Anglian Water

PR19 DRAFT DETERMINATION SUPPLEMENTARY EVIDENCE

August 2019

RESPONSIBLE BUSINESS OF THE YEAR 2017
BUSINESS IN THE COMMUNITY

THE QUEEN'S AWARDS FOR ENTERPRISE: SUSTAINABLE DEVELOPMENT 2015

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EXTERNAL RECOGNITION

Winner

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Business in the
Community Responsible
Business of the Year

ROSPA Gold – Anglian
Water and @One Alliance

Queen's Award for Enterprise:
Sustainable Development

Leading Utilities
of the World

Green Finance Award

British Construction
Industry Award

Utility Week Awards

WINNER
Capital Project Management Award

WINNER
Supply Chain Excellence

1. INTRODUCTION

This document provides the further evidence to underpin our investments as set out in WS2 and WWS2. In our September 2018 Plan and IAP Response the detail was included in table commentary for WS2 and WWS2. We have not updated the investment detail in WS2 and WWS2 table commentary for our DD Response.

The information in this document should be read in conjunction with Chapter 8 Enhancement Costs of our main DD Representation.

2. SMART METERING

Table 1 Investment Summary Table

	April Plan (£m)	DD Ofwat Position (£m)	Representation (£m)
Capex	118.52	44.76	76.13 (enhancement) 42.39 (reallocated to Botex Plus)
Opex	63.33	63.33	60.67
Totex	181.84 [1]	108.09	136.81 (enhancement) 42.39 (reallocated to Botex Plus)

2.1 Summary

- In setting a smart meter uplift unit rate, Ofwat assumes there is no difference in technology between ourselves and the comparator (Northumbrian). This does not recognise the materially different solutions we and Northumbrian Water are proposing. We provide further detail of these differences, based on our experience. The evidence provided in our September Plan, our April IAP Response and our further representations, supports the full allowance of enhancement totex requested.
- For meters replaced before they reach their end-of-life, our view is that only the uplift unit cost is treated as enhancement expenditure, in line with Ofwat's view at DD. Consistent with Ofwats methodology we provide a Cost Adjustment Claim for Smart Metering under botex. This investment is needed in order to secure the supply demand balance for existing customers. The demand reductions resulting from replacing over one million dumb meters with smart meters in AMP7 is required to deliver our WRMP, and is not discretionary.
- We do not challenge Ofwat's use of the ODI mechanisms to monitor the delivery of our smart metering programme. Consistent with our wider representation evidence, we propose that the ODI penalty rate for this performance commitment be uplifted to be consistent with representing 50% of the allowed unit rate.
- We have made a £2.655m RPE adjustment to our enhancement opex costs.

2.2 Overview

In the DD, Ofwat assessed our smart metering proposals through an enhancement deep-dive. This approach is appropriate given the importance of this area and the fact that as this investment is not uniform across all companies, it is less suitable for generic benchmarking approaches.

Not all companies propose investment in this area because there are:

- Variations in water stress, growth, and supply demand pressures; and
- Variations in existing meter penetration

The enhancement case passed the deep-dive assessment gates for:

- Need for investment;
- Need for adjustment, and;
- Best option for customers.

At DD, this investment received a "partial pass" assessment for 'Robustness and efficiency of costs' after having also received a "partial pass" at IAP.

1 This figure does not include £33.73m of capital maintenance costs for dumb exchanged for smart meters

In the IAP, Ofwat misinterpreted the international benchmarking we provided which showed new meter installation costs rather than existing meter replacement. In our IAP response, we corrected this misrepresentation, provided additional evidence of international comparison costs, and gave a breakdown of smart metering expenditure.

The table below summarises our representations for each line in table 2 of Ofwat's deep-dive assessment.

Table 2 Summary of representations for smart metering

Line	Description	Enhancement totex requested (£m)	Assessment method	Enhancement totex allowance (£m)	Ofwat DD rationale	Our representations
1 &6	New smart meters (optants and introduced by Anglian Water) & new dumb meters (optants and introduced by Anglian Water)	20.170	Unit cost model	17.509	We calculate the allowance using figures from Anglian Water confirmed in response to query ANH-DD-CE-007 and output from the revised totex regression analysis	**The unit cost model Ofwat applies does not take into account increasing marginal costs at higher metering penetration rates. As a result of this, Ofwat underestimates the cost of new meter installations in our plan, and the full requested totex should be allowed.**
2	Dumb exchanged for smart (at end of life or when faulty)	22.410	Unit cost model	11.004	We make an allowance based on an enhancement uplift for replacement of a basic meter with a smart meter through comparison with other companies considering the benefits and savings the company can realise from smart metering and the implicit allowance from the base models for meter replacement.	**Ofwat's assumption of there being no difference in technology is inappropriate and does not recognise the significant difference that different solutions represent. We provide further detail of these differences, based on our experience.** **Ofwat's comparison with other companies is inappropriate because there are clear differences between the smart meter rollout and technology being used between ourselves and Northumbrian.** **We have provided additional evidence to explain the legitimate difference in cost between the smart meter unit costs with the comparator (NWL).** **Our view is that the evidence provided in Our September Plan, Our April IAP Response and our further representations, support the full allowance of enhancement totex requested.**

						Elsewhere in our representations we have updated the unit rate reflected in the smart metering delivery ODI penalty rate.
3	Dumb exchanged for smart (before end of life)	71.780	Unit cost uplift	14.970	We consider that the decision to bring forward the replacement of the meter assets prior to the end of their asset life has been taken by the company based on the expected benefits from this course of action. The company will be able to use the enhanced assets to achieve its performance targets in areas such as PCC and leakage and therefore we do not consider meters to be a special case over any other asset type the company may choose to replace earlier as part of its strategy. Therefore we treat these meters the same as replacement of basic meters with smart at end of life, in line 2 and provide enhancement uplift on this basis.	**We consider that of the £56.81m difference between the requested totex and allowed totex for this line, £42.39m is attributable to base (dumb-for-dumb replacement) costs and £14.42m is attributable to the revised uplift unit cost applied by Ofwat.** **Our view is that only the uplift unit cost is treated as enhancement expenditure, in line with Ofwat's view at DD.** **As Ofwat assesses base + costs separately to enhancement costs, and part of the overall smart metering strategy relates to the movement from maintaining existing assets (c.600k meters), in these representations we reallocate the expenditure between base and enhancement because this represents a shifting of base costs between AMPs (i.e. early replacements, will mean lower replacement (base) costs in future AMPs).** **Consistent with Ofwat methodology we provide a Cost Adjustment Claim for Smart Metering under botex.** **This investment is needed in order to secure the supply demand balance for existing customers. The demand reductions resulting from replacing over one million dumb meters with smart meters in AMP7 is required to deliver our WRMP, is not discretionary and not simply a strategy to help achieve our performance commitments. Non-delivery of this programme would undermine our WRMP and would not align with the views of our customers.**

4	Smart increment - new connections in roll out areas	4.150	Unit cost uplift	1.274	We make an allowance consistent with line 2 because we consider that due to growth being incorporated into the revised Botex Plus model the resulting allowance will be for the installation of a basic meter based upon historical expenditure	**New connections present a higher cost because all new connections are manifold meters and this is our most costly installation. Existing meters are a combination of differing fits including internal, which have a lower installation cost.**
5	Dumb exchanged for dumb (at end of life or when faulty)	0.000	Included in base	0.000	Base maintenance as identified by the company	**No comment – Ofwat has treated appropriately**
7	Fixed data network	42.350	Deep dive	42.350	We make this allowance based on the evidence provided by the company, providing detail of its comparison between options, suppliers and with international smart metering installation projects.	**No comment – Ofwat has treated appropriately**
8	Demand management programme	20.980	Deep dive	20.980	We make this allowance based on the company forecasting to retain upper quartile leakage performance and the combined associated leakage/water efficiency benefits being identified as 22.431 Ml/d, implying a unit rate of 0.94 £m/Ml/d which is lower than both the 2020-25 SDB enhancement unit rate and the median leakage unit rate. The company receives a leakage allowance through the supply demand enhancement model because it forecasts to achieve upper quartile performance in leakage in 2024-25 therefore we consider making an allowance in this model is also appropriate.	**No comment – Ofwat has treated appropriately**

At DD, Ofwat assess the 'Customer Protection' as a partial pass. The table below highlights Ofwat's assessment and summarises our representations.

Table 3 Customer protection - assessment and representations

Assessment gate	Assessment	Comments	Our representations
Customer protection	Partial pass	The company proposes "a simple symmetric true up mechanism, applicable at the end on AMP7 to protect customers." However, we consider that it is more appropriate to protect customers using the outcome delivery incentive mechanism and that this will provide greater clarity to customers regarding the ongoing company performance. This is also consistent with the approach taken for Northumbrian Water and Thames Water in this area. Therefore we propose a performance commitment at DD to protect customers in the case of a shortfall of delivery of the replacement of basic meters with smart meters (PR19ANH_38, smart metering) for which an additional enhancement allowance is made.	**We do not challenge Ofwat's use of the ODI mechanisms to monitor the delivery of our smart metering programme.** **It is clear that Ofwat's emerging view is that the ODI framework should be used to monitor the delivery of outputs for specific investments, in essence a return to outputs based regulation in certain areas.** **Consistent with our wider representations evidence, we propose that the ODI penalty rate for this performance commitment be uplifted to be consistent with representing 50% of the allowed unit rate.**

Ofwat's DD conclusions on our smart meter programme are flawed. The DD risks preventing the necessary investment to deliver reductions in the overall demand of our customer base to ensure we can effectively manage supply and demand in our region. This is particularly important in our region because of the acute pressures being both one of the driest and fastest growing regions in the country. This programme is a central component of our demand management strategy set out in our statutory WRMP. Moving previous "dumb" technology to a smarter, more customer orientated interface is firmly supported by our customers.

The remainder of this chapter addresses the points raised by Ofwat in the DD. These focus on three areas, namely the:

- Treatment of costs for meters replaced before end of life due to the smart metering programme
- Smart meter premium and the proposed customer protection mechanism
- Unit costs for new meter installations (smart and dumb meters)

2.2.1 Treatment of costs for meters replaced before end of life due to the smart metering programme

The DD proposes that where we replace a dumb meter when it would not have naturally reached the end of asset life during AMP7, allowance is only made for the uplift costs of replacing these meters with a smart meter, rather than the full replacement cost.

Ofwat's rationale is twofold. Firstly, the decision is within management control and secondly, these enhanced assets will directly contribute to the delivery of AMP7 performance targets such as leakage and PCC.

Our smart meter programme is a core component of demand management under our WRMP. This is therefore an essential part of our demand management strategy.

We expect the rollout of smart meters to deliver a 13ML/d reduction in demand by 2025 under our proposed programme, thus avoiding the need for more expensive supply side schemes to ensure resilience of water resources. The programme is supported by customers who see this as a central component in driving behaviour change to reduce demand and also recognise the personal benefits from reducing water consumption, including reduced bills. Ofwat partially recognise the need for an emphasis on demand management by allowing in full the proposed demand management costs (£21m) in the DD.

Ofwat's DD suggests that the company is the sole beneficiary of this investment through performance delivered against some of the common ODI measures. This assertion neglects to recognise the necessity of delivering this programme to deliver our WRMP, the customer benefit of having greater control over water usage and bill, customer support for the full rollout, and the wider benefits for the environment and future customers arising from the demand reductions. The need for this investment is demonstrated by Ofwat's and government's recent push to further drive down per capita consumption.

