C5 B

Cost and Efficiency

C5B Technical Annex 16
ICA and Telemetry Investment Case: Technical Approach and Business Case

NTPBP-INV-ICA-0543

BRISTOL WATER

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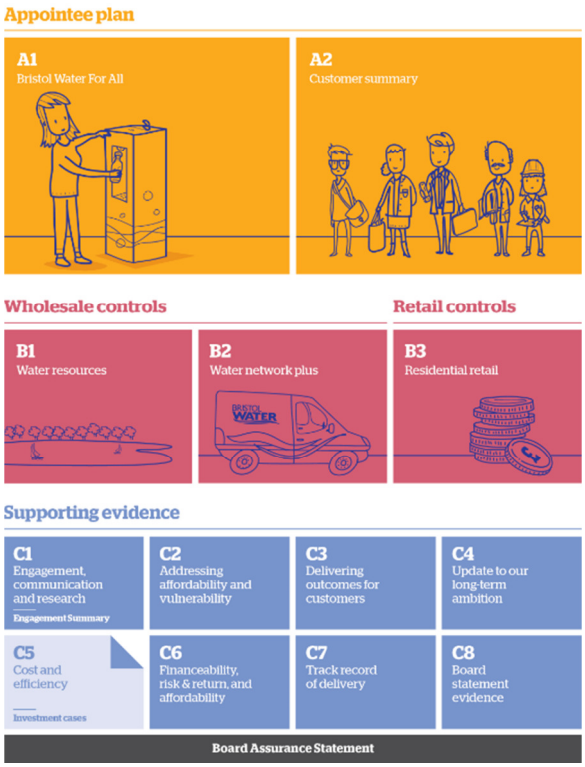
1 Foreword

The Instrument Control and Automation (ICA) and Telemetry investment case will focus on maintaining the level of risk posed by our ICA and Telemetry assets byt implementing capital maintenance of obsolescent assets which will contribute to a Safe and Reliable Supply to our customers.

The purpose of this document is to set out our customer led, outcome focused plan which will mitigate risks posed by and associated with ICA and telemetry.

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

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 Network Plus Wholesale Control aspect of our business plan. It is recommended that this investment case is read in conjunction with the PR19 Investment Case Summary Document1 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 a Safe and Reliable Supply, we will focus on maintaining the level of risk posed by our ICA and telemetry assets in our supply zones. We will achieve this by using our totex investment approach which includes investment of base maintenance and capital expenditure of £0.900m. We will deliver one capital intervention that will contribute towards the supply interruptions and unplanned outages performance commitment. We will challenge ourselves to deliver more efficiently and apply innovation to the process we adopt to in all aspects of water supply. When considering our efficient and innovative approach we plan to deliver our ICA and telemetry capital programme for £0.828m.

We have completed an extensive customer engagement programme which has identified that one of five key priorities for customers is that we keep the water flowing to their tap and one of our four key outcomes is that we provide a Safe and Reliable Supply.

This investment case will address specific site operational issues by utilising a totex approach to determine necessary capital maintenance investment to manage obsolescent plant

ICA and telemetry is a collective term for all equipment and software utilised for the automatic control in the abstraction, treatment, transmission and distribution of water with the aim of maintaining excellent water quality and reliable supply to our customers. Our assets are designed for unmanned operation and continual monitoring where external assessment of live data and subsequent control is critical in ensuring safe and effective operation and maintenance of these critical assets to manage and minimise supply interruptions.

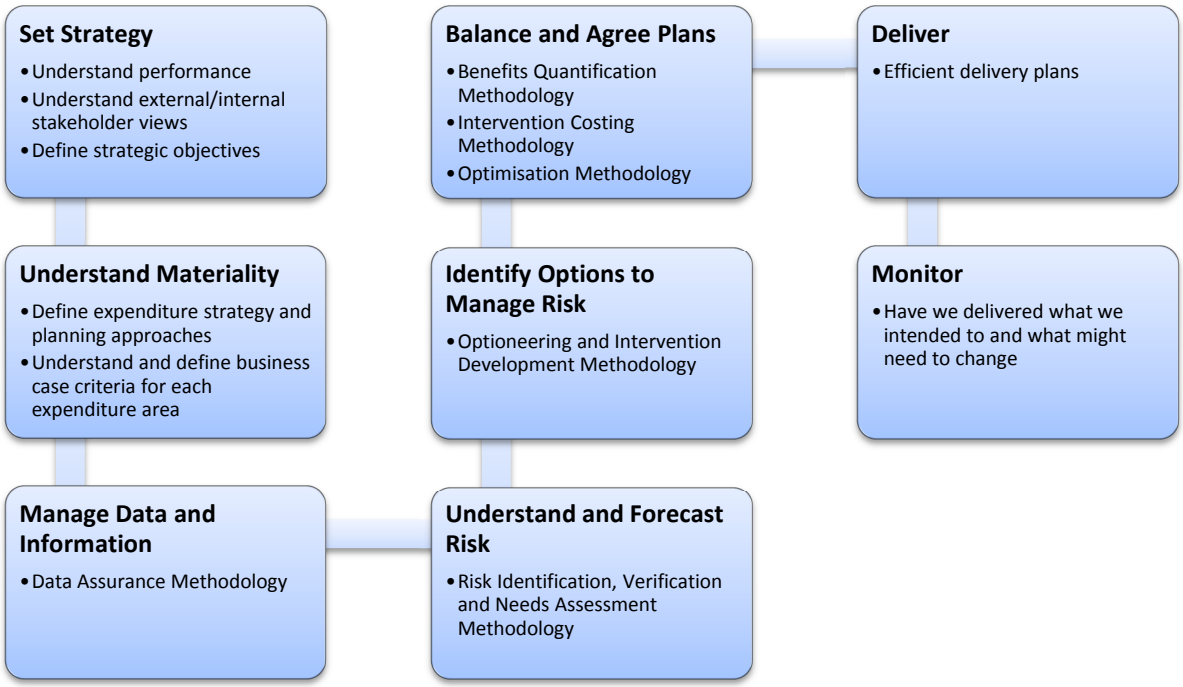
To deliver our customers' priorities we will measure progress via performance commitments for which we have set delivery targets both for the end of AMP6 and for AMP7. In AMP7, the ICA and telemetry investment supports the performance commitments of supply interruptions (target 1.8) and unplanned outages (target 1.74%).

