# SRN40 WINEP – Storm Overflows
# Enhancement Business Case

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Version 1.0

from Southern Water

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# Glossary

| Acronym | Term |
|---|---|
| ASP | Activated Sludge Plant |
| ASP | Activated Sludge Plant |
| BAS | Biosolids Assurance Scheme |
| CIP | Chemicals Investigations Programme |
| CAD | Conventional Anaerobic Digestion |
| DO | Dissolved Oxygen |
| DWMP | Drainage And Wastewater Management Plan |
| MCERT | EA's Monitoring Certification Scheme |
| EA | Environment Agency |
| EPA | Environmental Performance Assessment |
| EDM | Event Duration Monitoring |
| IED | Industrial Emissions Directive |
| INNS | Invasive Non-Native Species |
| LSO | Long Sea Outfall |
| NE | Natural England |
| PE | Population Equivalent |
| RNAG | Reason For Not Achieving Good Ecological Status |
| R&V | Risk And Value |
| RBMP | River Basin Management Plan |
| SPS | Sewage Pumping Station |
| SSO | Short Sea Outfall |
| SSSI | Site Of Special Scientific Interest |
| SOAF | Storm Overflow Assessment Framework |
| SODRP | Storm Overflows Discharge Reduction Plan |
| SOEP | Storm Overflows Evidence Project |
| TAL | Technically Achievable Limit |
| UPM | Urban Pollution Monitoring |
| WFD | Water Framework Directive |
| WINEP | Water Industry National Environment Programme |

# Executive Summary

The media spotlight is on Government and water companies to reduce the discharges from storm overflows. The pressure is not easing. We need to act now – but it's a joint problem that needs joint solutions from Government, regulators, water companies, other organisations and communities. It's a fundamental shift in how we use and value water in communities, and how we adapt communities for future climates by making them greener and happier places to live and work.

We plan to invest £2.9 billion over the next 25 years to reduce discharges from storm overflows to prevent environmental harm and protect public health. This starts by investing £682 million1 between 2024 and 2030 on 179 storm overflows to stop a further 2,500 spills – prioritising sensitive waterbodies in rivers as well as shellfish and bathing waters along the coast.

Our focus will be to reduce discharges through catchment and nature-based approaches, including sustainable drainage systems (SuDS). These approaches are known as green infrastructure. Every storm overflow will require a combination or package of measures (actions) to reduce discharges involving a mix of green infrastructure and traditional grey infrastructure options. We will focus first on green and phase the grey across 2 AMP periods. This approach enables us to maximise the opportunities for catchment and nature-based solutions before we size and develop the grey infrastructure. We recognise that all storm overflows will need some grey infrastructure to meet the expected spill targets set out in the Government's Storm Overflows Discharge Reduction Plan (Defra, 2022).

In a storm up to 95% of water in our sewers is rainwater[2] and this is the major cause of spills. But some spills also occur in dry weather due to groundwater ingress into our systems. In 2022, our 978 storm overflows collectively spilled 16,688 times for 146,819 hours[3]. Our investment in AMP8 will avoid more than 2500 spills across 179 priority sites (a 38% reduction from our 2020 baseline).

For rainwater driven spills, we will focus on managing rainwater at source, as close to where it falls as possible using green solutions. All storm overflows will need a mix of both green and grey infrastructure solutions. But we will achieve the outcomes as much as possible through green solutions and do this before sizing and building grey infrastructure. We will work in partnership with local councils, highway authorities, environmental groups, landowners and communities. Our focus on green infrastructure will see the widespread use of Sustainable Drainage Systems (SuDS). Green infrastructure will enable opportunities for wider multiple benefits for our customers and the environment, and opportunities to attract additional sources of funding for these wider benefits beyond what our customers should fund.

For groundwater driven spills, our approach is to reduce groundwater infiltration through lining of our sewers and private sewers, and construct wetlands at our storm overflows to treat the discharges before the water is released back to the environment.

Our preferred options will cost more, but they represent best value when considering the wider benefits and the more sustainable approach. This approach will avoid having to build ever larger and larger storage tanks – we need to break out of this unsustainable cycle. We will protect customers for paying more through a new price control deliverable.

We are already demonstrating the benefits of this approach through our Clean Rivers and Sea Task Force and the pathfinder projects delivered so far in AMP7, and this work will continue in AMP7 with the accelerated funding that Ofwat has already enabled.

A summary of our storm overflows enhancement case is set out in Table 0-1 below.

[1] This figure includes all proposed PR24 investment in storm overflows.
[2] a0003_dwmp_regional_plan_final.pdf (southernwater.co.uk)
[3] Flow and spill reporting (southernwater.co.uk) [redacted]

**Table 0-1: Summary of our Enhancement Case for Storm Overflows**

| Summary of Enhancement Case | |
|---|---|
| Name of Enhancement Case | WINEP – storm overflows |
| Summary of Case | This business case sets out our planned investment and approach to reducing discharges from storm overflows to deliver the requirements of Defra's Storm Overflows Discharge Reduction Plan, published in August 2022. |
| Expected Benefits | • 2500 spills avoided by 2030<br>• Over 500 hectares of impermeable area managed with SuDS (includes 350km of roadside SuDS, 72,000 downpipes and 2,000 driveways)<br>• Around 50 Ha wetland<br>• Over 300 km sewer lining<br>• More than 100,000 m3 of storage |
| Associated Price Control | Wastewater network plus |
| Enhancement TOTEX | £370.077 million<br>(Note: our total investment on storm overflows is £682 million when including our accelerated programme in AMP7, alternative delivery and the storm overflow investigations) |
| Enhancement CAPEX | £369.183 million |
| Enhancement OPEX | £0.894 million |
| Is this enhancement proposed for a direct procurement for customer (DPC)? | Yes, in part.<br>Our programme of wetlands and highways SuDS will be delivered through an alternative delivery mechanism. The total value of work proposed through this route is £287.3m and is covered by SRN17 Direct Procurement for Customers & Alternative Delivery Model technical annex. |

Our submitted business plan costs assume we will be contracting with a third party for two key elements of our storm overflows programme. These are for the delivery of (a) the wetlands to treat groundwater driven discharges, and (b) the large programme of highway SuDS to separate and attenuate rainwater landing on roads, car parks and driveways from our wastewater systems. This investment will go through DPC or an alternative delivery mechanism. Our enhancement cost table therefore includes a total cost of £370 million for our storm overflow programme rather than the £657 million it would cost us to deliver the whole programme in house.

Our full storm overflows totex investment for AMP8 to 12 is shown in Table 0-2.

**Table 0-2: Summary of our Storm Overflows Investment to deliver the Government Targets[4]**

| | AMP8 | AMP9 | AMP10 | AMP11 | AMP12 | Totals |
|---|---|---|---|---|---|---|
| In-House | £394.93m | £900.72m | £538.62m | £475.76m | £354.7m | £2,665m |
| DPC/Alternative Delivery | £287.29m | £0m | £0m | £0m | £0m | £287.3m |
| Total | £682.22m | £900.72m | £538.62m | £475.76m | £354.7m | £2,952m |

[4] WW Enhancement expenditure comes from CWW3 and LS4g for future AMPs and includes the cost of storm overflow investigations under WINEP driver INV4

Our storm overflows programme will deliver the Defra Storm Overflow Discharge Reduction Plan (SODRP) targets for 2035 and:

- Deliver the recommendations from AMP7 investigations on storm overflows
- Reduce spills to **Shellfish Waters** to 10 or fewer rainfall driven spills on average per year by 2035
- Ensure no more than 3 spills per **Bathing Water** by 2035 (3 for good classification, 2 for excellent) during the bathing water season.
- Ensure **no environmental harm** to waters by 2045. This is the focus for the investigation programme to assess harm / spill frequency
- Deliver actions to ensure 10 or fewer rainfall driven spills per year on average across all overflows by 2050.

# 1. Introduction and Background

This document explains:

(a) how we have developed the needs for enhancement investment
(b) the process for options development,
(c) how we have ensured our costs are efficient, and
(d) how customers are protected from non- or late delivery.

The document finishes with a conclusion summarising each section and setting out our recommendations.

Storm overflows have been attracting a lot of public and media attention due to the concern about releases of untreated sewage. This is partly due to the increasing popularity of open water swimming but also growing public concern about the environment more generally. The government has responded by committing to a step change in action to protect public health and the environment from storm overflow releases. The Defra Storm Overflows Discharge Reduction Plan (SODRP), first published in August 2022, sets out two key targets:

- By 2035, water companies will have: improved all overflows discharging into or near every designated bathing water; and improved 75% of overflows discharging to high priority sites.
- By 2050, no storm overflows will be permitted to operate outside of unusually heavy rainfall or to cause any adverse ecological harm.

Defra published an update to their SODRP on 25 September 2023. The main change was to include shellfish waters and marine conservation zones within the definition of high priority sites. The key targets remain the same as the earlier published version.

Our storm overflows programme is focused on the main Defra target to improve overflow discharging into bathing waters and other high priority sites, including shellfish waters. The key date for this target is 2035 (end of AMP9) so there is a balance of how much to invest now in AMP8 and how much to phase into AMP9.

Our priority is to make rapid progress on reducing spills from storm overflows, and we are already taking action through our Clean Rivers and Seas Task Force set up in 2011. For our storm overflows programme, we have phased the AMP8 investment over AMP8 and AMP9 to enable us start work on more storm overflows in AMP8, especially for coastal sites which our customers tell us are a priority for them. This approach allows time for us to develop and implement more sustainable and better green solutions by 2035, and to demonstrate swift progress to our customers on tackling this important and political issue. This also ensures that our programme is affordable and deliverable[5]. Our approach is in line with Defra's updated SODRP and the requirement to promote green, sustainable solutions. Defra considers this important and says in the plan that "*green infrastructure projects started before 2027 and delivered as quickly as possible will count towards completion of the targets, subject to review. This will be the case even when the full environmental impact of these projects has not yet been realised by the target end date*."

The two root causes of discharges from storm overflows are rainwater and groundwater in our wastewater systems.

(i) Rainwater: We are proposing to focus on managing rainwater at source through a mix of catchment and nature-based solutions delivered by working in partnership with local councils, environmental groups, landowners and communities. We will focus on green, and phase grey solutions to maximise the opportunities for wider multiple benefits for our customers and the environment, and opportunities for additional sources of funding for these wider benefits.

(ii) Groundwater: Our approach is to reduce groundwater infiltration through lining of our sewers and private sewers, and construct wetlands at our storm overflows to treat the discharges before the water is released back to the environment.

[5] Our approach to address affordability and deliverability challenges is described in technical annex SRN38 – WINEP methodology.

The total planned investment to reduce discharges from storm overflows to meet the Defra targets for 2035 is £1,583million, split between £682 million in AMP8 and £901 million in AMP9. A summary of our programme and costs within this Enhancement Business Case by WINEP drivers is shown in Table 1-1.

### Table 1-1: Summary of our storm overflows programme

| WINEP area | AMP8 totex, £m (2022/23 prices) | WINEP drivers | Number of WINEP actions |
|---|---|---|---|
| Storm overflow related investment | £657.4^ | SW_ND | 29 |
| | | SW_IMP | 1 |
| | | BW_ND | 4 |
| | | EnvAct_IMP2 | 79 |
| | | EnvAct_IMP3 | 18 |
| | | EnvAct_IMP4 | 48 |
| Improving understanding, enhancing catchments and working in partnership | £24* | EnvAct_INV4 | 210 |

^ Includes AMP7 accelerated funding, AMP8 planned and alternative delivery
* Investigations costs are covered in SRN42 WINEP Wider Environmental Enhancement Business Case.

Our submitted business plan costs assume we will be contracting with a third party for two key elements of our storm overflows programme that deliver green infrastructure solutions. These are for the delivery of (a) the wetlands to treat groundwater driven discharges, and (b) the large programme of highway SuDS to separate (from our wastewater systems) or attenuate flows into our wastewater systems from rainwater landing on roads, car parks and driveways. This investment will go through DPC or an alternative delivery mechanism, as explained in SRN17: Direct Procurement for Customers and Alternative Delivery Models. Our enhancement cost table therefore includes a different total cost of £370 million for our storm overflow programme rather than the £652 million it would cost us to deliver the investment in house. Table 1-2 summarises the activity types and number of storm overflows included within this enhancement business case.

### Table 1-2: Planned Investment in Storm Overflows by type

| Activity | Total Cost (£m) |
|---|---:|
| Increase flow to full treatment | 27.179 |
| Increase storm tank capacity at STWs - grey solution | 111.017 |
| Storage schemes to reduce spill frequency at CSOs etc - grey solution | 110.339 |
| Storm overflow - infiltration management | 51.761 |
| Storm overflow - new / upgraded screens | 8.025 |
| Storm overflow - sustainable drainage / attenuation in the network | 33.618 |
| Storm overflow - source surface water separation | 22.410 |
| Storm Overflow - discharge relocation | 5.728 |
| Increase storm system attenuation / treatment on a STW - green solution | 0 |

This investment, along with the investment in wetlands and highways SuDS proposed through the alternative delivery route (see Data Table SUP12), will make a big difference in reducing spills.

There were 25,323 spills in 2020/21 from the 978 storm overflows across our operating region. The number of spills is weather dependent so the numbers can increase in wetter years. In 2020–21, the average number of spills was 25.9 per overflow, and 614 storm overflows discharged on average more than 10 times per year. The actions we've already taken through our Clean Rivers and Seas Task Force has reduced the number of spills to 17381 in 2022/23 (17.8 spills per overflow). Our investment in AMP8 will driver this figure down to 15.5 spills on average per overflow by 2030, see Table 1-3.

**Table 1-3: Forecast Average Number of Spills (OUT5)**

| Storm overflows - Forecast Average Number of Spills (OUT5) | Units | 2020-21 | 2024-25 | 2029-30 | 2034-35 |
|---|---|---|---|---|---|
| Total number of monitored spills | Number | 25323 | 17604 | 15114 | 10684 |
| Average number of spills per overflow - monitored | Number | 25.9 | 18.0 | 15.5 | 10.9 |
| Uptime | % | 96.19% | 97.00% | 97.00% | 97.00% |
| Unmonitored storm overflows adjustment | Number | 3.81 | 3.00 | 3.00 | 3.00 |
| Average number of spills per overflow - with unmonitored adjustment | Number | 29.70 | 21.00 | 18.45 | 13.92 |

# 2. Needs Case for Enhancement

## 2.1. The Need for Action

There is a clear need for us to take action to tackle storm overflows. The driver comes from our customers and to meet regulatory requirements of the Environment Act 2021 and WINEP. The Environment Act now places a new duty on water companies to reduce discharges from storm overflows. This is an enhancement activity and needs enhancement funding through the WINEP.

Our customers are concerned about discharges from storm overflows. They want action. Releases of sewage into rivers and the sea, even if diluted and in accordance with permits, is no longer acceptable to them. We have seen a very emotional response from most customers in our insights work (see box 1).

The Government has committed to a step change in action to protect public health and the environment from storm overflow releases. The Environment Act 2021 places a legally binding duty on water companies to progressively reduce the adverse impacts of discharges from storm overflows. This is in addition to the legal duties on water companies under the Urban Wastewater Treatment Regulations 1994, and under the Water Industry Act 1991 to effectually drain their areas.

The UK Government published their Storm Overflow Discharge Reduction Plan (SODRP) in August 2022. An updated version of the Defra SODRP was published on 25 September 2023 to include storm overflows that discharge into the sea that do not impact on bathing water quality. The Government's plan sets out a mandatory programme across England of storm overflow improvements with an estimated investment of £60 billion by 2050. The Secretary of State said "This is the largest infrastructure project to restore the environment in water company history". The Government set specific targets for water companies:

- By 2035, water companies will have: improved all overflows discharging into or near every designated bathing water; and improved 75% of overflows discharging to high priority sites.
- By 2050, no storm overflows will be permitted to operate outside of unusually heavy rainfall or to cause any adverse ecological harm.

We have developed our Enhancement Business Case on storm overflows based on the SODRP published in August 2022, although our plan includes all our storm overflows including all those discharging into the sea. The inclusion of overflows impacting on marine conservation zones (MCZ) needs additional analysis to ensure these are included in our programme for completion by 2045 to meet the 100% target.

**Box 1: Customer Insights on Storm Overflows**

- Very strong support for addressing storm overflows to protect environmentally sensitive areas – and support for us to focus on finding green and nature-based solutions
- Very strong support for addressing the top spilling storm overflows first
- Support for us to go even further in reducing spills from storm overflows and to bring forward work on the bathing waters, but there is a limit when bill impacts get too high.
- Recommendation from research is that work on storm overflows is needed for reputation purposes too – and our customer challenge group would very much reinforce this need.
- Acceptability testing also shows we should go further on storm overflows – so feels like the right solution.

The EA introduced an interim target in their WINEP driver guidance (v0.3 dated August 2022) on storm overflows requiring improvements under the improvement driver for shellfish waters to be completed by 2030.

We have published our response to the Government's plan in our [Drainage and Wastewater Management Plan] (DWMP), and we have included actions for AMP8 in the WINEP. We have also agreed an accelerated programme with Ofwat to bring forward investment from AMP8 into AMP7 to start our programme of work on storm overflows.

There were 25,323 spills in 2020/21 from the 978 storm overflows across our operating region. The number of spills is weather dependent so the numbers can increase in wetter years and are expected to increase due to climate change and greater urbanisation.

In 2020–21, the average number of spills was 25.9 per overflow, and 614 storm overflows discharged on average more than 10 times per year. The actions we've already taken through our Clean Rivers and Seas Task Force has reduced the number of spills to 17,381 in 2022/23 (17.8 spills per overflow). Our aim is to continue to invest and make significant net reductions in the number of releases from storm overflows. Our investment in AMP8 will drive this figure down to 15.5 spills on average per overflow by 2030, but we need to go much further to meet customer expectations.

The Environment Agency's data on water quality[6] identifies the reasons why rivers and the sea are not in good ecological condition. Storm overflows are one of the causes, along with agricultural and urban runoff. Of the 1,798 waterbodies within our operating area, the EA states that the cause of not achieving good status is either probable or confirmed as partly being as a result of our operations for 508 (28%) of waterbodies (15% are confirmed). The number of waterbodies in our region where storm overflows are thought to be a reason for not achieving good ecological status is 51 (or 3%). Hence, reducing discharges from storm overflows will not lead to a significant increase in the number of waterbodies achieving good ecological status, unless we work with and co-ordinate activities with other sectors, especially the agriculture and land use sector and the urban and transport sector. Therefore, we need to work with other organisations to develop solutions that also tackle other reasons for waterbodies not achieving good ecological status. We can best achieve this through catchment and nature-based solutions, which will enable wider benefits to be delivered. This is why our approach is to work with local councils and land managers to deliver our storm overflow programme.  It is worth noting that this measure of ecological status does not take into account the public health and amenity value, or customer concerns, which are another key reasons why action is required to significantly reduce discharges from storm overflows.

The need for investment in storm overflows has been identified through our DWMP Baseline Risk and Vulnerability Assessment (BRAVA) on storm overflows, the AMP7 investigations and through our analysis of spill data from Event and Duration Monitors (EDMs).

The DWMP used data from 2017-2019 in line with national DWMP Framework[7] and associated guidance and identified the wastewater system of most concern when considering the number of spills, see Table 2-1. The 2017-2019 was the latest and best available data at the time of producing the BRAVA in the first cycle of the DWMP and all water companies were asked to use this data to ensure national consistency.