We have reviewed our Plan and the associated expenditure to replace existing meters before they reach the end of their life and consider that this expenditure remains fully justified and consistent with our customers' priorities. As the savings due to reprofiling the meter replacement programme will accrue to botex in future AMPs, we consider it appropriate that the costs for the base element of these replacements (i.e. the dumb-for-dumb replacement costs) should be considered as uplift to botex in AMP7. Given the uplift in base expenditure that this necessitates, we have prepared a cost adjustment claim for this element of the smart metering programme. This cost adjustment claim highlights the considerable customer benefits which will accrue from replacing these meters before they reach the end of their life, driven ultimately by the necessity to deliver our WRMP for customers.

The cost adjustment claim equates to £42.387m. This represents the costs of replacing 602,380 meters before the end of their life on a like-for-like basis (i.e. a dumb meter replaced with a dumb meter). The premium costs which provide the extra smart metering capability are considered to be enhancement expenditure. While we are separating to costs in this way, the botex and enhancement expenditure should be considered in tandem as the enhancement from dumb-to-smart meter cannot be delivered without the base cost to replace the dumb meter.

We provide our full justification for the special cost factor in the smart metering cost adjustment claim.

2.2.2 The smart meter premium and proposed customer protection mechanism

The DD proposes an allowance to replace dumb meters with smarter meters based on the cost provided by Northumbrian Water. This "dumb to smart" cost equals £24.85 per meter. The value for "dumb to smart" in our Plan is £50.61 per meter.

Following DD, we have actively sought to understand the legitimacy of this comparison of costs. This includes actively engaging Northumbrian Water to understand the comparability of the "dumb to smart" inferred cost.

These costs are not directly comparable and Ofwat's comparison is inappropriate. The principle reason for this is that Ofwat's DD assessment assumes that the proposed technology companies' propose to deploy is insignificant both to the proposed benefits to customers and the environment and also the associated costs of the proposed solution. This can be easily disproved by a comparison of existing dumb meters with "smarter" technologies. These smarter technologies, include AMR (Automatic Meter Reading) and AMI (Advance Meter Infrastructure) based technologies. At first glance, these both are "smart" relative to their dumb counterparts which require manual meter reading. However, it is well established that different technologies will deliver different benefits. This was set out in our WRMP, which explored the rationale for our proposed solution of AMI (an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers). These smart meters can take meter readings every 15 minutes and our WRMP clearly set out that we chose this option because of the benefits it will offer over and above AMR through:

- Analysing individual customers' consumption patterns to identify customer supply pipe leaks (CSPL) and leaks within a property (plumbing losses). Allowing us to proactively notify the customer of the leak so that it can be fixed, saving both water and money for customers.
- Customers saving 3% more water than those with a dumb meter, which could be further increased alongside behaviour change initiatives
- The possibility of non-price behavioural change incentives, financial tariffs and rising block tariffs

We understand from NES, that it is still looking at Automatic Meter Reading (technology that automatically collects consumption data from walk by and drive by readings) up to 2022 which will not enable the benefits above that result from high frequency readings. We have trialled AMR meters in Colchester (2012- 2017). During this trial, radio meters were installed at 21,000 customer properties and targeted by a 'mobile' network of passive readers. The data was collected periodically (weekly or bi-weekly). We equipped around 10 refuse collection lorries operated by Colchester Borough Council with passive readers which 'listened' for the AMR water meters installed at properties on their weekly refuse collection rounds. We decided not to progress AMR metering following the findings of the AMR trial in Colchester. The results did not give us the confidence that we could use this method of data retrieval for our customers. We would not be able to meet the customer expectation of a regular and reliable reading which is a vital enabler for our behavior change strategy to reduce demand. We would still need to visit the properties to guarantee a billing read, which effectively provides us with no benefit on reducing meter reading costs or carbon. Even if the data were reliable and comprehensive, the data can not be used to track down leaks on the network – a key benefit which hourly smart meter data will provide. For these reasons we have discarded this as a viable long term solution.

After 2022, NES is relying on technology which is not currently available and remains uncertain in terms of both its deliverability and the customer benefits arising from it. We have been clear that delivering the demand reduction expected from smart metering is not discretionary, this is a core component of our statutory WRMP. It is therefore not in customers' interests to a) delay the rollout of smart metering until new technologies become available and b) rely on a the delivery of new technologies whose demand management benefits are currently unclear.

2.2.3 Our approach

We set out in our WRMP, that the replacement of all dumb meters in our region with smart meters by the end of AMP8 (with over 1 million of these in AMP7) was a core part of our demand management strategy, with expected demand reductions of 13ML/d by 2025 and 51Ml/d by 2045. We set out in our September Plan and our April IAP response that we have taken a range of approaches to ensure the robustness and efficiency of our costs including through:

- Delivery of the programme in a way which provides the best long-term value for customers (including rollout out on a district meter area basis)
- Ensuring the most cost effective smart meter rollout (e.g. through replacing rather than retrofitting meters)
- Challenging our costs based on benchmarking with international comparisons of large scale smart meter rollouts
- Building efficiencies from previous AMPs into our costs (including from the smart metering trials in Norwich and Newmarket)

Our IAP response highlighted that our unit costs for smart meter replacements are low compared to the international comparisons for which we could source cost data. This is summarised in the table below which uses the unit costs of dumb for dumb replacement at end of life and reactive replacements. Our unit costs are reduced even further when our proactive dumb-for-dumb replacements before included.

Table 4 Unit costs for meter replacements

Location	Anglian Water	Yarra Valley	Valencia	Austin, TX
Number of replacements	1 million (in AMP7)	800,000	550,000	250,000
Unit cost per meter	£163[1]	£191	£120[2]	£240

1 sum of unit costs in line 2 (dumb exchanged for dumb before end of life) and line 7 (fixed data network) in the meter installation costs table on page 65 of our April IAP Response – water data tables commentary
2 As raised in our April IAP response, this figure excludes network configuration costs which uses a SIM cards and is significantly different to our proposal. Our like-for-like unit cost is therefore £127 (rather than £156) as per line 2 on page 65 of our April IAP Response – water data table commentary. We expect the unit costs for Valencia to be lower because meters are stored in together in 'batteries' allowing meters to be exchanged in batches at lower cost

Ofwat has compared our uplift costs with those of Northumbrian and Thames Water. We note that the £16 unit cost for Thames refers only to the 'cost of AMI technology' element and excludes £63.44 unit costs requested by Thames for AMR uplift costs which Ofwat has disallowed. This would give a unit cost of £79.44 per meter (excluding the cost adjustment for Thames' internal meters of £53.54 per meter). We therefore focus our analysis below on Northumbrian's plan, where the full costs have been allowed by Ofwat, and these unit costs have been used to determine our DD unit uplift costs.

Following the DD, we have studied Northumbrian's smart metering programme proposals and engaged directly to understand the legitimacy of Ofwat's comparison. We do not believe the comparison is appropriate for the following reasons.

2.2.4 The different nature of the smart metering rollouts

Through our smart metering rollout we will provide customers with detailed daily usage information, with hourly readings from the customer's new meter. This will provide significant customer benefits including, increased scope for reduction in water usage through behavioural change and bill reductions associated with having greater understanding and control over water consumption. In addition this will materially increase the identification of leaks on the customer property. The prioritisation of leakage was a central theme of customers' views and remains a wider government and regulatory priority.

Our plan seeks to maximise the proposed benefits by rolling out smart meter technology fully on a district meter area (DMA) by DMA basis. That is, we propose to rollout smart meters fully in the DMAs where we have assessed, based on current supply-demand assessment they will provide most benefits to the supply demand balance and customers more broadly. Simply put, we target the areas in AMP7 where there is most benefit. This is consistent with both WRMP guidance and basic economics. This also allows the full utilisation of the data networks in each area, prior to smart meter installation. This means minimising the inferred cost per meter of the implementation of the fixed network and demand management costs and maximising the likely scope for demand reduction by allowing customers to engage with their consumption data and identify issues on the assets they retain responsibility for.

We have specified a consistent data protocol required as a result of the meter and network specification. This means that as we progress through the AMP and new technologies come to market, we can take advantage of these providing the data collected remains consistent with our protocol. We can only do this if we roll out area by area. If we install a network up front and then install meters on the network as they reach end of life, we will not be able to take advantage of new network technologies and new opportunities to improve customer service as new products come to market.

Table 5 Meter fits hardware costs

Hardware needed	Retrofit cost	Replacement cost
Pulsehead	£17.00	N/A
Radio module	£45.00	N/A
Radio meter	N/A	£37.50
Smartpoint	£21.50	£21.50
Total	**£83.50**	**£59.00**

Optimising the proposed fixed network investment requires a radio meter and smartpoint to be installed at each meter in order to communicate with the network. The costs of the smartpoint and radio meter are reflected in the proposed investment. Note that the table of hardware costs above reflects the uplift costs across all meter types including higher cost manifold meters. Our unit uplift costs for the replacement of existing meters are lower than this because they consist of more lower cost meter replacements (e.g. including internals).

We outlined these costs on page 64 of our April IAP water data tables commentary.

Northumbrian's plan states the following in relation to its smart meter rollout:

"We want to upgrade new (and replacement) meters to future proof, 'smart' capable meters from 2019. In the short term, this will enable drive by or walk by reading to ensure customers on a meter will always receive bills based on a reading. By 2022 we want to link meters up to a wide area network which will be the next development in the area of smart metering; offering a more affordable solution for data communication than is currently available. " (NES.CE.A1 – Appendix 3.2 Enhancement Business Cases)

This highlights that in first part of the AMP, NES are delivering an AMR solution rather than an AMI solution. The differences between these two solutions are demonstrated below.

Table 6 Difference between AMR and AMI metering solutions

AMR (drive by or walk by reading)	Anglian's AMI solution
Semi-automated reading (requires site presence)	Readings fully automated
Single reads a week apart	15 min reads and hourly communication with network
Customers consumption data updated when reads are taken	Consumption data available to customer and updated daily

This highlights a number of key differences with our planned smart meter rollout. NES is using an AMR solution until 2022, whereas we are implementing an AMI solution from the beginning of the AMP. This will provide high frequency readings which are not possible using an AMR solution. This will allow customers to view their consumption data daily through the customer portal and app, helping to reduce demand through behaviour change techniques, identifying leaks in customer properties and customer supply pipes. AMI hourly data allows customers to analyse in detail their consumption on individual use events during the day and hence properly assists them to understand their consumption trends and behaviours in order to help reduce their use and bills. This functionality is essential for us to deliver the demand reductions required in our WRMP, and would not be possible through an AMR solution. An AMR (or walk by/ drive by) solution only allows a customer to analyse their consumption patterns on how much they use per week. The uplift of delivering AMI over AMR is approximately £20 per meter due to the need for a smart point (see hardware costs in the table 5). Furthermore, the nature of smart meters being rolled out in this way means that if Northumbrian Water were to rollout AMI from 2022, this would not be on a whole DMA basis significantly reducing the benefits of rollout out a network on a regional basis, as set out in our cost adjustment claim.

