Groundwater Impacted System Management Plan

Clanfield, Clanfield Brook

January 2021

Version control

Version	Date	Amendment	Author	Checked	Reviewed
1-d1	Nov 2020	Draft for EA	NW and AJ	DJ	APH
1-d2	Jan 2021	Final Draft for EA	DJ	APH	JO
1-V1	Jan 2021	Version 1	DJ	APH	JO
1-V2	July 2021	Update to introductory text and infiltration potential figures	DJ	APH	JO
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Annual Update 2021	October 2021	Addition of the Annual Update 2021	DJ	APH	JO
Annual Update 2022	October 2022	Addition of Annual Update 2022	MB/JH	DJ	DJ
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Annual Update 2024	October 2024	Addition of Annual Update 2024	MW/CW	DJ	DJ
Annual Update 2025	Nov 2025	Draft for EA	AF and PP	BT and JE	MH and DS

Table of contents

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 significant likely leading to the sewerage system, on occasions, to become overwhelmed.

All sewerage systems combined and separate will experience some groundwater infiltration[1] 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 centred 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 possible[2]. 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 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 Clanfield catchment

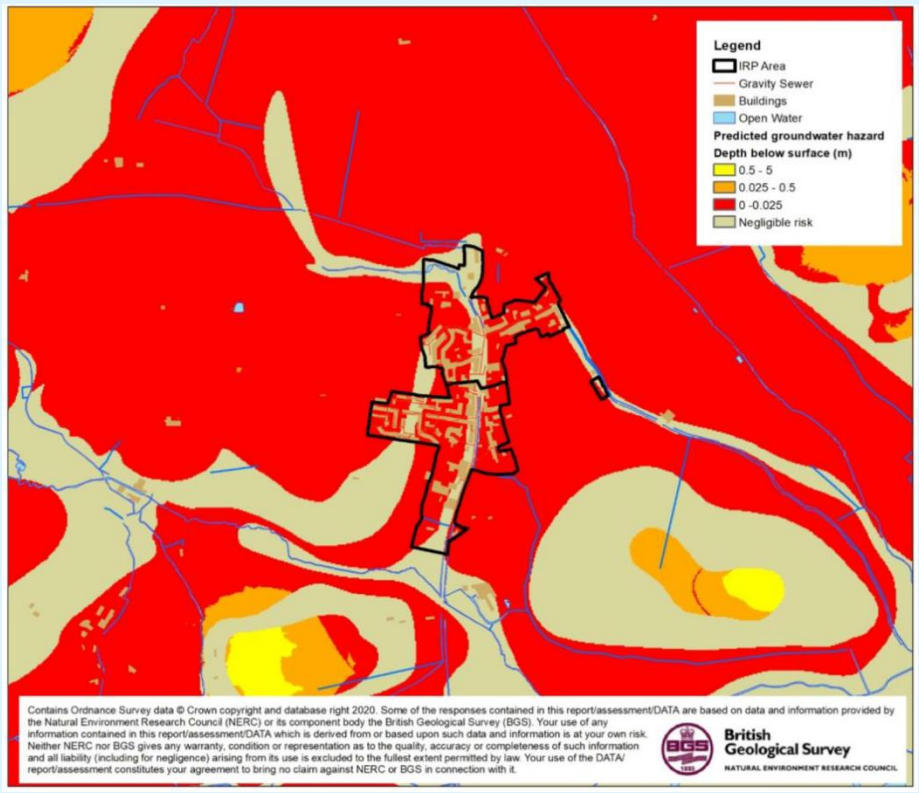


Figure 1.0 – Clanfield catchment

Clanfield is located in Oxfordshire, England, 3 miles South of Carterton and 15 miles West of Oxford. Clanfield serves a population equivalent[3] of 900 with a predominantly separate sewerage network totalling some 5 km in length excluding private drains and sewers. The extent of the catchment is shown in Figure 1.0 above.

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 sewage system becoming overwhelmed.

[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.

Our permit conditions for Clanfield 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 snowmelt. 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 minimum off-line storm storage required is specified in table S3.3." (Table 3.3 is within the permit for the site).*

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 Oxfordshire County Council and as the lead local flood authority, 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).

We believe that the system has become impacted because of a combination of groundwater infiltration emanating from public sewers and private drainage, surface water runoff from saturated fields and surface water misconnections into the foul sewage system (such as down pipes from roofs). We are currently investigating the source and impact of these flows to confirm the source of the flows.

In some of the recent winters the problems associated with groundwater infiltration have been predominately with the STW, with no escapes from wastewater manholes in the network being reported or instances of restricted toilet use as a result of surcharged sewers.

On occasions where the incoming flow has exceeded treatment capacity for sustained periods, the storm tanks have become full and spills to the Mill Lane ditch have occurred.

Anticipated unavoidable discharges

We do not believe there to have been unplanned or unconsented discharges in the network as a result of groundwater infiltration.

General outline plan & timescale

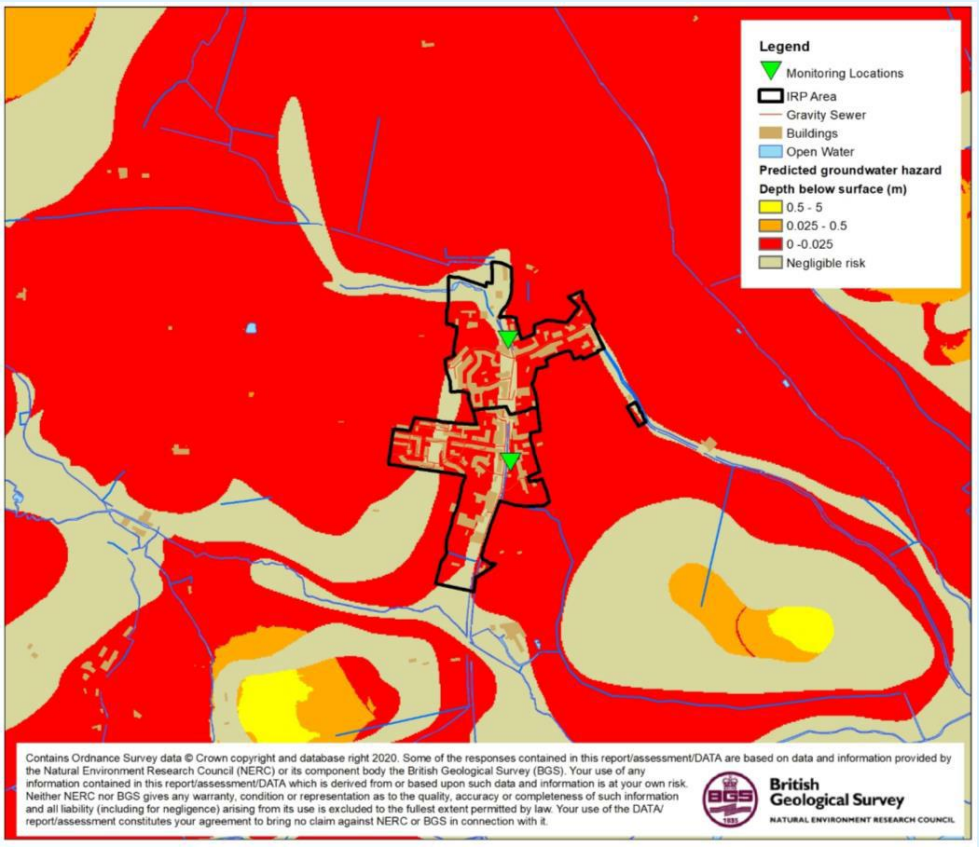


Figure 2.0 – Clanfield monitoring and infiltration zones

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

Complementing the flow [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 Clanfield 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 wholly[4] 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 Clanfield.

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

Activity	When	Description
Model Zones	2020/21	JBA have been engaged to undertake modelling activities to identify the areas to be targeted for sealing in the 56 systems identified as being impacted by infiltration.
Install monitors	2020/21 – 2021/22	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 'quick fixes' 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, result of monitoring and successful submission of our plans for investment.

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 / Price review	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.

Clanfield Infiltration Management Plan

As detailed above the impact of infiltration is experienced at the STW but the mechanisms involved are still to be confirmed through investigation of the network. If the mechanisms are confirmed to be as a result of groundwater ingress into the network, our approach to the resolution of infiltration impacting the Clanfield sewerage system is outlined below.

High level approach statement

For Clanfield our approach to tackling infiltration will be undertaken as follows:

1. To deal with the infiltration experienced we will investigate the network with a view to identifying sources of ingress of infiltration that are cost effective[5] to address. To investigate the network, we/will

- Have undertaken a desktop analysis to determine infiltration high to low risk zones (October 2020);
- Installed additional monitoring to back up the analysis (a) and to aide 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.
- Undertake sample CCTV in the high to low risk zones to assess the general asset health of the sewers and manholes (ongoing).
- Review results of Winter 2019/20 and 2020/21 with historic data to build up evidence to support interventions in the network (Summer 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 our future investment cycles.

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.

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, 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.

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 (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 Clanfield we do not envisage needing to undertake mitigation work within the network.

We are trialing the implementation of an ATAC bio-filter unit at the works to partially treat the storm flows discharged to the river when our storm tanks are full, with the aim of improving the quality of flows arriving at the river.

Updates

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

Appendix

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

The three tables below summarise the findings of the survey and implementation work identified in the 2019/20 period. The final table summarises our current known plans for remediating groundwater infiltration issues.

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	2.22	44.4
Medium	Predicted groundwater extreme 0-1m above pipe invert	0.66	13.2
Low	Predicted groundwater extreme 0-1m below pipe invert	0.09	1.8
Very Low	Predicted groundwater extreme >1m below pipe invert	2.03	40.6
Total		5.00[6]	100.0

Manholes by Surface Water Inundation Risk Category

Risk category	Description	Number	Percentage
High	Inundation risk in 3.3% AEP fluvial or pluvial event	24	10.5
Medium	Inundation risk in 1% AEP fluvial or pluvial event	7	3.0
Low	Inundation risk in 0.1% AEP fluvial or pluvial event	24	10.5
Very Low	All other manholes	174	76.0
Total		229	100.0

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

2019/20 Implementation Works

Activities	Value	Comment
Sewer Lining Length (m)	-	The focus of this period was investigations to identify the location of implementation works required
Infiltration Points Targeted (no.)	-	
Manhole Sealing (no.)	-	

Future Works

	Priority 2020/2021	Known follow On Work
Survey	Look and lift and CCTV surveys are currently on-going in the Clanfield system as of January 2021. Findings will be detailed in the next iteration of this Groundwater Impacted System Management Plan.	
Sewer Lining		
Manhole Sealing – Infiltration Ingress		
Manhole Sealing – Pluvial and Fluvial Ingress		
Sewage Treatment Works Upgrade		

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 2021 Table of contents

Introduction

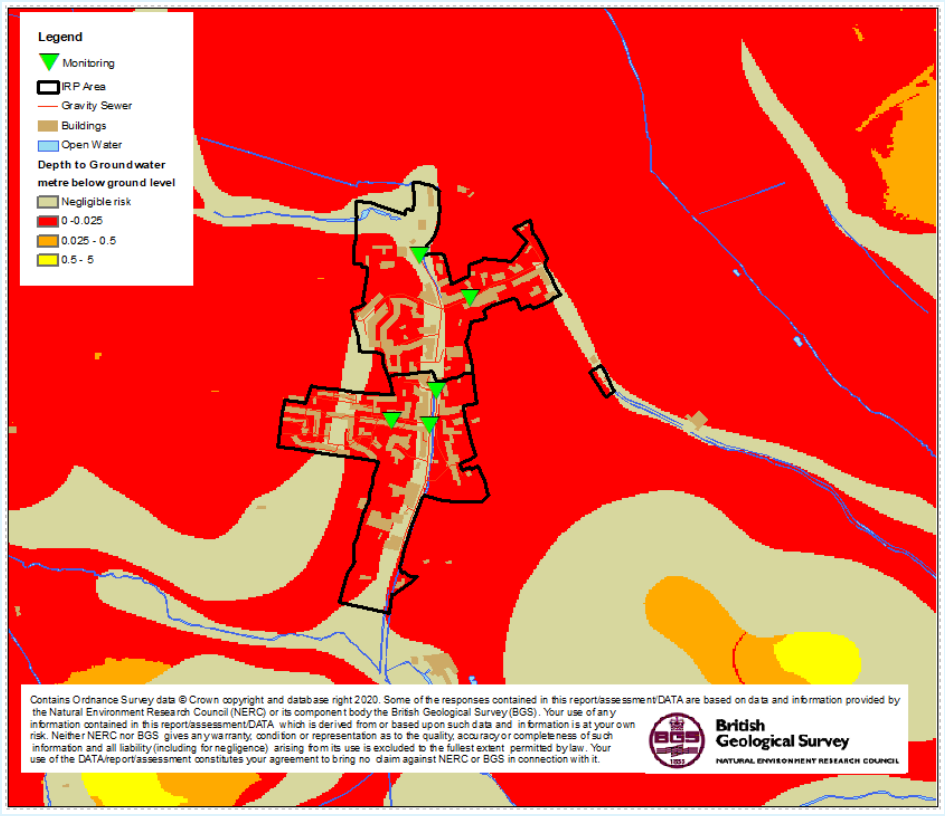


Figure 1 – Clanfield monitoring and infiltration zones

This addendum to the Clanfield Groundwater Impacted System Management Plan 2020 (GISMP) provides an update on performance/work undertaken in the period from September 2020 to September 2021 (the UK Hydrological Year [1]) 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 next steps

Happy New Water Year! | National River Flow Archive (ceh.ac.uk)

2020-21 Hydrological Review

This section summaries the hydrological conditions at Clanfield in the period.

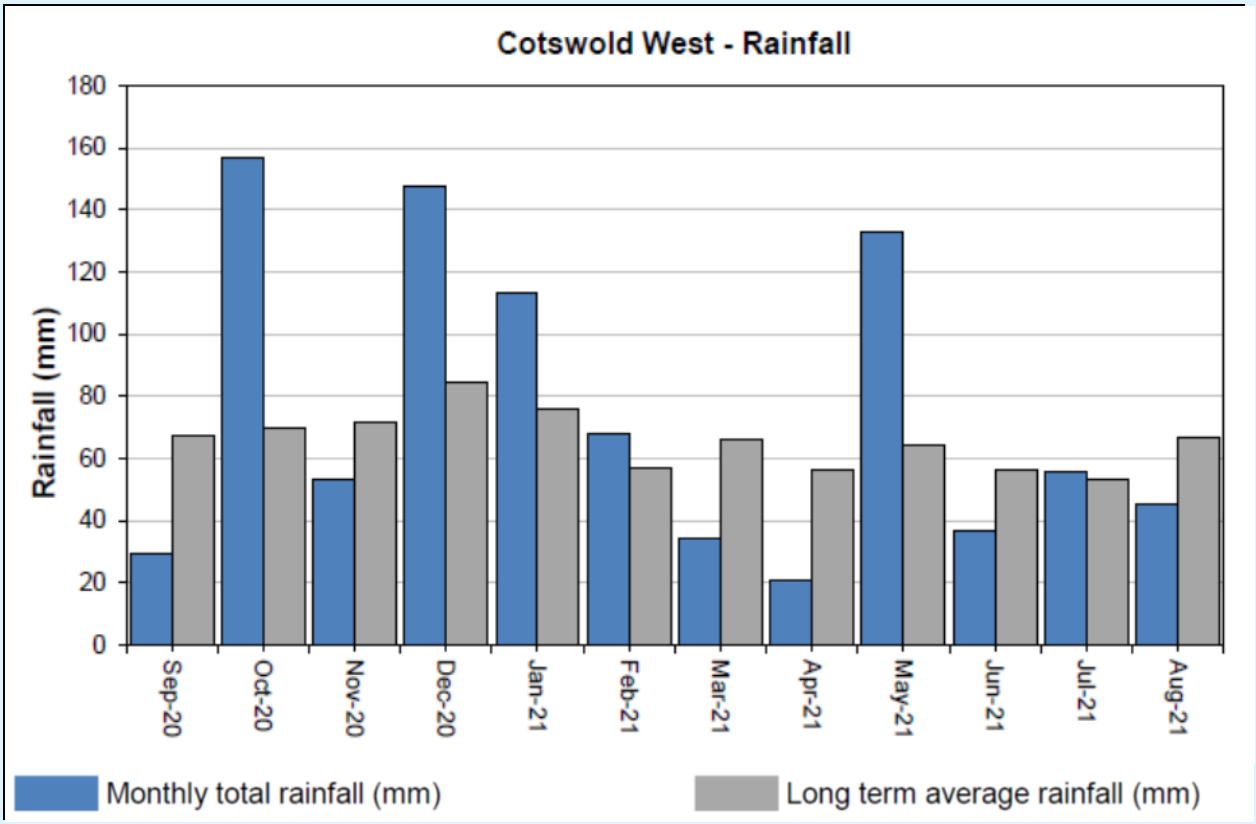


Figure 2 – Monthly rainfall depths local to the system

Clanfield is situated in the Cotswold West water resources area. Figure 2 shows the monthly rainfall total depths against the long-term average rainfall in the location of Clanfield over the period taken from the *Environment Agency Water Situation Report August 2021.*[1]

The graph indicates that monthly rainfall at times in the last year has significantly exceeded long-term average, especially in the winter period.

Figure 3 shows the location of the British Geological Survey (BGS) monitoring borehole at Ampney Crucis which has been monitoring groundwater since 1959. Figures 4 and 5 show river levels in the Clanfield Brook at Clanfield which are a good indicator of the localised groundwater levels over time. Figure 6 and 7 show the last two and ten years of groundwater level data overlain on expected ranges. This shows how recent groundwater levels have compared against the expected range, they show that generally over the last two winters groundwater levels have been notably higher, with the peak groundwater levels close to or within the exceptional high range.

[1] *Environment Agency Water Situation Report August 2021: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1016481/Thames_Water_Situation_Report_August_2021.pdf*

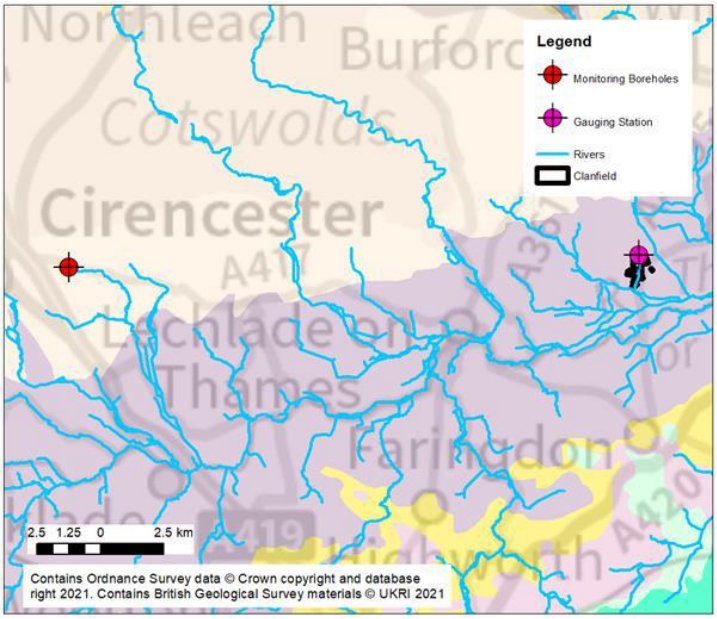


Figure 3 – Location of Ampney Crucis Monitoring Borehole Relative to Clanfield.

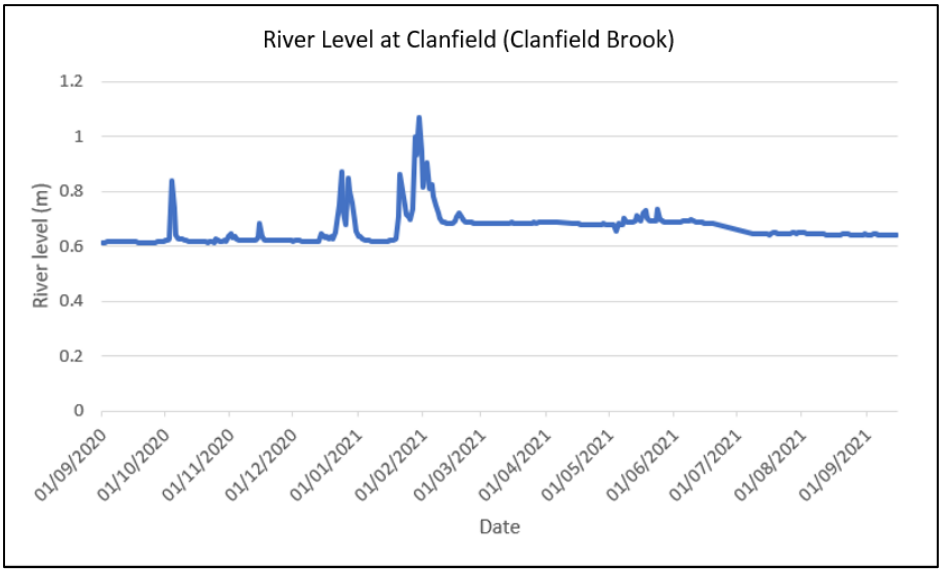


Figure 4 – 2020-2021 River levels at Clanfield (Clanfield Brook) – River Levels UK (riverlevels.uk).

