C5 B

Cost and Efficiency

C5B Technical Annex 20
Environment Investment Case: Technical Approach and Business Case

NTPBP-INV-ENV-0549

BRISTOL WATER

Contents

Tables

Figures

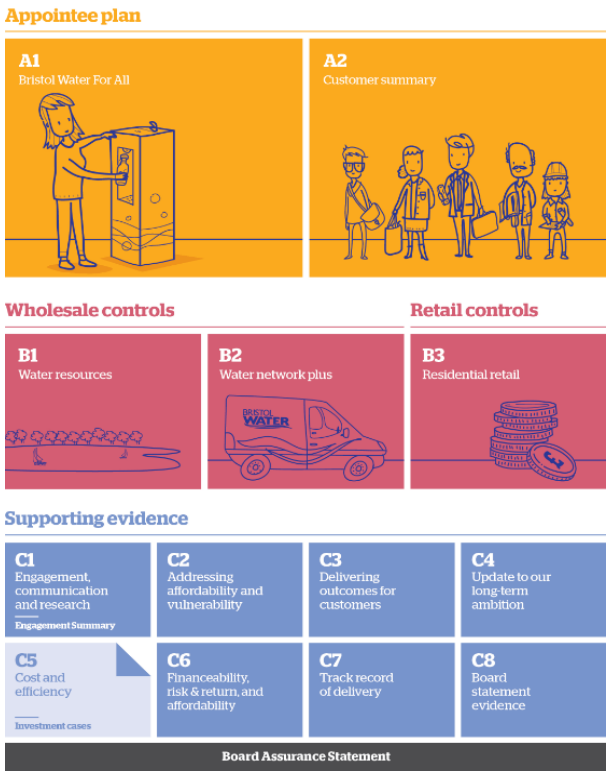
1 Foreword

The Environment investment case sets out the investment that is required to deliver our Local Community and Environmental Resilience outcome. We will invest in our natural assets and the natural capital they provide in order to protect and enhance our local environment for present and future generations.

The purpose of this document is to set out our customer led, outcome focused plan which will mitigate environmental risks and enable maintenance of our assets in terms of their natural capital.

This investment case, one of twenty one, will summarise the facts, risks and investment requirements for our natural capital assets for the next review period for 2020 to 2025. This investment case will also summarise performance for the current review period from 2015 to 2020 and our methodology for determining and delivering our future strategy.

This investment case document is a technical annex to section C5B of our overall business plan submission, as illustrated by the diagram below:



This investment case is aligned to the Water Resources Wholesale Control aspect of our business plan. It is recommended that this investment case is read in conjunction with the PR19 Investment Case Summary Document[1] which outlines in detail our methodology for defining investment.

[1] Bristol Water PR19 Investment Cases Summary Document NTPBP-INV-PR1-0635

2 Executive Summary

In order to provide customers with Local Community and Environmental Resilience, we will deliver on our statutory requirements to protect and enhance the quality of our wildlife sites, and to address environmental impacts of our operations. We will achieve this by using our totex investment approach which includes capital investment of £7.717m. We will deliver ten interventions that will contribute towards the biodiversity index, raw water quality and WINEP[2] compliance performance commitments and ensure we meet our statutory obligations. We will challenge ourselves to deliver more efficiently and apply innovation to the process we adopt to deliver these commitments. When considering our efficient and innovative approach we plan to deliver our environment capital programme for £7.100m.

At Bristol Water we have completed an extensive customer engagement programme, which has identified that the role we play in protecting the environment is important to our customers, particularly for our future customers and that customers support increasing resilience in the natural environment. For some customers, particularly the most engaged customers such as those who participate in our customer forum, and many stakeholders, the natural environment is an area where they want Bristol Water to show leadership. Customers and stakehdolers also see our community impact as a positive aspect of what we do. One of our four key outcomes is that we provide Local Community and Environmental Resilience.

This investment case will address our statutory obligations by utilising a totex approach to determine necessary capital investment to manage environmental risks and enable maintenance of our assets in terms of their natural capital.

To deliver our customers' priorities and meet our compliance obligations we will measure progress via performance commitments for which we have set delivery targets, both for the end of AMP6 and for AMP7. In AMP7, the environment measures are the biodiversity index (target 17,711), raw water quality (target 531) and WINEP compliance (target 100).

As at July 2018 we are achieving our AMP6 targets for raw water quality of sources and biodiversity index performance commitments, and are forecasting to continue to achieve these for the remainder of AMP6.

We have set the level of investment for our environment investment case so that it is sufficient to deliver our performance commitments and meet our statutory requirements. This will ensure the continued maintenance of our assets in terms of their natural capital and enable us to continue to improve the local environment that our customers can enjoy.

[2] Water Industry National Environment Programme.

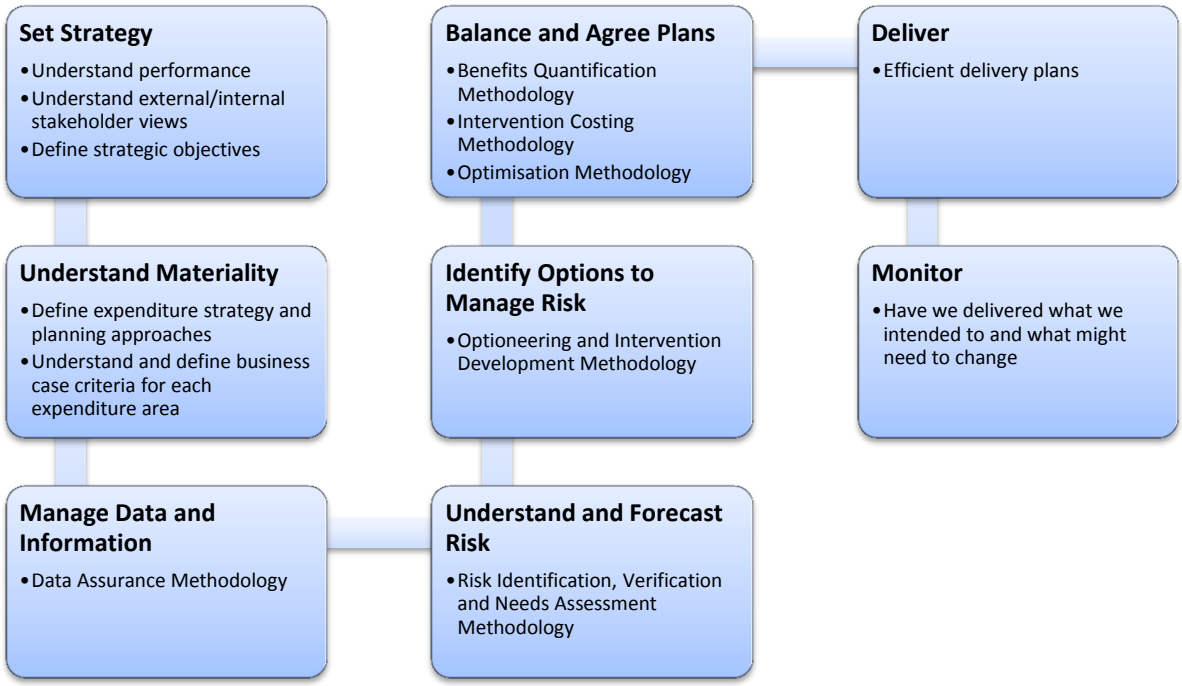
We will achieve this in a number of ways:

- By completing investigations and options appraisals on our abstractions;
- Undertaking river restoration;
- Delivering eel protection;
- By monitoring and preventing the spread of invasive non-native species;
- Developing a Strategic Biodiversity Action Plan;
- Delivering catchment management;
- Undertaking water quality investigations; and
- Improving the quality of our raw water sources.

Should we fail to invest in our natural assets, or not achieve the associated performance improvements mentioned above, we would fail to meet our WINEP compliance performance commitment and would also risk failing to deliver our statutory obligations under the WINEP, with the risk of incurring fines and a deterioration in reputation with our customers and the regulators. Consequently we would not provide our customers with Local Community and Environmental Resilience which is a key outcome for them.

In order to ensure that we meet customers' priorities and manage environmental risks and enable maintenance of our assets in terms of their natural capital, we have adopted an asset management totex focused approach as set out in Figure 1.

Figure 1: Approach to meeting Customer Priorities and Mitigating Risks



This approach enables us to demonstrate full "line of sight" from customer priorities, through risk review, options analysis and investment optimisation, to outcomes and benefits provided for our customers.

We plan to invest £7.717m from 2020 to 2025 to achieve the performance commitments associated with the Local Community and Environmental Resilience outcome, as set out in Table 1.

We have set ourselves a challenging target of reducing our costs by 8% during AMP7. This will be achieved by delivery of our business transformation programme resulting in a post-efficiency investment of £7.100m.

Table 1: Associated Performance Commitment Targets and Percentage Contribution

Performance Commitment	Unit	2019/20 Baseline	2024/25 Target	Targeted Performance Commitment Improvement in AMP7	Environment % Contribution to Performance Commitment Target
Biodiversity Index	Index	17,659	17,711	+52	50%
Raw Water Quality of Sources	Kg of phosphorous loss reduction achieved by Bristol Water schemes	0	531	+531	100%
WINEP Compliance	%	n/a	100	+100	100%

Our AMP7 investment in the continued maintenance of our assets in terms of their natural capital will enable us to continue to deliver an improved local environment that present and future generations will benefit from.

This investment case contributes 50% towards our AMP7 target for our biodiversity index performance commitment. Additional biodiversity index points will be achieved over the AMP via the delivery of the site specific management plans, where habitat management proactively influences the quantity and condition of the company's environmental assets. The site specific management delivery is not included as an intervention in this investment case, but this work will be delivered via partnership working with external stakeholders and across the business.

Full details of our outcomes, performance commitments, and outcome delivery incentives are provided in Section C3 of our business plan.

3 Background to Our Investment Case

3.1 Context

As a water company, water is arguably our most precious asset, and one for which we rely on the natural environment, specifically our source catchments, to provide this resource. Our landholdings, including reservoirs, treatment works and pumping stations, are in many cases valuable in terms of the natural services they provide, such as wildlife habitats. As landowners we have legal obligations to look after these assets.

Natural assets include a variety of geological, hydrological and biological features, and can be viewed at the landscape scale down to the species specific scale. We currently steward three designated Sites of Special Scientific Interest and one Special Protection Area, which afford national and international significance due to the biology and habitats found within them. These sites are Chew Valley, Blagdon and Cheddar Reservoirs. These sites are also important in terms of their value as recreational resources for our customers and local communities; 66% off our online panel of 2000 customers said that they visit the lakes at least once a year and 90% said they would visit them in the future. Many of our other sites also provide valuable habitats that are not designated.

We manage our abstraction, treatment and provision of water into supply such that environmental impacts are limited. Our activities are regulated and controlled, for example through environmental permits for discharges and through the abstraction licensing system. This enables us to support the resilient management of our natural assets. We also work with others across our source catchments to help protect the quality of our water sources, thus helping maintain healthy aquatic ecosystems and ensuring that our source water is treatable for human consumption.

The primary objective of this investment case is to ensure the continued maintenance of our assets in terms of their natural capital and enable us to continue to deliver a safe, high quality, and reliable drinking water supply to our customers and an improved local environment that they can enjoy. This will in turn enable us to provide Local Community and Environmental Resilience.

This investment case does not share performance commitment targets with any other investment case.

Following discussion with Natural England and the Environment Agency, we have agreed that the WINEP will include the provision of high-quality, MCERT[3] standard, flow monitoring at ten water treatment works. Provisions for this investment are not included in this investment case but are included in the Bulk Meters investment case.

There are a range of synergies and interdependencies between this investment case and the Water Resources investment case. These are discussed below.

[3] MCERT is the Environment Agency's monitoring certification scheme

3.1.1 Eel Protection Delivery

There will be synergy in working with the structures element of the Water Resources investment case, to ensure that our statutory obligations under the WINEP to retrofit eel passes on sites where we are undertaking other remedial works are fulfilled. We will also work with the structures team to help fulfil other reservoir related environmental obligations, including continued adaptive management of flows downstream of reservoirs in order to meet Water Framework Directive requirements.

3.1.2 Abstraction Investigations

The requirements for these investigations will overlap with plans to undertake yield tests at a number of boreholes as part of the Water Resources Management Plan intervention. There will be efficiencies in ensuring environmental monitoring is implemented alongside pump tests for yield analysis. The boreholes where both abstraction investigations and yield tests are required are:

- Banwell Springs
- Chelvey Well
- Honeyhurst & Wellhead (Well)
- Oldford (Borehole)
- Winscombe (Boreholes)

Proposals to improve data adequacy as part of the Water Resources Management Plan intervention will support delivery of environmental investigations under the WINEP, particularly those around abstraction sustainability.

Monitoring in relation to our Drought Plan (proposed as part of the Water Resources Management Plan intervention) will be aligned with requirements associated with WINEP adaptive management projects downstream of Chew and Blagdon Reservoirs.

3.1.3 Strategic Biodiversity Action Plan

The delivery of the actions from the Strategic Biodiversity Action Plan has a clear synergy with the Public Access and Recreation Interventions to deliver a great customer experience of our lakes.

The implementation of good estate stewardship as set out in the WINEP is a dependency for the Lakeside Recreations Works intervention. Catchment management within this investment case will support our ambitions to improve public access assets, recreation assets and enhance visitor experience by improving raw water quality in the reservoirs.

3.2 Strategy

Developing the investment needs for our natural capital assets is underpinned by our long term corporate strategy which has the vision “Trust beyond water-we provide excellent experiences”. Our Outcomes Delivery Framework together with our Strategic Asset Management Plan provides the strategic framework that supports this vision and enables investment in our natural capital assets to clearly focus in delivering against outcomes and performance commitments.

Our long term strategy, as set out in the Outcome Delivery Framework (section C3 of our business plan) has a focus on resilience and a growing need to ensure our assets are, and remain well maintained and effective in meeting our performance requirements. There are three strategic drivers identified that together ensure we meet our current and future needs for customers and stakeholders. These are:

- **Operational Resilience** – performance commitments to reflect reliability, resilience and quality of water.
- **Customer Focused** – performance commitments to reflect customer experience and support with affordability and vulnerability.
- **A Sustainable Business** – performance commitments to reflect the environment representing our community and sustainable resources.

Within this strategy there is a specific outcome (Local Community and Environmental Resilience) and specific performance commitments (biodiversity index, raw water quality and WINEP compliance) that have strategic targets and incentives that will be directly influenced by our investment needs for our natural capital assets.

Our Asset Management Strategy has objectives developed in alignment with the long term strategy and delivery of corporate objectives and outcomes. These objectives cover both short-term needs and the longer-term aims for Bristol Water and drive the capability development plan and asset planning activities. Delivery of the investment for our natural capital assets will be driven through the Asset Management Framework, which is designed to enable the efficient and effective planning and delivery of all our asset related activities to successfully deliver our business outcomes. The framework aligns to, and interacts with, our corporate drivers, which in turn are there to deliver the external expectations and requirements placed upon Bristol Water by stakeholders.

Our on-going strategy is to maintain and enhance our assets and the natural capital they provide. In doing so, we will comply with all relevant legislation and mitigate foreseeable risks to the environment. As a company we are fully aware of our responsibilities as custodians of the environment. As owners of a number of important internationally and nationally designated wildlife sites, it is our responsibility to ensure that their value and condition is maintained, and where possible, enhanced. We will also make sure that our activities are sustainable.

Our long term strategy consultation document, Bristol Water Clearly4, identifies how, as a company, we plan to respond to the outcomes of our customer and stakeholder research. Stewardship of the environment is at the heart of this strategy.

3.3 Customer Priorities

Customer priorities relating to Bristol Water's outcomes and performance commitments have been determined through our extensive programme of customer engagement and research. During the development of our business plan we have engaged with over 37,000 customers and conducted over 50 pieces of research. By delivering customer engagement, we have ensured that we can build on the

[4] Bristol Water, 2018. *Bristol Water Clearly - Our long-term ambition for excellent community water experiences 2018*.

customer insights that we have gained, producing a business plan influenced by our engagement events. This ensures that at Bristol Water we have engaged effectively with our customers on longer-term issues, and have taken into account the needs and requirements of different customers including those in vulnerable circumstances and also our future customers.