NES sets out its intention to use a wide area network from 2022, citing that believes it can make use of a solution that is more affordable than that which is currently available. We highlighted earlier in this representation the concerns we would have in relation to relying on technology which is currently unavailable and whose potential benefits are uncertain, particularly given the criticality of the need to reduce demand through smart metering. To deliver the demand reductions required for our WRMP, we need to deliver smart metering benefits from the start of the AMP, and we need a solution which provides customers with data that will enable the necessary demand (consumption and leakage) reductions. The scheme proposed by Northumbrian could be more affordable because both the costs and benefits of the smart meter rollout to customers are lower, thereby providing lower cost, but not necessarily better value.

The proposal set out in our plan is fundamentally different to that of Northumbrian meaning the direct comparison and inference of efficient costs Ofwat has carried at DD is inappropriate.

2.2.5 Nature of delivery incentive

The DD sets out a performance commitment for both Anglian and Northumbrian with respect to delivery of their respective smart meter programmes in AMP7.

As currently drafted, these performance commitments are defined such that "smart meters" constitute materially different levels of what is considered smart. For example, as defined these PCs count meters which rely on walk by or drive by readings towards the achievement of the performance commitment. As set out above, this delivers a materially poorer customer experience and environmental benefit, and reinforces the inappropriate comparison between our proposal and the NES proposal. The DD assumes these are suitable for cost comparison and performance monitoring but this is not correct.

Ofwat's FD needs to reflect the material differences in these proposals. This would result in both different levels of expenditure requirements and differently defined performance commitments recognising the different service offerings and associated benefits to customers and the environment.

We therefore propose that a more suitable, tailored definition for our performance commitment would be (additional text to the DD definition captured in italics):

"For this performance commitment a smart meter is defined as a meter within that has the capacity as part of a system for metering water supplies to all the following:

- Measures consumption over representative periods to legal metrology requirements;
- Store measured data for multiple time periods;
- Allow ready access to this data by customers as well as by the company; and
- Transfer consumption data to the company for the purposes of accurate billing without requiring access to the property.
- *Capable of communication with a wide area network* "

Furthermore, at DD, Northumbrian's performance commitment definition includes the following line, which is not included in Anglian's performance commitment:

"A meter can be counted if it has the capacity, even if the required systems are not in place to utilise this capacity"

Our DD performance commitment penalty rate proposed by Ofwat uses Northumbrian's unit costs. For reasons set out above, this is inappropriate. Given the greater functionality commitment of our smart meter programme, we consider that the penalty rate should reflect our unit costs for smart meter rollout.

We calculate our revised rate as follows:

- Enhancement totex requested: £51.80m (£29.39m for replacements before end of life, £22.41m for replacements at end of life or when faulty)
- Volume replaced: 1,045,153 (602,380 replacements before end of life, 442,773 replacements at end of life or when faulty)

- Unit rate: £49.56 per meter (lower than £50.61 reflecting a slight difference in unit costs between before end of life and at end of life replacements)
- *Penalty rate: £24.78 per meter (reflecting 50:50 sharing rate with customers).*

In summary, the difference in unit costs highlighted in the DD should be resolved by:

- Identifying that our uplift unit costs are based on a different approach to Northumbrian's, by guaranteeing enhanced benefits to customers from the start of AMP7 as a result of every installed smart meter having the capacity to utilise a fixed network. Therefore, the full requested totex should be allowed for this investment.
- Reflecting this differentiator in our Performance Commitment definition, to provide additional protection to customers that our smart meters will have this capacity.
- Increasing the penalty rate from £12.48 per meter, to £24.78 per meter.

2.2.6 Unit costs for new meter installations (smart and dumb meters)

Ofwat uses a regression model to determine allowances for new meter installations. This model is driven by historic and AMP7 forecast meter installation volumes and unit costs across all companies excluding Thames (as an outlier). The regression formulae (level and log) are applied to the number of meter installations in AMP7 to determine the appropriate cost allowance for these meter installations.

This model assumes that all meter installations are uniform, and does not reflect the level of meter penetration as a cost driver. When meter penetration is low, it follows that a company will tend to prioritise the selective installation of meters where this will come at a lower cost. Therefore, those companies that have a lower meter penetration will be able to prioritise installations, whereas for companies with a higher meter penetration, the remaining meter installations are likely to have a higher cost, the company having already prioritised lower cost installations.

We therefore consider that the enhancement allowance should reflect the full £20.17m requested in our September 2018 Plan and IAP Response.

3. PARTNERSHIP FUNDING

3.1 Ofwat proposals

Ofwat has disallowed the Partnership Funding element of the Pluvial and Fluvial Flood Protection business case at DD, resulting in £15.817m being removed from the business plan.

Disallowing this expenditure means we will not be able to support partners in delivering flood risk management schemes which either protect our assets (such as the Gt Yarmouth or TEAM2100 schemes) or make our water recycling network more resilient to the challenges of climate change and urban creep (such as the Pix Brook or Southend schemes), and means we lose the opportunity to do more for less on behalf on our customers.

In Ofwat's view we have not previously provided enough evidence on the specific cause of failure the investment mitigates; the probability of failure; how the failure and its consequence is currently beyond management control; and the impact on customer service. Furthermore, Ofwat believe that there is insufficient evidence to confirm that there is no overlap between this investment and any improved performance measured by the company's internal sewer flooding; external sewer flooding and; risk of sewer flooding in a storm performance commitments. Ofwat has invited us to provide this evidence.

Post IAP, we submitted evidence for our Coastal, Fluvial and Pluvial business case (where we will protect our assets from flood risk alone, i.e. not in partnership with others). Ofwat has accepted this investment need at 7 sites (6 water recycling sites and 1 water site). Our response to query ANH-DD-CE-014 supports our investment in protecting our assets from pluvial, fluvial and coastal flooding.

We reject the complete removal of partnership funding from our business plan, and have refined the business case. We provide additional evidence which covers our partnership funding business case submission.

The original amount of £15.817m has been refined. We have removed 33 schemes, with a total cost of £2.154m, leaving £13.663m for 27 named schemes (up from 10) with a total value of £8.753m and the remaining demand driven schemes valuing £4.910m.

3.2 Anglian Water Response

Partnership funded schemes deliver benefits to our customers. Our partnership funding approach, as established in AMP6 with £8.5m of funding, supports the to funding flood and coastal erosion risk management as set out in Defra's 'Flood and coastal partnership funding: an introductory guide'. Back in May 2011, Defra announced changes to the way funding is allocated to flood and coastal erosion risk management projects. Government will meet a proportion of the costs, with beneficiaries expected to make up any shortfall.

We decided at PR14 to take a positive stance on Partnership Funding where the customer benefits, because we are classed as a Risk Management Authority by the Flood & Water Management Act 2010. This approach means that we can do more for less, whilst working with our customers and partners to make the East of England resilient to the risks of drought and flooding, as outlined in our Strategic Direction Statement. Such an approach also helps to meet Defra's goals for Enabling Resilience in the Water Sector (Defra, pp16), and the Environment Agency's expectations, as set out in the Water Industry Strategic Environmental Requirements (WISER). Defra highlight that 'Collaboration with other parties who have drainage responsibilities is important. Sewerage companies can continue to develop partnerships with local authorities, environmental groups and others'. In the WISER, the Environment Agency expect water companies to 'Take every opportunity to increase the no. of partnership schemes delivering multiple benefits'. In August 2019 we recieved a letter from Emma Howard Boyd, chair of the EA, setting out the Agency's support for our investment in working in partnership to reduce the risk of flooding, and its reassurance that our

draft plan strongly aligns with the vision and ambition of the draft FCERM strategy. The full letter is provided as an appendix to our representation, along with several further letters of support (see Annex 8d of our PR19 DD Representation).

In compiling more evidence on our Partnership Funding business case post DD, we note Ofwat's approach to other companies' Partnership Funding requests. It is clear that where partnership working results in delivering resilience to assets and our customers, then this is acceptable, but equally Ofwat highlight the requirement that there should be no overlap with any improved performance measured by the company's internal and external sewer flooding PCs, which are funded through implicit base plus allowances.

With this in mind, a total of 33 schemes have been removed from our August 2019 Plan. This figure includes schemes which have since been identified (through further investigation) as non cost beneficial, those which have been delivered early (in our AMP6 programme) and those which would have contributed towards internal and external flooding performance commitments (a total of £2.668m). Those schemes which contribute towards internal and external flooding performance commitments will be funded, where appropriate, through base plus allowances. This leaves 92 schemes that manage the risk of pluvial, fluvial and coastal flood risk, coastal erosion and creating SuDS and green infrastructure to manage excess surface water runoff entering the sewer network, delivering long term resilient drainage solutions for customers as set out in Ofwat's Resilience in the Round report (Ofwat, pp11).

3.3 Further evidence

The service failure mode and associated quantitative or semi-quantitative likelihood of failure the investment is proposing to address. For example, simply specifying 'catastrophic treatment works failure' is insufficient

Since our April IAP Response we have submitted additional evidence for our Pluvial, Fluvial and Coastal Flooding business case. To be clear, the evidence we submitted was only related to AW assets at risk of flooding, i.e. where there is no partnership working opportunity. A total of 7 assets (6 water recycling sites and 1 water site) were identified for investment. This investment has previously been accepted by Ofwat.

This new evidence relates to where partnership working schemes being led by another Risk Management Authority (RMA), has been identified and it has been deemed appropriate to allocate partnership funding to assist with the delivery of opportunities where there are identifiable benefits to Anglian Water customers.

Working in partnership with others will help us to make our assets more resilient to the following failure modes, and aims to address the following likelihoods of failure:

Failure mode	Details	Likelihood of failure
Pluvial, Fluvial and Coastal Flooding and Coastal Erosion	Mitigating the risk of flooding from a range of sources, including pluvial (surface water) runoff, fluvial (river) flooding, coastal flooding and coastal erosion, and consequential pollution to sensitive water bodies or a loss of service to customers	1 in 20-year to 1 in 1000-year flood events for one, or multiple, sources of flooding

The large range of likelihood, from all sources of flood risk, highlights the challenges of managing flooding across the East of England. Schemes identified by our partner RMAs aim to address this range of failure modes, and their associated likelihood of flooding. For example, pluvial flooding often has a much higher likelihood of occurrence (for example failure in a range of flood events from 1 in 20-year) than coastal flooding (failure in a range up to the 1 in 1000-year), but both sources of flood risk can be equally damaging to people and property. Climate change will only increase the risk, meaning we must use all the tools available to us to protect our customers and assets.

In developing this investment to address the service failure modes identified above, we appointed a Flood Partnerships Manager who was funded by the three Anglian Regional Flood and Coastal Committees and AW. This commitment of funding from our flood risk management partners demonstrates the external value put upon our approach to partnership working and partnership funding. We took the decision to make this fixed term post permanent to show our commitment to continue this work.

Working in conjunction with the Environment Agency, 22 separate Lead Local Flood Authorities, Internal Drainage Boards and coastal authorities, we undertook an extensive engagement exercise to identify partnership funding opportunities that benefit our customers, for example, protecting a range of assets, including water recycling centres, pumping stations, trunk sewers and property from coastal erosion, tidal, fluvial and pluvial flooding.

We undertook a similar exercise with partners at PR14, which resulted in an investment of £8.5m. Our methodology for PR19 was updated using learning from PR14 and AMP6. On feeding into and reviewing the recommendations of the UKWIR document 'How best to align the funding processes with the various bodies involved in resolving flooding (Ref. No. 16/SW/01/16)' we found that our process was already very strong, but we took on board the recommendations we hadn't already implemented. This included strengthening the engagement process, requesting more information from partners on external programmes/funding streams, and an assessment of confidence scoring.