Unplanned customer minutes lost has been used throughout AMP6 to measure and report on performance related to supply interruptions. It will be replaced by the supply interruptions performance commitment in AMP7. The unplanned customer minutes lost performance commitment was not met for 2017/18. The average amount of minutes lost per property per year (at 73.7 minutes) was significantly affected by an exceptional burst event at Willsbridge in July 2017, which we explained in a detailed case study in our 2017/18 mid-year performance report.

We have set the level of investment for our ICA and telemetry assets so that it is sufficient to deliver our performance commitments and support our delivery of a safe, high quality, and reliable drinking water supply to our customers. We will achieve this by investing in the replacement of obsolete programmable logic controllers. The units have been declared obsolete by the manufacturer as they are no longer producing or offering support for the units.

In order to ensure that we meet customers' priorities and mitigate the risks associated with ICA and telemetry assets, 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 £0.900m from 2020 to 2025 in order to achieve the performance commitments associated with the outcome Safe and Reliable Supply, 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 and results in a post-efficiency investment of £0.828m.

Costs are allocated to the Water Treatment and Treated Water Distribution business units. Investment is all related to maintaining the long term capability of the non-infrastructure assets and is a mixture of maintenance and other capital expenditure.

All of our investment for ICA and telemetry is associated with water treatment, and is categorised as maintaining the long term capability of the non-infrastructure assets.

Table 1: Performance Commitment Targets and Percentage Contribution from ICA and Telemetry

Performance Commitment	Unit	2019/20 Baseline	2024/25 Target	Total targeted performance improvement in AMP7	ICA and Telemetry % contribution to improvement target
Supply Interruptions	Average mins per property	12.20	1.80	10.40	0.24%
Unplanned Outage	%	1.74	1.74	0.00	n/a

Our AMP7 investment in ICA and telemetry will help ensure our assets are being maintained appropriately to deliver resilient water services to current and future generations.

This investment case contributes 0.24% towards our AMP7 target for supply interruptions performance commitment, with the remaining performance being achieved through capital interventions as set out in other investment cases.

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

ICA is a collective term for all equipment and software utilised for the automatic control of our water treatment works and pumping stations in a safe, secure manner with the aim of maintaining excellent water quality and reliable supply to our customers. This equipment is also widely known within various industries as 'operational technology'.

Our water pumping stations and water treatment works are designed for unmanned operation. Only two operational sites are staffed 24 hours a day and even these sites are designed for automatic control. Permanent staff presence is only required due to the complexity and criticality of the processes on site. Manual operation of ICA assets is only expected in unusual circumstances.

Unmanned sites are monitored by a 24 hours operational control and alarm monitoring centre, our operations room. For this reason, programmable logic controllers/telemetry equipment providing automatic control and remote monitoring functionality are essential. The reasons below outline why ICA systems are critical to our day-to-day operation:

- Treatment Works control systems are designed to review feedback from equipment, make automatic adjustments where necessary and shutdown automatically should water quality exceed prescribed limits.
- Pumping Stations control systems are designed to automatically respond to demand changes in the network without, in most instances, remote intervention from the operations room.
- The telemetry system is designed to provide remote visibility and where necessary, remote control functionality of all but the most minor operational sites from the operations room. The system also facilitates the collection and archiving of data and makes such data is available for review and analysis by a number of systems. This data may be analysed for operations, energy management, or asset management purposes.

ICA systems are designed to ensure the highest water quality is achieved at all times. This will be delivered through the use of:

- Accurate instrumentation;
- Reliable and repeatable control functionality;
- Shutdown systems which promptly isolate supply to the customer in the event of the control function failing to maintain quality limits; and
- Control of operator access to shutdown limits.

Every one of our sites has a process, whether this is a treatment or distribution process, which is influenced or entirely reliant on ICA and telemetry. This includes our seventeen treatment works, one hundred and fourteen clean water pumping stations and twenty five raw water pumping stations.

ICA assets will be selected to ensure customer supply is not lost to due to a control system failure.

Should an ICA or telemetry control system fail, there is a risk that a works, whether it is a treatment works or pumping station, will be shutdown and all output will be lost until the control system is repaired, increasing out number of unplanned outages and unplanned maintenance events. This will ultimately impact the customer outcome of a Safe and Reliable Supply.

If an ICA and telemetry asset fails, a different approach is taken to rectify the problem, depending on the nature of the failure. These are described below.

If an asset misreads and triggers a shutdown due to a water quality failure, the water can be sampled on site and the asset can be reset by an operative. If the issue persists, the asset will be replaced.

If the asset catastrophically fails and the site shutdowns (an unplanned outage), the asset will be replaced and the works restarted. If there are parts on the asset that are still in working order, these are stored and used as spare parts.

Between 2015 and 2017 we suffered 2,759 failures attributed to ICA assets. These failures can range between soft failures (where the asset needs resetting or adjusting) and hard failures (where the asset needs to be taken out of service and replaced).

We can lower the risk of asset failure by:

- Using equipment selected from reputable manufacturers;
- Undertaking extensive testing both offline and within low risk applications prior to full deployment;
- Allowing control systems to self-reset following a failure where it is safe to do so;
- Undertaking offline simulation and testing of software routines;
- Undertaking regular maintenance and calibration;
- Ensuring staff are trained and competent in the provision of maintenance;
- Holding adequate spares;
- Providing remote override functionality, allowing prompt re-zoning where loss of supply may otherwise result during equipment failure.

Reliable supply is also maintained through the provision of resilient and efficient telemetry systems. These promptly alert the operations room staff of a site failure occurrence, or an imminent failure, enabling rapid attendance and a reduced period of supply loss to our customers.

This investment case covers the ICA and telemetry assets associated with electrical, electronic and programmable electronic hardware and software which enables the reliable, repeatable and safe control of the assets that abstract, store, treat, distribute and monitor water supplies to customers. This includes supervisory, control and automation systems locally and remotely across our treatment works, treated water and raw water pumping stations, reservoirs and service towers. Specifically it includes:

- Hardware and software for main and emergency control rooms;
- Raw and treated water quality monitoring systems;
- Control system hardware (such as programmable logic controllers);
- Process control instrumentation including:
    - Level;
    - Process flow;
    - Pressure; and
    - Analytical (e.g. pH, turbidity, Iron, chlorine).
- Safety systems (such as gas alarms and water quality shutdown systems);
- Telemetry outstations;
- Existing condition based monitoring systems;
- Software and licences for control system design and maintenance, communication and user interfaces; and
- Site instrument and control, cabling and wiring.

