

Infiltration Reduction Plan Alkham Valley

January 2024
Version 6.0



from
**Southern
Water** 

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Document Control

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Alkham Valley	1.0	October 2021
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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 Alkham Valley has been prepared in response to the Environment Agency's (EA) Regulatory Position Statement (RPS). Southern Water has been carrying out work for many years to survey and repair sources of infiltration in the vicinity of Alkham Valley and notably in the catchment for Newnham Valley Wastewater Treatment Works (WTW) in Kent which is adjacent.

Figure 1 shows the Town of Dover of which Alkham Valley is a part. Wastewater flow from the Dover sub-catchment drains to the wastewater recycling centre at Broomfield Bank which also treats flow from the neighbouring town of Folkestone. Figure 2 shows the location of Alkham Valley to the west of Dover Town. Development within the valley is a ribbon style along the valley floor and includes the settlements of (from upstream to downstream) South Alkham, Alkham and Wolverton. The village of Ewell Minnis sits above the valley floor and flows from here connect into the system serving Wolverton. All wastewater flow arising in the villages are conveyed by gravity to a wastewater pumping station at Kearsney named Kearsney Abbey WPS. Flows arriving at the WPS are pumped for a short distance over the local watercourse draining through Alkham Valley and then connect with the wastewater flow from Kearsney and areas to the north of Dover. All flow from this point gravitates to the terminal pumping station at Elizabeth Street Dover, the system runs roughly parallel to the River Dour.

The Alkham Valley sewerage network has not had an Infiltration Reduction Plan previously. However, in winters of 2019/20 and 2020/21 some instances of external flooding did occur from the sewer network due to the high groundwater levels. This external flooding has the potential to run overland into the watercourse in the valley floor and have an environmental impact. It was agreed that because of this a plan to tackle the infiltration in the system was required.

The plan will be shared with key stakeholders including:

- Environment Agency,
- Kent County Council,
- Dover District Council

Southern Water will consult with representatives of these parties in the delivery of the plan.