The report also found our assessment of equitable apportionment of funding follows the recommendations i.e. we only contribute towards benefits we can legitimately claim, we consider whole life value and affordability, and our return on investment has to be greater than delivering an investment as a stand-alone project in order for us to contribute to a partners' scheme.

For example, during AMP6 Tendring District Council (TDC) undertook a coastal erosion protection scheme at Walton on the Naze, an area of low lying land where AW have a Water Recycling Centre (WRC)protected from coastal flooding by London Clay cliffs. These cliffs are soft and are actively eroding at an average rate of 1.03m/year. The scheme involved the construction of a counter wall connecting the existing sea defences and tied back into the higher ground levels at the WRC. This work provides longer term protection to our WRC and as a beneficiary of the scheme, we were asked to contribute. TDC initially requested a contribution of £250,000, which was half of the total scheme cost.

After assessing the risk to our WRC, the consequences of coastal erosion and the cost of a scheme undertaken by AW in isolation, we capped our contribution at the total cost of us delivering our own scheme, a total of £71,500. TDC's scheme provided the same level of protection to our assets as a scheme we could have undertaken in isolation, but by contributing this money to our partner, the scheme was able to provide wider benefits for the protection of The Naze Nature Reserve and designated areas of SSSI, SPA and RAMSAR sites. Other contributions came from TDC, local landowners and Local Levy grants from the Anglian Eastern Regional Flood and Coastal Committee.

The identification of such partnership working opportunities has enabled us to better understand how we can protect our services to customers and the environment, reduce the overall costs of flooding events, meet the requirements of the National Flood Resilience Review, and meet our responsibilities to assess risks and plan for emergencies, as a Category 2 responder under the Civil Contingencies Act (CCA) 2004.

The work we did (and continue to do), with our partners and internally with colleagues, for PR19 involves four phases:

Phase 1:

- Started engagement with our flood Risk Management Authority (RMA) partners
- Presented at Regional Flood and Coastal Committees and other stakeholder forums
- Met with each RMA partner
- Discussed the process and talked the RMAs through the application proforma
- Reviewed all applications that came in and rejected those that clearly provided no benefit to AW customers
- Requested further information where detail was lacking.

Phase 2:

- Reviewed the applications with internal teams (including asset planning, operations, coastal bathing water, biodiversity and customer support teams), assessed the likelihood and severity of flooding based on historic data, and checked for customer reports in the area
- Removed those where detail was lacking, benefits weren't clear or where the project was not primarily related to flood risk
- Of the remaining schemes, they were ranked based on confidence and 10 were named for the PR19 business case in a similar manner to the PR14 business case. The un-named schemes had at that time a lower confidence and due to this, they were set as a % of the total submissions, determined by an AMP6 demand profile for the final partnership funding ask.

Phase 3:

- Undertake modelling using a range of return periods to assess the likelihood and severity of the risk, to better understand the consequence of flooding
- Assess costs and compare these to delivering our own investment not in partnership
- Optimise the benefits for our customers to ensure increased resilience is delivered through jointly funded work, and encourage the delivery of a range of sustainable solutions
- Review both AMP6 and AMP7 programmes continually to identify opportunities for early delivery or postponement (two schemes were removed from the AMP7 programme for early delivery in AMP 6)
- Remove non cost beneficial projects. 33 schemes have been removed with a total investment of £2.154m from the AMP7 programme.

Phase 4:

- On completion of final scheme design, the scheme is promoted internally for final approval.
- Recheck benefits before any legal agreements are signed and contributions are confirmed
- Hold back a proportion of the contribution until the scheme has completed and been reviewed. Deduct the proportion of efficiencies gained during the project from the final payment
- The final notification of outputs and benefits is prepared by the lead partner and shared internally.

The original outcome of our September Plan was the recommendation for investment in 10 named schemes, and 115 un-named schemes.

Following DD, we have now named 27 schemes which have a high confidence of delivery (a total value of £8.753m). The un-named, demand driven, schemes have a lower confidence and have been set as a % of the total submissions, determined by an AMP6 demand profile. The remaining 65 schemes have a total value of £4.910m.

Total no. of partnership funding (PF) requests received from other RMAs	Total no. of PF requests taken forward for further analysis for PR19	Total no. of PF requests removed from our August 2019 DD Representation	Remaining Total no. of PF requests with a high confidence of delivery	Total no. of PF requests with a medium or low confidence of delivery
172	125	33	27	65

Drawing on AMP6 experience, we know that a partnership funding programme needs to remain flexible to adapt to changing priorities of the Government, our partners and our own customers and commitments. Local Authorities in particular plan their budgets on a year to year basis and so are not able to provide high confidence ratings on many of their funding requests in case funding is pulled.

Having flexibility enables us to contribute sooner or later than originally envisioned meaning that schemes are not held up when they are ready to be delivered and that funding can be maximised from other partners, such as EU or Local Levy funding. The programme is refreshed on an on-going basis and where schemes are delayed and/or reprioritised as less urgent, other beneficial schemes may replace these to make the best use of customer money.

How mitigating against the failure is currently beyond management control

For those investments that provide protection against pluvial, fluvial and coastal flooding and coastal erosion, management control will not provide appropriate standards of protection for customers and the environment. This is due to factors such as prolonged limitations on site access, likely extent and duration of flooding, and the number of assets at risk.

For example, TEAM2100 (the Environment Agency's 10-year programme to refurbish and replace tidal flood defences on the Thames) proposes works to 12.5km of linear fixed defences which would provide a standard of protection of 1 in 1000 years to approximately 460km of wastewater network, 18 pumping stations and 6 water recycling centres, meaning that in each year the risk of flooding to a depth of 0.1m would be less than 0.1%.

By 2050, without the TEAM2100 proposed works, out of the above assets 8 pumping stations and 3 water recycling centres would have a 10% or greater chance of tidal flooding to a depth of at least 0.6m each year. The remaining pumping stations and water recycling centres will benefit from the proposed works beyond 2050, highlighting the long term resilience delivered through partnership funding.

Other partners involved in TEAM2100 include DP World, Forth Ports, RWE, Highways England, Network Rail, the South East Local Enterprise Partnership and the local District and County Councils.

For those investments that propose to create green infrastructure and SuDS, delivering long term resilient drainage infrastructure can help to manage pluvial flooding that is very hard to predict and manage over largely dispersed geographical areas. Creating resilience to pluvial flooding can help protect a large number of assets whilst providing multiple benefits that management control can not deliver. This includes creating assets that are resilient to climate change, creating multifunctional green space for both customers and wildlife, and improving wellbeing and air quality, alongside traditional benefits such as managing flood and pollution risks.

For example, in AMP6 we worked with Essex County Council to make Basildon Hospital and downstream areas more resilient to extreme pluvial events. The work, funded by Essex County Council, Anglian Water and EU Interreg funding, has implemented a number of innovative, place-based climate adaptation solutions alongside local stakeholders. The hospital courtyards and the adjacent washland area have been renovated with a number of sustainable drainage features. The courtyards now have 50% less impermeable area and have reduced roof runoff by over 60%, and the washland stores over 2,800m3 of water during extreme events. The work to the washland has resulted in a 12% reduction in peak flows downstream, and approximately £4million of damages avoided to downstream property and sewerage infrastructure.

These examples show that the most efficient and cost effective way to maintain service to customers and the environment and deliver long term resilience is to work, wherever possible, in partnership rather than individually, as promoted by Defra, Ofwat, the Environment Agency, UKWIR and other Risk Management Authorities.

The impact on customer service

As with our pluvial, fluvial and coastal investment, key customer service drivers include a loss of services (either potable water or water recycling services), and ensuring environmental protection (as supported by customers who endorsed a package of service enhancements as "indisputably positive") is maintained and/or improved.

In order to better understand the impact on customer service, risk assessments were made up of a combination of the likelihood of flooding (from a range of sources) and the consequence (or impact) of the flooding.

The likelihood of flooding is derived from the return period of the flood event affecting our assets. To better reflect the impact on customer service, modelling has been used to identify the consequence of flooding based on cumulative property count information and Business Impact Matrix (BIMs), which provides details of the costs of failures of service and the potential impact of flooding and pollution.

For example, in Great Yarmouth the Environment Agency are leading work to repair 13km of flood defences that reduce the risk of tidal flooding from the River Yare to over 6,000 homes, businesses and critical infrastructure. This critical infrastructure protects a number of Anglian Water assets, including 12 combined sewerage pumping stations that pump to Great Yarmouth water recycling centre. The standard of protection provided by the work ranges from 1:75 to a 1:500, and delivers over £6million of benefits to our customers.

We have also considered the beneficial impact on customer service alongside the risk, in particular for those schemes that help to manage surface water. Benefits to customer service include improved amenity spaces, increased biodiversity through diverse planting regimes, aquifer recharge through returning surface water to the ground, enhanced community education opportunities, enabling capacity for climate change, urban creep and future growth, and a reduction of downstream flood risk.

How, should the failure occur, the consequence is currently beyond management control

For the investments identified for partnership funding, management control will not be suitable to mitigate the consequence of failure. Whilst there are instances where the consequences of failure can be mitigated through management control, for example, re-zoning water supplies, it is not possible to 're-zone' water recycling infrastructure against catastrophic failure from tidal surges or extreme surface water events. Extreme events often impact a large number of assets and/or properties in multiple catchments, making consequence management extremely difficult.

For example, the consequence of failure may result in the pollution of sensitive water bodies and/or bathing waters, increased CSO/EO discharges, damage of property, disruption of livelihoods and adverse environmental impacts. Managing such a consequence is not acceptable to our customers or the Environment Agency, and so taking the opportunity to work together with partners and invest in partnership funding opportunities is considered to be the most appropriate solution.

This was seen during AMP6 where we invested in Clacton on Sea where Tendring District Council led work to deliver enhanced sea defences. A very large trunk sewer along the sea front, constructed in 1999 to collect all the wastewater from the town, was at risk from coastal erosion. If this tunnel was to fail, approximately 90% of Clacton would be without mains sewerage service and bathing waters would become polluted.

An independent review of the rate of erosion, cliff face and slip circle analysis identified when and if our sewer would be affected in the event of coastal erosion. The work identified that the sewer would fail if the coast was allowed to erode at some point between 15 and 50 years time. Given the potential widespread disruption to customers and the impact on the environment, as well as the substantial costs of building and/or repairing a trunk sewer, we concluded that it would be appropriate to work in partnership with Tendering District Council and contribute £3m towards the project, a cost reduction of over £20m.

For those investments that propose to manage pluvial and fluvial flooding through the creation of green infrastructure and SuDS, delivering long term resilient drainage infrastructure can help to reduce the consequence of flooding in urban areas that are beyond management control due to their impact and widespread nature. For example, the Pix Brook in Letchworth and Stotfold drains through a complex system of minor and major drainage systems comprising pipes, open channels, overland flow paths and detention areas. The urban areas experience regular flooding, most recently in 2015 and 2016, with damages for a 1:100 event estimated at over £31million (over £12.5million of damages can be linked to the sewerage infrastructure).

Additionally for the 'Pluvial and fluvial flood protection' scheme, please specify the value of the investment that is related to agreed schemes

The following investments are included in our business plan for partnership funding, as part of Pluvial and Fluvial flood Protection. We have now named 27 high confidence schemes, with the remaining 65 schemes of medium or low confidence making up the demand driven portfolio.