This investment case is focused on the strategic replacement of assets that will become obsolescent by the end of AMP7.

A proportion of our ICA and telemetry asset base comprises of obsolescent equipment. Spares holdings are acceptable at present, but items held in stock have predominantly been removed from other systems during replacement and are consequently of a similar age and condition to the installed base, with spares no longer available from the manufacturer.

We have established minimum levels of expenditure in relation to the base maintenance of ICA and telemetry, as set out in the Non-Infrastructure Base Maintenance Investment Case. These minimum levels provide investment for routine and reactive maintenance, to ensure the continuation of 'business as usual'. The investment proposed through this ICA and Telemetry investment case will contribute towards these minimum levels, as it represents improvements to the performance of our ICA and telemetry assets above current levels. Investment for treatment work strategic maintenance in relation to non-infrastructure base maintenance is described in full in section 5.6.

The following assets are related to, but are excluded from, the ICA and Telemetry investment case as they have been included in other investment cases:

- Flow meters installed during construction of new raw and treated water pumping assets (see the Water and Raw Water Pumping Stations investment cases);
- District meters, chambers and data collection, pressure and flow control valves, smart control systems (see the Bulk Meters and PRVs and Leakage investment cases);
- customer meters (see the customer Meters investment case);

- Provision of new network monitoring equipment including loggers and flow measurement (see the Network Monitoring investment case);
- Provision of new leakage detection equipment (see the Leakage investment case);
- Provision of new flow meters through the installation of new or refurbished water treatment processes (see the Treatment Works Strategic Maintenance investment case).

This investment case is also interdependent with the following investment cases as they share the same performance commitment targets:

- Trunk Mains; shared target of supply interruptions
- Distribution Mains; shared target of supply interruptions
- Water Pumping Stations; shared target of supply interruptions
- Network Monitoring; shared target of supply interruptions
- Raw Water Pumping Stations; shared target of unplanned outages
- Treatment Works Strategic Maintenance; shared target of unplanned outages
- Resilience; shared target of supply interruptions

3.2 Strategy

Developing the investment needs for ICA and telemetry 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 distribution mains 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 that our assets are, and remain, fit and 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** - which have performance commitments to reflect reliability, resilience and quality of water.
- **Customer Focused** - performance commitments to reflect customer service and affordability.
- **A Sustainable Business** - performance commitments to reflect the environment representing our community and sustainable resources.

Within this strategy there is a specific outcome (Safe and Reliable Supply) and specific performance commitment (supply interruptions and unplanned outages) that have strategic targets and incentives that will be directly influenced by our investment needs for ICA and telemetry.

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 our short-term needs and

longer-term aims for Bristol Water and drive the capability development plan and asset planning activities. Delivery of the investment in ICA and telemetry 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 and customer 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 us by our stakeholders.

Our Strategy for ICA and telemetry is to replace all obsolescent assets by 2025. This will ensure we maintain a risk level within the network that translates into a stable and acceptable level of service for our customers. We will also use our ICA assets to develop a smart network, to better capture risks of supply interruptions to our customers. This will contribute to reducing our operating costs, resulting in lower bills to our customers.

One of our four customer outcomes is maintaining a Safe and Reliable Supply. Managing our telemetry assets is a key enabler to delivering our strategy for achieving this outcome.

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 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
- 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 as follows:

- Excellent Customer Experiences
- Safe and Reliable Supply
- Local Community and Environmental Resilience
- 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 ICA and Telemetry and one of our outcomes – Safe and Reliable Supply.

We undertook more detailed discussions at phase 2 of our engagement process; gathering evidence (see section **C1 – customer engagement, communication and research** appendix to our business plan) which gave us a wealth of information about how our customers' view Bristol Water, our services, and long term plans. 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 respond to service interruptions. When discussing the Safe and Reliable Supply outcome with our customers, we found that they are understanding of one-off events and often focus more on how we can improve our response to them. We asked them about investment in water quality and reliability and we asked what areas they felt most comfortable investing in. In our March 2018 customer panel, our customers prioritised reliability above local environment, resilience and customer experience[2]. Detailed analysis of customers' views on this area can be found in **section C3 – Delivering Outcomes for Customers.**

We consulted on three potential scenarios in relation to our Safe and Reliable Supply outcome, as summarised in Figure 2 below.

Figure 2: The Three Potential Scenarios for our Safe and Reliable Supply Outcome

			2024/25 target		
Service	**Performance Commitment**	**2020 target**	**Slower improvement plan**	**Suggested improvement plan**	**Faster improvement plan**
Water quality	Compliance risk A lower score reflects a lower risk of water quality problems	1.22	0.7	0	0
Interruptions to supply	Supply interruptions greater than 3 hours (average minutes per property)	12.2	4.2 66% improvement	1.8 85% improvement	1.5 88% improvement
Water that doesn't look clear	Number of customer contacts about the appearance of tap water (contacts per 10,000 customers)	9.3	9.3	4.3 54% improvement	3.2 66% improvement
Water that doesn't taste or smell right	Number of customer contacts about the taste and smell of tap water (contacts per 10,000 customers)	3.0	3.0	2.5 17% improvement	1.4 53% improvement
Protection against a major water supply event	Risk of a major event - population centre size protected against critical asset failure	Centres over 25,000 people*	Centres over 25,000 people	Centres over 10,000 people (10 year programme)	Centres over 10,000 people (5 year programme)
Forecast increase to the average bill from additional investment			£5	£14	£18

* With 5060 customers in these centres remaining at risk

Results show affordability concerns have driven some customers to choose the slower plan, whereas customers also value the service improvements in the suggested plan. In summary, we consider that a

[2] A4g: customer online panel March 2018

plan with a lower bill level with the suggested improvement plan 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 section C3.

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 ICA and Telemetry, specific details on our planned investment and associated performance can be found in section 3.4.

3.4 Asset Health, AMP7 Performance Commitments and Outcome Delivery Incentives

This investment case supports our outcome Safe and Reliable Supply outcome, by investing in our ICA and telemetry assets in order to provide high quality, reliable supplies for present and future generations.

The Safe and Reliable Supply outcome will be measured through a set of associated performance commitments. Our planned investment in ICA and telemetry 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
Supply Interruptions	Average mins per property	12.20	4.2	3.6	3.0	2.4	1.8	10.40
Unplanned outage	%	1.74	1.74	1.74	1.74	1.74	1.74	0.00

Unplanned outage is new performance commitment in AMP7, we have historical information for this measure and therefore we have set a target in line with our forecast of our 2019/20 performance. Our investment in ICA and telemetry will support our ability to sustain this level of performance.

