



Groundwater Impacted System Management Plan

Ampney St Peter, Ampney Brook

March 2021



It's everyone's water

Version control

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1-d1	March 2021	Draft for EA	DJ	SE	APH
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Introduction

This document sets out Thames Water's approach to the management of groundwater infiltration in sewerage systems where the influence of groundwater infiltration is viewed as being significant and likely to lead the sewerage network, on occasions, becoming overwhelmed.

All sewerage systems combined and separate will experience some groundwater infiltration¹ and a nominal allowance in design will be made for this. However, in some catchments the impact of groundwater infiltration can be considerable leading to impacts on service during periods of high groundwater, typically during the winter.

Groundwater can enter the sewerage system through the pipes and manholes, this may occur at a defect (crack, hole, displaced joint) or on a normal joint on the sewer or in the manhole. A key point to note is that where infiltration occurs it is not necessarily an indicator that the sewer is in poor structural state simply that jointing techniques used are not completely watertight.

Ingress of groundwater is not limited to the public system that Thames Water owns and maintains but potentially the private drains, manholes and sewers that connect to our system.

Preventing and reducing the impact of groundwater infiltration is predominately achieved through the lining of sewers and

sealing of manholes. This entails the application of a synthetic liner within the pipe that creates a contiguous membrane for the length of the pipe or possibly section if the source of ingress can be narrowed down. For manholes it will typically entail sealing in a similar manner.

To line all sewers and manholes within most catchments would be prohibitively expensive to do so. Our approach to date has been centered on a 'find and fix' basis which has involved monitoring and investigating the networks in periods of high groundwater to identify sources of ingress and fix as we find them. This approach is constrained for the reason that investigations are typically limited to periods of high groundwater and when high groundwater occurs there are limited windows of time in which investigations can be successfully undertaken before flows either subside or the system is fully surcharged meaning CCTV surveys are not possible². Once sections of sewers have been lined, it will be a case of waiting until high groundwater levels reoccur to assess the effectiveness of the work undertaken, which may not be the subsequent winter but several years later.

It is recognised that the 'find and fix' approach to date lacks a degree of certainty of resolution and for this reason Thames Water in 2020 undertook a different approach for the medium to long-term management of groundwater, which is covered within this

¹ Sewers for Adoption makes an allowance for 10% of peak wastewater flow to allow for unaccounted flows such as groundwater infiltration.

² On occasions it is possible to over-pump between manholes to isolate sections of sewer to survey, this is not always feasible when the flows involved are simply too great to over-pump or the location prohibits this approach.

document under the plan section. These plans require significant investment which Thames Water will seek to secure through the price review process as service enhancement. In the meantime, we will continue to investigate sources of infiltration when it occurs and where feasible, undertake the work through our capital maintenance budgets. We refer to these as 'quick win' opportunities i.e. where we have high degree of certainty of reducing point sources of infiltration and can do so with reasonable costs and time.

The structure of this document has been created with input from the Environment Agency. Sections covered in this document include our 'Outline Plan' with timescales, Mitigation i.e. how we intend to manage the risk until our plan is fully implemented and when we will publish future updates on progress against this plan.

Brief description of the Ampney St Peter system

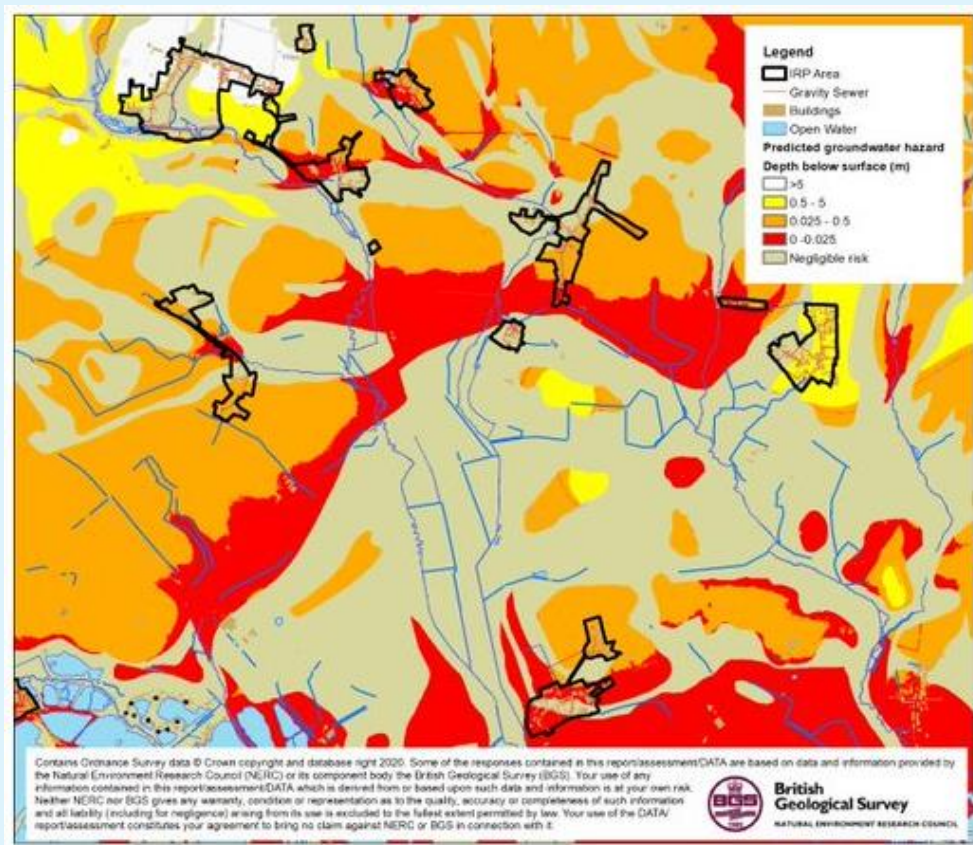


Figure 1.0 – Ampney St Peter catchment

The Ampney St Peter system is situated next to the Ampney Brook in Gloucestershire, England, 5km east of Cirencester. The system serves a population equivalent³ of 2,487 with a predominantly separate sewerage network totalling some 28km in length excluding private drains and sewers. The extent of the catchment is shown in Figure 1.0 above. The system comprises the villages of Ampney St Peter, Ampney St Mary, Ampney Crucis, Poulton, Meysey Hampton and Harnhill/Driffield.

Problem characterisation

Groundwater has the potential to enter our sewers when levels are high and a positive head above the soffit of the sewer is created. Significant groundwater ingress can impact sewer capacity and increase the risk of the sewerage system becoming overwhelmed. There's a strong link between the rising river levels that cause rising groundwater levels, particularly adjacent to the Ampney Brook and its tributaries, and the drainage issues some of our customers have experienced, including sewer flooding and restricted use of their toilets and bathrooms.

³ Population equivalent based on unit per capita loading, (PE), in waste-water treatment is the number expressing the ratio of the sum of the pollution load produced during 24 hours by industrial facilities and services to the individual pollution load in household sewage produced by one person in the same time.

In recent years the foul sewerage system in the Ampney St Peter system has on occasions become overwhelmed, following prolonged and heavy rainfall and raised groundwater levels. This has resulted in some properties experiencing from sewer flooding and restricted toilet use.

We believe that significant volumes of surface water run off from surrounding saturated fields have entered the foul sewerage network during recent wet winters, causing the network to become overloaded and surcharge. The surveys we have carried out have detected that there is some evidence of groundwater infiltration into the foul sewer network when groundwater levels are high, and surface water inundation from highways, public spaces and properties and fluvial flooding from the Abbey Brook. Surface water misconnections (i.e. down pipes from roofs into the sewer network) are also suspected to be a contributing factor, further analysis is required to determine the extent to which this has contributed to sewer flooding.

The sewerage system is identified on the public sewer records as being a separate foul system, rather than a combined system. It should therefore, in theory, only be accepting foul drainage rather than the combination of foul and surface water, however, there are a limited number of public surface water sewers in the area.

The impact of the groundwater infiltration and high flows in the Ampney St Peter system has contributed to the overloading of the gravity sewers and sewage pumping stations in the local villages. To maintain sewerage services, tankers have been required on occasions at a number of sewage pumping stations in Ampney St Peter and occasionally Down Ampney and Meysey Hampton to reduce internal and external flooding of properties and pollution incidents.

Although works have been carried out in Ampney St Peter in recent years, including the installation of a new sewage pumping station, flooding has still occurred, demonstrating that further investigations are needed to understand the full extent of problems in the catchment (and sources of unwanted flow) in order to be certain of the full range of solutions required.

A number of our sewerage systems include for permitted overflows, these structures are there to protect against sewer flooding as a result of rainfall or equipment failure where appropriate. Discharges from these structures should not be impacted by infiltration as detailed by the EA Regulatory Position statement on groundwater impacted sewerage systems.

During the winter months, following prolonged heavy rainfall, we experience increased rates of flow arriving at the STW which on occasions may impact the performance of the STW.

Our permit conditions for Ampney St Peter STW state:

“The discharge shall only occur when and only for as long as the flow passed forward is equal to or greater than the overflow setting indicated due to rainfall and/or snow melt” and

“Off-line storm storage must be fully utilised before a discharge occurs. It shall only fill when the flow passed forward is equal to or greater than the overflow setting indicated due to rainfall and/or snow melt and shall be emptied and its contents returned to the continuation flow as soon as reasonably practicable.”

The root causes of sewer surcharges are therefore numerous and resolution of issues complex, requiring all stakeholders responsible for drainage in the catchment to work together to resolve them.

The Flood and Water Management Act 2010 places a responsibility on Lead

Local Flood Authorities (LLFAs), to manage flood risk from surface and groundwater, plus a duty on all Risk Management Authorities (RMAs), to cooperate regarding flood risk. In our role as an RMA, Thames Water will work with Wiltshire County Council as Lead Local Flood Authority, County Council and Planning Authority, and the Environment Agency to ensure that a collaborative approach can be developed to address the problems.

Thames Water also has a statutory obligation to comply with environmental legislation. The Water Framework Directive establishes a strategic approach to managing the water environment, which the Environment Agency achieves through River Basin Management Plans and setting environmental objectives for groundwater and surface water. The environment is also protected from adverse effects of discharges of urban wastewater through the Urban Wastewater Treatment Directive, which requires us to improve and extend the sewerage system according to section 94 of the Water Industry Act (1991).

Anticipated unavoidable discharges

Within recent years there have been unavoidable sewage escapes in the network as a result of surcharging manholes.

We anticipate that this situation may continue until such time we are able to implement a long term solution.

No mitigation in the form of temporary overflows has been undertaken in this system.

