

Infiltration Reduction Plan

Hursley

October 2021
Version 3.1



from
**Southern
Water** 

Contents

Contents	2
Document Control	3
Glossary	4
1. Background	5
2. Groundwater Infiltration at Hursley	7
2.1. The significance of groundwater infiltration.	7
3. Investigation & repairs	8
3.1. Outline Plans to Investigate Sources of Infiltration	8
3.2. Investigation and Repairs in Hursley	8
4. Over-pumping	10
4.1. Circumstances that lead to over-pumping	10
4.2. Steps to prevent discharges and alternatives to over-pumping	11
4.3. Over-pumping arrangements (flow rates and minimisation of effect on watercourse)	11
4.4. Steps to minimise the volume and duration of over-pumping	11
4.4.1. Tankering	11
4.4.2. Over-pumping	11
4.5. 3rd Party Communications about over-pumping	13
4.6. Monitoring quality of the downstream watercourse	13
5. Options to Reduce Infiltration	13
5.1. Sewer Rehabilitation Programme	13
5.2. Property Level Protection	13
5.3. Local Flow Control	14
5.4. Main Road and South End Close Pumping Stations	14
5.5. Monitoring	14
6. Action Plans	17
Appendix	25

Document Control

Version	Date	Prepared by (Author)	Checked by	Reviewed by	Approved by
V1.0	December 2014	Andrea Bougard	N/A		
V2.0	January 2015	Richard Andrews	N/A	Richard Andrews	Graham Purvis
V3.0	June 2016	Matthew Sadie	N/A	Richard Andrews	Mike James
V3.1	September 2021	Adarsh Essurredeen	Richard Dow	Andy Adams	

Glossary

AMP – Asset Management Programme
CCTV - Closed-circuit television
EA - Environment Agency
GW – Ground Water
IRP - Infiltration Reduction Plans
l/s - litres per second
MH – Manhole
RPS - Regulatory Position Statement
SW – Southern Water
WaSC - Water and Sewerage Companies
WC – Water Closet
WPS - Wastewater Pumping Station
WTW - Wastewater Treatment Works

1. Background

This Infiltration Reduction Plan (IRP) for Hursley in the Chickenhall Eastleigh WTW catchment has been prepared in response to the Environment Agency's (EA) Regulatory Position Statement (RPS). SW has been carrying out work for many years to survey and repair sources of infiltration in the catchment for Chickenhall Eastleigh Wastewater Treatment Works (WTW) in Hampshire.

Figure 1.1 shows flows from the north of Hursley gravitates to South End Close WPS, from where it is pumped to Chickenhall Eastleigh WTW via Main Road, Hursley WPS and Chestnut Avenue WPS.

The IRP covers the village of Hursley. Southern Water has been communicating with other agencies and in particular during flooding events, SW has been working closely with these bodies to minimise the inconvenience to residents.

The repairs carried out by SW improve the integrity of the sewerage system. SW has been working with the following organisations and is dependent on their support to achieve the objective of reducing non-sewage flows into the sewers.

- Environment Agency,
- Hampshire County Council
- Winchester City Council
- Hursley Parish Council
- National Flood Forum
- Hursley Flood Action Group

Southern Water has consulted with representatives of these parties as part of meetings with the local councils.

