

PRIVATE AND CONFIDENTIAL.

UTTOXETER WATER SUPPLY.

Notes as to present conditions and proposals under consideration for augmenting supply to the Urban District and Outside Areas now served, by Messrs. Willcox, Raikes & Marshall, - 10th November, 1936.

Notes in regard to the Consumption of Water.

The population of the enlarged Urban District at the 1931 Census was 6,249.

Since that time considerable building development has taken place, some 331 houses having been built. Many of these houses however, were required to replace slum properties and to prevent overcrowding. It is estimated that the present population is 6,800.

An additional 100 houses may be built during the next three years, partly to replace further slum houses and 46 new houses are at present being built on the Timber Lane Estate.

The actual consumption of water at the present time is as follows:

The quantity used per 24 hours for domestic purposes (obtained from Crumpwood, Bramshall and Somersall)	is..	283,000	gallons.
The meter supply in the Town is..		35,000	"
The meter supplies outside the Town, including Rolleston, Denstone, Stramshall, and Bramshall Villages are...		<u>21,000</u>	"
<u>Total:</u>		<u>339,000</u>	"

This amount is said to be just sufficient to meet the requirements at the present time, but if more water were available, the quantity consumed would probably be increased.

The actual consumption for domestic purposes only in the Town works out at 42 gallons per head which is exceptionally high. It is unusual for the consumption in a Town of this size to exceed 30 gallons per head. The excess is probably due to defective services and mains, baths and hot water services.

No doubt, as time goes on the consumption of water will tend to increase owing to the introduction of baths and water closets to all new houses.

Many of the old houses are without baths.

Some years ago, a very careful inspection was made of the mains and services with a view to reducing the consumption, and supplies to various portions of the Town were metered in order to locate where the excess was taking place. It was found to be general throughout the Town and very little improvement could be effected without very considerable cost in the renewal of mains and services. This being so it was probably thought less expensive to provide the additional water required to give an adequate supply.

At certain times of the year when the Bramshall and Somersall springs are low, reducing the quantity available, there is difficulty in maintaining a supply at the higher levels, namely High Wood, Balance Hill, and Bramshall, and this is also partly due to the lack of storage and insufficient pumping capacity.

The small size of some of the distributing mains also may lead to insufficient supply to some portions of the high level areas.

Sources of Supply.

The main supply to the Town at the present time consists of water obtained from Wood Spring at Crumpwood and also from certain Springs at Somersall and Bramshall.

The quantity of water which can be utilised from Crumpwood is limited by the capacity of the pumps and rising main and may be taken at 230,000 gallons per 24 hours. This is approximately the minimum yield of the Wood Spring. The water is raised by two of the three turbine pumps provided, the other being kept as a stand-by. An oil engine is also provided for use when the river is in flood.

The yield from the Somersall and Bramshall springs varies with the seasons, but we have taken the lowest minimum yields recorded as a basis and it is estimated that in dry seasons the quantity available for the supply of the Town is as follows:-

From Crumpwood	230,000 gallons.
" Bramshall	48,000 "
" Somersall	<u>21,600 "</u>
Total:	<u>299,600.</u>

After making allowances for additional supplies for Rocester, Denstone, Bramshall, Stramshall and Doveridge, together with supplies to the villages of Ellastone and Wootton, and provided a fair margin for an increased population of say 1,000 per sons as well as for additional trade supplies, we estimate that the minimum quantity required to supply the Town is 385,000 gallons.

The sources from which the supply can be best augmented are two in number:-

- (1) The Railway Spring at Crumpwood.
- (2) The Hulme and Pond Springs at Alton.

The following table gives the approximate yield and particulars of hardness of the three sources of supply at Crumpwood:-

	<u>Yield - gals.</u>	<u>Temp. Hardness.</u>	<u>Permt. Hardness.</u>	<u>Total.</u>
Wood Spring	230,000.	11.7. ^o	16.9. ^o	22.6. ^o
Railway Spring	237,600.	6.94. ^o	14.06. ^o	21.0. ^o
Alton Springs	381,000.	6.39. ^o	4.0. ^o	10.39 ^o

We understand that some trouble is experienced at one of the new housing schemes in the Town by reason of the furring of boilers caused by the deposit of lime. It is therefore desirable if possible, to reduce the temporary hardness which is the cause of the furring and thus avoid the necessity of softening the water, which would be a very costly process.