Investment Name	Capex	Opex
Partnership Funding - Caistor	-	1.5588
Partnership Funding - Tilbury, Canvey Island, Southend, Pitsea	-	1.4476
Partnership Funding - Caistor	-	0.7794
Partnership Funding - Saltfleet	-	0.7794
Partnership Funding - Poppyhill	-	0.5851
Partnership Funding - Tetney-Newton Marsh	-	0.4676
Partnership Funding - Lowestoft	-	0.3897
Partnership Funding - Immingham	-	0.3897
Partnership Funding - Canwick	-	0.3897
Partnership Funding - Southend	-	0.3897
Partnership Funding - Dunstable	-	0.3118
Partnership Funding - Heacham	-	0.2463
Partnership Funding - Runton Middlebrook Way	-	0.2151
Partnership Funding - Felixstowe	-	0.1559
Partnership Funding - Felixstowe	-	0.1559
Partnership Funding - Heacham	-	0.1018
Partnership Funding - Lowestoft	-	0.0779
Partnership Funding - Caistor	-	0.0779
Partnership Funding - Southwold - The Common	-	0.0779
Partnership Funding - Spalding	-	0.0395
Partnership Funding - Deeping	-	0.0312
Partnership Funding - Great Billing	-	0.0291
Partnership Funding - St Neots	-	0.0239
Partnership Funding - Lowestoft	-	0.0197
Partnership Funding - Biggleswade	-	0.0083
Partnership Funding - Flag Fen	-	0.0042
Partnership Funding - Flag Fen	-	0.0021
Partnership Funding - Demand Driven schemes	-	4.910

Also explain any overlap (if any) between this investment proposal and any improved performance you are expecting as measured by your "internal or external sewer flooding" or "risk of sewer flooding in a storm" performance commitments

As described above, where proposed partnership funding opportunities addressed internal or external sewer flooding or risk of sewer flooding in a storm, these have been removed from this business case (to be consistent with Ofwat's approach to other companies).

The remaining investment supports long term resilience of our assets and water recycling network and helps adapt to the challenges of climate change.

3.4 Supporting information

We have 6 letters of support of Partnership working which can be found in Annex 8d to our PR19 DD Representation:

- Emma Howard-Boyd, Chair of the Environment Agency
- Paul Hayden, Chair of the Anglian Eastern Regional Flood and Coastal Committee
- Brian Stewart, Chair of the Anglian Central Regional Flood and Coastal Committee
- Eddie Poll, Chair of the Anglian Northern Regional Flood and Coastal Committee
- Robert Cauldwell, Chair of the Association of Drainage Authorities
- Julia Beeden, Chair of the ADEPT Flood and Water Management Group

3.5 Resilience Case Studies

3.5.1 Overview

During AMP6 we are due to work in partnership on 49 separate schemes with 22 separate Risk Management Authorities. This will deliver a range of benefits, including reduced flood risk from a range of sources, including surface water, sewer, fluvial and coastal flooding, reduced loss of service, reduced pollution, creating resilient infrastructure, and improving places for people to live, and significant savings to customers, currently over £22m.

Two examples of working in partnership are outlined below:

3.5.2 Stamp End, Lincoln

Back in 2007, a storm event passed over Lincoln that resulted in 77 dwellings flooding internally, including a large block of flats. There were additional properties that flooded externally, extensive flooding of the highway and local businesses, and 80 households were evacuated to temporary shelter. All of the properties affected by this flooding fall within the 20% most deprived areas as defined by the Office of National Statistics.

This incident also prevented access to Anglian Water's offices at Enterprise House in Lincoln, causing major disruption to the running of our Operations Management Centre (OMC) on an unbelievably busy day.

The same area flooded again in 2009, although not as severely this time around, resulting in external flooding in several streets.

The Lead Local Flood Authority in this area, Lincolnshire County Council, identified a partnership approach to jointly fund a flood risk reduction project. Completed in early 2018, this approach significantly reduced the risk of flooding to the properties previously affected and ensured that Anglian Water's OMC is reachable by staff even in times of heavy rain.

The partners involved in the scheme included Lincolnshire County Council, the Environment Agency, a major local business and the local Internal Drainage Board, as well as Anglian Water. Cllr Lewis Strange, Chairman of Lincolnshire County Council's Flooding and Drainage Scrutiny Committee said: "This scheme will help to reduce the risk of flooding to hundreds of residents in the Stamp End area and I am delighted that Anglian Water are helping to fund this work in partnership with ourselves, the Environment Agency and the Witham Third Internal Drainage Board. This is a fantastic example of how the different authorities involved in managing flood risk can work together to benefit the lives of our communities".

3.5.3 Clacton on Sea

In Clacton on Sea we have a very large trunk sewer along the sea front, constructed in 1999 to collect all the wastewater from the town, which was at risk from coastal erosion. If this tunnel was to fail, approximately 90% of Clacton would be without mains sewerage service and bathing waters would become polluted.

Tendring District Council led work to deliver enhanced sea defences that would protect the town, and our critical infrastructure from coastal erosion.

To assess if we should contribute to the works we undertook an independent review of the rate of erosion, as well as cliff face and slip circle analysis, to see when and if our sewer would be affected in the event of coastal erosion. The work identified that the sewer would fail if the coast was allowed to erode at some point between 15 and 50 years time.

Given the potential widespread disruption to customers and the impact on the environment, as well as the substantial costs of building and/or repairing a trunk sewer, we concluded that it would be appropriate to work in partnership with Tendering District Council and contribute £3m (less than 10% of the total scheme costs) towards the project, a potential saving to customers of c. £20m.

4. MEETING LEAD STANDARDS

Table 7 Investment Summary Table

	April plan (£m)	DD Ofwat position (£m)	Representation (£m)
Capex	25.023		18.168
Opex	4.728		4.738
Total	29.751 (31.154[1])	11.026	22.906 (24.287[2])

1 Water in buildings
2 Water in buildings

In Anglian Water's DD, Ofwat proposes the following for Quality Enhancement investment related to lead.

4.1 Ofwat Proposal

OFWAT has allowed £11.026m (against our requested totex of £31.150m) for the meeting lead standards enhancement case, (this also included a totex allocation of £1.403m for our water in buildings enhancement).

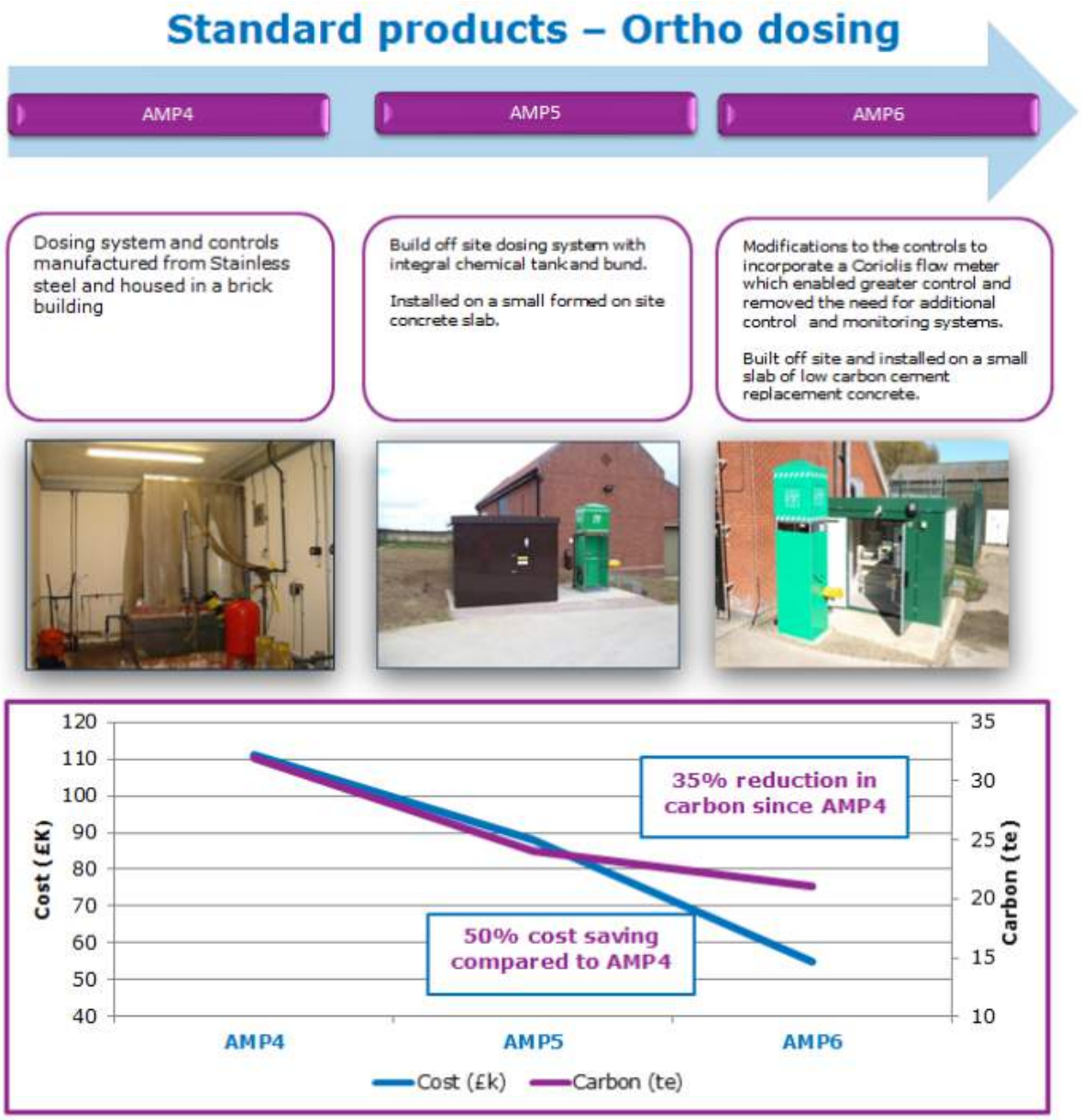
This includes the removal of £0.34 from a specific efficiency challenge on water treatment costs due to the lack of costing explanation for the orthophosphoric acid dosing costs. The further analysis/ arguments provided by OFWAT within the shallow dive sheet for our treatment costs include the following bullet point:

'There is a significant lack of detail and difference in costing's >200K per orthophosphoric acid dosing installation between presented by AW (£55k) and the monies forecast £2.718m) – thus company specific efficiency challenge'.

4.2 Orthophosphoric acid dosing installation costs further evidence

Within our IAP response we included further break down of our robustness and efficiency of costs, this referenced the decrease in the costs of that standard product over AMP4, AMP5 and AMP6. This information is provided below.