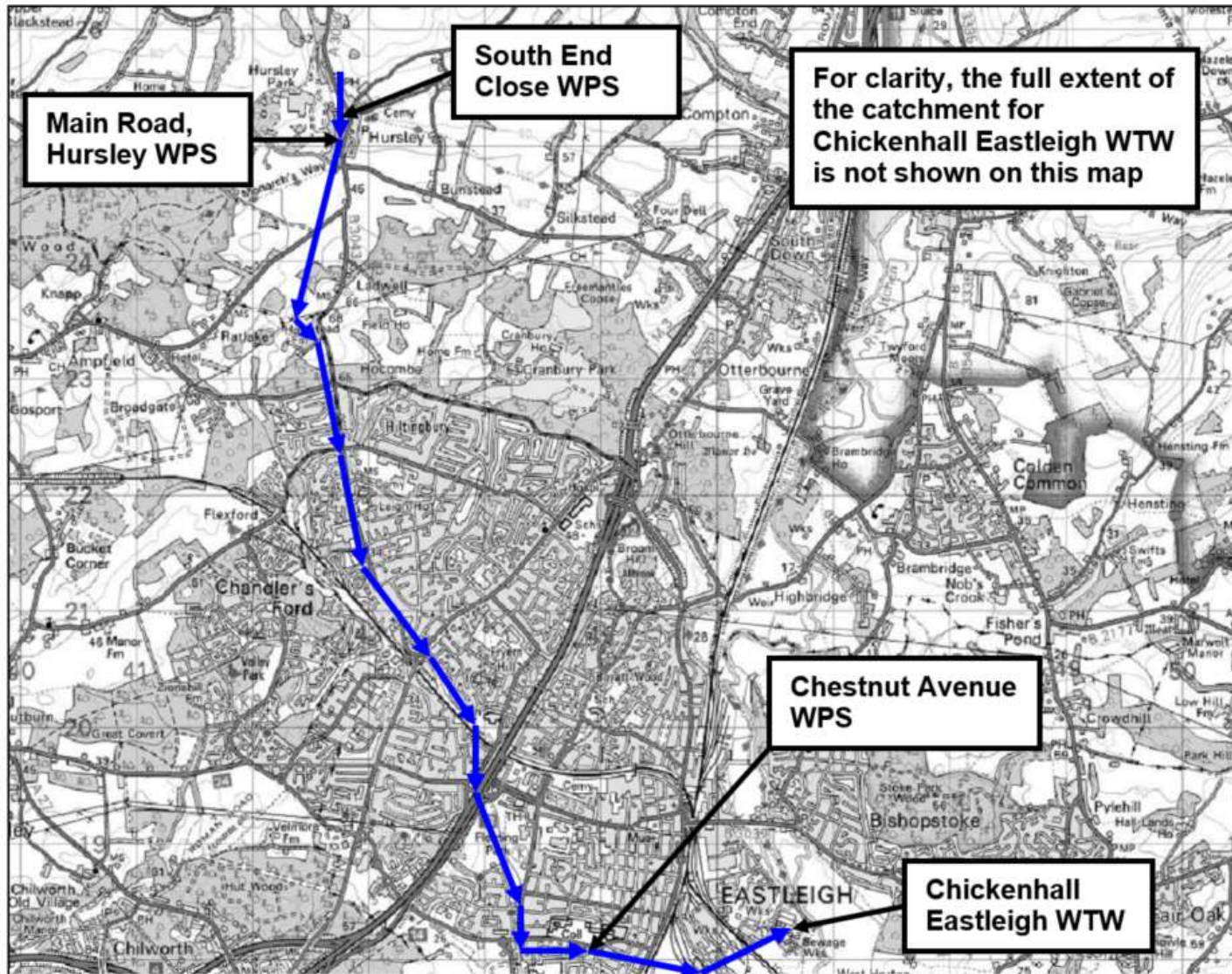


Figure 1.1 – Representation of the sewerage system for the Chickenhall Eastleigh WTW catchment

2. Groundwater Infiltration at Hursley

2.1. The significance of groundwater infiltration.

Hursley is one of a number of areas in Southern Water’s operating area where, during excessively wet winters, customers have been inconvenienced by the effects of groundwater infiltration into sewers. Such effects can include flooding and restricted toilet use (RTU).

Southern Water strives to maintain services for customers by a programme of investigation, repair, maintenance and mitigation. Mitigation measures include the use of tankers and over-pumping. Such mitigation measures are not sustainable, so during the last seven years SW has invested in carrying out major improvements to the integrity of the sewers and manholes in the vicinity of Hursley in order to minimise the occasions on which over-pumping is required.

2.2. What would happen if Southern Water did not take action?

Despite the significant groundwater flow through the valley during these conditions, incidents of sewer flooding have been relatively infrequent. Table 2.1 below show reported incidents of external flooding since 2010.

In some catchments, SW has hydraulic models of the sewers which can be used to predict the locations where the sewers are expected to flood during certain storm conditions. Hursley is covered by the hydraulic model for the Chickenhall Eastleigh catchment. However, from experience, SW is aware of the locations which are likely to suffer first from the effects of flooding.

It should be noted that other than during 2013-2014 (with an average daily rainfall of 6.14) there has been no incident of flooding recorded. This demonstrates the effectiveness to date of the sewer sealing work undertaken in the network and the particularly high groundwater level experienced in 2013/14.

Table 2.1 – Reported Flooding Incidents in Hursley

Year	Internal Flooding	Restricted Toilet Use	External Flooding
2010_2011	0	0	0
2011_2012	0	0	0
2012_2013	0	0	0
2013_2014	0	0	6
2014_2015	0	0	0
2015_2016	0	0	0
2016_2017	0	0	0
2017_2018	0	0	0
2018_2019	0	0	0
2019_2020	0	0	0
2020_2021	0	0	0
Totals	0	0	6

3. Investigation & repairs

3.1. Outline Plans to Investigate Sources of Infiltration

The Generic Plan describes Southern Water’s Infiltration Reduction process. The specifics of the investigations and repairs at Hursley are captured in Section 3.2 below, and includes the following elements:

- Manhole Inspections and CCTV Surveys
- Manhole and Sewer Repairs
- Follow-Up Surveys and Repairs

3.2. Investigation and Repairs in Hursley

Groundwater infiltration into sewers has been a long-running issue for Hursley. SW has been making significant investments over many years to minimise infiltration and the need for over-pumping.

SW recently completed a major programme of survey and repairs to the sewers in the Hursley catchment. The investigations and repairs followed the process set out in the Generic Plan. The timing and status of each step is in Table 3.1 below.

