C5 B

Cost and Efficiency

C5B Technical Annex 21
Infrastructure Base Maintenance Investment Case:
Technical Approach and Business Case

NTPBP-INV-INF-0741

BRISTOL WATER

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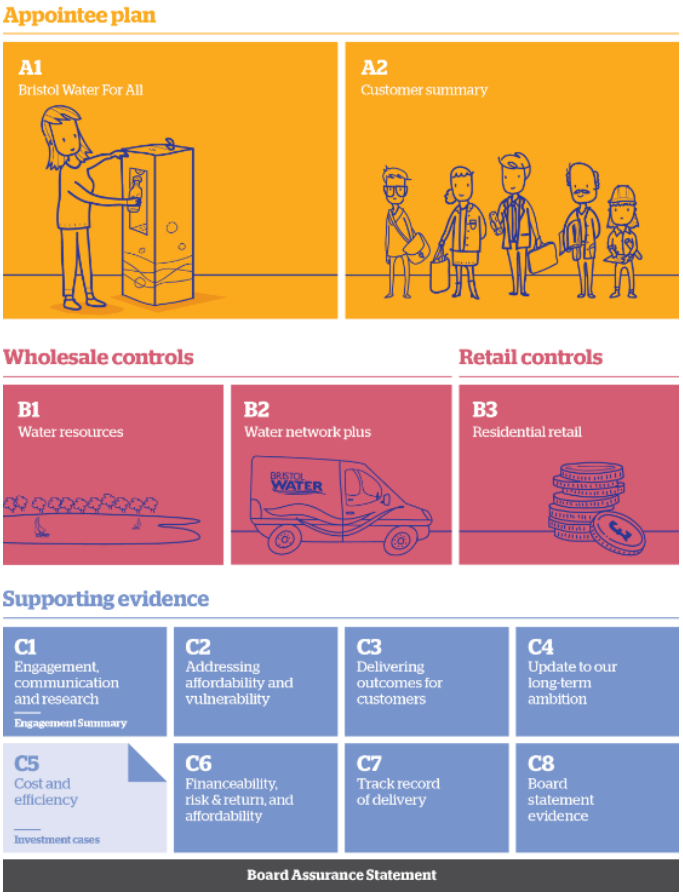
1 Foreword

This investment case concerns the levels of capital expenditure (capex) for base maintenance of infrastructure assets required generally and for the AMP7 period in particular.

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

The investment case, one of 21, will summarise the facts, risks and investment requirements for infrastructure base maintenance for the next review period for 2020 to 2025. This investment case will also summarise performance related to infrastructure base maintenance for the current review period from 2015 to 2020 and our methodology for determining and delivering the future infrastructure base maintenance 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 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 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 ensure that our asset base has sufficient funding to manage risks associated with deterioration, we have assessed minimum levels of capital maintenance required for major asset types that deliver baseline performance. This allocation provides a foundation for any improvements to performance included in our business plan. We plan to invest £7.671m in infrastructure base maintenance interventions. We have set ourselves a challenging target of reducing out costs by 8% during AMP7. When considering our efficient and innovative approach we plan to deliver our infrastructure base maintenance capital programme for £7.057m.

There is a need to ensure that a baseline level of capital expenditure is included in our Investment Plan to facilitate dealing with the underlying rate of deterioration of infrastructure assets and provide an allowance for forecast customer driven requirements such as stop tap replacement.

'Base Maintenance' is the term used to describe this requirement. It provides sufficient funding to prevent the base level of performance from declining. Insufficient base maintenance allowance would lead to a risk of worsening performance and prejudice the ability of strategic and enhancement interventions to deliver our proposed performance commitment levels.

The methodology used to calculate base maintenance links to the overall investment plan to establish whether sufficient funding has been provided to ensure that minimum values of planned expenditure have been included. Where there are clear shortfalls, additional cost provision is made to cover the discrepancies.

We plan to invest £7.671m between 2020 and 2025 in order to deal with the underlying rate of deterioration of infrastructure assets and provide an allowance for forecast customer driven requirements.

We have set ourselves a challenging target of improving our efficiency by 8% during AMP7. This will be achieved by delivery of our business transformation programme resulting in a post-efficiency investment of £7.057m.

All of our investment for infrastructure base maintenance is associated with the treated water distribution business unit. All investment is categorised as maintaining the long term capability of our infrastructure assets.

3 Background to Our Investment Case

3.1 Context

This investment case concerns the levels of capital expenditure (capex) for base maintenance of infrastructure assets required generally and in particular for the AMP7 period. It provides a plan for individual asset categories and a mechanism for preventing double counting of interventions between this investment case and other infrastructure investments.

In the context of this business case the term 'base maintenance' is taken to mean:

> *Minor capital works (with no engineering design and with lower levels of supervision) managed directly by Bristol Water's Operations directorates through simple procurement processes. These works are treated as programmes within the PR19 process each representing relatively large numbers of small, like for like replacements of, for example, mechanical and electrical equipment, customer-driven requirements and works to resolve local health and safety issues. These works are on-going throughout the AMP periods.*

In essence, base maintenance relates to the expenditure required in any period to retain a base level of performance. The overall aim of this business case is to establish reasonable levels of such expenditure from the evidence of historical costs and deterioration modelling.

