

Port Wemyss/Portnahaven STW Scheme

£2.2m project has environmental benefits for island community

By

Paul Anderson

The villages of Port Wemyss and Portnahaven lie side by side at the end of the Rinns Peninsula on the Inner Hebridean Island of Islay. As well as the coast being home to seals, it is also the site of the world's first operational wave power machine. A new sewage system was required to deliver environmental benefits under the Urban Wastewater Treatment Regulations (Scotland) 1994. The system includes provision of a wastewater treatment plant to serve the two communities of Portnahaven and Port Wemyss which are together home to around 150 residents. The previous sewage system consisted of six short sea outfalls which discharge untreated sewage along the coastline. This new scheme has one continuous discharge and ensures that discharges do not adversely impact on the designated shoreline waters and other amenity waters in the area. The scheme has overcome significant problems associated with planning approval and construction and provided a new outfall from the treatment works.



Wemyss: The coast off Portnahaven, Islay, benefits from environmental improvements to sewerage system

photo courtesy Scottish Water

Design review

The design review identified a potential location of the WwTW on a site between each of the villages. The consultation process involved local county and community councillors, in addition to public meetings with the local community, all of whom were engaged as key stakeholders in this process. The public meetings were held at regular intervals during both the design and construction phases of the project.

Engineering detail

The process selection matrix solution for the Portnahaven/PortWemyss population and future consent standard was the provision of septic tank treatment with an extended sea outfall. This provided an appropriate level of treatment in line with the Urban Wastewater Treatment (Scotland) 1994 Regulations.

Environmental assessment

The area of foreshore extending from Portnahaven to Port Wemyss is a designated shoreline water - a shoreline that may be visited by the public but where there are generally no water contact activities. As a result of this, the Scottish Environment Protection Agency (SEPA)

stipulated that discharges in this area achieve mandatory microbiological standards, as per the bathing water directive, at the shoreline ie 95% of samples should not exceed 2,000 faecal coliforms per 100ml.

Drainage area & marine modelling

The proposed collection and transfer system design was to be designed as a combined system where Formula A flows are passed forward for treatment. In order to develop the proposed scheme, Scottish Water Solutions carried out catchment studies which included a structural survey, CCTV survey, flow survey and a connectivity survey.

The design flow used was based on a water usage at 150l/hd/d and a conservative infiltration element of 210l/hd/d, which was derived from statistical evidence and historical records. The design population was derived from a house count.

A computer drainage area model was developed, verified and validated using the catchment survey data obtained and the model was run using Time Series Rainfall events to ascertain storm overflow

frequency prediction. Further runs were made for design storms for maximum storm discharge rates (a 1 in 5 year event) in accordance with Scottish Water policy. Discharges from the new wastewater system included WwTW septic tank final effluent and controlled storm overflow discharges (only after screening) if the storm overflow exceeded the Formula A pumping rate. The impact of the proposed scheme on the marine environment was assessed using a variety of modelling work.

Initial dilution and secondary dispersion were assessed using calculations and a 'Quick Plume' computer marine model. An outfall from the WwTW was designed to ensure an initial dilution of 1 in 50 or better and an adequate 'mixing zone' of the discharge.

Outfall design

Further to the marine survey work, a diver's survey was commissioned in order to assess the sea-bed conditions for design of the outfall pipe from the WwTW. The discharge point is located in a narrow channel of water between the islands of Islay and Orsay. Tidal flow in this channel is in the order of 6 - 7 knots, which reduces to 1-2 knots during slack tide.

The standard outfall detail was based on a 'sink and lay' method of construction. Concrete filled sacks are used to fill voids beneath the pipe and a single layer of concrete matting laid over the pipe. This matting is designed to provide the outfall with protection against ship anchors and local tidal conditions. It is a labour intensive construction method requiring divers to assist in placing the mats and bags. However, a tidal stream greater than 1 knot makes diving operations difficult, particularly when it involves working with tools from an umbilical line. Therefore, the outfall could only be constructed safely when the weather conditions allowed and also only during periods of slack tide.

The strong tidal stream also necessitated the number of mats required to protect the pipes to be substantially increased beyond the standard detail. An additional four mats would be placed on the pipe along its full length, in order to weigh it down against the currents.

The costs for this additional protection made alternative construction methods viable, such as trenching from a spud leg barge or directional drilling. However, trenching was discounted as virtually all of Europe's spud leg barges were employed on oil exploration work, and it would have been at least 18 months until a barge became available to begin works.

Therefore, the team considered directional drilling as the alternative construction method. The benefits of this method, particularly on Islay, are that the influence of the weather, sea conditions and tidal currents would have minimal impact. The outfall pipe would be installed through rock and, therefore, well protected from currents and shipping activities.

Drilling operations, carried out by *Longbore*, were able to be completed from onshore locations with no requirement for marine support. The avoidance of delays due to adverse weather and tides subsequently gave Scottish Water Solutions confidence in the delivery of the programme and the scheme out turn cost.

Process/Civil Contractor: Biwater Leslie Joint Venture. Designer: Scottish Water Solutions. ■

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