Table 3.1 – Summary of Survey and Repairs at Hursley

Step.	Description	Approx Date	Status
1.	Manhole lifting followed by CCTV Investigation (320m of sewer surveyed)	Spring 2014	Completed
3.	Determination of required repairs	Summer 2014	Completed
5.a.	Dry Weather Flow Survey	Not appropriate	Not carried out
4.	Repairs (80m of sewer and 7 manholes repaired)	January – April 2015	Complete
5.b.	Wet Weather Flow Survey	Not appropriate	Not carried out
6.	CCTV survey	January – February 2018	Completed
7.	Sewer Rehabilitation	April 2018	Completed
8.	Ongoing monitoring	Commenced January 2015	Ongoing
9.	Further surveys and subsequent repairs	Post 2022	Planned

In 2014 SW lifted strategic manhole covers, resulting in sewer lengths totalling over 300 metres being identified for detailed survey by mobile CCTV camera. The survey identified ground and surface water infiltration in a number of manholes and sewer lengths. Significant clear water flows were also identified in some customers' private laterals. Work took place between January 2015 and April 2015 to seal 80m of sewers in the Meredun Close, South End Close and Main Road areas.

The extent of the repairs carried out in 2015 is shown in the plans in Appendix A. Further CCTV Investigations were carried out from January 2018 to February 2018, which led to Sewer rehabilitations in April 2018. Whilst no further work is scheduled, if infiltration remains an issue, the requirement for further investigation and repairs will be considered in relation to other locations which experience sewer flooding.

In addition to physical investigations on site, SW has instigated a long-term monitoring programme at critical locations, including Hursley. Details are given in Section 5.3.

Generally, SW investment to survey and seal the sewer system in the many locations across its region which are prone to groundwater infiltration of the sewers is paying dividends. Nevertheless, there are never any guarantees as the unpredictable nature of groundwater is that sealing one part of the sewer network can increase the groundwater table locally because it is no longer being drained via the sewers. The result is that it finds another way into the sewers, usually via the next highest joint which previously it may not have reached and therefore could not be identified during a sewer survey. It is a long term battle as points of ingress will continue to appear in different places, but if the ingress is significant, SW's intention is to conduct further survey work.

4. Over-pumping

4.1. Circumstances that lead to over-pumping

Since 2013, SW has made significant investment to reduce infiltration and to protect specific properties at risk of flooding, with the objective of reducing the frequency of discharges to watercourses.

If flows continue to increase, as groundwater levels rise, mitigation measures at certain locations will be required. Using previous experience, areas likely to be the first affected, are identified. The requirement for tankering or pumping will be driven by levels in the manholes locally. Based on experience in 2014, over-pumping could be expected to be required when the groundwater level at King’s Somborne borehole reaches 33.6m. However, to allow time for investigation and preparation, SW is using lower ‘trigger levels’ in the winter planning report. A trigger level of 32.0m is currently being used.

Figure 4.1 shows the groundwater level at King’s Somborne borehole over the last six years. The repair programme was completed in March 2015. Prior to that tankering was required from 24/01/2014 and stopped on the 25/03/2014; and pumping was required from 14/02/2014 to 30/04/2014. Tankering was required between 11th March and 14th April 2020. Neither tankering or over-pumping were required in the winter of 2020/21