Excluded from this business case are interventions or asset-related schemes to provide performance enhancements or strategic capital maintenance interventions. In this context 'strategic interventions' are defined as:

> *Interventions that are individually reviewed through the Investment Planning process for PR19 and usually include larger projects that require more sophisticated or complex solutions or procurement processes and that will normally require engineering design and delivery.*

Enhancement schemes are defined as:

> *Interventions that are required to improve future performance above current levels, as dictated by statutory, regulatory or organisational requirements.*

Also excluded from this business case are the base levels of operational expenditure (opex) associated with infrastructure assets.

The planned capital expenditure is based on the following evidence and processes:

- Deterioration modelling of assets
- Historical expenditure analysis
- Cost- Benefit analysis of investment options

We have utilised a Water Industry standard system (Servelec 'Pioneer') to undertake deterioration modelling for our AMP7 investment plan. Pioneer provides the functionality to assess all interventions

developed across our AMP7 investment cases, and produces an optimal investment plan to meet the targeted performance commitment improvements in AMP7.

The base maintenance requirements are categorised in line with the following infrastructure investment cases:

- Trunk mains (current network total: 828km; 12% of our total supply network)
- Distribution mains (current network total: 5,975km; 88% of our total supply network)
- Network ancillaries (2,076km of communication pipes (684km of which are lead), and 409,706 stop taps)

For the purposes of this infrastructure base maintenance business case, trunk mains and distribution mains are taken together.

The fundamental risk that this business case deals with is the decline in underlying performance associated with infrastructure assets through an inability to deal with asset deterioration and customer demands.

Without the provision of sufficient funding for base maintenance, the proposed strategic and enhancement interventions may not be able to deliver their planned performance benefits.

3.2 Strategy

We have developed a set of outcomes and associated performance commitments. Asset related investment supports the delivery of many of these outcomes. The relevant programme of interventions and asset activities is contained in the investment cases.

Our Asset Management Strategy supports the development and delivery of our outcomes by translating organisational goals into asset management objectives. The risks to meeting these aims have been examined and a range of solution options prepared, utilising a consistent and focussed methodology. Each proposal includes its costs and benefits.

Through the use of cost-benefit analysis, we have determined the best package of interventions that deliver the required outcomes at the lowest wholelife cost. In addition, we have a clear ‘line of sight’ from each planned asset activity to its effect on performance and outcome.

All details of the overall process are documented as are the information and data used and produced in the assessments. Reviews have been undertaken of all main stages of the procedures including the quality of supporting information.

Base maintenance assessment forms a foundation for all strategic interventions and consequently the delivery of our outcomes and performance commitment levels. This investment case provides a level of minimum expenditure for a number of asset activities. These minimum amounts are subsequently adjusted to reflect the total maintenance provisions already included in the overall investment plan.

3.3 Customer Priorities

Customer priorities relating to our outcomes, performance commitments and outcome delivery incentives have been determined through customer engagement and research. This ensures that we have engaged effectively with customers on longer-term issues such as resilience, and has taken into account the needs and requirements of future customers. Through this process the high level objectives, known as outcomes, that customers value most have been identified as:

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

To secure these outcomes, and based on the customer priorities, we have developed innovative and sector-leading performance commitments together with corresponding outcome delivery incentives. The performance commitments are therefore, in effect, a measure of what the customer wants.

As this business case deals with base levels of maintenance, it is not specifically driven by customer priorities. However, base maintenance delivers a base level of performance that supports several performance commitments.

Customer consultation has demonstrated strong support for reducing supply interruptions. These are primarily caused by the effects of burst mains and overlong planned mains rehabilitation. Infrastructure base maintenance supports the reduction of supply interruptions through the repair of bursts.

Another performance improvement supported by customers is the reduction of leakage. The repair of bursts and the replacement of certain network ancillaries help reduce leakage.

In addition, infrastructure base maintenance generally supports compliance with the following performance commitments:

- Water quality compliance, as measured by the Compliance Risk Index (CRI) (in terms of compliance failures in water supply zones)
- Supply interruptions
- Leakage
- Mains bursts
- Risk of low pressure
- Appearance contacts
- Taste and odour contacts

Base maintenance by definition does not provide additional performance improvements. However, it is the foundation upon which strategic and enhancement schemes are built.

The health of our assets is a key element in delivering resilient water services to our customers. Our infrastructure base maintenance investment will help ensure our assets are being maintained appropriately for the benefit of current and future generations

3.4 AMP7 performance commitments and outcome delivery incentives

Infrastructure base maintenance provides a baseline platform for a number of performance commitments. However, it does not contribute directly to performance improvements.

Similarly, base maintenance has no effect on outcome delivery incentives, other than it provides the foundation for interventions that are designed to deliver improved performance.

