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Affordable, sustainable technology - water supply

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AFFORDABLE WATER SUPPLY AND SANITATION

Affordable, sustainable technology - water supply

D.C. Sims, WEDC, UK

THIS PAPER EXAMINES three examples of affordable sustainable technology from the Cotswold area of England.

Shipston-on-Stour water supply

The history

Shipston-on-Stour is a small rural town in Warwickshire on the Northern edge of the cotswold Hills. In 1897 the town was very short of water and the Health Inspector indicated that there was a danger of the water supplies from shallow wells becoming polluted leading to an epidemic of water borne disease.

The town had a Parish Council which was very concerned about this, and they asked the Local Area Rural District for support. The two councils formed a joint working committee of eight people (4 from each) to investigate the problem. They engaged an engineer and together they inspected many local springs and possible water sources. These were all measured (gauged) and the only source large enough was at Ebrington, about 7 kilometres from Shipston. The engineer designed a scheme which included a spring chamber, pipeline, service reservoir, and distribution system for the town. The estimated cost was £7250. The money raising began. A £4000 mortgage was obtained, and a loan from the "Local Government Board" for £2250 was arranged. They were £1000 short! Mr. R. Badger, who was a member of the Committee generously donated £1000 to the scheme.

The water rights were purchased from Lord Ebrington, the permission of the Railway Company obtained to pass under the land, land was bought for the reservoir, and contracts were let for the purchase of pipes, and the construction work. The contract included 6 kilometers of pipeline of 5" diameter, 1 kilometer of 4", a meter, and the distribution system of 3" and 2" pipes all in grey cast iron; a spring chamber; a tunnel 300m long; a service reservoir of 40,000 gallons capacity; and a deep trench (19 feet) . . . "to maintain the hydraulic gradient".

Figure 1. Service Reservoir TWL 135.8m (424ft).
(The Hydraulic gradient is shown in sketch form above.)

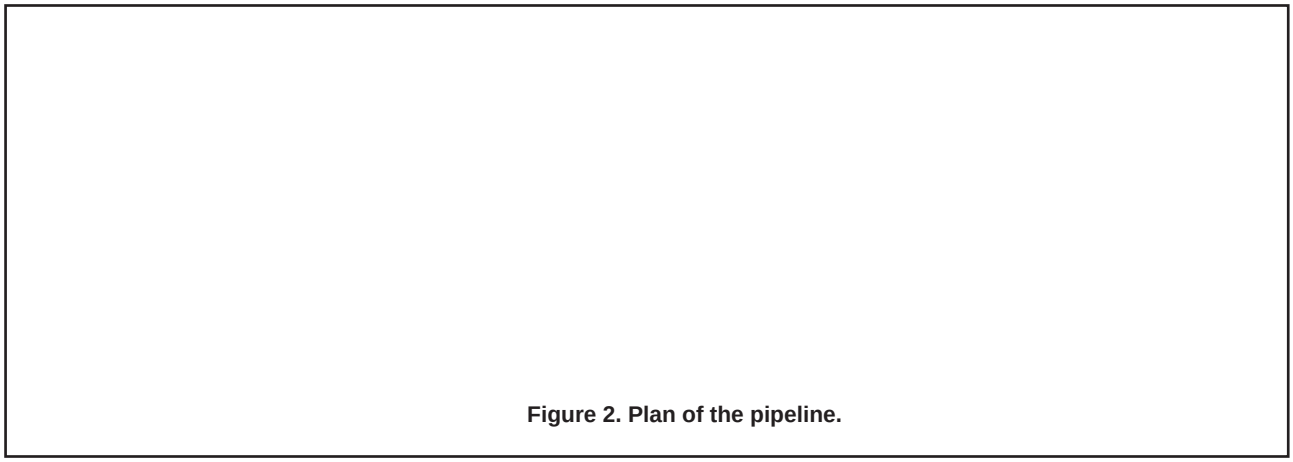


Figure 2. Plan of the pipeline.

The work was carried out and the water supply was available from October 3rd 1901.

Technical data for the scheme design

Population to be served 1,600 with 25 galls / h / d demand estimated 40,000 g.p.d.

Spring gauging indicated 256,000 to 104,000 g.p.d. yield

Key levels (elevation): Spring chamber TWL 153.5m (468ft) Town Centre 69m (210ft)

Execution of project (1900/01)

The works commenced in October 1900 and supplied water from October 3rd 1901. The water is collected by means of a trench in the solid oelitic rock dug to intercept several fissues yielding water. It is fed into an intake and gauging chamber where the pipeline is taken off with a control sluice valve. Water surplus to requirements overflows to the stream. The water was diverted and the concrete chamber constructed in dry ground.