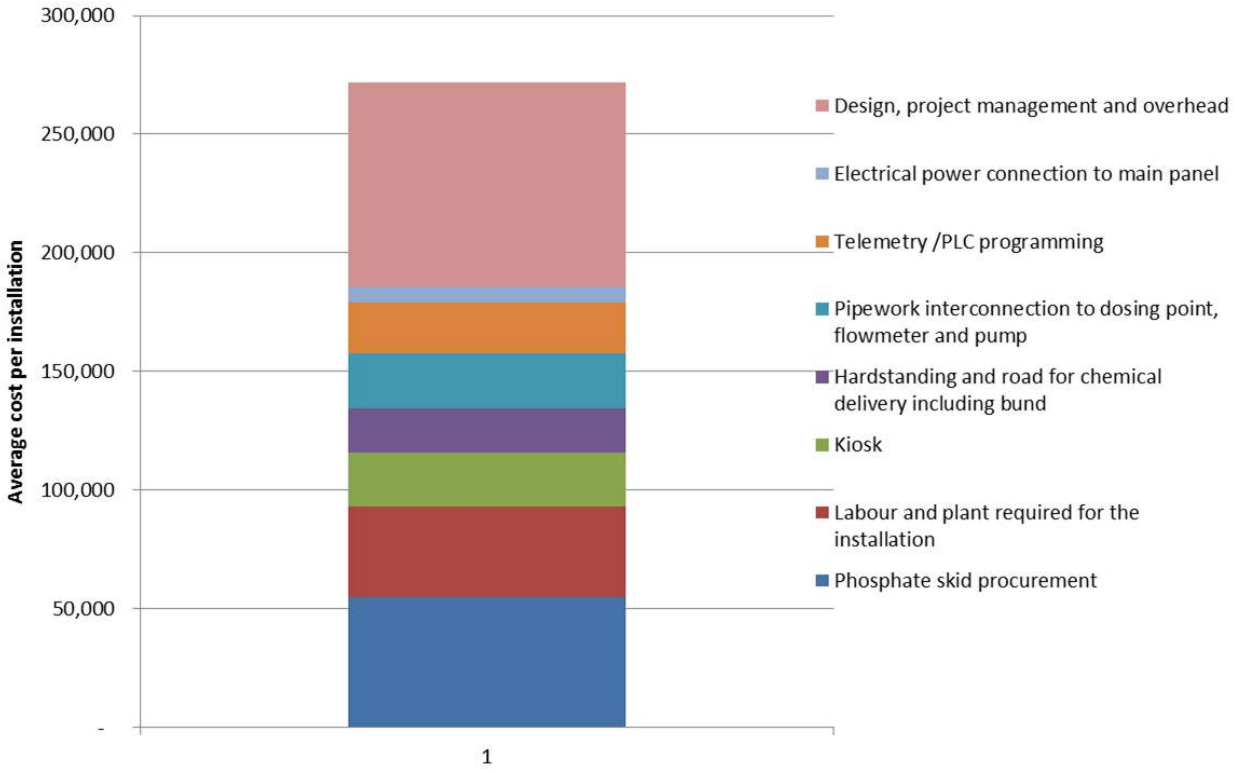
Figure 1 Ortho Dosing - AMP4 to AMP6



Cost	£111.2k	£88k	£55k
Carbon	32te	24te	21te
Number delivered	17	23	18
Average time on site	6-7 weeks	3-4 days	3-4 days

The £55k cost is for the product only i.e. the dosing skid and does not include installation and ancillaries. Further evidence of the average cost breakdown for a new orthophosphoric acid dosing plant installation is provided below. The example below provides an average cost of £271k.

Figure 2 Orthophosphoric Acid Dosing - total installation cost breakdown



4.3 Ofwat position on the model application for lead pipe replacement

Our IAP Response requested a total totex of £31.150m, for the lead enhancement and our water in buildings enhancement cost, the latter included £1.403m of the overall totex cost.

OFWAT has removed £19.74m from the model application (Modelled treated water distribution costs [50% log model, 50% unit cost model] which is driven by the number of lead pipes replaced).

Within our IAP response we did not make any changes to this enhancement business case. However, we did provide additional information on the breakdown of the analysis of pipe replacement.

Ofwat's position on the lead pipe replacement is based on the unit cost of each pipe (£/pipe). Ofwat has taken an industry unit cost based upon all water company submissions. Ofwat's DD unit cost per pipe industry unit cost (medium) is £1,353.

Our Sept 2018 Plan and IAP Response included the cost of the customer's side of the pipe.

Based on our historical costs and cost base models, the cost to replace a lead communication pipe was £1028, at an average length of 2 metres, giving a unit rate of £514 per metre of pipe replaced. For AMP7, our proposal included the replacement/rehabilitation of both the communication pipe and the customer owned side of the pipework. The length therefore is significantly longer, our cost build up uses an estimated average of 20 metres. Our business plan submission included the cost of replacing the customer's side of the pipe on all of the proposed 5250 lead pipe replacements.

Following the DD, we have refined our approach and revised this to include the communication pipe (AW side) replacement of the 5,250 pipes and the replacement of the customer's side of the pipe on 2,250 of those pipes. The 2250 has been calculated using historical run rate for reactive

replacements . This is broken down to 1,750 reactive pipe replacements (to include both the communication pipe and the customer's side) for example following a lead failure, and a focused trial area within planned replacement areas of 500 customer side pipes.

This has resulted in £6.86m being removed from our Plan.

4.4 Why it matters (significance/effect)?

We have developed our planned and reactive pipe replacement investment to align to the 'Long term planning for quality of drinking water supplies' and the DWI requirement to consider the benefits of the replacement of the customer side of the pipework.

DWI considers lead to be a significant health risk and requires companies to consider the benefits of replacement of the customer's side pipework within their lead strategies. We consider that this revised approach to the number of customer side replacements, continues to align to the DWI requirements. Additionally we envisage that the lead notice which we currently await to be issued from the DWI will include a requirement to consider replacing the customer side pipework.

The inspectorate requires companies to consider alternatives to plumbosolvency control measures for lead pipework and assume duration of up to 50 years to minimize affordability issues. This includes specific reference to the customer's pipe.

DWI has supported the upgrading and installation of plumbosolvency treatment at selected WTWs within their letter of support (ANG3 – Lead strategy) as well as a scheme of lead replacement. The draft lead notice includes upgraded or new plumbosolvency control at 10 sites and the consideration of replacement of the customer's side as part of the pipe replacement. We are awaiting the issue of our lead notice.

DWI has supported the water in buildings within their letter of support (ANG05 - Water in buildings – various parameters) and we have a regulation 28 notice (LI/ANH/2018/00002).

In summary we believe that the above investments provide valuable enhancements to the service we provide our customers in the area of quality enhancement and should be allowed by OFWAT at Final Determination.

5. RESILIENCE

Table 8 Investment Summary

	Post reallocation value (£m)	DD Ofwat position (£m)	Representation view (£m)
Totex	55.646	17.082	30.118

5.1 Summary

Our business plan has systems thinking at its heart, and has been built on the needs of our customers, protecting the environment and being resilient to the potential future shocks and stresses. Our plan was A rated for customer engagement and reflects the priorities of our customers. Customers have told us that they value the service that we provide to them and that they expect us to be resilient to events that put that service at risk. In this section we focus on areas where we need to enhance the resilience of that service to protect our customers.

To develop our PR19 Plan we created a 'bottom-up' planning process, developed to address our needs and build asset resilience. This was based on our robust and detailed understanding of risk and asset need and involved stakeholders from across the business. In this portfolio we utilised system thinking to identify additional specific investments to mitigate known resilience risks in our systems. Our Risk, Opportunity and Value (ROV) methodology uses the 4Rs (Resistance, Reliability, Redundancy & Response and recovery) to identify the most effective and efficient systems, process and projects that will enhance resilience.

This systems thinking approach is integrated within our business, with our internal systems, processes and decision making all being strongly interconnected and linking back to our assessment of shocks, stresses and mitigations. Further information on our approach to resilience can be found in our response to IAP Action AN.LR.A2 "Anglian Water: Systems Thinking" submitted to Ofwat on 22 August 2019.

Ofwat's DD View

After reallocations, the total expenditure assessed within the water resilience enhancement line is £55.646m which comprises of the following:

Single source of supply risk management (£18.338m; £18.058m capex and £0.280m opex): seven investments to connect isolated communities to a second source of water supply. The investment is accepted as it mitigates the risk to customers only fed from one supply point through interconnecting mains, exploiting synergies with the WRMP strategic inter-connector schemes.

- *Known water quality challenges (£3.631m; £3.244m capex and £0.387m opex), including: an ultra violet plant (UV) at Covenham Water Treatment Works to mitigate cryptosporidium risk (£2.167m); one investment in the Hartlepool region to dual an existing water main to reduce the risk of customers receiving discoloured water (£0.877m); and enhanced river flow monitoring at one of their reservoirs (£0.587m). These schemes are not allowed under the resilience lines since they address persistent water quality problems that are outside of the scope of resilience enhancements, particularly in terms of the failure modes and probability of the events causing failures or that these are beyond management control.*
- *WTW resilience (£29.674m; £29.389m capex and £0.285m opex), including: telemetry improvements and other related investments (dashboards, panels and monitors) (£12.120m); installations to reduce fire risk in critical electrical panels at 35 sites (£0.419m); upgrading unreliable incoming power supplies at 50 sites (£0.642m); installation of run to waste facilities (£14.061m) and standby dosing lines (£1.374m). The power resilience scheme is accepted, but the other WTW resilience projects are rejected as these relate to either: process failures whose mitigation is within management control, maintenance investments, and site emergency plans that should be in place.*

- *Supply system resilience (£3.940m; £3.930m capex and £0.010m opex): Communications resilience investments to provide communications back-up (£1.098m) are considered to be covered by base funding. The investment to duplicate mains at critical infrastructure crossings (£2.842m) is not sufficiently evidenced to be accepted, particularly regarding key aspects of the risk that the scheme mitigates (i.e. failure mode, probability of failure, consequence for customers and an explanation that these are beyond management control).*

The total investment passed within the need for investment gate is £18.980m.

Ofwat's view that other areas of investment are included in botex is inadequate as these other areas of investment provide additional protection to customers from unforeseen resilience events and therefore should be enhancement investment. In failing to provide the investment for these areas it means we will not be able to deliver these programmes to enhance resilience to customers. We provided additional evidence to support the need in our April IAP response and we have demonstrated that these are strongly supported by customers.

After careful consideration we will not make representations on a number of Ofwat's proposals as set out in the DD with the exception of three areas;

- water treatment works (WTW) critical shutdown systems
- proactive risk visualisation dashboard
- critical infrastructure crossings

These are investments fall within enhancement and provide particularly significant additional protection to customers from resilience events We provide further evidence to support the need for these investments

The combined investment requested is £29.857 which includes expenditure allowed in our DD.

We have reflected in our plan the removal of investments in the following areas:

- known water quality challenges
- WTW resilience
- Supply system resilience

Table 9 Investments included in DD representation

Resilience enhancement investment	Capex (£m)	Opex (£m)	Totex (£m)
Single Source of Supply[1]	18.196	0.253	18.449
Fluvial and Pluvial flooding[1]	0.039	0	0.039
Power resilience[1]	0.645	0	0.645
WTW Resilience	7.602	0.540	8.142
Critical infrastructure crossings	2.840	0.003	2.843
Total included in our Revised DD representation	29.322	0.796	**30.118**

1 Allowed at DD

We set out below further detail in additional to our query response.

There are two drivers of our Water treatment works resilience programme;

- Firstly replacing all of our critical shutdown systems for Safety Integrity Level (SIL) rated shutdown systems
- Creation of a proactive risk visualisation dashboard.

We believe these should remain in this enhancement portfolio and have provided additional specific evidence for these two areas.