It is clear from the analysis given above that the best results both with regard to the temporary and permanent hardness would be obtained by utilising the water from the Hulme and Pond Springs at Alton, though so far as temporary hardness alone is concerned, practically as good results would be obtained by utilising the Railway Spring.

The temporary hardness of the water from either of these sources does not appear sufficient to justify the cost of a softening process and assuming the Alton Springs were utilised and mixed with water from the Wood Spring, as well as that from Bramshall and Somersall, both of which are soft, the hardness would be very considerably reduced, the amount of reduction depending on the ratio of water used from each source.

Before any opinion can be given as to the necessity or otherwise of softening the water, a quantitative analysis of water from all three sources should be obtained in order to ascertain the nature of the permanent hardness, which is not given in any of the analyses supplied to us. It might be well to submit samples of the waters to Drs. Beale and Suckling who are well known chemical experts with very wide experience in this direction, and they would no doubt at once say whether, as a result of their analysis, a softening process was necessary or desirable.

We have made investigations and taken the levels with a view to ascertaining how the Alton Springs can best be conveyed to the Pumping Station at Crumpwood.

Owing to the small fall available, (15ft. only), the best gradient obtainable is about 1/660 which is very flat and consequently if the whole of the water from the Springs is to be conveyed to Crumpwood Pumping Station which is the proper course to adopt, a 9 inch pipe would be necessary. We estimate the cost of this at £4880. 0. 0.

The line we have selected is the best possible route and crosses the river at a shallow point near the Alton Springs and also at another shallow point lower down, in order to avoid heavy cutting through rock which would otherwise be necessary.

There will be little difficulty in conveying the water from the Railway Springs to the Pumping Station, but it must be made by means of a separate connection. This would only be a short one and it will be understood that if a branch was taken from the 9 inch pipe conveying the water from the Hulme Springs, it would, owing to the levels, result in the water from those Springs escaping at the Railway Spring.

Pumping Plant at Crumpwood.

The pumping Plant consists of three turbines with Ram Pumps. They are in good order, each capable of lifting about 5,000 gallons per hour.

Owing to the small capacity of the rising main, it is found that if all three sets are run together, the frictional resistance is largely increased. The yield of the Spring is also overtaken, consequently only two sets are intended to be run at the same time.

Pumping is practically continuous for 23 hours out of 24, the quantity raised during that period being 230,000 gallons.

The third pump is used as a stand-by when the others are under repair.

There is also an Oil Engine for running the pumps when the river is in flood. This is practically worn out.

The pumping plant and rising main are inadequate for pumping the largely increased supply now needed.

An additional pump consisting of an automatically -controlled motor-driven Centrifugal Pump should be installed, but this involves laying a cable to the Pumping Station, which we gather the Electric Supply Department are prepared to do.

An additional rising main 7-inches in diameter is required from the Pumping Station to Prestwood Reservoir.

As the pump would, owing to the lift have to be a two or three-stage one, there would not be sufficient room for it in the present Engine House, but the small building required for it could readily be erected in front of the present pump-well into which the water from the springs now discharges.

The suction pipes from the centrifugal pump would be taken to this pump-well.

We think the new Pump-House should be built of a size to accommodate a second pump eventually, even if it is not installed at once as this is required to ensure complete safety of the supply not only when the River is in flood but at all times.

Alternatively, the Oil Engine might possibly be repaired for use as an emergency plant.

A float indicator should be provided at the Reservoir connected with an indicator at the Pump House, so that the man in charge can readily see what depth of water is in the Reservoir. The small cable for this indicator could be fixed for part of the way on the poles taking current to the Pumping Station.

Storage of Water.

The existing Reservoirs are altogether inadequate so that additional storage is necessary.

The Prestwood Reservoir which was intended to ensure the supply of water to Bramshall when the pumps were not running is now used as a Service Reservoir for Rocester, Denstone, Stramshall, Bramshall, and the higher portions of the Town, which was not intended.

