

Cranbrook Reservoir Extension

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The South East of England faces increasing water demand due to rising population and climate change. As part of a £31 million investment project by South East Water, a new 10MI service reservoir has recently been constructed at Cranbrook in the heart of the Weald of Kent. Located in a rural area of high environmental and ecological value, the challenge at Cranbrook has been to design and construct the reservoir to minimise its temporary and permanent impact on the surroundings.



Cranbrook Reservoir under construction

Courtesy of South East Water

History

Cranbrook in Kent is a typical Wealden town, white weather boarded houses, hung-tile cottages, narrow streets and even overlooked by a windmill. There has been a community in Cranbrook for over a thousand years, being a thriving cloth centre in the 15th century and later an agricultural centre with a weekly sheep and cattle market. Having expanded greatly in the past century, the town now has a population of more than 7,000, with many commuting to Maidstone and some to London.

In its earliest days tributaries of the River Beult, which run through the town, would have been the primary source of drinking water; later supplemented by private wells. Public water supply came to the area in the 1900s with the construction by Cranbrook and District Water Company of groundwater boreholes and a treatment plant to the south. Treated water was then pumped using coal-fired steam engines to a small covered reservoir on high ground south of Cranbrook, where it then gravitated into the town.

Increasing water demand

Ever increasing demand during the 20th century led to more boreholes at Goudhurst and more storage, such that by 2000 11MI of storage had been constructed at Cranbrook, the original 1900 storage being abandoned in the 1930s. By this time local demand throughout the Weald had started to outstrip supply, particularly in the east where Ashford had expanded from a population of 56,000 in the 1950s to more than 100,000 in 2001.

The only significant water resource available to meet this increased demand was Bewl Water, a large surface storage reservoir constructed in the 1970s, located 11km to the west of Cranbrook. Consolidation of water undertakers led to the Cranbrook area being later absorbed by Mid Kent Water and more recently by merging with South East Water in 2007.

A scheme was developed by South East Water comprising the construction of a 500 mm diameter trunk main to transfer potable

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Cranbrook Reservoir columns

Courtesy of South East Water

water 35km from Bewl Water to Kingsnorth Reservoir at Ashford, via service reservoirs at Cranbrook and Biddenden. The scheme also included the construction of a new service reservoir at Cranbrook, improving the reliability of future water supply in the Weald area. Halcrow Group was commissioned by South East Water to develop the service reservoir design, prepare the planning application and contract documentation, and supervise construction.

For operational reasons the new reservoir needed to be located in close proximity to the existing reservoirs however, since the site lies within the High Weald Area of Outstanding Natural Beauty, from the outset environmental considerations were paramount in the design development.

It is inevitable that the construction of a structure of this size will have some impact on the local environment, albeit temporary. Extensive environmental investigations were undertaken, aspects being covered included ecology, archaeology, traffic management, cultural heritage, visual impacts, flora and fauna as well as construction noise. An Environmental Statement was produced to report on these investigations and identify appropriate mitigation measures during both construction of the reservoir and when in service.

In spring 2007 local residents and representatives were invited to a public consultation exhibition in Cranbrook where South East Water's proposals were presented. The proposals were generally well-received. There was recognition of the need to improve reliability of local supplies and acknowledgement of the environmental mitigations measures proposed.

A planning application for the reservoir was subsequently submitted to Tunbridge Wells Borough Council with planning permission being granted in spring 2008, accompanied by a number of conditions primarily to protect the local ecology.

Design

The reservoir is of conventional design, comprising two equally sized rectangular reinforced concrete covered compartments approximately 58m x 37m x 6m deep. The reservoir is partially buried with earth embankments and an earth covered roof supported by 60 reinforced concrete circular columns with conical heads. In each compartment ductile iron pipework comprises a DN500 high level inlet, low level outlet and overflow. The proposal included extensive landscaping to enhance the environment, with a focus on no net removal of spoil from the site.

Construction

South East Water awarded the contract for the construction of Cranbrook Reservoir to Dean & Dyball Civil Engineering Limited and one of the first activities to be undertaken was the development of a Construction Environmental Management Plan based on the Environmental Statement prepared for the planning application. The Plan identified environmental risks and associated mitigation measures to be taken during construction. These included tree and hedgerow protection zones and the retention of the existing field margins. Site works commenced in November 2008, supervised by Halcrow Group.

The construction site covered an area of 3.2ha, sufficient to accommodate the temporary spoil heaps as well as material storage, offices and welfare facilities. The site was accessed by a 200m temporary access road constructed across an adjacent field, built to prevent disruptions to local traffic.

Over a three-week period at the start of works, approximately 10,000m³ of spoil was excavated and stockpiled using three excavators and two 30T dump trucks. Approximately 240T of steel reinforcement and 2,600m³ of concrete have been used in its construction.

Bespoke steel shutters were fabricated for construction of the 60 circular columns and column heads, incorporating a high level working platform to enable the concrete to be placed safely. The steel shutters enabled a high quality surface finish to be maintained throughout construction, matching that achieved elsewhere in the structure.

Challenges during construction phase

Separate from the ambitious construction programme, there were additional challenges on site which had to be met. Though in a quiet rural area the reservoir site is adjacent to a small housing estate. South East Water was keen to ensure that the residents would not be adversely impacted by noise, especially as ambient noise levels prior to construction were particularly low. The planning conditions restricted working hours and every effort was made to minimise construction noise throughout the works. Acoustic enclosures housed



Cranbrook High Street

Courtesy of South East Water



Column formwork

Courtesy of South East Water



Nesting Pied Wagtail



Courtesy of South East Water

site power generation and the precise siting of the temporary offices provided a useful noise and visual screen block between the construction works and the residents.

Throughout the project Health and Safety was of prime importance. Daily site inspections by Dean & Dyball and Halcrow staff, regular tool-box talks and Health & Safety audits ensured a safe working environment for all parties, both internal and external. Dean & Dyball had registered the project on the Considerate Contractors Scheme; the audit visits placed the project in the top fifteen percent of registered sites.

Adverse weather in early 2009 caused disruption to construction. In December 2008 a spell of prolonged heavy rain flooded the excavation, delaying the placing of the blinding concrete. In addition unusually heavy snow fell in early February 2009, resulting in the site being closed for two days.

The environmental mitigation measures were however unable to accommodate all visitors. In May 2009 a bird nested in the rear of some formwork quite oblivious to the construction activity around, requiring work in the area to be stopped on its discovery. A visit from

a Halcrow specialist enabled the bird to be identified as a pied wagtail and a total exclusion zone was established in the vicinity of the nest until the chicks fledged.

By early summer 2009 the reservoir structure was completed. The earthworks and the landscaping are due to be substantially completed by autumn 2009.

Summary

The project at Cranbrook provides a contemporary example of engineering construction taking full account of environmental and ecological constraints. Once planting is established, the scheme will be absorbed into the landscape and its impact on the Area of Outstanding Natural Beauty will be negligible. Although Cranbrook reservoir will be invisible to the untrained observer, it hopefully will still be fulfilling its purpose for those living in the Weald for the next one hundred years.

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