6 WFD RBMP2 Reasons for Not Achieving Good Status - data.gov.uk
7 Water-UK-DWMP-Framework-Report-Main-Document.pdf

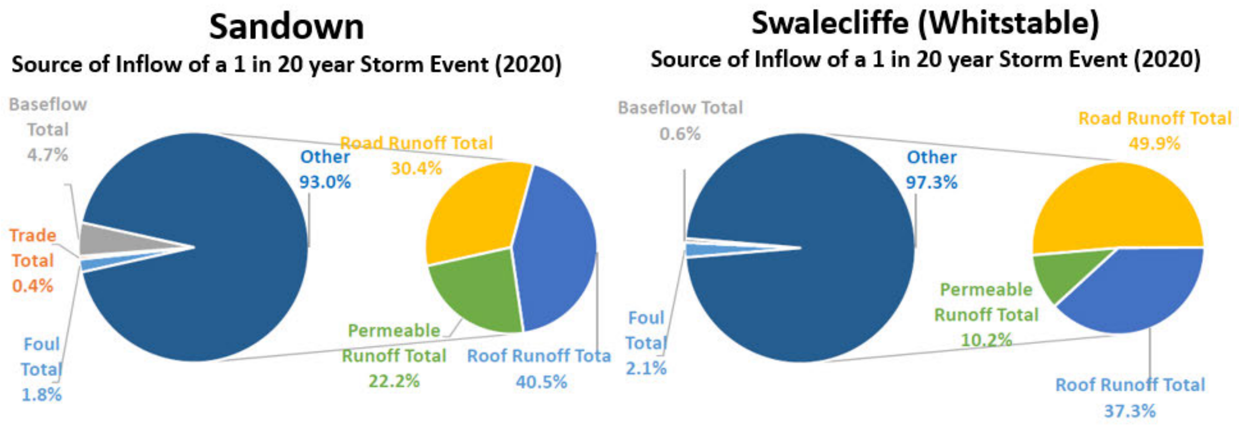
**Table 2-1: Wastewater Systems with the highest number of spilling storm overflows**

| Wastewater system | Population served | No. of storm overflows in the system | Spills using 12-24hr counting method | | | No. of spilling more than 20 (8 for shellfish, 3 for bathing) |
|---|---|---|---|---|---|---|
| | | | 2017 | 2018 | 2019 | |
| SANDOWN | 124,937 | 94 | 898 | 1312 | 1350 | 26 |
| MOTNEY HILL | 254,144 | 68 | 576 | 1072 | 624 | 15 |
| PEEL COMMON | 257,249 | 76 | 206 | 662 | 448 | 13 |
| TONBRIDGE | 49,838 | 19 | 177 | 362 | 402 | 7 |
| BUDDS FARM HAVANT | 366,725 | 32 | 136 | 424 | 223 | 7 |
| BEXHILL AND HASTINGS | 141,227 | 27 | 164 | 209 | 350 | 5 |
| GRAVESEND | 59,928 | 11 | 175 | 177 | 249 | 4 |
| HAILSHAM SOUTH | 28,533 | 15 | 130 | 119 | 330 | 7 |
| NEWHAVEN EAST | 58,692 | 9 | 115 | 206 | 254 | 2 |
| FORD | 130,053 | 22 | 62 | 151 | 292 | 6 |
| Note: There are 231 other wastewater systems with storm overflows, of which 110 have zero high spilling overflows, 92 have one, 24 have two, and 4 have three high spilling overflows. | | | | | | |

Our DWMP modelling identified that our wastewater systems are increasingly under pressure from the effects of climate change and greater urbanisation. The latest UK Climate Projections (UKCP2018) predict changing rainfall patterns and more intense summer storms, which can overwhelm drainage systems, increasing the risk of sewer flooding. The risks of sewer flooding are reduced and managed through storm overflows to prevent homes, businesses, schools, and roads flooding. So, we need to take action to reduce the number of discharges from storm overflows under both current and future climates without increasing flood risk. Our target for 2030 is to get to an average of 15.5 spills per overflow (18.5 based on Ofwat's method factoring in the availability of EDM data) despite the increasing pressures from climate change (based on moderate climate change scenario). Taking a longer-term view is consistent with the adaptive pathways methodology proposed in our Long Term Delivery Strategy, enabling us to think about solutions that work now and will remain effective under future climates.

Our DWMP identified that up to 95% of the water in sewers in a 1 in 20 year storm is rainwater, mainly from paved areas, such as roads, roofs, and also permeable areas such as sports fields, parks and green spaces, see Figure 2-1 . These permeable areas can become saturated in a storm and lead to run-off of rainwater into local sewers.

**Figure 2-1: Sources of flow in sewers in a 1 in 20 year storm**




We identified 88 wastewater systems with significant risks from storm overflows in our DWMP. We will, where possible, deliver storm overflow improvements on a wastewater system-by-system basis as this will enable us to maximise the opportunities for delivering catchment and nature-based solutions. This means we will look at a complete wastewater system to identify and deliver solutions that reduce the storm overflow risks and reduce the risks across all 14 of our DWMP Planning Objectives. For example, separating rainwater at source with sustainable drainage could reduce risks from storm overflows, as well as the risks of sewer flooding, deteriorating bathing water quality, risks to good ecological status, and shellfish water quality. Systematically tackling storm overflows in each wastewater system will be more cost effective overall and be more efficient in reducing the number of wastewater systems at very significant risk. This approach enables us to show how our business plan for PR24 is delivering progress in getting our wastewater systems to an acceptable level of risk (Band 0 - not significant risk) across all the DWMP planning objectives. Further information is provided in our DWMP (www.southernwater.co.uk/dwmp).

## 2.2. Developing our Storm Overflows Programme

We have built our storm overflow discharge reduction programme to comply with the Government's storm overflow discharge reduction plan and the EA WINEP guidance. The EA WINEP guidance for PR24 includes 5 drivers for actions on storm overflows. These are statutory drivers. We have used these drivers to develop our storm overflows programme for inclusion within the WINEP. This becomes a statutory programme for us to deliver during AMP8.

We are committed to reducing discharges from storm overflows at pace with a programme to improve the environment and address our customers concerns. We are already taking action. Our Clean Rivers and Seas Task Force was established in November 2021 demonstrating our commitment to drive down the use of storm overflows. The Task Force is responsible for delivering six pathfinder projects in 2022 and 2023 to explore and test new catchment and nature-based solution to tackle the discharges from storm overflows through better rainwater and groundwater management.

Our EDM data from 2020 and 2021 was used to understand changes in risks since the DWMP risk assessment and to develop our regional storm overflow programme to comply with the WINEP guidance. We submitted our regional programme to the EA in January 2023 as part of the WINEP development. We also submitted our storm overflows discharge reduction programme to the Defra Minister on 30 June 2023, along with data on storm overflow spills that occurred during 2022.

Defra's approach to take an average of the number of spills over a longer period is an appropriate approach for planning investment in reducing discharges from storm overflows to avoid year by year changes to our investment programme. This enables action to be taken and evaluated against wetter and dryer years. Our

EDM data will monitor the number of spills each year and we will continue to publish spill data for our customers, as well as the potential impact on bathing water quality through our Beachbuoy App.

We are holding discussions with Defra, Ofwat and the EA regarding our concerns about deliverability and affordability of the full WINEP and storm overflows programme. We put forward proposals in May 2023 to phase our AMP8 programme over 8-10 years, not 5, and starting some AMP9 investment on storm overflows early. Our PR24 plan is based on this phasing. This is still subject to regulatory approval.

We believe that adopting our phased plan and amended timelines will result in a better set of solutions and a better overall outcome for the environment. This allows us to build upon our Pathfinder projects in AMP7 to explore and maximise the opportunities for tackling the issue at source by managing rainwater through catchment and nature-based solutions. We will "focus on green and phase the grey". This means we will progress the green elements of our solutions and extend delivery of the associated grey storage options by 2-3 years (into AMP9). This will allow us to maximise the learning and benefits evaluation from the Pathfinder projects, customer-based interventions and the green solutions before deciding how large any underground storage / storm tanks need to be to achieve the target number of spills.

On 19 July 2023, we submitted our proposed phased WINEP to EA, Ofwat and Defra in response to the EA letter setting out the Defra Secretary of States steer on phasing WINEP. We included in this response our plan for storm overflows to ensure the affordability and deliverability of our programme. A copy of the table from our phasing proposals submitted in July is included below to explain the changes to our WINEP programme, see Table 2-2. The costs have been updated from 2021 prices and are included in CWW3, CWW20 and SUP12.

**Table 2-2: Copy of the table provided in our Phasing Proposals dated 19 July 2023**
**(note: 2020/21 prices)**

| | Number of overflows in Plan for AMP8 start | AMP8 cost without phasing (£m, 2021 prices) | AMP8 Cost with Phasing (£m, 2021 prices) | Proposed totex phased beyond AMP8 (£m, 2021 prices) |
|---|---|---|---|---|
| Updated WINEP (3 July 2023) | 159 | 839 | 529 | 310 |
| Final WINEP with additional actions for Portsmouth and Langstone Harbours | 183 | 940 | 579 | 361 |
| 20 coastal sites* | 0 (all AMP9) | 0 | 202 | n/a |
| Phased plan** (without coastal) | 159 | 839 | 529 | 412 |
| Our Proposed phased plan (inc 20 coastal being brought forward to start in AMP8) | 179 | 1,231 | 731 | 501*** |

* £202m of the £393m planned investment for these sites in AMP9 brought forward into AMP8
** Additional shellfish for Langstone and Portsmouth Harbour deferred to AMP9 @ cost of £102m
*** includes planned investment in AMP9 for 20 coastal sites (i.e. not phased from AMP8).

Our phased plan for storm overflows means that we will start addressing more storm overflows in AMP8 than our original plan. It also means that starting early on some sites will avoid tight deadlines which could drive us to deliver grey concrete solutions. More time to trial methods will lead to more green solutions being adopted. We are currently seeing positive improvements from our Pathfinder projects in forming partnership projects and delivering green infrastructure solutions.

We will industrialise our pathfinder approach ready for AMP8 to start green infrastructure projects before 2027 and deliver them as fast as we can (allowing for collaboration with other partner organisations and using alternative delivery routes where possible). The phased plan means that improvements to high priority storm overflows (i.e. those spilling on average more than 10 times per annum) into shellfish waters will be delivered in full by 2033 (not 2027 or 2030). This allows time for the required investigations for these storm overflows to be completed by 2027, and any recommendations for less than 10 spill solutions to then be developed and delivered (by 2033). The target to address 14% of our total stock of storm overflows by 2030 will also be delivered in full by 2033. The Defra SODRP (2022) says: "To promote sustainable solutions, green infrastructure projects started before 2027 and delivered as quickly as possible will count towards completion of the targets, subject to review. This will be the case even when the full environmental impact of these projects has not yet been realised by the target end date." Hence, the storm overflows in progress by 2027 will count towards the targets and enable us to meet these requirements. In addition, we will still meet the spills reduction target to get from our current position to 15.5 spills per overflow by 2030. The reductions in coastal spills at the 20 additional coastal storm overflows to be commenced in AMP8 will be fully achieved by 2035. Table 2-3 sets out how our phased plan meets the Defra and EA target dates.

**Table 2-3 How our phased plan meets the Defra Storm Overflow and EA WINEP targets**

| EA Driver | Target Dates | Legislative Framework | Target to be achieved with Phased Plan |
|---|---|---|---|
| EnvAct IMP2 Environmental Impact | • Defra SODRP target: 75%+ storm overflows discharging in or close to high priority sites (including shellfish waters) by 2035.<br>• EA target: 100% impacting shellfish waters by 2030 | EnvAct<br>WFD | Yes, by 2035<br>By 2035 to meet the Defra target above |
| EnvAct IMP3 Bathing Waters | • 31 March 2035 | Env Act | Yes |
| EnvAct_IMP4 Inland and Coastal <10 spills | • 38% of high priority storm overflows by 2030 and<br>• 14% of the total stock of storm overflows by 2030 | Env Act | Yes*<br>Yes |
| EnvAct_INV4 Investigations | • 30 April 2027 | Env Act | Yes** |

Notes:
* 38% will be met based on Defra's policy on green infrastructure commencing by 2027. Although works on these storm overflows will not be completed until 2035, our phased plan enables us to reduce spills from storm overflows by 38% by 2030, and adopt a managed adaptive approach (i.e. implement household and non-household SuDS, measure reductions in spills, implement further SuDS (e.g. roadside SuDS), measure, implement grey solutions to add final storage required to meet spill targets)
** 210 investigations, although an additional year may be needed to deliver the investigations, especially for 46 sites where improvement planned for AMP9.

Table 2-4 provides a breakdown of our Phased Plan by WINEP driver. The majority (79 storm overflows) are associated with high priority sites (including shellfish waters) to meet Defra target 1 to prevent ecological harm.

**Table 2-4: Our Storm Overflow programme for AMP8 by WINEP driver:**

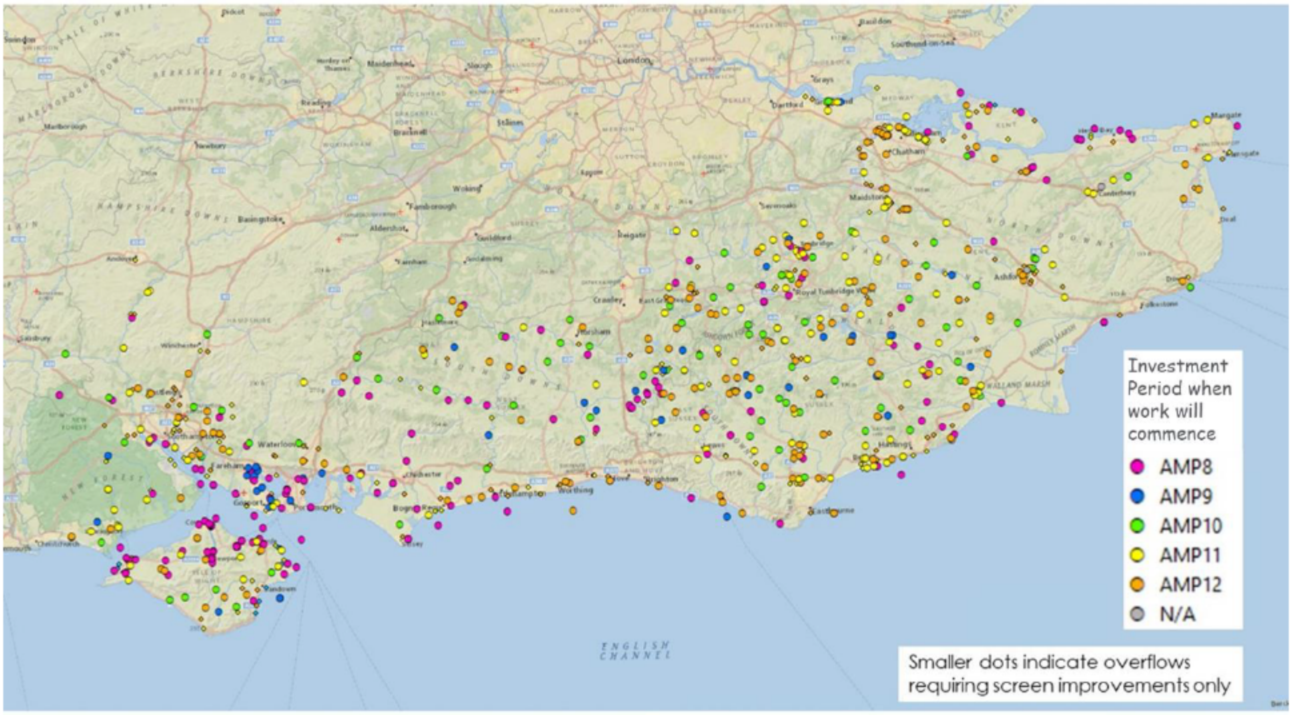
| WINEP Drivers | Number of Storm Overflows in Phased Plan to commence in AMP8 |
|---|---|
| EnvAct_IMP2 driver (Ecological Harm) | 79 |
| EnvAct_IMP3 driver (Bathing Waters) | 18 |
| EnvAct_IMP4 driver (10 spills or less) | 48 |
| EnvAct_IMP5 driver (screen improvements) | 0 |
| BW_ND | 4 |
| SW_ND | 29 |

| | |
|---|---|
| SW_IMP | 1 |
| **Total no. of storm overflows for improvement** | **179** |
| Plus: EnvAct_INV4 driver (Investigations) | 210 |

We have also included investigations for 210 storm overflows to determine the reduction in spills needed to prevent harm to the environment for storm overflows that are being improved in AMP8 and some in AMP9. These investigations are included in SRN42 WINEP - Wider Environmental Enhancement business case.

Figure 2-2 illustrates the location of storm overflows in our programme over the next 5 AMP periods.

**Figure 2-2: Map showing the location of storm overflows and when work is expected to commence**




## *Portsmouth and Langstone Harbours*

The EA WINEP guidance on shellfish waters sets out the need for action under the Water Framework Directive (WFD) to prevent deterioration of shellfish waters by 2027 and to deliver improvements by 2030. The WFD drivers have previously been subjected to cost benefit analysis which has limited the interventions to protect and enhance shellfish waters in previous AMPs. For PR24, the cost benefit requirements are removed, and the EA is keen to ensure that all actions are included in AMP8 to prevent deterioration and bring about improvements to the shellfish water across our region.

We have 30 shellfish waters across our region[8]. We have developed 28 actions in collaboration with the EA to prevent deterioration (23 actions are for storm overflows). The actions requiring reduction of spills from storm overflows have a primary shellfish driver but are included in our phased storm overflows programme. We will commence all 23 of these actions in AMP8, and progress green infrastructure options prior to 2027. The final completion dates are 2033 and 2035 to allow for green options to be delivered, tested and measured, then for further action to be taken before the target completion dates.

[8] England and Wales - Cefas (Centre for Environm[redacted]heries and Aquaculture Science)

Two additional improvement actions were added to the WINEP by the EA on 5 July 2023 – one for Portsmouth Harbour for completion by 2027 and one for Langstone Harbour for completion by 2030. These actions are to meet the requirements of the Water Environment (Water Framework Directive) Regulations 2017 (WFD Regs), which set out the environmental requirements for shellfish waters. The WFD requires environmental objectives to be established to improve or protect the shellfish water. An additional objective for shellfish waters is the Shellfish Directions microbial standard of 300 or fewer E.coli per 100ml of shellfish flesh and intravalvular fluid. The Environment Agency must "endeavour to observe" this standard in the 96 areas currently protected for shellfish production.

This late addition to our WINEP increases the scope and cost of our programme for a further 24 storm overflows (all spilling less than 10 times or not at all) at around £100 million in cost. We do not consider that improvements to these 24 overflows will produce a material contribution to the target to get below an agglomeration of 10 spills per year from all overflows discharging into these shellfish waters by 2030, or that they `will be sufficient to change the bivalve mollusc (shellfish) harvesting areas classification to enable human consumption. We have, however, developed our WINEP programme to avoid deterioration in shellfish water quality and improve shellfish water quality to meet the Shellfish Directions standard at priority shellfish waters. Our actions, across a range of WINEP drivers, including the reductions in spills from the high spilling storm overflows, as well as improvements at wastewater treatment works will improve water quality in these designated shellfish waters. In previous AMPs, actions for shellfish waters were subject to cost benefit analysis to ensure the benefits outweigh the costs. This is not the case for PR24. The costs for the actions to the additional 24 sites are greater than the benefits. In addition, the EA data[9] shows that discharges from storm overflows is not a reason why Portsmouth and Langstone Harbours are not achieving good ecological status.

There are 36 storm overflows discharging into the Portsmouth Harbour shellfish water. We included 16 of these overflows as a priority for improvement in our PR24 WINEP. These 16 overflows spill more than 10 times on average[10]. We know that 20 of the 36 overflows do not spill or spill 10 or less on average, so these are phased to commence in AMP9.

Langstone Harbour is one of the Government's priority shellfish waters. There are seven storm overflows discharging into the Langstone Harbour shellfish water. We have included the 3 overflows that spill more than 10 times per annum in our PR24 WINEP and phased actions at 4 overflows into PR29. These four overflows already spill 10 or less times per annum[11].

The case for phasing the low or no spilling overflows into AMP9 is to allow time for shellfish investigations in Portsmouth Harbour and Langstone Harbour. These investigations will be completed by 2027 to inform investment in AMP8 and AMP9. They will determine the causes of pollution to shellfish waters and the target the appropriate reduction in spills for all 43 overflows in these two harbours. Importantly, we need the investigations to determine whether any of the 24 overflows with no or low numbers of spills (i.e. less than 10) also need investment in spills reduction.

Our phased plan focuses on improvements to the 19 storm overflows spilling >10 times on average and also completing the investigation into all 43 storm overflows discharging into these harbours by 2027. The investigations in AMP8 will determine the need for further investment. If these investigations show that lower spills solutions are required for the 19 overflows being improved in AMP8 then we would endeavour to reduce spills further in AMP8 to achieve these outcomes. If a 2-spill solution is required for these storm overflows then this could add £50m of cost to our programme for PR24. This highlights the need to understand the spill reduction target for each overflow before commencing investment, especially for shellfish waters where the target is for a maximum of 10 spills per annum across the agglomeration of overflows. Our approach and phasing of the 24 additional sites will allow the investigation to determine the target for each overflow, the options for each overflow to be appraised, the benefits understood and the best

[9] WFD RBMP2 Reasons for Not Achieving Good Status - data.gov.uk
[10] Flow and spill reporting (southernwater.co.uk)
[11] Flow and spill reporting (southernwater.co.uk) [redacted]

value solutions to be proposed. At this stage, we consider that another £100 million to improve the additional 24 storm overflows is not good value and a disproportionate cost versus the benefit, especially without understanding the potential benefits in water quality, and without considering other sources of pollution into these harbours.

## *Bathing Waters*

Our AMP7 investigations identified the need for grey storage solution at four storm overflows to reduce spills impacting on bathing waters. These actions were signed off by the EA in the AMP7 reports for inclusion within our AMP8 WINEP as improvements. We have included these in our PR24 WINEP, with an extended completion date to 2033 to allow us to explore and deliver as much of the spill reduction through green infrastructure and surface water separation schemes as possible, in line with the more recently published Defra SODRP. Construction of any additional storage requirements using grey infrastructure will then follow and will be sized depending upon how much is achieved through the catchment and nature-based solutions and the spill targets required. The Defra SODRP target for bathing waters in 2035, which we will achieve.

