Dŵr Cymru Welsh Water

IAP Response

Ref B2.23.WSH.CE.A1

Storage schemes in the network to reduce spill frequency at CSOs IAP response

1 April 2019

Contents

1. Ofwat's cost efficiency challenge

We have carefully reviewed Ofwat's feedback on our 'Storage schemes in the network to reduce spill frequency at CSOs' programme and we are providing clarifications and further evidence that substantially addresses the challenges and issues raised by Ofwat. In conclusion, we are firmly of the view that our programme is fully justified and needs to be funded in full if we are to meet our obligations under NRW's National Environment Plan and the current and future needs of our customers.

Ofwat's Spill frequency enhancement feeder model states that:

"We assess the investment for this line by using a model which estimates expected capex based on the company requested capex and volume of storage each company is planning to construct. We use the model to estimate our expected costs and apply an efficiency challenge to these estimates."

Our programme consists of work to reduce spills at the Menai Strait for shellfish waters (£14.1m) and CSO spills identified under Storm Overflow Assessment Framework (SOAF) (£33.9m).

Ofwat have used the volume of storage capacity constructed in the Menai Strait project as a driver for the unit cost modelling and applied the derived efficiency to the SOAF programme.

We are satisfied that Ofwat have accepted the need for both the Menai Strait and SOAF enhancements, and note Ofwat's approach to applying the efficiency derived from the Menai programme to the SOAF schemes. However, we believe that Ofwat's model does not take into account the storage volume equivalent of the innovative non-storage solutions in our plans for the Menai Strait.

Our response provides:

- Storage volume equivalent for the non-storage elements of the Menai Strait programme.
- Additional information relating to the drivers of the SOAF programme.

2. Menai Strait – storage volume equivalent

In designing our CSO spill frequency enhancement programme, we have employed an approach that moves beyond traditional reliance on hard engineered options and, instead, utilises a combination of innovative solutions that embed sustainable development and long term resilience within our asset planning process.

While our proposal utilises 3,089m3 additional conventional storage, most of the volumes that would otherwise require storage will be rendered unnecessary through an innovative combination of surface water removal from sewer, green infrastructure to attenuate surface water flows to sewer and by making better use of existing assets.

By only recognising the storage element of our Menai scheme and thus assigning to storage all the other costs associated with diverting 8,347 m3 of surface water higher up in the sewerage catchment, Ofwat has assumed an artificially high unit costs for our Menai Strait programme.

When comparing our costs with other sewerage undertaker costs for meeting spill frequency objectives, a full 'traditional' storage volume of 11,436 m3 is the most appropriate cost comparator in the cost efficiency assessment.

	Storage volume m^3	Cost of storage volume £m	Surface water volume diverted m^3	Cost of diverted water solutions £m	Total volume m^3	Total cost £m
Menai Strait (Mainland)	653	0.9	8,347	10.0	9,000	10.9
Menai Strait (Anglesey)	2,436	3.2	-	-	2,436	3.2
Total	3,089	4.1	8,347	10.0	11,436	14.1

Ofwat should therefore reassess the cost efficiency of the Menai Strait scheme in light of the new volume data provided above.

3. Storm Overflow Assessment Framework (SOAF) programme

Ofwat's IAP assessment challenged that we did not provide an estimate of output for the SOAF programme that could be used as a cost driver.

In lieu of a cost driver Ofwat have applied the efficiency derived from the Menai Strait programme and applied this to the SOAF expenditure.

We note this approach and in this section provide further information to explain our general approach to shaping the programme that will emerge from the Storm Overflow Assessment Framework (SOAF).

Our SOAF programme is an extension of our AMP6 programme to install Event and Duration Monitors (EDM) at 100% of the intermittent assets that discharge to the environment by the end of December 2019. The SOAF programme forms part of our regulatory requirements under the NEP determined by NRW for AMP7. Having begun installing EDMs in AMP5, our AMP7 programme focuses on using the data they provide to reduce spills from those assets causing the most impact to the environment.

Under the NEP for AMP7, we are required by NRW to invest £33.9 million to address SOAF schemes, as part of a SOAF investment programme which will continue into AMP8 and possibly beyond. At this stage, the precise nature of the schemes to be pursued under the NEP is subject to further refinement and will ultimately be specified by NRW at the completion of an EA/NRW 5 stage decision framework (see section 3.1).