Through this process our customers have told us that their top priorities have remained largely unchanged from PR14 and have been identified as follows:

- You can get a bill you can afford;
- Keeping the water flowing to your tap;
- Help to improve your community;
- Save water before developing new supplies; and
- You get the best possible experience every time you need us.

Our engagement with our customers has resulted in the development of four specific outcomes for PR19, which capture what our customers and stakeholders have said; these are:

- Excellent Customer Experiences;
- Safe and Reliable Supply;
- Local Community and Environmental Resilience; and
- Corporate Financial Resilience.

In order to deliver our customers' priorities and outcomes we will measure progress via twenty six performance commitments for which we have set delivery targets.

There is a clear relationship between our investment in the environment and one of our outcomes – Local community and environmental resilience.

We undertook more detailed discussions at phase 2 of our engagement process; gathering evidence (see appendix C1 – Engagement, communication and research of our business plan) which gave us a wealth of information about how our customers view Bristol Water, our services, and long term issues. We also explored short and long-term trade-offs in decision making and asked customers to tell us how we should approach long term issues of resilience and how we could best protect the environment.

Our research showed that customers are broadly supportive of us taking steps to improve and enhance the environment. In our 2017 annual customer survey, 94% of customers said that it was very or quite important to protect the environment. All groups of participants at our day long deliberative resilience events expressed that the natural environment was an area worthy of investment and that we should take responsibility for protecting the environment and mitigate any negative impacts caused by the company's activities. Certain groups of stakeholders are very passionate about the environment and the leading role that we, as a community focused Water Company, can play in enabling environmental resilience in the region.

We consulted on three potential scenarios in relation to our Local Community and Environmental Resilience outcomes, as summarised in Figure 2 below:

Figure 2: The Three Potential Scenarios for our Local community and Environmental Resilience Outcome

Service	Performance Commitment	2020 target	2024/25 target		
			Slower improvement plan	Suggested improvement plan	Faster improvement plan
Leakage	The amount of water lost from pipes (million litres per day)	43.0	41.0 5% reduction	36.5 15% reduction	36.0 16% reduction
Water used by customers	Water use per person (litres per day)	142	138 3% reduction	135 5% reduction	129 9% reduction
Enhancing your local environment	Biodiversity index (score)*	17,658	17,683 25 point increase	17,711 53 point increase	17,858 200 point increase
Customers satisfied with our contribution to the local community	Community satisfaction survey	N/A – new measure	Continue current initiatives such as 'Refill' and Water Bar	Enhanced recreational benefits from our sites Working in partnership to deliver community benefit, such as reduced use of resources	Accelerated programme to deliver wider community benefits
Forecast increase to the average bill from additional investment			£3	£10	£12

10 points is equivalent to approximately 1 hectares of great new habitat

When discussing local community and environmental resilience outcome with our customers in our draft business plan consultation, the performance commitments under the local community and environmental resilience had some of the highest levels of support for the faster plan, and for the slowest plan, reflecting the mixed views our customers have about how much of a priority these issues should be for investment.

In summary, we consider that a plan with a lower bill level with the suggested service levels is more likely to be acceptable to more customers, particularly low-income groups. You can see more about how the feedback from our draft business plan consultation influenced each of our performance commitments in appendix C3 of our business plan.

When we tested the acceptability of our proposed plan with customers, 82% of customers from the telephone survey agreed with our planned improvements to the environment and local community (only 4% disagreed) and 94% of focus group participants agreed. The level of support for our plan expressed by our customers, both those we have engaged with over a period of time and those we met for the first time, gives us confidence that our final business plan strikes the right balance of delivering service improvements that customers value at a price that is acceptable to the majority.

This investment case describes how we will achieve the suggested improvement plan and associated level of performance through our investment in our natural capital assets, specific details can be found in section 3.4.

3.4 AMP7 Performance Commitments & Outcome Delivery Incentives

This investment case supports our Local Community and Environmental Resilience outcome, by investing in our natural assets and the natural capital they provide in protecting and enhancing our local environment, and provide high quality, reliable supplies for present and future generations.

The Local Community and Environmental Resilience outcome will be measured through a set of associated performance commitments. Our investment in our assets and the natural capital they provide will support the achievement of the performance commitments set out in Table 2.

Table 2: Associated Performance Commitments

Performance Commitment	Unit	2019/20 Baseline	2020/21	2021/22	2022/23	2023/24	2024/25	Performance Improvement Required in AMP7
Biodiversity Index	Index	17,659	17,668	17,678	17,689	17,700	17,711	+52
Raw Water Quality	Kg of phosphorous loss reduction achieved by Bristol Water schemes	0	109	216	322	427	531	+531
WINEP Compliance	%	n/a	100	100	100	100	100	+100

Our innovative biodiversity index performance commitment quantifies the enhancements we make to the natural environment across our sites. The index is measured by calculating the cumulative hectares and meters of habitat (for example grassland and hedges) and the quality of this habitat.

The proposed AMP7 methodology for raw water quality is based on kilogrammes of phosphorus not lost to the environment as a result of our work with farmers. This will more directly measure our delivery of catchment management than the AMP6 methodology, which is based on frequency of algal blooms in reservoirs.

The WINEP compliance metric will measure our compliance with all requirements of the WINEP. Our commitment is to deliver all the requirements under the WINEP.

Full details of our outcomes, performance commitments, and outcome delivery incentives are provided in Section C3 of our business plan

A detailed diagram illustrating the full line of sight between customers, outcomes, performance commitments and outcome delivery incentives related to this investment case, is included in Appendix A.

3.5 Compliance Obligations

Statutory and compliance obligations have influenced the development of interventions in this investment case and the proposed investment for AMP7. Relevant legislation is detailed below.

The WISER5 document outlines the expectations of the Environment Agency and Natural England for water industry delivery of statutory obligations. Compliance with the WINEP is a requirement set down in the WISER. The WISER replaces Defra's Statement of Obligations and the Environment Agency's Letter of Expectations issued at PR14. The WISER provides water companies with guidance on how to bring these obligations and expectations into the development of their business plans. The WISER encourages companies to aim for delivery beyond the statutory minimum and to seek opportunities to work innovatively in partnership with other organisations, to achieve wider benefits. It also promotes the principles of natural capital valuation and incorporation of such values in business plan decision making.

Obligations under the WINEP are defined according to the requirements of individual items of legislation. These include:

- Natural Environment and Rural Communities Act 2006 - we should contribute to the biodiversity priorities under Biodiversity 2020, including work to halt overall biodiversity loss and to support healthy well-functioning ecosystems.
- Wildlife and Countryside Act 1981 - requires public bodies to take responsible steps to further conserve and enhance features of Sites of Special Scientific Interest that we own and sites that are within catchments impacted by our business.
- Conservation of Habitats and Species Regulations (Habs Regs) 2017 - provides us with the obligation to conserve Natura 2000 sites (Special Protection Areas, Special Area of Cconservation, and Ramsar).
- Water Framework Directive (WFD) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242) for England and Wales.

3.6 AMP6 Investment and Performance

AMP6 investment related to environment is provided in Table 3 below. This investment supports our ability to meet our performance commitments for biodiversity index and raw water quality of sources, and will underpin these performance commitments in AMP7.

We have re-categorised data used in line with the scope of our investment cases. For historic data we have used the 2016/17 wholesale cost assessment data (data tables 1 and 2). Forecast data has been derived from PR19 data (data tables WS1 and WS2).

[5] Water industry strategic environmental requirements.

Table 3: AMP6 Capital Investment

Year	Environment Investment capex (£m)
2015/16 actual	0.265
2016/17 actual	0.399
2017/18 actual	0.659
2018/19 forecast	2.397
2019/20 forecast	1.852
AMP6 forecast	**5.571**

Our AMP6 investment delivers against our defined NEP6 schemes and improvements, including eel protection, biodiversity action plans and catchment management. These improvements have allowed us to achieve sustained compliance against our biodiversity index and raw water quality of sources performance commitments.

The AMP6 performance commitments that are related to environment investment, and our performance, are given in Table 4.

Table 4: AMP6 Performance Related to Environment Investment

Performance Commitment		2015/16	2016/17	2017/18	2018/19 (Forecast)	2019/20 (Forecast)
Biodiversity Index						
Bristol Water	Target	17,649	17,650	17,651	17,652	17,653
	Company Performance	17,649	17,650	17,657	17,658	17,659
Raw Water Quality (% of AMP5 baseline aggregate of algal bloom frequency)						
Bristol Water	Target	>+10%	>+10%	±≤10%	±≤10%	±≤10% for ≥2 years
	Company Performance	+20%	+11%	-1%	-1%	-1%

We monitor our protection and enhancement of the natural environment through an innovative approach that we have called the biodiversity index. This quantifies the environmental value of our sites and creates a ‘direction of travel’ for the way we manage our assets. We have met our biodiversity index target each year, and there has been an improving trend in our biodiversity improvement since we created this measure in 2014-15.

[6] National environment programme.

For raw water quality of sources, the measure is the percentage of AMP5 baseline aggregate of algal bloom frequency. We have been working with local landholders and farmers to identify where these raw water quality issues can be addressed, and through our partnership programmes we are able to work together on these issues. We are continuing to hold a range of successful farm engagement and training sessions with landholders in the key catchment areas. We monitor the quality of water in the Mendip reservoirs and this monitoring has indicated that our catchment management programme is having a progressive beneficial effect on water quality, with a gradual reduction in the level of algal blooms experienced in these water sources.

3.6.1 Raw Water Quality of Sources

The Raw Water Quality of Sources performance commitment is new for AMP7. It measures the kilogrammes of phosphorus which are not lost to the environment either as a result of implementing interventions, or land management changes made by farmers as an outcome of our catchment management programme. Our AMP6 version of the Raw Water Quality of Sources performance commitment is based on assessment against algal population data from weekly samples taken at the following reservoirs - Cheddar, Blagdon and Chew Valley. As the two performance commitments measure different parameters, predicted performance in AMP7 cannot be compared to AMP6.

The AMP6 performance commitment is reputational only, so there are no financial rewards or penalties for over or under-performance. Catchment management was the approach proposed to deliver this commitment. The lack of financial reward or penalty acknowledges the fact that there are many factors beyond our control which could influence algal populations in the reservoirs, and hence cause under or over-performance.

3.6.2 Biodiversity Index

The Biodiversity Index is an innovative performance commitment that we developed as a novel approach and pioneered during AMP6. We were the first water company in the industry to develop a metric to value the biodiversity of its sites and use this metric to value the environmental work we delivered. This metric and approach has driven support for environmental delivery across the business in AMP6.

The AMP6 Biodiversity Index performance commitment is reputational only and did not set a numerical target. There has been no financial reward or penalty for over and under performance of this performance commitment. Delivering the Biodiversity Index approach across the business in AMP6 aimed to deliver an improvement in the biodiversity of our sites and to mitigate any negative impacts of operational impacts and on the company Biodiversity Index score.

As the AMP6 and AMP7 performance commitments have been reported in different parameters, predicted performance in AMP7 cannot be compared to delivery in AMP6.

3.6.3 WINEP Compliance

While we do have a set of environmental obligations under the AMP6 NEP, we do not have a performance commitment attached to these obligations. Therefore, we do not have an AMP6 equivalent to the proposed AMP7 WINEP compliance performance commitment.

4 Developing Our Investment Plan

As we have discussed earlier, the starting point for investment case development is to understand our customers' priorities and determine associated performance commitments. We have adopted totex principles to determine how we should invest in order to deliver these priorities and associated commitments. The totex approach we have adopted considers which the best solution is because it is the lowest cost over the whole life of the asset, regardless of whether it is operational expenditure (opex) or capital expenditure (capex).

Whilst we do not currently have health and risk indices across our asset groups, we do have a wealth of data. In some cases, analytical models such as the mains deterioration model, provide us with a view of how our assets are performing, as well as a view on their deterioration. The following section describes the process we have created and followed in order to develop our investment cases.

4.1 Investment Case Development Process

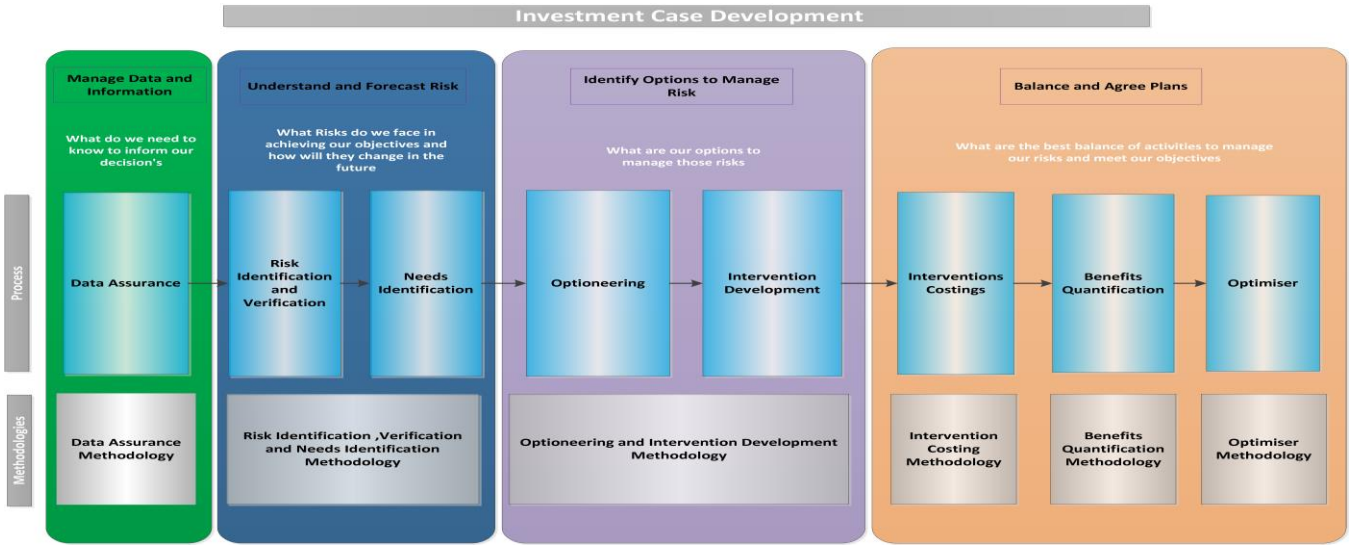
We have created and implemented a process that is supported by a set of six methodologies. When developing the methodologies, we wanted to ensure that they:

- Deliver what the customers have asked for;
- Satisfy our business needs; and
- Deliver a high quality business plan in accordance with Ofwat's Company Monitoring Framework.

The collective application of these methodologies has enabled us to develop investment proposals that are well evidenced through a line of sight approach, ensuring our investment plan achieves the required targets at the optimal cost.

Figure 3 illustrates, at a high level, the process required to identify risks that require addressing in AMP7, and the subsequent development of appropriate interventions.

Figure 3: Investment Case Process Overview – Level 1 Diagram



4.1.1 Data & Data Assurance

The development of our investment cases is dependent on having consistent, accurate and assured data. We therefore recognise that we must be able to demonstrate the quality of the data and information used in the development of our investment cases.

Wherever possible, we have utilised data from our core company systems in order to undertake our analysis, and we have sense checked the quality of the data as we have used it.

However, in addition, we have applied a data assurance methodology. We have assessed data quality in terms of completeness, accuracy and reliability. In addition, the methodology also assesses whether data is used as part of the Annual Performance Report to Ofwat, and hence is already subject to existing Annual Performance Report assurance mechanisms.

In total we have developed twenty one investment cases. The values of these investment cases range from less than £1m to over £37m. Our overall capital investment plan totals circa £212m.