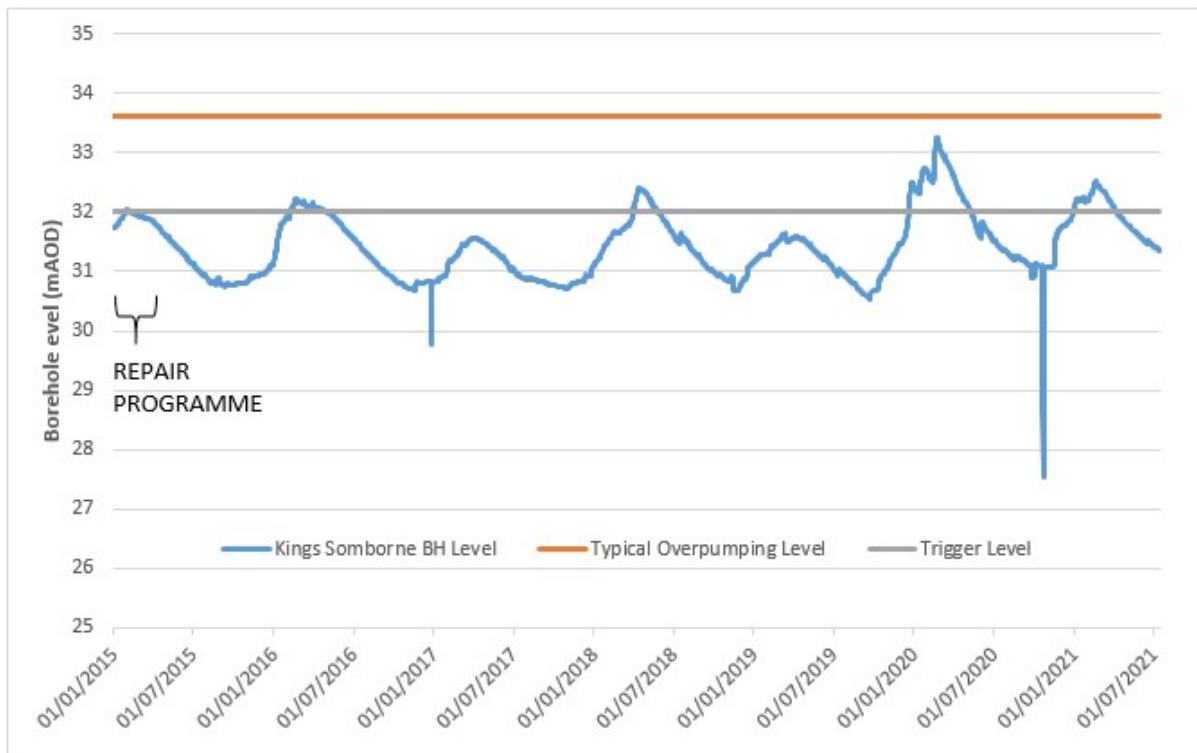


Figure 4.1 – Groundwater levels from 2015 to 2021

The details of where tankering and over-pumping has been necessary in the past are given in Appendix B. The repairs carried out, combined with the winter preparation checks, are expected to minimise the number of locations where over-pumping would be required. However, as a consequence of repairs and potentially other

factors outside SW's control (such as the severity of the weather), the hydraulics may dictate that over-pumps are required at other locations either in place of, or in addition to, the sites described in Appendix B.

4.2. Steps to prevent discharges and alternatives to over-pumping

The Generic Plan details the typical activities that Southern Water undertakes to minimise the requirement for discharges to watercourses. Since 2013, SW has undertaken extensive surveys and repaired sewers and manholes where infiltration had been found (the extent of the work is shown in Appendix A). This built on the repairs that had been carried out in previous years (shown in Appendix A).

4.3. Over-pumping arrangements (flow rates and minimisation of effect on watercourse)

A typical arrangement of an over-pumping setup is provided in the Generic Plan.

The locations where tankering and over-pumping has been used in recent years are shown in Appendix B. These locations were effective in restoring service to customers and are the default locations should the situation re-present itself. Dates of historic tankering and over-pumping are also provided in Appendix B.

4.4. Steps to minimise the volume and duration of over-pumping

The Generic Plan outlines a detailed rationale behind the use of tankers and over-pumping, and summarises the benefits and disadvantages. Some specific issues in relation to the Hursley catchment are captured below.

4.4.1. Tankering

Benefits:

- See Generic Plan.

Disadvantages

- The flow rate is low (approx. 2l/s per tanker over a 24 hour period).
*Tankers operating at Hursley discharge to Chickenhall WTW - a round trip of approximately 2.5 hours including loading and discharging.
- See also the Generic Plan.

4.4.2. Over-pumping

Benefits:

- Typical pump fuel consumption is 36% of the fuel that one tanker would use in a day.
- The discharge rate is significantly greater. A 150mm pump will discharge typically 80 l/s; the equivalent of a fleet of 28 tankers.
- See also the Generic Plan.

Disadvantages

- See Generic Plan

The graph in Figure 4.2 shows the estimated carbon emission per m³ of dilute effluent removed by tanker and by pump. In this example, data has been used for a 4,000 gallon tanker and 150mm pump at Hursley in 2014.

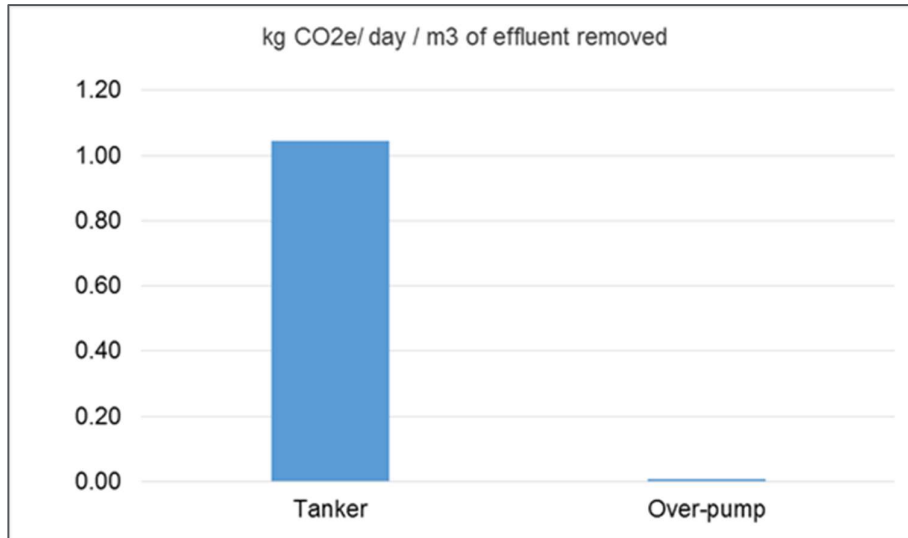


Figure 4.2 – Carbon Footprint figures for Tankers and Over-pumps per m³ of effluent removed.

4.5. 3rd Party Communications about over-pumping

Since the start of the Infiltration Reduction Programme in 2013, Southern Water has been proactive in communicating with stakeholders and customers about planned and completed work to improve the integrity of the sewerage system. Stakeholders have been kept informed of progress on survey and sealing work via emails and or face-to-face meetings.

