

# Katrine Water Project

£100m 'flagship' project to upgrade water supply for 700,000

by

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In the 1850s the City Council of Glasgow proposed to bring water from Loch Katrine in the Trossachs – a popular tourist area north of Glasgow, made famous through the writings of Sir Walter Scott. In 1855 an Act of Parliament gave the go ahead for an ambitious scheme devised by John Frederick Bateman. The scheme required 26 miles (40km) of aqueducts to be laid from Loch Katrine to Milngavie on the north side of Glasgow. This Victorian system has served the city of Glasgow well for the past 140 years though now with ever more stringent water quality standards a new water treatment plant is required. The existing water receives very little treatment - raw water is microstrained, disinfected and pH corrected. The supply needs a physical filtration barrier now in order to comply with future legislation, cryptosporidium requirements and the requirements to upgrade disinfection and pH correction. West of Scotland Water gave an undertaking to the Scottish Executive that it will meet all of these requirements by December 2005.



Caption required

This £100 million 'flagship' project for Scottish Water, with challenging time and budgetary targets, is required to upgrade the water supply to around 700,000 customers in the Greater Glasgow area. It will replace the existing Milngavie microstrainer works and use spare treatment capacity at the existing Balmore WTW.

West of Scotland Water, now Scottish Water awarded the Katrine Water Project to *Stirling Water* in August 2000. *Stirling Water* is a consortium of *MJ Gleeson*, *Montgomery Watson Harza* and *Thames Water*.

The project team comprises of: *Scottish Water*, *Stirling Water*, *Environmental Resources Management (ERM)*, *E C Harris*, *Keppie Design* and *Gillespie Landscape Architects*.

## Contract procurement

Scottish Water have issued this contract under an IChemE 'Green' Book Conditions of Contract with a paid/gain share mechanism. Partnering is also operated by all the team and is a cornerstone to the achievement of 'best value'.

The project is being procured through two distinct phases.

## Stage 1

Stage one of the project investigated a range of options for the

Katrine Water Project using a Value Management process to arrive at a preferred option. Options were investigated and comparatively assessed on a range of criteria i.e. engineering, environmental and cost criteria. 17 locations for the water treatment works and 19 locations for a service reservoir were considered. This together with the required connecting pipework, degree of conjunctive use of the existing Balmore Water Treatment Works and treatment process options meant that at the first value management intervention, some 900 options were considered. The option matrix indicates the complexity of this process. Throughout Stage 1, over 190 options were costed for comparison.

The preferred option was selected at the third Value Management meeting in June 2001. A detailed Environmental Statement was produced and a planning application was submitted in November 2001. The initial design was being developed throughout this period and a Target Cost was approved by West of Scotland board in December 2001.

Stage One also included the design, construction and operation of a £1 million pilot plant at the existing works in Milngavie. The proposed option represents the culmination of the efforts of some 175 personnel, comprising of 25 different technical disciplines, which have spent in excess of 100,000 man hours on Stage 1.

Stage 2 started in mid December 2001. This stage is the detailed design and construction of the preferred option. The principle of Value Engineering will be utilised throughout this period.

**Process**

Within the legislative framework, three treatment processes were considered; dissolved air flotation, Direct Filtration and membrane filtration. The pilot plant which became operational in May 2001, tested these three processes. Results indicate that the direct filtration system is best suited for Loch Katrine water.

The existing Balmore Water Treatment Works, some 5km from Milngavie, also has a Direct Filtration System for Loch Lomond Water. The Katrine Water Project will be supplying Loch Katrine water to Loch Lomond via a gravity cross connection in Strathblane, 10km to the north of Milngavie. A smaller scale, year long, pilot plant was commissioned from Mott MacDonald in April 2001, to ensure that the Lomond/Katrine blended waters would operate successfully at Balmore.

The Direct Filtration process for the Milngavie WTW has two distinct elements. The first stage is a conditioning phase and the second is the filtration stage. Direct filtration is a tried and tested, robust process which is suited to Loch Katrine water. One innovation which is to be included within the process is the use of lime water. Trials have indicated that precise pH control is required to achieve optimum filtered water turbidity compliance. Lime water has been found to provide this degree of control. Traditionally, lime slurry would have been chosen for pH correction/. However, given the scale of the new plant, the potential for blockages and the need for fine pH control, lime water has several advantages. Lime water as pH control has yet to be used within a UK water treatment works.

The process sludge waste is to be subject to a sludge treatment process. Sludge is dewatered using holding and thickening tanks and sludge pressing. Excess water from the sludge press is passed to the local sewer and the pressed sludge cake is taken off site for disposal to a licensed landfill.