We have selected a sample of nine investment cases, and have applied detailed data assurance based on their value and complexity. The total value of these nine investment cases represents 66% (circa £140m) of the total capital investment plan, and represents two hundred and eighty six individual data types. We have evaluated all two hundred and eighty six data types and we have evaluated them for quality and their use in the Annual Performance Report process. The overall data quality assessment identified 93% of the data as being good quality, and 55% as having been used and assured through the Annual Performance Report process.

This investment case was not included as part of the sample of nine investment cases. We will continue to focus on improving the quality of our data and the associated assurance processes going forwards.

4.1.2 Risk Identification, Verification & Needs Assessment Methodology

The purpose of our risk identification, verification and need assessment is to ensure that:

- The risks that we are currently facing are captured in a single risk register;
- Each risk is assessed and verified to determine details about the nature and magnitude of the risk and whether any mitigation is currently planned in this AMP period;
- Each risk is scored on a common basis to allow risks to be compared; and
- The most significant risks are identified, and that for each a clear and uniquely referenced statement of need is produced to define the problem as clearly as possible, and to identify what benefits or performance commitments mitigation of this risk will achieve.

The risk score is the product of the likelihood and consequence, each is scored 1 to 5 and then multiplied together to provide a potential maximum risk score of 25.

Risks scoring 15 to 25 are the most significant strategic risks, and these were developed into needs statements.

Those scoring 10 or 12 were subject to a further round of review. Where the risk was confirmed, it was developed into a needs statement. Where the risk was not confirmed (for example it is currently being addressed in AMP6 or the risk was assessed to be not as significant as initially scored), it was not considered further as part of the PR19 investment planning process.

The risks scoring 1 to 9 were considered to be risks of a lower priority and were therefore not considered further as part of the PR19 investment planning process.

The risks not considered further as part of the PR19 investment planning will continue to be monitored and assessed as part of the live business and on-going business as usual risk management process. Where there is a need to mitigate these risks within the AMP, we will respond with appropriate action, such as increased base maintenance.

Unselected risks will continue to be monitored and assessed as part of the live business and on-going business as usual risk management process. Where there is a need to mitigate these risks within the AMP, we will respond with appropriate action, such as increased base maintenance.

Further development of our business as usual risk management process is on-going and we are looking to innovate by developing smarter systems to optimise this process.

We developed need statements for all selected risks.

4.1.3 Optioneering and Intervention Development Methodology

The next stage in our process is to develop options for how we could meet the needs of the selected risks.

To generate the options, data was gathered from a number of sources (see Appendix B). This included meetings with stakeholders and historical records, including reviews following operational events, previous scheme proposal reports and previous options assessment reports.

We then progressed to data assimilation, analysis and consultation with key stakeholders. Multiple options were developed and recorded. These options were reviewed and all options identified as not viable were discarded.

All viable options were identified as proposed interventions with a unique reference number and were taken forward for further scope development, benefits calculation and costing.

4.1.4 Intervention Costing Methodology

In order to provide assurance of our investment costs and to ensure standardisation, we engaged ChandlerKBS as our costing partner. They were selected in part due to their ability to provide us with industry comparable cost data, often at intervention level. They supported us in several ways:

- In some instances development and analysis of intervention costs, and
- Support to build our cost database.

Indirect overheads, such as contractor costs, design costs, contract management, and our overheads have been applied at intervention level. Wherever possible we used our data, or if unavailable, we used industry average costs.

Therefore we have to assess the expected capital cost of each intervention.

Expected Capital Cost (capex after)

If we deliver the capital intervention in a planned way, we have labelled it as ‘capex after’. This is the expected capital cost of the intervention.

Cost estimates were usually based on high level scopes, which contained activity schedules, and sketches provided by ourselves, and were developed using the cost model we developed with ChandlerKBS.

4.1.5 Benefits Quantification Methodology

The benefits for each intervention are those which are considered to affect company performance during subsequent AMP periods.

Benefits can be assessed as being either:

- Direct – savings in reactive capex or savings in opex; or
- Indirect – improvement in performance commitments or other resultant effects on the company’s performance.

Both direct and indirect benefits are considered and quantified.

Direct Benefits

We have a totex approach which considers both capex and opex.

Expected Capital Cost (capex before)

If we deliver the capital intervention in an unplanned way, we have labelled it as ‘capex before’. This is the reactive cost that would potentially arise if we had to deliver the intervention in an unplanned way.

We could respond to this scenario in one of two ways:

- 'Patch and Repair' or
- Implementation of the intervention in an un-programmed accelerated manner.

The capex before was estimated for each intervention. For most interventions the estimate is site specific. A risk factor, taken from the likelihood score recorded in the Strategic Risk Register[7], was applied to the initial capex value to produce the final capex before figure.

Where a 'patch & repair' solution would not be appropriate should the risk materialise, this would lead to the immediate implementation of the intervention. The cost of the intervention in this scenario is the expected capital cost of the intervention (capex after), with the application of a suitable uplift to cover the costs associated with fast-tracking the intervention, for example, the cost of labour at premium rates.

The expected capex before effectively formed the 'Do Nothing' option.

Expected Operational Cost (opex before & opex after)

In most cases we have made an estimate of the opex levels either with investment - opex after, or without investment - opex before. Opex includes power, chemicals, materials, contract hire and in house labour.

Opex before represents the opex associated with not mitigating a risk through capital investment, for example, increased maintenance visits or replacement of components.

Opex after represents the additional opex cost to the business after the implementation of an intervention. This could include negative values associated with predicted savings associated with increased plant efficiency or performance, or positive values where there is an operational cost increase, for example greater inspection levels.

Indirect Benefits

To measure our performance against our customers' priorities and the associated performance enhancements associated with interventions; we measured the impact that each intervention had on the performance commitment measure.

Other Benefits

In addition to the performance commitment benefits described above, other indirect benefits which do not relate to performance commitments were calculated and recorded in the benefits calculations where appropriate. This includes avoidance of health and safety penalties, customer compensation payments, and environmental penalties. These benefits have been monetised.

Once the benefits were prepared, the interventions were put forward for investment optimisation.

[7] Bristol Water, 2018. *NTPBP-CAL-STR-0127 Strategic Risk Register (WIP).xlsx*

4.1.6 Investment Optimisation & Intervention Selection

The investment optimisation process determines which interventions are selected to provide the optimal AMP7 investment plan, by delivering the targeted performance commitment improvements, at the lowest cost. We have utilised a water industry standard system (Servelec 'Pioneer') to optimise our AMP7 investment plan. Pioneer provides the functionality for us to assess all interventions developed across all of the investment cases. It assesses the interventions both individually and in comparison to other interventions. It is a decision support tool that produces an optimal investment plan to meet the targeted performance commitment improvements required in AMP7.

The Pioneer investment optimiser model assesses interventions primarily on the overall benefit, which takes account of performance and wholelife costs. The investment optimiser calculates the wholelife cost as the net present value over 40 years. This determines if an intervention is cost beneficial.

We will select interventions for one or more of the following reasons:

- The intervention is mandated (i.e. is a WINEP requirement);
- The intervention is cost-beneficial; or
- The intervention is required to achieve the performance commitment targets.

Any performance commitment improvement obtained from mandated or cost-beneficial interventions will also contribute to overall performance improvement.

A series of business reviews and sense checks of the investment optimiser results have been undertaken prior to finalising the AMP 7 investment plan.

We can of course model any number of scenarios, and during the process of engaging our customers we ran three scenarios as described in Appendix C1 (the slower Improvement plan, the suggested improvement plan and the faster improvement plan).

4.2 Applying the Investment Process to the Environment Investment Case

Each of the following sections describes the specific details associated with the application of the investment case development process for the Environment investment case.

4.2.1 Risk Identification, Verification & Needs Assessment

There were fifty two risks identified in the Strategic Risk Register[8] associated with this investment case. Every risk went through a process of assessment, scoring, and review, following the Methodology of Risk Identification, Verification and Needs Identification.

Twenty six risks were selected and developed into need statements. The risk descriptions, scoring and associated needs statements are captured in the Strategic Risk Register. Details of the selected risks are provided in Appendix C.1.

[8] Bristol Water, 2018. *NTPBP-CAL-STR-0127 Strategic Risk Register (WIP).xlsx*

Twenty seven risks were not selected and these risks return to being monitored and reviewed under our business as usual risk management process. Details of the non-selected risks are provided in Appendix C.2.

An example of a non-selected risk is given below in Table 5.

Table 5: Example of an Unselected Risk

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score
SRR248	Blagdon Pumping Station	If we fail to comply with the discharge consent at Blagdon fish farm we may impact the reservoir fish rearing operations and risk receiving a financial penalty from the Environment Agency and damaging our reputation.	4	2	1	2	5	1	5	20

In the example above a risk was listed around compliance with an environmental permit on the discharge from Blagdon fish farm. While compliance with this permit is a regulatory requirement, we have agreed with the Environment Agency that over the remainder of AMP6, we will review how the consent conditions can be complied with. This acknowledges the unique circumstances at Blagdon, including that the fish farm discharge constitutes the compensation flow from the reservoir and therefore is not subject to dilution. As we are working to resolve this risk in AMP6, it was not taken forward into the investment planning process for AMP7.

The 'Line of Sight' for the whole process, beginning with the selected risks, the source of the risk, a record of source documents used to verify the risks, and the needs statements, is captured in the Environment Interventions Register[9].

4.2.2 Optioneering & Intervention Development

Since 2016, we have worked with the Environment Agency and Natural England to develop an appropriate set of WINEP obligations. This optioneering of environmental interventions has included negotiation to arrive at a pragmatic and deliverable set of commitments that while delivering on our legislative requirements, are also in line with our customer priorities. For example, in 2016 as part of a national programme, the Environment Agency asked us to investigate all of our abstractions to determine if they may be causing deterioration under the definitions of the Water Framework Directive. Through discussion at Area level within the Environment Agency, we were able to reduce the number

[9] Bristol Water, 2018. *NTPBP-CAL-ENV-0160 Environment IC Intervention Register.xlsx*

of required abstraction investigations to eight, demonstrating a measured approach to delivering interventions, which is in line with customer priorities.

This proportionate and measured approach has been deployed across the development of our WINEP obligations. The refinement process started in 2016 and has required close working with the Environment Agency and Natural England including regular meetings. Lines have been entered onto the WINEP such that certainty around their requirement is managed through each iteration of the WINEP. Lines have been colour coded red, green or amber according to the certainty of their requirement. Lines that remained coloured red, denoting uncertainty in requirement, prior to the finalisation of WINEP3, have now been removed. This included obligations to undertake environmental improvements around Bleadon Clyse sluice, as the ongoing ownership dispute has yet to be resolved.

Three iterations of the WINEP have been developed thus far and WINEP3 was issued in March 2018. We are not expecting any changes to be made to this version. We will be working closely with the Environment Agency and Natural England to develop the scopes for our WINEP projects and these are required for sign off by the end of 2018.

As the majority of interventions within this investment case are statutory requirements, the scope for alteration via the optioneering process is limited. For these particular interventions, we can either undertake the intervention to a standard which is appropriate and acceptable to the regulators (Environment Agency, Natural England and the Drinking Water Inspectorate), or if the alternative 'Do Nothing' option is pursued by the business, we accept the risk of harming our reputation and potentially incurring the likely fines and penalties for not honouring our statutory duties. As the majority of the intervention proposals concern statutory obligations, there is little scope to deliver at a lower level of performance.

A copy of WINEP3 issued in March 2018 is included in Appendix G. A summary of all non-selected risks is given in Appendix C.2.

Once interventions were developed, costs were prepared which are discussed in section 4.2.3.

Regulatory (WINEP and Drinking Water Inspectorate) Requirements

We have collated our activities on the WINEP and developed nine interventions. These fall into two broad categories - appraisals and investigations and on the ground delivery projects:

- Appraisals and investigations
    - Abstraction investigations and option appraisals
    - Invasive non native species and raw water transfer investigations
    - Riparian and reedbed habitat investigations
- On the ground delivery projects
    - Planned delivery of habitat improvements via the Strategic Biodiversity Action Plan
    - Eel conservation and barrier mitigation
    - Catchment management on the Cam and Frome (Gloucester & Sharpness Canal) catchments (Drinking Water Inspectorate supported intervention)

- Catchment management (Cheddar Springs, River Axe, Egford Boreholes)
- Biosecurity facilities to manage and mitigate the risk of recreational transfer of disease and invasive species
- Adaptive management of flows downstream of reservoirs

Non-Regulatory Requirements

We will continue our work with farmers across the Chew Valley and Blagdon Reservoir catchments to reduce pollution risks and improve the water quality of our sources. This will also help us to fulfil our legal duties to maintain the condition of these important wildlife habitats which are currently considered at risk of deterioration due to poor water quality issues.

This investment case also includes provisions to continue catchment management across the Chew Valley and Blagdon Reservoir catchments. This work started in AMP6 under the NEP and will deliver a sustainable and cost-effective raw water quality solution for our customers. By its nature, catchment management is a long term approach and although it is relatively low cost, it has wide benefits for the environment and society, many of which are difficult to quantify. In recognition of the broader importance of sustained catchment management in the Chew and Blagdon catchment areas, the Environment Agency and Natural England have provided a letter of support for our proposals to continue delivery of catchment management across the Chew Valley and Blagdon Reservoir catchments (not included on the WINEP), an excerpt of which is provided below. The letter is provided in full in Appendix H.

'Further to your request for a letter of support from both the Environment Agency and Natural England for Bristol Water to continue with Catchment Management Schemes; we can confirm that both organisations support your proposal to further employ Catchment Management to improve water quality, as detailed in your Catchment Management Notes paper. Indeed, given that the Favourable status of the Bristol lake SSSIs is threatened by hyper-eutrophication we consider it essential that further measures are introduced to reduce the loads of nutrients into these sites.' Letter from Jeremy Bailey Environment Agency, and Mark Taylor Natural England dated 22nd March 2018.

4.2.3 Intervention Costing

In this investment case, intervention costs were either calculated in house or calculated in collaboration with external consultants Ricardo and WWT.

When costs were calculated in collaboration with Ricardo or WWT, costs were based on scopes we supplied. The consultants then costed the interventions based on their understanding of the work involved and the associated time and expertise requirements. The costed interventions were returned to us for peer review, leading to further refinement in collaboration with the consultants. These costed interventions are presented in Appendix E.

Where costs were calculated in house, this was based on historical project costs. An example of an in-house cost is detailed below.

Cost Example: Catchment Management (Regulatory) (34.001.07)

We developed the costs for the catchment management interventions in-house and they were based on historic spend, mainly from 2017/18. Costs were therefore included for sample analysis, specialist advisors, the Bristol Water Catchment Grant Scheme, sampler time, and consultancy support. Costs were also included for staff salary time.

Costs for the regulatory catchment management programme were transposed from AMP6 costs based on the number of farms in the catchments. According to Government data, there are 380 farm holdings across the Chew and Blagdon catchments, and 510 farms across the Cheddar Springs, Egford Boreholes and River Axe catchments. Costs were therefore increased by a multiple of 1.34. Costs of undertaking catchment management across the WINEP regulatory catchments were therefore estimated at £1.752m over the AMP. A cost of £500k for the AMP was allocated to deliver catchment management across the Gloucestershire and Sharpness Canal catchments – this is a direct transfer of costs from AMP6. This resulted in a total cost of £2.252m.

4.2.4 Benefits Quantification

All ten interventions were assessed for direct and indirect benefits. These are presented in Appendix E.

In terms of indirect benefits, the performance commitments that relate to this investment case are discussed below.

Biodiversity Index

The Biodiversity Index was assessed using data on the quantity and quality of habitat improved. Historic environment data taken from the last 4 years (2014 – 2018) on the quantity of habitats we manage, was used to calculate the metric Biodiversity Index benefit that would be delivered with each intervention. The Environment investment case is the only investment case contributing to the Biodiversity Index performance commitment.

Raw Water Quality

Two interventions contribute to the raw water quality performance commitment. These are the regulatory and non regulatory catchment schemes. These are the only interventions in the investment plan which will deliver against this performance commitment.