Our phased WINEP enables us to bring forward the start of investment for 20 additional coastal storm overflows that were previously planned for AMP9. Many of our larger wastewater systems and resident population centres are along the coast, so discharges from these storm overflows tend to involve larger volumes. They are more challenging to resolve. Bringing these 20 overflows forward to AMP8 enables us to start green infrastructure and still have time to construct grey solutions, if required, to get to the spill reduction target before the Defra target date of 2035. Importantly it enables us to demonstrate action is being taken now to meet the priorities of local customers, and support businesses and the coastal economy in the South-East.

Of the 20 overflows, 12 are for high priority sites and, of the remainder, all are high spillers with 7 of them impacting on bathing waters, see Table 2-5.

**Table 2-5: Coastal storm overflows with improvements brought forward to start in AMP8**

| River Basin Catchment | Wastewater System | Name of Storm Overflow | High Priority Site | Impact on Bathing Water | Discharge into or within 50m of SSSI | Discharge into or within 50m of SAC | Discharge into or within 50m of SPA | Discharge into or within 50m of RAMSAR |
|---|---|---|---|---|---|---|---|---|
| Adur and Ouse | SHOREHAM | SHOREHAM CSO | Yes | Yes | No | No | No | No |
| Adur and Ouse | PEACEHAVEN | MARINE DRIVE BRIGHTON NO.2 CEO | Yes | Yes | No | No | No | No |
| Arun and Western Streams | FORD | WEST PARK BOGNOR REGIS CEO | Yes | No | No | No | Yes | No |
| Arun and Western Streams | FORD | SEA ROAD LITTLEHAMPTON CEO | No | No | No | No | No | No |
| Arun and Western Streams | FORD | SOUTH TERRACE LITTLEHAMPTON CSO | Yes | Yes | Yes | No | No | No |
| Arun and Western Streams | S DLESHAM | EAST BEACH ROAD SELSEY CEO | No | Yes | No | No | No | No |
| Arun and Western Streams | S DLESHAM | OUTSIDE 83 EAST BEACH SELSEY CEO | No | Yes | No | No | No | No |
| Cuckmere and Pevensey Levels | HASTINGS AND BEXHILL | BEXH LL & HASTINGS CSO | Yes | No | No | No | Yes | No |
| Cuckmere and Pevensey Levels | HASTINGS AND BEXHILL | BROCKLEY ROAD BEXHILL CSO | Yes | Yes | No | No | Yes | No |
| Cuckmere and Pevensey Levels | EAST DEAN | EAST DEAN SSO | No | Yes | No | No | No | No |
| East Hampshire | PEEL COMMON | SALTERNS ROAD H LL HEAD CEO | Yes | Yes | Yes | No | Yes | Yes |
| Isle of Wight | SANDOWN | SANDOWN NEW NO.1 SSO | Yes | Yes | No | Yes | No | No |
| Isle of Wight | SANDOWN | H LLWAY BEMBRIDGE CEO | No | Yes | No | No | No | No |
| Isle of Wight | SANDOWN | LANE END STORAGE TANKS BEMBRIDGE CEO | Yes | Yes | Yes | Yes | Yes | Yes |
| Isle of Wight | SANDOWN | HYDE DESTRUCTOR SHANKLIN CSO | No | Yes | No | No | No | No |
| Isle of Wight | SANDOWN | THE POINT BEMBR DGE NEW CEO | Yes | Yes | Yes | No | Yes | Yes |
| Isle of Wight | SANDOWN | MADEIRA ROAD TOTLAND SSO | Yes | Yes | No | No | Yes | No |
| Rother | HYTHE | RANGE ROAD HYTHE K CSO | No | Yes | No | No | No | No |
| Rother | CAMBER | LYDD ROAD CAMBER CEO | No | Yes | No | No | No | No |
| Stour | MARGATE AND BROADSTA RS | BROADSTAIRS CEO | Yes | Yes | No | Yes | No | No |

The standard valuation of benefits from spill reductions primarily focuss on environmental benefits and do not take full account of social benefits. We have been working with [redacted] to review options to strengthen the methodology to reflect social benefits. Using Marine Drive Brighton as one of the examples, the approach described within the case study resulted in an additional benefit of £713k per annum[12]. The

[12] The wel being value of cleaner rivers and seas, [redacted] 2023

monetised values are based on changing the perception of water quality which has been shown to impact wellbeing. We believe this supports the proposal to accelerate delivery of the additional coastal overflows.

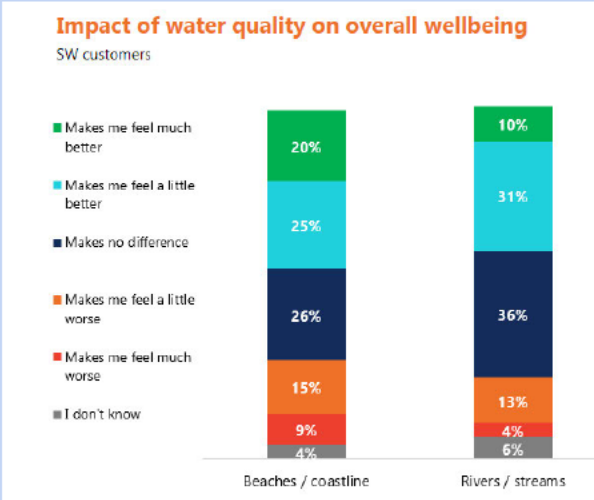
## Case Study: Social Benefits of Green Options for Storm Overflows

### Southern Water Wellbeing Methodology: Applying ‘Green Book Wellbeing Methodology’ to water quality impact.

We commissioned experts from [redacted] to develop a methodology to enhance the consideration of social value in business cases for our investment in clean rivers and seas.

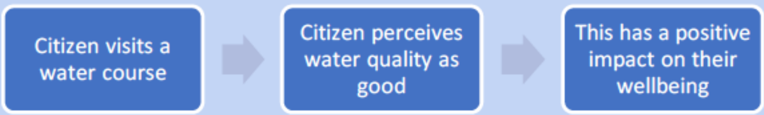
Approach:
We wanted to fill a gap in existing business case methodology and better understand and quantify the wellbeing benefits of cleaner rivers and seas for our customers.

Our Customer Insights team worked with [redacted] to design a survey to assess how customers perceive local water quality, and how this impacts their wellbeing. This survey incorporated the Personal Wellbeing Standard, ONS 4.




Using the survey data from 1000 customers, 500 inland and 500 coastal, and the guidance outlined in HM Treasury’s Green Book supplementary guidance for wellbeing, [redacted] designed a methodology for estimating the wellbeing value of improved water quality in recreational blue spaces.

[redacted] used the data to monetize the impact for business cases, using the WELLBY* figure, the duration of impact, the level of change experienced, and the estimated number of citizens/customers impacted by water quality in 2 locations using ORVal.
As a result of this work, we gained greater insight into the impact of cleaner water on customer’s wellbeing and perceptions. The research has proven the hypothesis that ‘An improvement in water quality at bathing locations has a positive measurable impact on the wellbeing of citizens/ customers’




The wellbeing impact valuation has filled a gap in existing methodology, which focuses on ecology and shellfish, and the quantitative estimates at the two case study locations, Brighton and Langstone Harbour, were found to be potentially significant in business case decision making

We will be working with the UKWP and [redacted] to share the innovative methodology and further develop the practice so that it can be of wider industry benefit.

[redacted]

*“for the first time we have been able to quantify the wellbeing impacts of cleaner water, enabling us to better prioritise what is important to our customers.” Chris Braham Head of Strategic Asset Management*

** A WELLBY is defined as one-point change in life-satisfaction for one year. A movement of 1 point on a scale of 1 to 10 on average over a year is worth £13,000 (Low £10,000, High £16,000) in 2019 prices and values.*

### *Storm Overflows from AMP7 Investigations*

We are completing investigations during AMP7 that are identifying the need to reduce the spills from storm overflows. The two relevant investigations are:

(a) Storm Overflow Assessment Framework investigations, and
(b) WFD Investigations.

The Storm Overflow Assessment Framework (SOAF) investigations are for 61 storm overflows and comply with the EA's Storm Overflow Assessment Framework. This framework applies to rivers only and precedes the Defra Storm Overflows Discharge Reduction Plan. It sets out an approach to identify high spilling storm overflows and any environmental harm based on modelling and ecological sampling. An options development approach is used to identify and evaluate solutions, and the costs and benefits calculated, for overflows where action is required. These investigations identified actions for 36 storm overflows, which are included in our WINEP storm overflows programme for PR24.

We identified a further 44 storm overflows during the WFD investigations in AMP7 where improvements are required to reduce discharges. The investigations identified the spill targets for these sites, some of which are below 10 spills per annum to ensure no environmental harm (Defra target 1). We have included all of these overflows in our storm overflows programme for PR24. The difference with these storm overflows, compared to Portsmouth and Langstone Harbours, is that the investigations have been completed, whereas the investigations for the two harbours needs to be completed first to identify the correct spill target so solutions can be developed. The benefits from the investment on these 44 storm overflows is as follows:

(i) 23 overflows impacting on shellfish waters
(ii) 4 overflows impacting on bathing waters
(iii) 17 overflows impacting on sensitive waters where an Urban Pollution Management (UPM) study was required.

## 2.3. AMP8 Accelerated programme

We have agreed with Ofwat to bring forward an investment of up to £35m from AMP8 into AMP7 to deliver spills reduction at up to 36 overflows included in the AMP8 WINEP submission. Out plan includes this accelerated spend, with a value of £28.6

Interventions will include improvements in the management of surface water through SuDS type features, sewer lining across the wastewater system, and integrated constructed wetlands. This accelerated programme allows us to reduce storm overflow releases by industrialising the pathfinders to maximise the learning, ahead of a large PR24 WINEP, to ensure we can deliver effectively and efficiently.

Our accelerated programme focuses on three main geographical areas:
(a) the Solent
(b) the North Kent Coast, and
(c) Chichester & Langstone Harbours.

Only overflows within the AMP8 WINEP submission have been included in the accelerated plan and we considered the following factors in our prioritisation process:
1. High spill frequency
2. Potential for environmental impact (e.g. shellfish impact)
3. Deliverability confidence within 2 years (for example sufficient adjacent land for wetland construction)
4. Knowledge from existing studies and catchment activity (e.g. Pathfinder areas)
5. Diversity in root cause, interventions, and geography
6. High stakeholder interest in the area

This programme is innovative and therefore carries a level of uncertainty in the outcome. The main objective of the programme is to maximise learning to ensure effective and efficient delivery in AMP8. This learning will not just benefit ourselves but all water and sewerage companies in the UK. We are already in discussions with other water companies in England and Scotland to share our learning to date. We also support the national Surface Water Management group hosted by Water UK, and we are linked into UKWIR.

We will reduce spills by 420 per annum across these 36 overflows. This was set out in our proposal to Ofwat for the transitional funding. We will achieve this spills reduction across the 36 storm overflows, although we cannot guarantee that this will reduce spills to <10 per annum on average over 10 years at each overflow within the accelerated programme by 2025 as the effectiveness of our actions needs to be evaluated over a longer time period post implementation of the investment.

We expect performance improvements will be seen in 2025. We will measure performance by analysing the spills rate before and after the intervention(s). This will enable us to calculate the overall reduction in the average number of spills per overflow across the region using the 3-year average. Importantly we will also aim to design, trial and shadow report a performance measure that decouples rainfall which we believe is required to remove the variability in the data.

One of the conditions from OFWAT of the Accelerated Plan scheme is that we need to:

(a) Provide evidence that all funding is for enhancing the functioning of the asset beyond the level set out in its environmental permit or beyond that which could be achieved through maintenance; and

(b) We must set out our method of providing this evidence.

## *Enhancement, not Maintenance*

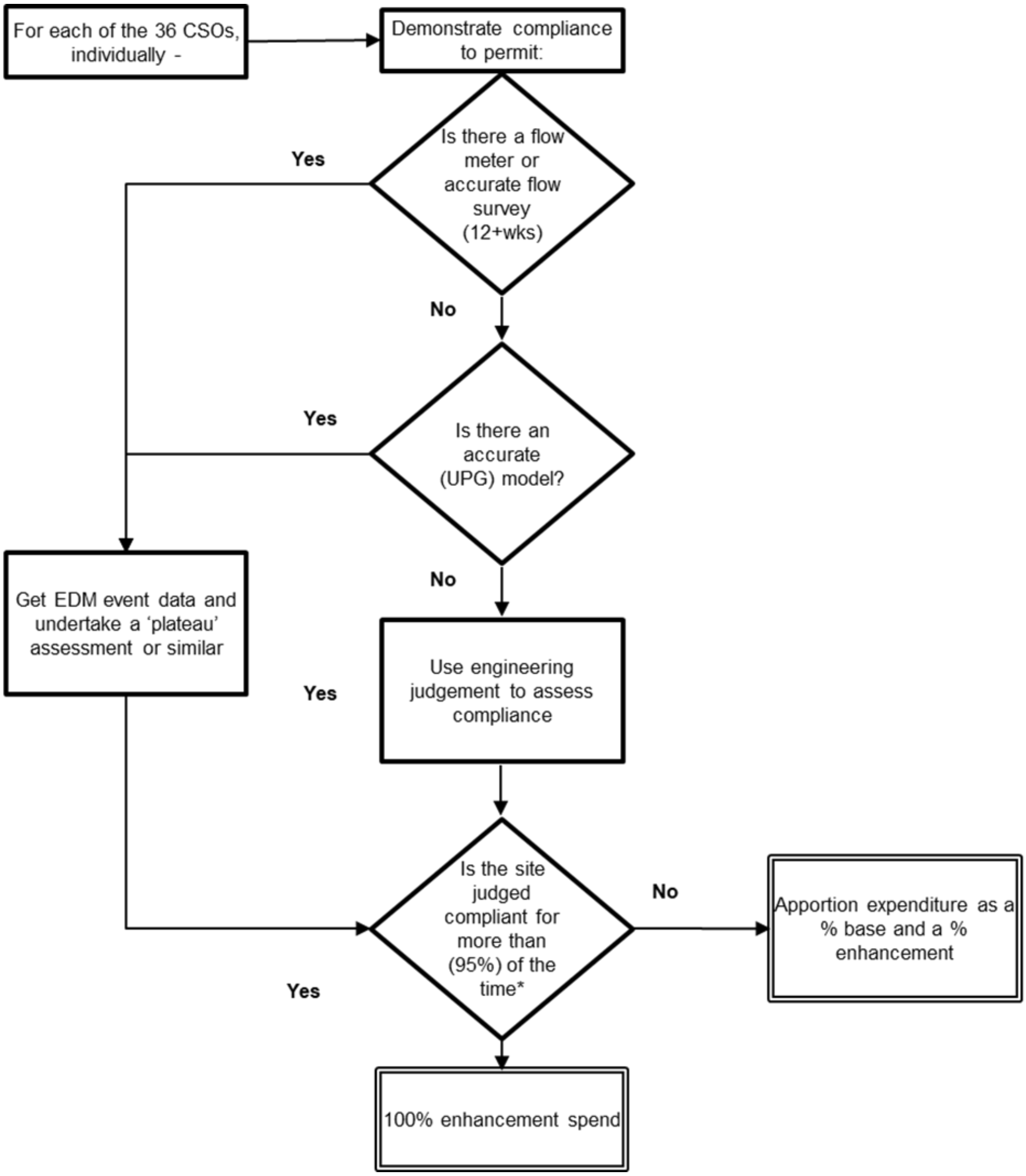
The aim is to demonstrate the storm overflow has been improved with enhancement funding and that the capex is not being used for maintenance.

A hierarchy of evidence will be used to assess compliance to permit. For example, we will assess storage and flow (m3 and flows passed forward l/s) permit requirements as follows:

a) Where there is a flow meter or at least 12 week flow survey data across wet and dry conditions this will be used alongside EDM event data to assess if PFR and storage permit requirements are met (e.g. using the plateau method).
b) Where flow data is not available but there is a grade 3 model (good) this will be used
c) Where neither of these are available then engineering and operational judgment based on SOAF, as well as our spills verification process and site operation history.

If the storm overflow is not 100% compliant then the investment needed will be estimated simply as a % of compliance proportionally allocated or the cost required to meet the permit (where known). Where evidence is not available, engineering judgement and experience will be used. Any additional cost to meet the Environment Act commitment need is enhancement. The process is shown in Figure 2-3 below.

**Figure 2-3: Process for demonstrating enhancement spend at a storm overflow**




The evidence for each CSO will be provided in the final report for the accelerated plan due in March 2025.

## 2.4. Our Storm Overflow Programme to 2050

Our storm overflows programme is for a total enhancement investment of £2.95 billion over the next 25 years. This is a significant investment programme to comply with the requirements of the Environment Act 2021, so it is included in our core pathway in our Long-Term Delivery Strategy (LTDS).

We have focused on green solutions to tackle rainwater at source in our storm overflow programme. This is to ensure our actions are adaptable and sustainable for future changes in climate. This is in contrast to the traditional solutions of building grey storage tanks at the treatment works or in the network, where we may need to go back to the site after several years to make the tanks bigger. None of the improvements planned are predicated on green solutions alone – they are always a hybrid of grey and green in order to introduce greater certainty, open up a wider supply chain, and enable us to achieve the delivery dates set by Government.

The mix of solutions is illustrated by the breakdown of totex costs for the next 5 years, see Figure 2-4. Our submitted business plan costs assume we will be contracting with a third party for two key elements of our storm overflows programme. These are for the delivery of (a) the wetlands to treat groundwater driven discharges, and (b) the large programme of highway SuDS to separate and attenuate rainwater landing on roads, car parks and driveways from our wastewater systems. This investment will go through DPC or an alternative delivery mechanism. Our enhancement cost table therefore includes a total cost of £370 million for our storm overflow programme (excluding investigations) rather than the £657 million total investment planned in storm overflows (excluding investigations).

Our approach to utilise a broader mix of solutions means we can implement a phased, managed adaptive approach to respond to changes in climate that may impact on the number of spills, see Figure 2-5. We will tackle operational issues first with base expenditure, implement green infrastructure at property level, measure benefits in terms of spills reductions, deliver more green solutions (including highway SuDS), measure benefits, and finally deliver grey storage solutions if they are required to achieve the spill frequency targets. This approach also enables us to respond quickly to any change to an alternative pathway as set out in our LTDS.

