

Dorchester Supply Strategy

resolving existing operational water supply problems

by
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Dorchester, the county town of Dorset has a population of approximately 20,000 and a strategy was required to meet all future water supply demand issues and resolve the existing operational problems in the town's water supply. The problems can be summarised as follows:-



Dorchester: New service reservoir under construction

courtesy: Wessex Water

- * major development is ongoing at Poundbury village, the highest part of the service area;
- * existing mains and service storage are inadequate for future demands;
- * the existing water tower in Dorchester has a limited working life;
- * Eagle Lodge source is under-utilised;
- * continued use of the 9" CI main through Dorchester, as rise and fall main from Eagle Lodge is considered unsatisfactory;
- * there are approximately 200 DG2 reportable properties within Dorchester;
- * existing district metering in Dorchester is unsatisfactory and changes to the supply arrangements will require major re-zoning of the system.

Scope of works

Eagle Lodge to Burton Road

For this option, the pumps at Eagle Lodge will be controlled by the level in Burton reservoir, and will not run for 24 hours a day.

Therefore, the pumps have been sized to deliver 145 l/s, equivalent to daily licence of 8.2 MI in 16 hours.

A flow of 145 l/s equates to a velocity of 1.5 m/s in the 350mm main. Burton Road Reservoir TWL is 62.75m AOD. However, there is a high point of 71m upstream of the reservoir which is the critical point. The pumps have been sized to maintain a positive pressure, 6m, at this high point. In order to maintain this pressure a constriction in the form of a partially closed valve, will need to be installed on the reservoir inlet.

When the pumps are running, the borehole water level is generally 3m below ground in winter and 9m in summer. The ground level of Eagle Lodge is approximately 54m AOD, and hence water level is 45 to 51m AOD. According to the model the total head required by the pump is 92.7m, and therefore the pump lift required is 47.7 to 41.7m. An allowance of 3m should be added to the lift for station losses.

Therefore, the new pump at Eagle Lodge requires the following duty point;

Flow 145 l/s
Lift 50m
Power 100kW, at pump and motor efficiency of 70%.

Burton Road Reservoir & pumping station

There are three sets of pumps proposed at Burton Road.

Pumps to Bridport road reservoir

Peak week demand on Bridport Road reservoir is projected at approximately 2.5MI/d The pumps have been sized to meet this demand in 21 hours, giving a duty flow of 35 l/s. The static lift is from Burton mean level 60.5m to 0.5m above Bridport Road TWL, equal to 33m.

Pumps to Lambert’s Hill

For this option the ring main pumps supply to a 0.5 MI reservoir at Lambert’s Hill. The demand off the reservoir is approximately 6.2MI/d at peak week by year 2019, with flows expected to vary between 30 l/s to 120 l/s. Although in the first years of operation minimum flows may be as low as 15 l/s. To meet this large and varying demand on a small reservoir, the pumps at Burton will need a great deal of flexibility. We propose a three pump system duty, duty-assist and standby exceptional peak. It is not expected that all three pumps will run simultaneously until peak week peak hour conditions towards the end of the design horizon. The three pumps would be identical

Pumps to the CAIM (Central Area Integration Main)

The surplus Eagle Lodge water, not required for Dorchester, is to be pumped into the CAIM. This surplus is expected to be around 2.5 MI/d when the scheme was commissioned, falling to 1.2 MI/d in the year 2019 as the Dorchester demands increase. The static lift is from Burton mean level (60.5m) to the head in the CAIM, which typically varies between 138 and 148m AOD. At the projected year 2019 peak day demand of 9.1MI/d in Dorchester, Burton Road will have to be supplemented with water from the CAIM to meet demands in Dorchester.

Proposed programme - issues critical to scheme timing

Factors critical to timing are: Poundbury development, Bridport Road tower life, DG2 problems. Eagle Lodge optimisation and the removal of Dorchester demands from the CAIM.

At present Poundbury is supplied from the CAIM via the ring main. The head available at Monkey Jump high point typically varies from 138m and 148m. The lower head relates to when the pumps at Empool are off and Northdown is supplying.

With the present zoning, the capacity of the ring main is such that it can continue to maintain 25m at the high point for the foreseeable future. A peak flow of 6MI/d only causes 3m head loss down the ring main.

The Bridport Road tower life is indeterminate, the building is structurally sound but the tank is in poor condition. Replacement of the tank is estimated at £300,000. The tower could remain in service for a further five years at least. More of a problem is that it is not high enough, and there are up to 100 properties at risk of receiving low pressure on the high ground outside the depot.

This should be addressed in this AMP period. In addition there are up to 100 properties at risk of receiving low pressure in the reservoir zone, which should also be resolved in this AMP period.

Eagle Lodge optimisation, and more importantly the removal of Dorchester demands from CAIM, is probably the critical issue. A change in the supply arrangements would allow the Eagle Lodge

source to be fully optimised, reducing the pumping requirement at Empool by 2 MI/d. The 30% of Dorchester system currently fed from the CAIM could be transferred on to the Eagle Lodge system, significantly increasing the capacity of the CAIM to transfer supplies to Forston and West Dorset at times of peak demand.

Construction

The project was implemented as part of Wessex Water’s AMP3 programme. In July 2004, a NEC Option ‘C’ Contract was awarded to *TJ Brent* to design and construct the project with a total project cost of £2,616,170, following an invitation to competitive tender.

Planning permission for the new Lamberts Hill service reservoir and building was obtained in advance of the detail design phase. Civil engineering works commenced in September 2004, with extensive excavation for the new service reservoir and landscaping works required to completely bury the service reservoir. This was required as the result of planning permission to ensure that the new works minimised the visual impact of the reservoir profile from the surrounding area and features.

Construction and E & M installation works is ongoing and is programmed for project completion in September 2005.

Total project value is £3.6 million. ■

Note on the authors: *Both Andy Gale, Client Project Manager and Martin Gans, Lead Design Engineer, are with Wessex Water.*