This metric is an assessment of the company's progress in implementing catchment management of nutrients across its reservoir catchments. The measure relates to the level of nutrient loss reduction, modelled as kg of phosphorus not lost to the environment based on the measures taken up by farmers across the Mendip Reservoir catchments (Chew, Blagdon and Cheddar). These measures are those that farmers have taken up as a result of encouragement and support delivered by the Mendip Lakes Partnership, led by Bristol Water, and by Bristol Water in delivering the Metaldehyde Action Project on the Gloucestershire Cam and Frome catchments.

The assessment of progress against the target is made using a recognised model (Farmscoper) to calculate mass of nutrients saved according to measures taken up. The same model is used to assess the baseline loss of phosphorus across the catchments. Catchment management across the Cheddar

catchment will be required under the WINEP. Reward will only be attributed to delivery over and above that required by the WINEP.

WINEP Compliance

The WINEP compliance performance commitment is new for AMP7. We are committing to deliver each requirement under the WINEP, with penalty for late delivery. In terms of benefit quantification, we are assuming 100% compliance for each proposed WINEP intervention.

Once the benefits were prepared, the interventions were put forward for investment optimisation.

5 Outcome

5.1 Selected Interventions

The ten interventions developed within the Environment investment case were assessed through the investment optimisation process. All ten interventions were selected.

The ten selected interventions are set out in Table 6, along with details of the associated costs.

Table 6: Selected Interventions, Costs and % Performance Contribution

ID	Intervention Title	Total capex (£)	Change in opex per annum (£)	Biodiversity Index	Raw Water Quality	WINEP Compliance
34.002.01	Catchment Management - Blagdon & Chew	£1,603,640	-£29,079	-	68%	-
34.001.01	Abstraction Investigations & Options Appraisals	£997,000	£0	-	-	100%
34.001.02	Adaptive Management of Flows & River Restoration	£256,000	£0	8%	-	
34.001.03	Eel Protection	£453,500	£0	8%	-	
34.001.04	Invasive Species & Biosecurity Investigations	£164,700	-£3,800	4%	-	
34.001.05	Recreational Transfer of Invasive Species - Management Implementation	£431,500	£2,400	12%	-	
34.001.06	Strategic Biodiversity Action Plan	£1,072,899	-£90,382	38%	-	
34.001.07	Catchment Management Delivery (Regulatory)	£2,251,810	-£58,050	-	32%	
34.001.08	Catchment & Water Quality Investigations	£100,900	£0	-	-	
34.001.09	Riparian Habitat & Reed bed investigations	£384,948	£0	30%	-	
Environment capital investment pre-efficiency		**£7,716,897**	**-£178,911**	**100%**	**100%**	**100%**
Environment capital investment with 8% capex efficiency		**£7,099,545**				

The interventions selected demonstrate our commitment to delivering on our role as stewards of the environment and to looking after our assets in terms of their natural capital.

Nine out of the ten selected interventions are selected because they are mandatory to meet our statutory obligations (see section 3.5). These interventions and how they link to individual pieces of legislation are explained in in Table 7 below.

Table 7: Proposed Interventions and Associated Statutory Obligations

Intervention Type	Associated Obligation
Abstraction Investigations (34.001.01)	These abstraction investigations and options appraisals are statutorily required under the WINEP and have the Water Framework Directive as transposed by the Water Environment Regulations as a legislative driver. These investigations will provide understanding of whether abstractions are likely to cause water body deterioration as defined by the Water Framework Directive.
Adaptive Management of Flows and River Restoration (34.001.02)	These abstraction investigations and options appraisals are statutorily required under the WINEP and have the Water Framework Directive as transposed by the Water Environment Regulations as a legislative driver. These projects will implement measures to improve river water bodies such that the target of 'Good Ecological Potential', as defined under the Water Framework Directive, can be assigned.
Eel Protection Delivery (34.001.03)	Delivery of a solution to mitigate impacts of the dam and associated infrastructure at Chew Valley Reservoir is included in the WINEP. According to Environment Agency policy, implementation of the solution is a statutory requirement if we are implementing any other capital solutions on the same site. The legislative driver for water companies to act to protect eels is the Eel Regulations 2009.
Invasive non-native species: Monitoring, Investigations and Delivery (34.001.04 and 34.001.05)	WINEP specific actions require us to assess the risk of transferring invasive non-native species in raw water transfers. Water Framework Directive Water body status can be significantly impacted by invasive non-native species. There is a significant adverse social, economic and environmental impact the company needs to manage as the changes in climate influence the dynamics of invasive non-native species and interactions with raw water sources. The Wildlife and Countryside Act 1981 makes it illegal to release or allow the escape into the wild any animal which is not ordinarily resident in Great Britain or to grow in the wild any plant listed in Schedule 9 of the Wildlife and Countryside Act 1981.

Intervention Type	Associated Obligation
Strategic Biodiversity Action Plan (34.001.06)	Delivering maintenance and enhancements to natural capital assets is a legislative requirement of the Wildlife and Countryside Act 1981. The Wildlife and Countryside Act (Section 28G) states that Bristol Water, as the owner of Sites of Special Scientific Interest, must further the conservation and enhancement of the flora, fauna or geological or physiological features of these designated sites. Stewardship of natural capital assets is also associated with the requirements under the Natural Environment and Rural Communities Act 2006 (part 3, section 40) to have regard for the environment and conserve biodiversity in relation to living organisms, habitats, restoring or enhancing populations of species and habitats.
Catchment Management Delivery (34.001.07)	Catchment management across the Cheddar Springs and River Axe safeguard zones is statutorily required under the WINEP, and as a Drinking Water Protected Area has the Water Framework Directive as a legislative driver (to preclude the requirement for additional treatment). As the reservoir is a Site of Special Scientific Interest, we are required to act to maintain the conservation status of the Site of Special Scientific Interest under the Natural Environment and Rural Communities Act 2006 and the Wildlife and Countryside Act 1981. Catchment management across the Egford Boreholes safeguard zone is statutorily required under the WINEP, and as a Drinking Water Protected Area has the Water Framework Directive as a legislative driver (to preclude the requirement for additional treatment). Catchment management across the Chew Valley and Blagdon Reservoir safeguard zones was a statutory requirement for AMP6 under the NEP. For AMP7, we plan to continue delivery of catchment management to meet the Raw Water Quality of Sources performance commitment, and because in the longer term, catchment management will lead to improved raw water quality and lower treatment requirements. Blagdon and Chew Valley Reservoirs are both Sites of Special Scientific Interest, and Chew Valley Reservoir is a special protection area under the Birds Directive, therefore we are obliged to act to maintain their condition, including protecting against water quality deterioration. Catchment management across the Cam and Frome catchments of the Gloucester & Sharpness Canal is required under the continuation of an undertaking to the Drinking Water Inspectorate. Catchment management remains the only feasible option to manage Metaldehyde concentrations in the raw water to Purton and Littleton Treatment Works.

Intervention Type	Associated Obligation
Catchments and Water Quality Investigations (34.001.08)	These investigations are statutorily required under the WINEP. The Barrow/Land Yeo water quality investigation has the Water Framework Directive Regulations and the fact that there is a Site of Special Scientific Interest downstream (protected under the Natural Environment and Rural Communities Act) as legislative drivers. The Forum Springs catchment investigation is focused on the Forum Springs Drinking Water Protected Area, designated under, and to meet, the objectives of the Water Framework Directive.
Investigations into Improving Raw Water Quality (34.001.09)	Delivery of investigations to look at improving raw water quality is included in the WINEP with specific actions stated within the WINEP document as agreed with the Environment Agency and Natural England.

The remaining intervention (34.002.01 Catchment Management – Blagdon & Chew) is selected because of its contribution to the raw water quality performance commitment target.

The individual interventions are described in detail in the following sections.

5.1.1 Abstraction Investigations & Options Appraisals (34.001.01)

During 2016, the Environment Agency contacted water companies asking them to review the sustainability of their abstractions, specifically to prevent deterioration and to avoid serious damage to water bodies as defined under the Water Framework Directive10. Water companies have a legal duty under the Water Framework Directive and its transposing regulations11 to have regard to the objectives of the River Basin Management Plans which have been drawn up to deliver the requirements of the Water Framework Directive. Water companies must demonstrate that they have solutions in place to resolve existing problems and also to prevent future deterioration in the context of increased water demand.

Following a series of discussions between us and the Environment Agency, a number of investigations were added to the WINEP. These investigations will focus on those abstractions that we and the Environment Agency have agreed could potentially cause deterioration to the water environment under projected rates of growth in demand. The investigations will determine if our abstractions are causing, or could in the future cause, a significant impact on river flows or groundwater levels. Subject to the outputs of the investigations, an options appraisal may be required to identify the appropriate solution to mitigate impacts. Any solutions identified would be implemented in AMP8 or beyond.

Investigations are required at eight of our sources:

- Banwell Spring;
- Cheddar Yeo (supplies Cheddar Reservoir);
- Chelvey Well
- Dundry and Elwell Streams;
- Honeyhurst and Wellhead;
- Oldford Boreholes;
- Tickenham Road Borehole; and
- Winscombe Borehole.

The WINEP states that the investigations and options appraisals will need to be completed during the first two years of AMP7, i.e. by March 2022 (except for Chelvey which has a regulatory date of March 2025).

[10] Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000 establishing a framework for Community action in the field of water policy.

[11] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, as amended by the Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015

5.1.2 Adaptive Management of Flows and River Restoration (34.001.02)

This intervention features continued adaptive management of flows and geomorphology in the rivers downstream of Chew and Blagdon Reservoirs. Investigation and options appraisal undertaken during AMP6 has assessed the impacts caused by the reservoirs and their operation on the downstream ecology, and is identifying solutions available to mitigate those impacts. Solutions for which trials are on-going, or implementation is on-going, during AMP6 include:

- Restoration of the river channels;
- Relocation of the compensation discharge point at Chew Reservoir; and
- Alterations, via adaptive management, of the compensation flow regime at each reservoir.

Continued investment during AMP7 will enable continued adaptive management of the flow regimes and associated ecological monitoring. This work is required under the WINEP, and has a regulatory completion date of December 2024.

This adaptive management project is required at the following sites:

- River Chew at Chew Valley Lake; and
- River Yeo (Congresbury) at Blagdon Lake.

Successful completion of these WINEP items will enable these water bodies, which are classified under the Water Framework Directive as ‘heavily modified’, to be assessed at ‘Good’ Ecological Potential’. Good’ Ecological Potential is a river basin management plan objective by 2027.

A third river restoration related item is included on the WINEP with a low level of certainty. This is ‘restoration of the River Axe and riparian habitats around the Bleadon Clyse sluice’. Ownership and responsibility for this sluice are currently subject to resolution between us and the Environment Agency. Until such time as this item is resolved, this item will not be implemented. This position is understood by Area staff at the Environment Agency and has been discussed at WINEP meetings, leading up to its inclusion in the WINEP, but with a low level of certainty.

5.1.3 Eel Protection Delivery (34.001.03)

During AMP6 under the NEP, we assessed the impacts of our intakes on eel and elver entrainment, and migratory barriers (dams and weirs) to eel and elver populations. Following these investigations and associated cost benefit analysis; we are installing new screens at the Littleton intake on the Gloucester & Sharpness Canal, and are delivering a suite of measures at the main Purton intake on the canal, after the screen has been replaced. Subject to further investigation, alternative measures or screen replacement will also take place at the River Axe Brinscombe intake. These works are budgeted to be completed by the end of AMP6, noting that the regulatory exemptions currently in place at these sites expire in 2021.

Of the assets assessed and subject to cost benefit analysis through the AMP6 investigations, installation of an eel pass solution was found to be cost beneficial only at Chew Valley Reservoir. As

directed by the Environment Agency in WINEP Driver Guidance12, companies are only required to deliver improvements for eel at sites where other capital maintenance work is planned. This is termed an 'opportunistic' approach by the Environment Agency, and is in line with the Environment Agency approach to the Flood Risk Management infrastructure improvements. A solution at Chew Valley Reservoir would enable upstream elver passage through the current gauging flume, over the main reservoir dam and over the weir into Heriot's Mill Pool.

Delivery of eel passage improvements at Chew Stoke Pumping Station is included on the WINEP and will be undertaken alongside work we have proposed to increase drawdown capacity under the Reservoir Safety Regulations, subject to its inclusion in our capital investment plan.

5.1.4 Invasive Non-Native Species: Monitoring, Investigations and Mitigation (34.001.04 and 34.001.05)

These interventions require collation of historic data and commissioning of new surveys and surveillance programmes as requested by the WINEP. These should identify and model the risk of invasive non-native species spreading via recreational transfer and the raw water network, considering the current status of invasive non-native species on company sites and in the adjacent landscape. The company should identify and implement a companywide management plan for controlling or removing known invasive non-native species. This includes the current abstraction operations and future operations, which risk spreading invasive non-native species. This management plan would propose and implement measures to manage this risk.

We will work in partnership with local organisations to provide resilient habitats for native species development. The AMP6 partnership with Bristol Zoological Society will be built upon to include further academic and citizen science involvement to support ark sites for the endangered white clawed crayfish within the Mendips.

Biosecurity measures, previously identified in AMP6, will be implemented at our recreation sites and procedures implemented with contractors and staff moving between company sites.

5.1.5 Strategic Biodiversity Action Plan (34.001.06)

Under the Natural Environment and Rural Communities Act 2006, we are required to contribute to the priorities of UK Government's Biodiversity 2020 strategy. This action includes halting biodiversity loss and supporting healthy and resilient ecosystems. We also have a responsibility under the Wildlife and Countryside Act 1981 to conserve and enhance the natural environment within our land holdings. We will continue to discharge our statutory duties as a steward of the natural environment. Furthermore, we will further develop the ecosystem and social services our natural capital assets provide.

A Strategic Biodiversity Action Plan will set out the delivery of environmental projects across company sites. It will inform habitat enhancement works, which deliver a net gain for the natural environment, and contribute to our biodiversity index performance commitment. Development of this Strategic Biodiversity Action Plan will provide initiatives and activity which has the long term objective to mitigate

[12] Environment Agency (2017) PR19 Driver Guidance: Eel Regulations (Implementation). Final Version. 6th January 2017.

habitat fragmentation and increase species connectivity, improving ecosystem resilience to operational changes, climatic changes and changes in water resource use and consumption. This intervention will build on AMP6 interventions, where we are currently working with local partners including the Wildlife Trusts and Mendips AONB, to develop 'opportunity' maps to identify locations for reconnecting habitats to improve ecological resilience.

We will continue to develop the biodiversity approach and quantification method initiated in AMP6. The habitat and natural asset work delivered in AMP7 will contribute to the annual biodiversity index performance commitment.

Flagship projects that our Strategic Biodiversity Action Plan will deliver include:

- Pollinators project to increase foraging habitat and seed bank resources across our landholdings, from covered reservoirs embankments to unimproved grassland habitats adjacent to our reservoirs;
- Greenways project to provide hedgerow and woodland within company sites and the adjacent landscape, to promote the importance of corridors for invertebrates, small mammals, small bird species, amphibians and reptiles;
- Linking the Mendip lakes to create a resilient wildlife corridor between them. This project will be delivered in coordination with our established catchment management programme (the Mendip Lakes Partnership); and
- Wet Wonderland habitats project to identify locations where wet habitats can be restored or created to provide wet woodlands, ponds, reedbeds and back waters. This will be delivered in coordination with the established catchment management programme.

In parallel to the above projects, a strategic approach to the natural environment will continue to embed the biodiversity index and the natural capital approach across the business. This approach is supported by Natural England, the Environment Agency, the Bristol Avon Catchment Partnership, and the West of England Nature Partnership. The West of England Nature Partnership align with our aspirations to advocate investment in the natural environment to support spatial planning, economic development and public health13. The intervention and its approach will also look to support local authority objectives for sustainability, in particular the City of Bristol's vision to be a resilient city14.