With regard to asset health, our investment in ICA and telemetry will help ensure our assets are being maintained appropriately for the benefit of current and future generations.

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

There are no statutory or compliance obligations that are influencing the development of interventions in this investment case and the investment for AMP7.

3.6 AMP6 Investment And Performance

Our AMP6 investment in ICA and telemetry supports our ability to meet our performance commitment for unplanned customer minutes lost. Our investment in AMP6 will also underpin our performance commitments for supply interruptions and unplanned outages in AMP7.

AMP6 investment related to ICA and telemetry is summarised in Table 3. 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 3: AMP6 capital investment

Year	ICA and Telemetry investment capex (£m)
2015/16 actual	0.109
2016/17 actual	0.650
2017/18 actual	0.461
2018/19 forecast	0.814
2019/20 forecast	0.461
AMP6 forecast	**2.494**

Investment in automation and control of our treatment and network assets ensures that water is delivered with the correct quality and at the appropriate flow and pressure. This ensures that customer complaints in relation to these factors are at kept low levels.

In addition to supporting our high levels of customer service, our AMP6 ICA and telemetry investment also supports the performance commitments as given in Table 4. Table 4 also sets out our AMP6 performance against these measures.

Table 4: AMP6 Performance related to ICA and Telemetry

Performance Commitment		2015/16	2016/17	2017/18	2018/19 (Forecast)	2019/20 (Forecast)
Unplanned Customer Minutes Lost (UCML)						
Bristol Water	Target	13.4	13.1	12.8	12.5	12.2
	Company Performance	15.5	13.1	73.7	12.5	12.2
Unplanned Outage (%)						
Bristol Water	Target	-	-	-	-	-
	Company Performance	1.52	1.52	1.5	1.74	1.74

Unplanned customer minutes lost is included as it has been used throughout AMP6 to measure and report on performance related to supply interruptions. It will be replaced by supply interruptions in AMP7. The unplanned customer minutes lost performance commitment was not met for 2017/18. The average amount of minutes lost per property per year (at 73.7 minutes) was significantly affected by an exceptional burst event at Willsbridge in July 2017, which we explained in a detailed case study in our 2017/18 mid-year performance report.

There are no targets in AMP6 for the unplanned outage performance commitment, as it is a new measure for AMP7. However, we have undertaken an evaluation of our performance against these measures for the AMP6 period. We have worked with Ofwat and the rest of the industry to align the reporting definition to help customers understand comparative performance in AMP6. See Section C3 of our Business Plan for full details.

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, provides 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

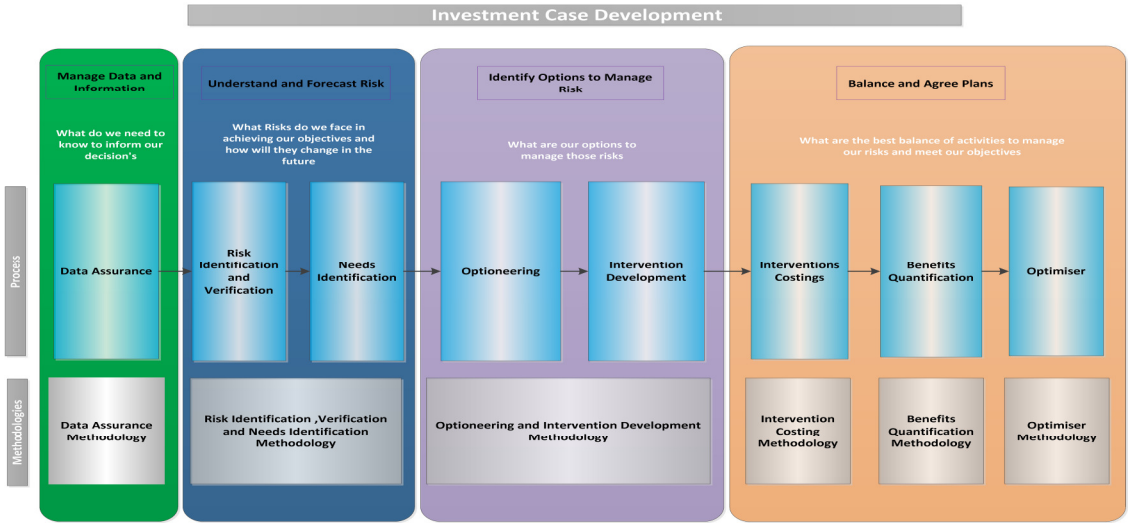
We have created and implemented a process that is supported by a set of six methodologies. When developing the methodologies, we wanted to ensure that they:

- 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



An overview of each of the key stages is described below and all of the methodologies are provided in the PR19 Investment Cases Summary Document (1).

4.1.1 Data and 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.

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 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 eight six individual data types. We have evaluated all two hundred and eight 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.

4.1.2 Risk Identification, Verification and 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

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 of 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 either being:

- 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 risk register, was applied to the initial capex after value to produce the final capex before value.

Where a 'patch and 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 Coat (opex before and 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 expenditure 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. These 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 measure the impact that each intervention had on the performance commitment measure.

Other Benefits

In addition to the performance commitments 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.

4.1.6 Investment Optimisation and 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 will assess 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 whole life costs. The investment optimiser calculates the whole life 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. Drinking Water Inspectorate - water quality 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 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 of our business plan (the slower Improvement plan, the suggested improvement plan and the faster improvement plan).

4.2 Applying the investment process to ICA and Telemetry

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

4.2.1 Investment Case Risk Identification, Verification and Needs Assessment

There were ten risks identified in the Strategic Risk Register (2) associated with this investment case. All risks went through a process of assessment, scoring, and review following the Methodology of Risk Identification, Verification and Needs Identification.

Six risks were selected and taken forward for assessment and potential development of needs statements. Of the six risks taken forward, three scored twelve, meaning they were borderline significant risks. When assessing the risks with engineers and site operatives with first hand experience of those risks, they were not deemed to be significant enough to develop needs statements and interventions. Therefore only three risks were finally developed into need statements. The risk descriptions, scoring and associated needs statements are captured in the Strategic Risk Register (2). Details of the selected risks are provided in Appendix C1.

Four risks were not selected for needs assessment and development, 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 C2.

