**Eliminating ground water infiltration to the sewers**

**The work undertaken so far by S Water**

* **119** **manholes surveyed**. Of these, 100 had clear water flowing through them showing that infiltration was occurring further upstream.
* **30 manholes identified for repair**. Manholes showing infiltration were found at various locations in the valley from St Mary Bourne as far as Ibthorpe.
* **11km of sewers (including private drains) surveyed**, using CCTV camera units.
* **Major infiltration** discovered at 12 sewer locations

The vast majority of this work was completed before work was halted by bad weather but S Water will return to complete it as soon as weather conditions permit.

**Work Still to be done**

* About **four manholes need to be sealed** (one of which is at one end of the slump near Applegate), and **four top hats**.  These will be repaired when levels allow, probably about June time.
* **The “slumps”** (areas where the sewer pipe has sunk) One is just downstream of Applegate (on the bend) and the other is located further downstream just past the Bourne Valley Inn.  The slump at Applegate will be repaired once the ground water levels drop as low as possible, so this is more likely to be done late summer/early autumn.
* S Water will be **installing flow monitors in the sewers** to record flows over a four-week period. This will help to assess whether there remain any major leaks in the sewers or in private drains causing inundation of the network. This will commence when appropriate conditions prevail.

**Sewer Capacity**

**Southern Water has provided the following calculation for the capacity of the sewer**

For sewer flows the **DWF** (dry weather flow) and sewer capacity has been calculated by village.

|  |  |  |  |
| --- | --- | --- | --- |
| **Village** | **Ibthorpe& Hurstbourne** | **Stoke** | **St Mary Bourne** |
| **Population** | **592** | **216** | **712** |
| **DWF l/s** | **1.5** | **0.54** | **1.8** |
| **Peak 3 DWF l/s** | **3.6** | **1.3** | **4.3** |
| **Sewer Capacity l/s** | **19** | **23** | **25** |

DWF figures are industry standard **155 l/h/d + 40 %** **infiltration allowance**

**Peak DWF** is breakfast diurnal peak **(3 DWF)**

Sewer capacity is the average across the five sewer lengths leading out of each village.

We confirm that flows (even at peak DWF) are far below the sewers'   capacity, so in dry weather there should be no problems. We calculate the flows based upon population served and an industry standard of 155 l/h/d. Population is determined from the Post Office address point data and Census figures for average occupancy in that area. The dry weather flow figures also allow for a **40% infiltration flow**, again this is an industry standard.

 Pipe capacity is calculated on hydraulics using the pipe diameter and gradient of each manhole to manhole sewer length. We have looked at the sewers leaving each village to confirm their capacity at pipe full exceeds the calculated peak dry weather flow (3 DWF). In the normal diurnal flow pattern of each day, peak flows result during  breakfast period and this is on average 3 x DWF.

 In conclusion this shows that for dry weather flows the sewers are more than adequately sized. However, it is worth mentioning that the majority of the catchment is a foul only system.  This means it is designed for sewerage flows only, and therefore not intended to carry rainfall from roofs or paved areas.  There are a few small areas in the catchment where there is a combined system, and this would accept both surface water and foul water.

**For the untechnically minded (by Clem Jones)**

These calculations are based on widely recognised statistics using averages, since the group we are considering is large, over 1500 people, any individual variances tend to smooth out. (Large house full of people compared with a cottage used at weekends only.)

The key number is that each person, on average, uses **155 litres per day (155 l/h/d)**. This allows for houses to have more than one bathroom, dishwashers and washing machines. To that figure **40% is added to allow for some infiltration** (we currently have much more than 40% infiltration), which is a **daily rate per person of 217 litres**. The above table expresses the rate in **litres per second**. Divide 217 litres by 86400 (60x60x24) to get litres per second - **Row 3** in the table (DWF l/s).

As in all statistical models like this you have to plan for peaks and troughs. In this case the peak is assumed to occur at getting up time in the morning when the majority of the houses are seeing maximum concurrent use of washing and other facilities. The peak is assumed to be three times average; this is **row 4** in the table.

**To calculate peak capacity (Row 4)**, for example in Ibthorpe & HBT,

* The DWF (in Row 3) is reduced by 40% (to take off infiltration calculation) 155/86400x592 =1.06 l/s
* 1.06 l/s is multiplied by 3 (peak demand) = 3.18 l/s
* Then add back the infiltration figure (40% of average is 0.44 l/s) = 3.62 l/s

 **Row 5** is the sewer capacity at the different locations.

We are only interested in the sewer at the southern end of SMB where it will be carrying all the sewage from Ibthorpe, Hurstbourne, Stoke and SMB.

**This capacity is 25 litres per second**, and the capacity it has to carry is **3.8 litres a second at average and 9.2 litres at peak.**

As stated by S Water, there is plenty of capacity in the sewer both now and going forward, when they are  not inundated by ground water, even though it has a couple of semi blocked areas (see Slumps above).

For those of an anorak tendency, if you look down the sewer in the summer when ground water is not an issue  the level of water running through is about **2 or 3 inches in the bottom of a 9 inch pipe**. This physical observation cross checks well with the calculations.

It is worth noting that another 100 houses in the catchment areas (SMB, Stoke, HBT and Ibthorpe) would increase the average flow by 0.2 l/s and 0.6 l/s at peak demand.

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