The Strategic Biodiversity Action Plan will support the delivery of other investment cases and their interventions, including lakeside and recreation interventions within the Water Resources investment case. It will also support the 'Spawn to be Wild' schools engagement project that raises awareness of European eel conservation and water efficiency.

This intervention will be informed by an evidence base and reportable under the WINEP.

[13] http://www.wenp.org.uk/

[14] https://www.bristol.gov.uk/policies-plans-strategies/bristol-resilience-strategy

5.1.6 Catchment Management Delivery (Regulatory and Non-Regulatory) (34.002.01 and 34.001.07)

We have been implementing a programme of catchment management across the Blagdon and Chew reservoir catchments during AMP6. In so doing, we set up the Mendip Lakes Partnership, to bring together and coordinate organisations working towards similar aims, This included Natural England, Catchment Sensitive Farming, and Avon and Somerset Wildlife Trusts. We are also on the Steering Group of the Environment Agency's Wessex Area Diffuse Pollution Programme.

Through our commitment to the catchment management programme, we are delivering advice and support to farmers, to enable them to reduce pollution risks and to deliver wider environmental benefits where opportunities arise. In AMP7, we will continue catchment management across the Blagdon and Chew catchments as part of our opex, and will deliver catchment management across the River Axe (Brinscombe), Cheddar Springs and Egford Boreholes catchments, as statutorily required under the WINEP. This follows on from catchment investigations in the Cheddar Springs and Egford Boreholes catchments during AMP6, and detection of high pesticide concentrations in the River Axe raw water. The collaborative approach established through the Mendip Lakes Partnership will be continued, and our continued activity and presence in the catchments will continue to increase and maintain the profile of raw water stewardship and resource protection among the farming community.

5.1.7 Catchments and Water Quality Investigations (34.001.08)

These investigations will examine potential impacts on water quality at a groundwater sources at Forum Springs and in the River Land Yeo, and undertake an appraisal of options to mitigate impacts.

The use of Forum Springs is currently affected by issues around turbidity, such that treatment is increasingly expensive, and at times the source cannot be used. We will undertake a catchment investigation to determine the sources of turbidity and will identify options to reduce these turbidity issues. This will help us to understand ways to reduce treatment costs and outages at the source, and will therefore indirectly contribute to our unplanned outage performance commitment. The investigation is required under the WINEP and would be undertaken over the first two years of AMP7 for completion by March 2022.

Investigations undertaken by Wessex Water during AMP6 to establish why the River Land Yeo has elevated phosphorus concentrations were inconclusive, but suggested that consented discharges from Barrow Treatment Works could be a potential source. This intervention will add to the work undertaken in AMP6 by Wessex Water, to further the understanding of the relative loads attributable to the various sources, including waste discharges from Barrow Treatment Works. Depending on the outcome of the investigations, options will be considered to mitigate the impacts. The investigation is required under the WINEP and would be undertaken over the first two years of AMP7 for completion by March 2022.

5.1.8 Investigations into Improving Raw Water Quality – Intervention ID 34.001.09

This intervention aligns with the Strategic Biodiversity Action Plan intervention (34.001.06) and the Catchment Management Delivery interventions (34.002.01 and 34.001.07), investigating opportunities to take action to improve raw water quality and treatment work discharges, supporting designated sites

and wider natural environmental assets such as streams and lakes. A programme of investigations will look at the impact of floating reed beds on algal blooms, natural flood management techniques on raw water quality, and bioremediation techniques on treatment work discharges. The practical application of these operations will also be assessed and proposals made for further investigation for delivery in AMP8.

This investment case is aligned to the Water Network Plus Wholesale Control category of our business plan. Costs are allocated to the Water Resources and Water Treatment Business Units. Investment is related to both Infrastructure and Non-Infrastructure assets and is a mixture of maintenance and other capital expenditure.

Water Service and Business Unit Allocation is summarised in Table 8.

Table 8: Water Service and Business Unit Allocation

Wholesale Control	**Water Resources**	**Total**
Business Unit Allocation	***01 Water Resources***	
Environment capital investment (%)	**100.0%**	**100%**
Environment capital investment (£m)	**£7.717m**	**£7.717m**
Other capital expenditure - infra	£2.765m (35.8%)	**£2.765m (35.8%)**
Other capital expenditure - non-infra	£4.952m (64.2%)	**£4.952m (64.2%)**
Environment capital investment with 8% capex efficiency		**£7.100**

5.2 Innovation

When it comes to delivering our programme of works we know that we must continue to be innovative and efficient. We have set ourselves a challenging target of reducing our costs by 8% during AMP7. This will be achieved by delivery of our business transformation programme.

We see innovation as integral to our everyday working at Bristol Water. We have deliberately embedded it within the business-as-usual processes of our asset management teams, by embracing the full flexibility that totex and outcomes enables. We will look to be innovative in the following ways:

- **Open Innovation**: We have defined our strategic innovation challenges and run events such as our “Innovation Exchange” that invite suppliers to present their innovative solutions to predefined challenges that we set.
- **Market Scanning**: We conduct market scanning for cutting edge technology against our strategic innovation challenges and feed this into our optioneering process. In particular we subscribe to the Technology Approval Group which regularly scans and meets with water companies to unearth the most promising innovations for the sector.
- **Partnering**: We undertake leading research into areas that we provide effective solutions for the future.

We will specifically look for innovative techniques that mean we can contribute to our 8% efficiency challenge and keep our customers' bills low into the future.

Innovation specific to this investment case is discussed below.

Our interventions in this investment case offer numerous opportunities for innovation and partnership working in AMP7. Discussions are on-going with the University of Bristol and University of the West of England, to identify areas which would benefit from research and innovation. These include pilot trials to investigate raw water quality issues in the reservoirs, approaches to catchment management and its validation, and valuation of natural capital. We will also act as an industrial partner in bids for studentships and participate in the delivery of undergraduate lectures.

The University of Bath are currently undertaking research around catchment management and influences on manganese concentrations and solubility in the reservoirs. This partnership, currently comprising two PhD studentships, is well established and will be extended through the remainder of AMP6 into AMP7.

To develop and deliver assessments for our Strategic Biodiversity Action Plan, we will be working with the University of the West of England to provide research, survey and educational opportunities for undergraduates and graduate students. By providing access to our sites, and participating in university lectures, we can support learning and gain student and staff time to carry out habitat assessment work, and also peer review the company's natural capital accounting tools.

We aspire to deliver further natural capital accounting approaches and tools to support the delivery of work in AMP8. Over the AMP7 period we will be working to further develop our existing natural capital accounting tool, the Bristol Water Biodiversity Index, and develop methods to quantify additional company ecosystem services, such as carbon sequestration and materials produced for local construction and cultural craft. As steering group members of the Bristol Avon Catchment Partnership, we will be working to help embed natural capital accounting approaches on a regional basis. Through contributing to the Partnership's grant fund, we can help to bring about strategic investment in natural capital across the Bristol Avon catchment. In 2017/18 for example, our investment of £3k has helped to enable £125k of overall investment in projects such as the Bristol Frome Partnership Project.

At the start of AMP6 we formed the Mendip Lakes Partnership, to bring together organisations concerned with reducing the impacts from farming in our Mendip catchments. Working with other organisations including Natural England, Catchment Sensitive Farming and the Environment Agency, we have developed our role to coordinate advice and support delivery as the Primary Catchment Contact for farmers in our safeguard zones. While catchment management in itself is not a new concept, we have developed a partnership approach which is now well established and working well in our target areas. We have developed partnerships with innovative solutions providers such as Rezatec, who are a successful start-up company with whom we began working in 2015 to explore the use of satellite imagery in our catchment management programme. We were able to work with Rezatec in the early years of their development to investigate changing land use, crop patterns and soil erosion, to help protect the quality of our water courses.

We will investigate methods and the feasibility of employing a reverse auction system in the River Axe catchment, as an approach to deliver cost effective catchment management. This could constitute a trial of an approach similar to that employed in the Poole Harbour catchment by Wessex Water, which has led to the development of their EnTrade platform.

5.3 Contribution to Performance Improvement

Table 9 set outs the percentage contribution to performance commitment improvement provided by the selected environment interventions. These percentage contributions are discussed in the following sections.

Table 9: Contribution to Performance Commitment Targets from Selected Interventions

Performance Commitment	Unit	2019/20 Baseline	2020/21	2021/22	2022/23	2023/24	2024/25 Target	Targeted Performance Commitment Improvement in AMP7	Environment % Contribution to Performance Commitment Target
Biodiversity Index	Index	17,659	17,668	17,678	17,689	17,700	17,711	+52	50%
Raw Water Quality of Sources	Kg of phosphorous loss reduction achieved by Bristol Water schemes	0	109	216	322	427	531	+531	100%
WINEP Compliance	%	n/a	100	100	100	100	100	+100	100%

5.3.1 Raw Water Quality of Sources

Over AMP7, our target is to prevent 531kg phosphorus being lost to the environment. Our catchment management programme, made up of non-regulatory interventions (across Chew and Blagdon reservoir catchments) and regulatory interventions (across Cheddar Springs catchment), will prevent a total of 531kg phosphorus being lost to the environment by the end of AMP7. Two interventions will deliver against this target.

5.3.2 Biodiversity Index

Over AMP7, this investment case will contribute 26 biodiversity points. This is 50% of the biodiversity index performance commitment end of AMP7 target, which is 52 biodiversity index points. Additional biodiversity index points will be achieved over the AMP via the delivery of the site specific management plans, where habitat management proactively influences the quantity and condition of the company's environmental assets. The site specific management delivery is not included as an intervention in this investment case but the work will be delivered via partnership working with external stakeholders and across the business.

5.3.3 WINEP Compliance

Measurement against this commitment will be equally weighted on compliance with delivery of each line of the WINEP by the regulatory dates, as signed off by the Environment Agency and Natural England. There are fifty one lines on the current version of our WINEP (WINEP3), which form nine out of the ten selected interventions.

Data for the performance assessment against this performance commitment will consist of annual email confirmation from the Environment Agency and Natural England that project progress is satisfactory to enable compliance with all of our WINEP requirements.

5.4 Non-Selected Interventions

All interventions put forward for investment optimisation were selected. Therefore we do not anticipate that any residual risks will be carried during AMP7.

5.5 Assumptions

There are a number of general assumptions that have been made in the development of our investment cases. These are discussed in detail in section 11 of the PR19 Investment Cases Summary Document[15]. Assumptions specific to this investment case are discussed below.

For costing purposes we have had to make general assumptions around the scale of works required for each intervention, given that in certain cases there is minimal data either in the literature or from the industry to draw upon. These include for example:

- The scale of work required to draft the Strategic Biodiversity Action Plan; and
- The level of detail required for the abstraction investigations to satisfy regulator requirements, and extent of monitoring.

It is assumed that there will be no further changes to the WINEP following publication of WINEP3 by the Environment Agency – this is as per our understanding.

[15] Bristol Water, 2018. *NTPBP-INV-PR1-0635 PR19 Investment Cases Summary Document.docx*

5.6 AMP8

The Environment Investment case is required for managing and mitigating short term and long term risks to the natural assets that we own and manage. Many of the risks will continue on into AMP8 as they relate to compliance with legislation. New legislation implemented after the submission of this business plan and/or during AMP7 may present additional areas of compliance for consideration in AMP8. We therefore expect to work with the Environment Agency and Natural England during AMP7 to develop a WINEP (or equivalent) for AMP8. This will form a major component of our investment planning for AMP8. At the current time there is no reason to expect that the scale and profile of investment required in AMP8 would be substantially different to that required for AMP7.

Risks to raw water quality are likely to continue and may increase due to as yet unknown pressures from agriculture and other industries, influenced by factors such as our exit from the EU and climate change. Natural capital will also be subject to change and potential influences which are as yet unknown. Through implementing the interventions detailed in this document, we will be in a good position to deal with further risks as they arise. However, it is likely that we will need to continue to invest in maintaining the quality of our raw water and in the quality of our designated and non-designated sites during AMP8 and beyond.

During AMP7 the interventions will support the development of additional Natural Capital Accounting tools and approaches, building on our biodiversity index approach. We aspire to develop a package of tools which appraise the natural and social capital of our assets, and provide a baseline for reporting on additional ecosystem services over the AMP8 period. This investment case dovetails with the long term strategy of the company; Bristol Water Clearly[16], linking in with provisions and services which support the local communities and environmental resilience.

5.7 Base Maintenance

In order to maintain a base level of performance upon which performance improvement can be achieved, we have identified minimum levels of expenditure on infrastructure / non-infrastructure assets (see the Infrastructure and Non-Infrastructure investment cases for further details). However, the Infrastructure Base Maintenance investment case and Non-Infrastructure Base Maintenance investment case do not define minimum levels of expenditure for asset types related to this investment case.

5.8 Historical & AMP7 Investment Comparison

AMP6 was the first investment period for which we were tasked with delivering a set of environmental projects and investigations under the NEP. Prior to AMP6 we focused on the responsible discharge of our duties as a landowner under the Natural Environment and Rural Conservation Act (2006), and previously under Section 3 of the Water Industry Act (1991). As such, we developed and published Biodiversity Action Plans for our Sites of Special Scientific Interest in 1998, 2008 and 2014. These

[16] Bristol Water, 2018. *Bristol Water Clearly - Our long-term ambition for excellent community water experiences 2018*.

Biodiversity Action Plans built on historic practices delivered by the company under a Conservation Strategy produced in 1987.

A summary of historical environment investment is provided in Table 10, along with our AMP7 investment in environment interventions. We have re-categorised data used in line with the scope of our investment cases. For historic data we have used the 2016/17 wholesale cost assessment data (data tables 1 and 2). Forecast data has been derived from PR19 data (data tables WS1 and WS2).

Table 10: Historical & AMP7 Capital Investment

AMP	Values	Capex Investment (£m)
AMP5	AMP5 actual	0.626
AMP6	2015/16 actual	0.265
	2016/17 actual	0.399
	2017/18 actual	0.659
	2018/19 forecast	2.397
	2019/20 forecast	1.852
	AMP6 forecast	5.571
AMP7	AMP7 pre-efficiency	7.717
	AMP7 8% capex efficiency applied	7.100

An investment of £7.717m is proposed in AMP7 for the Environment investment case.

The costs that we have used to develop the interventions for our AMP7 investment plan reflect AMP6 delivery costs. However, the overall level of investment for AMP7 is higher than the actual/forecasted AMP6 spend due to a larger programme of catchment management delivery and the requirement to deliver natural capital asset enhancements.

The cost of the catchment management programme in the Mendips is forecast to be £1.6m for AMP6. This will increase to £3.4m in AMP7 with extension of the programme over the River Axe, Cheddar Springs and Egford Boreholes catchments, as required under the WINEP. These additional safeguard zones increase the number of farms to be targeted for engagement by a factor of 2.3.

The final cost of delivery of natural capital asset maintenance, enhancements and investigations for AMP6 is projected to be £2.965m. This will increase to £4.3m in AMP7 with proactive and strategic development of ecological investigations and delivery of a regional programme of works required under the WINEP.

6 Conclusions

In order to ensure that our natural assets continue to deliver our customers' priorities and the environmental improvements, meeting our compliance obligations, we will measure our progress via our performance commitments and regulatory requirements which have set delivery targets.

In AMP7, the environment measures are the biodiversity index (target index score 17,711), raw water quality of sources (target 531kg reduction in phosphorous loss) and WINEP compliance (target 100%).

AMP7 will see further progress in the way we deliver environmental performance, reflected by a continuing transition from opportunistic delivery towards strategic planning and delivery of environmental services, quantified in the benefits received by our customers. A healthy and resilient natural environment will enable and support operational performance, community engagement, and our ambitions for delivering a sustainable and resilient service for our customers. The work required to achieve this will require collaborative working across departments, and with organisations and regional stakeholders.

The interventions proposed are expected to contribute 50% of the biodiversity index target (17,711), contribute 100% of our raw water quality at sources target (531) and ensure 100% achievement of our WINEP compliance performance commitment target. They also support compliance with our statutory obligations under the WINEP.