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

Table 5: Example of a non-selected risk

SRR ID	Location/Zone	Revised Risk Description	Likelihood	Human Health / Environment	Ease to Resolve	Publicity and Reputation	Regulatory Impacts	Customers Impacted	Max Impact	Risk Score
SRR170	Pucklechurch Reservoir	Unplanned customer minute lost as a consequence should obsolete Seprol S200 PLC telemetry equipment at Pucklechurch Pumping Station	3	1	3	1	2	3	3	9

In the example above, it was determined that the risk of the telemetry equipment at Pucklechurch Reservoir failing was only likely towards the end of AMP7, and was therefore given a likelihood score of three to reflect this. However, the impacts of the telemetry failing were assessed to be low as water can be diverted from other areas to ensure customers have a supply until the issue can be rectified.

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 ICA and Telemetry Interventions Register (3).

4.2.2 Optioneering and Intervention Development

As described in section 4.2.1, three risks were developed into needs statements. Further investigation of these needs included data assimilation, analysis and consultation with key stakeholders. Options were developed and recorded for each of the three needs statements. These options were peer reviewed and all options identified as not viable were discarded. Viable options are converted into interventions. Each intervention had its costs and benefits assessed.

Two options were developed for each risk. These were to complete the intervention, or do nothing. Due to the age of our ICA assets, the manufacturer can no longer provide support for them. Therefore our options are to do nothing and let the asset fail, or replace it with a supported product instead. In each case the option to complete the intervention was selected, as doing nothing would not mitigate the risk to our customers.

A summary of all selected risks and their associated options is included in Table 6 below.

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

Table 6: Examples of Option Selection

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification and Viability of Options		
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?
SRR777	A failure of an obsolete flow meter necessary for chemical dosing control could result in a loss of supply or poor pressure due to a treatment works site shutdown.	SRRN53	Bristol Water has 170 flow meters which are associated with the Process function and are process critical. A failure of the flow meter will lead to the outage of the treatment process, which will result in customers losing supply. Of these flow meters 13 of them have no support because they are made by a manufacturer that no longer supports their flow meters and they can therefore be regarded as obsolete. To avoid customer losing supply, the meters need to be replaced to avoid the works suffering an Interruption to Supply.	Replace Obsolete Flow Meters	Replace the identified obsolete Flow Meters	This option will mitigate the risk and meet the need.
				Do Nothing	Do not replace any obsolete flow meters	This option will not meet the need or mitigate the risk and is therefore not a viable option.
SRR778	A failure of telemetry remote monitoring to site would result in a loss of alarm annunciation. The Operations Room would therefore not be aware of failures at site, for example a duty pump failure would not be acted upon and could lead to a loss of supply or poor pressure should the standby pump subsequently fail.	SRRN232	Across multiple Bristol Water sites the telemetry that transmits data back to head office is obsolete. Should the telemetry fail then the manufacturer cannot provide support as the asset is no longer produced. In the event of a telemetry system failure Operations Room visibility of equipment failures at remote sites will no longer be available. To avoid customers losing supply the telemetry systems need to be replaced to ensure sites can be monitored effectively.	Replace Obsolete PLC	Replace Obsolete PLC	This option will mitigate the risk and meet the need.
				Do Nothing	Do not replace any obsolete PLCs.	This option will not meet the need or mitigate the risk and is therefore not a viable option.
SRR779	An instrumentation failure for example a turbidity monitor fault could result in loss of supply due to a treatment works shutdown. Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered.	SRRN233	Across multiple Bristol Water sites there are a number of obsolete turbidity meters. Should the turbidity meter fail then the manufacturer can provide no support as the asset is no longer produced. It would take an unknown amount of time to remove and replace the turbidity meter with a newer model. To avoid customer losing supply or suffering a water quality issue the turbidity meters need to be replaced.	Replace Obsolete WQ Instruments	Replace Obsolete WQ Instruments and install additional instrumentation	This option will mitigate the risk and meet the need.
				Do Nothing	Do not replace any obsolete water quality instruments.	This option will not meet the need or mitigate the risk and is therefore not a viable option.

4.2.3 Intervention Costing

As described in section 4.2.2, three interventions were taken forward for scope development and cost estimation.

The Instrumentation intervention had a high level scoping document developed, which included an activity schedule. ChandlerKBS utilised a water industry unit cost database to complete estimation in accordance with their own assured methodology. The costed activity schedule as returned to us for peer review, and found to be acceptable.

Costs for interventions to replace obsolescent Programmable Logic Controllers and Water Quality Instrumentation were prepared in-house, based on historical project data from work completed in AMP6. The calculated costs were presented for peer review, and found to be acceptable.

The cost for each intervention that has been developed is presented in Appendix E. An example of how those costs have been developed is outlined below:

Cost Example: Obsolete PLC and Telemetry Replacement

Investment is needed for strategic replacement of obsolete programmable logic controller units to ensure we can monitor any issues that could occur at our sites, minimising unplanned outages, and supply interruptions to our customers should an issue arise.

We have established a cost of undertaking the works of £0.900m; this includes labour and materials as well as contractual costs. The latter includes items such as (but not limited to) contractor accommodation, contractor management, contractor overhead and profit, and design. We have then also applied Bristol Water's overhead for internal activities associated with the intervention, such as project management, land & compensation, legal, environmental costs, commissioning/handover, contract management, operations & system support, consultants and administration.

All of the direct costs above gave us an intervention cost of £0.900m to implement the intervention in a planned way (the capex after).

We have established that regardless of whether we undertook the above intervention in either a planned or reactive way, there would be no change in operational expenditure (opex after).

Once interventions were costed, benefits could be calculated which are discussed in Section 4.2.4.

4.2.4 Benefits Quantification

Three ICA and telemetry interventions were assessed for direct and indirect benefits. These are presented in Appendix E.

Direct Benefits

A totex approach considering both capex and opex has been applied to the ICA and Telemetry investment case.

No capex before has been assessed. Repairing the asset will not be possible as we do not have the spare parts available to complete an effective repair. Therefore this has been discounted as an option. Replacement of ICA assets is relatively cheap, so this cost has been removed as a capex before and evaluated as the unplanned outage that can be saved from having to replace the asset when it fails.

No opex impacts were identified for the ICA interventions.

Indirect Benefits

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

Unplanned Outage

Unplanned Outage has been calculated in this investment case as opposed to a capex before. This has been done by calculating how long it will take to replace an asset should it fail.

