

Boat of Garten WwTW

first below ground structures using DfMA including pre-installed M&E kit & Corporate responsibility/environmental best practice

by Sam Neill Bsc Civil Engineering IEng MICE

Boat of Garten village lies in the Spey Valley, about four miles north east of Aviemore and thirty miles south east of Inverness, with Loch Garten to the south and the River Spey passing by to the east. The village sits within the Highland Council area of Badenoch & Strathspey and is part of the Cairngorms National Park. This project involves construction of a new wastewater treatment works within the confines of the existing site, a major part of which is within the flood plain of the river and so all the plant needs to be situated above the flood level or be suitably rated for submersion, which would bring unusual construction challenges. Additionally, it is a special area of conservation and a special site of scientific interest, adjacent to the renowned River Spey. Scottish Water awarded Laing O'Rourke the contract to deliver the new Boat of Garten WwTW.



Aerial view of the Boat of Garten WwTW - Courtesy of Laing O'Rourke

Project drivers

Boat of Garten WwTW was identified as part of Scottish Waters SR10 programme SG 1 (WIC 165). Investment was required to ensure that the works comply with the removal of development constraints for future growth.

The main driver for the project is the Fresh Water Fisheries Directive which requires compliance with certain standards to protect waters designated to support healthy fish populations.

The Boat of Garten WwTW discharges into the River Spey which flows through the Cairngorm National Park from its source, Loch Spey, approximately 100 miles to Spey Bay in Moray. It is a famous salmon and trout fishing river which is also used for canoeing and kayaking.

Brief description of the works

The existing effluent from the catchment of Boat of Garten was being treated by four first stage septic tanks and two second stage septic tanks with a total capacity of 108m³, together with a river

outfall. These tanks have been abandoned now that the new works has been constructed and commissioned.

The new works provides primary and secondary treatment comprising the following structures which replace the existing treatment system:

- CSO with mechanical screen.
- River outfall.
- 4 (No.) septic tanks (248m³ capacity).
- CopaSac[®] chamber (6mm net screen) from Jacopa.
- Intermediate pumping station.
- Submerged aerated filter (SAF) plant.
- 2 (No.) humus tanks.
- Control building with MCC.

In addition to the new WwTW improvement, Laing O'Rourke have carried out an upgrading of the main town sewer relieving flooding issues within the town, further reducing contamination risk to the adjacent water courses.

Design flow

The majority of the site is at risk from flooding from the River Spey. In general the works have been designed to operate satisfactorily during a 1 in 200 year flood event.

The Boat of Garten WwTW treats municipal flows from the Boat of Garten catchment with no non-domestic or trade flows. The current population equivalent (PE) is estimated at 946 and an allowance for growth of 177 PE was allowed for in the design giving a new effective PE of 1,123. The new works has a discharge consent to meet a 35mg/l ammonia and 50mg/l biochemical oxygen demand (BOD) standards on a 95%ile basis as well as upper tier limits of 100/100/70 for BOD/SS/NH₃.

Logistics

The primary challenge on the Boat of Garten site was logistics and the lack of storage areas. Logistics for the project were managed with prior consultation with the local council and community. Large delivery vehicles were routed past the local saw mill to avoid the need for them to pass through the town centre of Boat of Garten and the local school. Therefore a 'just in time' approach was implemented to mitigate any risk.

Design

The Boat of Garten WwTW was designed by Jacobs on behalf of Scottish Water Solutions 2. Completion of final detailed design was coordinated by Laing O'Rourke and overseen by Jacobs.

Laing O'Rourke, Jacobs and Scottish Water worked together with the Design for Manufacture & Assembly (DfMA design) and construction approach to the Boat of Garten project.

The main structures were constructed off site and assembled on site, in the form of precast chamber construction with mechanical equipment already pre-fitted. Scottish Water's specialist precast framework supplier was selected to provide the precast concrete, used for delivering the mechanical and electrical equipment.

DfMA construction greatly reduced the need for on-site shuttering and steel fixing activities and reduced the requirements for working space excavations which was key, given the logistic of the site, the relatively narrow strip of ground, and the close proximity of the river at which the majority of works took place. This brought with it programme saving, vastly reducing health and safety risks and guarantees a much higher quality of the final product over traditional means.

The following structures were delivered using DfMA techniques:

- Pumping station, wet and dry wells ~ precast concrete bases, rings and cover slabs complete with covers pre-fitted.
- CSO chamber.
- Flume chamber constructed.
- Septic tanks (Conder GRP tanks).
- CopaSac® chamber (Jacopa).
- SAF plant and humus tanks.
- Kiosk ~ GRP kiosk with timber cladding (Scottish Larch in line with Cairngorm National Park planning requirements).
- Manholes ~ Perfect precast manhole products.
- Precast concrete capping beams to permanent sheet piled retaining walls.