General outline plan & timescale

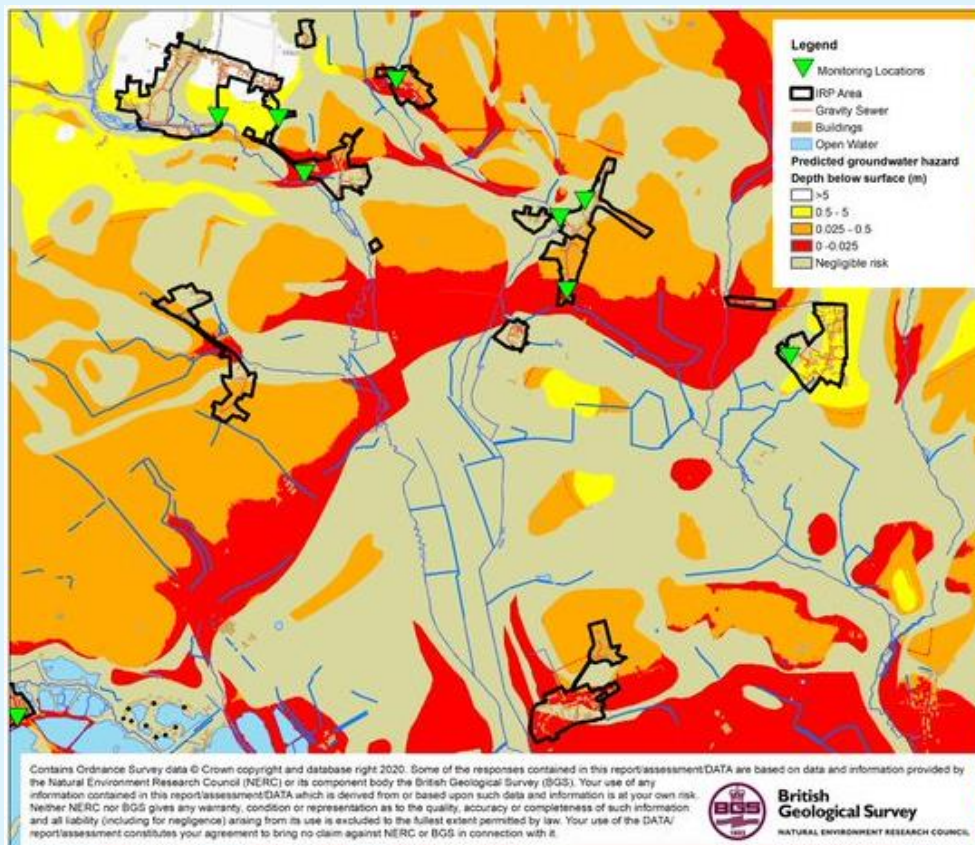


Figure 2.0 – Ampney St Peter monitoring and infiltration zones

Key to bringing the impact of groundwater infiltration under control is an enhanced monitoring regime. We have identified and have installed several telemetered depth monitor locations around the Ampney St Peter system – see Figure 2.0.

Complementing the flow measurement [at the treatment works] and depth measurement [in the sewer network] we will use pumping station run time data, rainfall data, river level data, and groundwater level data to create a full picture of movement and source of flows around the catchment.

Zones of Groundwater Risk

We engaged with JBA Consulting to develop plans for Ampney St Peter that identify zones of groundwater risk, see Figure 2.0. These zones are modelled areas where the groundwater has been determined to be above the sewer and hence pose a potential risk for groundwater ingress.

The sewer depth monitors referred to earlier have been sited in and around these zones to verify and calibrate the risk in each of the zones.

If following the proposal to the sealing in part or wholly⁴ of the high risk zones, should it be required, the system is found to be still experiencing excessive infiltration we would then look to potentially seal ‘private’ laterals and/or drains along with starting to seal the medium to low risk zones.

This document sets out an unconstrained approach to resolving the impact of groundwater infiltration within the system. Investment to address infiltration will be

assessed and prioritised against other drivers e.g., STW upgrades, both in the catchment and across the region at each price review.

With this plan we remain committed to minimising the impact of groundwater on the sewerage system in Ampney St Peter.

Our general medium to long term plan is therefore to apply a hierarchy to sealing the sewer as follows:

Activity	When	Description
Model Zones	2020	JBA have been engaged to undertake modelling activities to identify the areas to be targeted for sealing in the 56 systems in the Thames Water region identified as being impacted by infiltration.
Install monitors	2020-2023	Monitors have been installed in the zones to help calibrate and validate the zones. Each year completeness / coverage monitors will be reviewed and added to / or modified, as necessary.
Calibrate zones	Refined each year	Following each winter, we intend to review the data from the monitors and if necessary, redefine the zones.
Look & Lift	Each winter	The look & lift surveys have two purposes, firstly to compliment the monitoring and secondly to identify ‘minor works’ that we would address through our normal capital maintenance.
CCTV	2020-2023	Required to confirm sewer condition and provide information to assist with costing any sewer lining.

⁴ Decision of extent of sealing will be based on outcomes of works undertaken to date, results of monitoring and successful submission of our plans for investment for future

Activity	When	Description
Minor works	2020-2023	As mentioned, if we detect minor works being required, we would look to resolve these as and when we find them.
PR24	2023/24	Ideally through monitoring and on-going investigations work towards managing the infiltration risk, in AMP7, will be successful. However, in the absence of evidence justifying the need not to undertake sealing of the high-risk zone this is to be included as part of PR24 investment plan. This work will be subject to Cost Benefit Analysis and Best Technical Knowledge Not Entailing Excessive Cost (BTKNEEC) assessments.
High risk zone sealing	2025-30	Sealing of high-risk zone undertaken subject to need being demonstrated.

Ampney St Peter Infiltration Management Plan

As detailed above the impact of infiltration is experienced in the network and at the STW.

Our approach to the resolution of infiltration impacting the Ampney St Peter sewerage system is outlined below.

High level approach statement

For Ampney St Peter our approach to tackling infiltration will be undertaken as follows:

1. We will investigate the network with a view to identifying sources of ingress of infiltration that are cost effective⁵ to address. To investigate the network, we have:
 - Undertaken a desktop analysis to determine infiltration high to low risk zones (October 2020);
 - Installed additional monitoring to back up the analysis and to aid focusing of locations for identification of infiltration (2020 to 2023). Each year we will assess the completeness of monitoring and if required add to or modify the current locations.
 - Undertaken sample CCTV in the high to low risk zones to assess the general asset health of the sewers and manholes (ongoing).

We will also review results of Winter 2019/20 and 2020/21 with historic data to build up evidence to support interventions in the network (Summer/Autumn 2021).

2. Where interventions can be undertaken as part of normal sewer maintenance activities these will be communicated and progressed.
3. If significant investment is identified as being required, then this will need to be considered in terms of relative need compared to other systems being investigated for infiltration reduction. However, where viable opportunities are identified these will be included in our AMP9 (2030-35) programme of investment. Significant investment needs may need to be included in future investment cycles.

Investigations

As mentioned above JBA Consulting have been supporting by undertaking an exercise involving assessing groundwater elevation data to determine which areas of the network are potentially below the groundwater table during high groundwater periods.

Site investigations are underway, undertaken by Dene-Tech and our Customer Field Services (Thames Water Operations) have included 'look & lift' surveys, CCTV and where necessary dye tracing to confirm connectivity.

⁵ Assessment of cost effectiveness is based on assessment of the ratio of the cost of a solution to the monetised benefit gained from implementing the solution i.e. reduction in flood/pollution risk and/or reduced operating costs.

A table of the work undertaken is included in the appendix to this report.

Monitoring

Sewer Depth Monitors have been installed in the catchment in 2020/2021 (see Figure 2.0). These devices are telemetered and provide real time data on the level of flow in the sewer.

The purpose of these units is to act as alerts for high groundwater impact in the sewer, calibration of the zones of infiltration risk and to demonstrate benefit gained from work undertaken to reduce infiltration.

To provide evidence in the future of further need to manage the impact of infiltration.

Mitigation

On occasions to avoid flooding of properties or to manage the risk of damage to the environment we may undertake tankering from (manholes) points on the network, make use of pumps to manage flows or deploy settlement tanks to part treat sewage before release to the environment.

With regard to the Ampney St Peter system we will continue to tanker where required .

Updates

Work on the Groundwater infiltration management plan will continue, and we will aim to provide updates in October 2022 and then annually by the end of October each year.

Appendix

Groundwater infiltration potential analysis

The table below presents a summary of the JBA groundwater infiltration analysis which identifies the sewers and manholes which are likely to be vulnerable to groundwater infiltration.

Sewer Length by Groundwater Infiltration Risk Zones

Risk category	Description	Length (km)	Percentage
High	Predicted groundwater extreme >1m above pipe invert	6.73	37.0
Medium	Predicted groundwater extreme 0-1m above pipe invert	0.46	2.0
Low	Predicted groundwater extreme 0-1m below pipe invert	0.62	3.0
Very Low	Predicted groundwater extreme >1m below pipe invert	10.71	58.0
Total		18.51 ⁶	100.0

In addition, the table below presents the surface water flood risk classification for manholes within the catchment

Manholes by Surface Water Inundation Risk Category

Risk category	Description	Number	Percentage
High	Inundation risk in 3.3% AEP fluvial or pluvial event	27	5.7
Medium	Inundation risk in 1% AEP fluvial or pluvial event	11	2.3
Low	Inundation risk in 0.1% AEP fluvial or pluvial event	17	3.6
Very Low	All other manholes	419	88.4
Total		474	100.0

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⁶Total of sewer length is for length of mapped sewers only and will not include unmapped S105a transferred sewers in all cases.

Investigations & remedial work undertaken since 2019/20 and future plans

Lift and Look and CCTV surveys are underway in the Ampney St Peter System. Our next update to the plan will include information on our progress in these areas

Glossary of terms

AEP – Annual Exceedance Potential

AMP – Asset Management Plan

CCTV – Closed Circuit Television

EA - Environment Agency

IRP – Infiltration Reduction Plans

MH – Manhole

STW – Sewage Treatment Works

WINEP – Water Industry National Environment Programme

Addendum – Annual Update 2022

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Overview

This addendum to the Ampney St Peter Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2021 to September 2022. The key points covered include:

- Hydrological conditions
- How the sewerage system has performed over this period
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2022/23