Work on the tunnel was difficult as indicated by extracts from the Engineer's progress reports . . . "the trunk main . . . is taken along the road to Charringworth Hill. Here, owing to the levels, it was necessary to lay the main in tunnel for a distance of nearly 300 yards, the greatest depth being 51 feet from the surface. This proved a most difficult piece of work, owing to the rock and water met with, and the difficulty of providing for efficient ventilation of the headings, added to which, labour was scarce, especially to work inthe headings." It is understood that unemployed miners from South Wales were employed. "However, the difficulties were surmounted, and the runnel completed in August last, having taken eight months in execution. From the tunnel the main continued to Longdon Hill, where a cutting 19 feet deep was necessary to maintain the required hydraulic gradient. This cutting being in running sand also proved a difficult work."

The reservoir is also described in his report . . . "dimensions of the reservior are 40 feet by 20 feet and 8 feet deep, and is constructed on concrete foundations, with brick walls and jack arches, carried on cast iron columns and rolled steel joists. An inlit chamber with high pressure ball valve regulates the flow . . ."

The distribution system . .. "from the resevoir the 5-in main is continued . . . as far as the top of Warden Hill, from which point a 4-inch pipe is taken . . . to the Tannery at the top of the town . . . mains 4in and 3in are taken through every street of the town, and continued along the Stratford Road as far as the Brewery, and the Tidimorten Road to near the cemetery. The workhouse and Fever Hospital are also supplied by branch mains."

The contract for construction was for £2980. The pipe supply contract . . . "was £2,679-11s-6d".

More recent developments

Nothing happened to the supply for many years.

By 1933 there were 445 consumers and an annual income of £600.

During the 1950's demand outstripped supply and in order to obtain more water the service reservoir was byepassed during peak demand times. This was achieved by the operation of valves twice a day, the reservoir being bought back into service at night.

In the 1960's the reservoir was taken out of service and the town fed direct from the spring chamber. Deterioration in the 'C' value of the trunk main reduced the output to 25 to 30,000 g.p.d. by 1971, and parts of the area which has been added were then supplied by other sources.

In 1972 a pump was installed in the spring chamber which operated at times of peak demand. This produced a dramatic increase in yield up to a flow maximum of 165,000 g.p.d. At this time chlorination was added in order to protect the distribution system. The source had never produced water which had B.Coli present. However the total bacillus count was increasing.

The trunk main sustained the extra pressures without giving trouble and Ebrington Spring was now capable of again supplying Shipston-on-Stour with its water requirements. A record of over 90 years service to its community, of 3808 people (91 Census) and the industrial, and comercial needs of the town.

Conclusions

1. It is interesting to note that in 1901 the average design supply was 25 g.p.h. (111 l/d) and in 1991 there was the possibility to supply average 43 g.p.h. (191 l/d)
2. The community in 1900 set up an organisation to get the water supplied and were so succesful that the community used the amenity for 90 years.
3. The initial cost was high, but the scheme was simple and sustainable with very low maintenance costs.
4. The initial selection of source was good - or was it just lucky?
5. The raising and borowing of the money was not easy for the community but they achieved it, and for the benefit of the next generation too.

Epwell dip well

Epwell is a small village to the West of Banbury in Oxfordshire. In this village is a water supply which is very old. There was no records of the time when this supply was first used. Perhaps the village may take its name from the water source. It is known that it has been in daily use for at least 100 years. It's birth must be many years before.

The design of the well is interesting and a sketch of it is given below:

The main points of interest are:

1. The iron railings for protection, including an iron gate.
2. The approach hard path.
3. The wooden door at the entrance.
4. The curved roof over the well.
5. The care given to maintain it.

Affordable technology, sustainable, ageless, maintainable.

Enstone spring supply

This water supply is from a spring. The exact location of the source is not known. A pipeline feeds into a supply system which is unusual. It is arranged in three levels. The water for the village is taken as the pipe discharges into the upper chamber. Water flows from this chamber into a large trough which supplies the animals through a lead pipe in a stone carved lions mouth. In passed years this was a regular stopping place for passing horse drawn vehicles. Finally the water passes to a low level trough which is for dogs and other domestic animals.

The supply is known to be over 100 years old, and is still used for the local animals.

Figure 3.