Environmental control

This River Spey is designated a Special Site of Scientific Interest (SSSI) and a Special Area of Conservation (SAC) by Scottish Natural Heritage (SNH). Since the wastewater treatment works site was located within the Cairngorm National Park and directly adjacent to the River Spey a number of environmental control measures were necessary.



PS base unit with pump stools and benching pre-installed
Courtesy of Laing O'Rourke



CopaSac® chamber from Jacopa with pre-fitted penstock and internal CopaSac® frame - Courtesy of Laing O'Rourke



Conder septic tanks being concrete surrounded
Courtesy of Laing O'Rourke



Flume chamber with Clippertech flume pre-installed
Courtesy of Laing O'Rourke



Precast CSO base installation - Courtesy of Laing O'Rourke



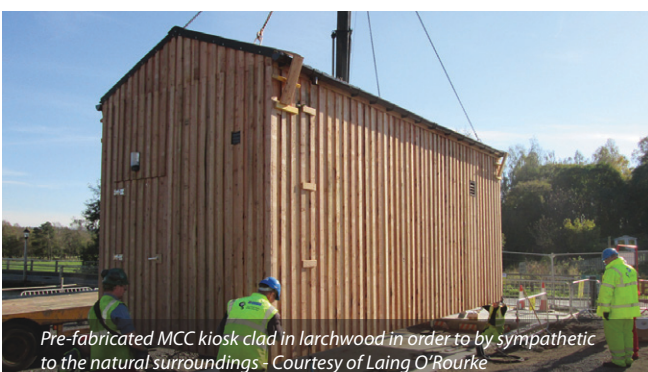
CSO base walls and dividing walls being installed
Courtesy of Laing O'Rourke



Balancing pond / Silt control from dewatering excavations
Courtesy of Laing O'Rourke



Otter and silt-proof fencing adjacent to River Spey
Courtesy of Laing O'Rourke



Pre-fabricated MCC kiosk clad in larchwood in order to be sympathetic to the natural surroundings - Courtesy of Laing O'Rourke

- The project site required rigorous ecological pre-construction surveys to ensure risk to protected species was kept to a minimum during construction works. Some of the protected species identified in the River Spey and surrounding area were otters, badgers, salmon, sea lamprey and fresh water pearl mussels.
- Silt protection fencing was constructed at the boundary of the main site to prevent run off from contaminating the River Spey prior to main civils works proceeding. This was also designed to incorporate otter-proof fencing. This protected the river from silt run off from the site and prevented otters being harmed by construction works.
- A Controlled Activity Regulation (CAR) License was required for the new river outfall. The design for the outfall was optimised to avoid the need for a gabion mattress to be located in the river bed which further reduced the impact of the construction on the ecology of the river.
- Food grade oil was used in the excavator which was located on the main site to reduce the impact of an oil spill caused by hydraulic failure.
- During the construction phase of the project and as working under the Considerate Constructors Scheme, Laing O'Rourke carried out works upgrading some forestry tracks at the Abernethy Forest. Laing O'Rourke also awarded a cheque for £4,500 to the RSPB who are working to replant the native Caledonian Forest.
- The dewatering system used for both the humus tanks and the septic tanks was designed by Laing O'Rourke's temporary works department. This allows the removal of up to 15l/s to a settlement pond at the rear of the site. The water was then allowed to soak back into the groundwater table. This was a simple, inexpensive and effective treatment.
- Waste material from the road excavation was segregated at the sewer upsizing compound. Surfacing material was segregated and sent to a recycling facility. Type 1 material was reused within the pipe trench therefore minimising the amount of imported type 1 required for reinstatement.

Community engagement

By establishing a complaints register, the local township was afforded the opportunity to feed back to the site team about improvements they could make. Through this feedback, the site team was able to make changes based on the concerns of the locals. This included changing generators over from diesel to electric and amending working hours during piling operations to respect the quality of life for the local residents.

The site team acted on every bit of feedback no matter how significant or insignificant the complaint was. The locals appreciated this and actually volunteered commendations to the project team. This showed excellent engagement with the community and would serve only to strengthen the reputation of Laing O'Rourke and Scottish Water.

Conclusion

The project gained CAPEX 3 approval in November 2013 and construction started in January 2014 by Scottish Water Solutions' in-house delivery partners, Expanded, CHt and Jacobs.

The project is now complete and gained plant acceptance in June 2015. The total Investment was in the region of £5.1m.

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CIVIL ENGINEERING CONTRACTORS

www.georgeleslie.co.uk

Blackbyres Road, Barrhead,
Glasgow G78 1DU
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