3.1. Background

Our delivery programme for the Storm Overflow Assessment Framework (SOAF) schemes in the NEP for AMP7 is not yet fully specified, as our regulators have not yet finalised the detail of the programme requirements. At this stage we cannot, therefore, quantify the potential requirements for additional storage volumes nor identify the volume of surface water removal that could be used as an alternative cost driver.

In this section we provide additional information on the high-level programme to improve confidence that it is deliverable, responds to the Welsh Government's ambitions and is in the best interests of customers and the environment.

Intermittent storm overflows provide a permitted means of managing storm induced flows in our network and treatment assets by diverting excessive flows to coastal, estuarine and inland watercourses, during and after heavy rainfall events. Although their key function is broadly similar, this asset base is diverse, ranging in age, size, type and complexity (e.g. mechanical screens, flow control devices). Where these assets perform below our expectations, there will be a variety of potential root-causes.

Aside from their intended purpose, the industry and our environmental regulators consider that intermittent discharges from storm overflows remain a reputational issue for the water industry. In terms of legal requirements, the Urban Waste Water Treatment Regulations (UWWTR) require sewer networks for areas with a population equivalent of 2,000 or more to be designed, constructed and maintained according to best technical knowledge, not entailing excessive costs. In accordance with long-standing guidance (DETR 1997), where such overflows have an adverse environmental impact, remedial measures are required.

It is increasingly being recognised that on-going population growth, urban creep, infiltration and changing rainfall patterns will add significant flows to our networks and so further increase the likelihood of discharges from storm overflows - with the environmental and reputational impacts that implies.

This led to Defra Ministers (Richard Benyon, 2013) calling for 'greater ambition for the monitoring of storm overflows', hence requirements for installing event duration monitoring were included in AMP6 NEPs.

In Wales, NRW received a specific steer from Welsh Government in September 2013 giving support for an 'expanded' monitoring programme in Wales during AMP6.

The Welsh Government has also set a more demanding installation rate, aspiring to full coverage for network assets rather than the risk based approach taken by the rest of the (English based) water industry. Consequently, the location of and the need to address frequently spilling assets is emerging earlier in Wales, i.e. in AMP7, as compared to England where significant investment is unlikely until AMP8.

Welsh Water started installing Event Duration Monitoring (EDM) on our Storm Overflows as long ago as 2011. Installations are still ongoing, so our performance dataset is currently incomplete and still growing.

	Monitors installed
2011-12	7
2012-13	7
2013-14	15
2014-15	448
2015-16	90
2016-17	445
2017-18	445
2018-19	536
2019-20	533

A number of event duration monitors will also be installed in AMP7, under the U_MON3 driver. They will placed on overflows to storm tanks at Wets to provide confidence that the permitted flow to full treatment (FFT) requirement is being complied with. These monitors are to be installed in conjunction with flow monitors to measure FFT under the U_MON4 driver. These monitors are therefore not recording storm discharges to the environment, but only storm discharges to storm tanks, and thus will not be subject to the same regulatory regime.

	Monitors to be installed
2020-21	77
2021-22	77
2022-23	78
2023-24	78
2024-25	78

Trigger thresholds have been set by EA and NRW to identify whether an asset may be spilling too frequently.

Number of full years of EDM data	Threshold
1 year	60 spills or more
2 years	50 spills or more
3 years	40 spills or more