We plan to invest a pre-efficiency total of £7.717m in our environmental performance and enhancement of the natural capital of our assets through AMP7. These interventions will reduce our operating costs by approximately £179k per annum. We have set ourselves a challenging target of reducing our costs by 8% during AMP7. This will be achieved by delivery of our business transformation programme, resulting in a post-efficiency investment of £7.100m.

The interventions in this investment case enable or indirectly support our performance commitments, which ensure we deliver what our customers expect. The inception and design of plans for environmental investment for AMP7 have kept our regulatory obligations and stakeholder expectations at the centre of our focus. The result is that everything in this investment case will help maintain and then enhance our natural environment for customers. There are investigations and project delivery on the ground which will feed into our strategic planning. It will be critical to maintain innovation and learning to deliver the significant benefits outlined in this investment case. Delivering our environmental objectives and managing the natural capital of our assets will be fundamental to successfully realising our ambition to deliver an excellent water service.

Our business plan provides assurance to both achieve and monitor the delivery of its outcomes, it will meet relevant statutory requirements and licence obligations imposed by the Drinking Water Inspectorate and the UK Government.

7 Appendices

- Appendix A: Line of Sight Diagram
- Appendix B: Datasets
- Appendix C.1: Selected Risks
- Appendix C.2: Non-Selected Risks
- Appendix D: Options Considered
- Appendix E: Interventions Developed
- Appendix F: Non-Selected Interventions
- Appendix F: Non-Selected Interventions
- Appendix H: Natural England and Drinking Water Inspectorate Letters of Support

7.1 Appendix A: Line of Sight Diagram

Environment Line of Sight

Investment Case
NTPBP-INV-ENV-0549

Customer Priorities

- Trust Beyond Water
- Environment
- Top Quality Water Supplies
- Quality

Performance Commitments

Optimiser Input Form Reference

NTPBP-CAL-ENV-0368

Safe and Reliable Supply of Water

Slower Plan
Suggested Plan
Faster Plan
Targets based on Lockdown 5

- Biodiversity Index — 17659 | 17711 | 17858
  - Customer High Priority
  - ODI
  - Bespoke Reward and Penalty

Local Community Resilience

- RAW Water Quality of Sources — 531 | 531 | 531
  - Customer High Priority
  - ODI
  - Bespoke Reward and Penalty

- WINEP
- Other Monetised Benefits

Interventions

- 34.001.02
- 34.001.03
- 34.001.04
- 34.001.05
- 34.001.06
- 34.001.09
- 34.002.01
- 34.001.07
- 34.001.01
- 34.34.002.02
- 34.002.01
- 34.001.03
- 34.001.07

OFWAT Initial Assessment Tests

Test Area	OFWAT Initial Assessment Tests
Engaging Customers	What is the quality of the Company's customer engagement and participation and how is it incorporated into the companies business plan and ongoing operations
Securing long term resilience	How well has the company used the best available evidence to objectively assess and prioritise the diverse range of risks and consequences of disruptions to its systems and services and engaged effectively with customers on its assessment of the risks and consequences
	How well has the company objectively assessed the full range of mitigating options and selected the solutions that represent the best value for money over the long term and support from customers
Targeted controls , markets and innovation	To what extent has the company clearly demonstrated that it has considered whether all relevant projects are technically suitable for direct procurement for customers. Where it has one or more such projects, to what extent has the Company provided a well reasoned and well evidenced value for money assessment
Securing Confidence and Assurance	To what extent does the company have a good track record of producing high quality data, taking into account the company's data submission, assurance process and statement of high quality , and our 2018 assessment of the company under the Company Monitoring Framework
Board Requirements	
Customer Engagement	Assurance that the company's business plan has been informed by customer engagement and feedback from the company's CCG about the quality of its customer engagement and how this has been incorporated into the plan
Resilience	Assurance that the company's business plan has been informed by a robust and systematic assessment of the resilience of the company's systems and services; customer views on managing resilience and a comprehensive and objective assessment of interventions to manage resilience in customers long term interests
Business Planning	How has it challenged an satisfied itself that the overall strategy for data assurance and governance processes delivers a high quality data
	How has it challenged and satisfied itself that the business plan will enable the company to meet its statutory and licence obligations , now and in the future and take account of the UK and Welsh governments strategic policy statements.
	How has it challenged and satisfied itself that its plan will deliver operational financial and corporate resilience over the next control period and the long term through its governance and assurance processes, taking into account of its track record of performance

Performance Commitment Key

- Common Performance Commitment
- Common New Performance Commitment
- Bespoke Performance Commitment
- Bespoke New Performance Comittment

Document Number: NTPBP-MET-ENV-0728

7.2 Appendix B: Datasets

This appendix lists the datasets used in this investment case and where they have been utilised.

Dataset File Name	Data Summary	Process In Which Data Has Been Used			
		Risk Identification, Verification and Needs Assessment	Optioneering	Intervention Costing	Benefits Quantification
NTPBP-EXT-ADD-0730 Additional Business Plan Costing Wash Final with Figures.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0731 Costing for Barrow reed bed and lagoon investigations.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0732 Costing for Company Wide Biodiversity Action Plan.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0733 Costing for Invasive Species investigations.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0734 Costing for Invasive Species Management Implementation.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0735 Costing for Reed bed and riparian habitat enhancement of Chew Valley Lake.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0743 Costings For Abstraction Investigations and Option Appraisals.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0744 Costing for Adaptive Management of Flows.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-COS-0745 Costing for Delivery of Eel Protection.pdf	Ricardo Costing Document	-	-	✓	-

Dataset File Name	Data Summary	Process In Which Data Has Been Used			
		Risk Identification, Verification and Needs Assessment	Optioneering	Intervention Costing	Benefits Quantification
NTPBP-EXT-COS-0746 Costing for Water Quality Investigation.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-EXT-FLO-0736 Floating reedbed impact study at Barrow Reservoirs.pdf	Ricardo Costing Document	-	-	✓	-
NTPBP-CAL-BIO-0673 Biodiversity Index 17-18.xlsx	2017-18 Biodiversity index	-	-	-	✓
NTPBP-EXT-BRI-0081 WINEP3_Final_Bristol_290318 _WnfordBkbr55.xlsm	Bristol Water final WINEP	✓	✓	-	-
Benefits Assessment Catchment Management_30.04.18.pdf	Ricardo Benefits assessment of catchment management	✓	-	-	✓

7.3 Appendix C.1: Selected Risks

This appendix shows the 26 selected risks of the 52 relevant risks.

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR163	Purton TW	IF there is Metaldehyde failure in treated water at Purton TW THEN costly investigations and DWI notification would be necessary and possible DWI enforcements (Purton TW).	5	2	2	3	5	4	5	25	Y
SRR257	Non Site Specific	There is a risk of diffuse pollution increasing the frequency of algal blooms at WTW which increase treatment costs. IF nutrient concentrations are elevated in reservoirs THEN algal blooms may occur making water difficult and expensive to treat, also threatening SSSI condition status.	4	3	3	3	5	3	5	20	Y
SRR753	Various Sites	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with obligation under the Water Framework Directive to investigate abstractions that may be causing serious damage or deterioration as defined under the Water Framework Directive , so that solutions can be implemented.	4	3	3	3	5	2	5	20	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR754	Non-Site Specific	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water would fail to comply with its obligations under the Water framework Directive to implement appropriate mitigation of the reservoir's impacts as required under the Water Framework Directive.	4	3	3	3	5	2	5	20	Y
SRR755	Non-Site Specific	Subject to resolution of ownership dispute between Bristol Water and EA. Risk that sluice and its operation could cause deterioration or serious damage as defined under the Water Framework Directive. The ownership of Bleadon Sluice is disputed between Bristol Water and the Environment Agency. Failure of the structure will negatively impact the European designations upstream and may create a significant H&S risk if allowed to fall in disrepair.	2	2	3	2	3	1	3	6	N
SRR756	Non-Site Specific	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with requirements under the Eel Regulations in terms of reducing impacts on eel populations and delivering eel protection.	3	4	4	4	5	1	5	15	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR757	Non-Site Specific	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a lack of biosecurity measures and procedures on Bristol Water sites which increases the risk of spread of biological hazards.	5	2	2	4	5	1	5	25	Y
SRR758	Non-Site Specific	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred between Bristol Water assets via the raw water network due to the lack of surveillance and mitigation measures in place, with potential associated operational cost increases.	2	1	4	4	5	1	5	10	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR759	Barrow Reservoir	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Barrow Reservoirs 1, 2 and 3 due to the lack of mitigation measures in place.	2	1	4	4	5	1	5	10	Y
SRR760	Cheddar Reservoir	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Cheddar Reservoir due to the lack of mitigation measures in place.	2	1	4	4	5	1	5	10	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR761	Chew Magna Reservoir	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Magna Reservoir due to the lack of mitigation measures in place.	2	1	4	4	5	1	5	10	Y
SRR762	Chew Valley Lake	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Valley Lake due to the lack of mitigation measures in place.	2	1	4	4	5	1	5	10	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR763	Litton Reservoir	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Litton Reservoir due to the lack of mitigation measures in place.	2	1	4	4	5	1	5	10	Y
SRR764	Non-Site Specific	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water does not have a Strategic BAP in place, THEN it will fail to dscharge its duties under the Natural Environment and Rural Communities Act and Wildlife and Countryside Act.	5	1	4	2	4	1	4	20	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR765	Non-Site Specific	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred between Bristol Water assets via the raw water network due to the lack of surveillance and mitigation measures in place, with potential associated operational cost increases.	5	1	4	2	4	1	4	20	N
SRR766	Egford	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF water quality at the Egford source declines due to diffuse pollution from agriculture, THEN it may become unusable without new treatment facilities.	3	2	4	3	5	1	5	15	Y
SRR767	Cheddar Reservoir	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken for the Cheddar Reservoir THEN treatment costs and outages could increase.	4	2	4	4	4	2	4	16	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR768	Non-Site Specific	IF Bristol Water does not continue the existing DWI undertaking THEN it will not be discharging its duties under the Water Industry Act (1991) and could face financial penalties.. . IF metaldehyde in the raw water increases above threshold, may cause outages and threat to security of supply	5	2	2	3	5	4	5	25	Y
SRR769	Non-Site Specific	IF Bristol Water fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. IF metaldehyde in the raw water increases above threshold, THEN there could be works outages and threat to security of supply.	4	2	2	3	5	4	5	20	Y
SRR770	Non-Site Specific	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to act to maintain condition of SSSIs THEN Bristol Water is liable to prosecution and reputational damage under the NERC Act.	3	2	4	4	5	1	5	15	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR771	Non-Site Specific	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If BW fails to act to maintain condition of SSSIs, then liable to prosecution and reputational damage under the NERC Act.	3	2	4	4	5	1	5	15	Y
SRR772	Non-Site Specific	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there ius a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions THEN there is potential for prosecuition, financial penalty, reputational damage.	3	2	3	4	5	2	5	15	Y
SRR773	Forum Springs	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If water quality issues at Forum do noto improve, then outages will continue and possibly become more frequent and increased loss of deployable output.	3	2	3	4	5	2	5	15	Y

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score	Risk Confirmed?
SRR774	Forum Springs	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF water quality issues at Forum do not improve, THEN outages will continue and possibly become more frequent and increased loss of deployable output.	3	2	3	4	5	2	5	15	N
SRR775	Chew and Blagdon Reservoirs	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC ActTHEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken, THEN treatment costs and outages could increase. (Lack of management to prevent this would also constitute non-compliance with duties to manage conservation status of SSSI / SPA).	4	3	5	4	5	3	5	20	Y
SRR776	Barrow TW	IF BW fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions, THEN there is potential for prosecuition, financial penalty, reputational damage. (Bristol Water is at risk of failing it's consented discharges from Barrow TW. Failures have already been recorded by the Environment Agency).	4	3	4	3	5	1	5	20	Y

7.4 Appendix C.2: Non-Selected Risks

This appendix shows the 26 non-selected risks of the 52 relevant risks.

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score
SRR21	Chew Magna Reservoir	IF no flood protection to on-site and off-site infrastructure at Chew Magna Reservoir THEN site at high risk of on-site and off-site flooding WHEN spillway used	2	2	2	1	2	1	2	4
SRR236	Cooks Corner PS	IF containment tank leaks THEN no containment AND cause ground or watercourse contamination	2	2	2	1	3	1	3	6
SRR237	Avonmouth PS	IF containment tank leaks THEN no containment AND cause ground contamination	2	2	2	1	3	1	3	6
SRR238	Alderley TW	IF Transformer oil leaks THEN no containment AND cause ground contamination	2	2	2	1	3	1	3	6
SRR239	Almondsbury PS	IF Transformer oil leaks THEN no containment AND cause ground contamination (Almondsbury PS)	2	2	3	2	3	1	3	6
SRR240	Axbridge TW	IF Transformer oil leaks THEN no containment AND cause ground contamination (Axbridge TW)	2	2	3	2	3	1	3	6
SRR241	Barrow TW	IF Transformer oil leaks THEN no containment AND cause ground contamination (Barrow TW)	2	2	3	2	3	1	3	6
SRR242	Cheddar TW		2	2	3	2	3	1	3	6
SRR243	Chew Magna Reservoir	IF Transformer oil leaks THEN no containment AND cause ground contamination (Chew Magna)	2	2	3	2	3	1	3	6

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score
SRR244	Chew Stoke PS	IF Transformer oil leaks THEN no containment AND cause ground contamination (Chew Stoke PS)	2	2	3	2	3	1	3	6
SRR245	Alderley TW	IF fuel oil leaches from redundant tanks at Alderley THEN soil and surface water contamination likely	2	2	3	2	3	1	3	6
SRR246	Non Site Specific	IF fuel oil leaches from redundant tanks at Axbridge THEN soil and surface water contamination likely	2	2	3	2	3	1	3	6
SRR247	Tetbury TW	IF fuel oil leaches from redundant tanks at Tetbury THEN soil and surface water contamination likely	2	2	3	2	3	1	3	6
SRR248	Non Site Specific	If we fail to comply with the discharge consent at Blagdon fish farm we may impact the reservoir fish rearing operations and risk receiving a financial penalty from the Environment Agency and damaging our reputation.	4	2	1	2	5	1	5	20
SRR249	Banwell Riverside		1	1	1	1	1	1	1	1
SRR250	Non Site Specific	If a customer-facing system to enable online Fisheries bookings is implemented it will improve the customer experience and potentially increase the volume of bookings	1	1	1	1	1	1	1	1
SRR251	Shirehampton PS		3	2	4	3	3	3	4	12
SRR252	Highridge PS		2	2	4	3	3	4	4	8

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity & Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score
SRR253	Barrow TW		1	1	1	1	1	1	1	1
SRR254	Barrow TW	IF badgers make residence in sand stores THEN cannot use Sand when needed (Barrow TW)	3	2	4	3	3	3	4	12
SRR255	Purton TW		1	1	1	1	1	1	1	1
SRR256	Purton TW		1	1	1	1	1	1	1	1
SRR261	Alderley TW	IF domestic oil spill in the catchment THEN Hydrocarbon risk, costly investigations and DWI notification, possible DWI enforcements (Alderley TW)	2	2	2	1	3	1	3	6
SRR278	Littleton TW	IF Metaldehyde failure in treated water THEN costly investigations and DWI notification, possible DWI enforcements (Littleton TW)	5	2	2	3	5	4	5	25
SRR282	Non Site Specific		1	1	3	3	5	1	5	5
SRR283	Non Site Specific		3	3	3	3	5	1	5	15

7.5 Appendix D: Options Considered

This appendix shows the 10 options considered from the 26 selected risks.

