contaminated made ground up to 5m deep from a manhole behind the river wall to Albany street followed by 20m of twin 675mm dia pipes across Albany Street and connecting to the existing surface water sewer.
- In the 30m section of the pipeline upstream of the river wall, the low strength made ground encountered at and below formation resulted in some settlement being monitored in the pipeline, the design was reviewed to reduce loading on the trench formation by providing a 500mm thick lightweight foamed concrete support slab below the pipe, wrapping the pipes/surround with geotextile and backfilling the trench with lightweight aggregate. In addition, Manhole 1 at the rear of the river wall was changed to a plastic 'Weholite' manhole to similarly reduce ground loading. Monitoring of the pipeline showed that these measures were successful in preventing further settlement.
- Cofferdam piles were cut down to 0.5m below ground level in the Pil on completion, the bank level was restored and capped with geotextile growbags planted with Common Norfolk Reeds.
- Reinstatement of the concrete capping beam to the river wall, a section of which had been broken out to allow the temporary cofferdam to be fully closed.
- Installation of a maintenance access stairway point over the existing flood defence wall with security gate.
- Groundwater from excavations was pumped to a storage tank, tested and passed through a Siltbuster unit prior to consented discharge to the foul sewer.
- The majority of the excavated made ground from the trench was classified as Hazardous Waste and 2,450 tonnes were pre-treated at the Biogenie Soil Treatment Facility at Trecatti before landfilling.

A number of unexpected situations requiring design and methodology changes were encountered during the work however these were overcome through the close collaboration between DCWW, Morgan Sindall, SWECO and ourselves to ensure this challenging contract was successfully delivered.