3.5 Compliance Obligations

The Water Industry Act 1991 requires every water undertaker to develop and maintain an efficient and economical system of water supply within its area. It is therefore necessary to ensure that existing assets are well managed and repaired or replaced as necessary to maintain a robust water supply system.

We have a statutory obligation under the Water Supply (Water Quality) Regulations 2016 to ensure that all water supplied to our customers meets prescribed Water Quality Concentrations or Values. Our obligations are defined as undertakings for the Drinking Water Inspectorate.

Health and Safety legislation requires water undertakers to provide safe working environments for staff and the public. Assets need to be maintained to minimise hazards related to asset condition and location.

4 Developing Our Investment Plan

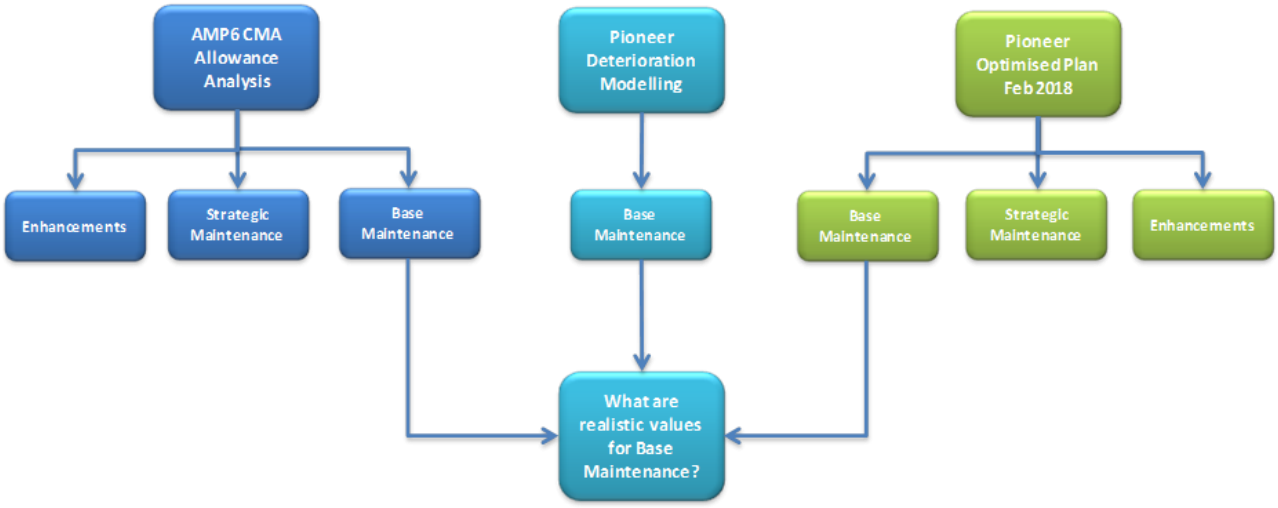
4.1 Investment Case Development Process

In this section, the evidence for base maintenance expenditure levels is examined in terms of cost and preserving assets to sustain prevailing performance. Support for establishing such levels is obtained from three main sources as illustrated in Figure 1. These three main sources are:

- Historical activity and costs;
- Deterioration modelling to establish underlying asset deterioration; and
- Investment planning analysis.

These three main sources are considered singly and in the ways their individual results provide collaborative evidence.

Figure 1: Evidence sources for base maintenance expenditure



4.1.1 AMP6 Costs Analysis – Competition and Markets Authority Determination

The costs allowed by the Competition and Markets Authority for the AMP6 period were chosen as they represent an externally approved budget for capital expenditure.

An analysis has been carried out on the overall capital programme as determined by the Competition and Markets Authority to allocate costs between the ‘base maintenance’, ‘strategic maintenance’ and ‘enhancement’ categories, based on the definitions described in Section 3.

The values Table 1 shows the breakdown of AMP6 expenditure against the principal maintenance categories for infrastructure assets.

Table 1: AMP6 infrastructure base maintenance – Competition and Markets Authority redetermination

Base Maintenance Expenditure Category	Expenditure (£m)
Mains Replacement	30.500
Zonal Mains Replacement	6.800
Mains and Network Assessment	-
Network Analysis	1.000
Stop Tap Replacement	4.100
Communications Pipes (not Quality driven)	5.500
Mains and Communication Pipes: Other	4.700
Infrastructure: Other	7.400
Total AMP6 CMA Approved Expenditure	**60.000**

It is forecast that circa 90km of distribution/trunk mains will be replaced in the whole AMP6 period. This total length comprises the amounts included in the 'mains replacement' and 'zonal mains replacement' categories in Table 1.

Stop tap replacement is largely customer-driven and exhibits a steady workload and therefore historical volumes of work provide a good indication of a continuous need.

The 'Mains and Communication Pipes: Other' category includes incidental work associated with standard interventions such as flushing, diversions, condition assessment and cathodic protection.