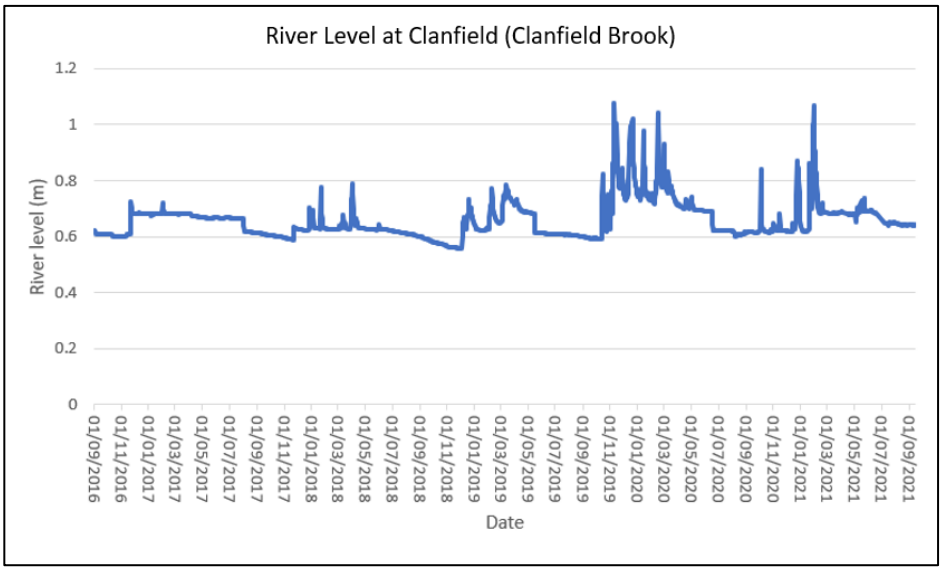


Figure 5 – 2016-2021 River levels at Clanfield (Clanfield Brook) – River Levels UK (riverlevels.uk).

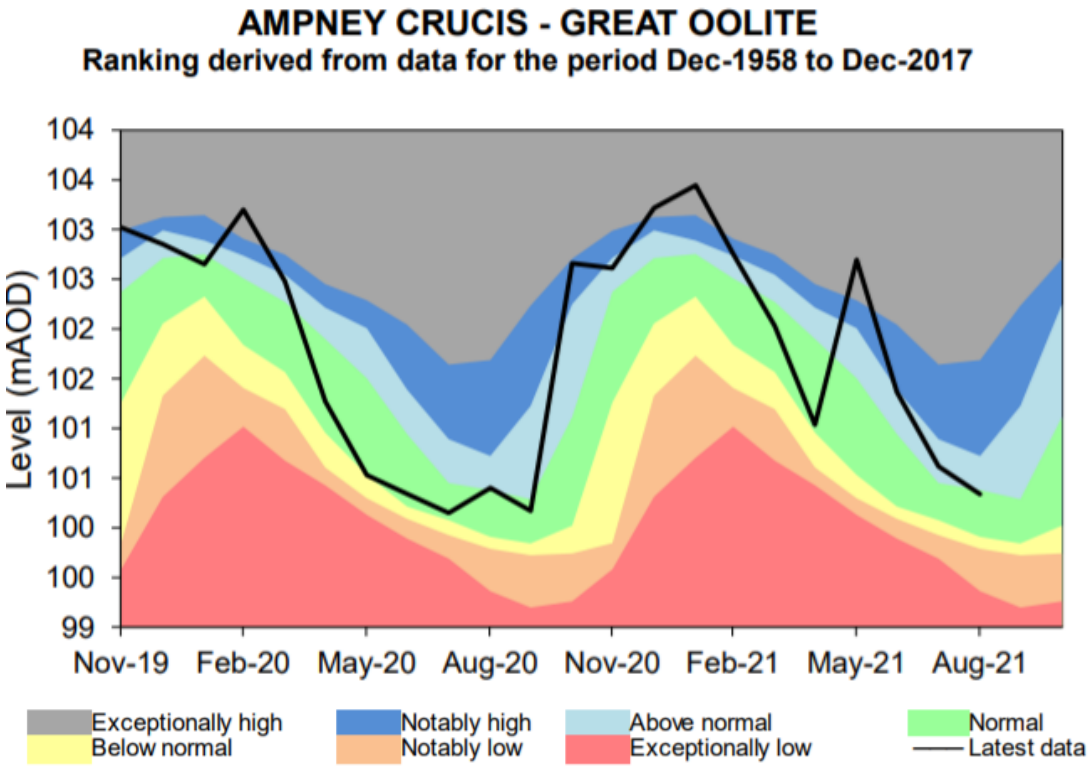


Figure 6 – 2019-2021 Groundwater levels at Ampney Crucis. (Environment Agency Water Situation Report August 2021)

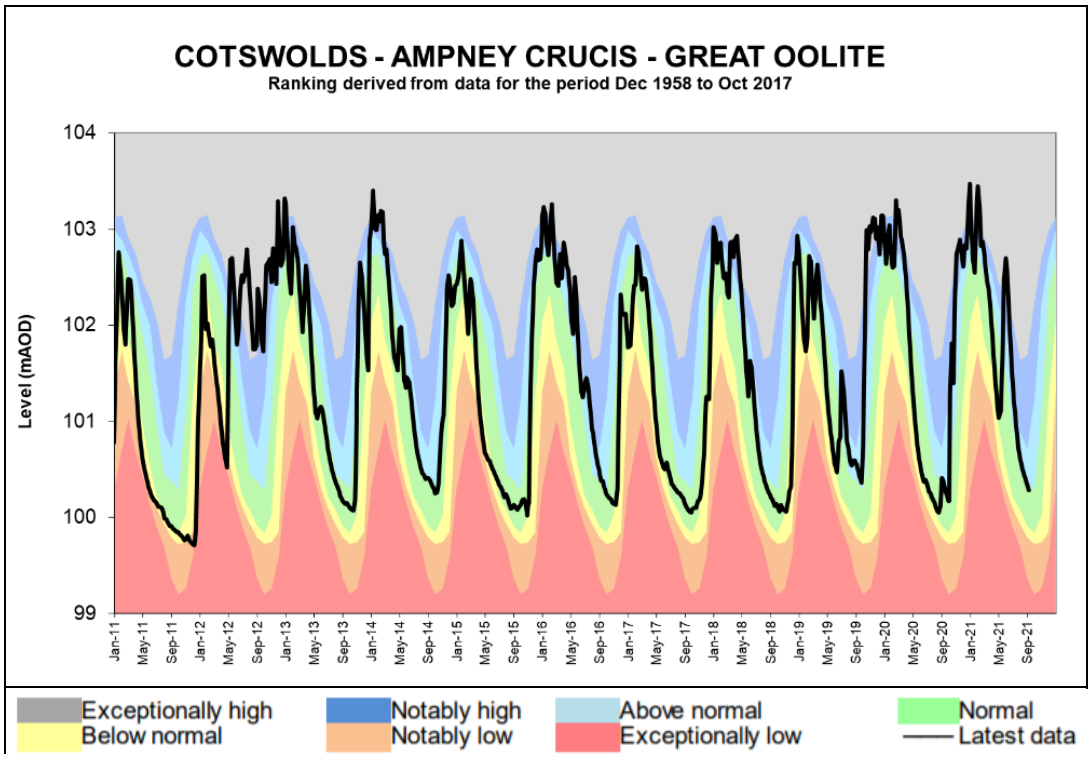


Figure 7 – 2011-2021 Groundwater levels at Ampney Crucis. (*Environment Agency Water Situation Report August 2021)*

(*Environment Agency Water Situation Report August 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1016481/Thames_Water_Situation_Report_August_2021.pdf*

Investigations & remedial work undertaken in the period and future work

The three tables below in summary provide an update on recent survey and remediation work undertaken during the period.

Additional Survey Statistics

Elements		Units	Value	Comment
Planned Survey		m	1564	CCTv supported by Look and Lift surveys
Survey Completed		m	1134	
		%	73	
		Lengths (No.)	76	
Clear Flow Observed		m	907	From above.
		%	59	
Sewer Infiltration Locations Identified	Infiltration Gushing	No.	0	3 Priority locations have been identified for repair
	Infiltration Gushing at Joint		3	
	Infiltration Running		5	
	Infiltration Running at joint		9	
	Infiltration Dripping		1	
	Infiltration Dripping at joint		4	
	Infiltration Seeping		1	
	Infiltration Seeping at joint		7	
	Grand Total		30	

Elements		Units	Value	Comment
Manhole Infiltration Locations Identified	Infiltration around pipe	No.	0	These locations are in addition to the ones identified in the original report (2020).
	Infiltration through benching		0	
	Infiltration through chamber wall		0	
	Gushing		0	
	Running		2	
	Dripping		0	
	Seeping		7	
	Grand Total		9	
Monitoring Locations Active		No.	5	We now have a total of 5 telemetered sewer depth monitors in the system for the purpose of the GISMP.
Details of other Surveys			N/a	

Remediation works in period

Activities	Value	Comment
Sewer Lining Length (m)	6 patch liners have been installed by our Operational teams.	Of these fixes one of the Priority 1 gusher locations in the above table has been repaired this year.
Manhole Sealing (no.)	N/a	

Future Works

Activity	Priority 2021/22	Known follow On Work
Survey	Further survey is planned for the Winter of 2021/22	To be confirmed
Sewer Lining	Two priority 1 (gushing) fixes have been approved and are being planned in for remediation.	To be confirmed
Manhole Sealing – Infiltration Ingress	None	To be confirmed
Manhole Sealing – Pluvial and Fluvial Ingress	Plan to be developed based on at risk manholes identified in JBA analysis.	
Sewage Treatment Works Upgrade	Bio-filter ATAC unit at the STW to partially treat high storm flows to river when our storm tanks are full to be made permanent. This ATAC filter will be monitored by an Event Duration Monitor (EDM)	

2020-21 Infiltration Review

This section looks at the impact of infiltration in Clanfield over the period.

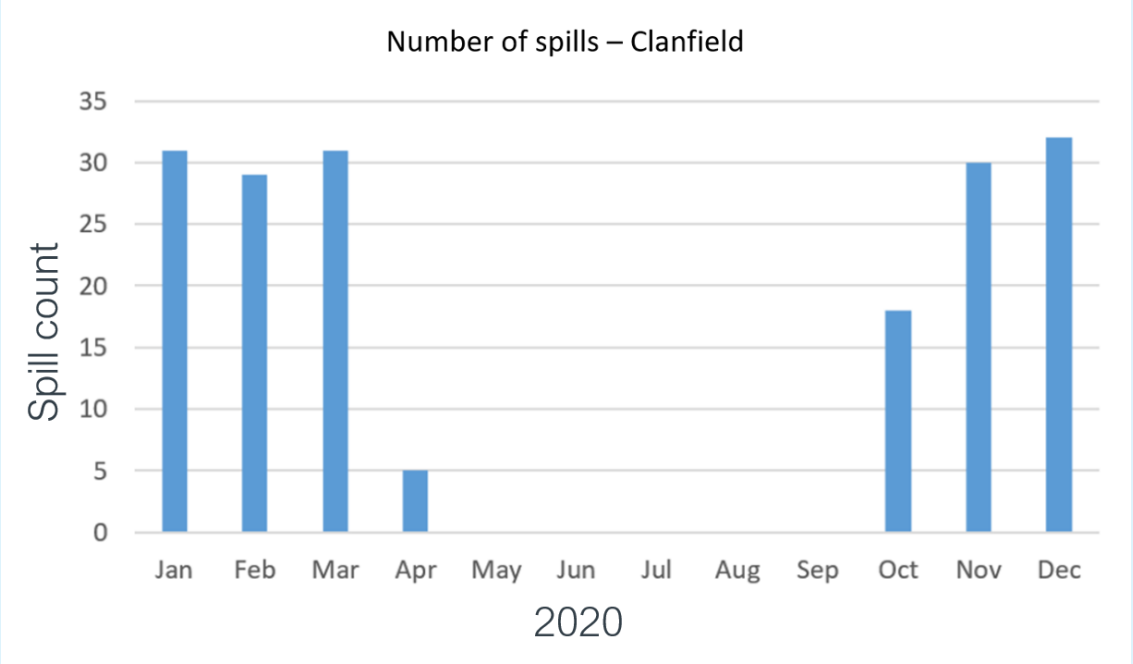


Figure 8 – Number of spills (discharge count) at Clanfield STW (taken from Event Duration Monitor (EDM) Data).*

Figure 8 shows the number of spills per month from the Sewage Treatment Works. The months of January to March and October to December experienced the greatest number of spills. In the summer, no spills were recorded highlighting the influence of groundwater infiltration/winter flows on the system. This Combined Sewer Overflow location has met the trigger for the EA's Storm Outfall Overflow Assessment Framework (SOAF) and is currently under further investigation with regards to root cause and impact.

A temporary bio-filter filter unit (ATAC unit) was deployed at Clanfield STW on the 22/12/2020 in order to partially treat flows discharged to the river over and above what our storm tanks are able to hold, with the aim of improving the quality of flows arriving at the river. We are looking to make this temporary feature into a more permanent structure over the next year to aid as mitigation whilst network investigation are ongoing to locate sources of inflow.

Impacts of groundwater infiltration in the Clanfield system in this period were seen at the STW in the form of prolonged discharges shown above, there were no performance impacts in the network.

**2020 verified and audited EDM data. 2021 calendar year data is awaiting verification before being published.*

Summary

The winter of 2020-21 was a particularly wet winter with groundwater levels in the aquifer beneath Clanfield notably high for long periods and in some cases reaching exceptionally high levels. This was reflected in the discharges seen at the Sewage Treatment works through Event Duration Monitoring (EDM) data.

A temporary bio-filter unit (ATAC) was deployed at the works in December 2020 to provide partial treatment of storm flows to the river when our storm tanks are full. We are looking to make this temporary feature into a more permanent structure over the next year and also introduce Event Duration Monitoring (EDM) monitoring to monitor its use.

Surveys carried out identified a number of sewers and one manhole requiring remediation to fix priority gushing infiltration locations. Six patch liners have been installed over the last year to fix these issues.

Lift and look and CCTV surveys will continue throughout the remaining wet 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.

The number of discharges (spills) occurring at the Clanfield STWs has hit the Sewer Overflow Assessment Framework (SOAF) trigger of 40 as a result of this we are looking at a number of factors relating to what impact / factors influencing the spills. We will work to ensure the investigations undertaken as part of the GISMPs are aligned to the investigations undertaken as part of the SOAF.

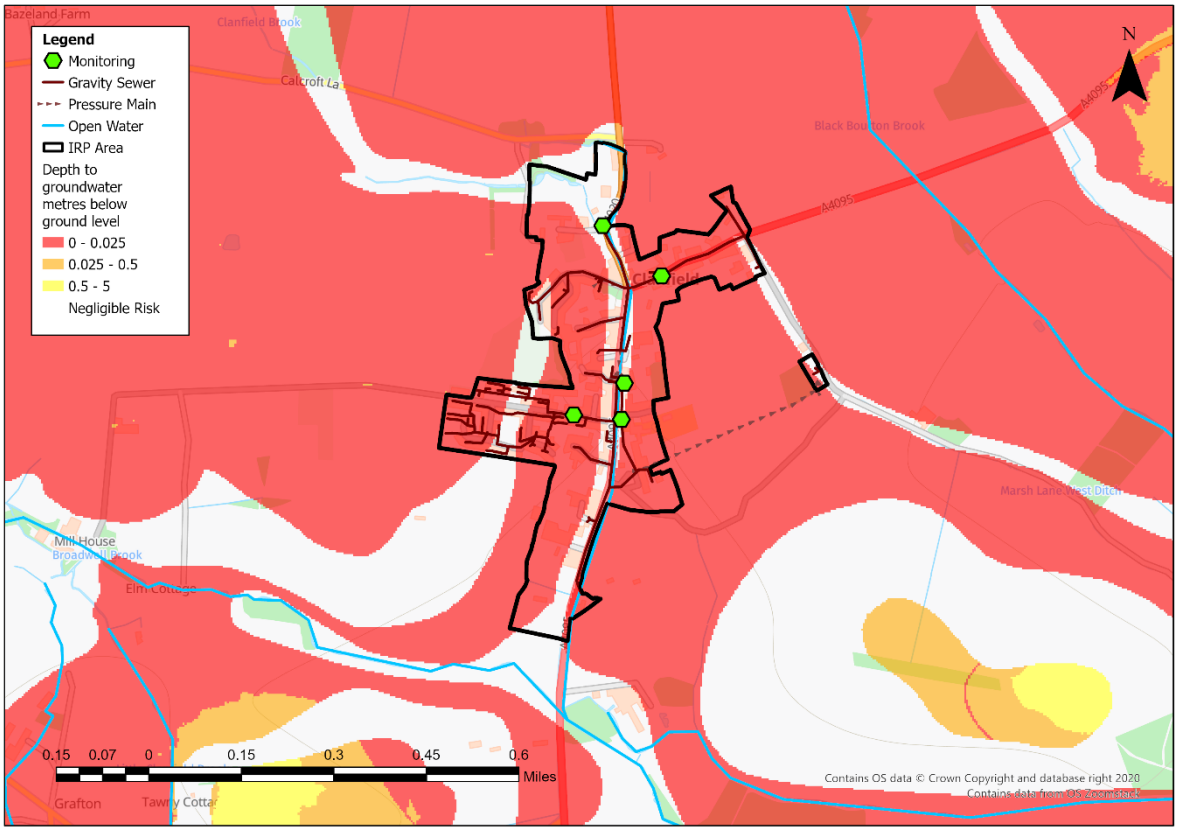
Addendum – Annual Update 2022 Table of contents

Overview

This addendum to the Clanfield 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 – Clanfield Monitoring Plan



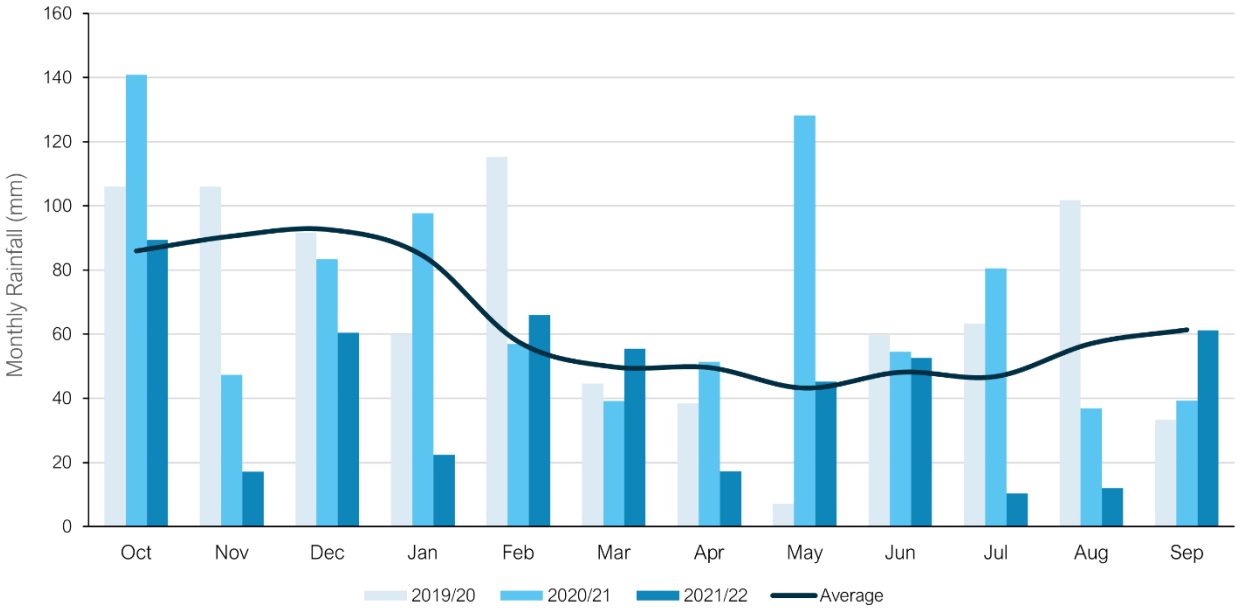
Hydrological Review – 2021-2022

This section summaries the hydrological conditions within the Clanfield 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 Thorney Island based on the period 1991-2020

The total rainfall for the 2021/22 hydrological year is 33% below the annual average total, with winter months generally showing below average totals. 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)
768	827	857	518

Groundwater / Local River Level

The Clanfield catchment is situated in the Upper Thames water resources area. It sits in the Oxford Clay and West Walton Formation of interbedded coarse/fine grained sediment. This formation is not a designated principal aquifer within the UK.