SW attends and convenes meetings with a number of local groups. In particular meetings with local councils and the flood action forum and flood group have been influential in helping to shape the IRP. During the flooding of 2013/14 SW had representatives on site who visited affected customers to help them. The latest version of the IRP approved by the EA, will be published on SW's website.

Despite the work being undertaken, if over-pumping is required, the location of advisory signs near the over-pumps is also provided in Appendix B. The Generic Plan provides more detailed arrangements around over-pumping.

From time to time, SW updates stakeholders about completed and planned work.

4.6. Monitoring quality of the downstream watercourse

The Generic Plan provides details of water quality monitoring that will be undertaken, should over-pumping be required.

5. Options to Reduce Infiltration

5.1. Sewer Rehabilitation Programme

SW acknowledges that infiltration reduction is on-going process. Since 2013, SW has undertaken surveys and repairs at Hursley. In 2014 SW lifted strategic manhole covers, resulting in sewer lengths totalling over 300 metres being identified for detailed survey by mobile CCTV camera. The survey identified ground and surface water infiltration in a number of manholes and sewer lengths. Work took place between January 2015 and April 2015 to seal 80m of sewers in the Meredun Close, South End Close and Main Road areas. Major improvements were also made at the Main Road pumping station with a new pump fitted in the summer of 2014 to improve the station's resilience.

However, on a company-wide basis, to ensure that benefit continues to be gained from the work that has been done, SW continued the programme of infiltration reduction investment across its region for AMP6 (2015 – 2020). Further CCTV Investigations were carried out from January 2018 to February 2018, which led to Sewer rehabilitations in April 2018.

5.2. Property Level Protection

Non-return valves have always been part of SW's armoury for dealing with infiltration, but they are only effective if infiltration is under control on both the lateral and the main sewer. Whilst there are no plans currently to install non-return valves, the potential benefit of property level protection on Main Road, Hursley will be investigated, if it is deemed appropriate.

5.3. Local Flow Control

As noted in Section 4.1 tankering was required from 24/01/2014 and stopped on the 25/03/2014. Pumping was required from 14/02/2014 to 30/04/2014. Tankering was required between 11th March and 14th April 2020. Neither tankering or over-pumping were required in the winter of 2020/21.

5.4. Main Road and South End Close Pumping Stations

Major improvements were made at the Main Road pumping station. A new pump was fitted in the summer of 2014 and a new air valve installed on the rising main in October that year to improve the station's resilience. The station's status was also raised to Category A so that it receives monthly maintenance visits. No problems were found at the smaller station in South End Close which receives quarterly visits.

Throughout 2014 sections of the sewers were jetted to clear blockages. A particular blockage affecting flows into the Main Road Pumping Station, which was unable to be cleared using conventional equipment, was freed by employing specialist equipment to conduct a major cleaning of the affected sewer run. A heavy duty 'super sucker' with expert 'deep entry' crew trained in confined space working entered the wet well of the pumping station to jet the sewer and clear a blockage caused by fat, oil and grease. The result was immediate. The previously restricted flows filled the wet well at the pumping station where the pumps took them away. Sewer levels in the north of the village dropped by half a metre.

A number of other sewer blockages were caused by fat, oil and grease being poured down sinks and toilets. In 2015 a scheme to help reduce sewer blockages was launched in Hursley. With the help of the Parish Council, Southern Water made available a fat trap for every property. A fat trap allows fat, oil and grease to be simply collected in a plastic bottle, helping pumping stations to transfer design flows without spills caused by fat, oil and grease blockages.

5.5. Monitoring

The Hursley catchment is one of ten locations, where groundwater levels have been monitored via electronic data since January 2015. This monitoring helps inform SW's response, in terms of when tankering and over-pumping are required. The Generic Plan has more detail on the overall monitoring strategy.

The graph below, in Figure 5.1, is an example of those used for predicting the earliest, average, and latest dates for when the trigger levels are forecast to be breached. This graph shows groundwater levels and an indication of flows.