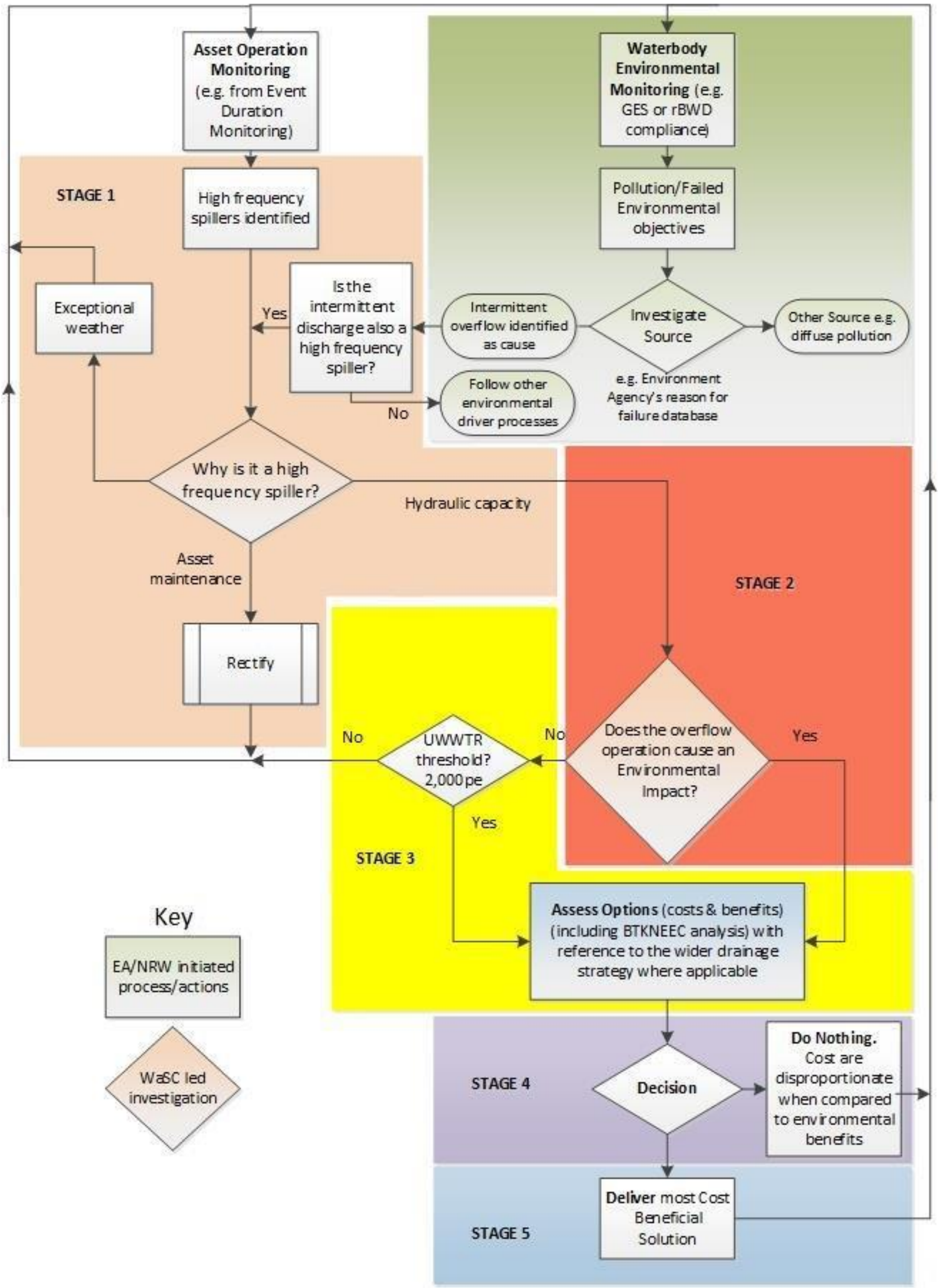
Our first official year of reporting results to NRW against these trigger thresholds was in 2016.

	2016	2017	2018*
Nr of monitors included	560	1014	1441
Nr of assets surpassing spill trigger thresholds (cumulative)	72	210	372

*Note – 2018 numbers reported above are draft status and are currently undergoing data cleansing and verification processes. As such, these figures are subject to change before formal reporting.

If an asset exceeds the spill trigger threshold, a check is made to see whether the asset has previously been upgraded to meet a Bathing Water or Shellfish Water driver. This only applies to a minority of assets: for the remainder, the SOAF process is applied. The process map for this is illustrated below.

Decision framework for assessing and addressing high frequency discharges from storm overflows under the UWWTR



NRW has recognised the importance of investing to reduce the number of spills and have included a line in the NEP (7CDC0435) for "*UWWTR spill frequency reduction scheme where it is cost beneficial and delivery prioritised for completion within AMP7 business plan allocation*".

3.2. SOAF Investigations undertaken to date

The SOAF process was only recently introduced and agreed with NRW and EA. We are currently trialling this process with assets that have triggered the thresholds in the early years of reporting.

When assets are identified as exceeding the thresholds, we are commencing the Stage 1 investigations. In a number of cases, we have found problems with the monitoring equipment or maintenance problems with the assets. These are fixed as quickly as possible from base maintenance or opex budgets to ensure the environmental impact is minimised.

For high frequency spillers that are discovered to require more than a 'quick fix', we are already piloting the Stage 2 SOAF process - currently applied to three assets, and intend to pilot our first Stage 3 investigation in 2019/20.