**Construction elements**

At Milngavie, a new 240MI/d WTW will be constructed. The building

will be sunk into the existing hillside to ensure that views above the treeline are not interrupted. As this is a 'flagship' project within an area of heritage importance to the City of Glasgow, a higher than normal architectural quality is being employed. Superior grade materials are to be used at public and administration areas of the works.

A raw water pumping station will be required to pump flow to the new works. A new 1.2km access road is also required for the construction and operation of the new works.

On site, there will be an 80 MI treated water storage reservoir which will be fed by gravity from the new works. Off site, a short distance to the east of the new plant there will be 140MI treated water storage reservoir, which will be supplied by gravity from the new works and up to 150MI/d pumped from the existing Balmore Water Treatment Works. The existing ten trunk mains supplying Glasgow will need to be connected to these reservoirs.

In order to connect the existing Balmore Water Treatment Works and the new scheme to the Greater Glasgow supply, around 12km of pipelines is needed. This varies in scope from 200m of 900mm diameter pipeline to 2.1km of 1500mm diameter pipeline and includes 250m of 1500mm diameter tunnel.

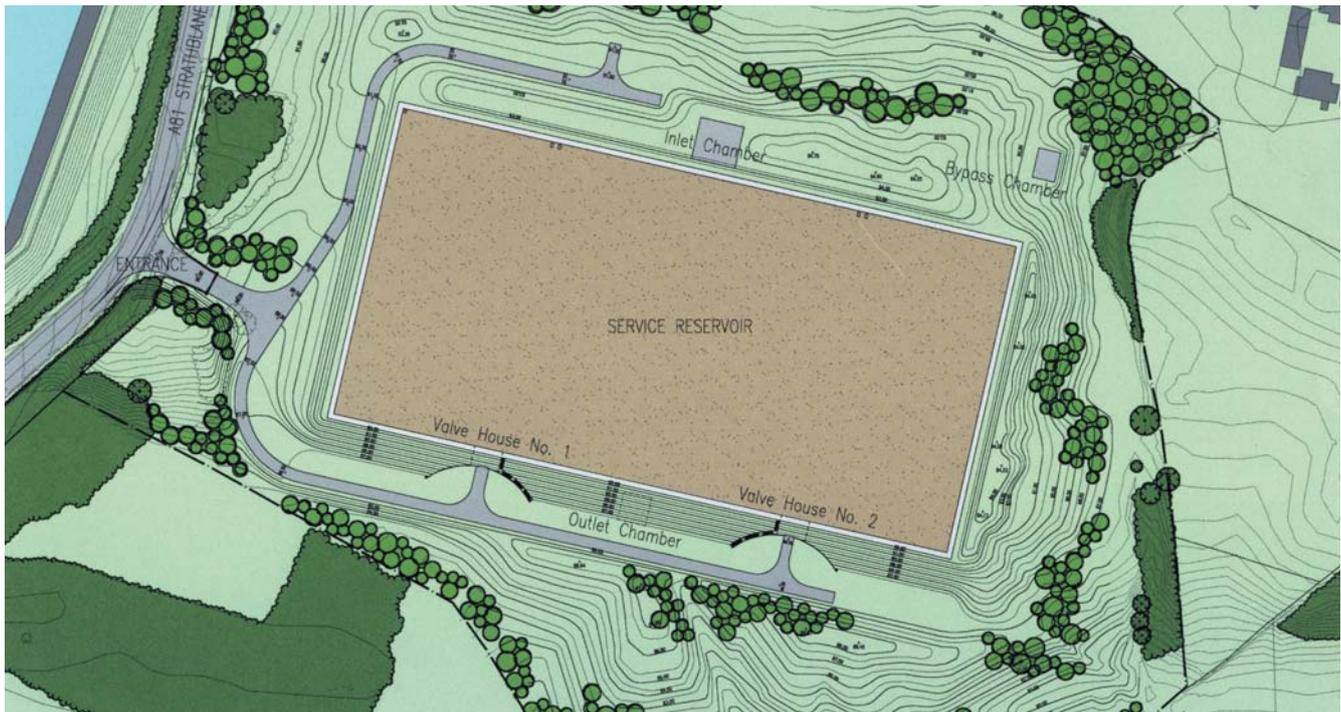
It is estimated that the scheme will involve the excavation of some 340,000m<sup>3</sup> of material together with the placing of approximately 56,000m<sup>3</sup> of concrete.

**Way forward**

The Katrine Water Project is awaiting a determination of the Planning Submission of November 2001. At this time, April 2002, detailed design is continuing. A Planning Determination is expected in May 2002, with a construction start in July 2002.

Construction completion is planned for April 2005, and commissioning should commence in October 2004. This will ensure compliance with the the Statutory Undertaking date of December 2005. ■

*Note: The author of this article, Louise Adamson, is Project Developer with Scottish Water.*



Caption required