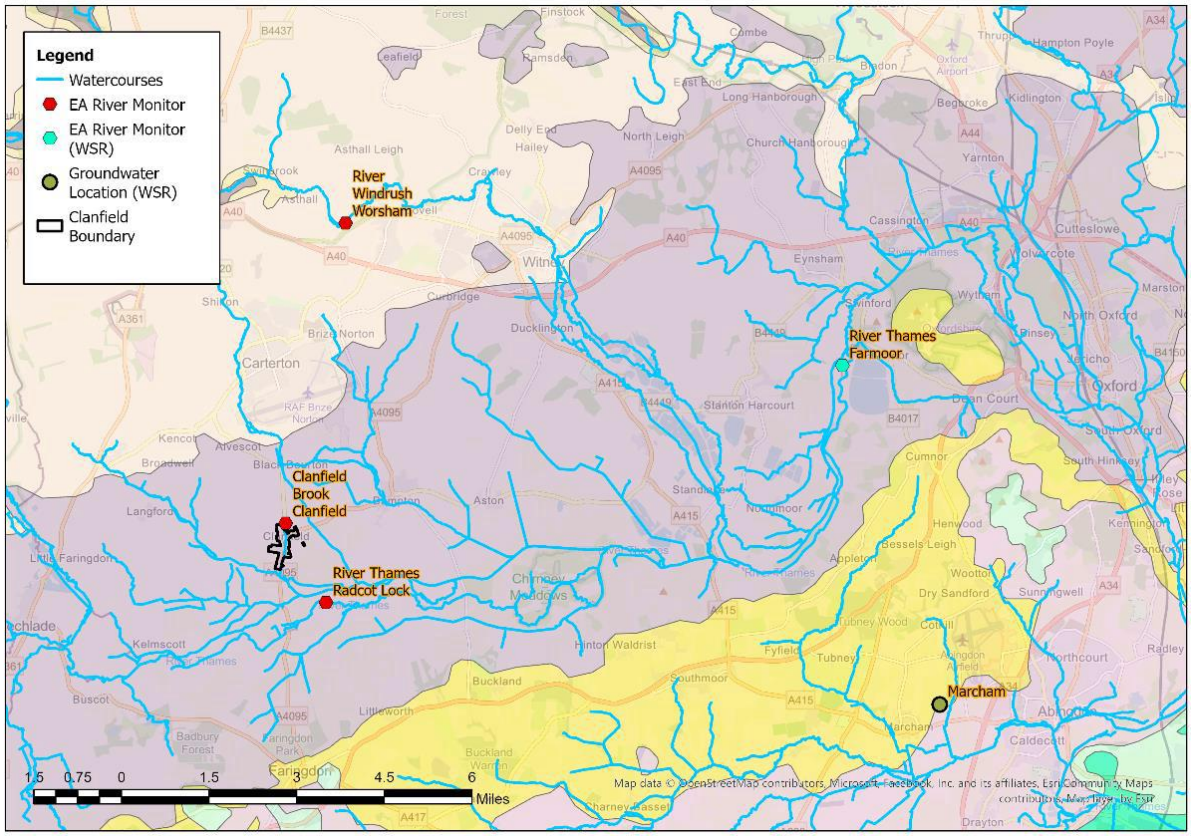
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

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

- River Windrush at Worsham
- Clanfield Brook, Clanfield
- River Thames, Radcot Lock

These sites are illustrated in Figure 4 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 – Windrush at Worsham

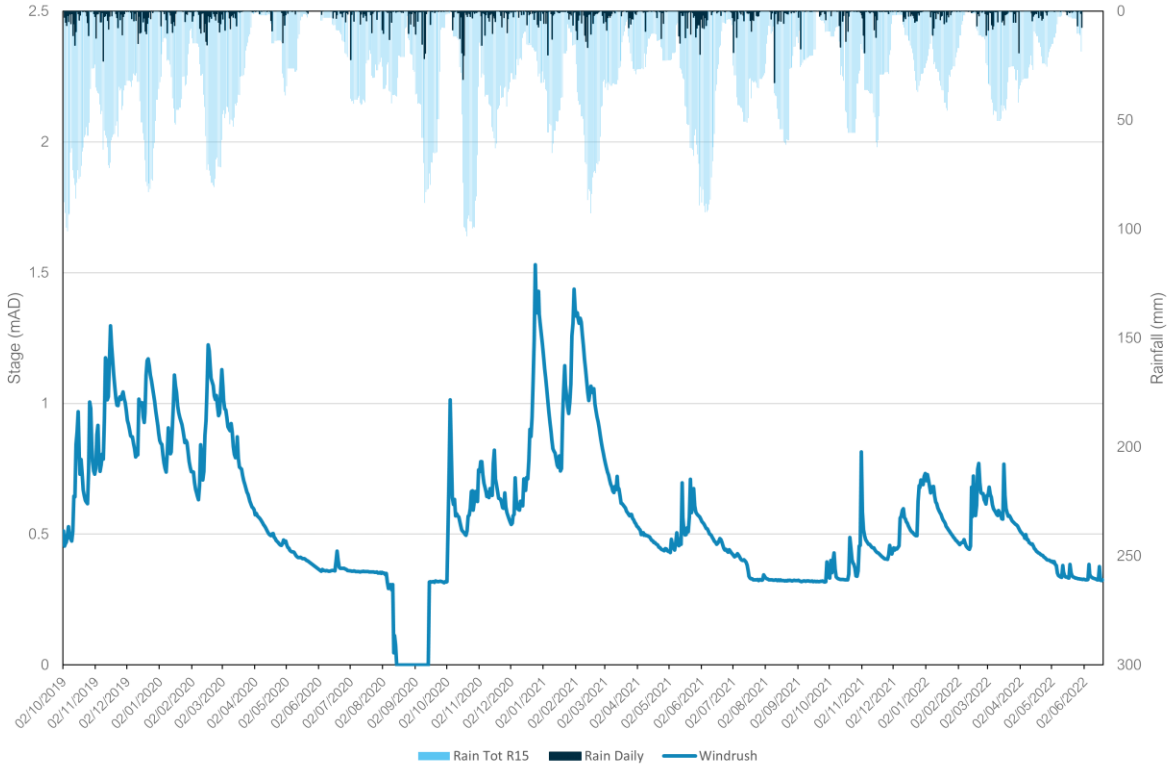


Figure 5B – Clanfield Brook at Clanfield

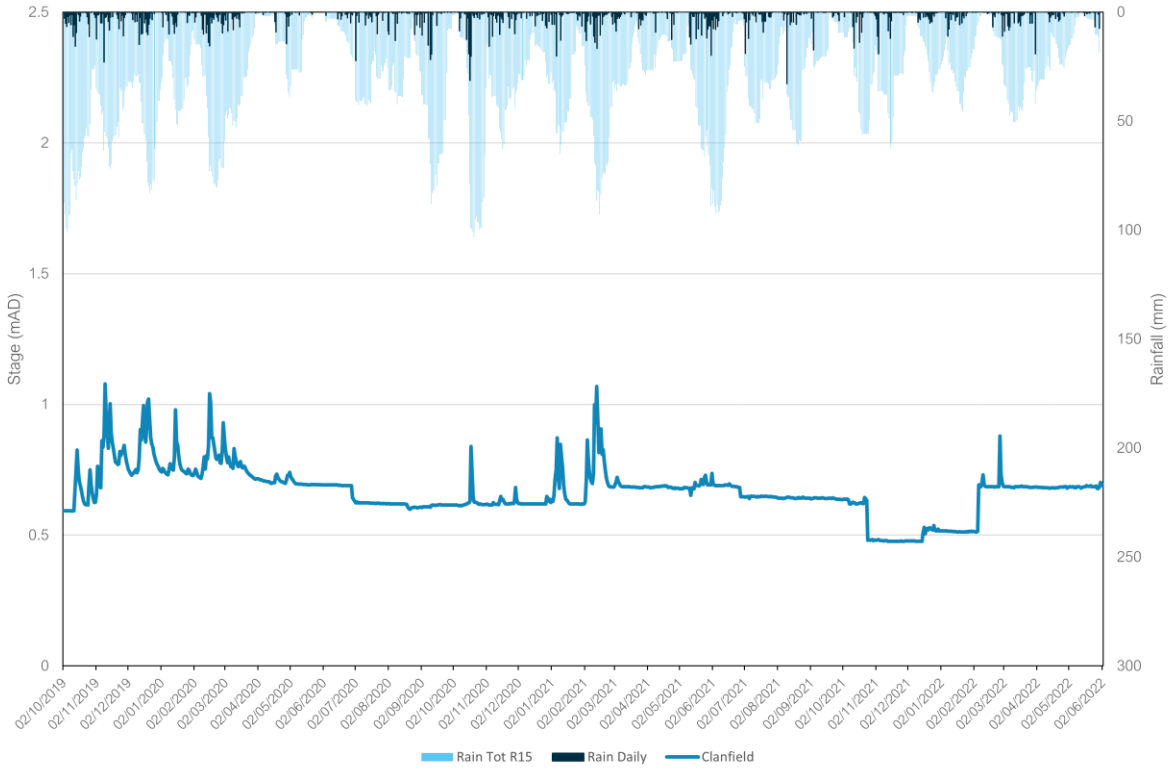
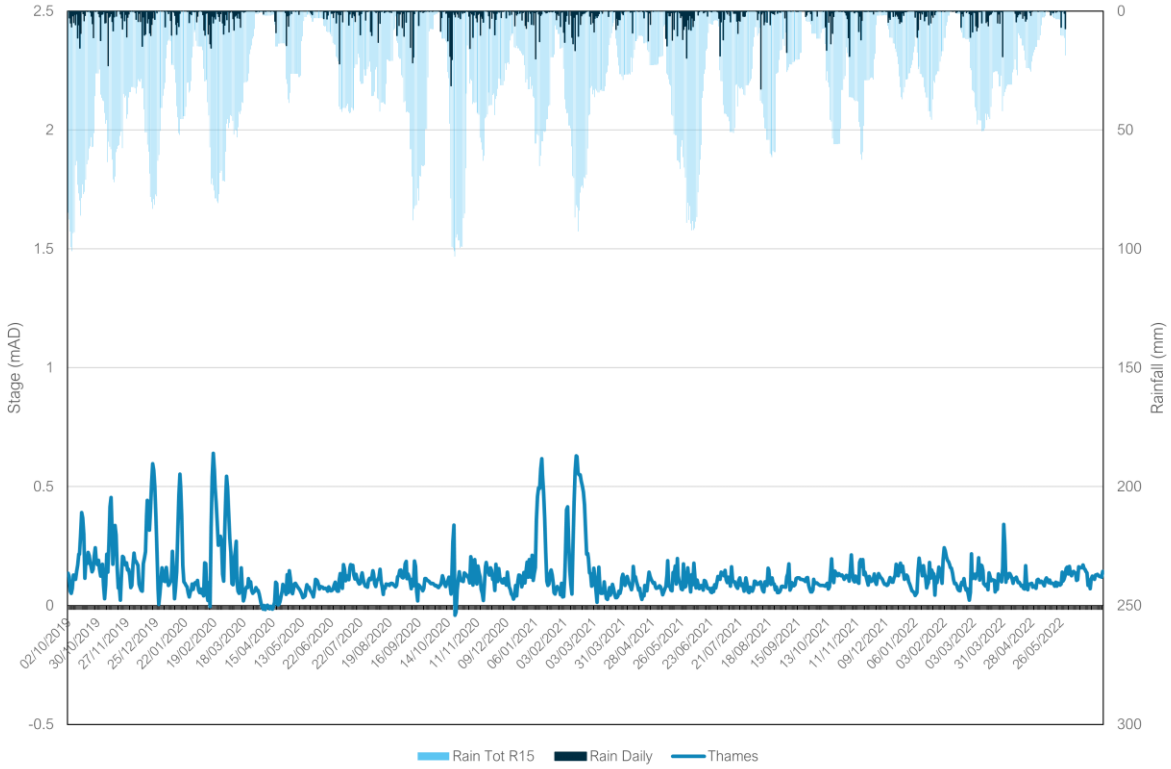
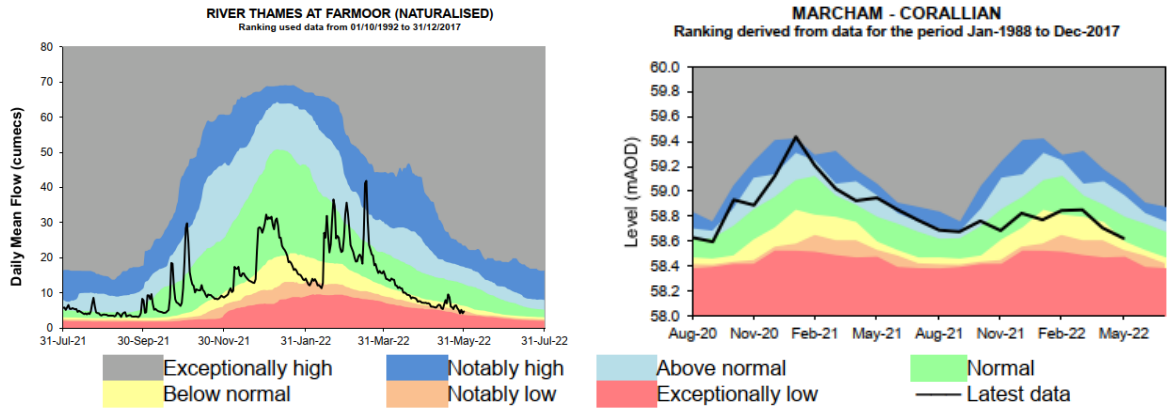


Figure 5C – River Thames at Radcot Lock



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for the Upper Thames. Whilst the Clanfield catchment does not sit within a principal aquifer, the closest groundwater reference station is Marcham. This site shows significantly lower overall groundwater than the previous year. This can be seen in the figure below alongside the river indicator location at Farmoor on the River Thames.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

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

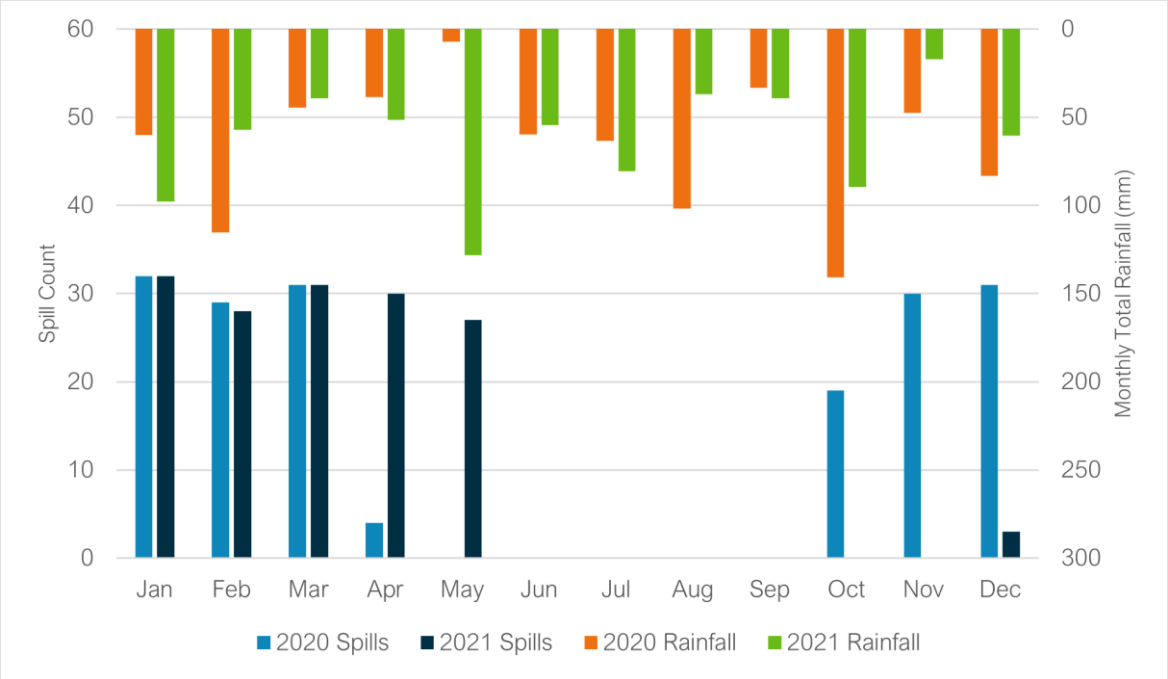
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2020		2021	
	Spills	Duration (hours)	Spills	Duration (hours)
Clanfield Marsh STW	176	3843.33	151	3504.00

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. Note that a spill count of 151 is stated for 2021, which is higher than the reported figure of 148. The spill count has been corrected/ re-validated and the revised figure of 151 will be included in the re-submission to the EA.

Figure 8 – EDM Monthly Performance



The trend in overflow performance suggests that spill at the overflow site is related to both groundwater level and rainfall. This can be seen in the different spill performance between 2020 and 2021 with comparable rainfall totals in month. It is particularly evident at the start of the hydrological years in October into December where spill frequency was significantly different despite broad similarities in rainfall. Note however, there were also operational issues at the STW in 2020, which may have impacted spill frequency.

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 5 monitors installed within the Clanfield catchment. There are no further monitor installs currently planned.

Remediation Works Undertaken this Hydrological Year

A temporary bio-filter unit (ATAC unit) was deployed at Clanfield STW on the 22/12/2020 in order to partially treat flows discharged to the river over and above what our storm tanks are able to hold, with the aim of improving the quality of flows arriving at the river. This has continued to be in place within the catchment and is being made a permanent feature in advance of October 2022 to support winter performance.

Within this year, the unit was activated on the 4/12/2021 and continues to run at the time of this report (July 22).

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Clanfield 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	136 metres
Look and lift survey	3 manholes
Sewer lining	281 metres
Patch lining	2 (due to be completed before end of November 2022)
Manhole sealing	1 manhole

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.

In addition to the interventions detailed for the 2021-2022 Hydrological Year, approval has been given to progress proposals for lining and sealing high risk sewers and manholes during AMP7 in the Clanfield catchment. Project definition and pre-survey will be undertaken over the next 3-6 months with lining and sealing to commence in year 4 of AMP7 (April 2023 – April 2024).

Summary

Rainfall in the Clanfield catchment over the 2021/22 hydrological year has been below average, with groundwater levels in the aquifer beneath Clanfield not reaching the levels seen in previous years. This is indicated in the lower number of EDM spills recorded at Clanfield STW in December 2021, in comparison to December 2020, when recorded groundwater levels were higher. Future comparison with 2022 spill frequency data will support the wider understanding of groundwater impact where observed levels show lower values within the winter period.

Remedial measures continue to be implemented and further extensive lining and manhole sealing is planned over the next year.

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.

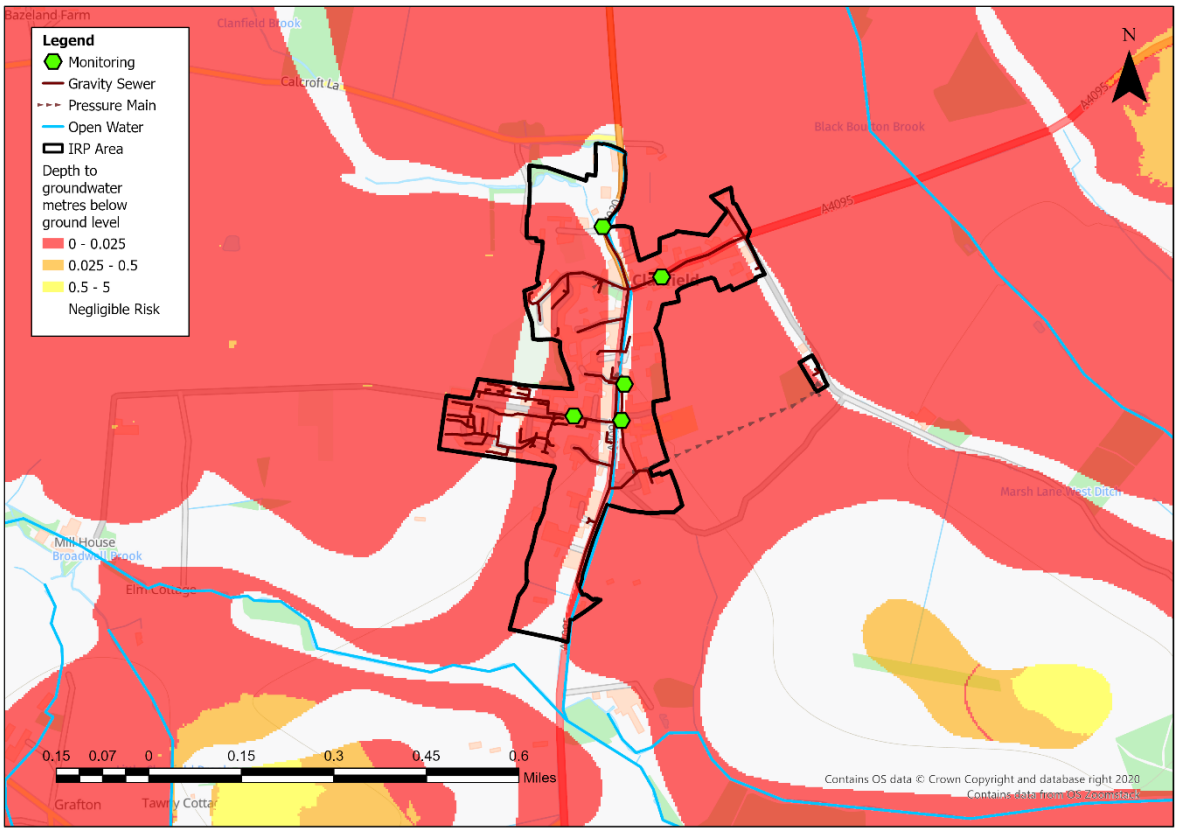
Addendum - Annual Update 2023
Table of contents

Overview

This addendum to the Clanfield Groundwater Impacted System Management Plan 2021 (GISMP) provides an update on performance/work undertaken in the Hydrological Year October 2022 to September 2023. 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 2023/24

Figure 1 – Clanfield Monitoring Plan



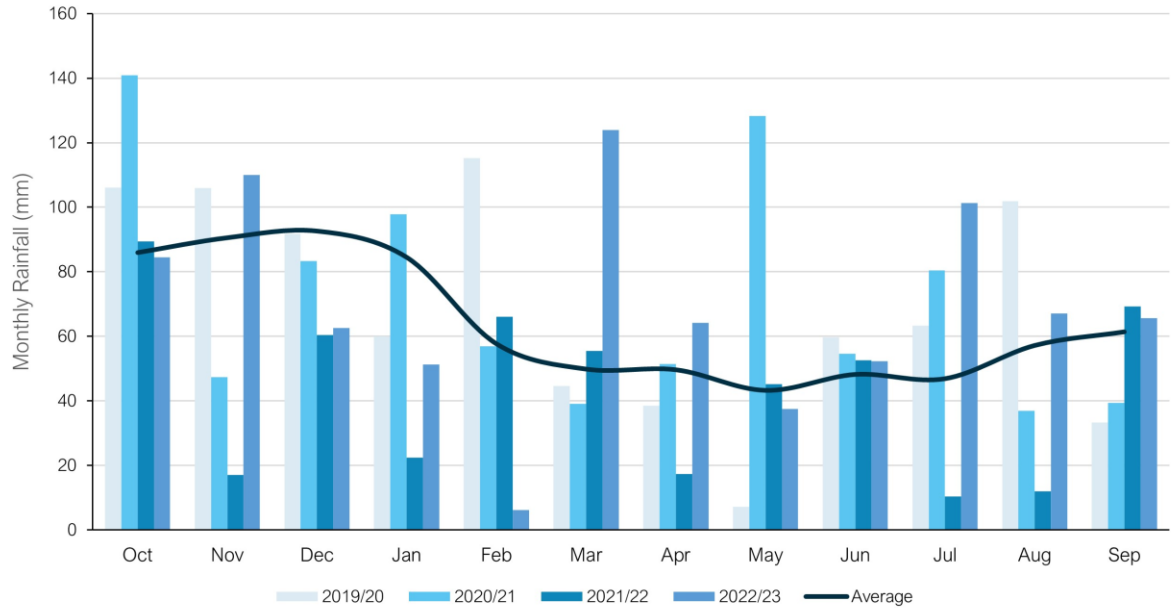
Hydrological Review – 2022-2023

This section summaries the hydrological conditions within the Clanfield 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 Thorney Island based on the period 1991-2020

The total rainfall for the 2022/23 hydrological year is 8% 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)
768	827	857	518	826

Groundwater / Local River Level

The Clanfield catchment is situated in the Upper Thames water resources area. It sits in the Oxford Clay and West Walton Formation of interbedded coarse/fine grained sediment. This formation is not a designated principal aquifer within the UK.