Figure 1 – Ampney St Peter Monitoring Plan



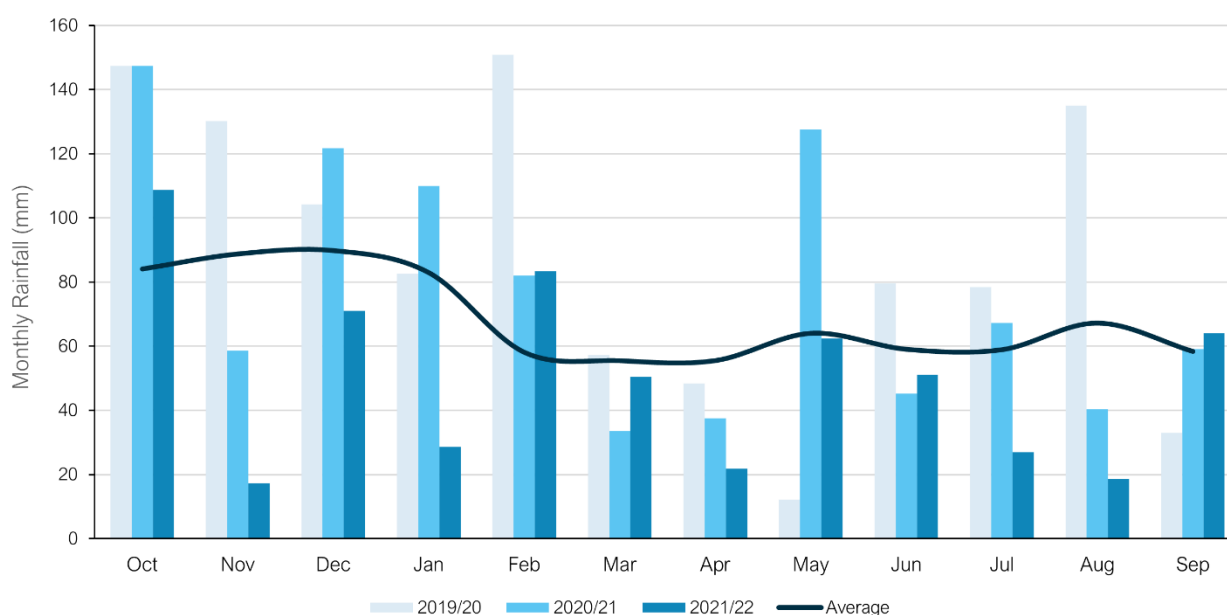
Hydrological Review – 2021-2022

This section summaries the hydrological conditions within the Ampney St Peter catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last three hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Performance



Average Values taken from Met Office Weather Station at Cirencester based on the period 1991-2020

The total rainfall for the 2021/22 hydrological year is 26% below the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)
823	1059	930	612

Groundwater / Local River Level

The Ampney St Peter catchment is situated in the Cotswold West and Upper Thames water resources areas. It primarily sits in the Forest Marble Formation of carbonate material, the Cornbrash Formation of carbonate material and the Oxford Clay formation of coarse to fine grained sediment. The Forest Marble Formation is a designated principal aquifer within the UK.

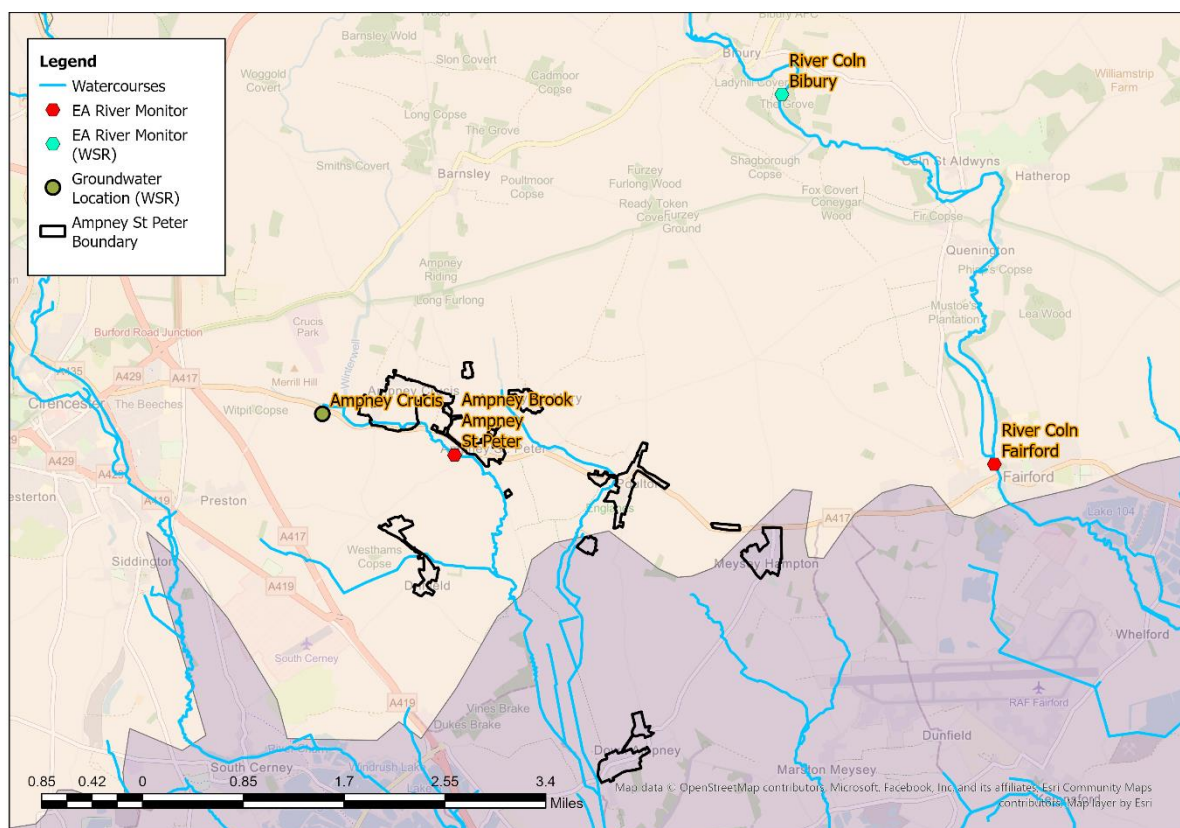
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- Ampney Brook, Ampney St Peter
- River Coln, Fairford

These sites are illustrated in the figure below, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



The following figures represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15 day total rainfall.

Figure 5A – Ampney Brook at Ampney St Peter

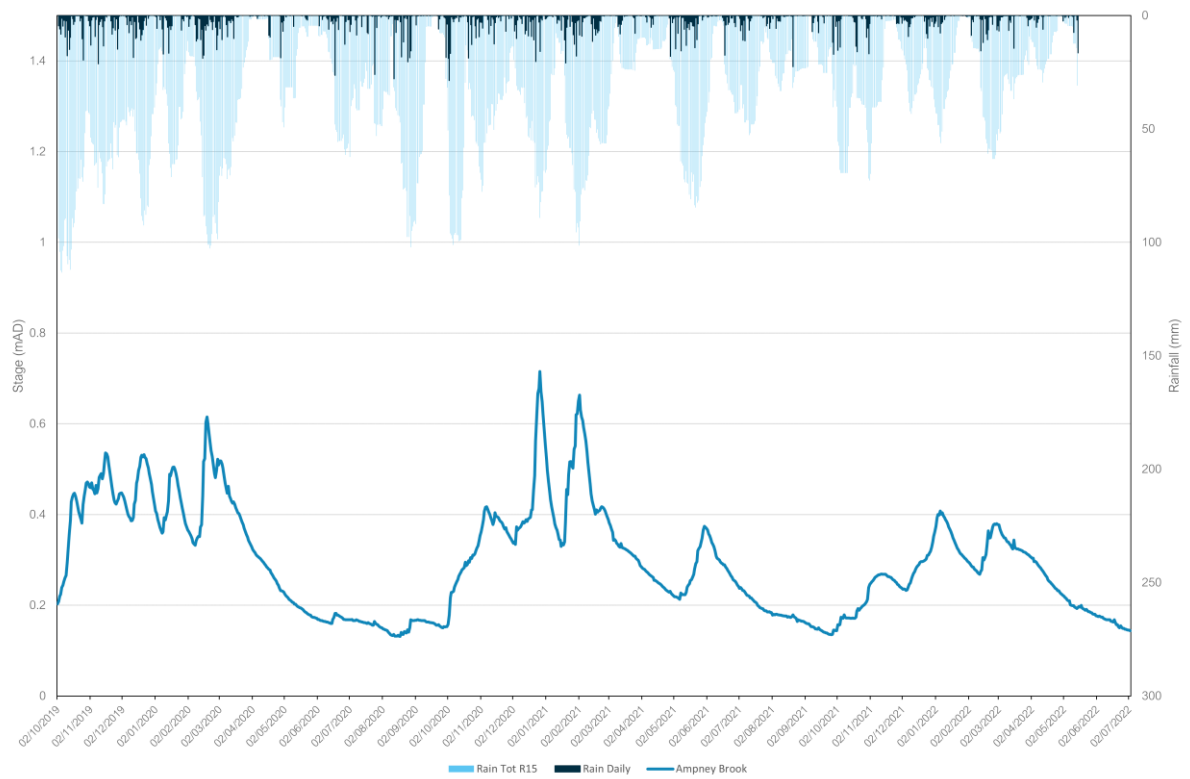
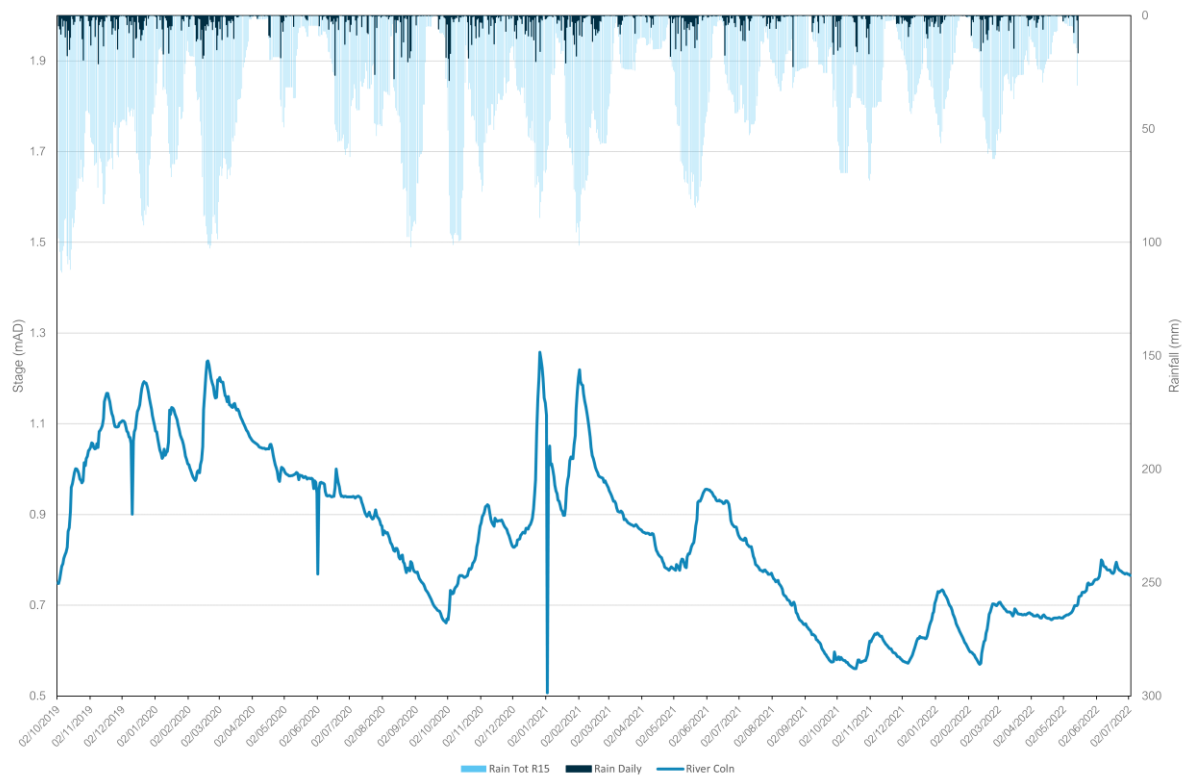
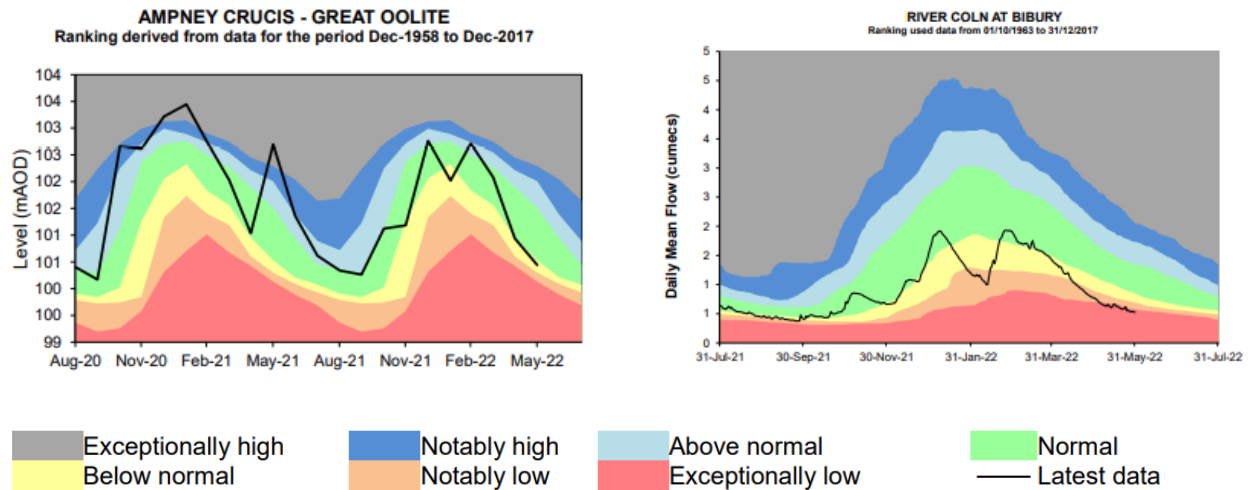