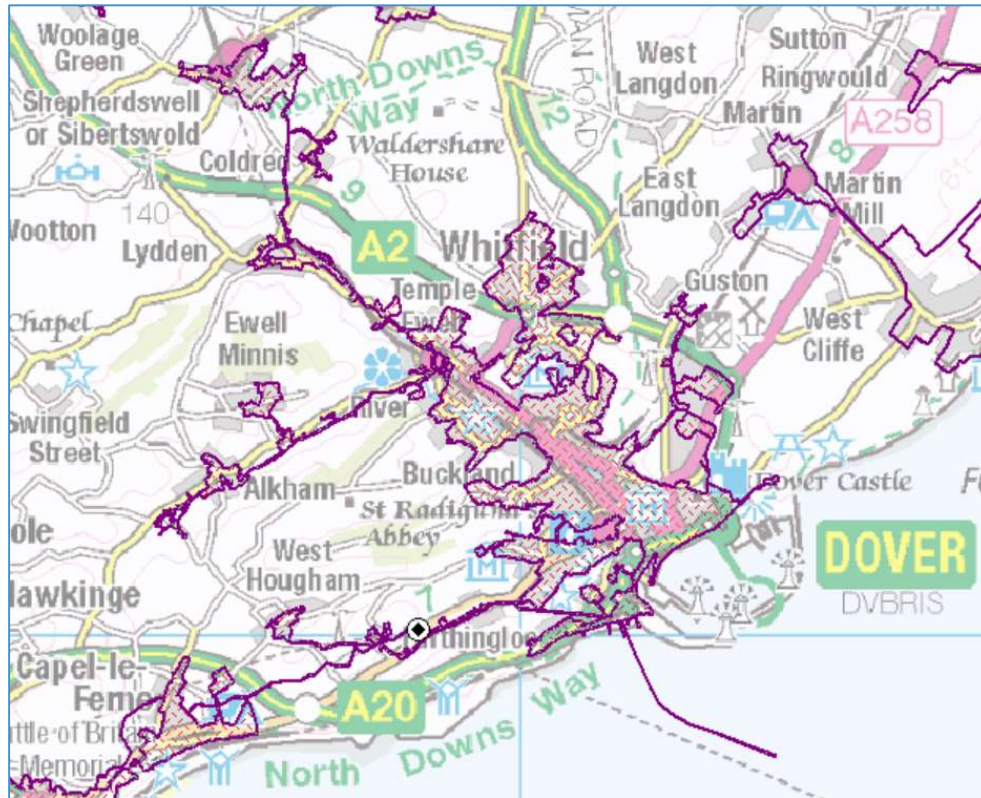


Figure 1 - Representation of the sewerage system for Dover

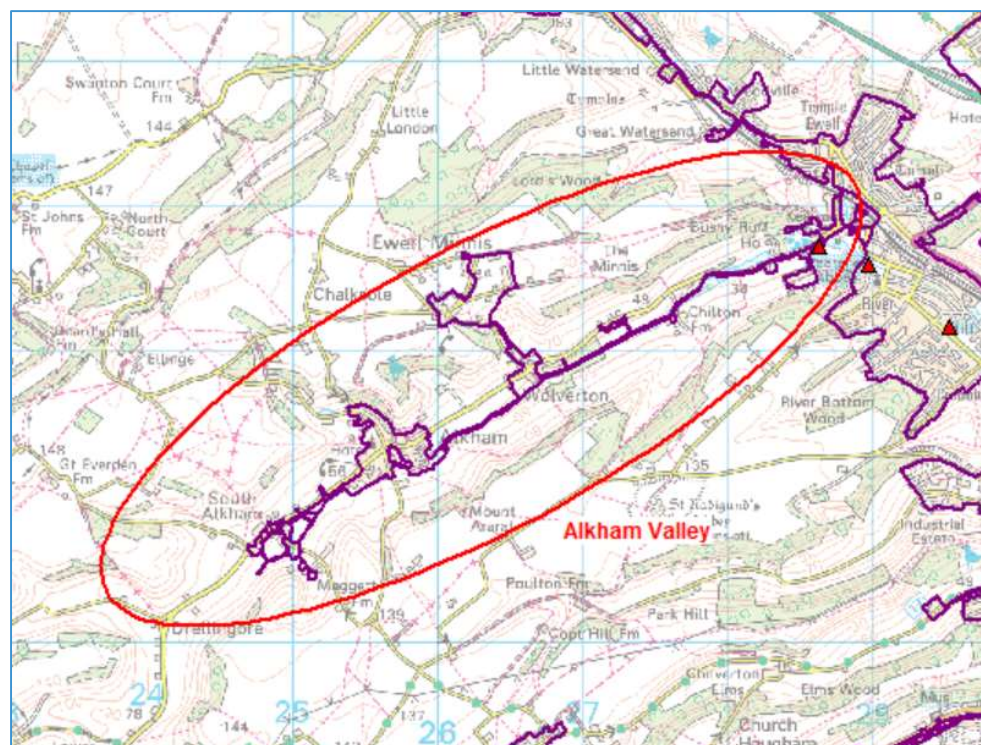


Figure 2 – Location of Alkham Valley

2. Groundwater Infiltration at Alkham Valley

2.1. The significance of groundwater infiltration at Alkham.

High groundwater in the Alkham Valley can enter the sewerage system through leaking joints in the holistic drainage system comprising public sewers and private drains. This was particularly a problem documented in the winters of 2019/20 and 2020/21. To manage the flows and continue to provide a sewerage service to customers and to reduce the impact of excess flows on the environment, daily tankering for prolonged periods was required at a number of locations. In addition, there were instances of uncontrolled discharges from manholes, where straw bales were deployed to divert flows to areas of lowest impact and to act as filters to prevent debris entering the local watercourse. This resulted in frequent calls to both SWS and the EA from residents to report issues. The number incidents of flooding or restricted toilet use can be seen in Table 2.1.

Table 2.1 – Reported Flooding Incidents by Category, in Alkham Valley during high groundwater seasons (December to May)

Year	External Flooding	Internal Flooding	Restricted Toilet Use	Total
2010	3	0	0	3
2011	6	0	1	7
2012	1	0	0	1
2013	1	0	0	1
2014	6	0	1	7
2015	0	0	0	0
2016	2	0	0	2
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	7	0	0	7
2021	4	0	0	4
2022	0	0	0	0
2023	3	0	3	0
Totals	33	0	5	38

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 as seen in Table 2.1.

Figure 2.1 and 2.2 below are maps of the area affected by infiltration, the locations where spills have occurred and where tankers are deployed to remove excess flow from the system. If no action were taken then uncontrolled discharges of wastewater to the environment would occur at greater frequencies and in greater volumes.