We also believe that one further area should remain in the enhancement portfolio, further evidence is provided for the investment to duplicate mains at critical infrastructure crossings. No further evidence was requested at IAP so it is provided here.

5.2 Additional evidence

5.2.1 Water treatment resilience (£8.142m)

Critical shutdown systems

During AMP5 and AMP6, we have led the water industry in the development of advanced process safety principles and their application to the water industry. This has involved engagement with Industry leaders from the Health & Safety Executive (HSE) and hazardous chemicals industries where high reliability of safety critical systems is key to risk management. We have hosted two water industry seminars on process safety and represents the water industry on cross industry process safety groups including the Chlorine User Network (hosted by the Chemical Industries Association). A key area of focus has been assessing, and where necessary improving the design and reliability of safety integrated control systems. By utilising best practice hazard assessment techniques such as Layers of Protection Analysis (LOPA) and Bowtie analysis we have ensured that all of our critical safety systems have been assessed and where necessary redesigned to meet the required Safety Integrity Level (SIL).

We have applied Process safety principles to our learning to protecting the water quality for our customers. During AMP6 we have redesigned our water quality shutdown systems that provide final protection in the supply to our customers.

- **the specific cause of service failures and associated probability of failure the investment is proposing to address**

Although relatively rare there have been incidents in the water industry where water quality shutdown systems have been known to fail. Traditionally, water quality shutdown systems are of a hardwired electro-mechanical design and are designed to fail in a “Safe” mode as far as is possible. However, certain mechanical failures of a component can result in failure in a “Non-fail-safe” mode and fail to shut down the process allowing potentially un-disinfected water to be supplied to customers.

To further protect our customers from these low probability but high impact failures we have completely redesigned our standard design for our water quality shutdown panels and have moved to SIL 1 rated Programmable Logic Controllers (PLCs) as a new standard. These PLCs are intrinsically designed to provide greater reliability for these systems and an enhanced level of protection for our customers.

- **the consequence of failure to customer service**

Failure of a water quality shutdown system is a low but high impact event which could lead to a loss of supply, or restrictions placed on water usage such as a requirement placed on customers to not drink or need to boil their water before drinking. Our customers tell us that the resilient provision of safe clean drinking water is their highest priority.

- **how the failure and the consequence are currently beyond management control.**

The failure rate is low on the electro-mechanical shutdown panels but failure leads to a high impact event for our customers. All such shutdown panels are subject to regular testing and inspection but this cannot identify failures that are not age related or predictable so therefore cannot be foreseen or planned for, and is therefore outside management control. Due to their nature and design the current systems do not meet the requirements of a safety integrated system and consequently have no designated SIL rating. This investment has been identified to reduce this risk by replacement of all critical shutdown panels with SIL rated systems. We believe this is a necessary investment and fully aligns to our customer priorities of Safe Clean Drinking Water and Resilient Service.

We believe it is incorrect to exclude this investment from enhancement and classify it as botex expenditure as this investment is providing an enhanced level of protection to our customers. Furthermore we believe that this is also creating a new level of understanding and risk assessment in the industry.

Risk visualisation dashboard

We have developed a proof of concept in this AMP for one of our water treatment works by creating an innovative risk dashboard which will give a single view of assets in an easy-to-use and navigable way. The dashboard identifies predictively where, through asset failure or water quality changes, the risk of supply interruptions is increasing. Utilising our asset criticality models, combined with real time asset performance data and current water quality information, our risk dashboard provides both a current and predicted risk status allowing early intervention to protect the service to customers.

We were recently recognised by the DWI for this work in their 2017 Chief Inspectors Report where they commented on our workshop at Barrow WTW highlighting that the findings have contributed to programmes of work to address risks associated to single points of failure over the coming years. Our water treatment works resilience programme will link closely with the development of improved reporting systems for the new Asset Health Performance Commitment of Unplanned Outages.

- **the specific cause of service failures and associated probability of failure the investment is proposing to address**

This investment is to proactively identify water quality and asset failure scenarios leading to low probability but high impact loss of supply events impacting on our customers.

Working with a specialist consultant we have developed a proof of concept criticality dashboard for Alton WTW. The aim of the project was to:

- Model the capability and criticality of assets on the site
- Identify investment needs for PR19 that eliminate single points of failure, critical for site operation and maintaining water supply and quality during challenge periods e.g. poor raw water quality or extended high demand
- Visualise this for the operator with a dynamic dashboard giving one view of the assets.

The criticality model assigns each asset on site a risk score based on likelihood and consequence of failure. This allows assets to be categorised and ranked so that the current risk can be compared with predicted future risk.

Risk = Probability of Asset Failure

*Probability mitigation failure (e.g. duty/standby)

*Financial consequence of failure

The criticality score was validated at Hazard and Operability (HAZOP) workshops with site teams therefore using direct site knowledge on reliability and performance at asset level in a range of water quality scenarios.

- **the consequence of failure to customer service**

This investment is to protect customers from significant loss of supply events arising from asset failure and water quality changes.

Alton WTW was chosen as the proof of concept site as this is a critical source where we are unable to have significant outage without substantial impact to our customers and the problems it would cause the business in terms of supplying emergency alternative supplies (classified as our worst case scenario under SEMD criteria). The DWI class this works as ‘too large to fail’ and therefore it requires an increased level of resilience. Sites such as this cannot be recovered from a failure event before normal safe service to customers and the environment is impacted.

The identified investment is to fully implement this risk dashboard at Alton WTW and all other sites where critical asset failure presents a risk to service to customers.

DWI have set an expectation for the industry, (based on a number of industry events over recent years where usage restrictions have been put in place (do not drink, or boil notices) as potentially non-compliant water has been been supplied to customers) that appropriate management controls must be put in place such that process failure or water quality changes do not result in a scenario where usage restrictions are the only available option. A failure of final water shutdown system is an example of a situation which would create such an event. DWI consider these events are enforceable offences. We assessed all our water treatment works for failure against our interruptions to supply criteria which incorporates time for customers to be affected and population impacted. This resulted in 32 WTWs which were then investigated with detailed HAZOP studies.

- **how the failure and the consequence are currently beyond management control.**

This investment provides a predictive capability to identify scenarios that could arise from asset failure event and exogenous conditions such as changes in water quality which create a risk to customers of either a loss of supply event or deterioration in water quality. Current capabilities do not allow us to accurately predict these risks to Customers and thereby adequately protect them from the consequential risk of loss of supply.

5.2.2 Critical Infrastructure crossings (£2.843m)

During AMP6 we have carried out extensive work to identify and risk assess all locations where our assets cross or interact with other significant infrastructure or natural features. This includes rivers, railways and major trunk roads and includes aerial crossings (pipe bridges) or buried crossings.

We have identified over 850 high risk infrastructure crossings that require enhancement to protect customers from significant loss of supply in the event of asset failure. We have prioritised these assets to those presenting the highest risk to customers using the following methodology to identify the highest risk assets based on the consequence of failure:

- All potable pipe crossing asset numbers where extracted from our geospatial mapping system (GNET).
- Road, rail and river crossings where then filtered by mains greater than 300mm and longer than 10 metres.
- Using our business impact matrices, particularly the number of properties affected by supply interruptions and an estimate of cost based on length and diameter this list was further prioritised.
- The prioritised list was then reviewed and validated in detail by the operational network modellers, who confirmed the supply interruption impact and in some cases grouped some of the mains into schemes. This identified the 14 highest priority schemes providing the best cost benefit which were then taken forward into the investment.

Note: These schemes by their very nature are complex engineering schemes, predominantly due to their location and accessibility.

- **the specific cause of service failures and associated probability of failure the investment is proposing to address**

This investment area is not to address maintenance issues but to provide additional protection by duplicating critical asset to protect customers from the impact of unpredictable or premature failures of infrastructure mains which interact with other critical infrastructure.

As previously described we have taken a system approach to resilience and We have identified investments in this portfolio which are by their nature low probability but high impact events with result in premature or unforeseen asset failure, this may be due to 3rd party damage or stresses caused by other utility infrastructure. The chosen solution is to duplicate the critical infrastructure in the area where repair is problematic and time consuming and what would be an otherwise routine asset repair leads to a protracted supply interruption to our customers (see case study)

- **the consequence of failure to customer service**

A recent case study is included as an example of the impact on customers from this type of failure. As shown in the below case study, the risk from asset failure at these crossings pose an inherently higher impact to our customers as repairs are likely to be protracted and difficult.

In addition to this, and particularly in the case of road and rail networks, the indirect impact on customers can also be significant and involve closure of access to the affected assets resulting in major disruption in the area. We have therefore focussed on these assets as higher risk.

- **how the failure and the consequence are currently beyond management control.**

These investments are not resulting from maintenance needs identified through our regular asset health reviews but have been prioritised based on their significant impact to customers and provide additional protection from asset failure whatever the root cause.

An event in 2017 continued heightened our focus on the criticality of these crossings and the risk they pose to customers from the impact of long and complex repair operations and the need to protect our customers from this sort of resilience event by removing these single points of failure. We have identified a significant number of these crossings and will look to address these over a number of AMPs.

Flint Hill Interruption to Supply Incident (March 2017)

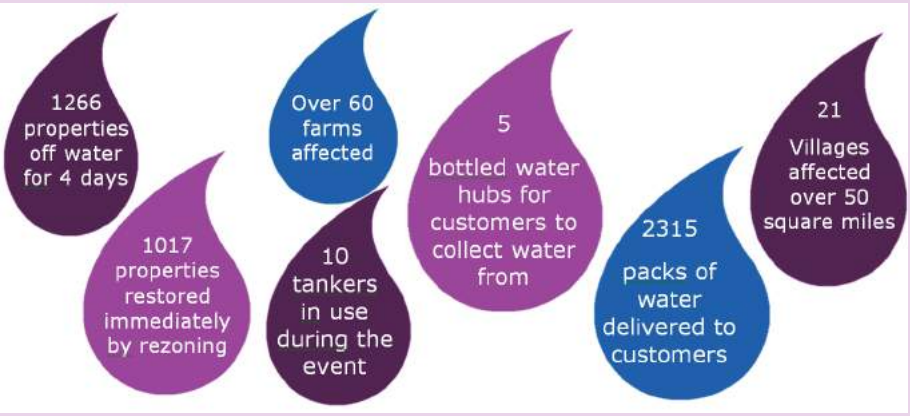
Overview of the event

This incident was an interruption to supply event caused by a burst water main, whilst under normal circumstances this would be a routine event dealt with quickly, due to the location of this particular burst, a long and protracted loss of supply event ensued.

A 12" cast-iron water main burst under the River Bain (Asterby) at 03:15 on 5th March. This water main supplied 222 properties in the villages of Hemingby and Scamblesby, before supplying Flint Hill Water Reservoir. The burst was located at 11:00 on 5th March.

Flint Hill Water Reservoir subsequently emptied at 12:15 which resulted in an additional 1044 properties going off water. The first No Water call was received at 07:04 and as of 10:15 (6th March) we had received 53 calls for No Water and 25 calls for Low Pressure.

The event was closed at 18:25 on the 10th March after full replacement of the damaged main by directional drilling.



Response

The repair could not be completed immediately due to its location under the river. Due to this, a significant alternative supplies operation was required to keep customers provided with water until supplies could be restored.