It is also contemplated to use it as a service Reservoir for Ellastone and Wootton.

It consequently becomes necessary to construct an additional reservoir here which will also act as a Balancing Tank and thus ensure a supply for Bramshall Reservoir.

At present the level of the water is often too low to ensure a satisfactory supply to Bramshall during the time of maximum consumption at the various points for which it is now made to act as Service Reservoir.

The storage capacity of Bramshall Reservoir is altogether inadequate to cope with the peak draw-offs in the Town, and in our opinion an additional Reservoir of at least 150,000 gallons capacity should be provided here.

A Reservoir of 200,000 gallons capacity would be preferable and will be required shortly if the building developments contemplated mature. It could be designed for construction in sections so as to be readily enlarged as found necessary.

With the present limited storage a grave risk is being run as regards the supply to the Town, and fire protection.

Capacity of Mains.

The trunk main from the Prestwood Reservoir to the Bramshall Reservoir is 7-inches in diameter and 11720 yards in length. It has an hydraulic gradient of 1 in ~~687~~. 3/4.

The floor level of the Prestwood Reservoir is 500 A.O.D. and the top water level of the Bramshall Reservoir is 388 A.O.D.

The main, when new, was capable of discharging 288,000 gallons per 24 hours from floor level at Prestwood to the top water level at Bramshall which is insufficient to meet the requirements of the enlarged Urban District as well as the outside districts supplied.

Some of the other mains in the Town are also too small for the adequate supply of the areas served, particularly the main to Highwood, a portion of which is only 1½-inches in diameter.

This main and those to Balance Hill, Browns Green and Bramshall are all fed off the 7-inch high pressure trunk main to Bramshall.

The remainder of the Town is supplied at low pressure from the Bramshall Reservoir, the main therefrom being 8-inches in diameter, but occasionally when complaints arise, other parts of the Town are temporarily supplied from the high pressure mains, as for instance at the Laundry.

Alternative proposals for increasing the discharging capacity of Mains.

There is little doubt that if the present rate of development continues, it will in the course of a few years be necessary to provide an additional main from Prestwood and possibly to have recourse to "boosting" for the supply of the high level portions of the Town and Bramshall village only.

The provision of an additional main from Prestwood to Bramshall Reservoir would no doubt be the most satisfactory and the best method to adopt, but such a main would entail an expenditure of approximately £12,000.

It may be that an additional main from Prestwood would result in such an increase in pressure, owing to the reduction of friction, that the higher portions of the Town and Bramshall village could be supplied with a limited quantity of water without "boosting" by providing storage tanks which would fill at night when the maximum pressure is available, but this depends on the position, level and extent of the building developments. If "boosting" were found to be necessary a small plant could readily be installed at Bramshall Reservoir and a separate "boosting" main provided to serve the high level portions of the Urban District.

The high level supply tanks would enable the demand to be met during the time of maximum draw-off, reflux valves being provided at suitable levels to ensure that the tanks are available for the high level only.

With an additional main however, no "boosting" would be needed for the supply to Bramshall Reservoir.

An alternative to the provision of an additional main from Prestwood is to instal a "boosting" plant fro increasing the discharge through the 7-inch trunk main to the Bramshall Reservoir, thus postponing for a few years the expenditure upon an additional 7-inch trunk main from Prestwood, the length of time depending on building developments.

A suitable point for the "booster" would be near Uttoxeter Mill, at the low level near where the River Tean crosses the main road to Rocester at the boundary of the Urban District.

At this point the Ordnance level is 281.00 and the 7-inch main is capable of discharging 390,000 gallons per 24 hours which could be lifted to the Bramshall Reservoir and would also supply the high level areas by putting the high level mains under increased pressure.

This however, would not be a very economical proceeding as it involves "boosting" the whole quantity against an additional head with friction of about 100ft, as compared with "boosting" to Bramshall Reservoir only, and probably it would be more economical to instal a separate "booster" at Bramshall Reservoir for the Village and high level areas.

There are advantages in connection with the proposal limiting the quantity to be lefted to the high level, and a "booster" at Bramshall Reservoir would also form part of a comprehensive proposal as and when an additional main from Prestwood is laid.