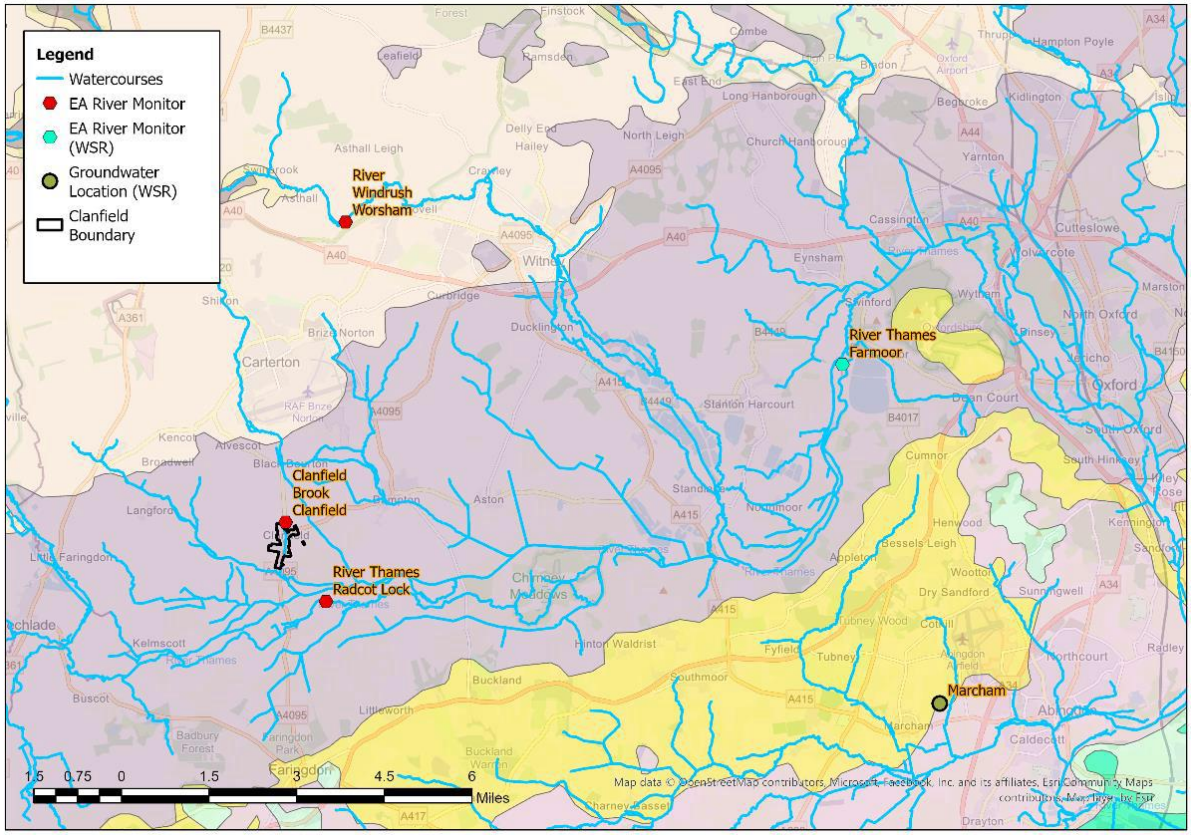
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

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

- River Windrush at Worsham
- Clanfield Brook, Clanfield
- River Thames, Radcot Lock

These sites are illustrated in Figure 4 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 – Windrush at Worsham

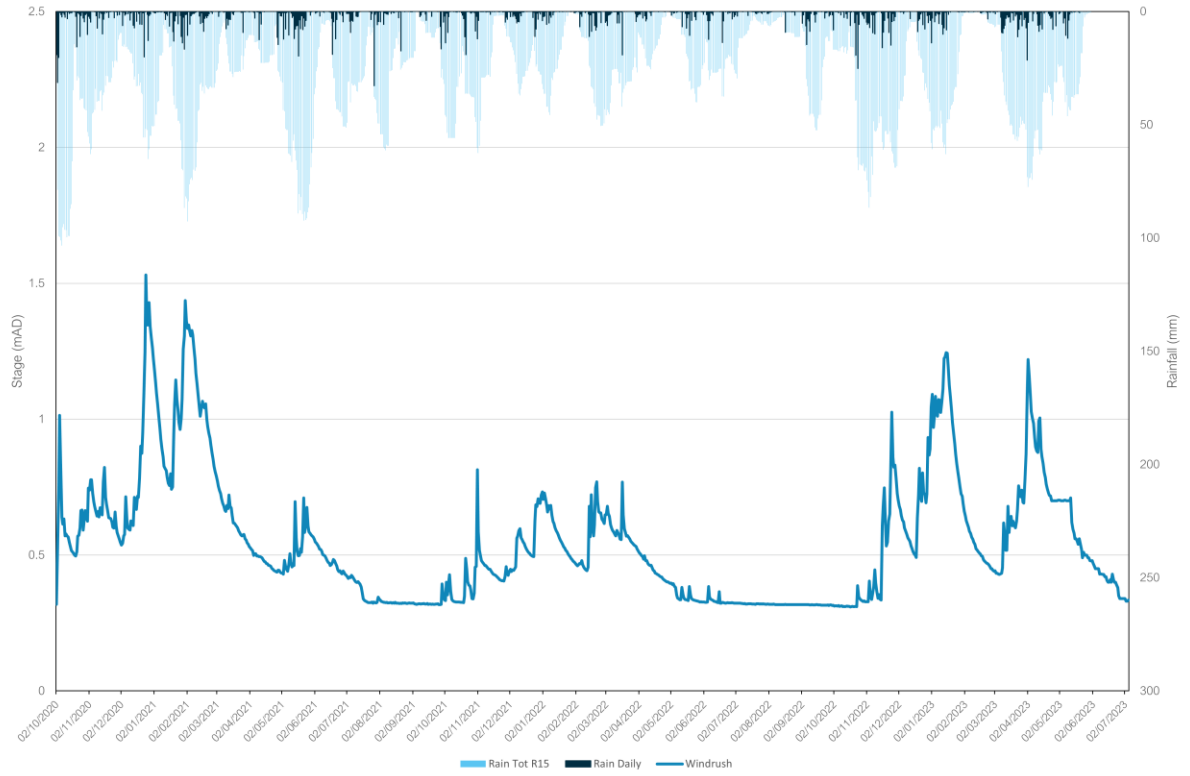


Figure 5B – Clanfield Brook at Clanfield

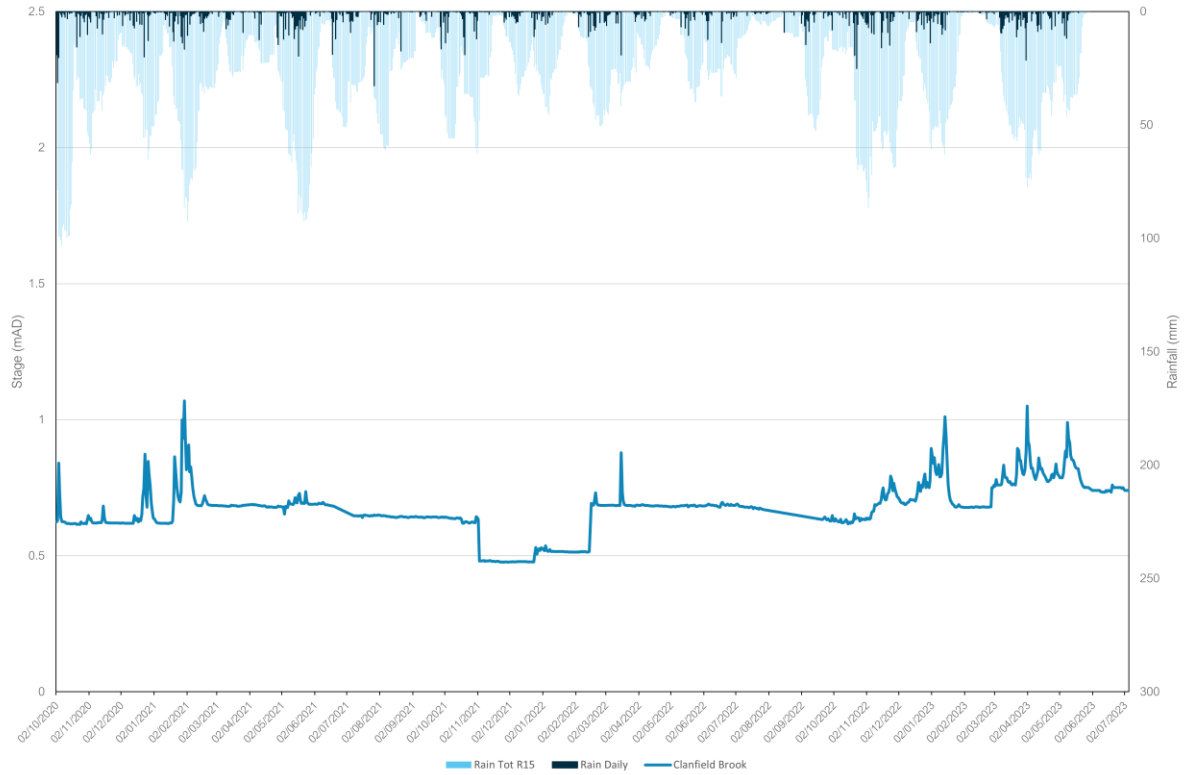
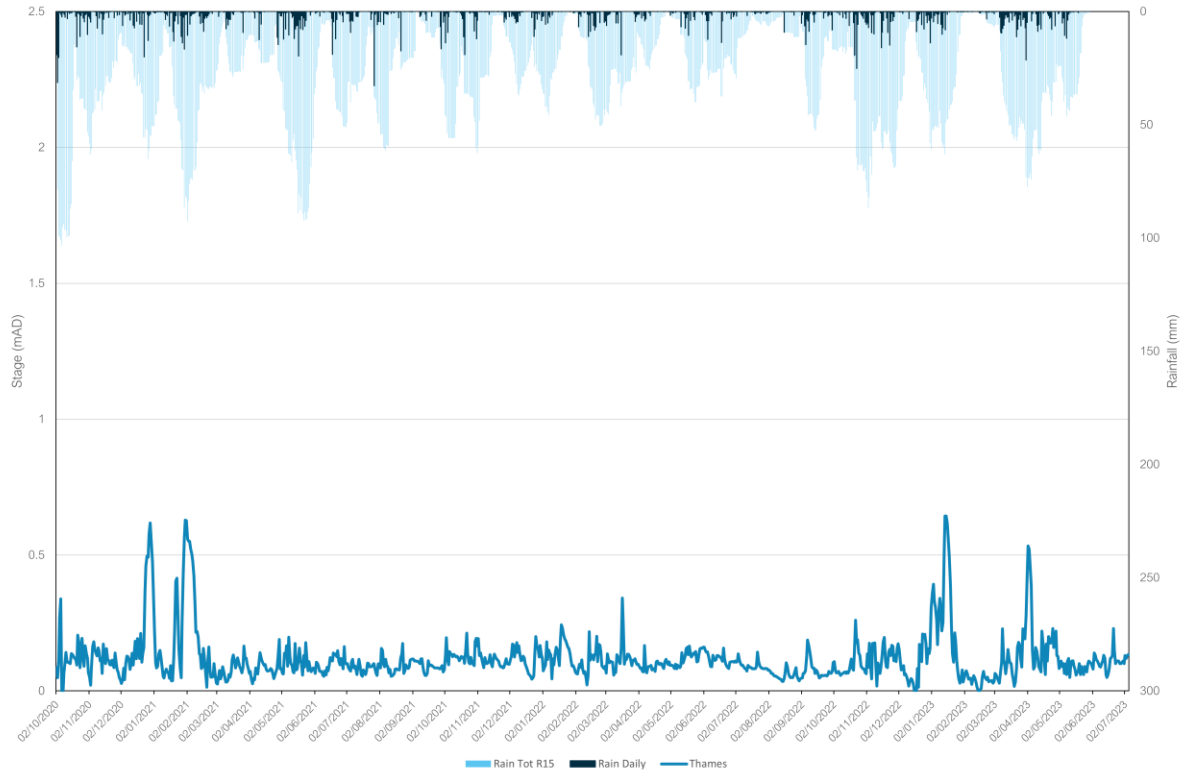
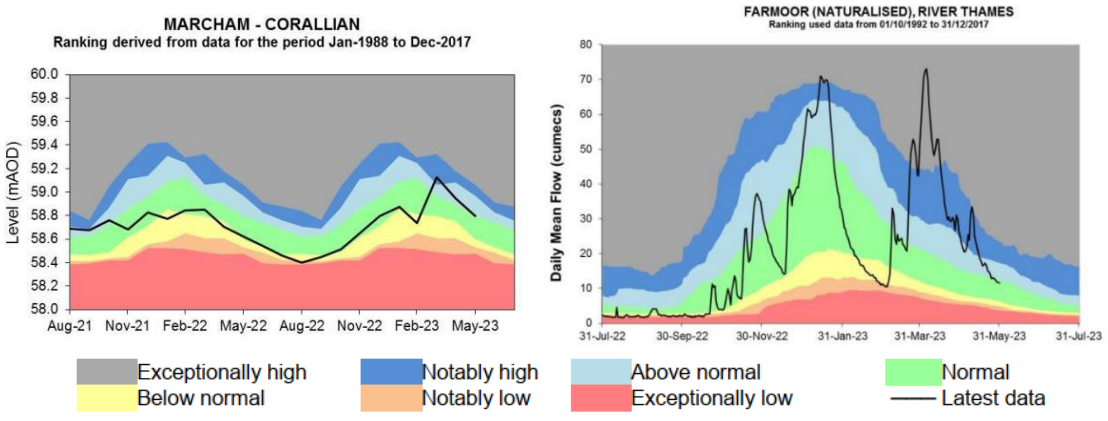


Figure 5C – River Thames at Radcot Lock



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for the Upper Thames. Whilst the Clanfield catchment does not sit within a principal aquifer, the closest groundwater reference station is Marcham. This site shows that groundwater levels in the year 2022 were generally at below normal or just above below normal levels. This hydrological year (October 2022 onwards), groundwater levels have generally been higher than the previous hydrological year. This can be seen in the figure below alongside the river indicator location at Farmoor on the River Thames.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

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

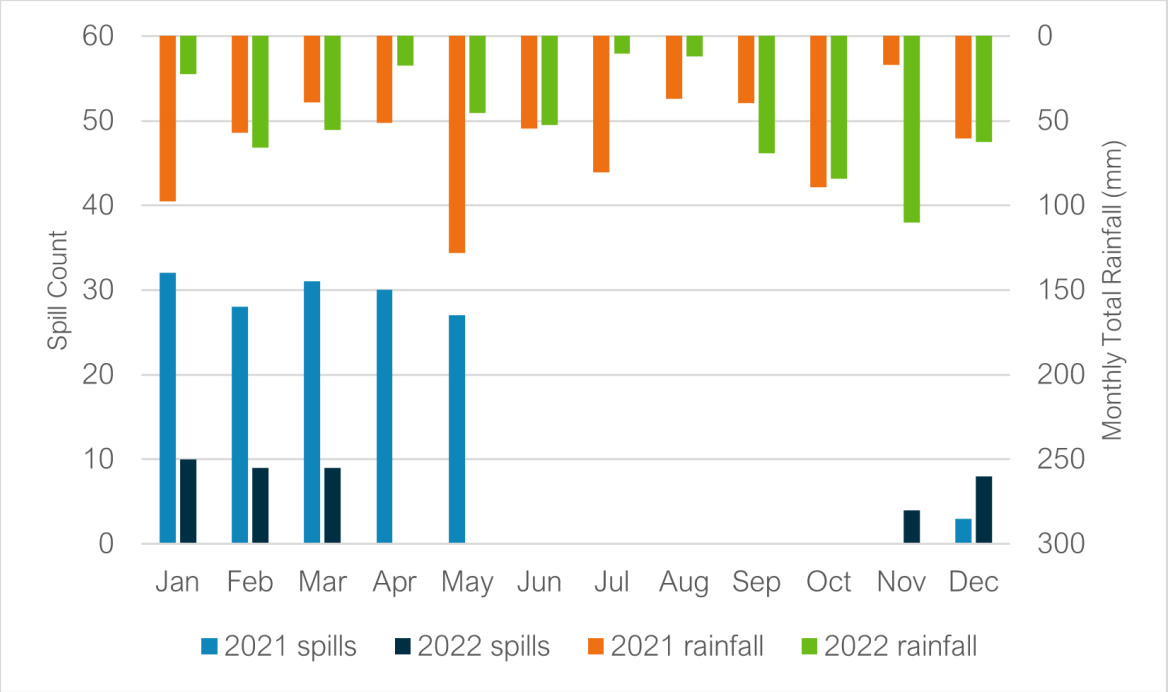
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2021		2022	
	Spills	Duration (hours)	Spills	Duration (hours)
Clanfield Marsh STW	151	3504.00	40	541.63

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. Note that a spill count of 151 is stated for 2021, which is higher than the previously published figure of 148. The spill count was revised/ revalidated, and 151 is the post-validation value.

Figure 8 – EDM Monthly Performance



The trend in spill performance does show variation in spills, with a focus on spills during the autumn, winter and spring months. The data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency. For example, despite broadly similar rainfall totals, significantly more spills were recorded at Clanfield Marsh STW in February and March 2021 compared to the same months in 2022. The Windrush at Worsham indicator site shown in Figure 5, suggests groundwater levels in the catchment were significantly higher in February and March 2021, with Figure 6 suggesting groundwater levels in the catchment were just above or at below normal levels in February and March 2022. Similar trends can be observed for April and May.

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 5 monitors installed within the Clanfield catchment. There are no further monitor installs currently planned.

Remediation Works Undertaken this Hydrological Year

A temporary bio-filter unit (ATAC unit) was deployed at Clanfield STW on the 22/12/2020 to partially treat flows discharged to the river over and above what the storm tanks are able to hold, with the aim of improving the quality of flows arriving at the river. This was made a permanent feature in advance of October 2022.

Table 9 below provides a summary of the investigations and remediation works undertaken or planned within the Clanfield 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 & in the 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 2021/22	Number/ length undertaken 2022/23
CCTV survey	136 metres	N/A
Look and lift survey	3 surveys	2 surveys
Sewer lining	281 metres	N/A
Patch lining	N/A	2*
Manhole sealing	1 manhole	N/A

**Detailed in last year's report as still outstanding, completed this hydrological year*

Previously lined sewers will be surveyed as part of this process to ensure that the liners are still intact.

An upgrade, currently in the design phase, is also planned for Clanfield STW. This will improve its ability to treat the volumes of incoming sewage, reducing the need for untreated discharges to the environment. The scheme is due to be completed in 2026.

Summary

Indicator site data suggests groundwater levels in the Clanfield catchment were generally lower in 2022 than in 2021, with trends in the EDM data indicative of the role of groundwater infiltration on spills in the catchment. This hydrological year (October 2022 – September 2023), 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.

Remedial measures continue to be implemented and further extensive lining and manhole sealing is planned over the remainder of AMP7.

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.