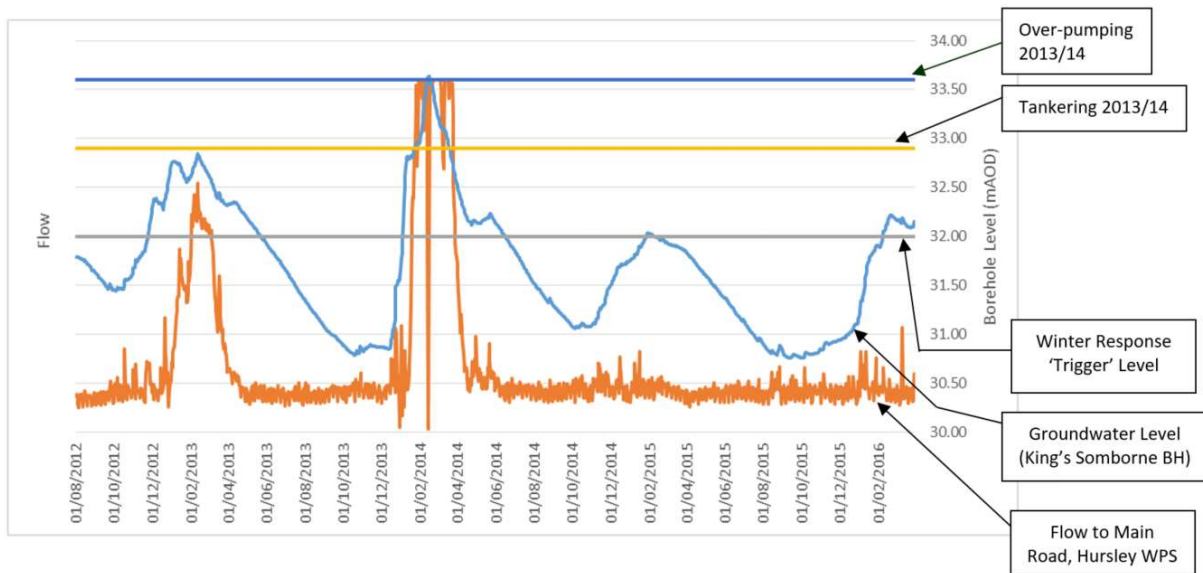


Figure 5.1– Forecasting of Trigger Dates

In addition to the groundwater flooding forecasts explained above, SW is also looking at longer-term trends to monitor the effectiveness of the completed rehabilitation work.

Figure 5.2 shows the groundwater levels at King's Somborne borehole plotted against flows at Main Road, Hursley WPS. The blue data points represent the period prior to repairs, and the brown data points represent the period after repairs. This tends to show a reduction in volumes at the WPS post repairs.

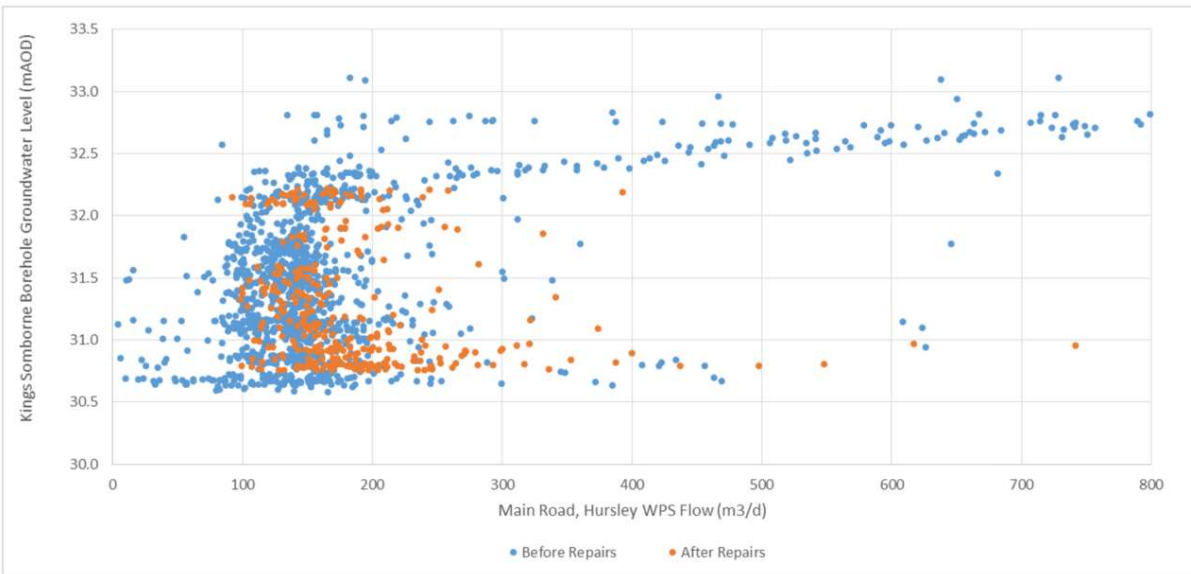


Figure 5.2 – Long Term Monitoring (Apr 2011 to Mar 2016)

Figure 5.2 quantitatively illustrates how flow varies with groundwater levels. Data is only available from April 2011 to March 2016, hence two distinct periods are outlined: Apr 2011 – Dec 2014 (before repairs in the Hursley), and May 2015 – Mar 2016 (after the repairs). It can be seen that for groundwater levels up to approximately 32.2mAOD flows are generally independent of groundwater level. Above 32.2mAOD and prior to repairs, flows increased significantly for a small increase in groundwater level. Since repairs have been completed, levels have not exceeded 32.2mAOD.

It can be seen from Figure 5.2 that there are few data points for the period after repairs. This is because the repairs were carried out so recently. It is therefore not possible to confidently conclude how effective the repairs are at mitigating infiltration at high groundwater levels. Nevertheless, it is encouraging that there has not been particularly high flows to Main Road, Hursley WPS since the repairs. In general, the analysis shows positive results, which is supported by operational experience. In order to enhance the validity of this analysis, further data is needed.