**Figure 2-4: Breakdown of expenditure by activity for AMP8 in our business plan**

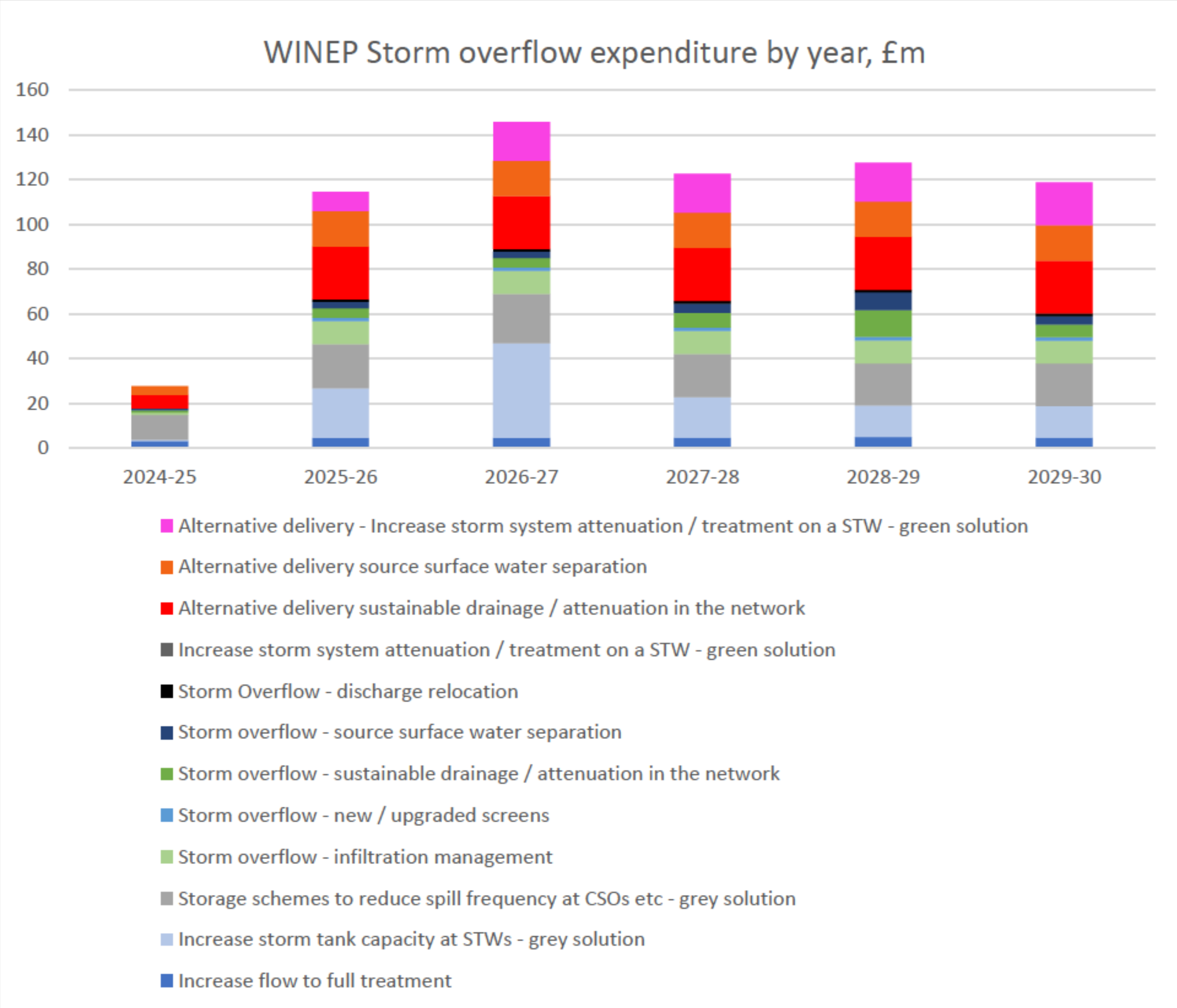
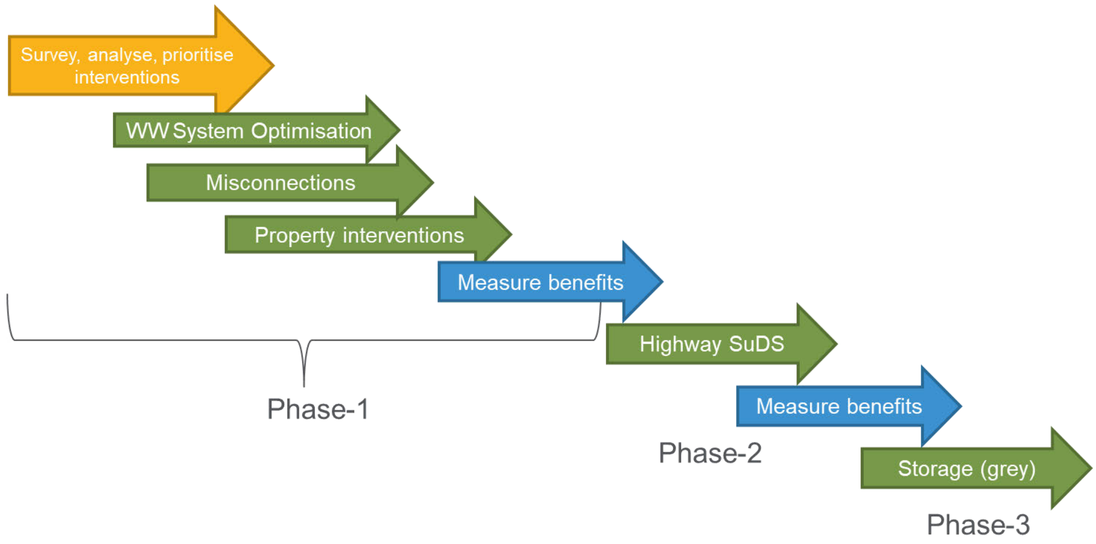


**Figure 2-5: Phased adaptive approach to storm overflow spills reduction**




## 2.5. Benefits of our phased plan

Our phased plan addresses the deliverability and affordability concerns of tackling complex storm overflows by phasing this work over two AMP periods. This enables us to maximise reductions through green and nature-based solutions before following up with grey solutions to achieve the targets. The operational activities (such as repair of sewers, misconnections, proactive jetting) are excluded from our enhancement programme as these costs are included in our base expenditure.

As a result of our phased plan, we are commencing work sooner on more overflows and for more high priority sites in AMP8Phasing means that we can focus on delivering catchment and nature-based solutions, before resulting to grey infrastructure.

The spills reduction from our investment will be significant. Our storm overflows discharge reduction plan, submitted to Defra in September 2023, shows our planned investment will reduce spills to an average of 18 spills per overflow by the end of AMP7, and a further reduction to 15.5 spills per overflow by the end of AMP8. Taking the availability of data penalty into account, the figures are 23 and 18.5 for the end of AMP7 and 8 respectively. This is a 5,154 reduction in spills since 2020.

Our storm overflows programme will deliver the Defra statutory milestones for 2035 and:

- Deliver the recommendations from AMP7 investigations on storm overflows
- Reduce spills to **Shellfish Waters** to 10 or fewer rainfall driven spills on average per year by 2035
- Ensure no more than 3 spills per **Bathing Water** by 2035 (3 for good classification, 2 for excellent) during the bathing water season.
- Ensure **no environmental harm** to waters by 2045. This is the focus for the investigation programme to assess harm / spill frequency
- Deliver actions to ensure 10 or fewer rainfall driven spills per year on average across all overflows by 2050.

## Box 2: What our customers say about storm overflows

From informed customers who have seen the wider 2025-2030 plan and proposed bill impacts:

- Customers support a focus on the 17 bathing waters and support the top (c30) spilling overflows
- Customers want the right solution, not just the quickest – so natural solutions are best
- Generally, we're seeing support for quicker pace – prioritising environment, then recreational / wellbeing
- We do need to be mindful of those that will struggle with bills – so vulnerability support will be needed.

From our Environmental Ambition work - Storm Overflows

- Fairly strong support for accelerating the top 30 spilling overflows and 17 that are near bathing waters – these are both directly addressing the customer desire for going above and beyond to get on top of the storm overflow situation.
- Many customers believe that optimisation will require time to see how much of the leg-work nature-based solutions are able to do in each location – their concern here in particular is doing unnecessary environmental damage via over-sized storm tanks as well as how this could visually affect local areas.

Pace of programme

- 3 out of the 5 customer groups feel that the pace needs to be quicker than what is mandated by government.
    - 2050 feels a long way off, and these customers are disappointed to see some of the areas close them on the maps not being prioritised until much closer to 2050.
    - They also feel as if this workstream is being backloaded and leads to doubts as to whether it will therefore be delivered or may end up slipping
    - Without this work being accelerated, they think it unacceptable that there will be places at which it remains unsafe to enter the water for decades to come and they are concerned about ongoing effects on tourism and businesses, as well as the environment itself.
    - These customers are somewhat reassured to hear that Southern Water wants to accelerate the pace of the programme, though this does make them wonder about how deliverable this will be and what the bill impact for customers will be.
    - On bill impact, there is seemingly a little bit of wiggle room amongst these customers to potentially pay a bit more on their bills to accelerate the programme, but they are mindful about the impact on those who cannot afford it.
- For the future customers group and the other household group, there is more of a sense that the government pace is acceptable.
    - They believe this will help to ensure the programme remains affordable from a customer perspective and deliverable from a SW perspective, though the household group even has doubts that dealing with 155 storm overflows by 2030 is achievable.
    - These 2 groups are more focused on how SW prioritises which storm overflows to tackle so that more headway can be made with the problem areas than dialling up ambition on how many overflows are being tackled in the timeframe.

Prioritisation

- Emerging consensus is that the most appropriate prioritisation focuses firstly on environment, secondly on recreation and wellbeing, and thirdly on overall spill volumes.
- Protecting the environment is felt to be at the very heart of the issue and there is a belief that if SW can do this better then there will be knock-on positive impacts on recreation, tourism, local businesses, health and wellbeing etc. This also feels like the ethically correct approach to take.
- There are some who feel environment and recreation/wellbeing are inextricably linked and it would be wrong to prioritise one over the other, but very few who state recreation/wellbeing should be the top priority over and above the environment.
- The reason for deprioritising overall spill volumes is that this feels as if it would be done more for political reasons, to achieve targets, or to 'manipulate figures' to show more progress than has actually been made on some of the core problem areas. Thus, customers are pretty clear that they wouldn't want this to be the lead priority when the SW strategy on tackling storm overflows is finalised. Their issue is not so much with storm overflows being part of the wastewater network, it is on the damage that they cause to the environment, recreation, tourism, businesses etc.

# 3. Best Option for Customers

## 3.1. Introduction

We are passionate about doing the right thing for our customers and the environment, so our focus is to reduce discharges from storm overflows by getting rainwater and groundwater out of our systems and keeping more wastewater in. But it means that we will need to tackle the issues at source by managing rainwater differently.

We have prioritised catchment-level and nature-based solutions (NBS) in our plan, where possible, to deliver best value to customers, enhance the environment and increase the resilience of our wastewater system. We will work with communities and partner organisations to manage rainwater as close to where it falls as possible. This is a key principle of Defra's SODRP and our customers support this approach too. It will enable us to deliver these new, innovative and best value catchment and nature-based solutions to provide green infrastructure that is sustainable and has wider multiple benefits. Sustainable Drainage Systems (SuDS) are a significant feature of our proposals to reduce discharges from storm overflows.

Each solution is unique, it's bespoke to the community, it's a package of measures that seize opportunities for getting rainwater back into local ponds, ditches, streams and rivers, and creating new raingardens, wetlands, swales and green spaces. Our programme includes property-based SuDS (water butts, raingardens) and non-property SuDS (e.g. wetlands, swales). We have developed a solutions menu for SuDS to inform our options development and costing of solutions (the costs are **direct costs** only to allow for comparison of costs between solution types). The solutions include:

CASE STUDY

### Deal, Kent

**The problem**

In Deal, Kent, residents have suffered from internal flooding for many years. This is in part due to the way water flows in the town and we're exploring solutions to slow the flow of water in the area.

**Action**

Working closely with Deal Water Action Taskforce, we offered smart water butts, planters and slow-drain water butts to residents of Claremont Road, Grange Road, Cowper Road, and The Grove. We've already installed 50 smart water butts.

We also completed an upgrade to a surface water pipe which will redirect flows away from Albert Road to Matthews Close Dyke during heavy rain.

**The benefit**

Reduced flooding for residents in Deal.

**Property Based SuDS**

**(a) Water Butts**

These collect rainwater from property roofs via downpipes. Slows the flow by means of a control device on the outlet. Returns water to the sewer network via the property drain. Smart water butts are able to empty prior to the arrival of a rainfall event, and hence they control flow in proportion to the expected rainfall intensity and duration. Leaky water butts are controlled by a fixed orifice on the outlet. Both types include a high-level overflow mechanism in the event of flow in excess of the system's capacity to control and store.

We are already using water butts for several of our Pathfinder projects to slow the flow from the property downpipe and leak back to the sewer at a reduced rate. They are ideal for properties with limited outdoor space and for water re-use (smart water butts only).

Two types of water butt are available:

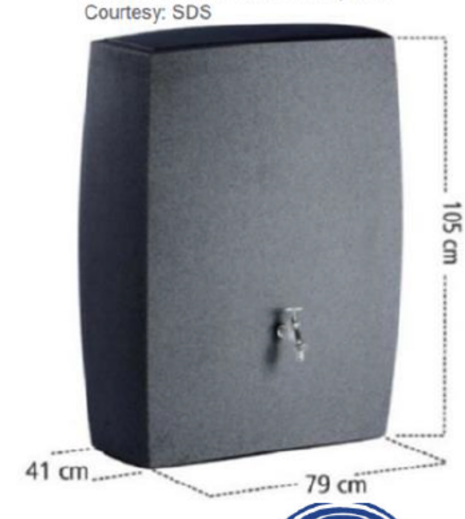
- 'Leaky' water butt holds flow back via a control orifice. Fixed control. No variation in control with rainfall intensity. No possibility for the customer to hold flow back in dry conditions for water re-use.
- Smart water butt actively controls flow. Allows for water re-use by only emptying if a rainfall event is predicted. Enables variable control such that performance is optimised for the actual rainfall event. Smart water butts have an expected design life of 5-10yrs.

Smart water butt prices are based on a quote provided from SDS. Leaky (passive) water butt costs are based on our Sandown Haven Street trial on the Isle of Wight.

Smart functionality empties the waterbutts in advance of a wet weather event and selects an optimal control parameter. The design life is 5 – 10 years.

Leaky water butt
Courtesy: Southern Water

Smart Water Butt and control panel
Courtesy: SDS



## (b) Raised Planter

Large box filled with soil (filter media) captures and attenuates water from the property downpipe before returning it back to the sewer network via the property drain. Flow that passes through the planter filter media is collected by means of an integrated underdrain beneath the planter box. The system includes a high-level overflow for excess flow.

### Raised Planter

| Key Parameters – typical residential property | |
|---|---|
| Dimensions | Width = 650mm<br>Length = 1000mm – 2000mm<br>Height = 90mm |
| Estimated capital cost of device | [redacted] |
| Estimated cost per m² managed to 12mm rainfall depth | |
| Estimated cost per m³ of storage provided | |

Courtesy: Wendy Allen Designs

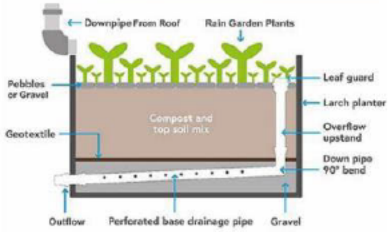
Raised Planter, Feligate
Courtesy: Christopher McLarnon, Stantec

**General Implementation**

- Intercepts flow from property downpipes to **slow the flow** reaching the sewer
- Good option for paved gardens with available space. Also for **schools and high-street businesses.**
- Compatible with particular plants that respond well to variable soil wetness / submergence.
- Prices shown are based on quotes by SuDSPlanter and East of Eden.

**Design & Performance**

- Soaks up the water into the planting soil. Excess flow percolates into an underdrain which connects back to the property drain.
- Additional flow can also pool above the soil if needed. High level overflow prevents spillage.
- Outflow from perforated base drainage pipe is controlled by an orifice
- Design life = 10yrs (stated by supplier)




Sourced from East of Eden (SuDS Raingarden Planter Guide)

## (c) Property Soakaway

Collects flow from property roof and/or driveway and infiltrates into the ground. The soakaway can be filled with shingle or geocellular crates. The entire system is buried beneath the ground and is not visible to the inhabitant of the property.

We have considered and compared two types of soakaway:

- Standard soakaway. Designed to accommodate flows up to 1 in 30yr (property owner to accommodate volumes in excess of this - i.e. volume that spills out of the soakaway). Infiltration rate needs to be verified on site with this approach.
- Soakaway with overflow. Designed for smaller size storms and maintains an overflow connection to the property drain at the downpipe. Any volume that cannot soak away drains into the sewer network. Potentially removes the requirement for infiltration tests at every property. Allows for smaller and more standardised designs."

# Property Soakaway

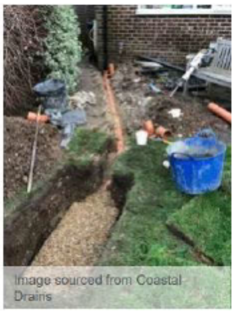
**General Implementation**

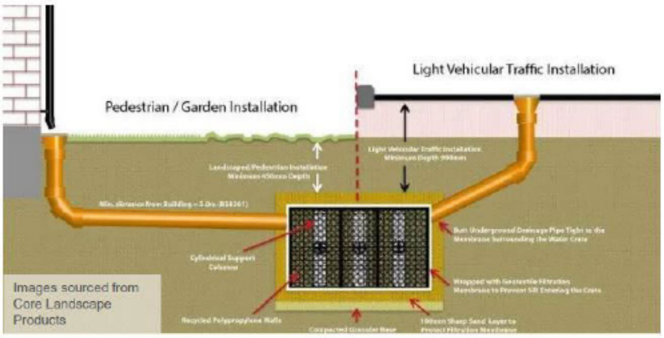
- **Diverts flow** from property downpipes and/or driveways away from the sewer and into the ground
- Soakaway is not visible once installed. **Minimal impact to customers.**
- Standard soakaway is designed to accommodate large rainfall event to prevent flooding of property garden
- **Proposed overflow soakaway facilitates a smaller structure** by providing an integrated overflow to the property drain by allowing the inflow pipe to back-up and overflow.
- Should generally be situated >5m from buildings to mitigate customer concerns about building stability.
- Can be installed in property garden or under driveway. Cost of driveway installation is significantly higher.
- Cost highly dependent on access and infiltration. Overflow soakaway alternative significantly reduces dependence on infiltration.

**Design & Performance**

- Can be filled with shingle/aggregate or crates (to provide more storage capacity)
- Design life is much higher than above-ground alternatives. Can be maximised by including inspection tube and facility for silt removal. No other maintenance required.

| Key Parameters – typical residential property and garden installation | |
|---|---|
| Dimensions | 1.2m x 1.2m x 1.5m deep. |
| Estimated capital cost of device | [redacted] |
| Estimated cost per m² managed to 12mm rainfall depth | |
| Estimated cost per m³ of storage provided | |




## (d) Property Raingarden

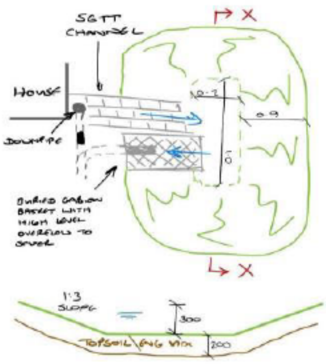
This is a small planted basin to be installed in property garden. It collects flow from downpipe via a channel to direct the flow into the raingarden (see photos). Water is stored within the planting soil beneath and also pools in the basin if required, then infiltrates into the ground. Also includes a gabion overflow which connects excess flow back into the property drain.

## Property Raingarden

| Key Parameters – typical residential property | |
|---|---|
| Dimensions | 2m x 3m x 0.3m deep (not including base layers) |
| Estimated capital cost of device | [redacted] |
| Estimated cost per m² managed to 12mm rainfall depth | |
| Estimated cost per m³ of storage provided | |

**General Implementation**

- Collects flow from property downpipe, stores water in basin and underlying soil, and infiltrates into the ground. Overflow functionality provided for excess flow.
- Effectively a surface-level soakaway with an overflow back to the sewer
- Good option for gardens with lawn space and for customers who want a surface drainage feature
- Probably not as widely applicable as the other property solution menu options
- Solution provides a relatively large volume for a typical property roof. Would be best suited to larger roofs with surrounding lawn area (e.g. for council-owned apartment buildings)





(e) **Permeable Paving**

Permeable paving can be used to capture, store and infiltrate rain that falls onto roadways, access routes, driveways and paved areas, see Figure 3-1. It can be an effective measure for residential streets with minimal highway space available for raingardens, tree pits etc. Storage can be provided beneath permeable paving in areas where the soils slow the rate of infiltration.

Infiltrating driveways can be installed within 5m of the property provided the driveway only drains itself (i.e. no roof drainage connected).

Estimated direct costs for permeable paving are shown in Table .

**Table 3-1: Typical Direct Costs for Permeable Paving**

| Key Parameters – typical residential property | |
|---|---|
| Dimensions | Typical driveway area = 45m2 |
| Estimated cost for typical driveway | [redacted] |
| Estimated cost per m² managed to 12mm rainfall depth | |
| Estimated cost per m³ of storage provided | |

### Figure 3-1: Examples of Permeable Paving


Typical resin bound porous driveway. Image sourced from theresinmill.co.uk

Typical permeable block paving driveway
Image sourced from Marshalls Paving

Permeable / porous paving types. Figure sourced from the CIRIA SuDS Manual

## Case study: £1.6 million SuDS in schools project

CASE STUDY

### Schools

#### The problem

Rainwater running off school roofs, playgrounds and hard surfaces can overwhelm the combined sewer system, causing localised flooding and storm overflows.

#### Action

We partnered with the Department of Education to work with 47 schools to install raingarden planters, free of charge, on school roof downpipes to remove or slow the flow of rainwater.

With four schools in the south, we've also designed large sustainable drainage solutions to completely separate surface water from their site.

This £1.7 million project includes working with schools that experience flooding, as well as areas where the network experiences pressure from excess water.

We have agreed to work with another 50 schools between April 2023 and March 2024 (an additional £1.2m project).

#### The benefit

We are currently monitoring the exact levels of water the project has removed and we'll be producing a report in 2023 to outline our findings and lessons learnt from the first year.