Using the lessons learnt so far, we are also embarking on a larger trial of full SOAF investigations in our South East catchment area. This is currently assessing 51 high spilling assets. Part of this exercise involves reviewing other information that we have to hand as a way of verifying the extent of any environmental impact, such as the detailed Water Framework Directive investigations funded during AMP 6 in some waterbodies. This trial also includes the creation of standardised business processes for the assessments, improvements to our data capture techniques and alignment of our regulatory reporting.

Our current response to the investigations is focusing on identifying and rectifying maintenance concerns, river bank cleansing and improving our localised hydraulic assessment tools. Our proposed suite of Stage 3 approaches is due for presentation to the NRW by May 2019, following which a programme of feasibility assessments for relevant assets will be completed by March 2020. The figures below illustrate how initial screening being undertaken as part of the SOAF stage 2 and 3 assessments.

Asset ID	32169			
Asset Name	VIADUCT ROAD CSO GARNDIFFAITH			
Survey Period	Desktop			
Date	09/01/2019			
Aesthetic Score				**Score**
Sewage derived litter (no. of items) downstream			1-10	5
Sewage fungus on outfall (present / absent)			Y	5
Sewage fungus in downstream mixing zone (% cover)			<2	5
Amenity				**Score**
High Amenity				10
Public complaints				**Score**
No. of validated public complaints related to wet weather discharges from the overflow			0	0
Pollution incidents due to storm sewage	**Incident category**	**Score per incident**	**No. of Incidents**	**Score x No. of Incidents**
NIRS incidents due to storm sewage attributed to the overflow	Cat 3	20	0	0.00
	Cat 2	60	0	0.00
	Cat 1	100	0	0.00
			Total score	25
Aesthetic Impact Classification		Low		
Survey Period				
Date				
Aesthetic Score				**Score**
Sewage derived litter (no. of items) downstream				
Sewage fungus on outfall (present / absent)				
Sewage fungus in downstream mixing zone (% cover)				
Amenity				**Score**
Public complaints				**Score**
No. of validated public complaints related to wet weather discharges from the				
Pollution incidents due to storm sewage	**Incident category**	**Score per incident**	**No. of Incidents**	**Score x No. of Incidents**
NIRS incidents due to storm sewage attributed to the overflow	Cat 3	20		
	Cat 2	60		
	Cat 1	100		
			Total score	0

32169

VIADUCT ROAD CSO GARNDIFFAITH

ection	Description	Example
g Context/Scheme	DCWW investigated potential solutions to reduce Combined Sewer Overflow spills in the Tredegar Park area, as part of its commitment to assessing high spilling assets. The aim is to identify any cost beneficial solutions, with a focus primarily on Rainscape and hybrid options. The design life is 40 years (3.5% discounting rate applied). Uncertainty was managed using ranges for key values along with confidence intervals (Benefits of SuDS Tool approach) and sensitivity analysis of the results.	***Aim of the assessment, including any constraints*** *Key parameters: fixed budget or affordability/minimum reduction is spills required/minimum WQ enviro standards to be met/ensuring no detriment to other drivers?* *Approach to uncertainty - used of BeST and sensitivity analysis* *What are the timeframes?*
ation:	Tredegar Park Golf Club CSO (33193) is located South East of Basseleg, discharging via gravity to the River Ebbw. It is an isolated CSO, with a design spill frequency of 99. Initial investigation noted that there are potential siltation issues at the site, however these are not believed to impact on spill performance, supported by hydraulic modelling utilising the existing SDP model. There is ongoing development immediately west of the asset which is not believed to impact on hydraulic performance. The River Ebbw at the discharge location is a high amenity watercourse, passing the Tredegar Park Sport Grounds and childrens park. It is currently classified as Moderate, with no linkage to DCWW assets affecting its status at this location. Q95%ile flow = 1.388 m3/s, design DWF = 13.46 l/s (3DWF = 32.38 l/s) giving	***Site Information*** *- location, type, single/group overflows, catchment name, info and outputs of SDAF St 1&2, previous/planned interventions* ***Overflow Information*** *- name, permit ref, type, size and screening arrangements, current & projected spills (EDM or modelled), current & project spill volumes and WQ river impacts* ***Receiving Waterbody*** *- name, discharge location, amenity class, WFD class/FFF, statutory or other drivers, environmental assessment completed (UPM), 95%ile low flow estimate* *https://nrfa.ceh.ac.uk/data/search*
and summaize	Option 1 - Reduced Spills through rainscape of xx ha of impermeable area. Option 2 - Improved screening for current loading and post spill storage to offset spills to 30/year.	***Minimum of 2 Options*** ***Reduce Spills*** *- Disconnection and source control (green), Disconnection and source control (grey), Storage and transfer* ***Improve discharge quality*** *- Screening, online treatment (green), online treatment (grey)* *Options should be evaluated to understand their performance against the required need and agreed decision making context. Extract the likely hydraulic and WQ benefits of each option (see individual option sheets)*
eening:		