Figure 5B – Coin at Fairford



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows generally lower overall groundwater than the previous year, particularly evident during the winter period. This can be seen in the figure below alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

Network Performance

Within the Ampney St Peter catchment there is one site detailed within the Environment Agency Consents Database which has an Event Duration Monitor (EDM) fitted.

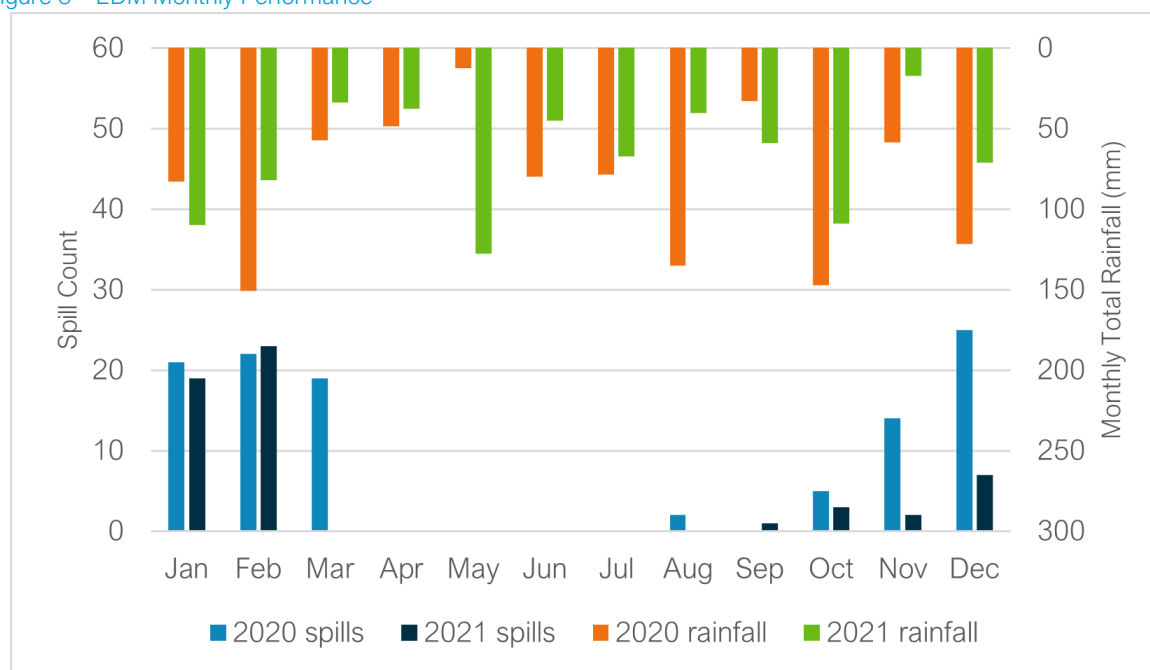
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2020		2021	
	Spills	Duration (hours)	Spills	Duration (hours)
Ampney St Peter STW	108	2316.11	55	1168.53

A critical part of the assessment of EDM performance and its relation to groundwater inundation is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Figure 8 below presents the EDM performance trend and rainfall for recent years.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the autumn and winter months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency, with a slower tail off in spills evident at the start of 2020, when the indicator sites shown in Figure 5 suggest groundwater levels in the catchment were higher than in 2021.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2021-22.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Ampney St Peter catchment. There are no further monitor installs currently planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Ampney St Peter catchment in the 2021-22 Hydrological Year.

Table 9 – Works Undertaken in the 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken
CCTV survey	329 metres
Look and lift survey	N/A
Sewer lining	116 metres completed. Additional 66 metres due to be completed by end of November 2022.
Patch lining	2
Manhole sealing	6 manholes
Manhole covers and frames replaced	2 manholes

Although the seasonal trends in groundwater have been low in comparison with previous years and the SDM installations are generally not showing significant groundwater presence, targeted surveys and appropriate remedial action have been undertaken where groundwater levels have allowed.

Summary

Rainfall in the Ampney Peter catchment over the 2021/22 hydrological year has been below average, with groundwater levels in the aquifer beneath Ampney St Peter not reaching the levels seen in previous years which triggered groundwater ingress into the sewerage network and elevated flow/depth readings at monitoring sites.

Lift and look and CCTV surveys will continue throughout the remaining wet winter periods with the aim of finding further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required.

Addendum - Annual Update 2023

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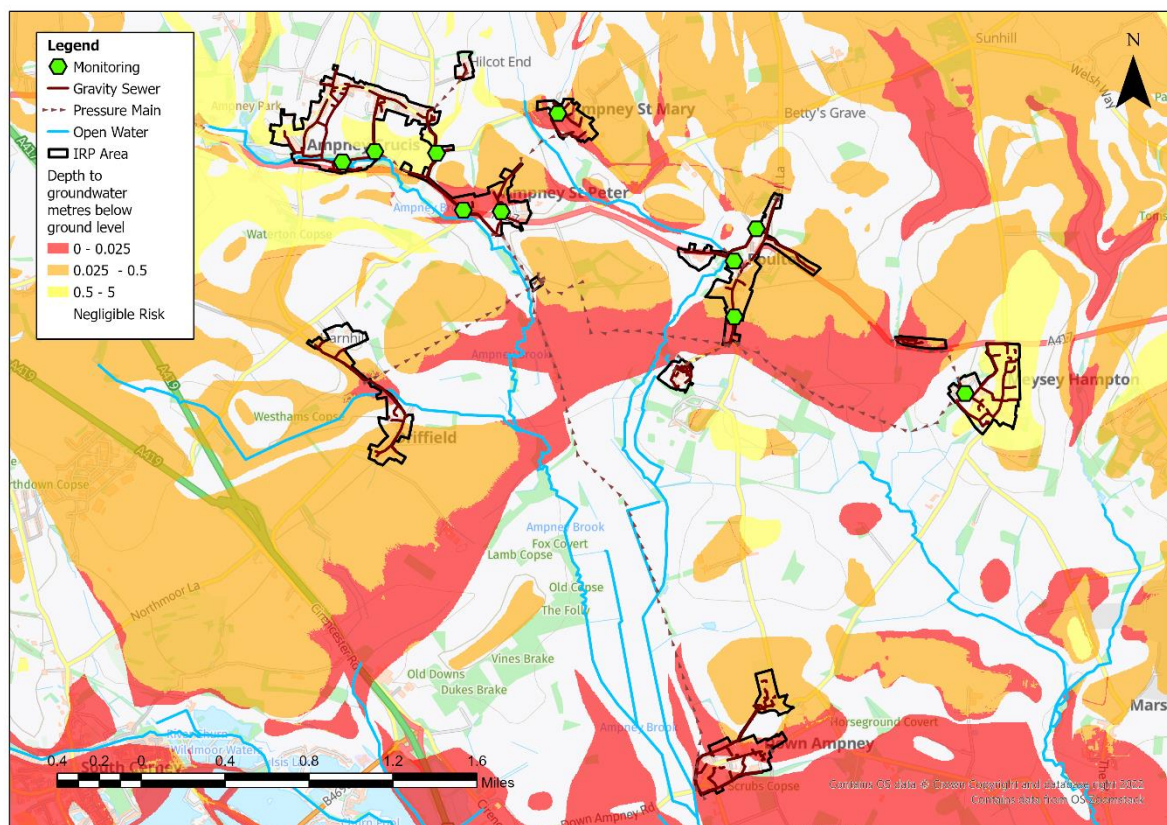
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- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2023/24