Supply Interruptions

The main benefit of replacing obsolesent ICA assets is a contribution to the reduction of supply interruptions. If an ICA asset fails, whether it is at a water pumping station or water treatment works, output from that site could cease. The benefit has been calculated using the loss of a critical site due to ICA failure as a worst case scenario.

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

5 Outcome

5.1 Selected Interventions

The three interventions developed within the ICA and Telemetry investment case were assessed through the investment optimisation process. Of these three interventions, one was selected.

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 new, innovative, ICA assets that mean we can contribute to our 8% efficiency challenge and keep our customers' bills low into the future.

The one selected intervention is set out in Table 7, along with details of the associated costs.

Table 7: Selected Interventions, Costs and % Performance Contribution

ID	Intervention Title	Total Capex (£)	Change in Opex per annum (£)	Unplanned Outage	Supply Interruptions
25.001.02	Obsolescent PLC and Telemetry Replacement	£900,000	£0	-	0.24%
ICA and Telemetry capex investment pre-efficiency		**£900,000**	**£0**	**-**	**-**
ICA and Telemetry capex investment with 8% capex efficiency		**£828,000**			

The programmable logic controller replacement intervention was chosen because of its contribution to achieving the supply interruptions performance commitment target. The intervention itself is described in more detail in the following section.

Obsolescent Programmable Logic Controller Replacement

In its most basic function, a programmable logic controller is a timer or a relay for water treatment and pumping processes. They are relied on for ensuring unmanned operations continue in an uninterrupted, reliable manner.

A number of programmable logic controllers are considered to be obsolete due to their age, and because of the age of the asset, the manufacturer no longer offers support and spare parts for these units. Strategic replacement of programmable logic controller units is essential to ensuring we can monitor any issues that could occur at our sites, minimising unplanned outages, and importantly supply interruptions to our customers, should an issue arise.

This investment case is aligned to the Water Network Plus Wholesale Control category of our business plan. Costs are allocated to the Water Treatment Business Unit. Investment is all related to maintenance non-infrastructure assets.

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

Table 8: Water Service and Business Unit Allocation

Wholesale Control	**Water Network Plus**	**Total**
Business Unit Allocation	***03 Water Treatment***	
ICA and Telemetry capital investment (%)	**100.0%**	**100%**
ICA and Telemetry capital investment	**£0.900m**	**£0.900m**
Maintaining the long term capability of the assets - non-infra	£0.900m (100%)	**£0.900m (100%)**
ICA and Telemetry capital investment with 8% capex efficiency		**£0.828m**

5.2 Contribution to Performance Commitments

Table 9 sets out the percentage contribution to performance commitment improvement provided by the selected ICA and telemetry intervention.

Table 9: Contribution to Performance Commitment Targets from Selected Intervention

Performance Commitment	Unit	2019/20 Baseline	2024/25 Target	Targeted PC Improvement in AMP7	ICA and Telemetry % Contribution to Target
Supply Interruptions	Average mins per property	12.20	1.80	10.40	0.24%
Unplanned Outage	%	1.74	1.74	0.00	n/a

Asset Health

Our AMP7 investment in ICA and telemetry will help ensure our assets are being maintained appropriately to deliver resilient water services to current and future generations.

Unplanned Outage

Our AMP7 target is to sustain our 2019/20 performance level of 1.74%. Our investment in ICA and telemetry will support our ability to sustain this level of performance.

5.3 Non-Selected Interventions

Of the three interventions developed within this investment case, two were not selected because they did not provide the most cost beneficial way of meeting performance commitment targets compared to other interventions available.

The risks associated with these interventions represent residual risks that will be carried during AMP7. We will continue to monitor these residual risks throughout AMP7, and if the process requires these risks to be mitigated, we will respond with appropriate action. Details of the two non-selected interventions are given in Table 10 below.

Table 10: Non-Selected Intervention and Residual Risk

SSR ID	Risk and Need Statement	Non-Selected Intervention and Residual Risk
SRR777	Bristol Water has 170 flow meters which are associated with the Process function and are process critical. A failure of the flow meter will lead to the outage of the treatment process, which will result in customers losing supply. Of these flow meters 13 of them have no support because they are made by a manufacturer that no longer supports their flow meters and they can therefore be regarded as obsolete. To avoid customer losing supply, the meters need to be replaced to avoid the works suffering an Unplanned Outage.	25.005.01 Flow Measurement Instrumentation A failure of an obsolete flow meter necessary for chemical dosing control could result in a loss of supply or poor pressure due to a treatment works site shutdown.
SRR779	Across multiple Bristol Water sites there are a number of obsolete turbidity meters. Should the turbidity meter fail then the manufacturer can provide no support as the asset is no longer produced. It would take an unknown amount of time to remove and replace the turbidity meter with a newer model. To avoid customer losing supply or suffering a water quality issue the turbidity meters need to be replaced.	25.004.01: Water Quality Instrumentation An instrumentation failure for example a turbidity monitor fault could result in loss of supply due to a treatment works shutdown. Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered.

5.4 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 (1). There are no additional specific assumptions related to this investment case.

5.5 AMP 8

As we are not increasing the number of ICA and telemetry assets in our system in AMP7, the volume of assets that will require appraising in AMP8 will remain similar to AMP7. We therefore anticipate that the strategic replacement and renewal of our ICA and telemetry assets will follow a similar pattern in AMP8 as proposed for AMP7.

There are a number of risk items that have been developed into interventions which have not been selected for inclusion in the AMP7 business plan (as given in Table 10 above), which will be reappraised for investment in AMP8.

5.6 Base Maintenance

We have established minimum levels of investment in relation to the base maintenance of ICA and telemetry assets, as set out in the Non-Infrastructure Base Maintenance investment case. These minimum levels provide investment for routine and reactive maintenance, to ensure the continuation of 'business as usual'. The minimum value for mechanical and electrical assets (including ICA and telemetry) within treatment works and pumping stations is £21m. These minimum levels have been determined through a combination of analysis of historical activity and costs, deterioration modelling to establish underlying asset deterioration, and investment planning analysis. Full details are provided in the Non-Infrastructure Base Maintenance investment case.

The investment detailed in this investment case contributes towards the minimum investment levels, as the selected intervention improves the performance of our ICA and telemetry assets above current levels.

In relation to this investment case, the Non-Infrastructure Base Maintenance investment case defines minimum levels of expenditure for mechanical and electrical assets in treatment works and pumping stations (including ICA and telemetry). The minimum investment levels are summarised in Table 11.

