Infiltration Reduction Plan
Alkham Valley

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Version 8.0

from
Southern
Water

Contents

Document Control

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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
ODI – Customer Outcome Delivery Incentive
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.

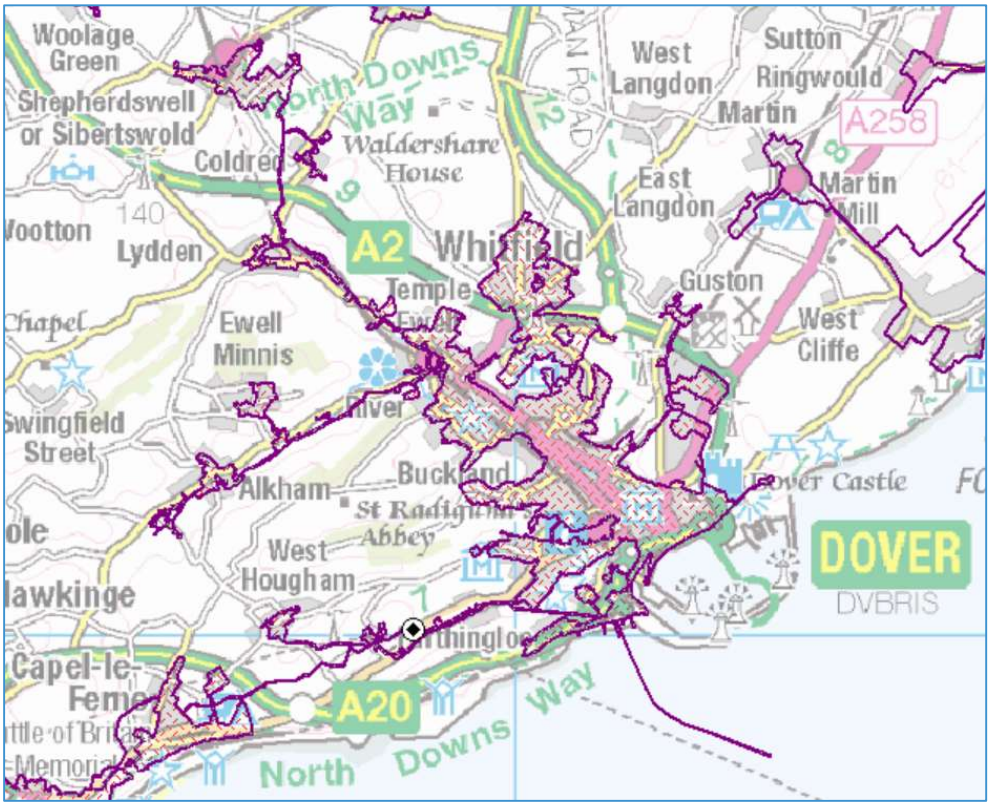


Figure 1 - Representation of the sewerage system for Dover

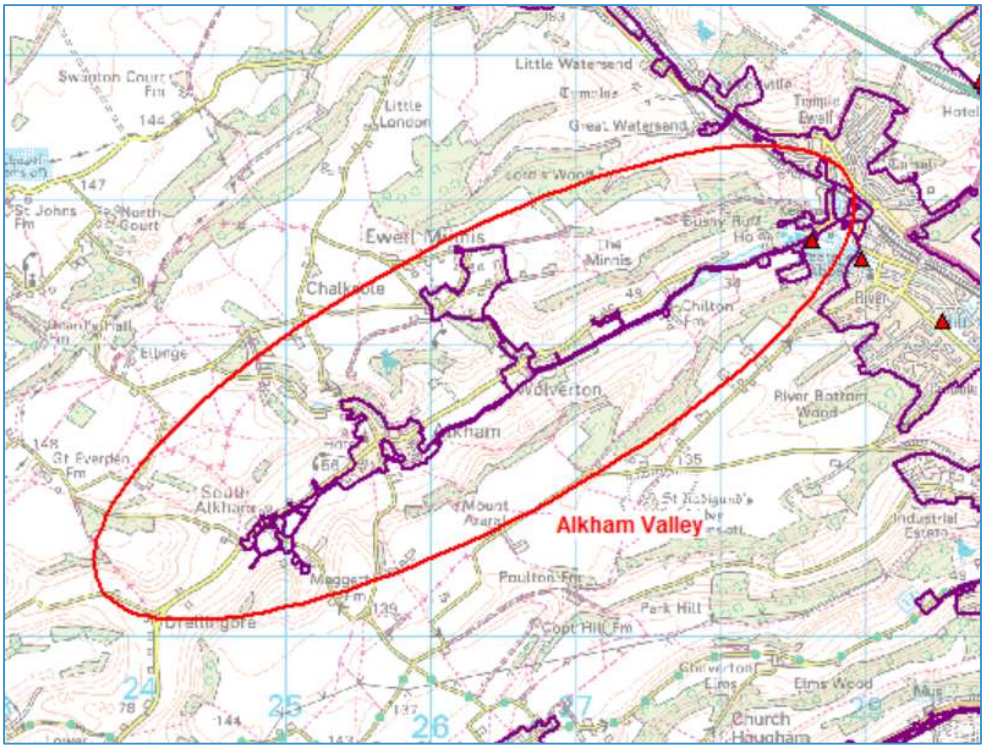


Figure 2 – Location of Alkham Valley

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, 2020/21 and 2023/24. 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 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. No incidents were reported in the winter of 2024/25.

Table 2.1 – Reported Flooding Incidents by Category, in Alkham Valley during high groundwater seasons

Year	External Flooding (properties / gardens)	External Flooding (Highways & Other)	Internal Flooding	Restricted Toilet Use	Total
2009/10	3	0	0	0	3
2010/11	6	1	0	1	8
2011/12	1	0	0	0	1
2012/13	1	0	0	0	1
2013/14	6	1	0	1	8
2014/15	0	0	0	0	0
2015/16	2	0	0	0	2
2016/17	0	0	0	0	0
2017/18	0	0	0	0	0
2018/19	0	0	0	0	0
2019/20	7	4	0	0	11
2020/21	4	4	0	0	8
2021/22	0	0	0	0	0
2022/23	3	0	0	3	6
2023/24	3	4	0	0	7
2024/25	0	0	0	0	0
Totals	**36**	**14**	**0**	**5**	**55**

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. This is in part illustrates the benefit of the tanker mitigation. If no action were taken then uncontrolled discharges of wastewater to the environment would occur at greater frequencies and in greater volumes.

3. Investigation & repairs

3.1. Outline Plans to Investigate Sources of Infiltration

The Generic Plan describes Southern Water's Infiltration Reduction process. The plan for the Alkham Valley does not include for the pumping of dilute wastewater flows to groundwater treatment. It is anticipated that excess flows will be managed by tankering. The specifics of the investigations and repairs at Alkham Valley are captured in Section 3.2, 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 Alkham 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, 2021 and 2023 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	Autumn-Winter 2023	Complete
5	Validate survey and scope repairs	Autumn 2024	Complete
6	Lining of sewers as required by the surveys in step 4	Autumn/Winter 2024	Complete
7	Review of the success of step 6	Winter 2025	Pending
8.	Long term system winter monitoring	Commences each year	Ongoing

The approach to addressing infiltration on this valley is in the early stages. 3.9km of sewer were surveyed comprising 73 sewer lengths. Very high levels of infiltration were indicated by the survey throughout the valley floor. 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. 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 had and groundwater levels remaining below the level of the sewer.

During Summer and Autumn 2024 we undertook detailed investigation on the sewers in the Alkham valley with a CCTV and electroscan survey of a selection of lengths. Priority repairs to seal the sewers which are identified as having the potential to infiltrate was completed in autumn/winter 2024.