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR753	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with obligation under the Water Framework Directive to investigate abstractions that may be causing serious damage or deterioration as defined under the Water Framework Directive , so that solutions can be implemented.	SRRN185	There is a risk that our abstractions can have an adverse effect on local river flows and groundwater levels. We have a legal obligation to understand the impacts of our abstractions, and identify and implement appropriate solutions to mitigate impacts if they are identified. An intervention is required to ensure legislative compliance under the Water Industry National Environment Programme and avoid reputational damage.	Abstraction Investigations & Options Appraisals	Investigate abstractions and potential effects on WFD water bodies and associated objectives. Appraise options to mitigate effects. Option has been refined through WINEP development from an investigation into all company abstractions, to only eight.	This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment. It will also mitigate significant impacts on reputation and potential regulatory penalty.	Y
SRR754	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water would fail to comply with its obligations under the Water framework Directive to implement appropriate mitigation of the reservoir's impacts as required under the Water Framework Directive.	SRRN186	There is a risk that the variation in flows released from our reservoirs can have an adverse impact on downstream ecology and geomorphology. We must therefore continue our approach of adapted management of flows downstream of our reservoirs. We are required under the Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015 and NERC Act, to avoid adverse impacts to downstream river ecology and geomorphology. An intervention is required to ensure legislative compliance under the Water Industry National Environment Programme and avoid reputational damage.	Adaptive Management of Flows & River Restoration	Continued adapative management of flows downstream of reservoirs with associated monitoring of ecology and gemorphology	This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment. It will also mitigate significant impacts on reputation and potential regulatory penalty.	Y
SRR756	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with requirements under the Eel Regulations in terms of reducing impacts on eel populations and delivering eel protection.	SRRN188	AMP6 studies have identified that there is a risk that our structures at Chew Valley Reservoir (the reservoir dam and downstream gauging flume) are having a negative impact on local eel populations. As we are already planning capital works at this site, we are required under the Eel Regulations 2009 to install an eel pass at the same time. Delivery of an eel pass solution is required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Eel Protection	Delivery of eel pass solution at Chew Stoke	This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR757	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a lack of biosecurity measures and procedures on Bristol Water sites which increases the risk of spread of biological hazards.	SRRN189	Where people (operational staff and members of the public), machinery and craft move between our raw water sites, there is a risk that invasive non-native species (such as zebra mussels in our reservoirs) can be spread. At our sites there are a lack of biosecurity measures and procedures that will reduce the risk of this spread. An intervention is required to investigate the current level of risk of invasive non-native species being transferred on our raw water transfers and the level of risk posed to the asset at the receiving end, what proecures and biosecurity measures are required at our sites to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Invasive Species & Biosecurity Investigations		This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR758	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred between Bristol Water assets via the raw water network due to the lack of surveillance and mitigation measures in place, with potential associated operational cost increases.	SRRN190	Where people (operational staff and members of the public), machinery and craft move between our raw water sites, there is a risk that invasive non-native species (such as zebra mussels in our reservoirs) can be spread. This could cause opertional impacts at our raw water sites, within our raw water network and at our treatment works. On our raw water network there is a lack of surveillance and mitigation measures in place to prevent this potential impact. An intervention is required to investigate the current level of risk of invasive non-native species being transferred on our raw water transfers and the level of risk posed to the asset at the receiving end, and to investigate what proecures and biosecurity measures are required at our sites to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				
SRR759	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Barrow Reservoirs 1, 2 and 3 due to the lack of mitigation measures in place.	SRRN191	Where operational staff move between Barrow Reservoirs 1, 2 and 3, there is a risk that invasive non-native species can be spread. This could cause opertional impacts within the raw water network upstream of Barrow Treatment Works and within the treatment works itself, leading to increased treatment costs. At this site there is a lack of mitigation measures in place to prevent these potential impacts. An intervention is required to scope and cost the management plans and measures that are required at this site to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Recreational Transfer of Invasive Species - Management Implementation		This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR760	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Cheddar Reservoir due to the lack of mitigation measures in place.	SRRN192	Where operational staff move between Cheddar Reservoir and our other local sites, there is a risk that invasive non-native species can be spread. This could cause opertional impacts within the raw water network upstream of Cheddar Treatment Works, leading to increased treatment costs. At this site there is a lack of mitigation measures in place to prevent these potential impacts. An intervention is required to scope and cost the management plans and measures that are required at this site to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR761	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Magna Reservoir due to the lack of mitigation measures in place.	SRRN193	Where operational staff move between Chew Magna Reservoir and our other local sites, there is a risk that invasive non-native species can be spread. This could cause opertional impacts within the local raw water network and within downstream treatment works, leading to increased treatment costs. At this site there is a lack of mitigation measures in place to prevent these potential impacts. An intervention is required to scope and cost the management plans and measures that are required at this site to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				
SRR762	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Valley Lake due to the lack of mitigation measures in place.	SRRN194	Where operational staff move between Chew Valley Lake and our other local sites, there is a risk that invasive non-native species can be spread. This could cause opertional impacts within the local raw water network and within downstream treatment works, leading to increased treatment costs. At this site there is a lack of mitigation measures in place to prevent these potential impacts. An intervention is required to scope and cost the management plans and measures that are required at this site to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				
SRR763	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Litton Reservoir due to the lack of mitigation measures in place.	SRRN195	Where operational staff move between Litton Reservoir Lake and our other local sites, there is a risk that invasive non-native species can be spread. This could cause opertional impacts within the local raw water network and within downstream treatment works, leading to increased treatment costs. At this site there is a lack of mitigation measures in place to prevent these potential impacts. An intervention is required to scope and cost the management plans and measures that are required at this site to avoid operational impacts, ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR764	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water does not have a Strategic BAP in place, THEN it will fail to dscharge its duties under the Natural Environment and Rural Communities Act and Wildlife and Countryside Act.	SRRN196	Under the Natural Environment and Rural Communities Act 2006, we are required to contribute to the priorities of UK Government's Biodiversity 2020 strategy. This action includes halting biodiversity loss and supporting healthy and resilient ecosystems. We also have a responsibility under the Wildlife and Countryside Act 1981 to conserve and enhance the natural environment within our land holdings. An intevention is required to develop a Strategic Biodiversity Action Plan, which will set out the delivery of environmental projects across our sites and will inform habitat enhancement works. It will ensure legislative compliance under the Wildlife and Countryside Act 1981 and the Water Industry National Environment Programme.	Strategic Biodiversity Action Plan		This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR766	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF water quality at the Egford source declines due to diffuse pollution from agriculture, THEN it may become unusable without new treatment facilities.	SRRN198	In AMP6 we completed catchment investigations in the Egford Boreholes catchments, which detected high pesticide concentrations in the River Axe raw water. An intervention is required to work in partnership with other organisations to influence farmers to reduce pollution risks and therefore the risk of poor quality raw water impacting our assets and increasing treatment costs. An intervention is also required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Catchment Management Delivery (Regulatory)	Work in partnership with other organisations to influence farms to reduce pollution risk.	This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR767	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken for the Cheddar Reservoir THEN treatment costs and outages could increase.	SRRN199	In AMP6 we completed catchment investigations in the Cheddar Springs catchments, which detected high pesticide concentrations in the River Axe raw water. An intervention is required to work in partnership with other organisations to influence farmers to reduce pollution risks and therefore the risk of poor quality raw water impacting our assets and increasing treatment costs. An intervention is also required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				
SRR768	IF Bristol Water does not continue the existing DWI undertaking THEN it will not be discharging its duties under the Water Industry Act (1991) and could face financial penalties.. IF metaldehyde in the raw water increases above threshold, may cause outages and threat to security of supply	SRRN200	Metaldehyde concentrations can threaten the favourable status of Sites of Special Scientific Interest within our stewardship, increase the cost of treating water at our sites, and if concentrations increase above threshold, we will experience an increase in unplanned outages. An intervention is required to continue the existing Drinking Water Inspectorate undertaking to supplement and replace the pesticide Metaldehyde with Ferric Phosphate across the Cam and Frome catchments. This will ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR769	IF Bristol Water fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. IF metaldehyde in the raw water increases above threshold, THEN there could be works outages and threat to security of supply.	SRRN201	Metaldehyde concentrations can threaten the favourable status of Sites of Special Scientific Interest within our stewardship, increase the cost of treating water at our sites, and if concentrations increase above threshold, we will experience an increase in unplanned outages. An intervention is required to monitor metaldehyde concentrations in the RIver Axe, and undertake a land use assessment of the catchments to assess the risk of pesticide use. An intervention is also required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.				
SRR770	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to act to maintain condition of SSSIs THEN Bristol Water is liable to prosecution and reputational damage under the NERC Act.	SRRN202	Poor quality raw water reaching our treatment works can impact on our assets and increase the cost of treating water. We there fore need to manage the quality of our raw water as best we can. An intervention is required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Riparian habitat and reedbed investigations	Explore reedbed options and other novel solutions to manage raw water quality	This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR771	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If BW fails to act to maintain condition of SSSIs, then liable to prosecution and reputational damage under the NERC Act.	SRRN203	We have a legal obligation to maintain the favourable status of the three Sites of Special Scientific within our stewardship. An intevention is required to develop a Strategic Biodiversity Action Plan, which will set out the delivery of environmental projects across our sites and will inform habitat enhancement works. It will ensure legislative compliance under the NERC Act and the Water Industry National Environment Programme.	Strategic Biodiversity Action Plan			
SRR772	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there ius a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions THEN there is potential for prosecuition, financial penalty, reputational damage.	SRRN204	We have to comply with our discharge permits issued from the Environment Agency. Failure to do so could result in prosecution, financial penalty and reputational damage. An intervention is required to investigate the impact of our discharges at Barrow Treatment Works on the downstream Fairwell Stream, ensuring legislative compliance under the Water Industry National Environment Programme.	Catchment & Water Quality Investigations	Includes investigation at Barrow WTW to determine influence of discharges on phosphorus concentrations in Fairywell Stream, and investigation at Forum Springs to determine influences on turbidity at source.		
SRR773	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If water quality issues at Forum do noto improve, then outages will continue and possibly become more frequent and increased loss of deployable output.	SRRN205	We have to comply with our discharge permits issued from the Environment Agency. Failure to do so could result in prosecution, financial penalty and reputational damage. An intervention is required to investigate the influences on turbidity at Forum Springs. This will ensure legislative compliance under the Water Industry National Environment Programme.				

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Option to be Developed into an Intervention?
SRR775	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken, THEN treatment costs and outages could increase. (Lack of management to prevent this would also constitute non-compliance with duties to manage conservation status of SSSI / SPA).	SRRN207	Algal blooms in our raw water sources can result in unplanned outages at our treatment works and increased treatment costs. An intervention is required to take responsible and innovative steps to manage and reduce algal blooms in our raw water sources, ensuring legislative compliance under the Water Industry National Environment Programme.	Riparian Habitat & Reed bed investigations		This is a viable option and delivery will ensure regulatory compliance and deliver on customers needs and priorities for a resilience natural environment.	Y
SRR776	IF BW fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions, THEN there is potential for prosecution, financial penalty, reputational damage. (Bristol Water is at risk of failing it's consented discharges from Barrow TW. Failures have already been recorded by the Environment Agency).	SRRN208	We have to comply with our discharge permits issued from the Environment Agency. Failures have already been recorded by the Environment Agency downstream of Barrow Treatment Works. Continuing failures could result in prosecution, financial penalty and reputational damage. An intervention is required to take responsible and innovative steps to manage discharges from Barrow Treatment Works, ensuring legislative compliance under the Water Industry National Environment Programme.				
SRR257	There is a risk of diffuse pollution increasing the frequency of algal blooms at WTW which increase treatment costs. IF nutrient concentrations are elevated in reservoirs THEN algal blooms may occur making water difficult and expensive to treat, also threatening SSSI condition status.	SRRN209	Increased nutrient concentrations in our reservoirs can lead to the formation of algal blooms, which can make water difficult and expensive to treat. Algal blooms can also threaten the favourable status of Sites of Special Scientific Interest, of which we have three in our stewardship. An intervention is required to continue our partnership work with other organisations to influence farmers in the Blagdon and Chew catchments to reduce pollution risks and therefore the risk of poor quality raw water impacting our assets and increasing treatment costs. An intervention is also required to ensure legislative compliance under the Water Industry National Environment Programme, and to avoid reputational damage.	Catchment Management - Blagdon & Chew	Continue programme of catchment management which has been established during AMP6 - Mendip Lakes Partnership, including delivery of free advice and services and implementation of grant scheme.	This is a viable option	Y
SRR163	IF there is Metaldehyde failure in treated water at Purton TW THEN costly investigations and DWI notification would be necessary and possible DWI enforcements (Purton TW).		In AMP6 we have been undertaking catchment management on the Gloucester & Sharpness canal catchments, to reduce metaldehyde concentrations at Purton Treatment Works. This is supported by a Drinking Water Inspectorate undertaking. An intervention is required to continue this Drinking Water Inspectorate undertaking and ensure legislative compliance under the Water Industry National Environment Programme.	Catchment Management Delivery (Regulatory)	Continuation of the DWI undertaking to deliver catchment management on the G&S canal catchments	This is a viable option	Y

7.6 Appendix E: Interventions Developed

This appendix shows the 10 interventions developed from the 10 options.

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Proposed Interventions		Costs		Benefits		
		Ref. No.	Intervention Title	Capex After (£)	Change in Opex (£)	Raw Water Quality (Kg of Phosphorus)	Biodiversity	Other monetised benefits
SRR753	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with obligation under the Water Framework Directive to investigate abstractions that may be causing serious damage or deterioration as defined under the Water Framework Directive , so that solutions can be implemented.	34.001.01	Abstraction Investigations & Options Appraisals	£997,000	-£29,080	0	0	0
SRR754	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water would fail to comply with its obligations under the Water framework Directive to implement appropriate mitigation of the reservoir's impacts as required under the Water Framework Directive.	34.001.02	Adaptive Management of Flows & River Restoration	£256,000	£0	0	2	0
SRR756	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. There is a risk that Bristol Water fails to comply with requirements under the Eel Regulations in terms of reducing impacts on eel populations and delivering eel protection.	34.001.03	Eel Protection	£453,500	£0	0	2	8.75
SRR757	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a lack of biosecurity measures and procedures on Bristol Water sites which increases the risk of spread of biological hazards.	34.001.04	Invasive Species & Biosecurity Investigations	£164,700	-£3,800	0	1	0
SRR758	TIF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred between Bristol Water assets via the raw water network due to the lack of surveillance and mitigation measures in place, with potential associated operational cost increases.							

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Proposed Interventions		Costs		Benefits		
		Ref. No.	Intervention Title	Capex After (£)	Change in Opex (£)	Raw Water Quality (Kg of Phosphorus)	Biodiversity	Other monetised benefits
SRR759	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Barrow Reservoirs 1, 2 and 3 due to the lack of mitigation measures in place.	34.001.05	Recreational Transfer of Invasive Species - Management Implementation	£431,500	£2,400	0	3	0
SRR760	TIF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Cheddar Reservoir due to the lack of mitigation measures in place.							
SRR761	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Magna Reservoir due to the lack of mitigation measures in place.							
SRR762	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Chew Valley Lake due to the lack of mitigation measures in place.							

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Proposed Interventions		Costs		Benefits		
		Ref. No.	Intervention Title	Capex After (£)	Change in Opex (£)	Raw Water Quality (Kg of Phosphorus)	Biodiversity	Other monetised benefits
SRR763	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water fails to act to control biosecurity THEN operational impacts could arise such as infestation of zebra mussels in the reservoirs with associated costs. There is a risk of INNS being transferred to and from Litton Reservoir due to the lack of mitigation measures in place.							
SRR764	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF Bristol Water does not have a Strategic BAP in place, THEN it will fail to dscharge its duties under the Natural Environment and Rural Communities Act and Wildlife and Countryside Act.	34.001.06	Strategic Biodiversity Action Plan	£1,072,899	-£90,382	0	10	0
SRR771	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If BW fails to act to maintain condition of SSSIs, then liable to prosecution and reputational damage under the NERC Act.							
SRR163	IF there is Metaldehyde failure in treated water at Purton TW THEN costly investigations and DWI notification would be necessary and possible DWI enforcements (Purton TW).							
SRR766	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF water quality at the Egford source declines due to diffuse pollution from agriculture, THEN it may become unusable without new treatment facilities.	34.001.07	Catchment Management Delivery (Regulatory)	£2,251,810	-£58,050	168	0	84.75
SRR767	IF Bristol Water fails to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act THEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken for the Cheddar Reservoir THEN treatment costs and outages could increase.							