Figure 2.1 – Locations of spill and tankering in Alkham

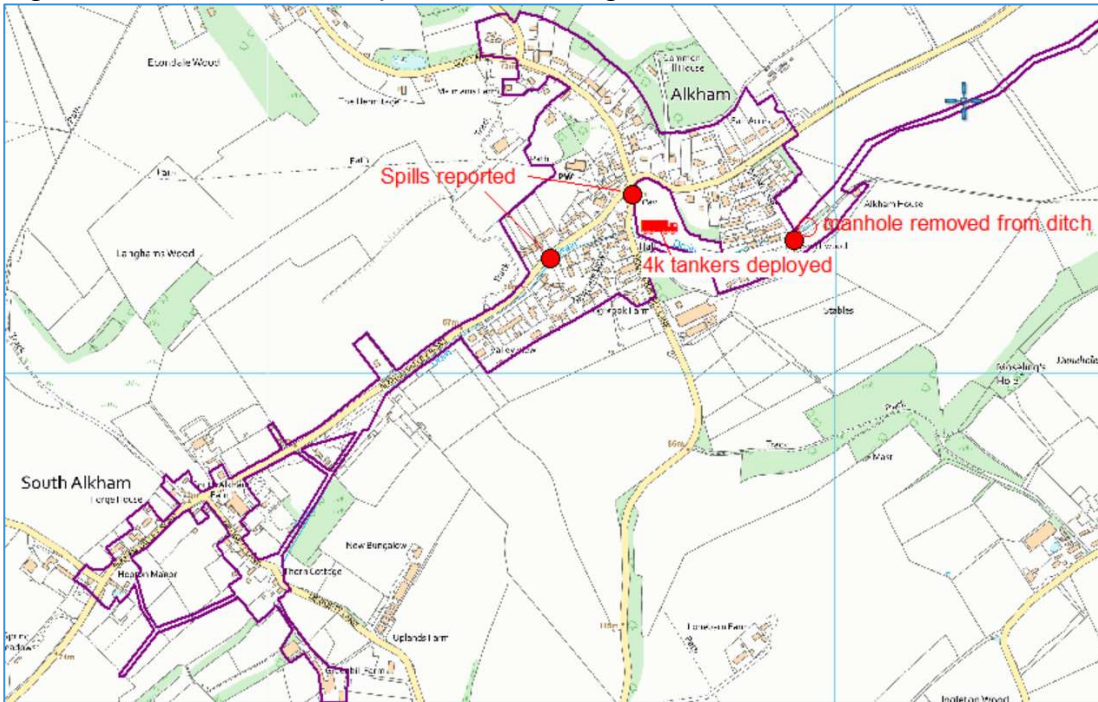
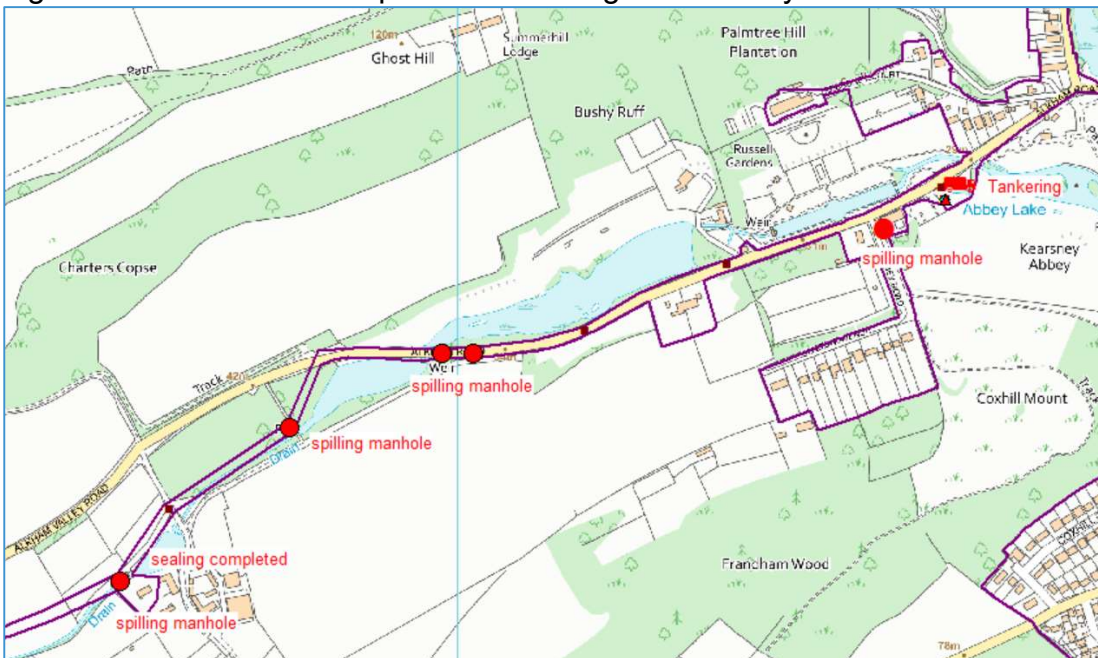