4. Mitigation measures

4.1 Circumstances that lead to mitigation

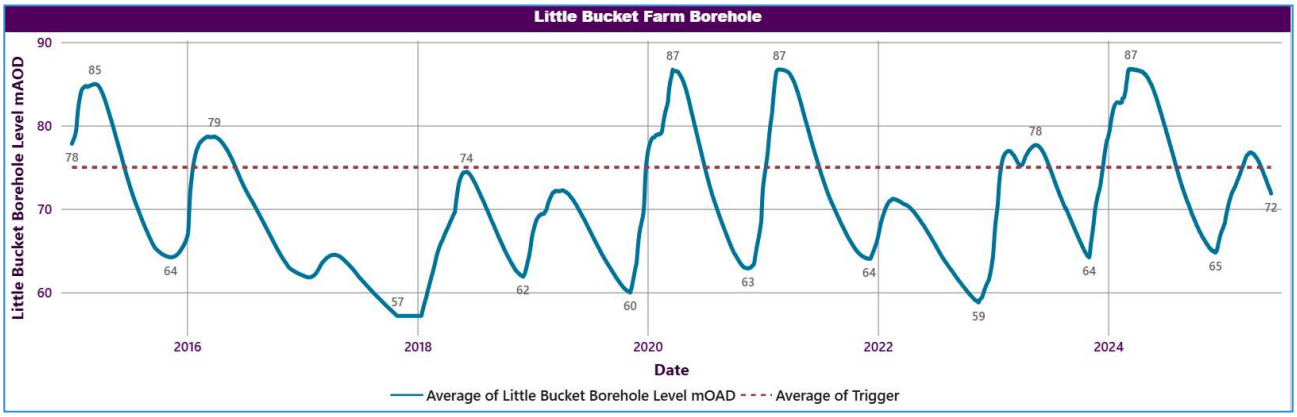
At times of high flows in the sewerage system removal of flow by tankering will always be the first course of mitigating activity. This has been deployed successfully at both the recreation ground in Alkham and at Kearsney Abbey WPS in the last 2 years though Southern Water is aware of the disruption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

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. Due to the rural nature, the location of the sewer in the valley floor. 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.

If there is a need for tankering the Parish Council will be the first point of communication.

Figure 4.1 - Groundwater levels from 2015 to 2025



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, 2021 and 2024 reports suggest that these have been the three worst years which has prompted the need for the Infiltration

Reduction Plan. The groundwater levels for these three years are similar and are the highest levels recorded in concurrent years. It is suggested that a level of 75m is used to trigger the start of tankering as this is the period we started tankering in 2024, as we get more data on this particular system, we may revise the trigger levels for the onset and deployment of tankering operation prior to flooding being experienced. No mitigating activity in the form of tankering was required in the winter 2024/25.

4.2 Steps to prevent discharges to the environment

Deploying tankers to manage excess flows in the network will be the preferred 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. 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.

5. Options to reduce infiltration

5.1 Sewer Rehabilitation Programme

It is recognised that infiltration reduction is on-going process. The trunk system running through the valley floor was the obvious place to start surveys to determine leaking potential. Surveys were commenced in Autumn 2023 and completed in winter 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.

Appendix A contains details of all sewer inspection and remedial work undertaken to date.

Following the electroscan surveys undertaken in 2023 as described in Section 3, further pipes have been identified for investigation to confirm the validity of the survey results. This work was undertaken in Autumn 2024. The electroscan survey shows that a large proportion of the system surveyed has high leakage, which is unusual, hence the need to validate the electroscan with another technique. Where we are confident that infiltration is an issue these lengths have been sealed.

Table 5.1 below summarises the work undertaken in the system since 2020 and to be undertaken, Table 5.2 provides an annual summary.

Table 5.1, Action summary

Action	Km of sewer
Length Surveyed	9.19
Length with no work required	6.45
Length Sealed	2.22
Length to be sealed	0.52
Manholes sealed	0
Manholes to be sealed	0

Table 5.2 provides an annual breakdown of the activities:

Year (JR)	Sewer length CCTV surveyed (km)	Sewer length electroscan surveyed (km)	Length sealed (km)
2021	3.8	0	0
2022	0	0	0.29
2023	0	3.87	0.5
2024	0	0	0.063
2025	1.52	0	1.37

5.2 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. There are no additional plans for installation of Pumped AFDs though this is regularly reviewed.

5.3 Local flow control

As noted in Section 4.1, in the winter 2013/14 SW used tankering at four locations. During the winter of 2023 and 2024 tankering was undertaken at 2 locations, only one of which is proposed in future. Full details are given in Appendix B.