## Highways SuDS

### (e) Roadside Raingardens

# Roadside Raingarden

#### Placement, Operation and Maintenance

- Target linear grass verges on residential streets & improves overall appearance and biodiversity
- Footprint can be adapted to specific verge widths as required
- Flexible surface design to accommodate maintenance preferences & residential parking patterns
- Can accommodate new tree and/or general planting if required

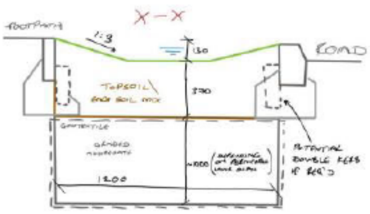
#### Design and Performance

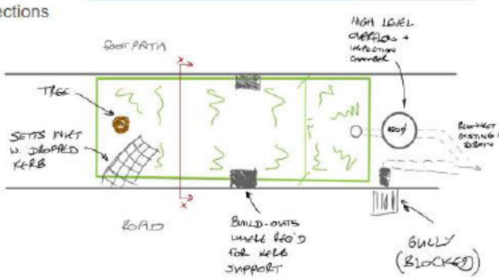
- Surface water is stored and infiltrated below the grass verge. Excess volume spills to sewer.
- Can be scaled up for additional gully connections

| Key Parameters (single installation managing 200m² road – 1 gully, first 12mm of rain captured) | |
|---|---|
| Footprint | 1.2m x 4.6m |
| Basin (surface) depth | 0.1m |
| Overall construction depth | 1.5m |
| Storage volume | 2.3m³ |
| Estimated device capital cost | [redacted] |
| Estimated cost per m² road area managed | |
| Estimated cost per m³ of storage provided | |

Photo of similar design taken at Garrard Ave, Margate. The proposed design does not include exposed aggregate. Photo by: S Riisnaes (Stantec)

Similar design in Leeds. Example of reducing surface level for planting. Also deters car parking on verge. Reduced width due to utilities. Credit: Mark Conway (Bentley/MMB)




### (f) In Road Raingarden

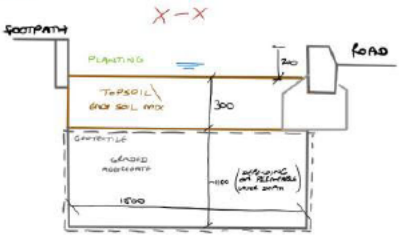
# In-Road Raingarden

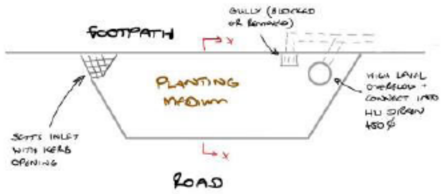
#### Placement, Operation and Maintenance

- Target wider residential streets with potential for traffic calming measures
- Footprint can be adapted to specific road sizes as required
- Flexible surface design to accommodate maintenance preferences
- Potential for feature or conservation kerbs to be used instead of standard (cost estimate based on standard kerbs)

#### Design and Performance

- Similar below ground arrangement to verge soakaway.
- Inlet configuration (against footpath kerb) provides effective flow collection mechanism.
- Can be scaled up for additional gully connections.




| Key Parameters (single installation managing 200m² road – 1 gully, first 12mm of rain captured) | |
|---|---|
| Footprint | 1.5m x 3.4m |
| Basin (surface) depth | 0.2m |
| Overall construction depth | 1.5m |
| Storage volume | 2.3m³ |
| Estimated device capital cost | [redacted] |
| Estimated cost per m² road area managed | |
| Estimated cost per m³ of storage provided | |

Build-out (in-road) raingarden in Emberton Road, Bristol. Photo by: Susdrain

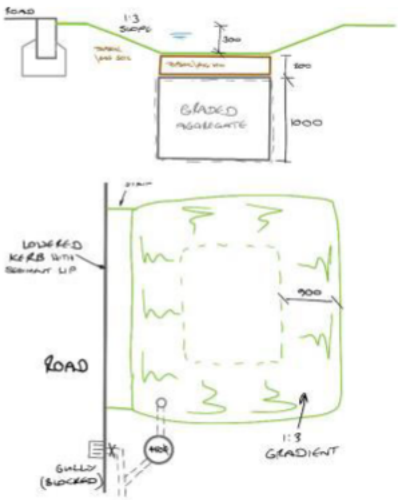
WATER for LIFE from Southern Water

### (g) Pocket Basin

Pocket basins are smaller features that can be incorporated into the roadside infrastructure to capture and attenuate rainwater, and provide wildlife and biodiversity benefits.

Placement, Operation and Maintenance:

- Use where there is green space next to the road (e.g. by a road junction)
- Basin size and footprint geometry can be adapted as required
- Flexible surface design to accommodate maintenance preferences – grass or wildflower/planting




Heriot-Watt University Campus, Edinburgh. Credit: CIRIA

| Key Parameters (single installation managing 200m² road – 1 gully) | |
|---|---|
| Footprint (including side slopes) | 3.8m x 3.8m |
| Depth of basin | 0.3m |
| Overall construction depth (can be shallower if slopes are designed to drain) | 1.5m |
| Estimated device capital cost | [redacted] |
| Estimated cost per m² road area managed | |
| Estimated cost per m³ of storage provided | |

Example of planted pocket basin in St Mary's Bay, Kent. Provided by Stantec.

Design and Performance

- Example shown uses road lip and filter strip as inlet but could also be adapted to a pipe or channel inlet
- Offers greatest potential (of the alternatives) for volume capture, due to footprint size
- and basin depth.
- Can be scaled up for additional gully connections. Best value where there are multiple
- gullies connected.

### (h) Paved Tree Pit

Placement, Operation and Maintenance

- Use in urban areas where no existing green space available (e.g. town centres)
- Underground storage size and footprint geometry can be adapted as required
- Flexible placement options due to small surface-level footprint
- Aligns with local authority urban and roadside tree planting initiatives

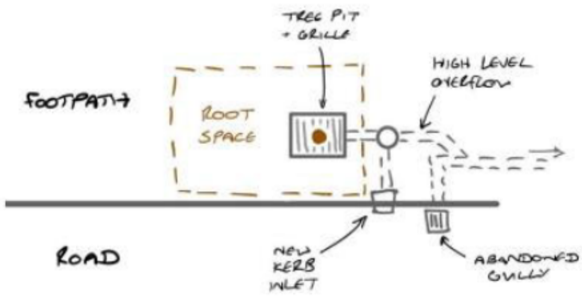
- Reference design assumes a ductile iron kerb drain but alternative inlets can be considered according to maintainer preferences.

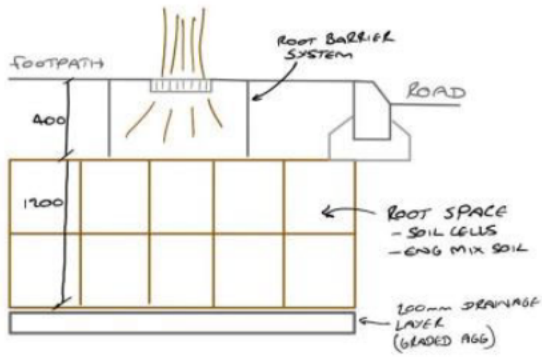
Design and Performance

- Soil cells required to provide the necessary support within the root space for the pavement above.
- Can be scaled up for additional gully connections. Best value where there are multiple gullies connected.

| Key Parameters (single installation managing 200m² road – 1 gully) | |
|---|---|
| Surface footprint | 0.8m x 0.8m |
| Buried footprint (e.g. located parallel to a road) | 1.5m x 3.2m |
| Overall construction depth | 1.8m |
| Estimated device capital cost | [redacted] |
| Estimated cost per m² road area managed | [redacted] |
| Estimated cost per m³ of storage provided | [redacted] |

Example tree pit showing buried soil cells supporting the footpath. Credit: Green-Blue Urban (Arborsystem product)




We will develop an effective package of measures which, when combined with additional storage, will deliver the reduction of spills required for each storm overflow and provide the best fit for customers, especially where actions are taken with them on their property or within their community.

## 3.2. Development of the Best Options

We are using our experiences from the Pathfinder projects in AMP7 to really understand the opportunities and how best to deliver these different types of solutions, and the costs involved. We have brought this knowledge and experience into our PR24 business planning to evidence that the proposed enhancement option is efficient and based on robust benchmarking evidence from our pilots in AMP7 and case studies across the industry.

Ofwat have commented on our Pathfinder projects and the approach we are taking on storm overflows: "*I'm deep in the world of storm overflows again and just wanted to say I watched your presentation yesterday and thought it was absolutely brilliant, it is really great to see that Southern Water are still challenging the norms and making great progress in tackling spills. While the innovative approach you're planning will probably make our cost assessment more challenging, I really look forward to seeing Southern Water's proposals and the action plan you're producing" (Ofwat feedback, 6 Sept 2023)*.

Our storm overflows programme includes 36 sites (of the 179 sites commencing in AMP8) arising from the AMP7 SOAF investigations and the 44 from AMP7 WFD investigations. The solutions and costings for these sites were developed during the AMP7 investigations and hence they are more detailed than for the remainder of the storm overflows in our programme. The solutions for these 80 storm overflows were developed through a rigorous options, appraisal process so we are more confident that these are the right solutions for customers and the environment.

We have developed the solutions and costings for the remaining storm overflows through our regional analysis. We assigned solutions to each overflow on the basis of the root cause of the spills and also the catchment dominant root cause of system exceedance. The scale of the solution is determined by the existing spill frequency and by the required maximum number of annual spills required to comply with regulatory targets.

Developing the optimum package of measures for each community is challenging at this stage of the process. Site surveys are required, as well as discussions with local organisations, landowners and the community to align objectives and opportunities.

We have considered three main ways to reduce the number of discharges from storm overflows:

(a) Make better use of existing drainage and wastewater infrastructure (both ours and other asset owners like the highway authority). Using smart controls on our storage tanks and pumps to manage peak flows is an example.

(b) Source control – prevent through separation, or slow the flow through attenuation, of rainwater entering foul or combined sewers, reduce groundwater infiltration, and reduce the inflow from customers. For example, using sustainable drainage systems (SuDS) for rainwater, reducing infiltration or reducing water use in the home.

(c) Build bigger infrastructure. For example, bigger pipes, storage tanks, pumps and treatment facilities.

Our customers and the Government expect us to deliver the best value solutions to maximise wider benefits and address multiple issues for people and the environment. Defra expects us to driver better solutions by:

(i) preventing additional rainwater from entering the combined sewer network and remove existing rainwater connections where it is the best value solution

(ii) prioritising a natural capital approach, considering carbon reduction and biodiversity net gain, as well as catchment level and nature-based solutions

(iii) achieving year on year reductions in the amount of surface water that is connected to their combined sewer network, and

(iv) considering treatment of storm overflow discharges (e.g. through wetlands) as an alternative solution where appropriate.

The Government's Storm Overflows Task Force investigated options for elimination of storm overflows in its 'Storm Overflows Evidence Project'(SOEP). They concluded from the evidence and cost benefit analysis that applying a policy of complete elimination nationally is not feasible, or within the public interest, due to the financial and environmental costs. However, they concluded that a combination of options such as storage, SuDS and treatment of discharges should be considered at a local or catchment basis.

The following methods for identifying the proposed solutions were used in our analysis:

- **Storage + SuDS.** In cases where overflows have a 'storm' root cause and are located in catchments that are dominated by rainfall-related spills, the selected solution is to use SuDS measures across 30% of the contributing impermeable area. This is supplemented by the provision of a buried storage tank in accordance with the SOEP methodology.

- **Wetlands and lining.** This solution is applied to overflows that have an infiltration root cause because it treats all of the overflow volume and, as such, is much better suited to groundwater-driven spills. The approach is outlined below
    - Assumes lining of 30% of sewer length (not including private laterals) to enhance the watertightness of the existing system
    - Since wetlands are a treatment technology, they need to be sized (and costed) on the basis of contributing PE. This is not known at overflow level and needs to be estimated based on the wastewater catchment population.
    - Because the wetlands need to be sized on the basis of a whole catchment, it is not possible to reliably size a wetland located in a rainfall-driven catchment. For this reason, such overflows are costed on the basis of a storage tank (assuming no SuDS).

- **Complex.** In cases where specific overflows have a 'storm' root cause but are located in catchments where groundwater infiltration is a concern due to high groundwater levels or the use of SuDS presents a groundwater pollution risk, the solution is less obvious and further analysis will be required. In such cases it is unlikely to be feasible to use large scale SuDS measures such as swales, ponds and wetlands, unless the groundwater levels are sufficiently below the surface. Also, storage tanks are less effective if there is significant infiltration. A bespoke range of actions will be required to reduce the discharges from these storm overflows.

Note: Overflows with an operational root cause are included within our botex plan, and not in this enhancement business case.

Having determined the solution types for each overflow and the scale of actions needed, we were then able to apply the various costing tools and databases on typical costs. Our costing tools for SuDS was used. This was previously developed by our cost consultants for our DWMP.

## 3.3. Options Development

We used an options development process for each overflow as set out below and illustrated in Figure 3-2. The process is:

a) Step 1. Confirm the environmental risks, issues to address and root cause.
b) Step 2. Develop constrained options list and assess the potential for each option category to address the root causes. Assign constrained options to each storm overflow.
c) Step 3. Develop feasible options lists. Identify, size and cost the least cost and preferred options. Calculate benefits for least cost and preferred options and calculate Net Present Values.

**Figure 3-2: Process for Options Development**

| STEP 1 | STEP 2 | STEP 3 |
|---|---|---|
| **DETERMINE DOMINANT ROOT CAUSE OF SPILLS AT EACH OVERFLOW**<br>A. Operational<br>B. Storm rainfall<br>C. Groundwater influenced infiltration | **ASSIGN CONSTRAINED LIST OF SOLUTIONS LINKED TO ROOT CAUSE**<br>A. Operational improvement (not WINEP)<br>B. Storage (grey) only AND hybrid storage / SuDS (grey-blue-green)<br>C. Wetland with reduced infiltration | **SIZE AND COST CONSTRAINED OPTIONS**<br>Volume of storage (cubic metres) to increase capacity of wastewater network<br><br>Impermeable area (Hectares) contributing runoff to wastewater networks in wet weather that is managed using SuDS techniques<br><br>Area of constructed wetland (Hectares) used to treate groundwater-caused storm overflow<br><br>Length (km) of public/private wastewater network relined to make more resilient to groundwater ingress |

We applied this options development and appraisal approach to identify a constrained list of options for each overflow from an unconstrained list of the possible solutions. The constrained list is made up of (in most cases) a preferred option and least cost option, each considered to be technically feasible and deliverable. Once funding is secured and we commence the delivery, we will further assess the local opportunities for maximising use of green and blue infrastructure, including SuDS, in each specific location by working in partnership with other organisations and landowners to identify specific locations and sites from which we can reduce rainwater getting into foul and combined sewers.

## Step 1 – Environmental Risks and Root Cause Analysis

In this step we determined the root cause of the spills (i.e. primarily rainfall-driven or groundwater-driven or operational reasons).

We used the spill reporting data for 2020/21 to identify storm overflows and number of spills. The root cause of the spills for each overflow was then assessed using data analytics. This integrates the EDM data with rainfall patterns and seasonality to determine the most likely root cause of the spills. Where the machine learning techniques could not be used (e.g. due to lack of data) we reverted to more conventional methods to determine root cause - e.g. by assessing the amount of infiltration in DWF.

Overflows were assigned one of the following possible root causes:

- Storm – spills are primarily a response to rainfall from impermeable surfaces
- Infiltration – spills are primarily a response to groundwater ingress to wastewater network
- Complex – spills do not correlate well with either of the above options and are considered likely to be a function of multiple factors.

Our analysis using artificial intelligence and modelling identified the root causes of our spills, which were:

- 65% are caused by rainwater
- 25% are caused by groundwater infiltration
- 10% are caused by other, often complex, issues.

**Table 3-2 Summary of root cause analysis**

| Root Cause | Overflow Count | Spill Count (2020/21 average) |
|---|---|---|
| Rainwater | 728 | 12818 |
| Groundwater | 115 | 4869 |
| Complex/Unknown | 135 | 2121 |
| **Total** | **978** | **19808** |

## Step 2 – Develop Constrained Options

The root cause analysis formed the first part of options development. This was used to narrow down the unconstrained options to a shorter list of constrained options based on the cause of the discharges. For example, sewer lining was not considered where the cause of discharges was rainwater getting into the sewers from roofs and roads.

The constrained options were developed based upon the type of interventions that would be effective at each location. For example, where the root cause was determined to be rainwater run-off, the feasible options are storage or a combination of storage and rainwater management (separation and attenuation) using SuDS. Likewise, where the root cause was determined to be groundwater ingress the constrained option was limited to the only technically feasible solution which is to ensure that the wastewater network is as watertight as reasonably possible and in conjunction manage residual storm overflow discharges through treatment in constructed wetlands. Where the root cause is more complex, further investigation is required to determine the right solutions.

**Table 3-3 Number of overflows in each category of options by root cause**

| Root Cause | Needs investigation | SuDS and Storage | Wetlands and Lining | Screen Only | No work required |
|---|---|---|---|---|---|
| Rainwater | 12 | 358 | - | 300 | 58 |
| Groundwater | 27 | - | 65 | 13 | 10 |
| Complex | 63 | - | - | 54 | 19 |
| Total | 102 | 358 | 65 | 367 | 87 |

## Step 3: Size and Cost Constrained Options

We determined the feasible options by sizing and costing options using a variety of methods depending on the solution and our understanding of the storm overflow's current performance. The approach is explained in detail in section 3.3 below. During this step we considered a range of data sources and issues:

### (a) Climate change

The solutions are scoped for a 2050 design horizon and hence include allowance for future population, water consumption and climate change. Climate change affects the pattern of rainfall events and we used industry standard tools ([redacted]) to determine 'future rainfall' for the 2050s scenario that is common to both RCP8.5 (business as usual) and RCP2.6 (high level of CO2 control). Science advice indicates that until 2050s the future pattern of rain will be similar irrespective of what emissions controls are deployed. Only after 2050s does the difference in impact from the two emissions scenarios become material.

**(b) Hydraulic models**

Many storm overflows requiring improvement are in catchments where we have previously developed and maintain hydraulic models. We have used these models to design storage needed to achieve the target spills frequencies. Where no models were available, we estimated the storage needs based on statistical rainfall models linking EDM spill frequency and duration to catchment characteristics. This is an industry standard approach for flood estimation and provides a reasonable approximation in the absence of a verified hydraulic model.

## 3.4. Developing our Storm Overflow Programme

We have focused on developing options to reduce discharges from storm overflows that deliver best value, in accordance with the Government's expectations and the Water Industry Strategic Environmental Requirements (WISER) and the principles set out by Defra in the SODRP. The approach we adopted is:

- **For rainwater driven discharges**: We will prioritise rainwater separation, followed by attenuation through sustainable drainage systems (SuDS), above construction of concrete and steel storm tanks. Traditional storage will be needed to meet the target dates for spill reduction. Hence, we propose hybrid solutions. The necessary grey / green balance is uncertain so we will lead with green, monitor and observe its effectiveness and introduce grey where this is necessary.
- **For groundwater driven discharges**: Storage options for groundwater driven discharges are ineffective as they quickly get filled and remain full when groundwater levels are high. Lining of private and public sewers can be used to reduce infiltration of groundwater, but infiltration even occurs in sewers that are in good condition due to the pressures from groundwater pushing water through the joints between sections of pipe. Our proposed approach is to treat the discharges through integrated constructed wetlands before the water is released into the environment. We are currently discussing the adoption of this approach with the EA, and how it will be regulated.
- **For discharges driven by other issues:** Multiple issues can lead to discharges from storm overflows. Operational issues are firstly identified, and action taken as part of our routine operation and maintenance activities to ensure the systems are working as designed. Operational issues include electrical supply failures or mechanical breakdowns or blockages driving spills. However, issues such as heat stress and flood risk which exceed the design parameters of assets are discussed in our resilience enhancement business case. But we're already taking action to reduce the releases that do not comply with the EA permits through our Pollution Incident Reduction Plan. Some overflows need other improvements to reduce spills. For these, further investigation and analysis is required to identify the root cause and develop solutions.

We have excluded from our WINEP submission activities that improve storm overflow performance that are base expenditure (such as repair of sewers, addressing misconnections, proactive jetting). Our Pollution Incident Reduction programme investigates and tackles non-compliant discharges that we record and report as pollution incidents.

*Options for Rainwater driven discharges*

There are over 120 storm overflows of the 179 in our programme for commencement in AMP8 where the discharges are caused by rainwater. We will reduce the discharges by separating rainfall from the combined sewers and discharging it back to the environment as close to where it falls, as per Defra's core principle.

Where this is not possible, then we will seek to attenuate rainfall through sustainable drainage systems (SuDS).

> **Findings from the public consultation on our DWMP**
>
> In our public consultation, 94% of responders either agreed or strongly agreed that rainwater should be separated from foul wherever possible to reduce flooding and overflow spills. Furthermore, 70% of all responders agreed or strongly agreed that nature-based solutions should be prioritised over traditional engineering approaches to reduce the risks from storm overflows.

We considered and tested a range of targets for rainwater separation to remove or significantly slow the flow. The Government's SOEP tested 10% and 50% separation. 10% had little effect and 50% was too expensive. 30% is a sensible middle ground and proven to be realistic target to commence this new journey. This means we will aim to remove 30% of the total impermeable area that currently connects to our combined sewer system. Our engineering judgement and experience of surface water separation schemes over many years tells us that this percentage value is feasible.