'Infrastructure: Other' is capitalised salaries for operational staff associated with the preceding categories of capital expenditure. It is necessary to add this sum to the two mains replacement items. Thus the overall cost of mains replacement in AMP6 is £44.7m (£30.5m + £6.8m + £7.4m).

Mains replacement is carried out for several reasons. In some circumstances, pipes are replaced to prevent bursts. However, a smaller proportion of replacement work is associated with performance improvement (e.g. reduction of leakage and/or the preservation of water quality). Therefore, the amount of replacement required to maintain distribution system pipelines at a base level is not the whole allowance, as additional replacement may be required to meet performance improvement targets in certain areas.

4.1.2 Distribution Mains - Deterioration Modelling

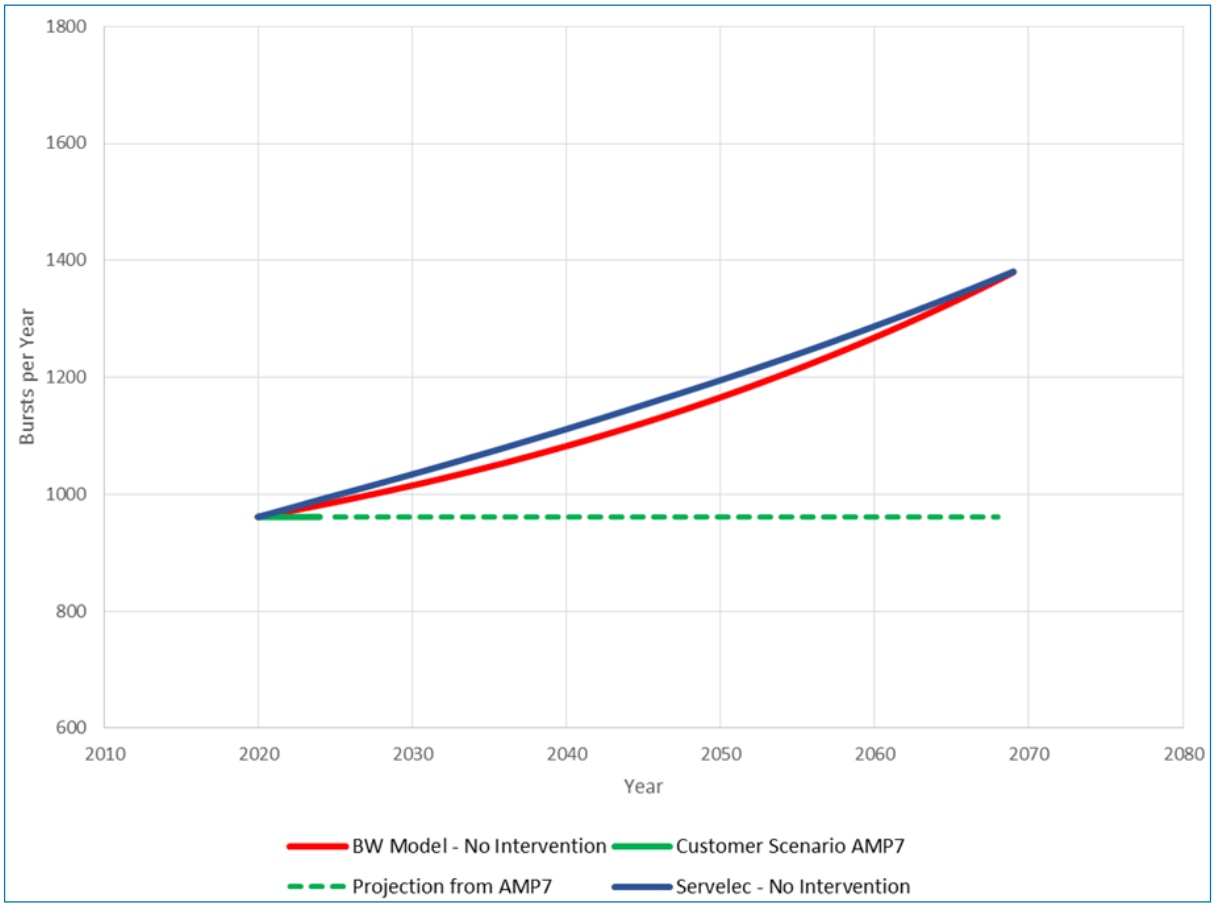
We utilised our in-house burst model to predicts the occurrence of bursts over time and provide evidence for the assessment of interventions needed to attain specified future burst targets. This model has been used to determine the natural rate of rise of bursts over time.

A benchmark analysis has been carried out using our in-house asset and cost data and a 'standard' deterioration models provided by our consultants, Servelec. These 'standard' models are based on an

amalgamation of fault and failure data from a number of other water utilities. Again, an analysis has been carried out to establish a natural rate of rise of bursts.

The two models provide a very close degree of agreement as shown in the chart in Figure 2.

Figure 2: Burst model predictions comparison



To maintain burst levels at the prevailing amount it is necessary, at a minimum, to provide sufficient funding to negate the natural rate of burst rise.