Figure 1 – Ampney St Peter Monitoring Plan



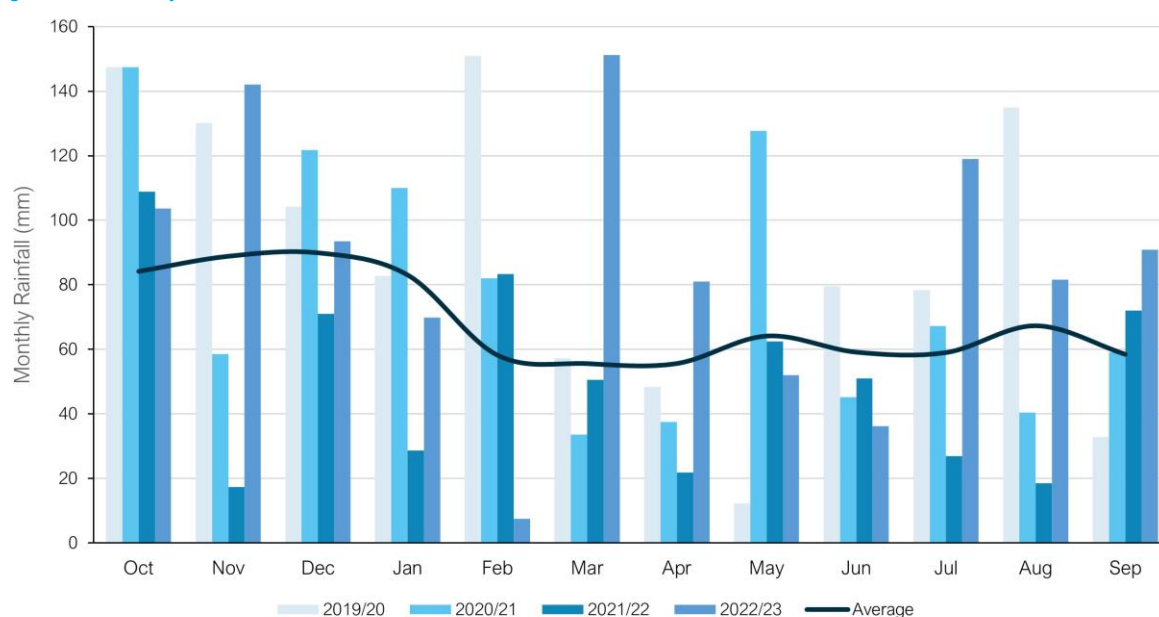
Hydrological Review – 2022-2023

This section summaries the hydrological conditions within the Ampney St Peter catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last four hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Performance



Average Values taken from Met Office Weather Station at Cirencester based on the period 1991-2020

The total rainfall for the 2022/23 hydrological year is 25% above the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)	2022/23 (mm)
823	1059	930	612	1028

Groundwater / Local River Level

The Ampney St Peter catchment is situated in the Cotswold West and Upper Thames water resources areas. It primarily sits in the Forest Marble Formation of carbonate material, the Cornbrash Formation of carbonate material and the Oxford Clay formation of coarse to fine grained sediment. The Forest Marble Formation is a designated principal aquifer within the UK.

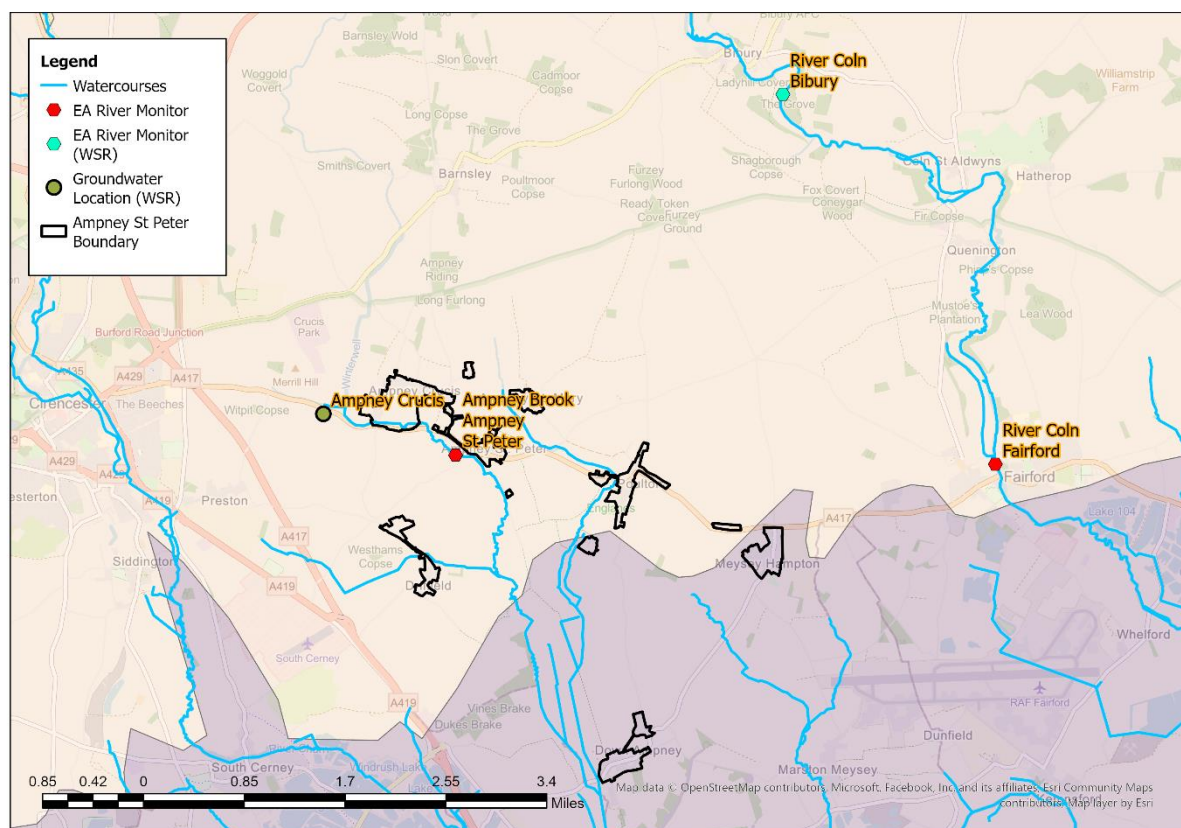
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- Ampney Brook, Ampney St Peter
- River Coln, Fairford

These sites are illustrated in the figure below, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



The following figures represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15 day total rainfall.

Figure 5A – Ampney Brook at Ampney St Peter

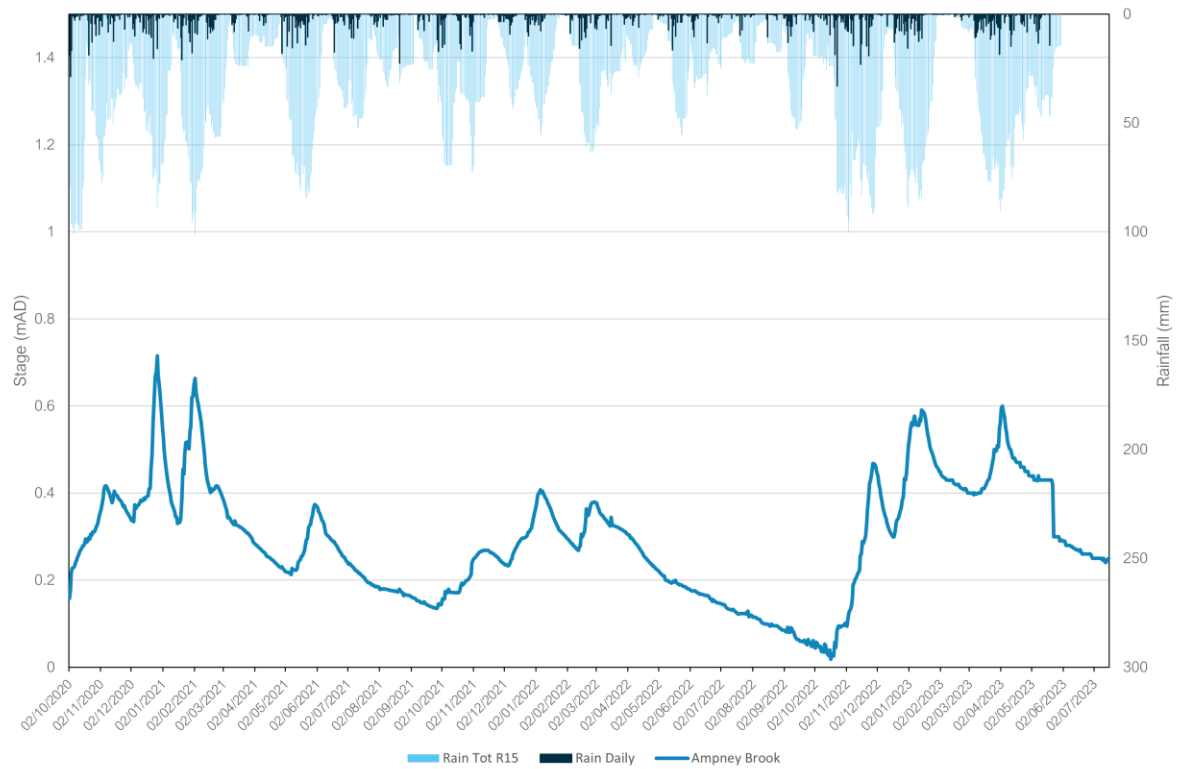
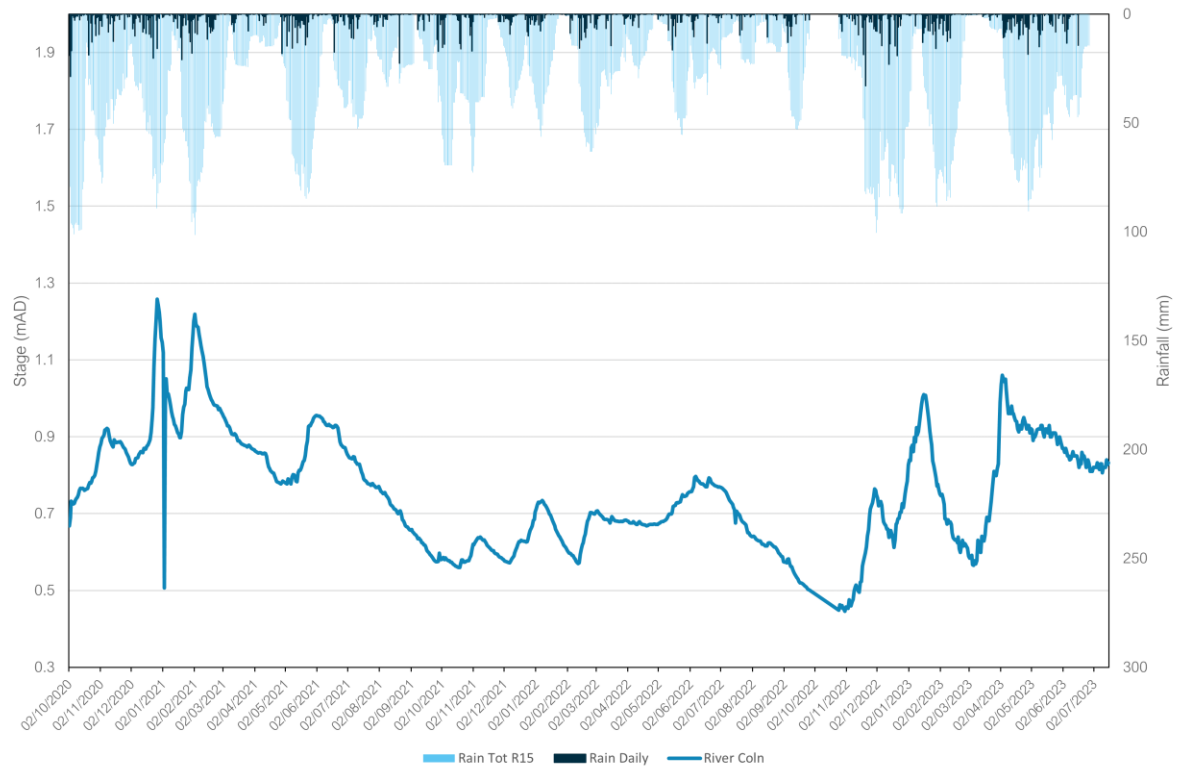
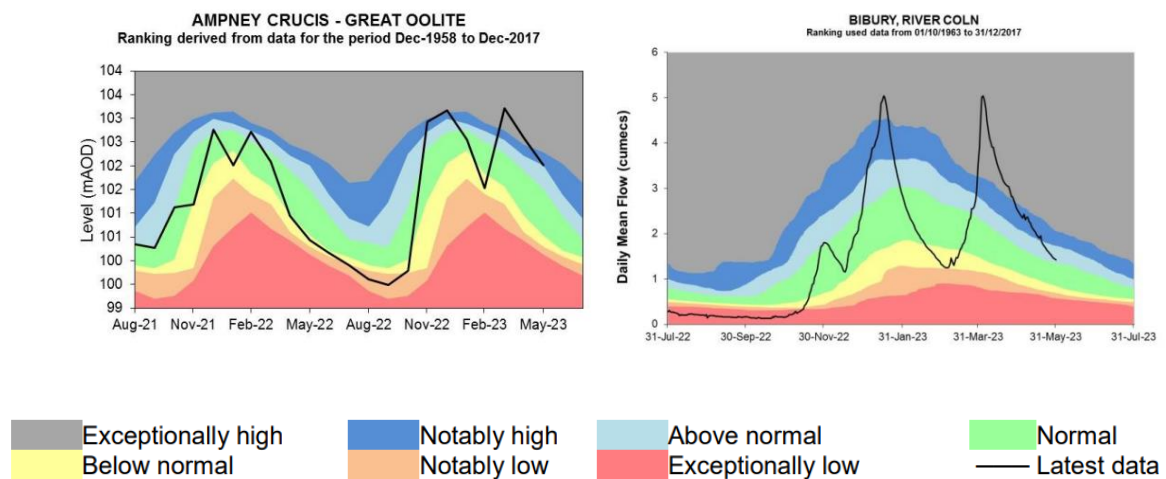