Figure 2.2 – Locations of spill and tankering in Kearsney



3. Investigation & repairs

3.1. Outline Plans to Investigate Sources of Infiltration

The Generic Plan describes Southern Water's Infiltration Reduction process. However, the plan for the Alkham Valley does not include for the overpumping of dilute wastewater flows from the sewerage system into the local watercourse to control flows. It is anticipated that this will be managed by tankering. The specifics of the investigations and repairs at Alkham Valley are captured in Section 3.2 below, and includes the following elements:

- Manhole Inspections, CCTV and electroscan Surveys
- Flow Monitoring Surveys
- Manhole and Sewer Repairs
- Follow-Up Surveys and Repairs

3.2. Investigation and Repairs in the Newnham Valley

Groundwater infiltration into sewers has been an issue for the villages by the Alkham Valley historically however, due to the exceptionally high groundwater levels in the winters of 2020 and 2021 this was more pronounced requiring an operational response to manage the excess flow. The table below describes the plan to investigate the issue and what steps will be taken to reduce the risk of issues arising in the future.

The timing and status of each step is in Table 3.1 below.

Table 3.1 – Summary of Survey and Repairs at Alkham Valley

Step.	Description	Approx Date	Status
1	Installation of AFDs at properties at risk of flooding	Pre 2021	Complete
2	Removal of manhole at Alkham that was located in the ditch and susceptible to high rates of infiltration	Summer 2021	Complete
3	Sealing of concrete rings in manhole at Chilton Farm where infiltration was observed	Summer 2021	Complete
4	Survey of trunk sewer system through the valley floor	Summer 2023 – dependent on budgetary approval	Planned
5	Lining of sewers as required by the surveys in step 4	Post summer 2023	Planned
6	Review of the success of step 6	Post summer 2023 – dependent on budgetary approval	Planned

Step.	Description	Approx Date	Status
7	Further surveys and sewer lining	Post summer 2023 – dependent on need identified in step 6	Planned
8.	Long term system winter monitoring	Commences each year	Ongoing

The approach to addressing infiltration on this valley is in the early stages. It is assumed that the most likely point of groundwater ingress is in the public sewers running adjacent to the watercourse in the valley floor. A survey of the structural integrity of this system will be the first step in the journey to understand how the system performs and where groundwater is finding its way into the network. A couple of locations of gushing infiltration and inundation have been sealed in summer 2021 including the removal of a manhole which is located in the base of the watercourse. It is very likely that when the watercourse is running flows would have been pouring into the manhole through the manhole cover and potentially overwhelming the system. It is anticipated that the removal of this manhole will have a positive impact on performance of the system.

In the winters of 2021/22 and 2022/23 no issues were encountered relating to groundwater infiltration and no actions were required to manage flows. This is most likely due to the dry winter period experienced and groundwater levels remaining below the level of the sewer. The sealing during 2021 of badly leaking manholes including the removal of one manhole which was situated in the bed of the watercourse would also have helped the situation.

4. Over-pumping

4.1. Circumstances that lead to over-pumping

Note – Overpumping from the sewerage system is not proposed in this location.

At times of high flows in the sewerage system removal of flow by tankering will always be the first course of mitigating activity. This has been deployed successfully at both the recreation ground in Alkham and at Kearsney Abbey WPS in the last 2 years though Southern Water is aware of the disruption that this causes.

Overpumping has not been used previously in this valley as a means of controlling flows and Southern Water do not plan to utilise this technique to manage flows in the system. As sewer flow due to groundwater increases, the initial response will be to deploy more tankers to the two locations above to maintain a sewerage service and to prevent escapes of wastewater to the environment. If flow continues to increase to above the level which flow can be controlled by tankering a further plan is needed. Due to the rural nature, the location of the sewer in the valley floor and the traffic conditions and speed of traffic, this system does not lend itself to a managed overpumping installation. If flows in particularly wet winters become too high for tankers to manage the levels in the sewer, then the plan is to provide bunding around manholes from which wastewater may escape. The bunds would be in the form of straw bales which would slow down any escaping flows, to act as filters to any solids and to contain any spills to land and reduce the likelihood of flow entering the watercourse.

It is a requirement of this infiltration reduction plan to notify the Environment Agency in advance of any deployment of bunding to prevent flows to the watercourse or minimise the impact of flows on the watercourse. This is to allow the EA the opportunity to assess and approve the proposal or to work with Southern Water in assessing other options which may further reduce the impact of excess flows on the environment, prior to installation. However, if it is not possible to contain all flows then the quality of the watercourse will be monitored by sampling and by using the CICs method to determine impact. If there is a noticeable impact on the receiving water quality a decision will then be taken on whether additional measures are required to reduce the impact on the watercourse. However, it is anticipated that the actions taken to address leaking sewers will mean this final step will not be required.