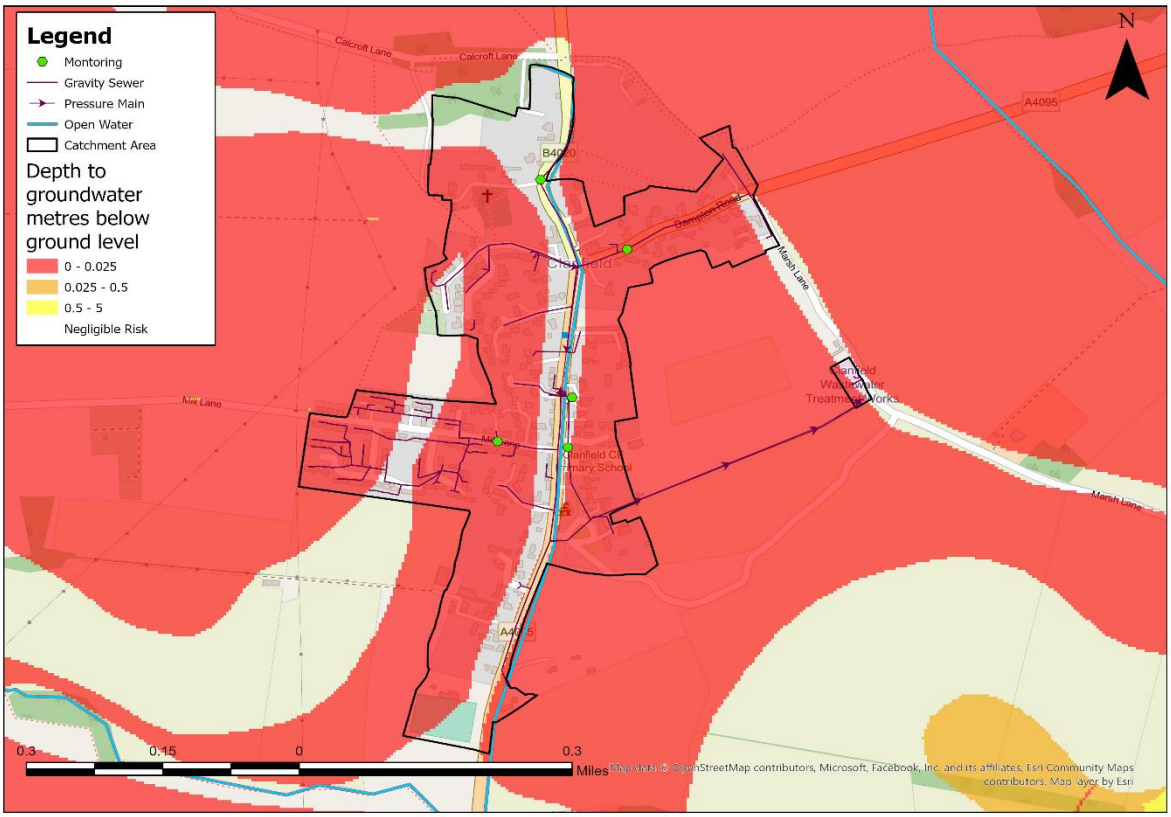
Addendum - Annual Update 2024
Table of contents

Overview

This addendum to the Clanfield 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 – Clanfield Monitoring Plan



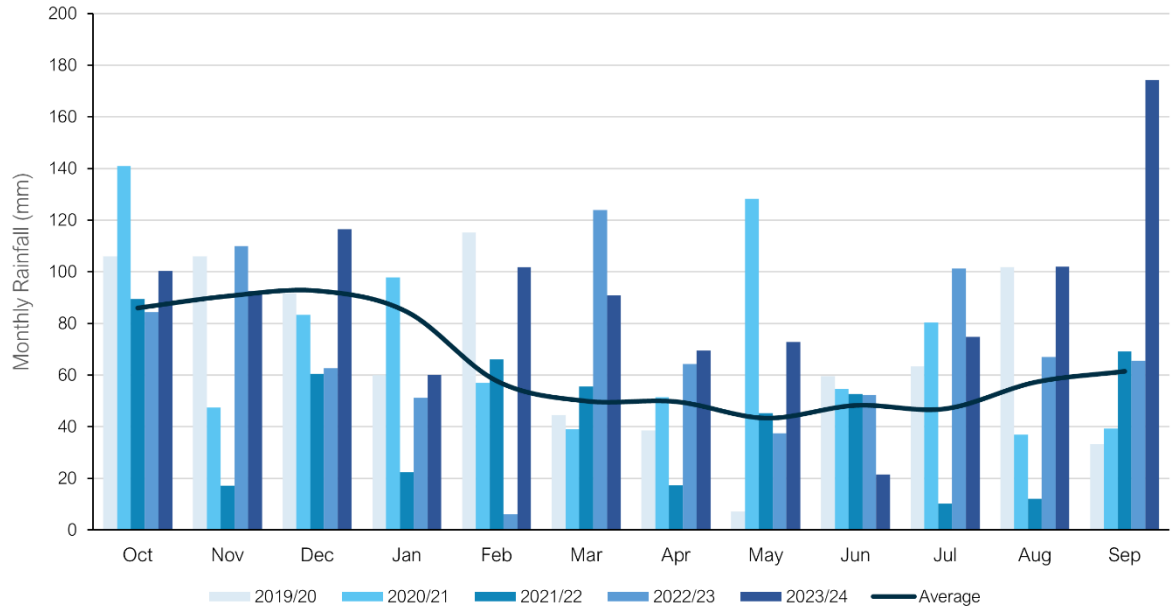
Hydrological Review – 2023-2024

This section summaries the hydrological conditions within the Clanfield 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 Thorney Island based on the period 1991-2020

The total rainfall for the 2023/24 hydrological year is 40% 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)
768	827	857	518	826	1077

Groundwater / Local River Level

The Clanfield catchment is situated in the Upper Thames water resources area. It sits in the Oxford Clay and West Walton Formation of interbedded coarse/fine grained sediment. This formation is not a designated principal aquifer within the UK.

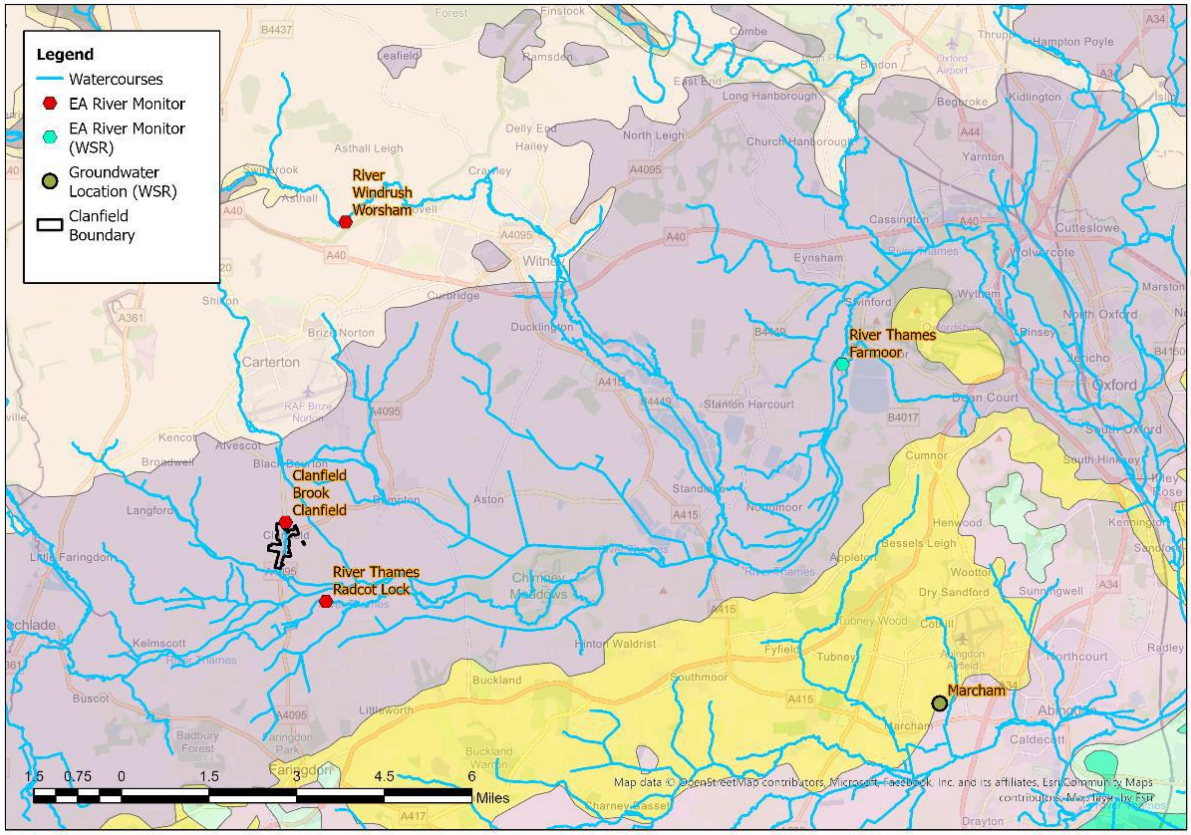
The Environment Agency has gauging stations on local watercourses measuring stage and observation boreholes (OBH) measuring groundwater levels locally to the catchment which can be used to provide indicative local groundwater performance.

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

- River Windrush at Worsham
- Clanfield Brook, Clanfield
- River Thames, Radcot Lock

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

Figure 4 – Local Monitoring Stations



Figures 5A-5C 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 – Windrush at Worsham

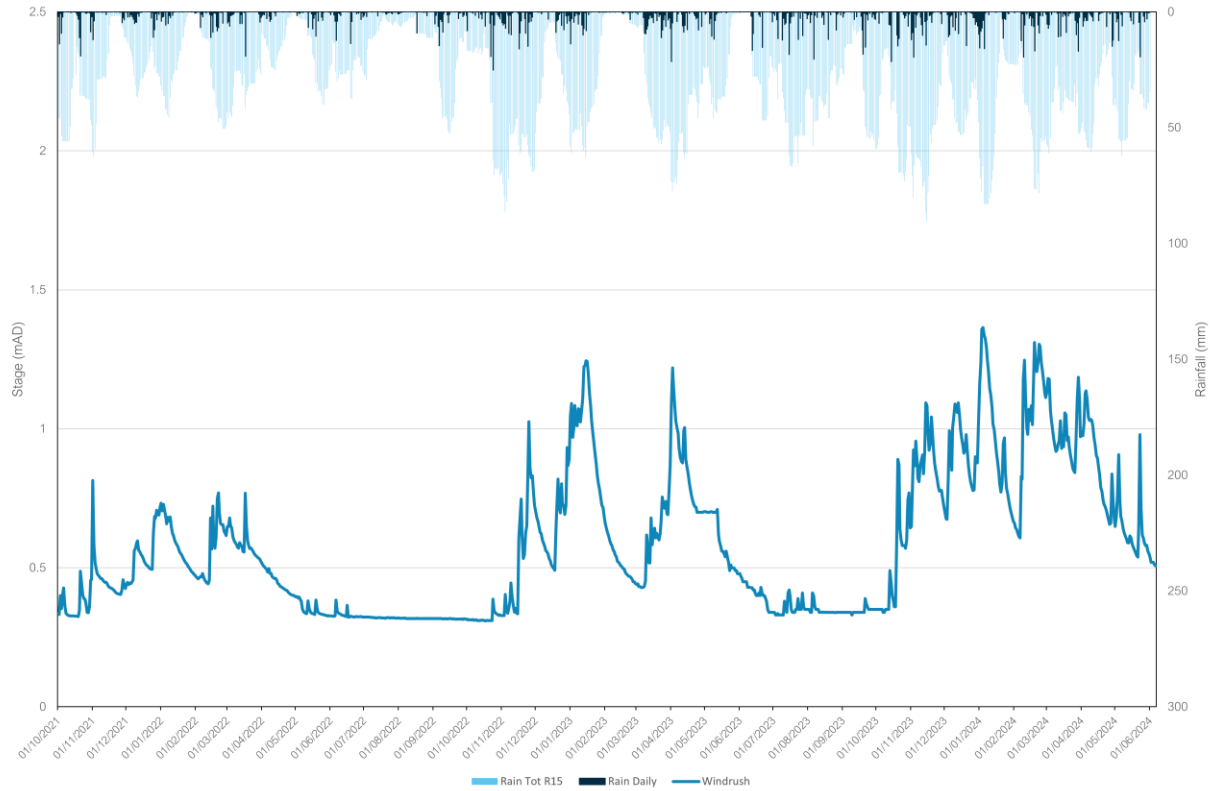


Figure 5B – Clanfield Brook at Clanfield

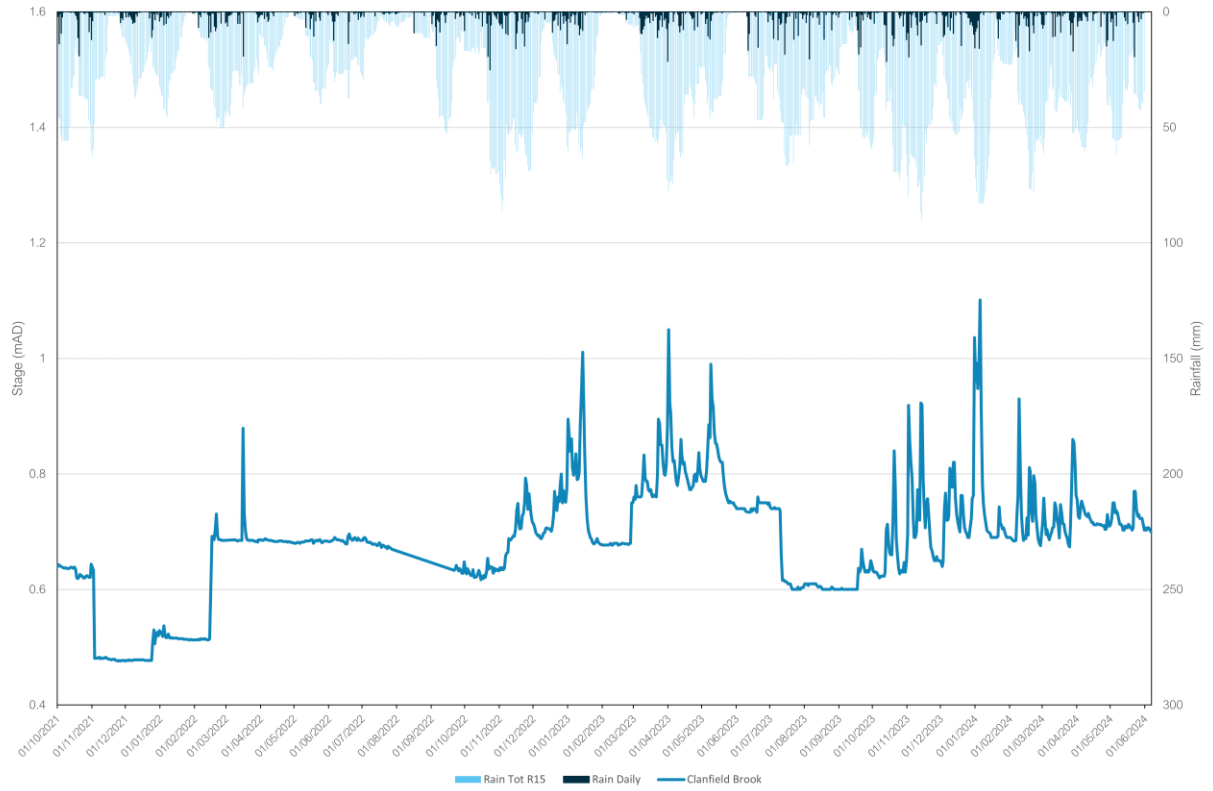
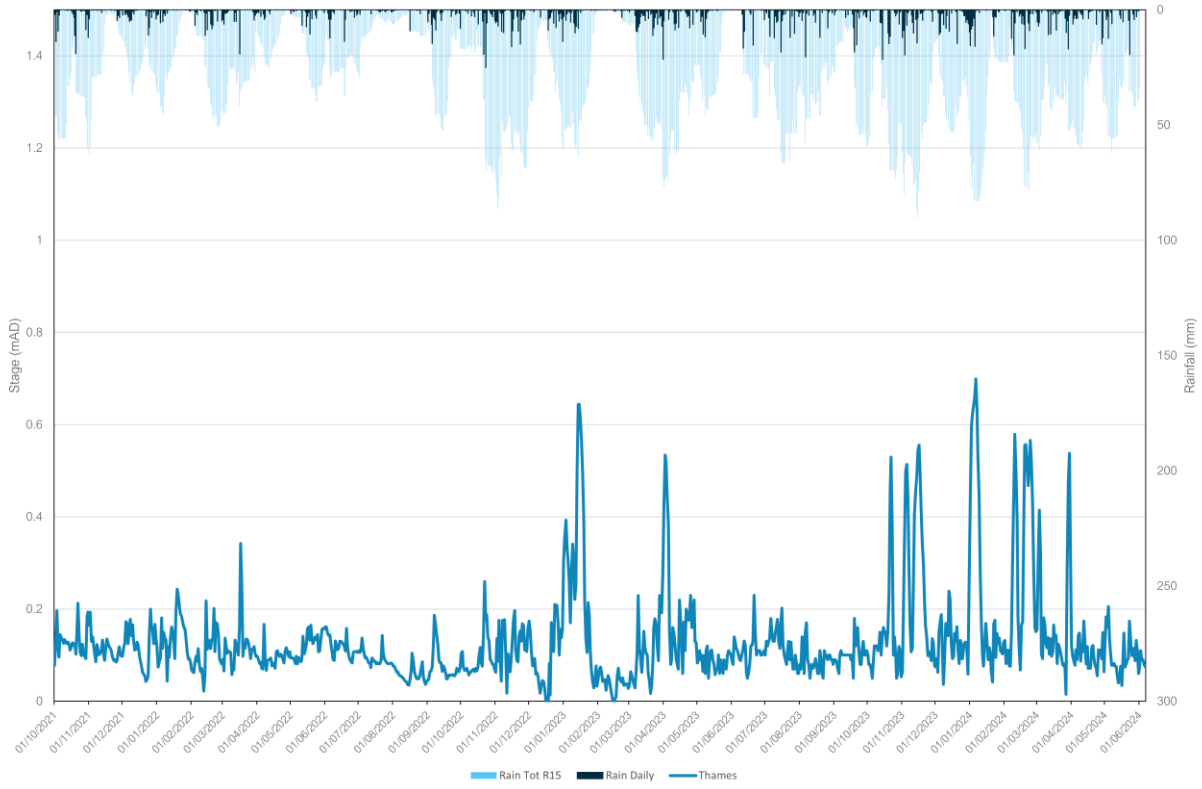
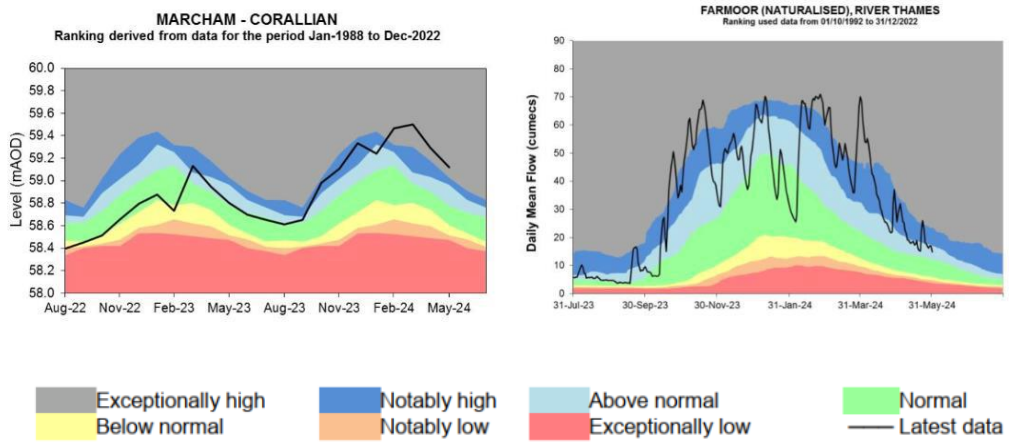


Figure 5C – River Thames at Radcot Lock



In addition to these specific stations, the wider groundwater context is illustrated in the Water Situation Report for the Upper Thames. Whilst the Clanfield catchment does not sit within a principal aquifer, the closest groundwater reference station is Marcham. Groundwater levels at this site have increased significantly since 2023, reaching exceptionally high levels in 2024, as can be seen in Figure 6 alongside the river indicator Farmoor on the River Thames.

Figure 6 – Water Situation Report



Extract from - [Water Situation Report (publishing.service.gov.uk)]

Network Performance

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

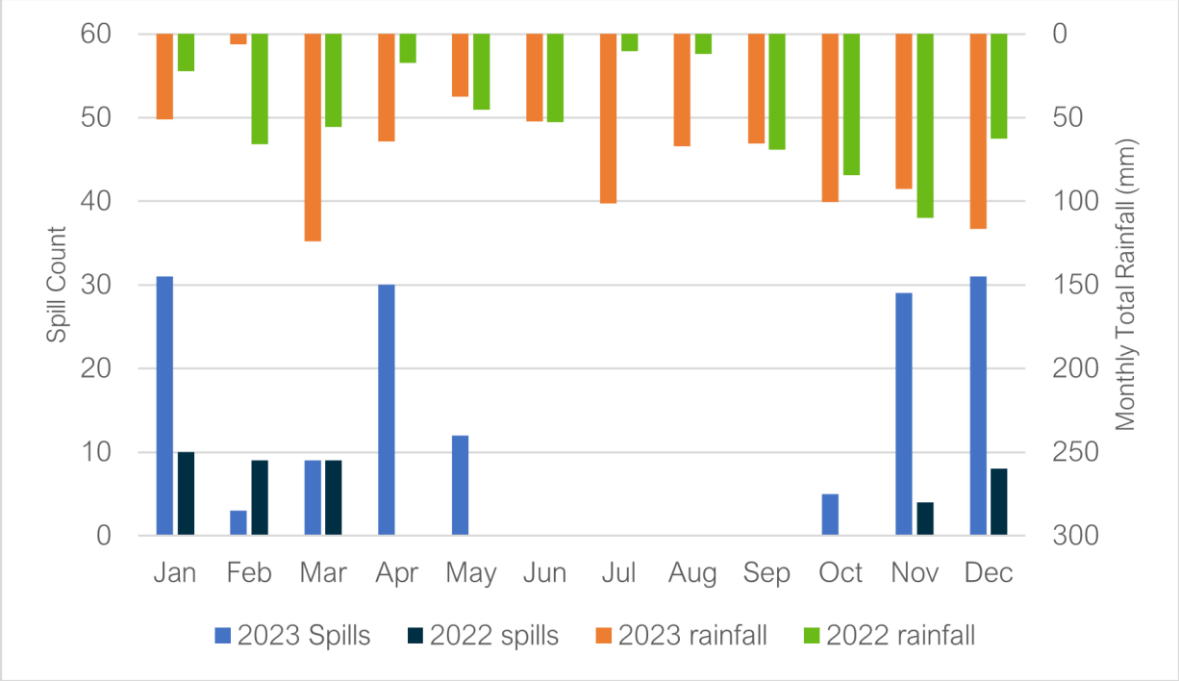
Table 7 below details the last 2 years performance of overflows within the catchment.

Table 7 – Event Duration Monitoring

Overflow	2022		2023	
	Spills	Duration (hours)	Spills	Duration (hours)
Clanfield Marsh STW	40	541.63	150	3156.00

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 data suggests a wider relationship between rainfall, elevated groundwater levels and spill frequency, with a focus on spills during the autumn, winter, and spring months. A significantly higher number of spills occurred at Clanfield Marsh STW in January, April and May 2023 compared to the same months in 2022. The indicator site data shown in Figures 5 and 6 suggests that groundwater levels in the catchment became elevated during January, April and May 2023 and reached higher levels than those observed in the same months in 2022. Similarly, a high number of spills occurred at Clanfield Marsh STW in November and December 2023, when the indicator site data shown in Figure 6 suggests groundwater levels in the catchment were at above normal/ notably high levels.

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 5 monitors installed within the Clanfield catchment. There are no further monitor installs currently planned.

Remediation Works Undertaken this Hydrological Year

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

Table 9 – Works Undertaken in the 2023/24 Hydrological Year, 2022/23 Hydrological Year & 2021/22 Hydrological Year

Investigation/ remediation type	Number/ length undertaken 2021/22	Number/ length undertaken 2022/23	Number/ length undertaken 2023/24
CCTV survey	136 metres	N/A	N/A
Look and lift survey	3 surveys	2 surveys	N/A
Sewer lining	281 metres	N/A	1.24 kilometres
Patch lining	N/A	2	N/A
Manhole sealing	1 manhole	N/A	145 manholes*

**Mix of manhole sealing and manhole sealing plates.*

In addition to the interventions detailed for the 2023-2024 Hydrological Year, GISMP strategic level sealing of high and medium risk assets in the Clanfield system to continue throughout the summer 2023/24 period, continuation of this programme will require groundwater to be at manageable levels to proceed with lining and sealing.