This level of separation would have a significant impact in reducing the need for sewer capacity increases and delivers a range of co-benefits which, when monetised, offset the higher costs of delivering hybrid solutions. We have additional evidence from modelling and catchment studies but every catchment will be different. But our strategy is to implement, measure, implement more if required, measure, repeat. Building storage is the last resort.

We are testing retrofit SuDS approaches in our Pathfinder projects. There is uncertainty about their effectiveness when applied at scale and when applied in different parts of catchments. Design assumptions applied in hydraulic modelling might be conservative and that the SuDS could be more effective than we are planning for, further reducing the need for network storage enhancement, or vice versa. Our preference is to embrace these uncertainties within an adaptive programme that commences with SuDS, closely monitors their effectiveness at reducing spills and then fine-tunes any residual necessary sewerage enhancement using grey infrastructure.

> **Newport and Ryde, Isle of Wight**
>
> CASE STUDY
>
> **The problem**
>
> The town centres are problematic drainage areas with large impermeable areas such as car parks, roads and buildings.
>
> **Action**
>
> We're working in partnership on two Local Authority projects to improve the town centres and install green designs. We will co-design, co-fund and co-deliver tree pits, rain gardens, permeable paving and other sustainable drainage features.
>
> **The benefit**
>
> Not only will the town centres look more green, and attractive, they will also reduce storm overflows by holding back and slowly releasing stormwater.

We have assigned a number/quantity of SuDS devices to each qualifying overflow within a given catchment in proportion to the size of the spill volume at each overflow and the catchment size and make up. This has enabled us to estimate the cost for spill reduction at each storm overflow. For costing purposes, we have developed CAPEX and OPEX costs per hectare of impermeable area managed with SuDS, assuming a typical package of SuDS of different types.

With our 30% target, we estimate that we will need to improve the management of rainwater across over 500 hectares of urban areas. Activities will include 350km of roadside SuDS, disconnecting or slowing the flow at 72,000 downpipes and 2,000 driveways.

We sized these SuDS and other rainwater management devices on the basis of providing sufficient storage volume to accommodate 12mm of rainfall on the contributing catchment. This is because, on average, there are 10 wet weather events (defined in 12hr periods) that are greater than 12mm of rain in any year. Hence, the SuDS will be designed to be effective for the first 12mm of a rainfall event - this is an appropriate design standard where the goal is to reduce the occurrence of overflow spills which can occur in only light rainfall. However, we will test the sensitivity of our designs to see if accommodating an increase in the volume of rainwater gives significant further reduction in the number of spills for a relatively small additional cost. This way we hope to achieve a greater benefit for lower cost and exceed our 30% target for impermeable area managed through SuDS.

**Table 3-4 Assumptions for SuDS and surface water management calculations**

| Assumption | Value | Comment |
|---|---|---|
| Percentage of domestic properties connected to combined sewer network with downpipe management measures (raised planters and water butts) | 40% | Based on Pathfinder testing |
| Percentage of non-domestic properties connected to combined sewer network with downpipe management measures (raised planters and water butts) | 40% | Assumed same as domestic |
| Proportion of domestic properties managed by leaky water butts | 90% | Large majority of solution to be leaky water butts due to relatively low cost. |
| Proportion of domestic properties managed by raised planters | 10% | |
| Leaky water butt: Equivalent domestic property roof area with 12mm of rainwater | $10m^2$ | Based on Pathfinder Solution Menu. 100L attenuation storage volume and $30m^2$ contributing area. |
| Leaky water butt: Equivalent non-domestic property roof area with 12mm of rainwater | $40m^2$ | Assumes availability of larger leaky water butts and larger roof area connected to non-domestic downpipes. |
| Proportion of non-domestic properties managed by leaky water butts | 80% | |
| Proportion of non-domestic properties managed by raised planters | 20% | |
| Raised planter: Equivalent domestic property roof area with 12mm of rainwater | $20m^3$ | Based on Pathfinder Solution Menu for small planter. 260L attenuation storage volume and $30m^2$ contributing area. |
| Raised planter: Equivalent non-domestic property roof area with 12mm of rainwater | $40m^2$ | Based on Pathfinder Solution Menu for small planter. 525L attenuation storage volume and $40m^2$ contributing area. |
| Percentage of domestic properties with permeable driveway | 2% | |
| Percentage of car park area managed by SuDS | 5% | |

There are benefits to the wider local economy arising from green solutions, including making space for nature, greening cities, supporting climate adaptation, as well as supporting mental and physical health and wellbeing, potential house price increases and creating local jobs. This opens up the potential to work in partnership with others – see below.

We recognise that some traditional grey storage and expansion of associated infrastructure (sewers and treatment assets) will be needed to meet government expectations and targets for the pace at which the storm overflows need to be reduced. Storage remains an option to reduce storm overflow spills. Our least cost plan uses it on its own. However, our preferred plan is a combined approach where we focus on green solutions and follow up with the grey to achieve the desired outcomes (see example below). In practice, the range of constrained options for delivering network storage will include simple above ground facilities at wastewater treatment works, large buried tanks in networks, oversized sewers, the re-instatement of some abandoned assets and the smart use of existing storage through methods such as real-time control of wastewater systems. Where root cause information is inconclusive and not obviously operational in nature, we are using network storage as a default solution pending future refinement.

The Defra Storm Overflow Evidence Project (SOEP) analysis highlighted that where SuDS are used, a supplementary infrastructure (storage etc.) provision will still be required. This was confirmed by our hydraulic modelling. However, where the required storage volume is predicted to be less than 500m$^3$, we assumed that a nurse tank (i.e. above-ground storage) will be provided instead of a buried storage tank. Our Regional Plan shows costs to be similar, but the big benefit of nurse tanks is speed of deployment. This solution is only applied at storm overflows located in WTWs and they are not supplemented by SuDS due to the low storage volume requirement.

Table 3-5 sets out the expected outputs from our preferred option and the least cost option for the first five years of our programme for AMP8. These are delivered through improvements to 179 storm overflows, and collectively they will reduce our average annual spills per overflow to 15.5 by the end of AMP8.

We are clear that the best value options are those greener sustainable options that support wider environmental outcomes and benefits (including supporting Government objectives to halt the decline in species abundance by 2030 in the Environment Act, to achieve carbon net zero by 2050, and support climate change adaptation and nature's recovery). The overall costs of the best value options are higher than the least cost. However, when taking into account the use of the alternative delivery route for a significant part of our storm overflows programme (these costs are included in the SRN17 Direct Procurement for Customers & Alternative Delivery Model), the preferred option appears to be lower than the least cost option in Table 3-5.

**Table 3-5: Options Summary and outputs**

| Proposed Outputs from our Storm Overflow Investment | Preferred Option | Least Cost Option |
|---|---|---|
| Buried storage volume (m3) ** | 158,763 | 231,468 |
| Hectares of wetland | 98 | 98 |
| Sewer length lined (km) | 494 | 494 |
| Hectares of impermeable area managed * | 1,178 | 20 |
| Number of downpipes managed (water butts etc) | 150,856 | 2,402 |
| Road length managed by SuDS (km) | 719 | 13 |
| Number of raingardens in public space (= approx. tree count) | 23,082 | 68 |
| Totex Cost (£M) | 370 | 492 |

* There are wider local economy benefits beyond these (house price increase and local jobs)
** This is the worst case: through an adaptive pathway we would first deliver SuDS, monitor and then build grey infrastructure (including storage) sized accordingly (but very likely to be smaller than estimated

**Case Study**

**Havenstreet - An exemplar for reducing CSO discharges**

Havenstreet is a small inland village of 4,000 people on the Isle of Wight. It is situated within a nationally designated Area of Outstanding National Beauty and UNESCO Biosphere Reserve.

The village is served by a combined sewer system which accepts foul water from properties but also rainwater from highway gulleys and roofs. When it rains, the pumping station at the bottom of the village becomes overwhelmed by the flows and the storm overflow discharges into the Blackbridge Brook, a SSSI (Site of Special Scientific Interest).

In 2021 there were 28 spills lasting a total of 58 hours. The watercourse is classified as 'failing' under the Water Framework Directive so a solution had to be found to reduce the discharges.

Traditional solutions would rely on storing excess flows in tanks but construction of these has a significant carbon footprint and ongoing pumping and maintenance costs. More importantly, as we experience more frequent and severe storms, tanks do not provide a long-term solution. We wanted to find a better way that reduced our environmental footprint, provided community benefits and a responsible investment opportunity by focusing on catchment-based solutions.

We collaborated with the Parish Council to:

1) offer every property a free, slow-draining water butt to capture rainwater from roofs whilst still allowing water use in gardens. More than 72% of homeowners took up this offer and it removed more than 30,000 litres of rainwater from the sewer system.
2) Install slow the flow planters on a number of large public roofs in the village.

In 2022 there were just 5 discharges and a few significant rainfall events of up to 30mm in 12 hours yet no discharges occurred from the outfall.

In total, the interventions cost less than £20,000 compared to an estimated £120,000 cost of a traditional storage solution. This shows a saving of 83%. The interventions have been shown to be completely effective when used in a small, controlled area. We now have a detailed programme of work to roll this out on a large scale and want to deliver it at pace.

Customer engagement during our Storm Overflows Pathfinders programme has indicated a general acceptance and willingness among the public to consider installing water butts, raised planters and other similar measures on domestic and non-domestic properties. These measures help slow the flow from the roofs of properties by, for example, intercepting it within property downpipes before it passes into the combined sewer network.

We will fund the provision and installation of property-based SuDS. The various models for future ownership, maintenance and replacement are being developed as part of our Pathfinder projects in AMP7. These are a key element of our plan and make a significant contribution to our spill reduction targets.

### *Options for Groundwater Driven Discharges*

The provision of additional storage is not an appropriate mitigation for overflows that have a clearly identified groundwater cause. This is because the prolonged nature of the spills at these locations cannot easily be attenuated as the tanks will fill and stay full for weeks or months on end.

Our plan includes lining over 300km of sewers. We estimate that intervention is required on a length of public-private sewer equivalent to 30% of length of public sewer in the relevant catchments. Lining can be selectively done in groundwater dominated catchments, although these are predominantly sewers that are already in good condition (i.e. grades 1, 2 and 3). Sewers in condition grade 4 and 5 are routinely inspected and relined as part of our normal operational and maintenance activities and are funded from base expenditure. However, our experience and evidence from our sewer rehabilitation programme shows that sewers in a condition grade 1, 2 and 3 are hydraulically efficient but can also allow significant ingress from groundwater through the joints between sections of pipe. Sealing sewers will improve the sewers beyond normal Grade 1, thus we are improving the design standard for sewers to reduce infiltration. Private laterals will need to be tackled as well. Water companies do not have the legal powers or responsibilities to carry out work on private sewers. We need to seek permission from property owners before completing work on their sewers. However, we need to secure funding for these sewer enhancements to ensure good condition sewers do not allow groundwater infiltration into the foul or combined sewers.

We also plan to mitigate the impact of spills at related overflows by creating 50 hectares of Integrated Constructed Wetlands (ICWs) to treat any overflowing water before discharge to the environment. The wetlands will be surface flow wetlands, providing secondary treatment to any spill flow that utilises it, and discharging the treated flow to the receiving watercourse. Where wetlands are located at existing treatment works, we anticipate that the final effluent could be used to sustain the wetland in periods of no spills from the storm overflow (otherwise the planting in the wetland could die during dry conditions). These will no longer be counted as overflow spills for purposes of reporting.

We have held initial discussions with the EA about using wetlands to treat discharges from storm overflows. These are part of a wider solution of infiltration reduction to ensure that action is taken to tackle the problem at source where possible, as part of the source-pathway-receptor approach and hierarchy. Other water companies are also exploring the use of sewer lining and wetlands for tackling discharges from groundwater related storm overflows.

The groundwater driven storm overflows included within this programme have targeted improvements to reduce spills. These are different locations to those included within the SRN50 Resilience – Infiltration enhancement business case.

## 3.5. Opportunities for Partnerships and co-funding

We have been working with partner organisations, including the EA, Natural England, local councils, planning authorities and Catchment Partnerships, to develop the enhancement options for our business plan over the last three years. These investment needs for enhancement in our DWMP have informed the PR24 WINEP.

We are partnering with local councils and highway authorities, including Kent County Council and the Isle of Wight Council, as part of our Pathfinder programme to deliver roadside raingardens, pocket basins and tree pits designed to intercept rainwater before it passes into the combined sewer network. These measures will be installed on streets and within parks and green spaces throughout our region to reduce storm overflows and enhance the aesthetics and biodiversity of the area. Our plan is for the highway authority to deliver the works with our funding and their procurement frameworks, and then adopt the asset on completion.

The investment in highway projects to introduce raingardens and other measures to separate rainwater may be best delivered by others, such as local councils or highway authorities, rather than ourselves. This may resolve issues relating to deliverability, affordability and financeability. We are exploring an option to deliver a package of work through the Direct Procurement for Customers (DPC) or alternative delivery route. This involves competitively tendering for services in relation to the delivery of certain large infrastructure projects, resulting in the selection of a third-party competitively appointed provider (CAP). This could include financing for the project. We are discussing with County Councils the opportunity to tap into their existing frameworks for highway maintenance, which have the skills, experience and resources to deliver highway construction projects. This innovative approach could potentially overcome some of the capacity issues within the water industry supply chain and lead to lower whole life costs of the projects.

CASE STUDY

**Cornwallis Circle, Kent**

**The problem**

Whitstable contains 74 hectares of non-permeable area.

**Action**

Working with Canterbury City Council and Kent County Council we're developing a scheme that could manage over 1 hectare of non-permeable area. Designs are being prepared for public consultation and we hope to implement the scheme later in 2023. This will be one of many across the town.

**The benefit**

One hectare of non-permeable area is 10,000m$^2$ or a 100m x 100m square. A 10mm rainfall event will produce 100 tonnes of water or 100,000 litres.

There are wider local economy benefits arising from green solutions, including making space for nature, greening cities, supporting climate adaptation, as well as supporting mental and physical health and wellbeing, potential house price increases and creating local jobs. This opens up the potential to work in partnership with others – local councils (County, Local and Parish councils), Local Enterprise Partnerships, developers, the Government Estate, community groups, local charities and volunteers, as well as landowners.

Once funding is secured and we commence the storm overflow investigations that need to be completed prior to delivery of improvements, we will be able to identify and enter into local partnerships with others to collaborate on the design and delivery of actions in specific locations associated with each storm overflow. These partnerships will help to maximise the use of green and blue infrastructure, including SuDS, in each specific location and open up other sources of funding. We will work towards an aspirational target to secure at least 5% extra funding for joint projects from working in partnership with other organisations. The extra funding will be used to design and deliver wider additional multiple benefits[13] for the local communities and to further improve the environment, over and above what water companies could be expected to fund.

## 3.6. Options selection and prioritisation of overflows

Our approach to options development and appraisal has enabled us to identify and select the best value options for our customers and the environment. We are focusing on catchment and nature-based solutions, that deliver wider multiple benefits, especially where we can work in partnership with other organisations. This approach is consistent with the Government's requirements in terms of climate adaptation, 25-year Environment Plan, Environmental Improvement Plan 2023, biodiversity net gain, net zero carbon, and the Water Industry Strategic Environmental Requirements (WISER). The Defra Storm Overflow Discharge Reduction Plan (SODRP) also places significant emphasis on water companies to deliver spills reduction from storm overflows using green infrastructure.

The gap between the least cost option and the best value preferred option in AMP8 is in the order of £76m[14]. The least cost options are based on 'grey' traditional end-of-pipe solutions (such as concrete and steel storage tanks) where the knowledge, expertise and technologies are mature – as this is what we have always done. This approach is a temporary fix. The effectiveness of storage tanks diminishes over time with climate change and increased urbanisation. The new approach for catchment and nature-based solutions brings wider multiple benefits to customers, communities and the environment, and these methods will increase community resilience for future climates.

[13] Additional benefits are those over and above the benefits funded and delivered through our customer bills.
[14] Once alternative delivery costs have been taken into account

We believe that the least cost option is not the best value option for customer because:

a) The least cost is based on storage only (mainly concrete and steel storage tanks at WTWs or within the network)
b) Storage tanks will take up valuable and limited space at our treatment works which will be needed for future additional treatment processes to reduce nutrient discharges into the environment
c) End of pipe solutions mean that rainwater has to be pumped through our network for storage and treatments at our works, rather than preventing rainwater getting into the foul and combined sewer networks in the first place. This results in higher energy and carbon costs, as well as additional wear and tear on our infrastructure
d) More rainwater and groundwater in the wastewater (i.e. the greater the dilution) means the biological processes at the works are less effective in treating the wastewater.
e) Storage tanks utilise UK resources of concrete and steel, more so than green infrastructure options, and are more carbon intensive (higher embedded carbon in the materials)
f) These options only utilise the civil engineering construction industry supply chain, whereas green infrastructure options opens up the supply chain further to other suppliers, include small and medium enterprises (SMEs) providing local jobs in the green economy.
g) These options are not supporting the Government's wider agenda on climate adaptation and supporting the green economy, as well as the carbon net zero targets for 2050
h) Grey options increase carbon use, green options could be carbon neutral and increase natural sequestration of carbon through tree planting
i) Limited opportunities for partnership working or additional sources of funding.
j) Creates a legacy of future investment needs to maintain, enlarge or replace large expensive tanks for future generations.

Conversely, green catchment and nature based solutions offer many opportunities and wider multiple benefits as state previously in this business case. Our customers support the green approach, even if it takes longer to deliver the outcomes. We have also investigated the social benefits of green infrastructure, see case study below.

The benefits of our preferred approach go much wider. These types of solutions also:

(i) Increase the resilience of our systems for future changes in climate and growth (including urban creep) and create space in our systems for wastewater ("keeping rainwater out, keeping more wastewater in"). This means that if we need to move to an alternative pathway (as set out in our Long-Term Delivery Strategy, then our solutions will remain effective but we may need to deliver more SuDS in the event of extreme changes in climate; and
(ii) Support collaborative working across river basin catchments to improve good ecological status by delivering projects with others to remove all reasons for not achieving good ecological status in waterbodies, not just the reasons caused by the water industry. If we only tackle the water industry reasons for failure, then the waterbodies may still not achieve good status.

We expect the gap in cost between the preferred best value options and the least cost options to decrease significantly as construction material costs and labour supply shortages push up the cost of grey solutions, and the implementation of green solutions shows that the benefits are higher than expected. The costs of the green, sustainable solutions are also likely to fall significantly as delivery mechanisms mature and the wider multiple benefits are understood.

We have prioritised the storm overflows based on the targets set out in Defra's SODRP and the EA's WINEP guidance. These are shown in Table 3-6.

**Table 3-6: Number of overflows for each Defra target**

| EA Driver | Target Dates | No. of Overflows |
|---|---|---|
| EnvAct_IMP2 Environmental Impact | • Defra SODRP target: 75%+ storm overflows discharging in or close to high priority sites by 2035. | 79 |
| EnvAct_IMP3 Bathing Waters | • 31 March 2035 | 18 |
| EnvAct_IMP4 Inland and Coastal <10 spills | • 38% of high priority storm overflows by 2030 and<br>• 14% of the total stock of storm overflows by 2030 (20% in updated SODRP) | 48 |
| EnvAct_INV4 Investigations | • 30 April 2027 | 210 |

In addition to the storm overflow drivers, there are 34 storm overflows that have been prioritised in our AMP8 programme based on bathing water and shellfish water drivers.

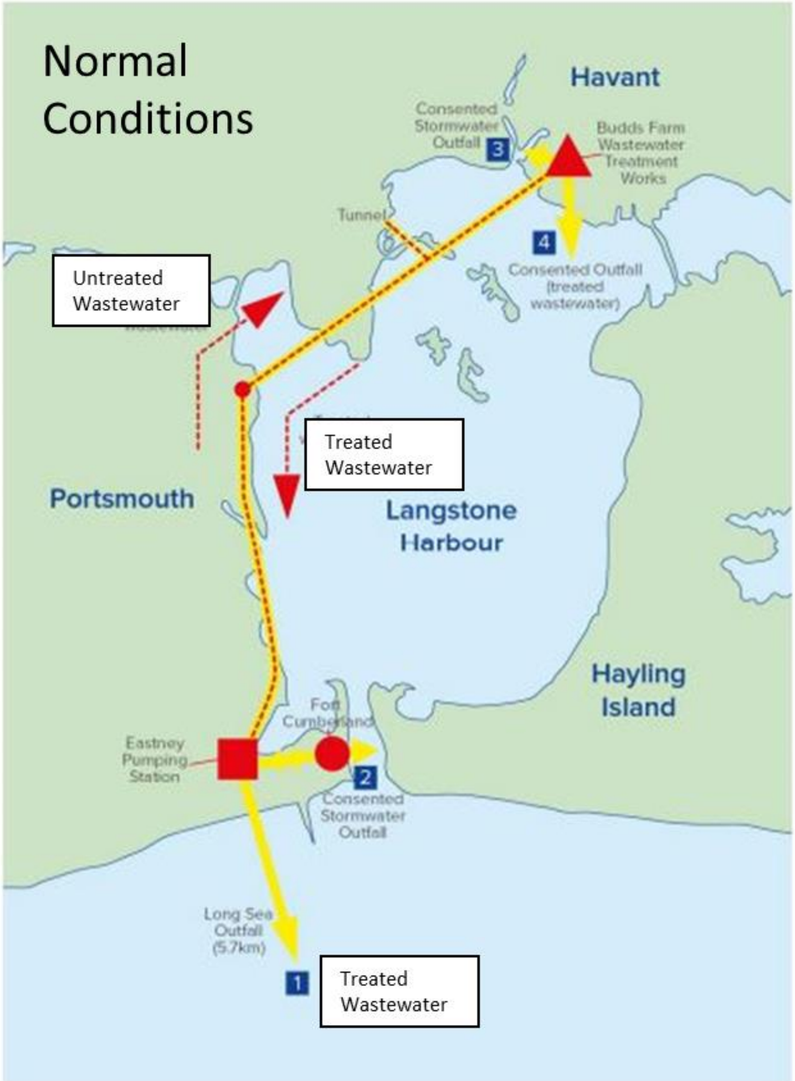
## 3.7. Budds Farm and the AMP8 programme

Budds Farm is our largest wastewater system serving Portsmouth and Havant and the risk from storm overflows is very significant (Band 2) (ref: DWMP). The investment needs here are significantly larger than in other wastewater systems in our region given the local coastal geography and highly built-up nature of the Portsmouth catchment. It is important to tackle storm discharges in this system as it discharges into Langstone Harbour, an internationally designated natural harbour and shellfish water.