The deterioration analysis suggests that a total replacement length of around 29.5km in AMP7 is sufficient to maintain burst levels. This analysis was undertaken using our consultant's 'standard' mains deterioration model with a baseline burst target and no target for supply interruptions.

4.1.3 Distribution Mains - Investment Planning

Several analyses of interventions required to meet particular performance targets have been carried out for PR19 investment assessments. This work is undertaken using the Servelec 'Pioneer' system which provides an optimal plan to meet specified performance targets. Pioneer investment optimiser runs have been undertaken in December 2017, January 2018, February 2018, March 2018 and May 2018.

In the January and February assessments, three scenarios of performance targets were analysed: Base, Customer and Upper Quartile. The Base scenario provides a view of a regulatory minimum level of performance.

The January Base result (see Table 2) for distribution mains provides a good indication of the minimum length of mains needing rehabilitation to maintain current burst levels. This is because it was the scenario that most closely reflects the maintenance of current burst rates without including targets for other measures that significantly affect mains rehabilitation. The associated level of expenditure is £10.06m (2016/17 prices).

The February Customer scenario is a good indication of the likely total mains replacement needs to meet all relevant performance targets including those for supply interruptions and discoloured water contacts. This level is in line with those in AMPs 4 to 6. Table 2 below provides the overall view.

Table 2: Historical Mains Replacement, and AMP7 minimum with no Proactive Interventions

Total Length of Mains Replaced (km)			
AMP4	**AMP5**	**AMP6 (forecast)**	**AMP7 (base minimum)**
102.92	263.86	90	24.4

4.1.4 Communication Pipes

Communication pipe base maintenance mainly reflects the Customer driven requirement to replace such pipelines. Replacement of communication pipes as part of zonal mains replacement schemes is not included in this allocation.

Likewise, the replacement of lead communication pipes for quality reasons is a specific investment item and is not included in the base maintenance allocation. The AMP6 forecast spend on this aspect is £0.78m. There are specific interventions nominated and available within the AMP7 investment planning approach for similar work.

The forecast spend in AMP6 for other communications pipe replacements is £5.5m. This allocation is equivalent to the base maintenance aspects within AMP6.

The deterioration model run by our consultant provides supporting information. The results are shown in Table 3.

Table 3: Communication pipes deterioration model analysis

Deterioration Model Run	Replacement cost (£m)
Communication pipes: stable service +5% deterioration	5.527
Communication pipes: stable service	6.830
Communication pipes: stable service -5% bursts	8.349

The stable service, which represents maintaining the prevailing levels of relevant performance, is costed at £6.830m.

This aligns well with the AMP6 values when looked at against the overall forecast of £6.3m (£5.5m + £0.78m), bearing in mind there is additional communication pipe replacement within the zonal mains replacement schemes.

4.1.5 Stop Tap Replacement

Stop taps are generally replaced as a result of a customer request. The AMP6 forecast expenditure on this aspect is £4.1m. There is no deterioration forecast for stop taps.

4.1.6 Other Infrastructure Work

In AMP6 there is a collection of activities that are generally required (such as flushing, diversions, condition assessment and cathodic protection) and need to be allowed for. The AMP6 allocation is £4.7m. It is considered prudent to continue with this additional allowance in order to cater for such minor work items.

4.1.7 Network Analysis

Network Analysis appears as a cost category but has no expenditure allocated as base maintenance in AMP6. Network analysis schemes are generally regarded as strategic work or base opex.

It is proposed that a £1m allowance is provided in the base maintenance category for this type of work in AMP7, to ensure we can obtain data on our network assets to enhance our understanding and analysis.

4.1.8 Summary of Output and Expenditure Allowances

By their nature, base maintenance requirements are not simple to quantify for any time period. Aspects such as trends in asset condition, customer demand, weather patterns and demographics can affect the volumes of work required. Base maintenance provisions can only be a reasonable guide to expenditure that is required to maintain a baseline service.

It is therefore prudent to provide sensible minimum values for the main categories of asset types considered in this section. In this respect, we are guided by the available evidence and the need to ensure that reasonable provision is made within an investment plan to maintain infrastructure assets at a level that protects existing service provision. The principle adopted is that, for the asset type categories examined, we have set minimum values of expenditure that need to be included in an investment plan. Any shortfall in any category is added to an infrastructure base maintenance amount to ensure sufficient funding is available.

From the evidence considered in the preceding sections, the minimum intervention expenditure provisions listed in Table 4 are proposed for AMP7 infrastructure base maintenance investment.