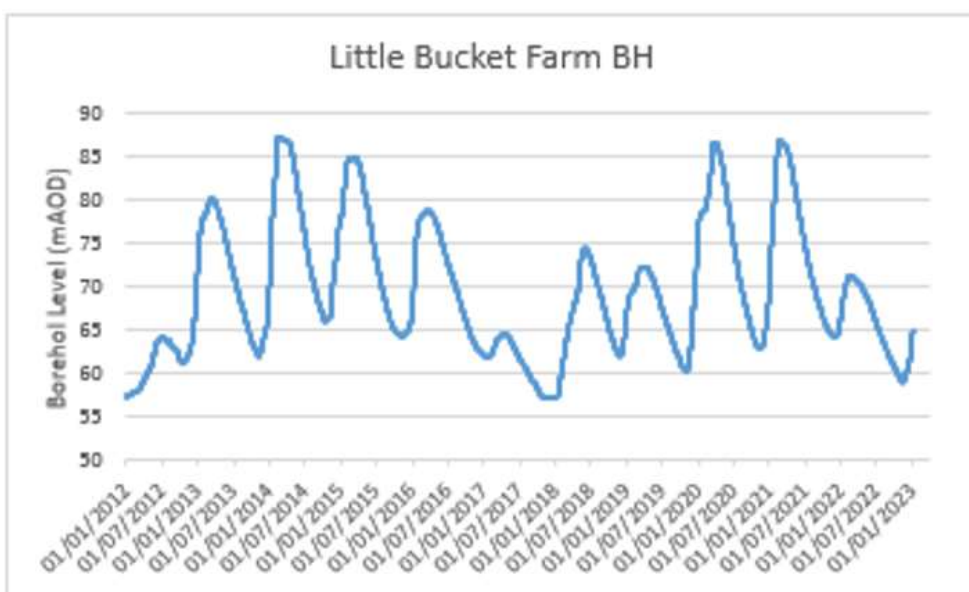


Figure 4.1 - Groundwater levels from 2012 to 2023

The closest groundwater gauge to Alkham Valley is the Little Bucket level gauge. Figure 4.1 shows the annual fluctuation in groundwater levels. In the winters of 2017, 2018 and 2019 the groundwater level did not rise above 75mAOD and from Table 2.1 no issues were reported to Southern Water. In 2020 and 2021 reports suggest that these have been the two worst years which has prompted the need for the Infiltration Reduction Plan. The groundwater levels for these two years are similar and are the highest levels recorded in concurrent years. As we get more data on this particular system, we will be able to determine trigger levels for the onset and deployment of tankering operation prior to flooding being experienced.

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

The deployment of tankers to manage excess flows in the network will be the method by which discharges will be controlled in the short term. Understanding the structural condition of the system and lining defective sewers will provide long term resolution. However, experience from other catchments susceptible to high groundwater does show that this can be a long-term activity as once a sewer is sealed the groundwater level will rise and may enter the system through leaking pipes which were not affected previously. The reduction of infiltration into the system is therefore an iterative process.

4.3. Over-pumping arrangements

There are no plans to deploy overpumping equipment in Alkham Valley.

4.4. 3rd Party Communications about over-pumping

The Southern Water County Case team will be the communication lead for any mitigating activity undertaken in the Villages. If there is a need for tankering the Parish Council will be the first point of communication.

5. OPTIONS TO REDUCE INFILTRATION

5.1. Sewer Rehabilitation Programme

Southern Water acknowledges that infiltration reduction is an on-going process. The trunk system running through the valley floor is the obvious place to start surveys to determine leaking potential. It is planned for this to commence in Summer 2023. It is anticipated that some of the work undertaken in 2021 by removing a manhole susceptible to inundation and by sealing a manhole where infiltration was gushing into the system will provide some benefit.

5.2. Planned work 2023/24

During 2023 we have surveyed part of the system towards the lower end of the valley. Parts of the sewer in this area were found to be structurally unsound with the potential to allow groundwater into the system. Repairs to these sections of sewer have been undertaken and these sections are now watertight. The repaired lengths are shown in Figure 5.2. Due to the wet summer experienced in 2023 it has not been possible to fully survey the total 7.2km of sewer in the valley. This work will continue once groundwater levels reduce in spring/summer 2024.

The figure 5.1 below is a plan showing in purple the sewers in the Valley floor that will be surveyed. These are the lowest lying trunk sewers in the valley and most prone to high groundwater conditions.