Figure 5B – Coln at Fairford



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows groundwater levels generally at normal, below normal, and notably low levels in 2022. Groundwater levels are observed to rise towards the end of 2022 and are observed at normal, above normal, notably high, and exceptionally high levels in 2023. This can be seen in the figure below alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

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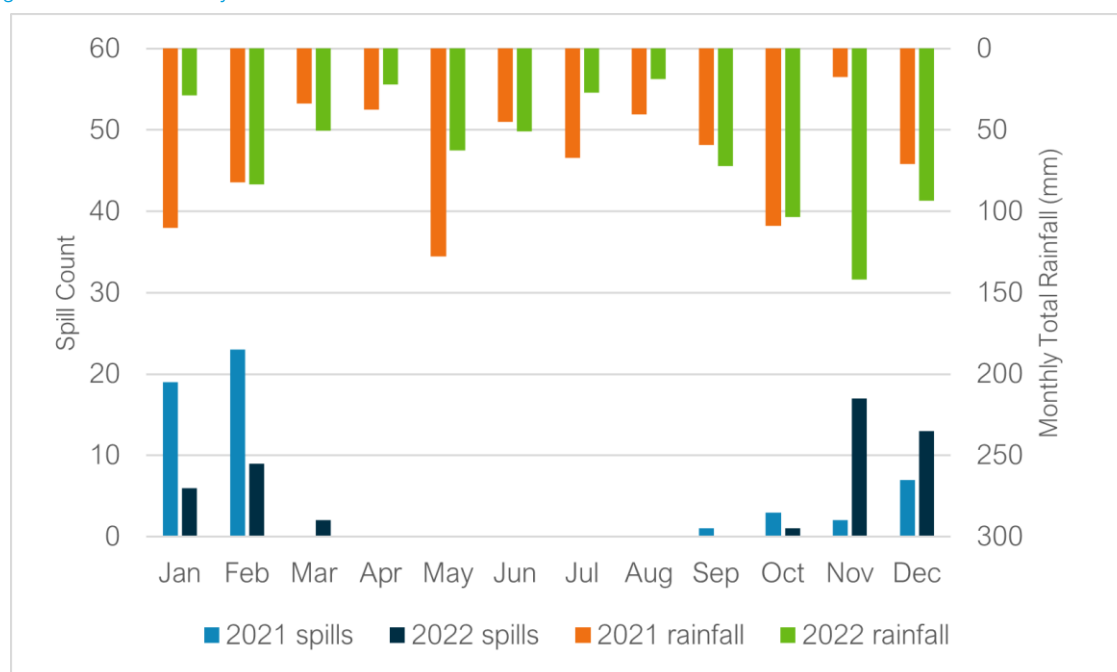
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2021		2022	
	Spills	Duration (hours)	Spills	Duration (hours)
Ampney St Peter STW	55	1168.53	48	944.72

A critical part of the assessment of EDM performance and its relation to groundwater infiltration is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Figure 8 below presents the EDM performance trend and rainfall for recent years.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the autumn and winter months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. Despite broadly similar rainfall totals, significantly more spills were recorded at Ampney St Peter STW in February 2021 compared to February 2022. The indicator sites shown in Figure 5, suggest groundwater levels in the catchment were higher in February 2021. Similarly, a significant number of spills were recorded in November and December 2022, with Figure 6 suggesting groundwater levels in the catchment reached notably high levels in these months.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2022-23.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Ampney St Peter catchment. There are no further monitor installs currently planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Ampney St Peter catchment in the 2022-23 Hydrological Year, as well as works undertaken in the 2021-22 Hydrological Year.

Table 9 – Works Undertaken in the 2022/23 Hydrological Year and in the 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 21/22	Number/ length undertaken 22/23
CCTV survey	329 metres	N/A
Look and lift survey	N/A	4 surveys
Sewer lining	116 metres	66 metres*
Patch lining	2	N/A
Manhole sealing	6 manholes	N/A
Manhole covers and frames replaced	2 manholes	N/A

*Detailed as outstanding in last year's Addendum Report.

Tankering was required at Down Ampney SPS in November 2022 due to high flows in the system, likely resulting from high levels of groundwater infiltration, with Figure 6 suggesting groundwater levels in the catchment reached notably high levels during the month. One tanker was deployed to the pumping station.

An upgrade is being planned for Ampney St Peter STW. It will include a substantial increase in treatment capacity, reducing the need for untreated discharges to the environment. The project is likely to be completed in 2026.

Summary

EDM data is indicative of the role of groundwater infiltration on spills in the Ampney St Peter catchment. This hydrological year, indicator site data suggests groundwater levels have generally been higher than the previous hydrological year, and EDM data for 2023 will be analysed once available to continue to examine the relationship between groundwater levels and overflow spills in the catchment.

Lift and look and CCTV surveys will be undertaken in remaining wet winter periods if conditions allow. The aim of this is to find further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required.

Addendum - Annual Update 2024

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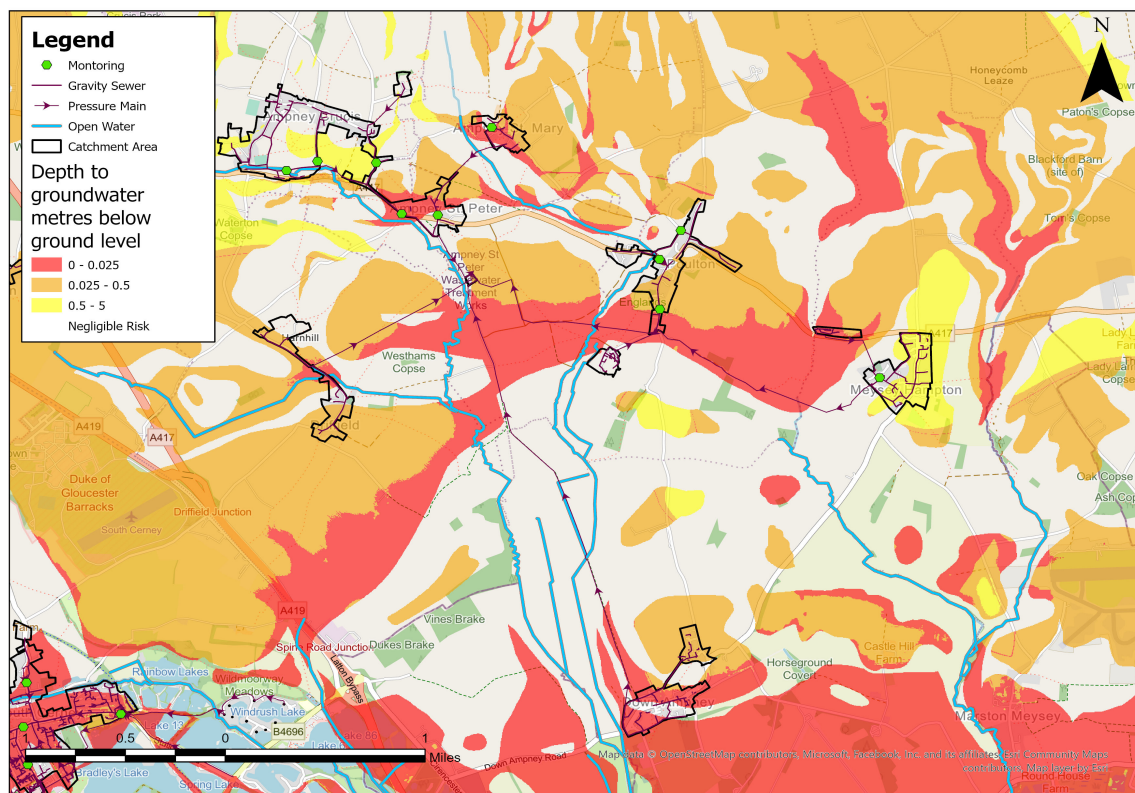
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Overview

This addendum to the Ampney St Peter Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2023 to September 2024. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year and being planned
- Summary and plan for 2024/25