6. Action Plans

A significant amount has been achieved in the Chickenhall Eastleigh WTW in the last eight years. Some actions are ongoing which reflects the continuous improvement process for dealing with infiltration due to groundwater. To make it easy to track progress, the following tables set out the actions to reduce infiltration and also to mitigate the effects of it, if the infiltration cannot be controlled at economic cost. Tables 6.1 and 6.2 cover the actions by SW and by other parties, respectively, to reduce infiltration. Tables 6.3 and 6.4 cover mitigation of the effects of flooding (Communication and other activities).

SW is committed to continuing to pursue infiltration to reduce the frequency of over-pumping. This IRP describes the work that has been done by SW to improve the situation. In addition, it also describes what is being done to monitor flows, the 'winter preparation' work to be carried out to ensure assets are operating correctly, and the work to be developed with other agencies to improve an integrated plan to address flooding.

Colour coding of actions in tables:

- Green – completed
- Orange – imminent action required
- Red – overdue
- White – on-going actions with no specific end dates.

Table 6.1 – Southern Water Current Activities to Reduce Groundwater Infiltration

Ref.	Item	Actions	Timescale and Status	Outcomes
1.1	Develop an approach for reduction of infiltration and maintenance of reduced levels of infiltration.	Refer to Section 3 above and the report in Appendix A.	SW, Summer 2013. Complete	The steps have been followed to deliver results.
1.4	CCTV etc. survey of sewers	Identify Strategic Manholes, survey manholes to identify clear flow and infiltration. Carry out CCTV survey where clear flow was identified.	SW, Summer 2014. Complete	Sources of high Infiltration identified by the 2014 CCTV surveys have been repaired.
1.5	Carry out sewer rehabilitation work	Use various techniques to seal infiltration points in manholes and sewers	SW, Repairs carried out from January 2015 – March 2015. Complete	Restored structural integrity of the sewers.
1.6	Further surveys (CCTV or alternative techniques), if required, where 'wet weather' flow surveys show areas of high infiltration remaining	Further surveys in areas where high infiltration flows remain.	Monitoring reveals further surveys not currently required. Review in Spring 2017. January – February 2018 – Completed	N/A
1.7	Further sewer rehabilitation work, if required, in areas where surveys carried out.	As above, use various techniques to seal infiltration points in manholes and sewers	April 2018	Rehabilitation will restore structural integrity of the sewers.
1.8a	Maintain IRP as a live document	Review text of the IRP and update if appropriate to describe work carried out and/or developments	SW, Annually – on anniversary of EA approval	Up-to-date IRP.

Hursley Infiltration Reduction Plan

Ref.	Item	Actions	Timescale and Status	Outcomes
1.8b	Maintain IRP as a live document	Review Tables 6.1 to 6.5 and as appropriate amend to show progress on individual activities.	SW, Quarterly (December, March, June, September)	Keep the Environment Agency informed of progress on a regular basis
1.9	Consider alternative solutions that involve some risk	Investigate unconventional options such as vacuum sewers or consider conventional combined sewer overflows	2020	Complete.
1.10	Monitor Flows	SW carry out pre-winter checks and monitor sewer flow to identify significant increases in inflows.	SW, Autumn 2016.	Preparation for winter responses.
1.11	Over-pumping Sites: improve effluent quality	Investigate potential for improved screening and basic treatment at points of discharge into watercourse.	SW, 2014. Complete for previously used sites.	Improved arrangements for discharges when required.
1.12	Over-pumping Sites: minimise flow	Add level control to pumps to reduce durations for pumping	SW, 2014. Complete.	Minimises volumes of discharge if seasonal discharge(s) are necessary in order to maintain use of sewerage services for customers during periods of very high groundwater levels.
1.12	Standards for emergency discharges	SW to discuss with EA about best practice set up for over-pumping arrangements.	SW, 2014. Complete.	Agreed with EA acceptable standards for discharges and acceptable flow rates.
1.13	Flow, location, screening arrangements for emergency discharges	Determine potential flow rates and screening arrangements and most appropriate locations,	SW, 2016. Included in this IRP. Complete.	Agree with EA, and inform HCC and Parish Council acceptable arrangements for future emergency discharges.

Hursley Infiltration Reduction Plan

Ref.	Item	Actions	Timescale and Status	Outcomes
1.14	Action Plans	Develop SW action plans documenting set up of pumps, tankers, etc. for emergency situations.	SW, Summer 2014. Complete.	Action Plan available for planning sessions with other authorities in preparation for repeat flooding events. Engagement with the local community about the potential arrangements for dealing with excess flows into sewers to mitigate disruption to customers.
1.16	Identification of lengths of sewer to survey or resurvey in the period 2021-25	Review sewer records with available ground water profile data	Post 2022	Planned – dependent on catchment performance with future high groundwater seasons
1.17	Surveys by CCTV or electroscan lengths of sewer potentially at risk	Compare historical survey coverage with results of 1.15 and produce a survey schedule.	Post 2022	Planned
1.18	Survey result review	Review results of surveys undertaken in 1.16 to determine sewer sealing work.	Post 2022	Planned
1.19	Undertake required sewer sealing	Seal sewers and manholes by most appropriate technique	Post 2022	Planned
1.20	Review effectiveness of any sealing work	Analyse monitoring data and groundwater data to determine benefit of investment	Post 2022	Planned
1.21	Review further options for property protection and alternative tanker points	Consider further improvements.	Post 2022	Planned