Table 4: Minimum Intervention Values – AMP7 Infrastructure Base Maintenance

Intervention ID	Intervention Title	Minimum AMP7 Base Maintenance Capex Provision (£m) (2016/17 prices)
100.002.01	Mains Replacement (including mains in zonal schemes)	30.000
Basis: AMP6 spend for this category which covers rehabilitation for bursts, leaks and other fractures with the deterioration evidence demonstrating that a smaller amount is sufficient to cater for statistical deterioration alone.		
100.002.02	Mains and Network Assessment	0.000
Basis: current practices		
100.002.03	Network Analysis	1.000
Basis: AMP7 requirements for network data		
100.002.04	Stop Tap Replacement	4.500
Basis: current practices		
100.002.05	Communications Pipes (not Quality driven)	5.500
Basis: current practices		
100.002.06	Mains and Communication Pipes: Other	5.000
Basis: current practices		
Total AMP7 Infra Base Maintenance minimum expenditure requirement		**46.000**

4.1.9 Adjustments

The interventions selected through the optimisation process are examined to assess whether the minimum provision is inherently met through the total 'capex before' element for the particular infrastructure base maintenance requirement. The investment cases and interventions that are used to determine the infrastructure base maintenance intervention provisions are set out in Table 5.

Table 5 Determinants of AMP7 Infrastructure Base Maintenance Provision

Intervention ID	Intervention Title	Investment cases and interventions – determinants of AMP7 base maintenance capex provision
100.002.01	Mains Replacement (including mains in zonal schemes)	Trunk Mains Investment Case – all interventions; Distributions Mains Investment Case – all 02.002 interventions; and Zonal Mains – all 02.006 interventions.
100.002.02	Mains and Network Assessment	Network Monitoring Investment Case – all interventions.
100.002.03	Network Analysis	Not determined from other investment cases – this provision is entirely provided through base maintenance.
100.002.04	Stop Tap Replacement	Network Ancillaries Investment Case – intervention 08.002.01 (Replacement of Stop Taps).
100.002.05	Communications Pipes (not quality driven)	Network Ancillaries Investment Case – intervention 08.001.02 (Nurseries - Lead CP Replacement); and 08.001.06 (Lead CP replacement – maintenance or other).
100.002.06	Communication Pipes (quality drive)	Network Ancillaries Investment Case – intervention 08.001.07 (Lead communication pipes replaced for quality (where lead > 8 microg/l.

Where the minimum base maintenance provision is not met, the sum of relevant intervention 'capex after' values is subtracted from the values shown in Table 4 to provide the residual base maintenance requirement, with the provision that no base maintenance value should be less than zero. The results of this are given in Section 5.1.1.

4.2 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 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 286 individual data types. We have evaluated all 286 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.

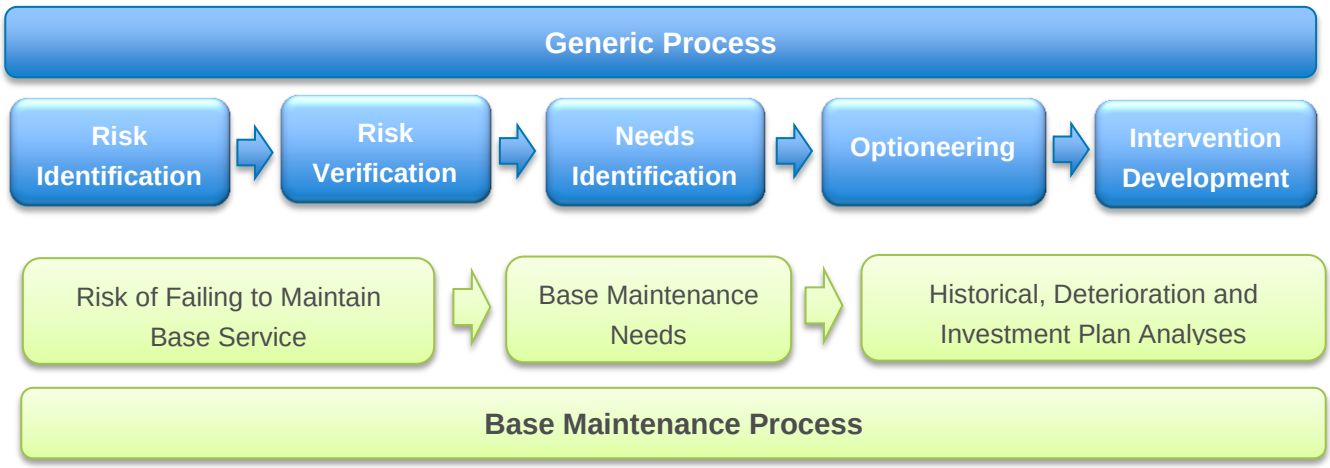
4.3 Investment Case Risk Identification, Verification and Needs Assessment

The assessment of base maintenance requirements examines risk in a different way from that used in other investment cases.

This is primarily because we are concerned with establishing levels of asset rehabilitation required to sustain prevailing levels of relevant performance. The risk being addressed is that of failing to retain a baseline performance level rather than a group of individually identified hazards.

Figure 3 shows the basic relationship between the generic process for risk and needs identification and that used for base maintenance.

Figure 3: Generic and Base Maintenance Assessment Processes



4.4 Optioneering & Intervention Development

The standard procedures for optioneering and intervention development are not applicable in this business case. See Section 4.3 for the basic relationship between the generic process and that used for base maintenance.