Figure 1 – Ampney St Peter Monitoring Plan



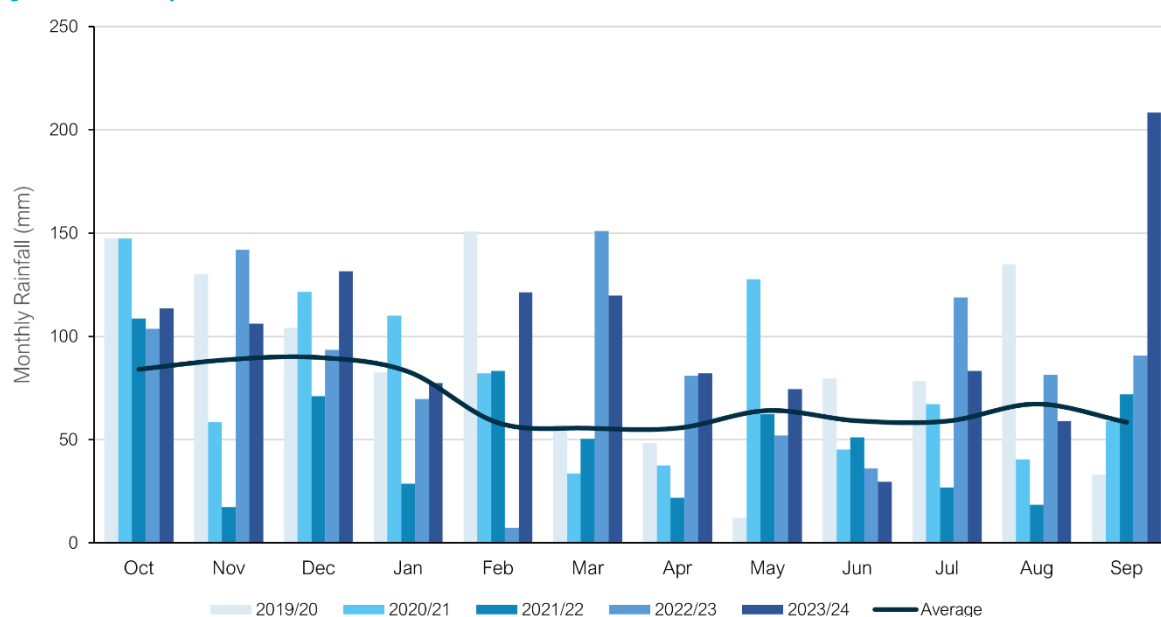
Hydrological Review – 2023-2024

This section summarises the hydrological conditions within the Ampney St Peter catchment within the period under investigation and provides comparison against previous year's performance to put the annual performance into context. The hydrological review has been undertaken based on the Hydrological Year which runs October 1st to September 30th.

Catchment Rainfall

Representative Radar rainfall has been used to generate monthly data at catchment level for comparison with average data generated by local Met Office Weather Station Records. Figure 2 presents the comparison of this data for the last five hydrological years to support longer term trends within the local system.

Figure 2 – Monthly Rainfall Data



Average Values taken from Met Office Weather Station at Cirencester based on the period 1991-2020

The total rainfall for the 2023/24 hydrological year is 47% above the annual average total. Total rainfall values are presented in Table 3 below.

Table 3 –Total Rainfall Based on Hydrological Year

Average (mm)	2019/20 (mm)	2020/21 (mm)	2021/22 (mm)	2022/23 (mm)	2023/24 (mm)
823	1059	930	612	1028	1207

Groundwater / Local River Level

The Ampney St Peter catchment is situated in the Cotswold West and Upper Thames water resources areas. It primarily sits in the Forest Marble Formation of carbonate material, the Cornbrash Formation of carbonate material and the Oxford Clay formation of coarse to fine grained sediment. The Forest Marble Formation is a designated principal aquifer within the UK.

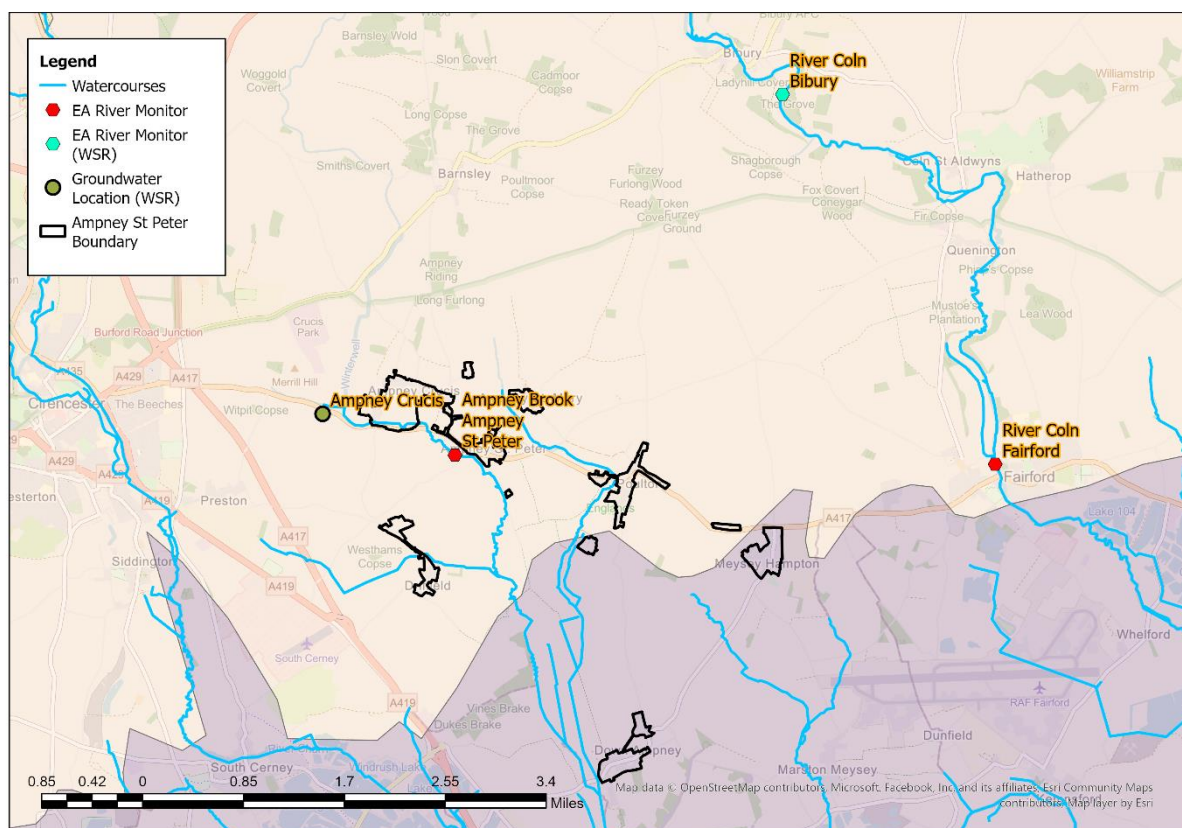
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

From previous investigations we have identified the following sites are good indicators of groundwater levels within the catchment.

- Ampney Brook, Ampney St Peter.
- River Coln, Fairford.

These sites are illustrated Figure 4, alongside the closest groundwater reference station and closest gauging station from the Water Situation Report.

Figure 4 – Local Monitoring Stations



Figures 5A-5B represent the last three hydrological years of level information at the indicator sites to build a picture of the relative conditions prevalent in the current year. It is presented against both the daily total rainfall values for the catchment and a rolling 15 day total rainfall. Note that there are step downs evident in the stage data for the Ampney Brook at Ampney St Peter site in 2023, limiting the utility of the late 2023/ 2024 data.