Table 6.2 – Multi-Agency Activities to Reduce Groundwater Infiltration

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
2.1a	Strategy for infiltration via private drains	Southern Water to propose a strategy for dealing with infiltration via private drains*	SW supported by EA and local Parish Councils, Summer/Autumn 2014. Completed 2014.	Southern Water objective is to improve awareness of the significance of infiltration into private drains and the importance for customers to ensure infiltration is repaired when it is discovered.
2.1b	Long-term Monitoring	SW will monitor sewer flow to identify significant increases in inflows.	Ongoing	Early identification of areas where infiltration has increased
2.2a	Investigate highway 'mis-connections'	Where non-sewage flow is identified, check highway drainage relative to sewers to ensure road drainage is not a source of flow into the SW sewers	Hampshire County Council with support from SW. To be pursued as and when required.	Reduced flow of surface water (if connections are found).
2.2b	Investigate groundwater infiltration on domestic drains	Where non-sewage flow is identified from domestic properties, investigate to identify source of flow into SW sewers	SW, with assistance from Winchester City Council where required, as appropriate, if connections are identified. To be pursued as and when required.	Reduced flow of surface water (if connections are found).
2.3	Consider effects of proposed new developments on infiltration.	District Council to continue to consult with SW on development applications.	Winchester City Council, Ongoing.	Developments in areas which would be detrimental to sewer flooding, to have conditions recommended by SW and applied, as appropriate, by the Borough Councils.
		SW to determine threshold above which they require to be consulted.	SW, Ongoing. SW wish to be consulted on all	

Hursley Infiltration Reduction Plan

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
			proposed development.	
		Sewerage materials for new developments	SW, Borough Council, when developments are at planning approval stage. Ongoing.	

*Note: Southern Water does not have powers to require residents to repair private drains. Hence the support of the other agencies is required. It is acknowledged that customers may not be aware of infiltration in their private drains, so SW will consider ways of obtaining information to demonstrate the presence of infiltration. District Councils would only be able to instigate action under Section 59 of the Building Act where proof/evidence is provided of the defect.

Table 6.3 – Publicity / Communication Activities to Reduce / Mitigate the Effects of Groundwater Infiltration.

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
3.1	Public meetings about reducing groundwater infiltration into sewerage system	Attend public meetings with other agencies as appropriate.	SW, as required	Inform stakeholders of progress and planned activities and receive feedback.
3.2	Communication from SW to stakeholders about reducing groundwater infiltration into the sewerage system	Send comms at regular intervals to communicate progress and planned activities	SW, as required	Inform stakeholders of progress and planned activities
3.3	Multi-Agency Group meetings	Discuss and agree actions to reduce requirements for tankering and emergency discharges to watercourses.	All Parties, Discussed and actions agreed in 2013 and 2014. To be discussed in future as required.	Improved understanding and appreciation of issues. Agreement to actions to help reduce the need for tankering and emergency discharges to watercourses
3.4	Communicate with stakeholders about optimum arrangements for emergency discharges	Explain potential flow rates and screening arrangements and most appropriate locations.	SW, ongoing. SW will communicate further when further emergency discharges are required.	Agree with EA acceptable arrangements for future emergency discharges. Notify HCC and Parish Council.

** SW can provide base information to councils to include in articles publicising the role that everyone can play in minimising non-sewage flows into sewers, and the importance of doing so to reduce the incidence of restricted toilet use during periods of high groundwater.

Table 6.4 – Activities to Mitigate the Effects of Groundwater Infiltration/ Other Flood Protection Mechanisms

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
4.1	Early Warning system	Joint continuous monitoring of groundwater levels and sewer levels/flows.	SW, EA, 2014. Ongoing. Commenced Jan 2015. Re-commenced annually	Develop trigger levels by comparing historic customer complaints and tankering with BH levels (or other reference). Note trigger levels should vary as a consequence of rehabilitation. Also they will need to reflect groundwater reaction times.
4.2	Tankering arrangements	Investigate options for improving location of tankers and over-pump units for future events. e.g. by use of longer hoses/ pumping	SW, Spring 2014, Complete	Potentially less disruption to residents when tankering / pumping is essential.
4.4	Flooding Management Plan	Develop plan to address the flooding issues caused by high groundwater. Implement recommendations. This is being addressed by the Hursley Flood Action Group.	Hampshire County Council & Winchester City Council with inputs from SW, EA and Parish Councils.	Plan including actions for participating authorities that in unison will reduce the extent of flooding and the impact of flooding.
4.5	Maintenance of watercourses	Riparian owners to carry out their responsibilities to maintain adequate flow through watercourses by clearing vegetation, desilting, etc	Riparian owners with input from District and Parish Councils – ongoing responsibility	Maximise the flow along watercourses in order to minimise surface flooding, which results in inundation of manholes to the sewerage system.

Appendix

A Survey Findings and Rehabilitation Scope

B Emergency Discharge Sites