Our plan for Budds Farm is to deliver the required spill reduction using a staged approach over 2 to 3 AMP cycles. This approach will prioritise reducing spills into the harbour from Budds Farm WTW and will also prioritise green nature-based solutions that offer a more sustainable future with much wider and longer-term benefits.

The Budds Farm system is highly complex and energy intensive consisting of 5 major assets, (Budds Farm treatment works, Eastney pumping station, Fort Cumberland storm tanks, dual pipe tunnel between Budds Farm and Eastney PS, and a long sea outfall) as shown in Figure 3-3.

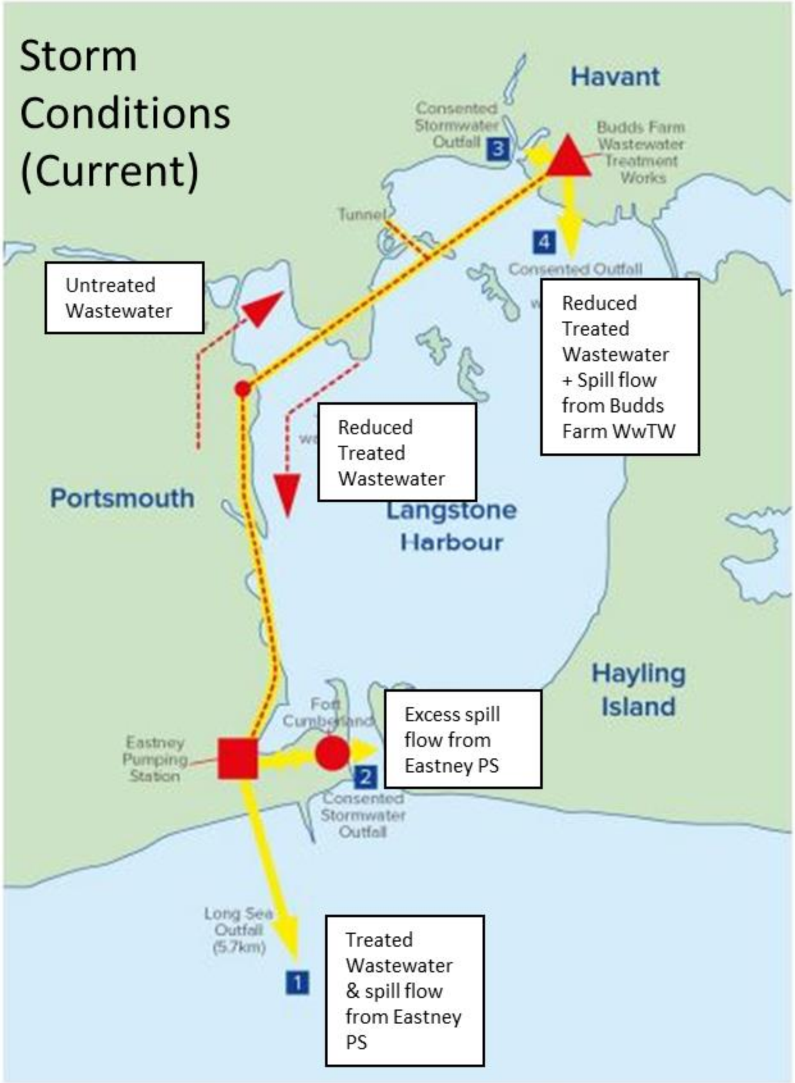
**Figure 3-3 The Budds Farm system in normal conditions**




Under normal conditions, wastewater from Portsmouth is collected at Eastney Pumping station and then pumped 7 km to Budds Farm. The treated effluent is returned via a treated effluent pipe to Eastney for pumping 5.7 km out to sea via a long sea outfall in the Solent at a depth of 17.74 metres (below Ordnance Datum). This ensures the effluent is diluted and does not impact bathing or shellfish waters.

During storm conditions, storm flows from Portsmouth coming into Eastney are pumped to Budds Farm with any excess flow diverted to Fort Cumberland storm tanks 0.9 km away, see Figure 3-4. If these storm tanks reach capacity, excess flows are spilled to the short sea outfall at the entrance to Langstone Harbour. After the storm has passed, the storm tanks are pumped back to Eastney and onwards to Budds Farm for treatment.  Storm flows from Havant coming directly in Budds Farm are diverted to storm tanks. If these reach capacity, excess flows are spilled to the outfall at Budds Farm into Langstone harbour. After the storm has passed, the storm tanks are pumped back into Budds Farm works for treatment.

**Figure 3-4 Budds Farm system in storm conditions**

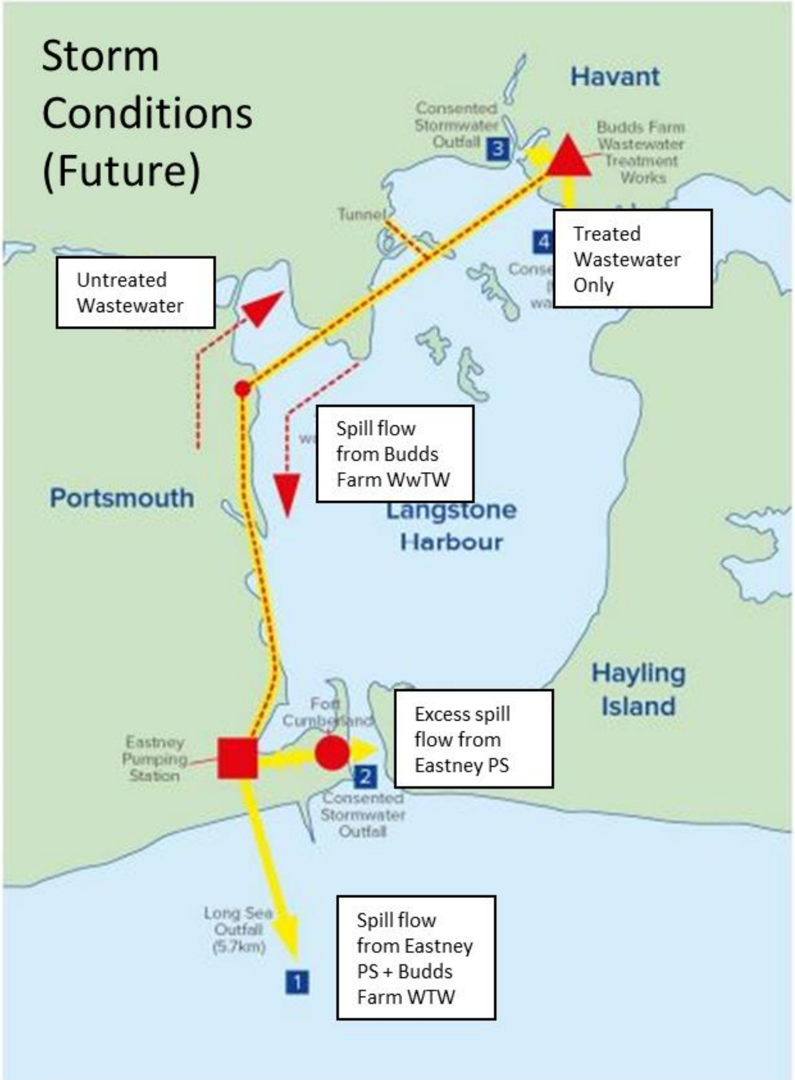



The first phase of our improvement plan is to reconfigure and adapt our existing assets to minimise environmental impacts of storms. To achieve this, the first stage is to reconfigure the outfalls at Budds Farm WTW and Eastney Sewage Pumping Station (SPS) (see Figure 3-5, Figure 3-4, numbers in square brackets below refer to blue boxes in this figure) such that storm overflow spills from Budds Farm WTW no longer discharge into the harbour via the short sea outfall (SSO) [4]. Our plan means that storm overflows will instead discharge via the long sea outfall (LSO) [1] via the existing tunnel to Eastney SPS. To facilitate this, the following changes will be made to the system in order to free-up capacity within the LSO [1] during storm conditions:

- Spills from Henderson Road (Eastney) CSO will be redirected from the LSO [1] to Fort Cumberland Storm Tanks [2]. This will use these large storm tanks.

- Final effluent from Budds Farm WTW, which usually discharges via the LSO [1], will discharge into the harbour via the SSO [4] – only during conditions when the storm overflow would otherwise be spilling into the harbour. During dry weather, the final effluent will continue to be discharged via the LSO [1].

**Figure 3-5: Future Budds Farm system in storm conditions**




After these changes, only very high storm conditions exceeding the tunnel and Eastney pumping capacities would be discharged via Budds Farm's emergency/settled storm outfall. We expect these changes to result in a significant improvement to water quality within the harbour and as a result protect the habitats site. Furthermore, the changes will also provide shellfish water improvements; the LSO [1] discharges outside of a shellfish designated water (it is approximately 700m from the Solent shellfish water boundary). Assessments are ongoing to quantify any residual impact on the shellfish water from the LSO [1] discharges.

We plan to also make the following further enhancements to the system during AMP8 in addition to the outfall reconfiguration described above and as part of the first stage of tackling the storm overflow discharges at Budds Farm:

- Green nature-based 'slow the flow' catchment measures in Portsmouth. The purpose is to enable us to achieve the required spill target at Fort Cumberland Storm Tanks [2] by 2030. We expect the impact of these measures to combine with similar measures already included in the plan to reduce spills from other storm overflows in the Portsmouth area of the Budds Farm catchment. These measures will be supplemented by additional buried storage at Fort Cumberland (or elsewhere) if required to achieve the overall spill reduction target (EnvAct_IMP2) at the Fort Cumberland outfall [2] by 2030. The timing of these measures will need to coincide with the outfall reconfigurations to reduce any short-term increase in the number of spills from Fort Cumberland Storm Tanks.

- A combination of green nature-based 'slow the flow' catchment measures and sewer lining in Havant and Hayling Island to start to reduce the spill count and volume from Budds Farm WTW. We will monitor the impact of these measures during the course of the AMP as part of an adaptive and incremental approach in order to inform further measures in AMP9 and beyond.

In summary, our plan for Budds Farm in AMP8 will significantly reduce storm spills into the harbour from Budds Farm WTW [4] (not counting emergency overflows) and will limit spills from Fort Cumberland [2] to 10 spills per annum, in line with the EnvAct_IMP2 requirement for shellfish waters. Spills from Budds Farm WTW via the LSO [1] will be reduced during AMP8, with further reductions planned for future AMPs as part of a staged multi-AMP approach. Further phases of our improvements to the Budds Farm system will be delivered in AMPs 9 and 10.

# 4. Cost Efficiency

## 4.1. Summary of Costs

Table 4-1 provides a summary of our storm overflow programme and costs.

**Table 4-1: Summary of Costs**

| Component | Number of sites | Unit measure | Volume of storage | AMP8 Capex | AMP 8 Opex |
|---|---|---|---|---|---|
| Increase flow to full treatment (grey solution) | 126 | £ / annual cubic metres additional treatment | 2.6m $m^3$ | £27,139,017 | £40,214 |
| Increase storm tank capacity at STWs - grey solution | 47 | m3 | 19,822$m^3$ | £110,907,080 | £109,698 |
| Storage schemes to reduce spill frequency at CSOs etc - grey solution | 99 | £ / cubic metre storage | 56,144$m^3$ | £110,029,935 | £308,801 |
| Storm overflow - infiltration management (grey) | 33 | km | 444.4 | £51,761,098 | - £0 |
| Storm overflow - new / upgraded screens (grey) | 78 | £/screen | n/a | £8,024,994 | - £0 |
| Storm overflow - sustainable drainage / attenuation in the network (green)<br><br>SuDS<br>(various measures applied depending on catchment characteristics and opportunity) - green | 145 | Various – see section 4.3.6 below | n/a | £33,355,742 | £262,033 |
| Storm Overflow - discharge relocation at Budds Farm (grey) | 1 | No. | n/a | £ 5,727,782 | - |
| Increase storm system attenuation / treatment on a STW – grey and green solutions | 24 | £ /m2 (where 4 m2 is required per PE) | 47.75 hectares (477,500 m2) | - | [£80,000,000 - through Alt Delivery / DPC] |

## 4.2. Approach to costing of our Storm Overflows Programme

Our standard enhancement solution costing approach, described in Part B of the Optioneering and Costing Methodology for Enhancements Annex (SRN15) was followed to estimate the costs of the storm overflow programme. This approach involves pricing solutions based on the best available information for the expected scope and the cost of that scope, and applying standardised allowances based on analysis of historical data for indirect costs, risks and overheads. The level of design development completed determines the granularity of scope that is available and therefore the specific costing approach to use. Costs are predicted using our libraries of standardised and regularly updated cost models developed from historical cost data augmented with industry information where required. These cost libraries are benchmarked internally and externally by our Cost Intelligence Team to understand relative cost efficiency, and further benchmarking has been performed for the chosen option.

Our programme consists of two types of solutions:

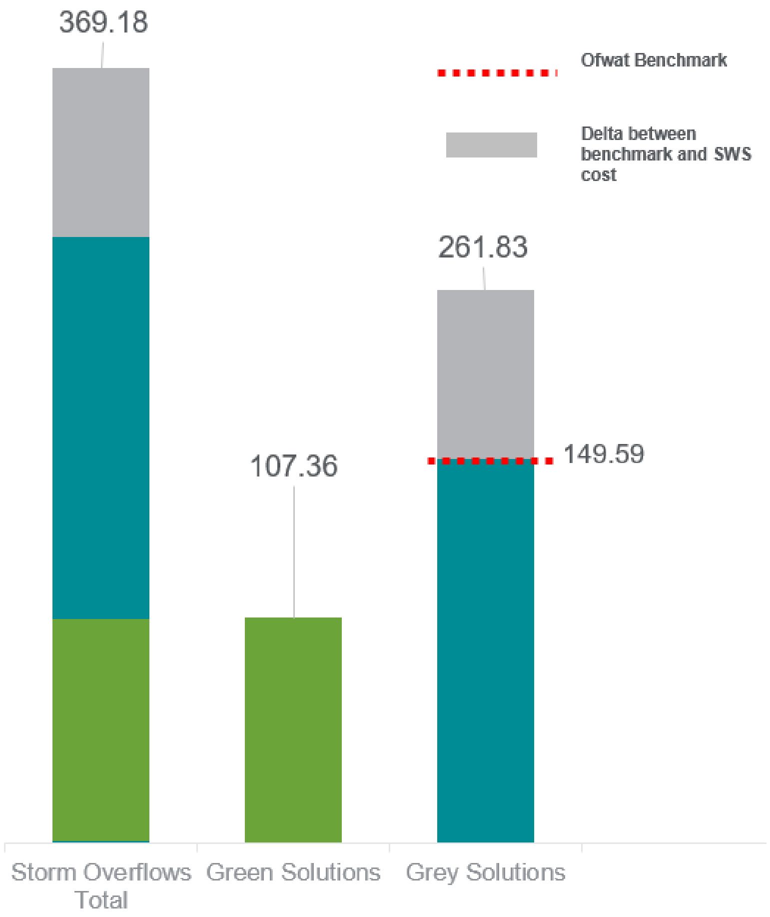
- Grey Solutions – These are traditional engineering-based solutions including new pipework, tanks, and equipment.
- Green Solutions – consisting of catchment based and nature-based solutions to store and treat storm flows in the network. These include sustainable urban drainage solutions (SUDs) and constructed wetlands.

The requirement is to deliver a reduction in spills, and we have committed to achieving an overall target number of spills by 2030. The investments will be on each storm overflow in our programme. Solutions will be designed to reduce the number of spills for that overflow to 10 spills or less (less where required to prevent ecological harm). As we will not know the target number of spills for each overflow until the investigations are complete in 2027, then the costs are based on a 10 spills solution. The costs will be managed for the whole programme, so that where additional investment is needed for a 2 or 3 spill solution, we will need to find efficiencies elsewhere within the programme.

## 4.3. Benchmarking of costs

We have undertaken an external benchmarking exercise on a sub-set of proposed investment in storm overflows to assess our costs against the position set by Ofwat at PR19. Figure 4-1 below shows the summary of our position.

**Figure 4-1: Summary of Storm overflow benchmarking**




We recognise that green solutions are a relatively new approach for the sector and, as a result, we have found no available benchmarks. We were however able to compare our position with respect to grey solutions. We found that our benchmarked costs of £261.83m for grey solutions were slightly higher than the benchmark position of £149.59m, using an Ofwat econometric model from PR19 adjusted to be in the same PR24 price base.

The difference between our position and the benchmark is due to a number of factors which are outlined below:

- Our programme includes additional treatment costs. Our plans to store more storm flows means that we will be treating a larger volume of wastewater. Some of our projects allow for some improvements at our treatment works to take account of these additional flows. There is uncertainty around the scale of some of these improvements and we will continue working with our supply chain to fully define these elements of our programme.
- Specific site constraints – construction of storm water separation and storm storage tanks requires space, suitable ground and environmental conditions and agreement from stakeholders. Many of the areas where we need to construct our solutions are densely populated and congested with other utilities which restricts the room available for us to build tanks and upsize sewers. This means that we have to build our storage in the nearest suitable location with additional civils works to convey flows from the network into the storage, and back again when capacity is available.

- Land issues – linked to the specific site constraints, we will have to use land that we do not currently own adjacent to our sites in some cases. This will generate land purchase costs in addition to the solution construction.
- Complexity of solutions – the solutions required to satisfy the PR24 requirements are more complex than those included in the PR19 programme.
- Higher standards required – the standards that are required to be achieved to satisfy current requirements in PR24 are notably higher than those required for PR19 and this is reflected by an increase in scheme costs.
- Benchmarks are quantity related and not quality related – this means that the calculation of benchmarks is not directly linked to the increase in quality that we are required to deliver. This results in our costs capturing current increasing quality requirements that are not reflected in the benchmarks.
- Investigations – We have included a programme of studies and investigations to assess environmental impact of spills at a number of locations. These are to determine where we need to tighten our number of spills to reduce the environmental impact of our operations.

As stated, we have not identified any appropriate benchmarks for green solutions. In the absence of a benchmark we have sought industry expertise to help us develop our programme. We utilised our Engineering and Technical Solutions team, and their Strategic Solutions Partnership supply chain to get access to engineering insight which formed the basis of our programme. We utilised the models that we had available to generate a series of representative scenarios from which we could base our optioneering. We then used these to triage each of our catchments and apply a solution. This approach is consistent with that taken by other water companies and means that we can be confident that our programme is appropriate.

The cost efficiency of each component of our storm overflow programme is discussed below in detail.

### 4.3.1. Increase in Flow to Full Treatment – Grey Solution

Our plan consists of interventions at 126 overflows which will pass forward an additional 2.6 million cubic metres of flows to our wastewater treatment works. Over half of this will arrive at our sites in Southampton, Ryde, Fairlee and Cowes. Addressing this flow requires us to make treatment improvements at our sites to accommodate the additional flow. This component of our plan has a cost of £27.14m.

We have used econometric modelling to test our programme with the final determination position that Ofwat took at PR19. This is based on taking 60% of the flow arriving at 4 sites to determine a representative benchmark value. Using this modelling we have determined a benchmark cost of £15.28m (adjusted to be in the equivalent price base). We have used 1.56million cubic metres based on the cumulative total flow arriving at Southampton, Ryde, Fairlee and Cowes. If we take the full flow arriving across the 126 sites then the econometric model does not produce a representative benchmark value.