3.3. Proposed investment in high spilling CSOs

When we were preparing our business plan that was submitted to Ofwat in September 2018, we had to work with a smaller dataset than we now have.

We fast tracked the investigation process to give us a general idea of the scale of investment that could be required. This involved desktop investigations and development of simple solution options using in-house engineers and our Unit Cost Database.

Based on our 2016 spill report data and our 2015 spill data, we previously estimated that about 25% of our assets could be classified as “frequent spillers”. This has since been verified against our 2018 draft spill report data results, which shows 372 of 1441 assets , i.e. 25.8%, are identified as frequent spillers.

If we apply this percentage to all the 2526 monitors that will be installed by the end of AMP6, this implies that about 630 assets will be identified as exceeding the triggers by the start of AMP7.

3.4. Cost of investigations

With such a large number of assets predicted to surpass the trigger thresholds there will be a significant number of investigations required. Therefore a significant element of our programme allows for undertaking these investigations. We have included this cost of £3.98m within the NEP investigations line of our plan.

3.5. Cost of remedial action

Our desktop review looked at 38 Stage 1 reports and classified the failures as maintenance, hydraulic or those that can be fixed without investment.

	Number of assets	Share	Total cost	Unit cost
Maintenance cause	13	34%	£3.2m	£0.25m
Hydraulic cause	13	34%	£5.8m	£0.45m
No investment	12	32%		

Some examples of solutions considered for those assessed as hydraulic cause are as follows:

- Laugharne WwTW – install higher capacity storm tank emptying pumps and improved control system, network flow reduction;
- Norton Avenue, Swansea – provide new overflow chamber with higher weir level;
- Pant du, Cwmafan – increase pass forward flow by installing higher capacity pumps;
- Lombard Street, Porthmadog – provide bigger pumps and new control arrangements;
- Pembrey WwTW – provide more storage volume and/or reduce incoming flows through surface water removal.

We aim to address issues relating to intermittent storm overflows by taking a catchment approach to analyse the root-cause of excess spills. For any sites failing as attributable to a hydraulic root cause, we intend to use a mix of traditional storage and innovative "RainScape" schemes.

We have been developing and implementing innovative surface water management techniques throughout AMP6 under our "RainScape" approach. This reduces the amount of surface water entering the combined network and causing spills and, where practicable, removes it all together. As a result, we create hydraulic headroom, ensuring the network is more resilient to extreme weather events and reducing the volume and frequency of spills.

By implementing these measures now, we are making our networks more resilient to the effects of climate change and extreme weather conditions on our network and assets. We are also mitigating the future risks posed to our customers by flooding, and to the environment.

Applying these unit costs and percentages to our estimate of 630 potentially high spilling assets gives an estimated budget requirement for dealing with hydraulic problems of £96m. However, we hope that when the full SOAF process is applied, additional assets will drop into the 'do nothing' category, particularly after an assessment of environmental impact and the cost/benefit of potential solutions.

As this part of the process has not been fully trialled, we have not been able to assess the impact of this element of the investment appraisal. However, in discussion with NRW around the scale of this investment as a part of the NEP, it was agreed that the current level of uncertainty would be managed by progressing a small, evidence based, prioritised programme in AMP7. A more substantial programme is likely to follow in AMP8. This led NRW to set a requirement for £34m of investment for AMP7, which is approximately a third of our current view of the total potential programme size.

NRW are clear that it is important to make a start on this programme, especially in locations where the monitoring has now clearly demonstrated that assets are potentially causing a significant environmental impact. In reaching this decision, we were particularly mindful of the clear regulatory policy statements on the subject made by the Welsh Government (see 3.7 below).

3.6. Implementation of the investment in AMP7

For AMP7, we will adopt a risk based approach to investment to ensure that our high-risk / high impact intermittent storm overflows meet spill frequencies that are in-line with requirements set out in SOAF.