Figure 5A – Ampney Brook at Ampney St Peter

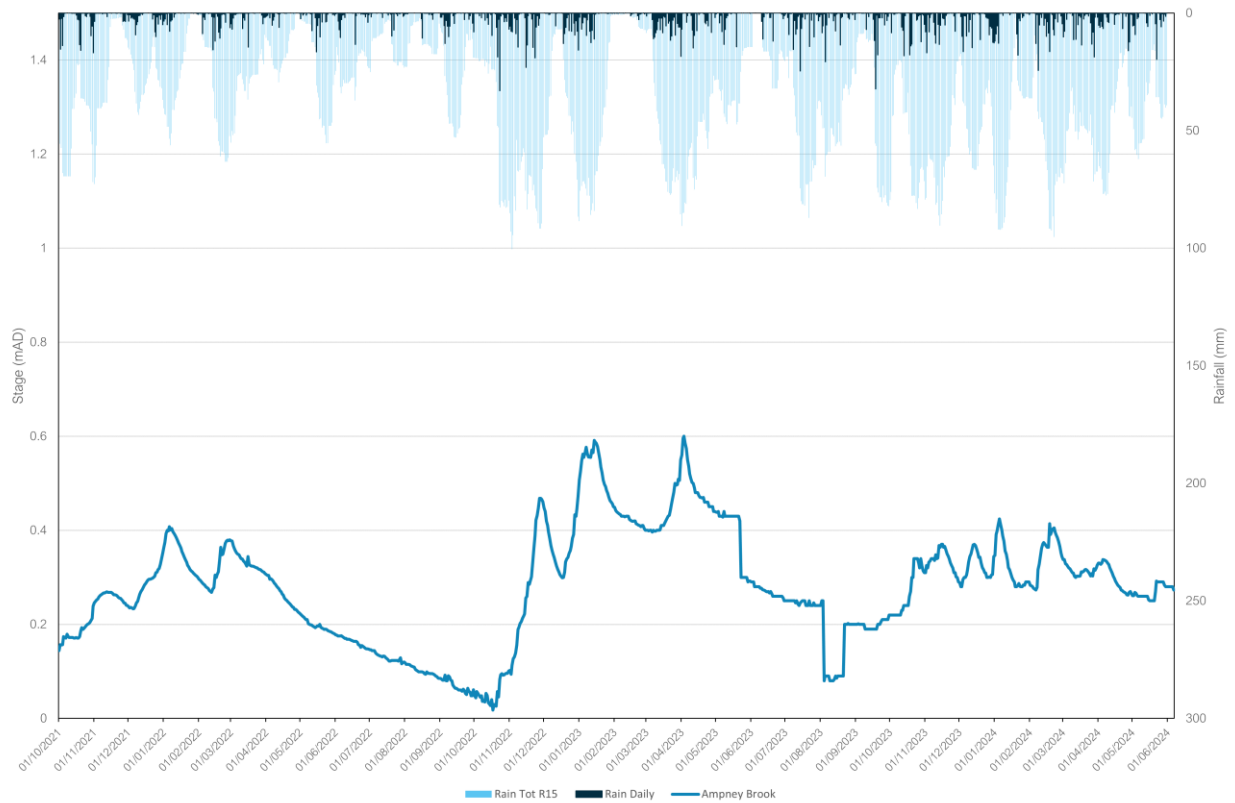
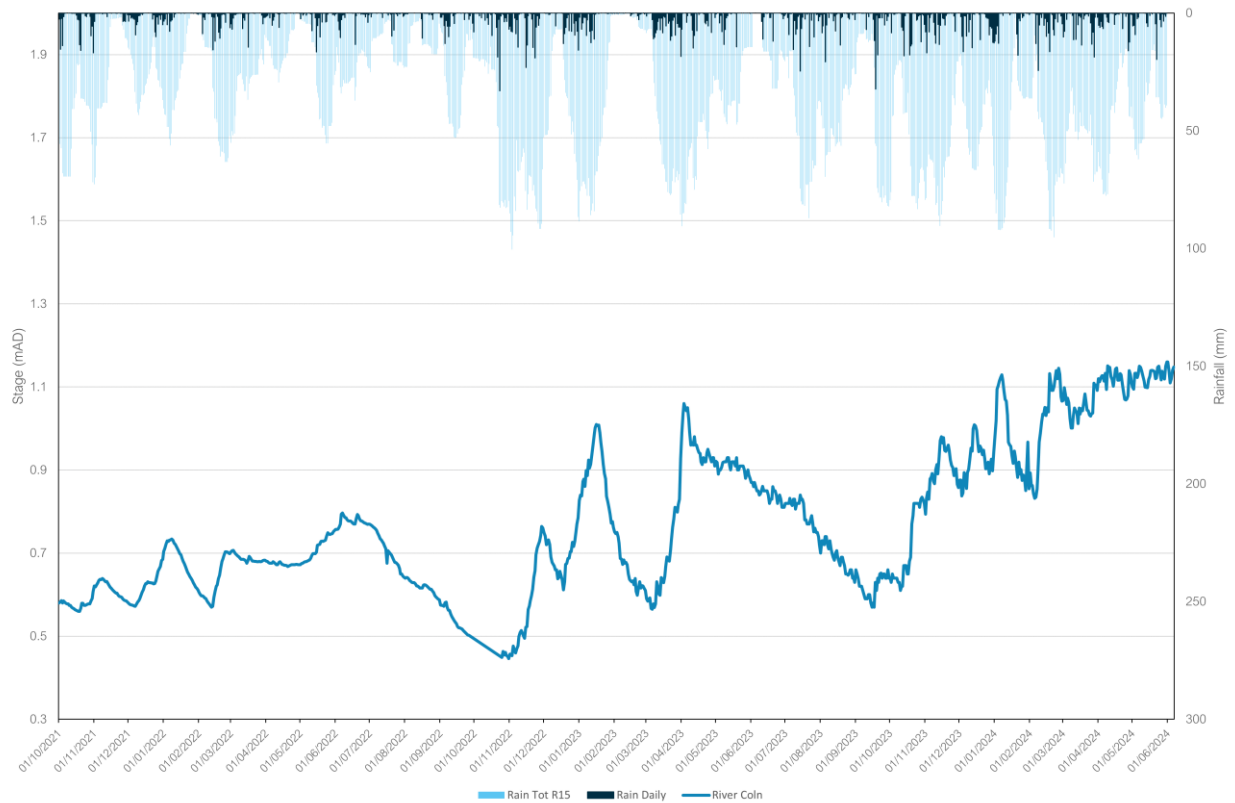
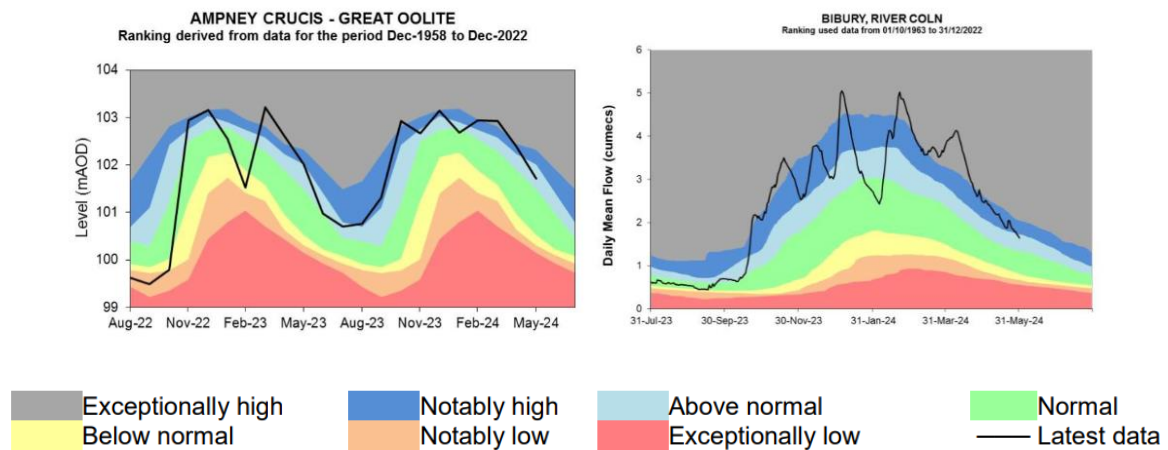


Figure 5B – Coln at Fairfield



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for Cotswold West. The nearest groundwater reference station is Ampney Crucis. This site shows groundwater levels to consistently be at above normal/ notably high levels in 2024, briefly reaching exceptionally high levels. This can be seen in Figure 6 alongside the river indicator location at Bibury on the River Coln.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

Network Performance

Within the Ampney St Peter catchment there is one site detailed within the Environment Agency Consents Database which has an Event Duration Monitor (EDM) fitted.

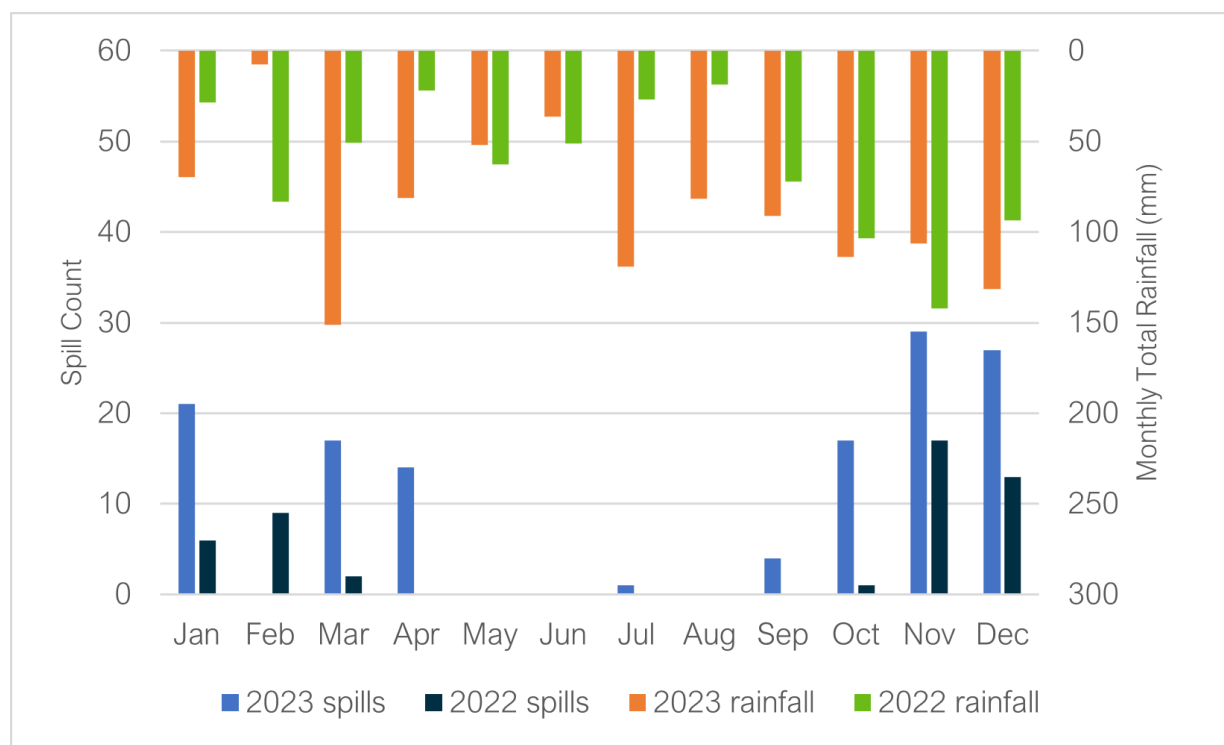
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2022		2023	
	Spills	Duration (hours)	Spills	Duration (hours)
Ampney St Peter STW	48	944.72	130	2759.5

A critical part of the assessment of EDM performance and its relation to groundwater infiltration is to review the month-on-month spill performance, against previous years and the monthly total rainfall values to give context to the performance. Figure 8 below presents the EDM performance trend and rainfall for recent years.

Figure 8 – EDM Monthly Performance



The trend in spill performance across the two recorded years does show variation in spills, with a focus on spills during the spring, winter and autumn months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. For example, despite similar rainfall, a significantly higher number of spills were recorded in October 2023, compared to the same month in 2022. The indicator site data shown in Figure 5B and in Figure 6, suggests groundwater levels in the catchment were higher in October 2023.

Investigations & Interventions

This section details the activities that have been undertaken within the catchment within the Hydrological Year 2023-24.

Monitor Installations

The sewer depth monitor (SDM) programme supports long term groundwater understanding within GISMP catchments. Currently, there are a total of 10 monitors installed within the Ampney St Peter catchment. There are no further monitor installs currently planned.

The data from these will be cross-referenced with other long-term records (where available) within the catchment.

Remediation Works Undertaken this Hydrological Year

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Ampney St Peter catchment in the 2023-24 Hydrological Year, as well as works undertaken in the previous two hydrological years.

Table 9 – Works Undertaken in the 2023/2024, 2022/23 & 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 21/22	Number/ length undertaken 22/23	Number/ length undertaken 23/24
CCTV survey	329 metres	N/A	200 metres Additional 137 metres
Look and lift survey	N/A	4 surveys	4 surveys
Sewer lining	116 metres	66 metres	N/A
Patch lining	2	N/A	N/A
Manhole sealing	6 manholes	N/A	N/A
Manhole covers and frames replaced	2 manholes	N/A	N/A

Tankering was required in the catchment during the 2023/24 Hydrological Year. A total of 42 days of flow management was undertaken across two locations: School Lane SPS and Down Ampney.

An additional 137 metres of CCTV was undertaken in the catchment over the summer/ autumn 2023 period. The purpose of these surveys was to assess the structural condition of sewers predicted to be at high risk of groundwater infiltration, rather than to identify locations of groundwater infiltration into the network. The majority of the network surveyed was identified as being in an acceptable structural condition.

An upgrade is planned for Ampney St Peter STW. This will include a substantial increase in treatment capacity, reducing the need for untreated discharges to the environment. The project is likely to be completed in 2027, however, delivery dates are being managed at a programme level, delivery dates stated are based upon current views and are subject to change.

It is expected this catchment will meet all government targets for storm overflows by 2035 – 2040.

Summary

EDM data is indicative of the role of groundwater infiltration on spills in the Ampney St Peter catchment. This hydrological year (October 2023 – September 2024), indicator site data suggests groundwater levels in the Ampney St Peter catchment have consistently been at above normal/ notably high levels. EDM data for 2024 will be analysed once available to continue to examine the relationship between groundwater levels and overflow spills in the catchment.

Lift and look and CCTV surveys will be undertaken in remaining wet winter periods if conditions allow and subject to funding and available capacity. The aim of this is to find further priority locations for remediation and investigating/justifying the need for future larger scale lining as part of our Price Review (PR) process if required.



It's everyone's water