Base maintenance requires the provision of sufficient funds to sustain prevailing levels of service. Interventions are many and varied but, in the case of infrastructure assets, are largely limited to small scale repairs, rehabilitation and replacements.

The methodologies used to derive suitable funding levels have been described in previous sections.

4.5 Intervention Costing

Costing of water mains rehabilitation used the standard cost model supplied by our cost managers and is the same cost model used to provide estimates for distribution mains and zonal mains replacement.

Other estimates are based on historical costs, uplifted to the standard price level of 2017/18.

4.6 Benefits Quantification

Infrastructure Base Maintenance provides a baseline platform for a number of performance commitments. However, it does not contribute directly to any performance improvements.

Base maintenance has no effect on outcome delivery incentives, other than it provides the foundation for interventions that are designed to deliver improved performance.

5 Outcome

5.1 Investment Optimisation & Intervention Selection

The optimisation process determines which intervention options provide the optimal AMP7 investment plan, by delivering the required levels of performance improvement at the lowest cost. We has utilised a Water Industry standard system (Servelec 'Pioneer') to optimise its AMP7 investment plan. Pioneer provides the functionality to assess all the interventions developed in the Investment Cases, and produces an optimal investment plan to meet the required levels of performance improvement in AMP7. Pioneer assesses interventions primarily on the overall benefit in terms of performance and wholelife cost.

The AMP7 investment plan optimisation process is described in full in the Investment Optimisation Methodology – refer to the PR19 Investment Cases Summary Document.

The infrastructure base maintenance requirements are derived from the methodology described in Section 4, adjusted by the effects of interventions selected through the optimisation process.

5.1.1 Selected Interventions

The infrastructure base maintenance requirements are derived from the interventions selected through the optimisation process, and are summarised in Table 6 along with details of the associated costs.

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.

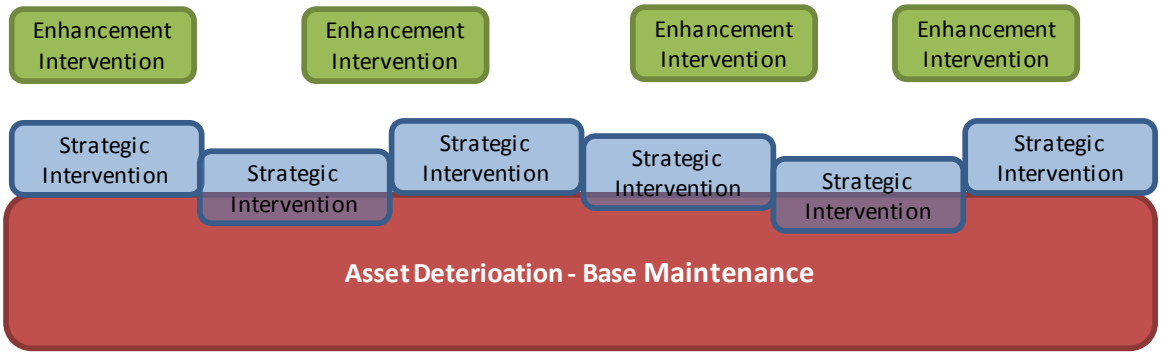
We see innovation as integral to our everyday working at Bristol Water: We have deliberately embedded it within the business-as-usual processes of our asset management teams, by embracing the full flexibility that totex and outcomes enables. We will look to be innovative in the following ways:

- **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 through 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 innovations that mean we can contribute to our 8% efficiency challenge and keep our customers' bills low into the future.

In relation to infrastructure assets, an example of such innovation is a move towards future optimisation, based on deterioration as a foundation, as illustrated in Figure 4.

Figure 4: Deterioration-based approach to infrastructure optimisation



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

Table 6: Summary of selected interventions in the infrastructure base maintenance investment case

Intervention ID	Intervention Title	Total Capex (£)	Change in Opex (£)
100.02.001	**Distribution Mains**	**0**	**0**
	Minimum allowance of £30m covered by selected trunk mains and distribution mains interventions		
100.02.002	**Mains & Network Assessment**	**0**	**0**
	No provision set for AMP7 – requirement not applicable.		
100.02.003	**Network Analysis**	**1,000,000**	**0**
	No relevant interventions selected elsewhere; full AMP7 provision set as base maintenance.		
100.02.004	**Stop Tap Replacement**	**0**	**0**
	Minimum requirement of £4.5m adequately covered by selected Stop Tap Replacement intervention.		
100.02.005	**Communication Pipes (Replacement)**	**1,867,000**	**0**
	Minimum requirement of £5.5m partially covered by selected Communication Pipes replacement interventions with a value of £3.633m; remaining AMP7 provision set as base maintenance.		
100.02.006	**Communication Pipes (Quality)**	**4,804,000**	**0**
	Minimum requirement of £5.0m covered by selected Communication Pipes (for quality) interventions with a value of £0.196m; remaining AMP7 provision set as base maintenance.		
Total infrastructure base maintenance capital investment		**7,671,000**	**0**
Total infrastructure base maintenance capital investment with 8% efficiency applied		**7,057,320**	

The total Infrastructure Base Maintenance investment, including Water Service and Business Unit Allocation, is summarised in Table 7. This investment case is aligned to the Water Network Plus Wholesale Control category of our Business Plan. Costs are allocated to the Treated Water Distribution Business Unit. Investment is all related to maintaining the long term capability of our non-infrastructure assets.