An upgrade, currently in the design phase, is also planned for Clanfield STW. This will improve its ability to treat the volumes of incoming sewage, reducing the need for untreated discharges to the environment. The scheme is due to be completed in 2026; however, delivery dates are being managed at a programme level, delivery dates stated are based upon current views and are subject to change.

Furthermore, an ATAC treatment unit has been permanently installed in the storm discharge line at Clanfield STW, to provide some treatment of flows over and above what the storm tanks are able to hold, with the aim of improving the quality of flows arriving at the river.

It is expected that this catchment will meet all government targets for storm overflows by 2030- 35.

Summary

Indicator site data suggests that groundwater levels in the Clanfield catchment this hydrological year (October 2023 – September 2024), have generally been higher than those observed in the previous hydrological year. The EDM spill data for 2023 is indicative of a wider relationship between rainfall, elevated groundwater levels and spill frequency in the catchment. The spill data for 2024 will be analysed once available to continue to examine the relationship between groundwater levels and overflow spills in the catchment.

Remedial measures continue to be implemented, and further extensive lining and manhole sealing is planned over the remainder of AMP7.

Table of contents

Cotswolds river basin summary

The Thames Water region covers the length of the River Thames from its source down to Tilbury including all its tributaries. The sewer network has overflows that discharge along the River Thames and its associated tributaries. The role of storm overflows in the network is to protect against property flooding from the sewerage system. Storm overflows, which may be augmented with settlement tanks, are employed to optimise the split between wastewater treatment and the management of rainfall. Storm separation is typically designed in accordance with regulatory guidance.

Aligned with our Drainage and Wastewater Management Plan (DWMP) approach, the Thames Water region has been split into River Basins, each contains a varying number of localised sewer networks. Taking this approach allows alignment to the different drivers in each river basin and provides and efficient way to investigate, tackle performance and protect the environment. This report covers the performance of the sewer networks within the Cotswolds River Basin which are heavily influenced by groundwater infiltration into the network.

The Cotswold River Basin covers the upper reaches of the River Thames including its associated tributaries and streams. The river basin contains ten heavily groundwater impacted Thames Water localised sewer systems that interact with various rivers and streams forming the tributaries to the River Thames. Each localised sewer system contains one or more storm overflows located at sewage treatment works (STW) and/or in the network. Figure 1 shows the relationship between the sewer systems and the associated rivers and streams. Figure 2 shows the location of each localised sewer system within the Cotswold River Basin with an insert showing the location of the Cotswold River Basin in relation to the Thames Water Region.

Sewer System	Associated River / Stream	Relationship to the River Thames
Bourton-on-the-Water STW	River Windrush	Direct tributaries of the River Thames
Broadwell STW	Broadwell Brook	Indirect tributary of the River Thames via Great Brook
Carterton STW	Shill Brook, River Windrush	Shill Brook indirect tributary of the River Thames via Great Brook. River Evenlode direct tributary of the River Thames.
Chadlington STW	River Evenlode	Direct tributary of the River Thames
Clanfield STW	Clanfield Brook	Indirect tributary of the River Thames via Broadwell Brook then Great Brook.
Faringdon STW	Faringdon Brook	Indirect tributary of the River Thames via the River Ock
Milton-Under-Wychwood STW	River Evenlode	Direct tributary of the River Thames
Moreton-in-Marsh STW	River Evenlode	Direct tributary of the River Thames
Standlake STW	River Windrush	Direct tributary of the River Thames
Witney STW	River Windrush	Direct tributary of the River Thames

Figure 1: Relationship of the Sewer Systems to Associated Rivers

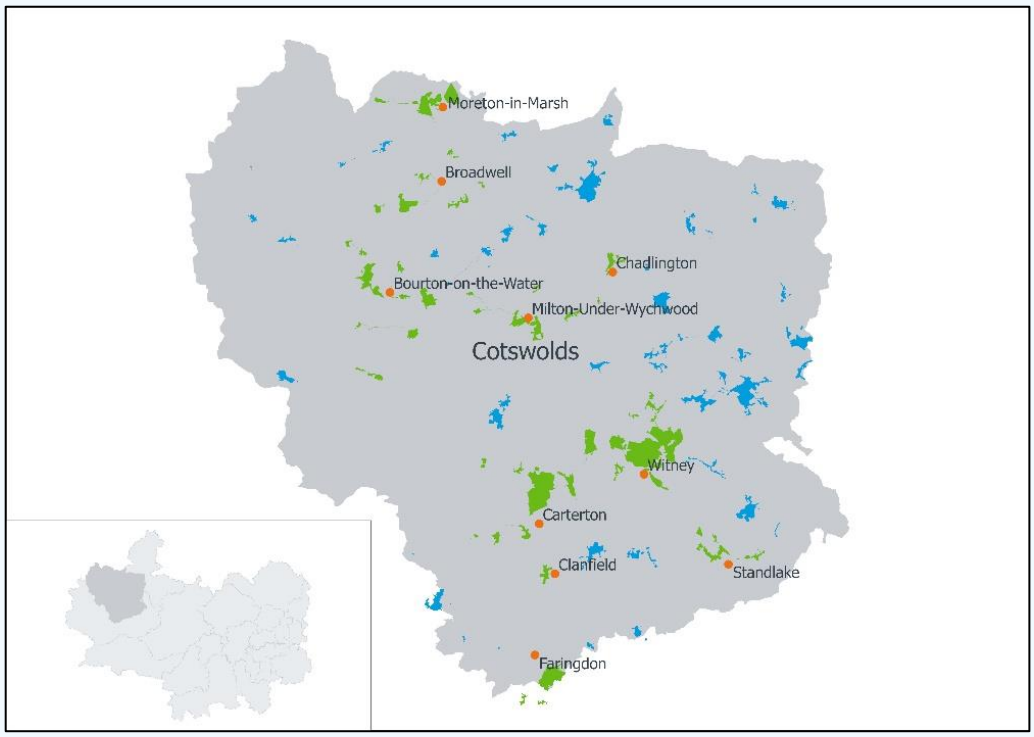


Figure 2: Location of Sewer Systems Within the Cotswold River Basin

Bourton-on-the-Water

Bourton-on-the-Water lies on the River Windrush in Gloucestershire, approximately 4 miles South of Stow-on-the-Wold and 14 miles East of Cheltenham.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Bourton-on-the-Water sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with reduced river levels (Figures 2 and 3), as well as a decline in the number and duration of CSO spills shown in Figure 5.

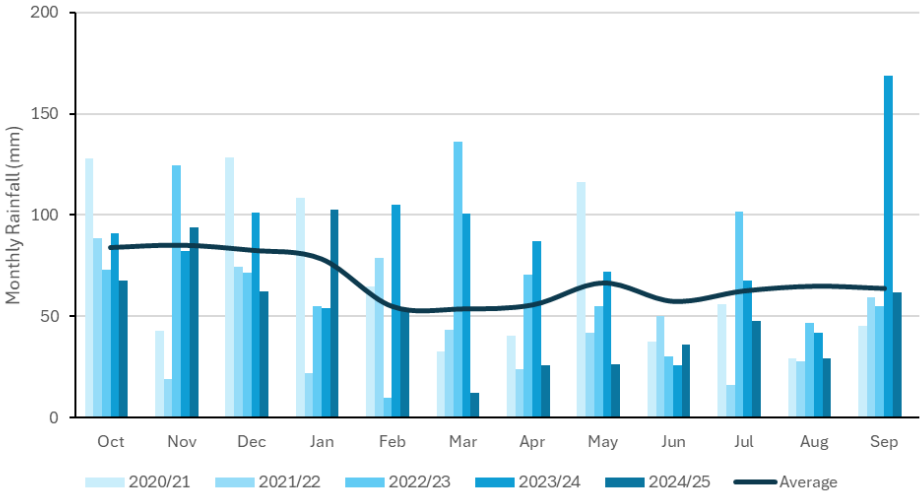


Figure 1: Monthly rainfall data 2020/21 to 2024/25

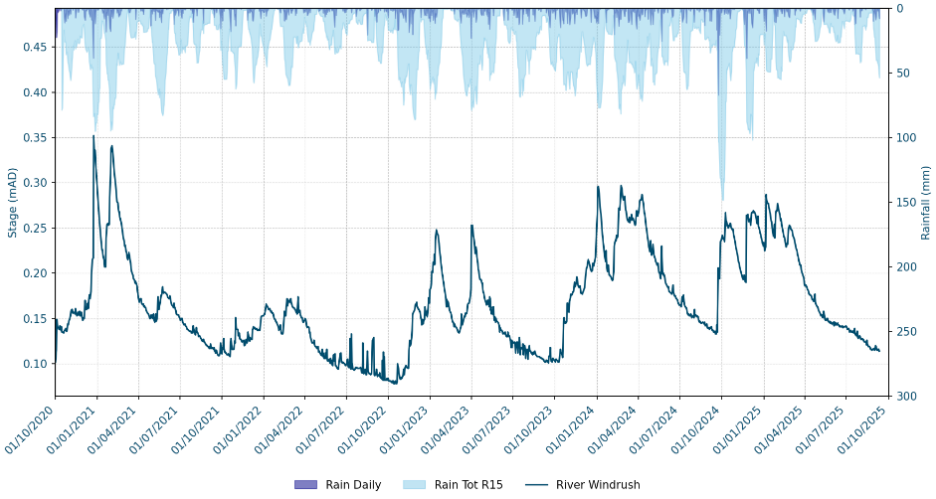


Figure 2: River Level data for Windrush, Bourton Windrush

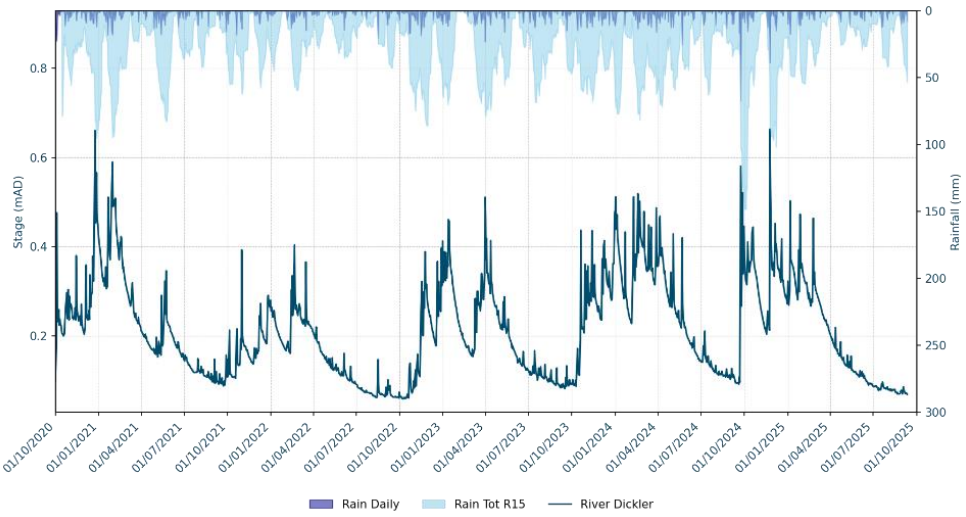
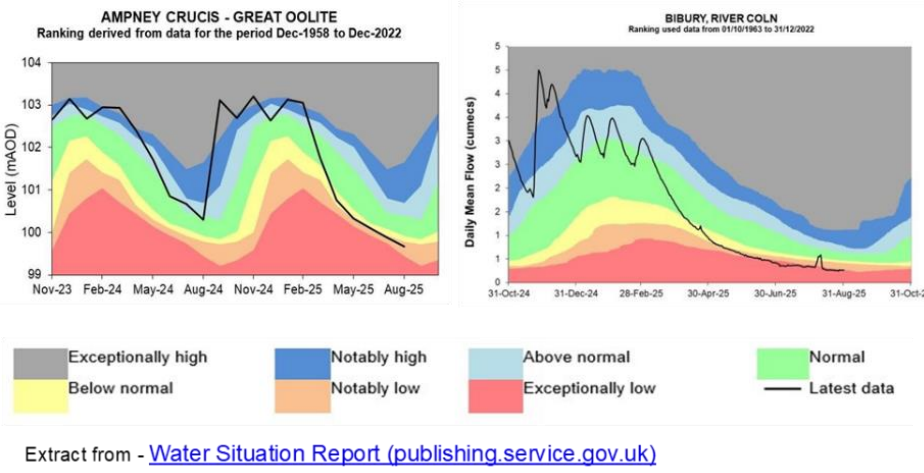


Figure 3: River Level data for Dickler, Bourton Dickler



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Bourton-on-the-Water STW	110	1565.25	153	2583.15

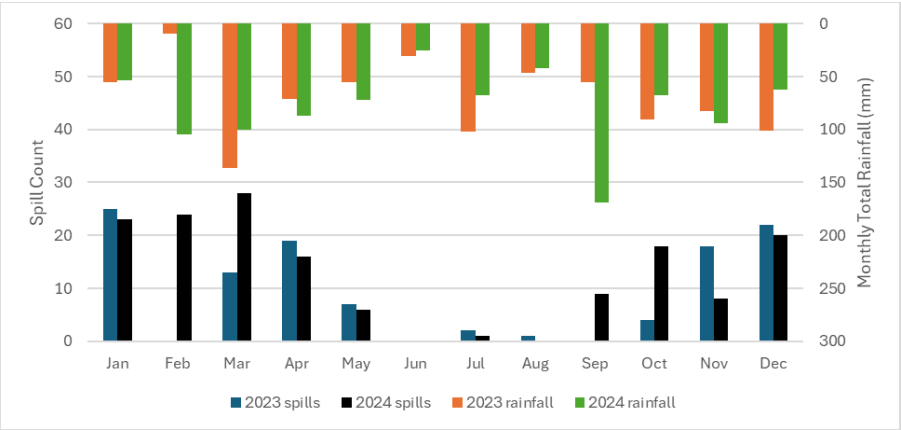


Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Bourton-on-the-Water STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	1,756m	1,177m	-
Look and lift surveys	-	-	-	61	-
Sewer lining	-	4,123m	2,347m	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	338	31	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 5). Moreover, groundwater levels for 2024/2025 have stayed relatively similar to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Broadwell

Broadwell is located in Gloucestershire, approximately 2 miles south of Moreton-in-Marsh and 2 miles west of Chipping Norton.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Broadwell sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 2 illustrate the relationship between rainfall and spills at CSOs. Figure 1 displays the reduced rainfall recorded in 2024/25 compared to 2023/24. Figure 2 represents a decreased number and duration of CSO spills from 2023/24 to 2024/25

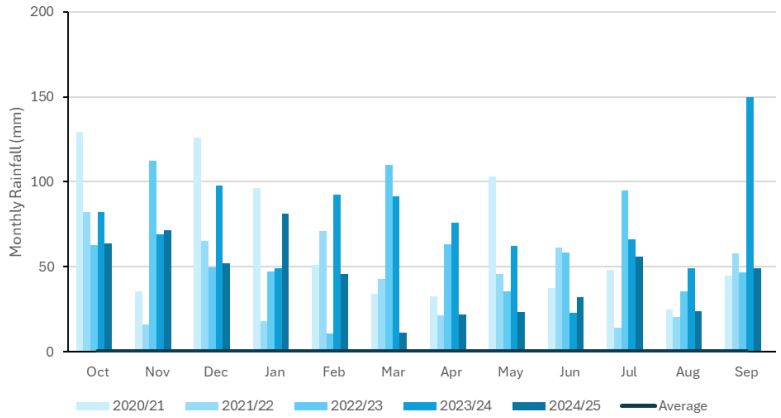


Figure 1: Monthly rainfall data 2020/21 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Broadwell STW	48	634.25	58	755.30

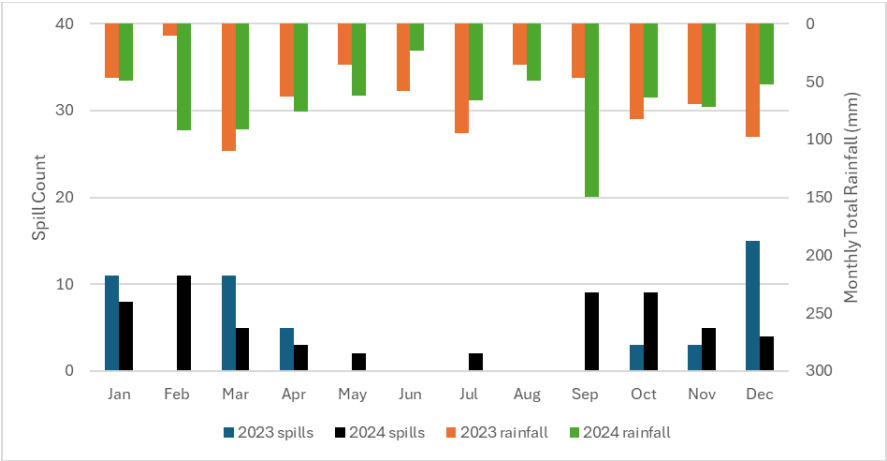


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Broadwell STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2023/24	2023/24	2024/25
CCTV surveys	-	-	-	600m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 2). This suggests that rainfall directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the spills are spread out throughout the year, with February having the higher number of spills 2024, but not being the wettest month.

Carterton

Carterton is located in West Oxfordshire, approximately 4 miles south-west of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Carterton sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with the decline in the number and duration of CSO spills shown in Figure 5. However, river and groundwater levels (Figures 2 and 3) have remained consistent with previous years.

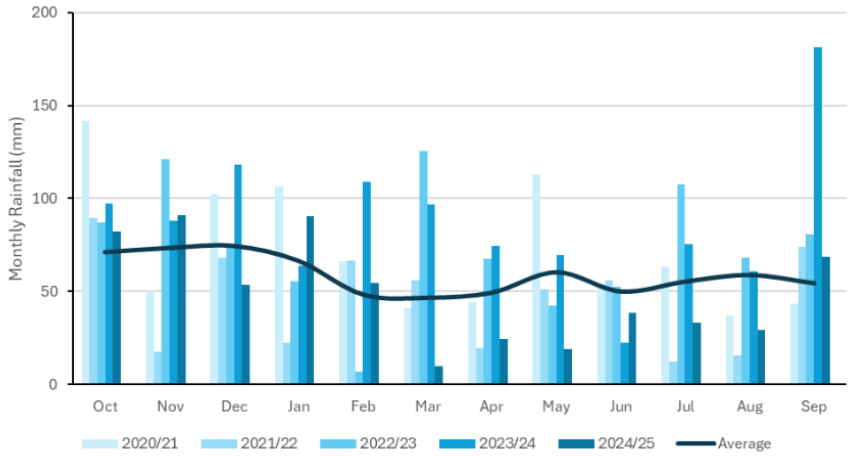


Figure 1: Monthly rainfall data 2020/21 to 2024/25

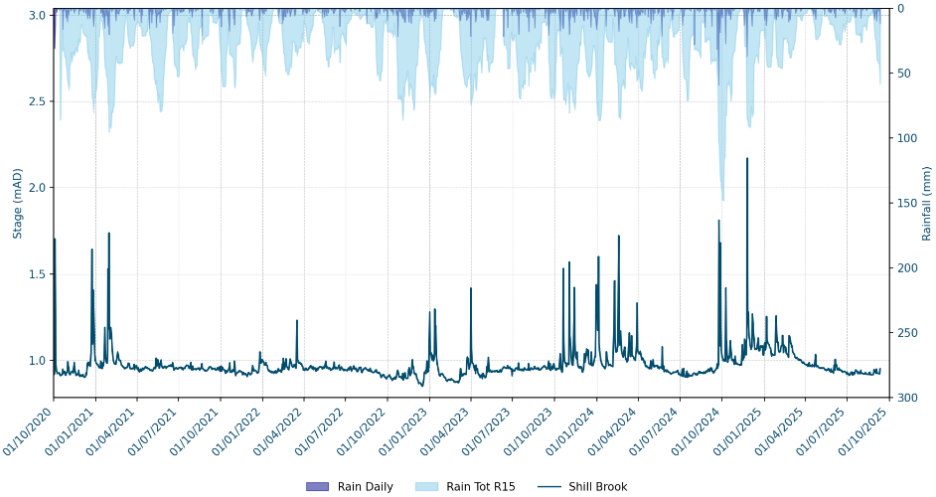


Figure 2: River Level data for Shill Brook, Bampton

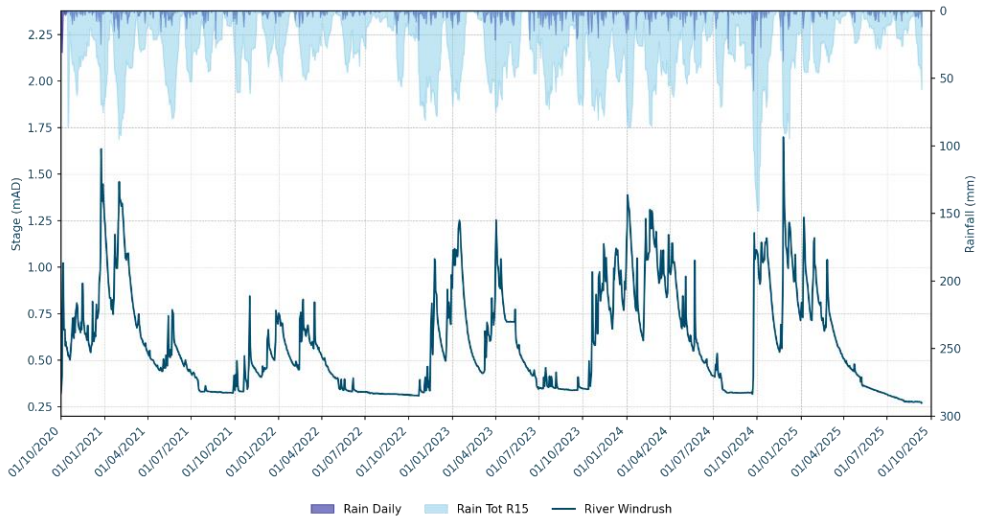
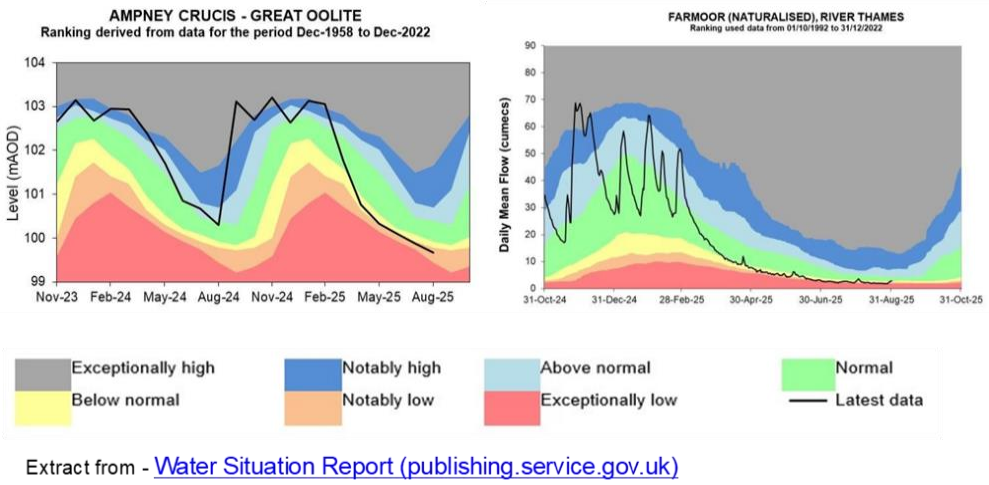