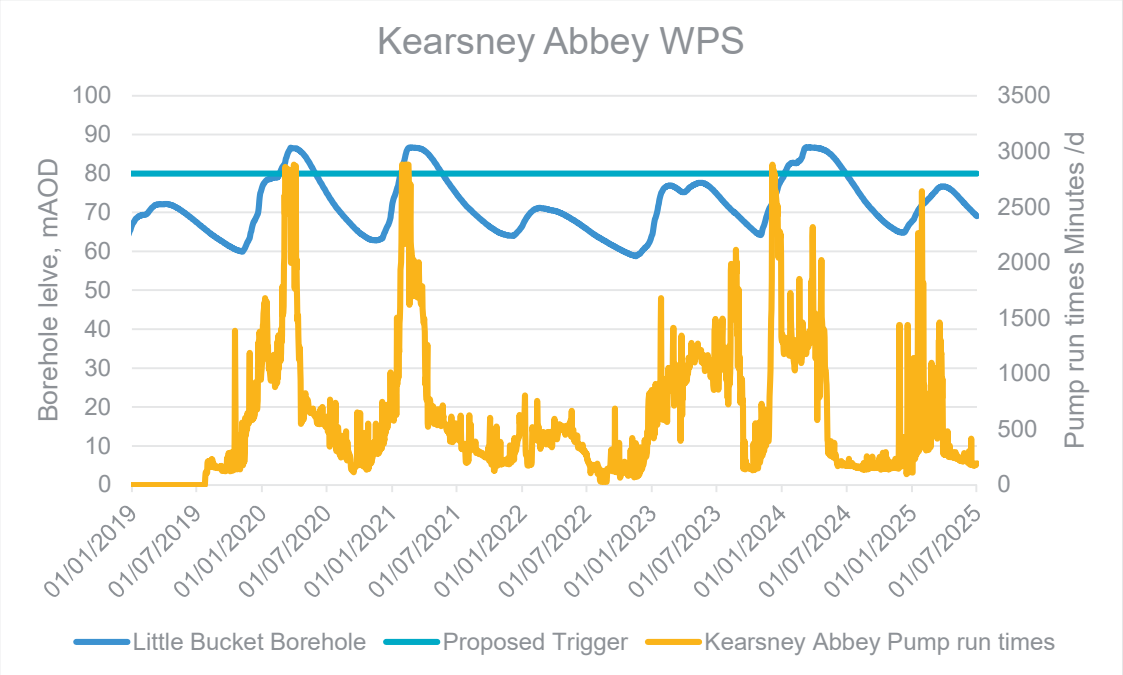
5.4 Pumping Stations

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 significant, as illustrated 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. As the high groundwater event progressed in 2024 and followed a more typical trend through the winter of 24/25 it should be noted that the pump run time did not increase to coincide with peak groundwater levels as was the case in 2020 and 2021, this is likely because Groundwater was not high during this period. It is anticipated that we will have to wait for further high groundwater before we measure benefit of the sewer rehabilitation work undertaken in 2021/22 and in late 2024. It is suggested a trigger level of 80m could be used for raising awareness of potential need for mitigation at this location.

Figure 5.3 – 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 been managed reactively. However, due to issues being more severe in both 2020 and 2021, a formal more planned approach has been 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.

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 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 electroscan	Autumn -Winter 2023	Complete
1.5	Validate condition of sewer following electroscan and scope repairs	Dry weather CCTV and Quotation	Summer/Autumn 2024	Completed
1.6	Undertake remedial action to address defects found in surveys	Line sewers found to be leaking	Planned autumn/winter 2024	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
1.7	Monitor benefit of sealing work	Use data at WPS to determine the reduction in flow during high groundwater	Post 2025	Planned - Post repairs
1.8	Further surveys and rehabilitation to follow as required.	Further surveys in areas where high infiltration flows remain.	Post 2025	Dependent on 1.7
1.9	Maintain IRP as a live document	Review text of the IRP and update if appropriate to describe work carried out and/or developments	Annually	Ongoing updates annually
1.10	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.

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 by various methods
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). No highway drainage found draining to foul.
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.	

*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	Summer 2024	Updated playbooks to be issued with revised locations prior to winter 2024
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.

Appendix

A Survey Findings and Completed and Planned Rehabilitation

B Mitigation measures