Table 7: Infrastructure base maintenance investment – Water Service and Business Unit Allocation

Wholesale Control	**Water Network Plus**	**Total**
Business Unit Allocation	***04 Treated Water Distribution***	
Infrastructure Base Maintenance capital investment (%)	**100.0%**	**100%**
Infrastructure Base Maintenance capital investment	**£7.671m**	**£7.671m**
Maintaining the long term capability of the assets - infra	£7.671m (100%)	**£7.671m (100%)**
Infrastructure Base Maintenance capital investment with 8% capex efficiency		**£7.057m**

5.1.2 Contribution to performance commitment Targets

Base maintenance provides a foundation level of asset activity. As such its contribution to performance commitment targets is to ensure that strategic interventions deliver additional performance benefits where required.

5.1.3 Non-Selected Interventions

Base maintenance does not define individual interventions. It describes minimum levels of capex required to retain underlying performance.

In line with the methodology described in Section 4, the base maintenance allocations are listed in Table 6.

5.2 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. Assumptions specific to this investment case are discussed below.

The need for a separate provision for infrastructure base maintenance is founded on the knowledge that interventions included in other infrastructure related investment cases are risk specific and do not necessarily take account of all capital maintenance requirements. This base maintenance business case states a minimum requirement together with a means of adjusting that value to allow for base maintenance elements of relevant selected strategic interventions.

Base maintenance in this investment case is restricted to capital items only; so does not include operating expenditure maintenance activities such as inspections, servicing, replacement of consumables and calibration.

Deterioration analyses are based on our asset and cost data but rely, for failure data, on industry wide models. The exception to this is the use of long-standing and good quality burst data available in our data systems.

Note: 'Capital maintenance' is defined as: Planned work by appointed water companies to replace and renovate water assets to provide continuing services to consumers (Ofwat definition).

5.3 AMP8

Water main deterioration is shown by the models employed to be reasonably constant over time with a moderate acceleration in burst rates forecast if no proactive replacement were to be carried out. It is therefore reasonable to assume that base maintenance provision for minimum allowances for mains should remain the same for the AMP8 period as for AMP7.

Similarly, those aspects such as stop tap replacement that are driven by customer requests exhibit fairly steady expenditure profiles over time and therefore the AMP8 expenditure requirements will be broadly similar to those of AMP7.

Provided the funding for the base maintenance activities listed in Table 6 is provided and the other related interventions are carried out, there will be no residual risk additional to those listed in the following investment cases:

- Trunk Mains
- Distribution Mains
- Network Ancillaries
- Leakage

5.4 Base Maintenance

All or part of estimates for some strategic infrastructure interventions (as detailed in other relevant investment cases) are categorised as 'base maintenance'. The methodology used to assess the underlying infrastructure base maintenance requirement takes account of contributing values from such strategic schemes. Therefore, there is a balance between the contributions made by strategic interventions and the overall base maintenance provision.

6 Conclusions

The infrastructure base maintenance interventions proposed as part of this investment case provide a baseline platform for a number of performance commitments, and provide the foundation for interventions that are designed to deliver improved performance.

We plan to invest £7.671m in infrastructure base maintenance interventions. We have set ourselves a challenging target of reducing out costs by 8% during AMP7. This will be achieved by delivery of our business transformation programme, resulting in a post-efficiency investment of £7.057m.

Our plan will provide assurance that it will deliver and monitor delivery of its outcomes, meet relevant statutory requirements and licence obligations and take account of the UK Government strategic policy statements.

The allowance for infrastructure base maintenance derived using the methodology and data described in this business case provides a prudent and reasonable expenditure plan for small scale planned and reactive activities to sustain the relevant asset base.

7 Appendices

- Appendix A: Datasets Used

7.1 Appendix A: Datasets Used

The following datasets have been used in the development of this investment case:

- Water Mains Asset Data
- Communication Pipe Assert Data
- AMP6 Capital Programme
- Mains Burst Records
- Deterioration Models
- Mains Cost Model for Renewal

Table 8 provides a summary of the main data sources.

Table 8: Data Sources

Data	Description	Source
Asset Data	Mains and Communication Pipes	GIS
Costs Data	Mains Cost Model	ChandlerKBS: see Distribution Mains Business Case
	AMP6 Costs	Bristol Water Capital Programme
Deterioration Data	Asset Deterioration	Consultant provided ‘standard’ models
	Burst Model	Bristol Water Burst Model