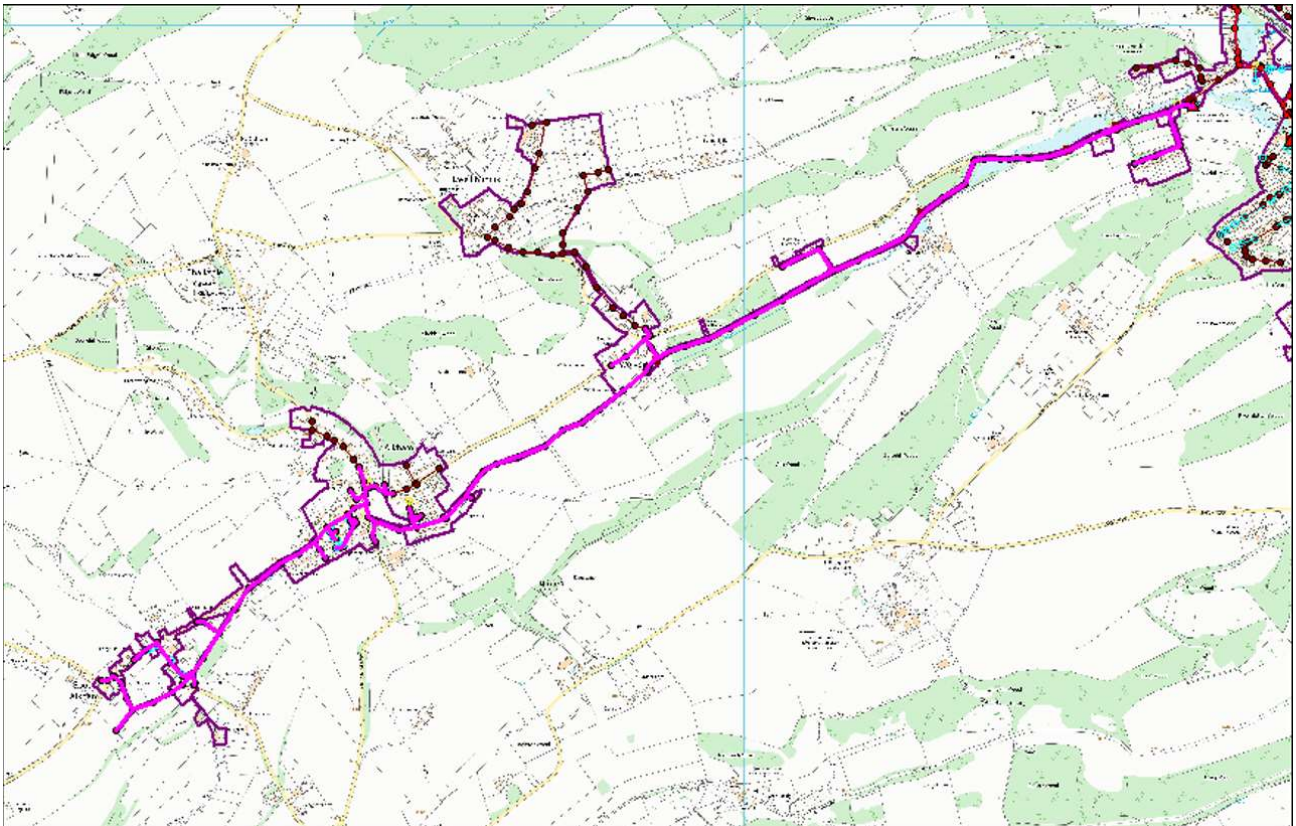


Figure 5.1 – sewers to be surveyed during 2023/24

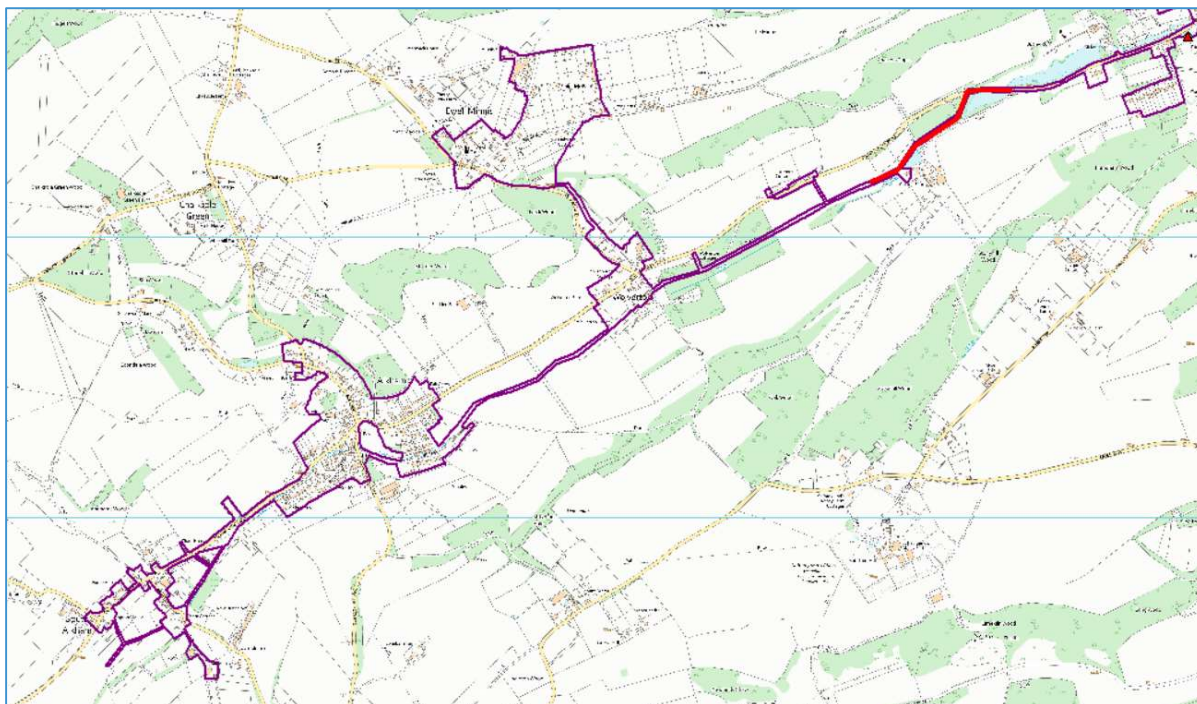


Figure 5.2 – sewers repaired during 2023

5.3. Property Level Protection

Properties which are at risk of more severe flooding have been protected by anti-flood devices and pumped AFD's. It is anticipated that the impacts of high groundwater will be controlled by tankering flows from the sewerage system and that no controlled discharges to drainage ditches will be required.

5.4. Pumping Stations

Prior to the winter season a health check of the pumping station at Kearsney Abbey will be undertaken to ensure this is fully operational.

5.5. Monitoring

The graph below, in Figure 5.2, shows how activity at the pumping station serving Alkham Valley increases at times of high groundwater. The groundwater data is that which is available at Little Bucket which is the nearest gauge data for the site. This gauge gives an indication of seasonal variation but due to the local conditions this may not most accurately reflect the levels which influence the sewer response. It can be seen from the graph that due to the wet summer and autumn in 2023 the groundwater levels started to rise in October which is at least a month earlier than a normal high groundwater season. The response to these wet conditions in 2023 has been very significant as can be seen by the large increase in hours run time at the pumping station. We

will continue to monitor the situation here to understand the trends and over time this will allow the benefit of any rehabilitation work to be quantified.