The key activities we are proposing include:

- An investigation programme to determine environmental impact (High Frequency Spillers)
- Improvements to the spill performance of overflows (High Frequency Spillers) where it is cost beneficial to do so.

We are working with NRW to agree the process by which the detailed programme will be developed and delivered. We currently have an established process for agreeing work required to improve dry weather flow and other flow related compliance through a joint Flow Compliance, Strategy & Programme Group.

We estimate that it will take us two years in AMP7 to complete the investigations required on all high spilling assets. We will then undertake a formal review with NRW to agree priorities for AMP7 delivery and the programme for AMP8 investment. The prioritisation process will be based on the extent of environmental impact identified and take into account plans for improving the Water Framework Directive status of rivers so that this work can be integrated with other programmes of work being undertaken by ourselves and through NRW.

Our investment will address those assets most at risk within our intermittent storm overflows asset base that are shown to be having the highest environmental impact and provide a forward programme for improvement in future AMP periods. Our need for investment over the medium term (2020 – 2030) will be determined by each and every investigation we undertake in AMP7 as part of SOAF. These investigations will determine the impact our assets are having and will also determine the scale of the intervention where required.

It is anticipated that our AMP7 catchment planning and investment decision making will be influenced by our adoption of the 21st century Drainage and Wastewater Management Plan Framework that is presently under development along with our proposed pilots using a Sustainable Management of Natural Resources approach. In the future our management of EDM performance will continue to reflect our aims set out in Welsh Water 2050, which is to seek opportunities for using nature to reduce flood risk and pollution whilst minimising the impacts of our assets to support cleaner rivers and beaches.

3.7. Responding to the Welsh Government agenda

Our PR19 approach to SOAF is framed in context of Welsh Government policy and guidance.

As noted above, in September 2013 the Welsh Government indicated that it wanted an 'expanded' monitoring programme in Wales during AMP6. This clearly aligned with its 2013 Social and Environmental Guidance to Ofwat issued under the then section 2A of the Water Industry Act 1991 which said, "*6.2 In order to ensure evidence based policy, appropriate environmental regulation and properly targeted investment for future maintenance and improvements, a monitoring programme is essential. This should help to ensure that problems are tackled earlier, when it is more cost-effective to do so, instead of them going unnoticed until a severe issue occurs resulting in remedial action at a higher cost.*"

In its 2015 Water Strategy for Wales, the Welsh Government said, "*Action to prevent and control water pollution from sewage discharges is vital for the protection of water quality. Therefore, we expect Natural Resources Wales and water companies to work together to ensure that our sewerage systems are fit for purpose. This means reducing the number of spills from combined sewer overflows and ensuring the impact of sewage discharge is kept to* *a minimum in line with standards set out in the Water Framework Directive and the Urban Waste Water Treatment Directive*."

The Water Strategy for Wales also confirmed the Welsh Government's continuing commitment to the sustainable drainage approach. It says, "*The SuDS approach is central to future surface water management and supporting innovative surface water drainage in Wales*."

As Dŵr Cymru's programme of installing event and duration monitoring is further advanced than our English based counterparts, we anticipate that our AMP 7 programme is very likely to include more investment to address frequent spillers than other companies. We believe that very much accords with the Welsh Government's agenda.

For example, in its Strategic Priorities and Objectives Statement to Ofwat under section 2B of the Water Industry Act 1991, the Welsh Government said, "*The regulatory framework should seek to ensure that companies do not delay appropriate investment in the short term to the detriment of the interests of future customers. Assets should be monitored and maintained appropriately to ensure that the costs borne by future bill payers are efficient*."

This is very consistent with the very clear policy articulated in the Water Strategy for Wales, "*We must not delay investment to make short term savings at the expense of future bill payers*."

It is as a result of the Welsh Government's policy commitments that, during AMP6, Welsh Water has been required to install more event duration monitors than other companies, and that we will consequentially be leading delivery of SOAF investigations and solutions in AMP7.

The delivery of solutions to SOAF failures, particularly those with a hydraulic root-cause, through an innovative and sustainable 'RainScape' approach also meets the Welsh Government policies set out in its statutory Natural Resources Policy under Section 9 of the Environment (Wales) Act 2016. This promotes the use wherever possible of "nature based solutions", with particular reference to green infrastructure in the context of urban drainage.