Table 11: Contribution to Minimum Non-Infrastructure Base Maintenance Investment

Non-Infrastructure Base Maintenance Asset Group	Minimum AMP7 investment to maintain asset health (£m)	AMP7 investment provided through ICA and Telemetry interventions (£m)	AMP7 investment provided through all interventions (£m)	Additional investment requirement as Base Maintenance (£m)
Treatment Works/Pumping Station Mechanical Electrical Assets	21.0	0.900	18.233	2.767

5.7 Historical and AMP7 Investment Comparison

A summary of historical investment in ICA and telemetry is provided in Table 12, along with our AMP7 investment in ICA and telemetry interventions. We have re-categorised data used in line with the scope of our investment cases. For historic data we have used the wholesale cost assessment (table 1 and 2 of the 16/17 return). Forecast data has been derived from PR19 data tables (4D and 4L).

Table 12: Historical and AMP7 capital investment

AMP	Values	Investment (£m)
AMP5	AMP5 actual	5.694
AMP6	2015/16 actual	0.109
	2016/17 actual	0.650
	2017/18 actual	0.461
	2018/19 forecast	0.814
	2019/20 forecast	0.461
	AMP6 forecast	2.494
AMP7	AMP7 pre-efficiency	0.900
	AMP7 8% capex efficiency applied	0.828

Our investment in AMP7 is lower than our AMP5 and AMP6 investment. This is due to large scale upgrades to ICA assets in AMP5, and in AMP6 at sites such as Purton, Barrow, Banwell and Stowey. These are large control systems and the hardware purchase costs are relatively high in comparison to smaller sites. In AMP7, a number of smaller site upgrades will be completed.

6 Conclusions

In order to ensure our ICA and telemetry assets continue to deliver our customers' priorities we will measure progress via performance commitments for which we have set delivery targets.

In AMP7, ICA and telemetry measures are supply interruptions (target 1.8) and unplanned outages (target 1.74%).

An initial list of ten risks was narrowed down to a total of three potential interventions. These interventions have been developed and assessed through our asset management totex focused approach and put forward for investment optimisation. Of these, one intervention was selected on the basis that it is a cost beneficial intervention that meets our customer priorities and associated performance commitments.

We plan to invest a pre-efficiency total of £0.900m on ICA and telemetry assets. This intervention will not increase our annual opex costs. 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 £0.828m.

The interventions proposed are expected to contribute circa 0.24% of the supply interruptions target (1.8), and also supports maintaining our performance levels for unplanned outages at 1.74%.

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
Appendix B: Datasets
Appendix C1: Selected Risks
Appendix C2: Non-Selected Risks
Appendix D: Options Considered
Appendix E: Interventions Developed
Appendix F: Non-Selected Interventions

7.1 Appendix A: Line of Sight

ICA and Telemetry Line of Sight

Investment Case
NTPBP-INV-ICA-0543

Customer Preferences

- Reliability
- Reliability

Performance Commitments

Optimiser Input Form Reference

NTPBP-CAL-ICA 0362

Safe and Reliable Supply of Water

Slower Plan
Suggested Plan
Faster Plan

Unplanned Outages

1.74 | 1.74 | 1.74

Customer High Priority

ODI | Common Reward and Penalty

Supply Interruptions

4.2 | 1.8 | 1.5

Customer High Priority

ODI | Common Reward and Penalty

Interventions

25.005.01

25.001.02

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-ICA-0727

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
REQ-0282 PLC Survey Sites.xlsx	Results of site surveys of PLCs and related hardware	-	-	✓	✓
Omron C200H Discontinuation.pdf	Note from Omron (PLC manufacturer) detailing PLC discontinuation.	✓	✓	-	-
Omron CQM1H Discontinuation.pdf	Note from Omron (PLC manufacturer) detailing PLC discontinuation.	✓	✓	-	-
Flow Meters Status - AJB 25.09.17.xlsx	Information on bulk meter installation standards, categorisation and support status	✓	-	-	-
NTPBP-CAL-MON-0085 Monthly Failures Report.xlsx	Maintenance Report examples from asset performance. Repeat failure reports. Unscheduled maintenance reports back to 2010. Example of monthly report to OTMs	-	-	-	✓

7.3 Appendix C1: Selected Risks

This appendix shows the 6 selected risks of the 10 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
SRR169	Highridge PS	UCML should obsolete Seprol S200 PLC telemetry equipment fail at Highridge PS	3	1	3	3	3	4	4	12
SRR171	Portishead (Down Road) PS	UCML should obsolete Seprol S200 PLC telemetry equipment at Portishead (Down Rd) PS	3	1	3	4	3	4	4	12
SRR172	Winscombe PS	UCML should obsolete Seprol S200 PLC telemetry equipment at Winscombe PS	4	1	3	1	1	1	3	12
SRR777	Non-Site Specific	IF a flow meter necessary for chemical dosing control fails THEN there could be a loss of supply or poor pressure due to a treatment works site shutdown.	4	2	2	2	3	4	4	16
SRR778	Non-Site Specific	IF the telemetry remote monitoring to site fails THEN there would be a loss of alarm annunciation. The Operations Room would therefore not be aware of failures at site, for example a duty pump failure would not be acted upon and could lead to a loss of supply or poor pressure should the standby pump subsequently fail.	4	3	2	4	3	4	4	16
SRR779	Non-Site Specific	IF an monitoring or control instrumentation fails (for example a turbidity monitor fault) THEN there could be a loss of supply due to a treatment works shutdown. (Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered)	4	3	2	4	3	4	4	16

7.4 Appendix C2: Non-Selected Risks

This appendix shows the 4 non-selected risks of the 10 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
SRR170	Pucklechurch Reservoir	Unplanned customer Minute Lost as a consequence should obsolete Seprol S200 PLC telemetry equipment at Pucklechurch PS							0	0
SRR173	Banwell TW	IF plcs, blowers and pneumatics for valves/pumps fail, THEN there could be a reduced output from site (Banwell-Area 3)	1	1	1	1	1	1	1	1
SRR174	Non Site Specific	If SCADA system suffers virus or malware attack THEN could lead to loss of monitoring, inability to restart works or ultimately loss of supply	2	1	3	3	3	1	3	6
SRR175	Cheddar TW	IF the Brent Knoll to Cheddar Underground signal/communication cable fails THEN loss of signal transmission and Brent Knoll pump continues at steady state(causing potential over or no flow)							0	0