Figure 3: River Level data for River Windrush, Worsham



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Carterton STW	61	1046.25	57	1057.30

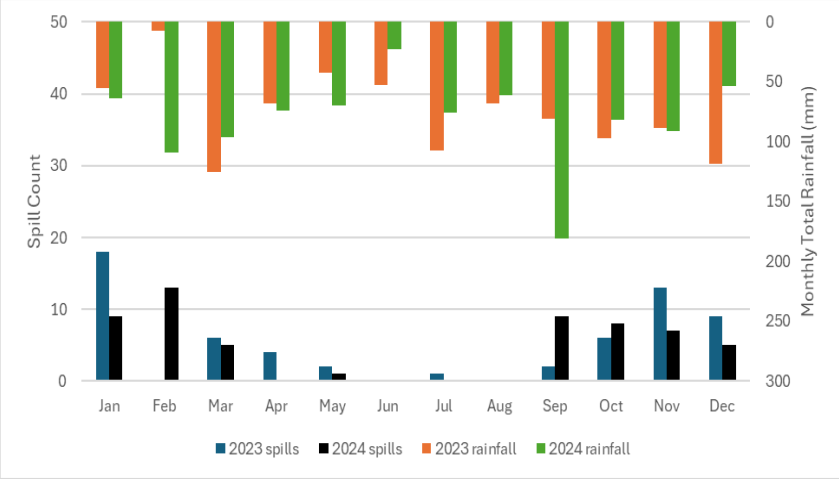


Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Carterton STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	530m	700m
Look and lift surveys	-	-	-	3	11
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/2024 shows a similar pattern being followed compared to previous years, including the average rainfall in 2023 staying fairly consistent compared to 2024 (see Figure 5). The lower number of annual spills could be a result of the rainfall and river levels staying consistent. Moreover, groundwater levels for 2024/2025 have stayed relatively similar to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

In the reporting year, we have undertaken CCTV survey of our sewers network, covering some 700 metres. These CCTV surveys help us monitor the condition of sewer network as well as identifying potential defects that could allow groundwater infiltration. In conjunction with the CCTV, we have undertaken 11 Lift and Look surveys, this type of visual inspection allows for quicker and more extensive checks on performance of the system but lacks the point source observations that CCTV can yield.

Chadlington

Chadlington is located in Evenlode valley, approximately 3 miles south of Chipping Norton.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Chadlington sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 2 illustrate the relationship between rainfall and spills at CSOs. There is a decrease in rainfall from 2023/24 to 2024/25 shown in Figure 1; this broadly correlates to fewer and shorter spills at the CSOs, shown in Figure 2.

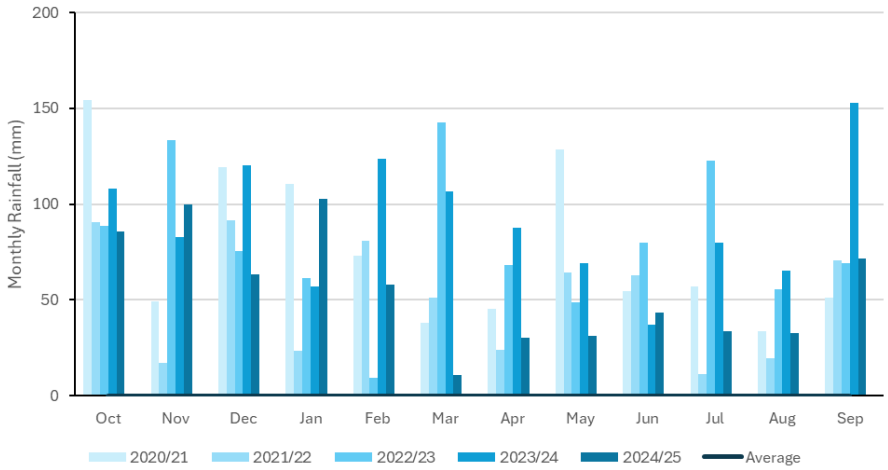


Figure 1: Monthly rainfall data 2020/20 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2024		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Chadlington STW	64	668	84	1311.30

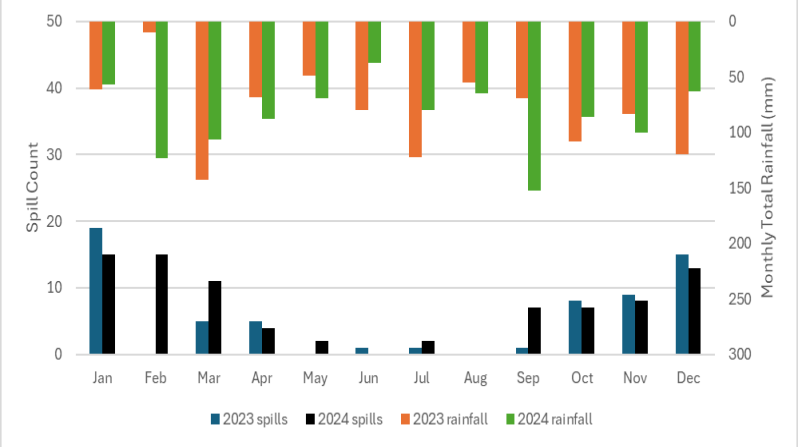


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Chadlington STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	30m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The average rainfall has stayed fairly consistent between 2023 and 2024. Rainfall usually directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the spills do not occur during summer season, which is usually the hottest months of the year, and dryest, August (2024) had the same rainfall as December but no spills, whereas December (2024) had some spills with the same rainfall.

Clanfield

Clanfield is located in the district of Oxfordshire, approximately 3 miles South of Carterton and 15 miles West of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Clanfield sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 6 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, rainfall decreases from 2023/24 to 2024/25, however river levels remain fairly consistent (Figures 2 to 4). There is a reduction in both the frequency and duration of CSO spills shown in Figure 6.

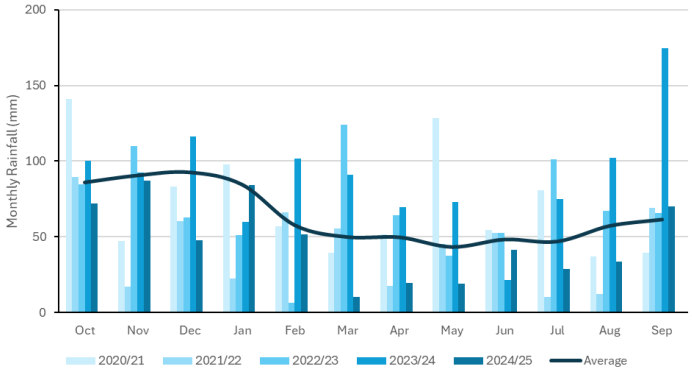
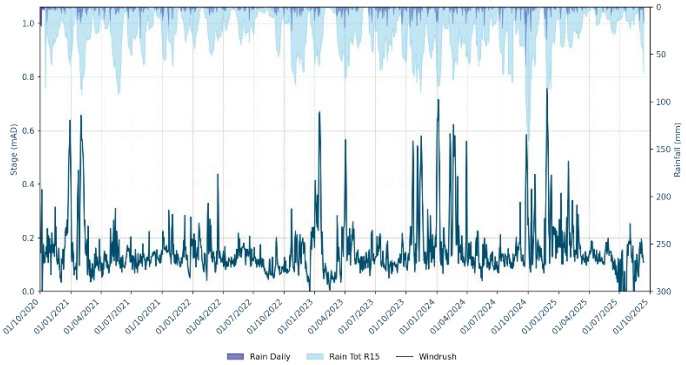


Figure 1: Monthly rainfall data 2020/21 to 2024/25



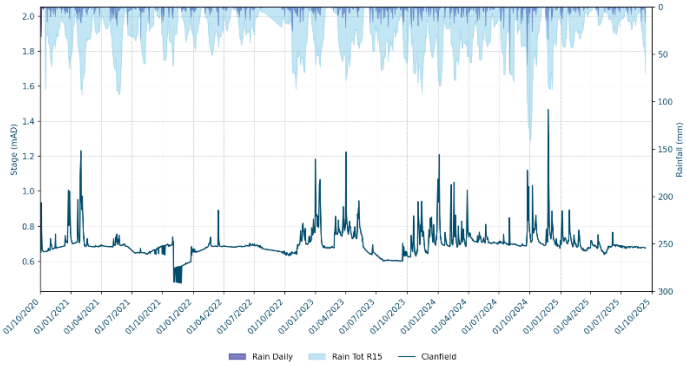


Figure 2: River Level data for Windrush at Worsham / Figure 3: River Level data for Clanfield Brook at Clanfield

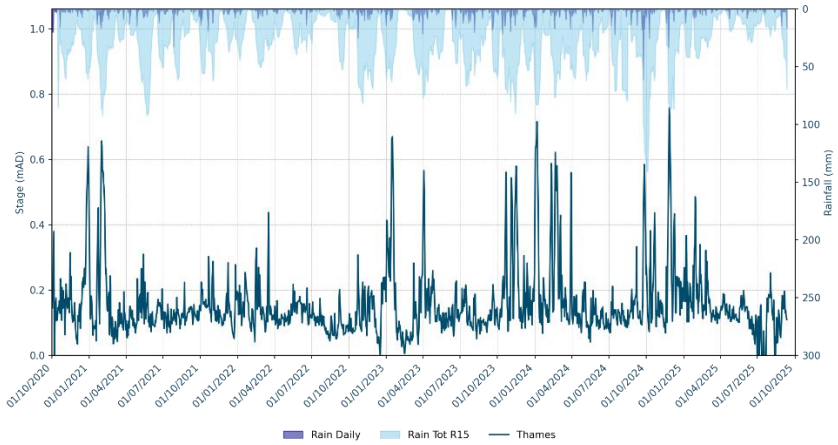
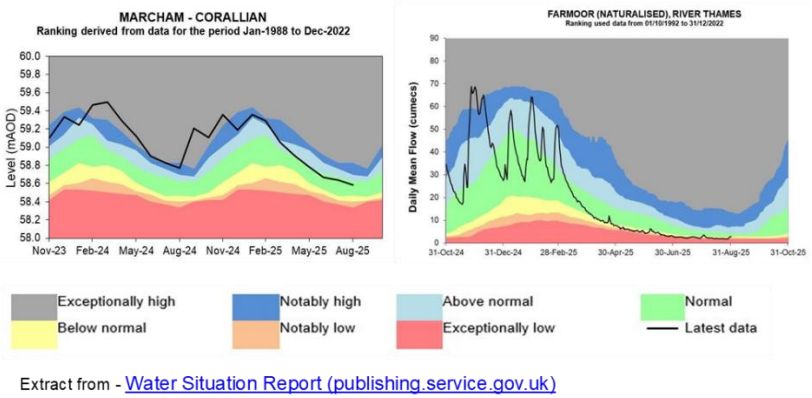


Figure 4: River Level data for River Thames at Radcot Lock



Extract from - Water Situation Report (publishing.service.gov.uk)

Figure 5: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 6.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Clanfield STW	150	3156	172	3402.45

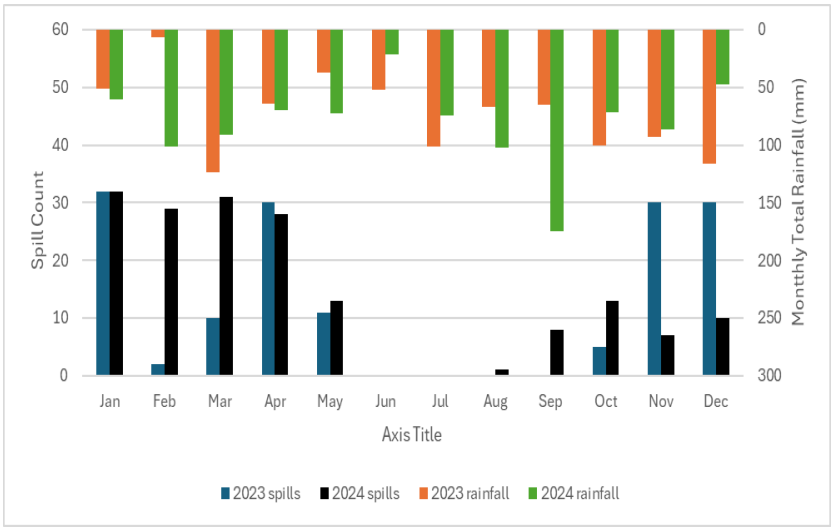


Figure 6: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Clanfield STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	136m	-	9,105m	-
Look and lift surveys	-	3	2	-	-
Sewer lining	-	281	-	1,743m	2,783m
Patch lining	-	-	2	1,725m	996m
Manhole sealing / plates / covers and frames replaced	-	1	-	296	24
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 6). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.

Thames Water delivered a wastewater treatment enhancement scheme in 2022 which has increased treatment capacity, reducing the likelihood of storm discharges. The extensive GISMP strategic manhole and sealing works also have a bearing on the reduction in spills.

Faringdon

Faringdon is located in Oxfordshire, approximately 18 miles southwest of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Faringdon sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 2 illustrate the relationship between rainfall and spills at CSOs. Figure 1 shows a decrease in rainfall from 2023/24 into 2024/25, correlating to fewer and shorter spills at the CSOs, shown in Figure 2.

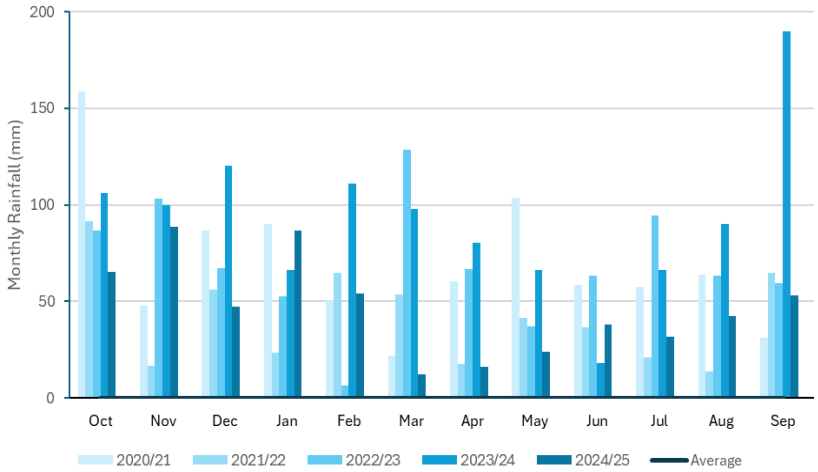


Figure 1: Monthly rainfall data 2020/21 to 2024/25

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 2.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Faringdon STW	116	527	138	790.15

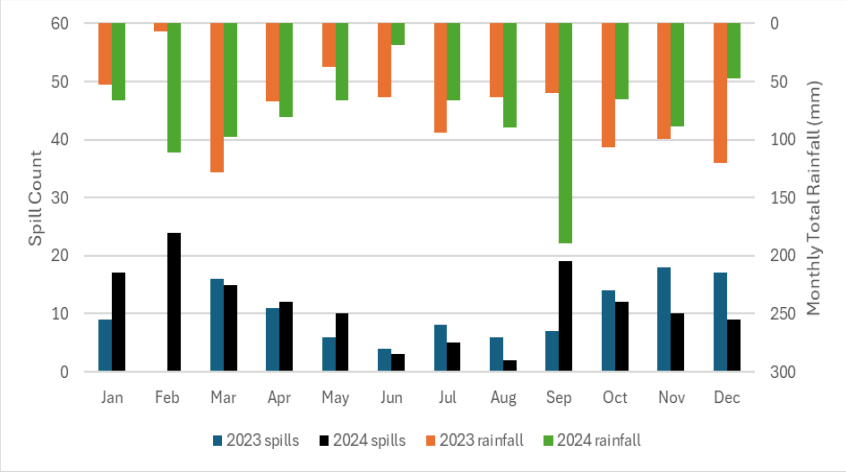


Figure 2: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Faringdon STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	360m	120m
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 2). This suggests that rainfall directly correlates to spill events. However, there is insufficient evidence to support the validity of this correlation, as the highest number of spills for 2024 (February) does not occur during one of the wettest months.

In the reporting year, we have undertaken CCTV survey of our sewers network, covering some 120 metres. These CCTV surveys help us monitor the condition of sewer network as well as identifying potential defects that could allow groundwater infiltration.

Milton-under-Wychwood

Milton-under-Wychwood is located on the River Evenlode, in Oxfordshire, approximately 11km northwest of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Milton-under-Wychwood sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 and 4 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with decrease in the number and duration of CSO spill events shown in Figure 4. River levels remain consistent between 2023/24 and 2024/25 observing Figure 2.

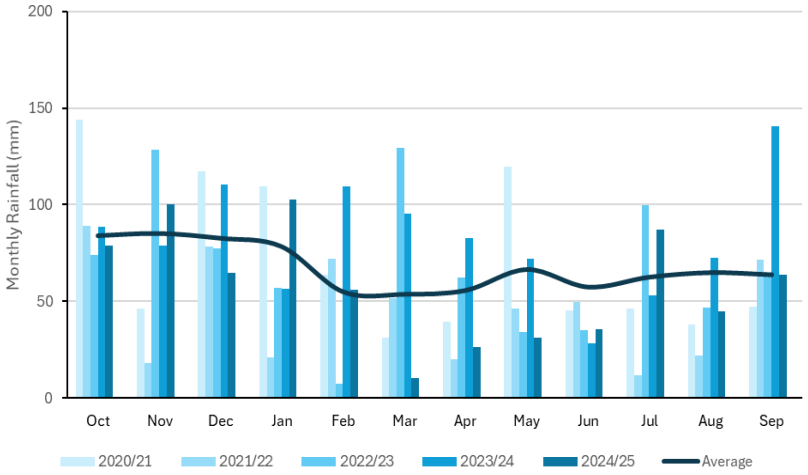


Figure 1: Monthly rainfall data 2020/21 to 2024/25

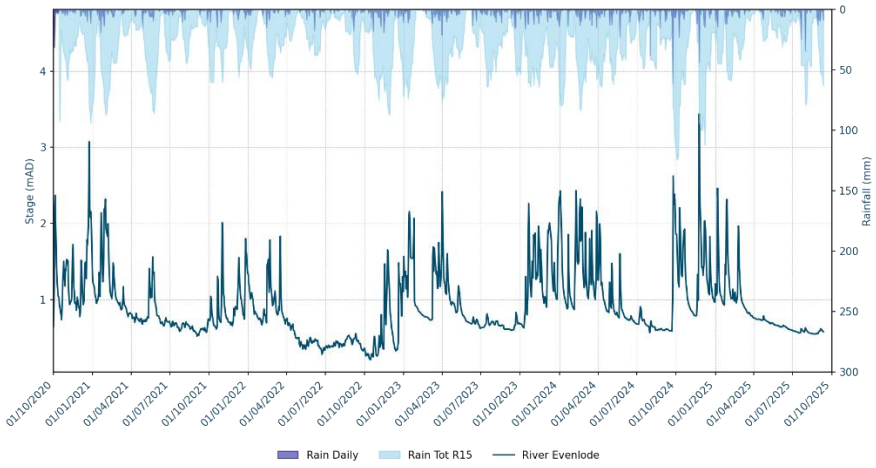


Figure 2: River Level data for River Evenlode, Shipton

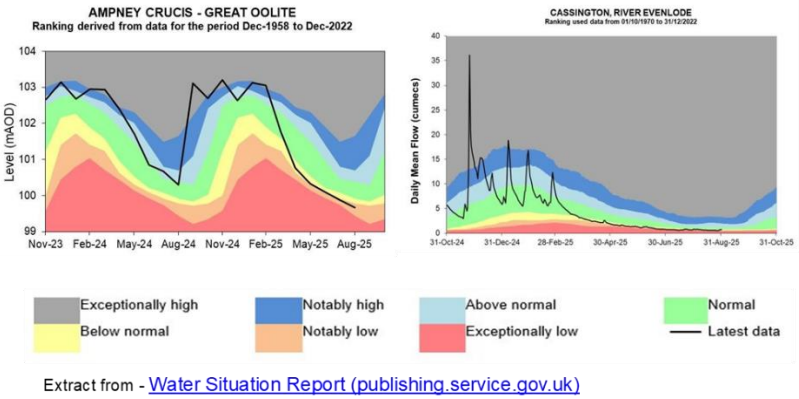


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Figure 3: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 4.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Milton-under-Wychwood STW	126	2141.75	152	2657.15

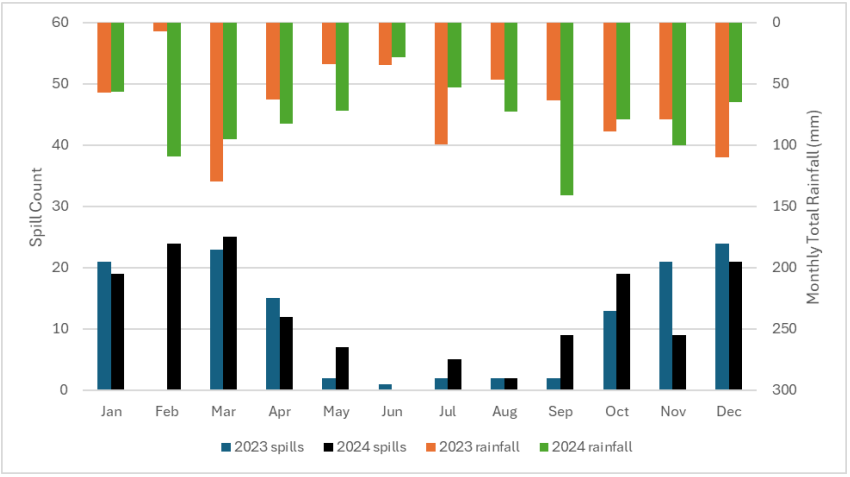

Figure 4: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Milton-under-Wychwood STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	1,893m	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	-	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remined consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 4). Moreover, groundwater levels for 2024/2025 have remained consistent compared to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Moreton-in-Marsh

Moreton-in-Marsh is located on the River Evenlode in Gloucestershire, approximately 6km north of Stow on the Wold.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Moreton-in-Marsh sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 6 illustrate the relationship between rainfall and CSO spills at indicator sites. As observed in Figure 1, there decrease in rainfall from 2023/24 to 2024/25. However, recorded river level data follows a similar profile between 2023/24 and 2024/25 observing Figures 2 and 3. Additionally, there is no spills data for 2025.