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Proposed Interventions		Costs		Benefits		
		Ref. No.	Intervention Title	Capex After (£)	Change in Opex (£)	Raw Water Quality (Kg of Phosphorus)	Biodiversity	Other monetised benefits
SRR768	IF Bristol Water does not continue the existing DWI undertaking THEN it will not be discharging its duties under the Water Industry Act (1991) and could face financial penalties.. IF metaldehyde in the raw water increases above threshold, may cause outages and threat to security of supply.							
SRR769	IF Bristol Water fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act,THEN there is a risk of prosecution, financial penalty and reputational damage. IF metaldehyde in the raw water increases above threshold, THEN there could be works outages and threat to security of supply.							
SRR772	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there ius a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions THEN there is potential for prosecuition, financial penalty, reputational damage.	34.001.08	Catchment & Water Quality Investigations	£100,900	£0	0	0	0
SRR773	If BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, then risk of prosecution, financial penalty and reputational damage. If water quality issues at Forum do noto improve, then outages will continue and possibly become more frequent and increased loss of deployable output.							
SRR770	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to act to maintain condition of SSSIs THEN Bristol Water is liable to prosecution and reputational damage under the NERC Act.	34.001.09	Riparian Habitat & Reed bed investigations	£384,948	£0	0	8	0

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Proposed Interventions		Costs		Benefits		
		Ref. No.	Intervention Title	Capex After (£)	Change in Opex (£)	Raw Water Quality (Kg of Phosphorus)	Biodiversity	Other monetised benefits
SRR775	IF BW fail to undertake WINEP requirement underpinned by legislative drivers including WFD, NERC ActTHEN there is a risk of prosecution, financial penalty and reputational damage. IF action to reduce algal blooms not taken, THEN treatment costs and outages could increase. (Lack of management to prevent this would also constitute non-compliance with duties to manage conservation status of SSSI / SPA).							
SRR776	IF BW fail to undertake WINEP requirements underpinned by legislative drivers including WFD, NERC Act, THEN there is a risk of prosecution, financial penalty and reputational damage. IF BW fails to comply with discharge permit conditions, THEN there is potential for prosecuition, financial penalty, reputational damage. (Bristol Water is at risk of failing it's consented discharges from Barrow TW. Failures have already been recorded by the Environment Agency).							
SRR257	There is a risk of diffuse pollution increasing the frequency of algal blooms at WTW which increase treatment costs. IF nutrient concentrations are elevated in reservoirs THEN algal blooms may occur making water difficult and expensive to treat, also threatening SSSI condition status.	34.002.01	Catchment Management - Blagdon & Chew	£1,603,640	-£29,079	363	0	144.5

7.7 Appendix F: Non-Selected Interventions

There are no interventions to include in this appendix as all interventions developed have been selected.

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7.8 Appendix G: WINEP3

This appendix shows all of the projects listed on WINEP3 published in March 2018.

Scheme Name/Name of Investigation/Site Name/License name	Name of Waterbody	Measure Type	Completion Date (DD/MM/YY)	Level of Certainty ? (P= Purple, R=Red, A=Amber, G=Green	Intervention Code
BANWELL SPRING	Banwell - source to conf R Banwell Estuary	Investigation and Options Appraisal	31/03/2022	Green	34.001.01
Barrow Reservoirs 1,2,3. Installation of signage and equipment to reduce the risk of INNS movement from and to this water body.	Barrow Reservoir	Adaptive Management	31/03/2025	Green	34.001.05
Barrow Water Treatment Works (Land Yeo and Tickenham, Nailsea and Kenn Moor SSSI) Phosphorus investigation	Land Yeo - source to Jacklands Bridge	Investigation and Options Appraisal	31/03/2022	Green	34.001.08
Biosecurity investigations, incorporating options appraisal and mitigation measures assessment	Water Company Scale	Investigation and Options Appraisal	31/03/2022	Green	34.001.04
Cheddar Reservoir. Installation of signage and equipment to reduce the risk of INNS movement from and to this water body.	Cheddar Reservoir	Adaptive Management	31/03/2025	Green	34.001.05
Cheddar Springs - DrWPAs- Algae (Cheddar, Banwell WTW's)	Catchment Scale: - see additional comments	Catchment Measure	22/12/2024	Green	34.001.07
CHEDDAR YEO (CHEDDAR) AT COX'S MILL POND	Cheddar Yeo - source to conf Stubbingham Rhyne	Investigation and Options Appraisal	31/03/2022	Green	34.001.01
CHELVEY WELL,BROCKLEY	Kenn - source to Kenn Moor SSSI	Investigation and Options Appraisal	31/03/2025	Green	34.001.01
Chew Magna Reservoir. Installation of signage and equipment to reduce the risk of INNS movement from and to this water body.	Winford Bk - source to conf R Chew	Adaptive Management	31/03/2025	Green	34.001.05
Chew Valley Lake eel passage	Chew - Chew Valley Lake to conf Winford Brook	Eel pass	31/03/2025	Amber	34.001.03
CHEW VALLEY LAKE, PARISH OF CHEW STOKE - WR	Chew Valley lake	Adaptive Management	22/12/2024	Amber	34.001.02
Chew Valley Lake. Installation of signage and equipment to reduce the risk of INNS movement from and to this water body.	Chew Valley lake	Adaptive Management	31/03/2025	Green	34.001.05
Develop and implement a company-wide Biodiversity Action Plan to fulfil objectives under NERC Act linked to the development and delivery of a Biodiversity Index performance indicator.	Water Company Scale	Land Management/ Habitat Restoration/ Physical Improvement	31/03/2025	Green	34.001.06
DUNDRY STREAM AND ELWELL STREAM, BARROW GURNEY	Land Yeo - source to Jacklands Bridge	Investigation and Options Appraisal	31/12/2022	Green	34.001.01
Egford Main and Sub Well - DrWPA GW SGZ - nitrate (Frome WTW)	Catchment Scale: - see additional comments	Catchment Measure	22/12/2024	Green	34.001.07
Establishing surveillance programmes for priority species (GB alert species) and rapid response plans to action at Wessex Water sites.	Water Company Scale	Adaptive Management	31/03/2025	Green	34.001.05
Feasibility study of the effectiveness of	Water Company Scale	Catchment Measure	31/03/2025	Green	34.001.09

Scheme Name/Name of Investigation/Site Name/License name	Name of Waterbody	Measure Type	Completion Date (DD/MM/YY)	Level of Certainty ? (P= Purple, R=Red, A=Amber, G=Green	Intervention Code
floating reed beds, creation of fringing wetland habitat and natural flood management techniques for nutrient removal to protect Bristol Lake SSSIs'					
Forum Springs - DrWPA GW SGZ - turbidity (Barrow WTW)	Catchment Scale: - see additional comments	Investigation and Options Appraisal	31/03/2022	Green	34.001.08
HONEYHURST WELL AND WELLHEAD SPRING - RODNEY STOKE GROUP	Axe - Cocklake to Brean Cross Sluice	Investigation and Options Appraisal	31/03/2022	Green	34.001.01
Litton Reservoir. Installation of signage and equipment to reduce the risk of INNS movement from and to this water body.	Chew - source to Chew Valley Lake	Adaptive Management	31/03/2025	Green	34.001.05
OLDFORD, 2 BOREHOLES	Somerset Frome conf with Mells to conf B. Avo	Investigation and Options Appraisal	31/03/2022	Green	34.001.01
Provide MCERTS flow monitoring - Alderley WTW	Ozleworth Bk - source to conf Little Avon R	Continuous Discharge	31/03/2023	Green	
Provide MCERTS flow monitoring - Banwell WTW	Lox Yeo - source to conf Rive Axe	Continuous Discharge	31/03/2023	Green	
Provide MCERTS flow monitoring - Charterhouse WTW	Not a WDF waterbody	Continuous Discharge	31/03/2023	Green	
Provide MCERTS flow monitoring - Cheddar WTW	Cheddar Yeo - source to conf Stubbingham Rhyne	Continuous Discharge	31/03/2024	Green	
Provide MCERTS flow monitoring - Chelvey WTW	Kenn - source to Kenn Moor SSSI	Continuous Discharge	31/03/2024	Green	
Provide MCERTS flow monitoring - Frome Town WTW	Nunney Bk - source to conf Mells R	Continuous Discharge	31/03/2024	Green	
Provide MCERTS flow monitoring - Oldford WTW	Somerset Frome conf with Mells to conf B. Avo	Continuous Discharge	31/03/2025	Green	
Provide MCERTS flow monitoring - Purton WTW	Gloucester and Sharpness Canal	Continuous Discharge	31/03/2025	Green	
Provide MCERTS flow monitoring - Sherborne WTW	Chew - source to Chew Valley Lake	Continuous Discharge	31/03/2025	Green	
Provide MCERTS flow monitoring - Stowey WTW	Not a WDF waterbody	Continuous Discharge	31/03/2025	Green	
River Axe - DrWPA SW SGZ - Metaldehyde (Cheddar, Banwell WTWs)	Catchment Scale: - see additional comments	Catchment Measure	22/12/2024	Green	34.001.07
RIVER YEO (CONGRESBURY), BLAGDON	Blagdon Lake	Adaptive Management	22/12/2024	Amber	34.001.02
RWT risk assessment Blagdon Lake to Barrow Tanks	Blagdon Lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Blagdon Lake to Cheddar Res	Blagdon Lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Cheddar Res to Barrow Tanks	Cheddar Reservoir	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Cheddar Res to Blagdon Lake	Cheddar Reservoir	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Chew Magna Res	Chew Valley lake	Investigation	31/03/2022	Green	34.001.04

Scheme Name/Name of Investigation/Site Name/License name	Name of Waterbody	Measure Type	Completion Date (DD/MM/YY)	Level of Certainty ? (P= Purple, R=Red, A=Amber, G=Green	Intervention Code
to Chew Valley Lake					
RWT risk assessment Chew Valley Lake to Barrow Tanks	Chew Valley lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Chew Valley Lake to Blagdon Lake	Chew Valley lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Chew Valley Lake to River Chew	Chew Valley lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Chew Valley Lake to Ubley Hatchery	Chew Valley lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Glouceseter Sharpness Canal TO Purton TW	Gloucester and Sharpness Canal	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Gloucester Sharpness Canal to Littleton TW	Gloucester and Sharpness Canal	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Gloucester Sharpness Canal to Severn Beach	Gloucester and Sharpness Canal	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Langford to Blagdon Pumping Station	Blagdon Lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Litton Res to River Chew	Chew - source to Chew Valley Lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Rickford Spring to Blagdon Pumping Station	Blagdon Lake	Investigation	31/03/2022	Green	34.001.04
RWT risk assessment Ubley Hatchery to Blagdon Lake	Blagdon Lake	Investigation	31/03/2022	Green	34.001.04
TICKENHAM ROAD WELL/BOREHOLE, CLEVEDON	Blind Yeo - Yearling Ditch to mouth	Investigation and Options Appraisal	31/03/2022	Green	34.001.01
WINSCOMBE BOREHOLES AND SPRING (POND)	Lox Yeo - source to conf Rive Axe	Investigation and Options Appraisal	31/03/2022	Green	34.001.01

7.9 Appendix H: Natural England and Drinking Water Inspectorate Letters of Support

Letters of support from Natural England for continuation of catchment measures for Chew Valley Lake and Blagdon reservoir and the Drinking Water Inspectorate for catchment measures in the River Axe (Brinscombe), Cheddar Springs and Egford Boreholes catchments.

creating a better place

Our ref: Bristol Water
BW/PR19/catchment/3/JeB&MT

Date: 22 March 2018

Mr. Matt Pitts
Bristol Water
PO Box 218
Bridgwater Road
Bristol
BS99 7AU
(Delivered by email)

Dear Matt,

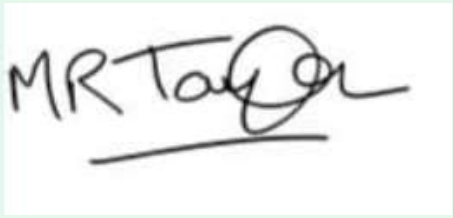
PR19: Continuation of Catchment Measures for Chew Valley Lake and Blagdon Reservoir

Further to your request for a letter of support from both the Environment Agency and Natural England for Bristol Water to continue with Catchment Management Schemes; we can confirm that both organisations support your proposal to further employ Catchment Management to improve water quality, as detailed in your Catchment Management Notes paper. Indeed, given that the Favourable status of the Bristol lake SSSIs is threatened by hyper-eutrophication we consider it essential that further measures are introduced to reduce the loads of nutrients into these sites.

We would like to request additional information from the company at this stage to allow us to assess how the company's ambition for this catchment work links to relevant performance targets. Please can you present to us detailed definitions of your proposed performance commitments related to **Raw Water** improvements and **Biodiversity**, both of which we believe the catchment management work will be contributing to. We would like you to demonstrate that your proposals are 'stretching' as required by Ofwat and, furthermore, what you consider to be worthy of a reward under both performance commitments.

We look forward to hearing from you.

Yours sincerely



Jeremy Bailey
Account Manager - River Basin Management Services (RBMS)
National Operations
Environment Agency

Mark Taylor
Lead Water Advisor
Somerset Avon and Wiltshire Team
Natural England

cc: Patrick Bulmer, Bristol Water

End

DRINKING WATER INSPECTORATE
Area 7E, 9 Millbank
c/o Nobel House
17 Smith Square
London SW1P 3JR

Enquiries: 030 0068 6400

E-mail: dwi.enquiries@defra.gsi.gov.uk
DWI Website: http://www.dwi.gov.uk

guardians of drinking water quality

6 March 2018

Graham Williams
Director of Water Quality
Bristol Water plc
P.O. Box 218
Bridgwater Road
Bristol
BS99 7AY

Dear Graham

METALDEHYDE – CURRENT SITUATION AND FORWARD PLANS

This letter in to inform you of the current position with regards to the review of undertakings for metaldehyde.

As you are aware the Minister, in her letter dated 26 January 2018, informed stakeholders that Defra intends to consult on a targeted ban on metaldehyde use.

The consultation will take place after a review of authorisations for all metaldehyde products to determine the impact the use of metaldehyde has on birds and small mammals. This review may lead to further restrictions on use. In the meantime, I am writing to you to explain our position and plans going forward.

We intend to review the continuing fitness for purpose of the current undertakings for metaldehyde, with a view to enabling companies to include them within their PR19 planning provisions. Revised undertakings will:

- where necessary, extend completion in achieving compliance beyond the current end date of 2020, up to 2025;
- cover metaldehyde only – if the current undertaking includes other parameters (apart from total pesticides) revised undertakings up to 2020 or completion reports (as appropriate) for the other parameters will be requested in due course;

- cover the same water supply zones as the existing undertakings - any extension of the geographical area covered requires justification and individual discussion with the Inspectorate;
- include steps to manage metaldehyde levels in drinking water supplies in conjunction with other stakeholders through the processes required to implement the Ministerial decision (i.e. a targeted or other use ban) including monitoring and liaison with stakeholders throughout the period up to 2025;
- Include an annual progress reporting step each January starting in January 2019;

We will provide guidance regarding the submission of revised undertakings when Ministers have decided on the authorisation review and we know the extent of the use ban.

Also, **please note that the provision of annual progress reports,** which were originally due on 31 January 2018, and delayed to 31 March 2018, **are now postponed until the next reporting date of 31 January 2019,** to take account of the forthcoming revisions**.** Nevertheless, we would encourage companies to continue to share their catchment management good practices.

Please contact Caroline Knight (Caroline.Knight@defra.gsi.gov.uk or phone 07990 623355) if you have any queries on this letter.

Yours sincerely

Milo Purcell

Milo Purcell
Deputy Chief Inspector