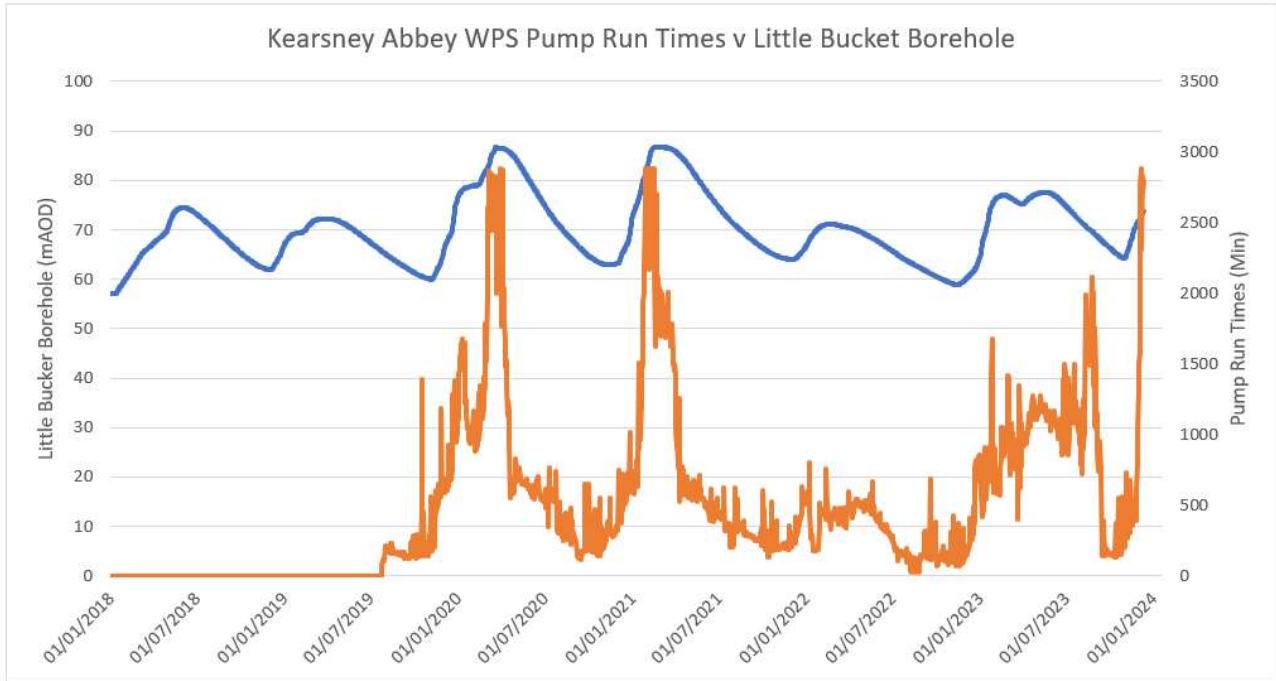


Figure 5.2 – Forecasting of Trigger Dates

6. ACTION PLANS

In the years up to 2021 issues relating to groundwater impacts on the sewerage system serving Alkham Valley have largely been managed reactively. However, due to issues being more severe in both 2020 and 2021 and the potential for issues to become more likely due to wetter winters being forecast, a more planned approach needs to be taken to address this. Some remedial work in the system has been undertaken which will have benefit but a more systemised approach is now required.

SW is committed to continuing to pursue infiltration to reduce the frequency of tankering. This IRP describes the work planned by SW to improve the situation.

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.	Prepare and publish the Infiltration Reduction Plan	May 2022	Completed
1.2	Determine condition of sewers	Identify sewers to survey in first phase	Complete	Trunk system in valley floor to be surveyed. Approx 4.5 km.
1.3	Funding approval	Apply for funds through the annual budget cycle	July 2022	
1.4	Determine condition of sewers	Undertake surveys by CCTV and electroscan	Planned summer 2023/24	Ongoing
1.5	Undertake remedial action to address defects found in surveys	Line sewers which are found to be leaking	Planned autumn 2023/24	Repairs to sewers of known condition complete. Further repairs to be delivered as required following completion of action 1.4

Ref.	Item	Actions	Timescale and Status	Outcomes
1.6	Monitor benefit of sealing work	Use data at WPS to determine the reduction in flow during high groundwater	Post 2024	Planned - Post repairs
1.7	Further surveys and rehabilitation to follow as required.	Further surveys in areas where high infiltration flows remain.	Post 2024	Dependent on 1.6
1.8	Maintain IRP as a live document	Review text of the IRP and update if appropriate to describe work carried out and/or developments	Annually	To be amended and published at the end of calendar year
1.8a	Maintain IRP as a live document	Review Tables 6.1 to 6.5 and as appropriate amend to show progress on individual activities.	Quarterly	Up to date tables of Actions. To be issued every 3 months following the annual update. End each December, March, June, September
1.9	Install Property Level Protection to Vulnerable properties.	Survey and install NRVs at vulnerable properties.	Complete pre 2021	The aim is that protection to vulnerable properties restricts tankering to those properties only as opposed to more significant sewer pumping.
1.10	Flow, location, screening arrangements for emergency discharges	Determine whether there is potential for controlled discharges via screening and disinfection in extreme circumstances. Flow rates and screening arrangements	January 2023	Discuss with EA and local Parish Councils acceptable arrangements for future emergency discharges. No overpumping planned currently.

Alkham Valley Infiltration Reduction Plan

Ref.	Item	Actions	Timescale and Status	Outcomes
		and most appropriate locations. To be undertaken once more data has been collected on flow rates during high groundwater.		

Table 6.2. Multi-Agency Activities to Reduce Groundwater Infiltration

Ref.	Item	Actions	Owner, Timescale and Status	Outcomes
2.1	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.
2.1a	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	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	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.	District Council, Ongoing.	Developments in areas which would be detrimental to sewer flooding, to have conditions recommended by SW and applied, as appropriate, by the City and District Councils.
		SW to determine threshold above which they require to be consulted.	District Council, Ongoing. SW wish to be consulted on all proposed development.	
		Sewerage materials for new developments	SW & District 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	Letters from SW to stakeholders about reducing groundwater infiltration into the sewerage system	Send letters 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.	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	Implement local campaign to discourage misconnections	Publicise through parish councils. Include article in Parish magazines. **	District and Parish Councils,	

** 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.	Winter 2022	Ongoing.
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	Winter 2022	Ongoing
4.3	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.