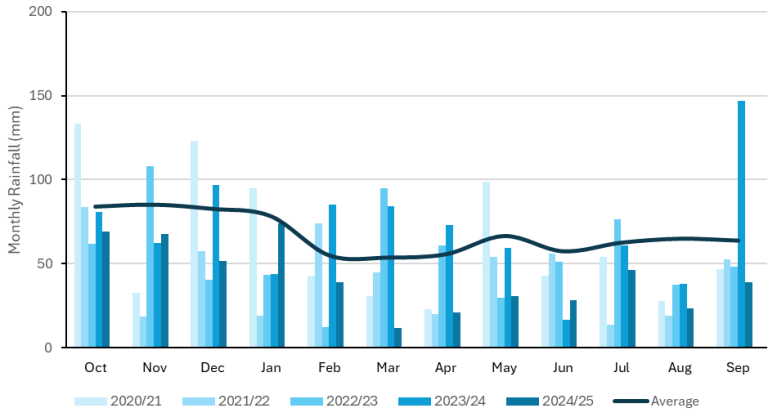

Figure 1: Monthly rainfall data 2020/21 to 2024/25

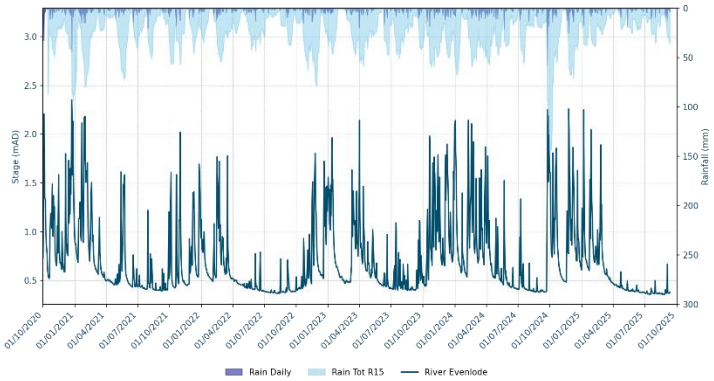

Figure 2: River Level data for River Evenlode, Evenlode Bridge

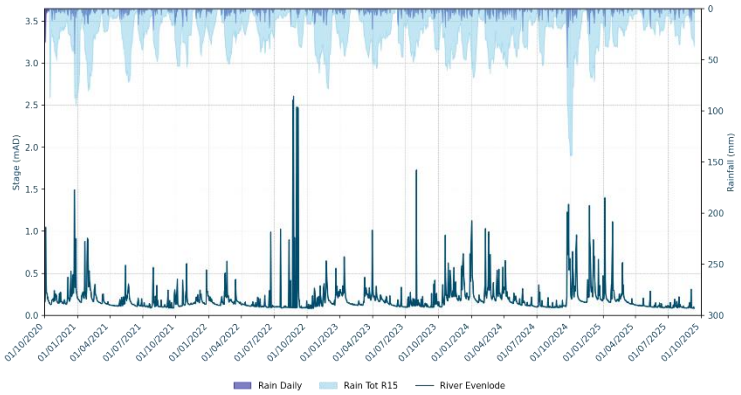

Figure 3: River Level data for River Evenlode, Moreton-in-Marsh

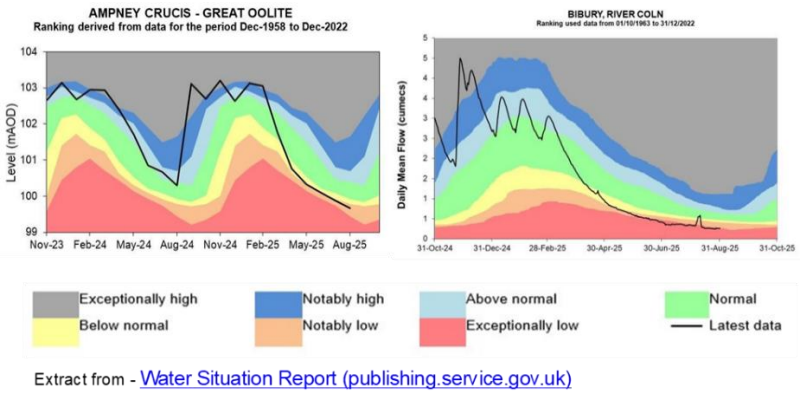

Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5 and 6.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
CSO at Moreton in Marsh SPS	4	20.7	26	157.45
Storm Sewage Irrigation Area (Primrose Court SPS)	128	2012.50	138	2055.45

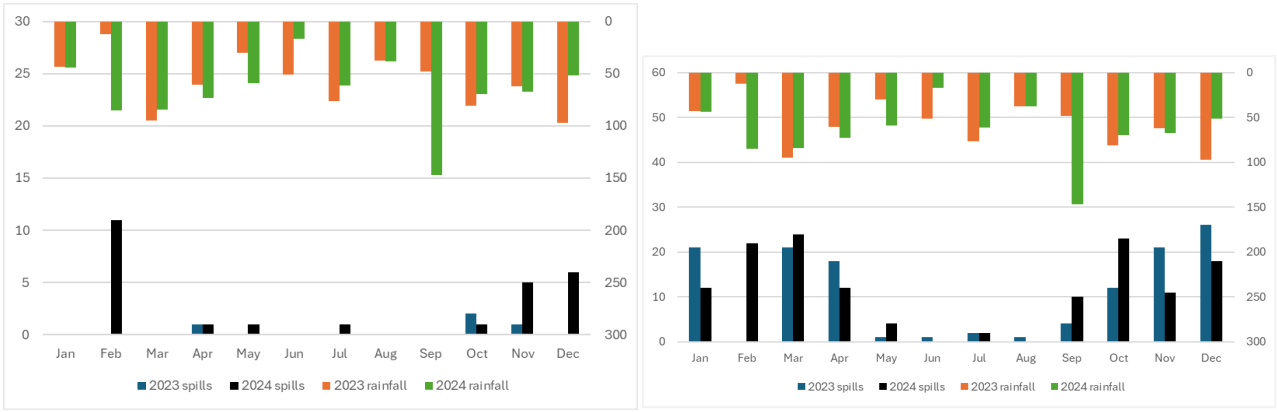

Figure 5: EDM Monthly Performance – CSO at Moreton in Marsh SPS / Figure 6: EDM Monthly Performance – Storm Sewage Irrigation Area (Primrose Court SPS)

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	-	-	-	-
Look and lift surveys	-	-	-	-	-
Sewer lining	-	-	36m	-	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remined consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023 for CSO at Moreton in Marsh SPS and Storm Sewage Irrigation Area (Primrose Court SPS). The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 5 & 6). Moreover, groundwater levels for 2024/2025 have remained consistent compared to the groundwater levels of the previous year, but the effect of this will be analysed when 2025 spill data is published.

Standlake

Standlake is located on the River Windrush, in West Oxfordshire, approximately 8km southeast of Witney.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Standlake sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 4 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with fewer CSO spills, as shown in Figure 4. Observing the river levels in Figure 2, there is a slight decrease in 2024/25 from 2023/24.

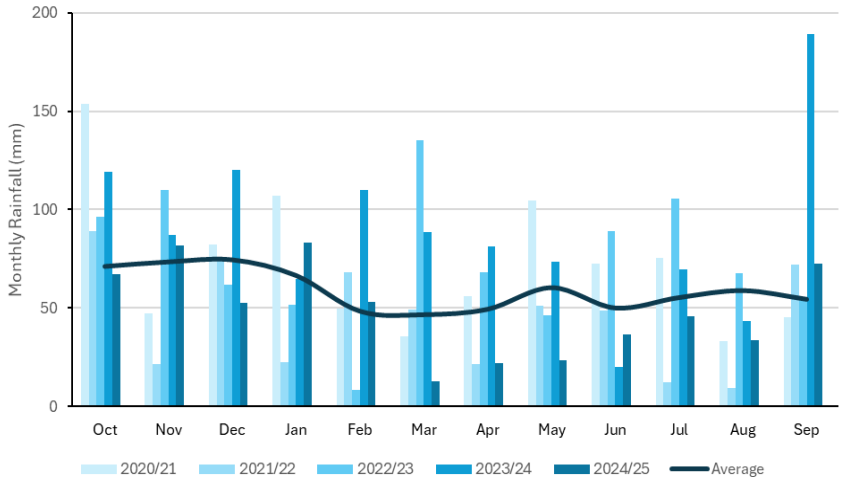

Figure 1: Monthly rainfall data 2020/21 to 2024/25

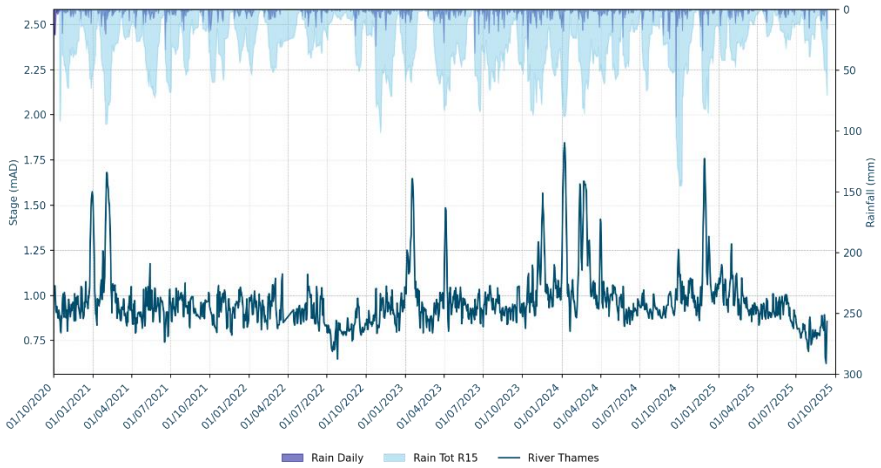

Figure 2: River Level data for River Thames, Farmoor

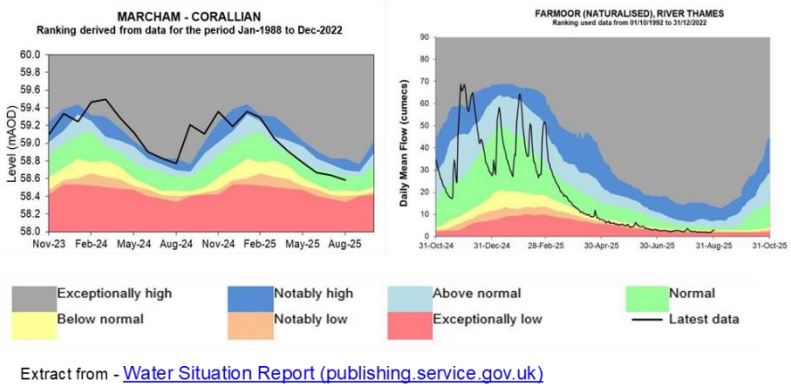

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Figure 3: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 4.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Standlake STW	131	2769	180	3967.45

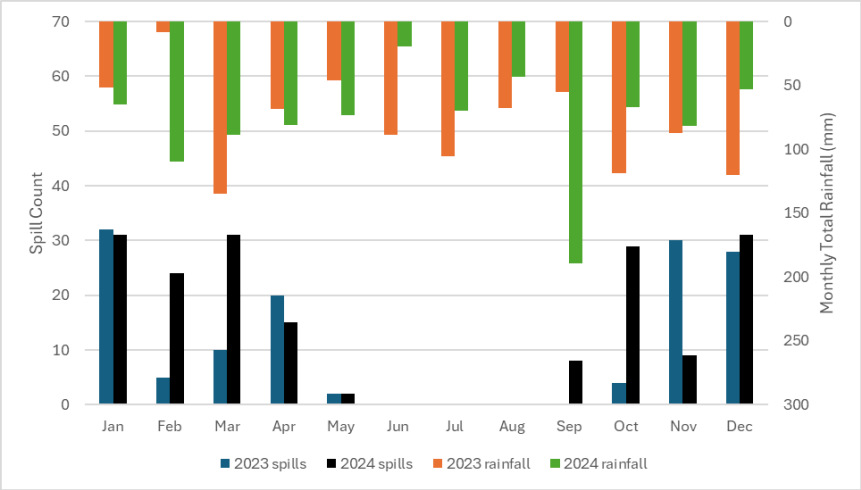

Figure 4: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Standlake STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2022/23	2023/24	2024/25
CCTV surveys	-	350m	2,007m	1,200m	-
Look and lift surveys	-	-	3	2	-
Sewer lining	-	-	-	-	-
Patch lining	-	2	3	-	-
Manhole sealing / plates / covers and frames replaced	-	-	-	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has increased compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills and river levels could be a result of the increased rainfall in 2024 (seen in Figure 4). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.

Witney

Witney is located on the River Windrush in Oxfordshire, approximately 12 miles West of Oxford.

This addendum provides an update on work undertaken in the hydrological year October 2024 to September 2025 for the Witney sewerage system. The key points covered include:

- Hydrological conditions
- Performance of the sewerage system
- Mitigation / remedial measures progressed over the last year

Figures 1 to 5 illustrate the relationship between rainfall and CSO spills at indicator sites. As shown in Figure 1, the decrease in rainfall from 2023/24 to 2024/25 correlates with fewer CSO spills, as presented in Figure 5. River levels (Figures 2 and 3) remained consistent.

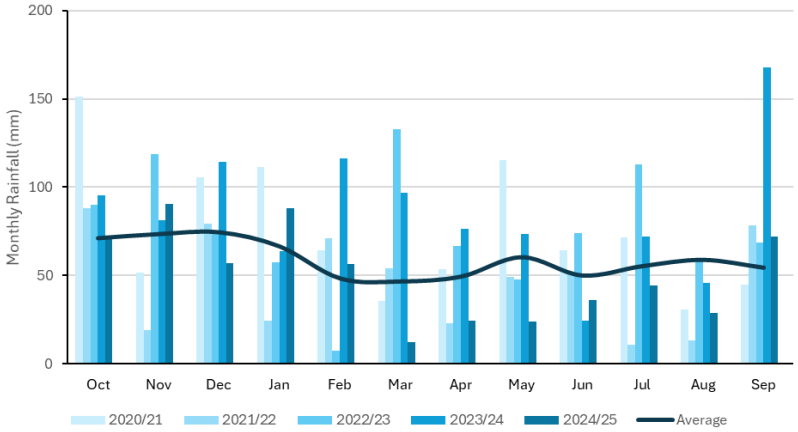

Figure 1: Monthly rainfall data 2020/21 to 2024/25

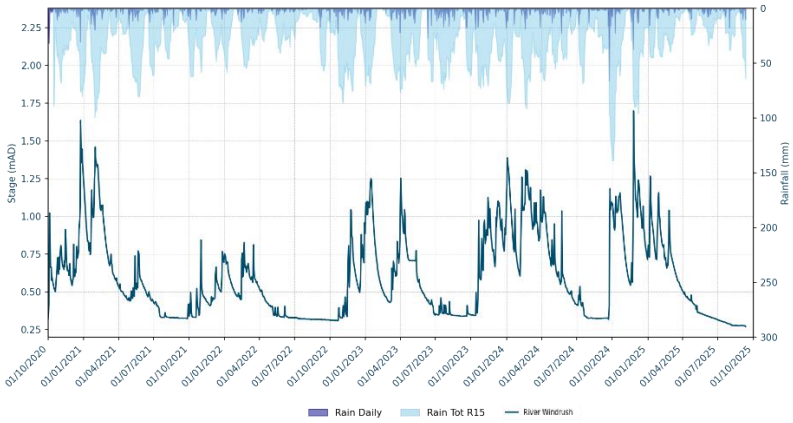

Figure 2: River Level data for River Windrush, Worsham

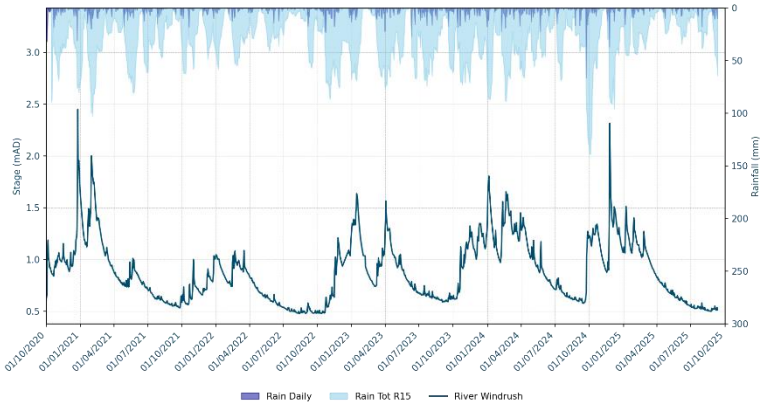

Figure 3: River Level data for River Windrush, Witney

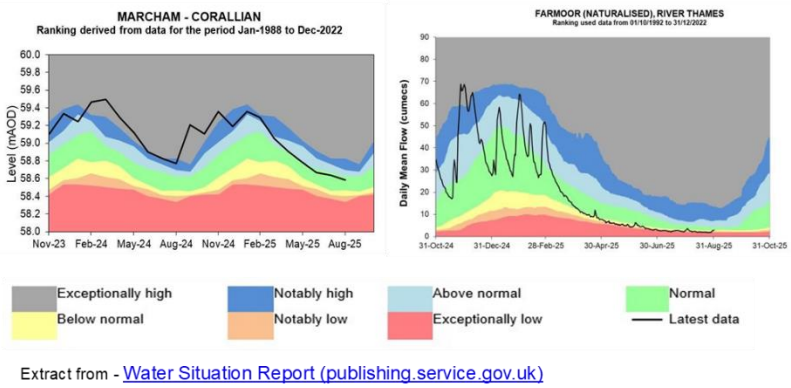

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Figure 4: Ground Water situation Report

Table 1 below details the last 2 years performance of overflows in the catchment. To assess EDM performance and its relation to groundwater infiltration, a review of the month-on-month spill performance in 2023 and 2024 against the monthly total rainfall values has been undertaken, as observed in Figure 5.

Event Duration Monitoring	2023		2024	
Overflow	Annual Spills	Duration (hours)	Annual Spills	Duration (hours)
Witney STW	119	2206.5	141	2800

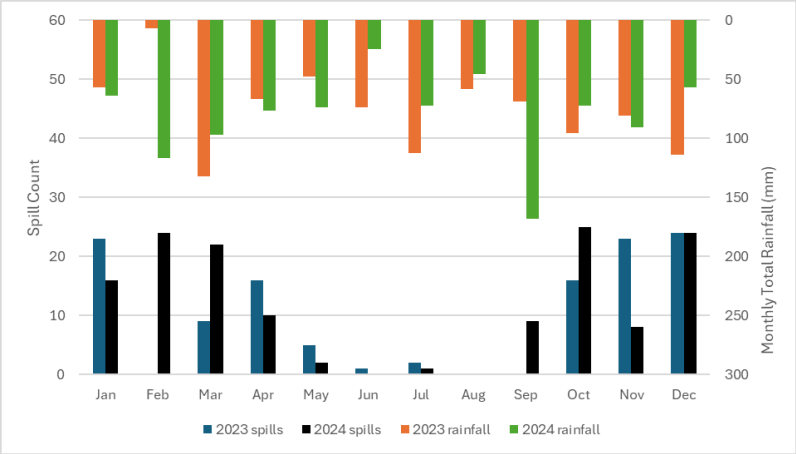

Figure 5: Monthly rainfall data versus monthly spill count for 2023 and 2024 – Witney STW

Table 2 below outlines the remediation works undertaken to address infiltration in the catchment, and enhancements to treatment works and/or pumping stations. Please note that this table only refers to work completed in the previous year.

Investigation / remediation type	2020/21	2021/22	2023/24	2023 /24	2024 /25
CCTV surveys	-	4,963m	1,437m	555m	-
Look and lift surveys	-	-	4	4	-
Sewer lining	-	10m	1,182m	24	-
Patch lining	-	-	-	-	-
Manhole sealing / plates / covers and frames replaced	-	5	4	-	-
ATAC unit deployment	-	-	-	-	-

Summary

A review of river level data over 2023/24 has remained consistent compared to previous years. The number and duration of spills have increased in 2024 compared to 2023. The higher number of annual spills could be a result of the increased rainfall in 2024 (seen in Figure 5). Moreover, there is a slight drop in groundwater levels for 2024/2025 compared to the groundwater levels of the previous year, but the effect of this decrease will be analysed when 2025 spill data is published.


Thames
Water