7.5 Appendix D: Options Considered

This appendix shows the 9 options considered from the 6 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
SRR169	UCML should obsolete Seprol S200 PLC telemetry equipment fail at Highridge PS	N/A	N/A	N/A	N/A	N/A	No
SRR171	UCML should obsolete Seprol S200 PLC telemetry equipment at Portishead (Down Rd) PS	N/A	N/A	N/A	N/A	N/A	No
SRR172	UCML should obsolete Seprol S200 PLC telemetry equipment at Winscombe PS	N/A	N/A	N/A	N/A	N/A	No
SRR777	IF a flow meter necessary for chemical dosing control fails THEN there could be a loss of supply or poor pressure due to a treatment works site shutdown.	SRRN53	Bristol Water has 170 flow meters which are associated with the Process function and are process critical. A failure of the flow meter will lead to the outage of the treatment process, which will result in customers losing supply. Of these flow meters 13 of them have no support because they are made by a manufacturer that no longer supports their flow meters and they can therefore be regarded as obsolete.	Replace Obsolete Flow Meters	Replace the identified obsolete Flow Meters	This option will mitigate the risk and meet the need.	**Yes**
			To avoid customer losing supply, the meters need to be replaced to avoid the works suffering an Unplanned Outage.	Do Nothing	Do not replace any obsolete flow meters	This option will not meet the need or mitigate the risk and is therefore not a viable option.	No
SRR778	IF the telemetry remote monitoring to site fails THEN there would be a loss of alarm annunciation. The Operations Room would therefore not be aware of failures at site, for example a duty pump failure would not be acted upon and could lead to a loss of supply or poor pressure should the standby pump subsequently fail.	SRRN232	Across multiple Bristol Water sites the telemetry that transmits data back to head office is obsolete. Should the telemetry fail then the manufacturer cannot provide support as the asset is no longer produced. In the event of a telemetry system failure Operations Room visibility of equipment failures at remote sites will no longer be available.	Replace Obsolete PLC	Replace Obsolete PLC	This option will mitigate the risk and meet the need.	**Yes**
			To avoid customers losing supply the telemetry systems need to be replaced to ensure sites can be monitored effectively.	Do Nothing	Do not replace any obsolete PLCs.	This option will not meet the need or mitigate the risk and is therefore not a viable option.	No
SRR779	IF an monitoring or control instrumentation fails (for example a turbidity monitor fault) THEN there could be a loss of supply due to a treatment works shutdown. (Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered)	SRRN233	Across multiple Bristol Water sites there are a number of obsolete turbidity meters. Should the turbidity meter fail then the manufacturer can provide no support as the asset is no longer produced. It would take an unknown amount of time to remove and replace the turbidity meter with a newer model.	Replace Obsolete WQ Instruments	Replace Obsolete WQ Instruments and install additional instrumentation	This option will mitigate the risk and meet the need.	**Yes**
			To avoid customer losing supply or suffering a water quality issue the turbidity meters need to be replaced.	Do Nothing	Do not replace any obsolete water quality instruments.	This option will not meet the need or mitigate the risk and is therefore not a viable option.	No

7.6 Appendix E: Interventions Developed

This appendix shows the 3 interventions developed from the 9 options.

Strategic Risk Register (SRR) Reference	SRR Revised Risk Description	Risk Need		Identification & Viability of Options			Proposed Interventions		Costs	Benefits		
		SRR Need ID	Need Description (from SRR)	Proposed Option Name	Proposed Option Description	Option Viability?	Ref No	Intervention Title	Capex After (£M)	Change in Opex (£k)	Supply Interruptions	Unplanned Outage
SRR777	IF a flow meter necessary for chemical dosing control fails THEN there could be a loss of supply or poor pressure due to a treatment works site shutdown.	SRRN53	Bristol Water has 170 flow meters which are associated with the Process function and are process critical. A failure of the flow meter will lead to the outage of the treatment process, which will result in customers losing supply. Of these flow meters 13 of them have no support because they are made by a manufacturer that no longer supports their flow meters and they can therefore be regarded as obsolete. To avoid customer losing supply, the meters need to be replaced to avoid the works suffering an Unplanned Outage.	Replace Obsolete Flow Meters	Replace the identified obsolete Flow Meters	This option will mitigate the risk and meet the need.	25.005.01	Flow Measurement Instrumentation	£0.28	£0	0.029322136	-
SRR778	IF the telemetry remote monitoring to site fails THEN there would be a loss of alarm annunciation. The Operations Room would therefore not be aware of failures at site, for example a duty pump failure would not be acted upon and could lead to a loss of supply or poor pressure should the standby pump subsequently fail.	SRRN232	Across multiple Bristol Water sites the telemetry that transmits data back to head office is obsolete. Should the telemetry fail then the manufacturer cannot provide support as the asset is no longer produced. In the event of a telemetry system failure Operations Room visibility of equipment failures at remote sites will no longer be available. To avoid customers losing supply the telemetry systems need to be replaced to ensure sites can be monitored effectively.	Replace Obsolete PLC	Replace Obsolete PLC	This option will mitigate the risk and meet the need.	25.001.02	Replace Obsolete PLC	£1.00	£0	-	-
SRR779	IF an monitoring or control instrumentation fails (for example a turbidity monitor fault) THEN there could be a loss of supply due to a treatment works shutdown. (Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered)	SRRN233	Across multiple Bristol Water sites there are a number of obsolete turbidity meters. Should the turbidity meter fail then the manufacturer can provide no support as the asset is no longer produced. It would take an unknown amount of time to remove and replace the turbidity meter with a newer model. To avoid customer losing supply or suffering a water quality issue the turbidity meters need to be replaced.	Replace Obsolete WQ Instruments	Replace Obsolete WQ Instruments and install additional instrumentation	This option will mitigate the risk and meet the need.	25.004.01	Water Quality Instrumentation	£0.10	£0	-	0.06489

7.7 Appendix F: Non-Selected Interventions

This appendix shows the 2 non-selected interventions. See appendix D for costs or performance commitments.

Ref. No.	Intervention Title	Expected Capex after (£M)	Change in Opex (£k)	Residual Risk
25.005.01	Flow Measurement Instrumentation	£284,746	£0	A failure of an obsolete flow meter necessary for chemical dosing control could result in a loss of supply or poor pressure due to a treatment works site shutdown.
25.004.01	Water Quality Instrumentation	£100,000	£0	An instrumentation failure for example a turbidity monitor fault could result in loss of supply due to a treatment works shutdown. Without adequate on-line instrumentation outgoing water quality could not be verified and a shutdown would be triggered.