Taking a proportional amount of the cost from the total programme costs to compare with the 4 projects where the majority of the flow is arriving shows that our costs are comparable. 60% of the cost is £16.28m against a benchmark of £15.28m. It should be noted that the benchmark cost referenced here is pre-WINEP-in-the-round efficiency challenge and would be approximately 6% lower at £15.31m

The remaining costs in our programme are due to the fact that our works need capacity increases to handle the additional flows. Ofwat's benchmark accounts for the cost of the additional treatment but not the construction and implementation of additional treatment capacity including upsizing of process assets and structures at inlet works.

Our costs are robust because they have been developed based on our experience of treating wastewater across our whole region. We treat millions of litres of wastewater every day and have robust cost curves for treatment processes, assets and capacity increases. Our cost curves are discussed in further detail, with a worked example, in the Optioneering and Cost Estimation Technical Annex (SRN15).

We have utilised our Engineering and Technical Solutions team to determine the spill volumes arising from the overflows. This has been completed using our bank of network hydraulic models (where they contain sufficiently granular data), monitoring data at our overflows and a series of desktop assessments based on our catchment knowledge. We have brought in a team from Stantec to support with this assessment to ensure challenge of the approach and a robust outcome.

We recognise that we have a degree of uncertainty in our assessment because not all of our catchment volume assessments are based on computational hydraulic modelling analysis. We are mitigating this through the inclusion of detailed catchment knowledge and experience within our engineering team and taking a triage approach for small, medium and large catchments to estimate programme costs that are representative of our whole network. We continue to refine our network knowledge and data through our business-as-usual operational activity and works that we complete in our region.

### 4.3.2. Increase Storm Tank Capacity at STWs – Grey Solution

We have included an allowance in our programme, linked to the Flow to Full Treatment to increase the storage capacity at our treatment works to contain the additional volume of sewage requiring treatment. The total cost that we have estimated for this component of the plan is £110.91m.

We have used econometric modelling to test our programme with the final determination position that Ofwat took at PR19. Using this modelling we have determined a benchmark cost of £41.64m (adjusted to be in an equivalent price base).

When testing our programme with the benchmarks there are a number of factors to be considered. The benchmark takes account of construction of tanks at treatment works and in close proximity to the inlet works. We have reviewed our constraints and note that many of our required storage tanks have to be located away from the inlet works, requiring additional civils to connect and pumping to return storm flows. We also have limited space on many of our inlet works sites and as such will need to purchase adjacent land in order to construct storage. This factor also increases our costs and leads to the benchmark not being equivalent.

Similar to the uncertainty discussed for the Flow to Full Treatment in section 4.4.5, we have used the same approach to determine our required storage volumes.

### 4.3.3. Storage schemes to reduce spill frequency at CSOs – Grey Solutions and Green Solutions

Our programme for storage to reduce spill frequency at CSOs consists of both grey and green solutions. The total cost for this component of our storm overflow programme is £190.03m, consisting of £110.03m grey solutions and £80.00m green solutions (including the costs through alternative delivery).

Our grey solutions are based around construction of new storage tanks to store flows that would have otherwise spilled at our CSOs. We are intending to construct 99 of these across our network and CSO sites. We have undertaken a benchmarking exercise to compare our planned costs with the PR19 Final

Determination position which we calculated to be £92.67m (adjusted to be in equivalent price base). This means we have identified a delta of £17.36m between the PR19 position and our PR24 plan. In terms of cost per cubic metre this is a Southern Water cost of £1,959.78 per $m^3$ against a PR19 allowance of £1,650.5 per $m^3$ (adjusted for inflation).

The delta is a result of similar factors as described in 4.3.2. Our schemes are more complex than the benchmark allows, due to land constraints and associated additional civils works to connect the new assets to our network.

Our green solutions consist of constructed wetlands to manage storm flows. We have identified and included a total of 32 overflows in our plan for AMP8 that require wetlands to treat the spills to prevent ecological harm. 24 of these are at treatment works and are included in PR24 WINEP.

We are progressing 4 wetland schemes in AMP7 as part of our storm overflow accelerated plan (using funding for AMP8 brought forward). These schemes will enable us to understand the technical and regulatory challenges, and how we can overcome them with the EA. We will also know the actual costs for delivery of this new approach to treating the discharges from storm overflows. These schemes in the accelerated programme will be delivered by March 2025.

The unit costs per square metre for integrated constructed wetlands has been developed and incorporated into our WINEP costing tool which we have used to price the remainder of the programme. The WINEP Costing tool is a version of the PR24 Options Scorecard that is discussed in full detail in the Optioneering and Cost Estimation Methodology Technical Annex (SRN15).

### 4.3.4. Infiltration Management

Our infiltration management programme consists of sewer relining. We have estimated our programme to cost £51.76m to address infiltration in 32 separate sewerage networks. These solutions are to be constructed in conjunction with our wetlands.

The scale of each has been calculated based on available data, but this will be re-evaluated as part of the detailed project implementation to achieve the best outcomes and deliver the storm overflow reduction target and/or provide adequate treatment of groundwater driven discharges

We do not have any benchmarking that we can compare our costs against, but we have developed our programme using our costs data base and cost curves as described in our Optioneering and Cost Estimation Methodology Technical Annex (SRN15).

### 4.3.5. New / Upgraded Screens

We have included an allowance of £8.025m for new and replacement screens within our storm overflow programme for AMP8. This covers the improvement or replacement of 78 screens across our network. The Defra SODRP places a requirement to upgrade the screens at storm overflows whilst work is ongoing to reduce spills from the site.

Our programme is based on a unit cost per screen of £[redacted] (direct cost) which is based on average modelled costs drawn from our preferred supplier costs database. Our suppliers undertake a competitive tendering process for a place on our preferred list so we can be confident that we are getting efficient and accurate market prices for these screens.

We recognise that there will be some additional works across our programme to facilitate the installation and fitment of our screens. We have made a risk allowance for this uncertainty and will continue to visit each of our sites to determine each site's specific requirements.

### 4.3.6. Sustainable Urban Drainage (SuDS) and attenuation in the network

Our Sustainable Drainage Systems (SuDS) programme has an estimated total capital cost of £33.36m (including the costs through alternative delivery). This is built up from a number of available options as discussed in section 4.3 of this document. The costs for each component are as shown in Table 4-2 below.

**Table 4-2 Costs of SuDS proposals**

| SuDS Solution | Quantum | Total estimated Cost |
|---|---|---|
| Domestic Downpipe | 47,408 | 2.8% |
| Non-Domestic Downpipe | 38,852 | 11.8% |
| Driveways | 2,370 | 3.7% |
| Car Park Area (ha) | 7.5 | 9.9% |
| Road Length (km) | 411.6 | 71.8% |
| Total | | £33.36m |

We have not identified suitable benchmarks for this component of our programme so we have sought to make our costs robust in other ways.

We have further built confidence in our programme by conducting a number of Pathfinder projects. Our Pathfinder programme is a series of trial projects based on SuDS interventions within our network. These projects are currently in delivery and we have been regularly applying the lessons we have learned to the estimation of our PR24 Programme. We have sought the support of [redacted] in the delivery of this programme to ensure that we are benefitting from their SuDS experience and knowledge. This means that our PR24 plan costs benefit from third party input and challenge to improve the level of robustness. Case studies of some of our pathfinder schemes are included in section 3.3 (Havenstreet) and 3.4.3 (SuDS in Schools). We have additionally used these schemes to inform the costs we have included for items such as water butts, SUDS and rain gardens.

The levels of storage compensation that these schemes provide have been estimated based on current industry best practice, developed for us by [redacted]. Drawing in the additional third-party challenge from [redacted] means that we can consider our approach and assumptions to be robust and tested through actual delivery.

### 4.3.7. Source Surface Water Separation

We have included a cost of £22.24m in our plan for source surface water separation projects (including costs through alternative delivery). Separation is our preferred option for managing rainwater and returning it to the environment as close to where it falls as per Defra's core principles for storm overflows. Some of the SuDS techniques described within section 3.3 will enable separation.

We do not have any applicable benchmarks that we can compare our position to, so we have sought additional technical input from [redacted] in the development of this programme to provide challenge and to help us define appropriate assumptions to progress.

We will determine the potential for separation during detailed site surveys once funding is confirmed, but for the purposes of our PR24 plan our costs are split between separation (40%) and attenuation through SuDS (60%).

### 4.3.8. Discharge relocation at Budds Farm

The costs in our plan for discharge relocation specifically relate to the construction of a new long sea outfall at our Budds Farm treatment works. The costs we have included for this component of our plan are £5.73m.

We have not got benchmark data for this specific project that we can compare our costs with. However, as with the other components of our plan we have used our standard cost estimation methodology and cost curve data. We have used our ETS team and their supply chain to determine an appropriate pipe route, identify scheme constraints, risks and uncertainties so that we can price an appropriate scope. We have sought to keep the route as lean as possible, using our engineering supply chain to draw on best practice and experience from other projects to ensure that we are not including anything unnecessary that our customers would be paying for.

The design of the scheme is still in its early stages and there are a number of uncertainties that remain. We will continue to develop the project through our Optioneering process as described in our Optioneering and Cost Estimation Methodology Technical Annex (SRN15).and our project design and delivery processes. We have made an allowance for risk to adjust for these uncertainties due to the complexity of the project. This allowance is 8.9%, following the process set out in the Optioneering and Cost Estimation Methodology Technical Annex (SRN15).

# 5. Alternative Delivery

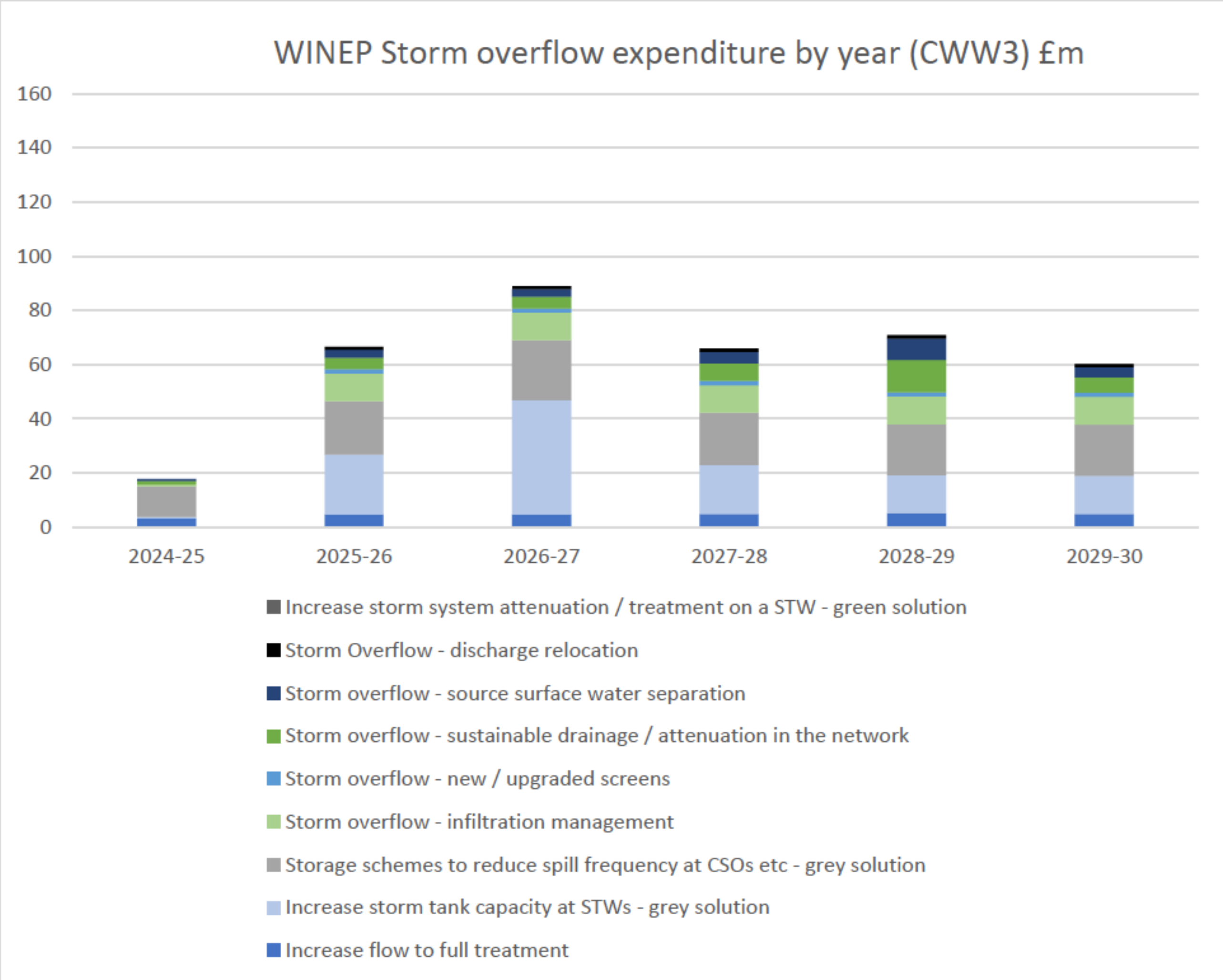
We are exploring opportunities for alternative delivery of elements of our storm overflows programme. The design and delivery of highway SuDS and integrated constructed wetlands have been identified as suitable for an alternative delivery route including third party financing – either under the DPC framework or through a voluntary alternative delivery mechanism if the schemes do not qualify under Ofwat's DPC eligibility criteria.

Some components of the wetlands programme and the highway SuDS programme have been identified as potentially suitable for alternative delivery as they do not meet the selection criteria for DPC but have characteristics that indicate delivery by a third-party provider could be viable.

Our approach and rationale for choosing the alternative delivery route, notwithstanding that the two programmes do not in our view qualify for DPC, is set out in our Technical Annex on Alternative Delivery (SRN17). This annex contains information about our proposed delivery routes and the business case for them. The costs are included in the Data Table SUP12.

The impact of using an alternative delivery approach on our requested WINEP costs for storm overflows is shown in data table CWW3 and shown in the figure below.

**Figure 5-1: WINEP storm overflow expenditure removing the investment we propose to carry out through an alternative delivery mechanism, as presented in CWW3 data table**



# 6. Customer Protection

## 6.1. Impact on storm overflows performance commitments

The specific performance commitment impacted by our WINEP investment in storm overflows is the storm overflows performance commitment. We describe the forecast of PCL and ODI benefits of our WINEP storm overflow investment proposals in the Performance Commitment Methodologies Technical Annex (SRN18).

**Bathing water quality**

We are investing in improvements at 4 storm overflows in AMP8 with bathing water as the primary driver. This means that these overflows discharging in or close to bathing water will be controlled to 3 (or 2) spills per bathing water season. However, storm overflow investment has no direct link to bathing water quality due to the exclusion of “abnormal situations” including extreme rainfall from bathing water quality assessments.

Our WINEP includes a small programme of disinfection of effluent from treatment works but it is targeted at preventing deterioration of shellfish waters. Although it may help to improve bathing water quality where a bathing and shellfish water are physically close, any impact on number of bathing beaches at different classifications will be small.

The low level of investment outlined above that specifically targets bathing water quality in our AMP8 WINEP means that we have assumed there is no impact on the bathing water quality PCL.

**Internal and External sewer flooding**

Investment in reducing spills from storm overflows is likely to have a secondary benefit in terms of a reduction in internal flooding. As much as 80% of internal (and external) flooding is caused by operational issues, mainly blockages. But the time between blockage forming and flooding occurring, and the extent of flooding, is dependent upon the flow of water within the system. The higher the flow, the quicker flooding is likely to occur. Hence, attenuating rainwater at source, or preferably separating out rainwater, is likely to reduce the number of internal floods caused by hydraulic overload. Our DWMP has identified locations of internal and external flooding, as well as high spilling storm overflows, with a wastewater system. This information will enable green, catchment and nature-based solutions to be developed where possible to provide benefits to reduce discharges and sewer flooding.

Where storm overflow and hydraulic incapacity issues coincide we hope to be able to demonstrate benefits to sewer flooding performance from storm overflow investment. We will develop this understanding and the causal links between storm overflows and flooding during our AMP8 programme. We know that traditional storage solutions do not generate these wider benefits across the system, but system wide rainwater management that separates rainwater through green solutions could be a game changer.

We are also mindful that poorly executed storm overflow 'improvements' might actually change where flooding occurs or increase flooding risks. Therefore, the design of solutions is important, and separation of rainwater and local re-use is expected to be the best option for customers where this is possible to deliver. Applying the Defra principle that rainwater should be returned to the environment as close to where it falls will be critical to success, although this will need a shift in policy within Government to enable this to happen.

## 6.2. Price control deliverables

Our programme to reduce the frequency of storm overflow discharges is a mix of grey and green solutions. Overall, it is the best value option for customers, even though it costs more than a least cost programme of all grey solutions. The additional benefits provided by the best value programme include making space for nature, greening cities, supporting climate adaptation, as well as supporting mental and physical health and wellbeing, potential house price increases and creating local jobs.

Customers are protected if we do not meet the reduction in the frequency of storm overflow discharges from our WINEP by the common storm overflows PC.

We provide more information about our WINEP PCD in the WINEP methodology Technical Annex (SRN38).

# 7. Conclusion

| Section | Key Commentary |
|---|---|
| Introduction & Background | The media spotlight is on Government and water companies to reduce the discharges from storm overflows. The pressure is not easing. We need to act now – but it's a joint problem that needs joint solutions from Government, regulators, water companies, other organisations and communities. It's a fundamental shift in how we use and value water in communities, how we manage rainwater and groundwater, and how we adapt communities for future climates by making them greener and happier places to live and work.<br><br>Our AMP8 WINEP provides an opportunity to make step change in reducing discharges to improve and enhance the local environment.<br>.<br>We are keen to play our part, and we have put forward a phased programme that tackles high spilling overflows and those discharging to the sea, as well as inland overflows. Whilst we are phasing investment to enable us to explore and exploit catchment and nature-based solutions, we are bringing forward investment from AMP9 so we can start earlier on more storm overflows and deliver more green solutions. |
| Need for Enhancement Investment | In 2022, our 978 storm overflows spilled 16,688 times for 146,819 hours. This is an average number of spills of 17.04 per overflow. In a storm up to 95% of water in our sewers is rainwater and this is the major cause of spills. But some spills also occur in dry weather due to groundwater ingress into our systems. This is real concern for customers and has recently been highlighted by the BBC investigation.<br><br>The need for investment is statutory. We need to deliver the targets set out by Defra in their Storm Overflows Discharge Reduction Plan (SODRP). This is to comply with the Environment Act 2021. |
| Best Option for Customers | Our plan is to tackle the issue at source where possible with green catchment and nature-based solutions.<br>(i) Rainwater: We are proposing to focus on green solutions and phase the grey. In reality all storm overflows will need a mix of both green and grey solutions. But we will achieve the outcomes as much as possible through green solutions and do this before sizing and building grey infrastructure. We will work in partnership with local councils, environmental groups, landowners and communities. Green infrastructure will enable opportunities for wider multiple benefits for our customers and the environment, and opportunities to attract additional sources of funding for these wider benefits beyond what our customers should fund.<br><br>(ii) Groundwater: Our approach is to reduce groundwater infiltration through lining of our sewers and private sewers, and construct wetlands at our storm overflows to treat the discharges before the water is released back to the environment.<br><br>Our preferred options will cost more, but they represent best value when considering the wider benefits and the more sustainable approach. This approach will avoid having to build ever larger and larger storage tanks – we need to break out of this unsustainable cycle and make communities more resilient to future climates. |
| Cost Efficiency | We have challenged our costs using benchmarks from:<br>• Internal outturn data<br>• Third party water industry-wide data |

| | |
|---|---|
| | • Applying top down efficiencies to our costs;<br>• APR outturn data and<br>• Ofwat's PR19 benchmark models where appropriate.<br>In addition, we have applied efficiency assumptions to future costs compared to historical costs.<br><br>Much of the evidence on costing solutions comes from the work we have delivered as part of our Clean Rivers and Seas Task Force.<br><br>Our plan to address the deliverability and affordability concerns means that a large part of our storm overflows programme for AMP8 is directed to an alternative delivery route. The costs associated with this are set out in the data table SUPP12. The costs associated with the elements of our storm overflows programme being delivered by ourselves are included in data table CWW3. |
| Customer Protection | .<br>We describe the forecast of our performance commitments and ODI benefits of our WINEP storm overflow investment proposals in the Performance Commitment Methodologies Technical Annex (SRN18). Customers are protected if we do not meet the reduction in the frequency of storm overflow discharges from our WINEP under this common storm overflows PC. |
| Expected Benefits | • Around 2500 spills avoided by 2030<br>• Over 500 hectares of impermeable area managed with SuDS (includes 350km of roadside SuDS, 72,000 downpipes and 2,000 driveways)<br>• Around 50 Ha wetland<br>• Over 300 km sewer lining<br>• More than 100,000 m3 of storage provided for rainwater. |