- Some properties were rezoned and supplied via a different main.
- One area was fed solely by tankers injecting into the system.
- As a temporary measure to restore water supplies to the other affected properties, an overland main was connected on 6th March to bypass the damaged section of main.
- Bottled water was delivered to seven Priority Services Register customers, two Nursing Homes and two Schools.

- Bottled Water Hubs were set up in the villages of Tetford, West Ashby, Belchford, Fulletby, and Hagworthingham and manned 24/7 from 6th March to 10th March to allow customers to pick up bottled water.
- Six Anglian Water tankers were in use throughout the incident.
- Four additional tankers were brought in through Mutual Aid (from Severn Trent Water and Water Direct).
- Tankers were continually in use keeping Flint Hill Reservoir topped up, while also injecting into the system and keeping farms on water.
- The Customer Support Unit was deployed to Tetford Village Hall on 6th March and to act as a focal point for customer liaison.

Resolution

Due to the location of the burst (under the river), excavation and repair was not possible. Directional drilling was used to drill two new mains under the river. Two 180mm water mains were installed to replace the damaged water main.

Over 150 operational staff & contractors were involved in keeping supplies maintained and installing the new mains.

Directional Drilling started on 7th March and the first main was installed, connected and commissioned and by 9th March, with flushing and sampling taking place to ensure water quality was acceptable prior to putting into service.

All customers were back on water by 10th March.

The second main was commissioned on 13th March and ground restoration work was completed by 24th March.

5.2.3 Summary

In summary we believe that the above investments provide valuable enhancements to the service we provide our customers in the area of resilience and should be allowed by Ofwat at Final Determination.

6. WATER SEMD AND NON-SEMD

Table 10 Investment summary table

	April plan (£m)	DD Ofwat position (£m)	Representation view (£m)
Totex	28.103	12.451	16.811

In our DD, Ofwat proposes the following for Enhancement Investment related to Security (Security and Emergency Measures Direction (SEMD) & non-SEMD).

6.1 Ofwat's DD

Ofwat's view is that "*companies have previously been funded enhancement expenditure to bring their networks up to the required SEMD standards by the end of AMP6. For most companies, we expect any SEMD requirements beyond this date to be funded through companies' base expenditure as we would not consider the ongoing costs to be a significant enhancement to their service. We do not propose to allow any SEMD costs for the company as it has spent above the average company expenditure (as a proportion of base totex) on security enhancement and the company has not provided sufficient evidence to demonstrate why these costs should be classed as enhancement.*

Non-SEMD

The main non-SEMD costs of £15.1m (£13.4m capex/£1.7m opex) are required to comply with the Network and Information Security (NIS) Directive which is a new regulatory requirement. The company states it will deliver the following in PR19

- *create reference operational technology (OT) secure architecture based on latest security policies (covers all OT systems, including supervisory control and data acquisition (SCADA))*
- *surveying most vulnerable sites to assess risk posed in event of cyber incident and assess work required to bring in line with reference architecture*
- *implement core data centre systems and networks needed to deliver reference architecture*
- *implement remedial work at highest risk sites*
- *penetration testing of SCADA systems*
- *develop cyber security standards based on OT/SCADA security policies.*

We note Anglian Water's argument that these costs are to meet NIS Directive standards rather than replacing out-dated equipment. However, the company forecasts higher non-SEMD costs than most other water companies and some of the costs, (such as surveying vulnerable sites or penetration-testing for example) could be considered as base expenditure. The company needs to provide further explanation to demonstrate why these projects do not fall under its base expenditure. Due to this uncertainty surrounding the scope we disallow 20% of the non-SEMD costs for our draft determinations.

Due to the uncertainty surrounding non-SEMD costs, we consider that a performance commitment based on the delivery of specific projects would enable this gate to be classed as a 'pass'.

Ofwat has accepted the need for Resilience investment in order to comply with the Network and Information Security (NIS) Directive. We provide further evidence to support the classification of this work as enhancement expenditure.

We disagree with Ofwat's rational regarding SEMD expenditure being covered by Botex expenditure. We believe all these investments provide additional protection to customers from unforeseen resilience events. The SEMD expenditure specifically relates to improvements and enhancements to the system rather than on-going maintenance. and is a specific Defra requirement.

SEMD enhancement investment in previous AMP periods has been to meet the requirements of DEFRA advice notes and the recommendations of company and site CPNI audits. As such the requirements are very site and company specific and do not have a direct relationship to Botex expenditure.

We are making representations on two areas of SEMD expenditure which should be included within enhancement expenditure. Including the areas allowed at DD the total value is £16.811

Table 11 SEMD and Non-SEMD Enhancement Investment - NIS directive

	Totex (£m)
NIS directive[1]	15.183
Mobile Treatment Facilities – Potable water tankers	0.961
Emergency preparedness – Ozone at site W	0.667

1 allowed at DD

We have reduced our plan in the following areas:

- mobile treatment facilities
- emergency preparedness

There are two areas in the above investments (identified below) which are specific new requirements that have arisen during AMP 6 and require investment. We believe these should remain in this enhancement portfolio and have provided additional specific evidence for these two areas.

6.2 Additional evidence

[redacted]

[redacted]

[redacted]	[redacted]		[redacted]		[redacted]	
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]						
[redacted]						
[redacted]						

[redacted]

[redacted]

6.2.3 Network and Information Security (NIS) Directive – additional evidence

Need for investment

The non-SEMD enhancement costs are specifically required to comply with the Network and Information Security (NIS) Directive which is a new regulatory requirement.

Our enhancement costs are directly attributable to ensuring vulnerable sites are compliant with the new regulatory requirements. The replacement of automation control asset within this enhancement is in order to meet minimum IT and Security standards over and above obsolescence. Investments such as a Security Operations Centre (SOC) included by other companies as enhancement, and allowed in full by Ofwat at DD, have been have already been implemented by us in AMP6 under botex.

Prior to the NIS directive, surveying sites for cyber security vulnerabilities was not a recognised requirement and therefore not undertaken. Within this enhancement investment, site surveys will explicitly target the determination of a site's cyber risk status and remediation activities required for compliance. Post survey and mitigation, Operational Technology penetration testing to ensure the effectiveness of the mitigations will be required, and this level of testing is over and above that currently carried out within base expenditure, as the nature and complexity will increase due to the volume and technology capabilities being implemented.

We note that Ofwat considers our non-SEMD costs are higher than other water companies.

Our review of other companies' enhancement claims shows a wide variety of what companies have included in their plans. Our enhancement requirement is targeted and specific to the additional expenditure required to comply with the NIS directive, so the focus is on Operational Technology at Water sites, whereas other companies include more general cyber investment as enhancement. We have not, for example included mitigations at water recycling centres as enhancement as others have done, or included general cyber capabilities such as a Security Operations Centre within enhancement.

It is not clear how Ofwat has reached the conclusion that our costs are higher than other companies other than at the total investment level unless companies have provided additional information outside of their business plans with greater detail on activities and unit costs that is not available to us. We have one of the largest telemetry systems in the industry, and have provided evidence of the number of sites to be surveyed and how we have arrived at a cost per site. The scale of our programme is determined by the number of sites to be surveyed and mitigated – we would expect our overall Non-SEMD investment to be proportional to the relative size of our programme.

Robustness and efficiency of costs

Within the proposed programme there are 106 sites identified that have automation control that will require investigation (survey) and remediating to meet the Industrial Control System Security Standards, as directed by the Anglian Water OT security policy, created to align to the Defra Cyber Assessment Framework and NIS Directive.

The delivery approach proposed utilises a standardised technology model to ensure a consistent and repeatable implementation. The enhancement costs have been determined using a tiered cost model, compiled with standard vendor pricing for Hardware and Software and, to recognise individual site complexity, an averaged cost per implementation for the resource and variable cost components.

Customer Protection

To protect customers we have introduced a performance commitment to survey 106 sites and implement the required enhancements to be compliant with the Industrial Control System Security Standards at 100% of sites identified by the surveys to be at high risk. If, for example, we mitigated only 80% of the high risk sites by the end of AMP7, we would return 20% of the funding to customers in the form of an ODI penalty. For more information please see chapter 5 Outcomes in the Main Representation document.

Summary

In summary we believe that all of the above investments provide valuable enhancements to the service we provide our customers in the area of security and should be allowed by Ofwat at Final Determination.

7. BIORESOURCES

7.1 Ofwat proposals

Ofwat's DD disallows £31.16m from enhancement investment for the Bioresources price control compared to our September plan. The areas include for MCPD (medium combustion plant directive) for our CHP engines, diesel generators and boilers, sludge input monitoring for flow and dry solids and additional sludge treatment capacity at two of our Sludge Treatment Centres (STC) to cater for the impacts of growth and the WINEP quality programme.

Ofwat disallowed £22.896m because it considered that evidence provided for need for additional capacity is unconvincing. £0.5m remains to support sludge market development.

Ofwat's view was *"The evidence provided of the need for additional capacity is not convincing: if the company wants to operate for the required capacity of 160,100tds in 2025 at 90% capacity, then the required total capacity is circa 177,900tds which is only approximately 2,100tds higher than the currently available total capacity. Therefore, in our view, Anglian Water does not require investment to the extent proposed."*

7.2 Our Position

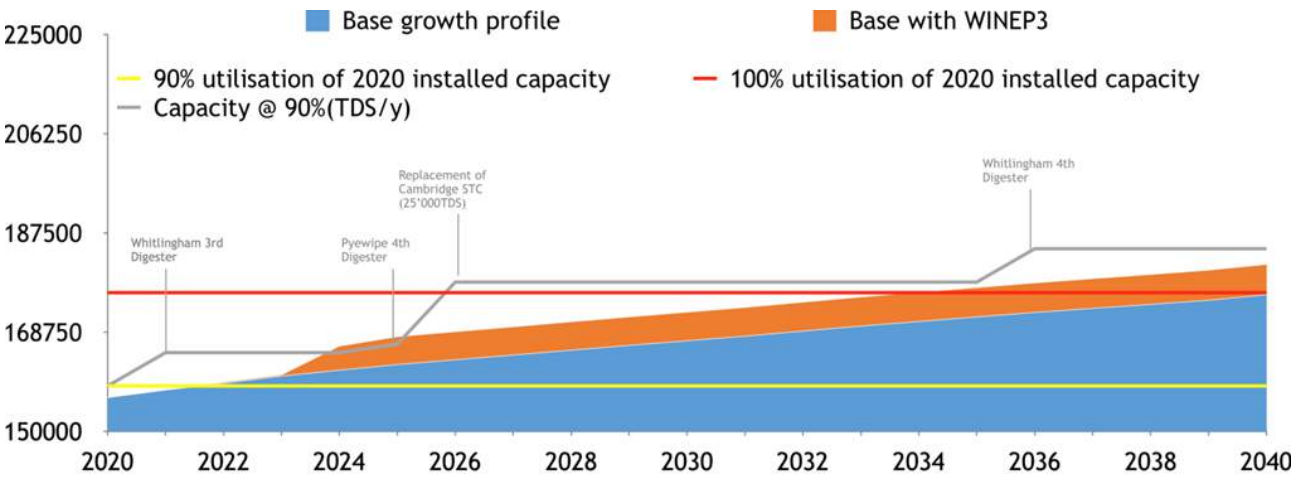
In Representation we accept Ofwat's DD assessment for the investments regarding enhancements to CHP engines, diesel generation and boilers for MCPD compliance and have removed these investments from our plan.

We accept Ofwat's DD with regards enhancement investment for sludge input monitoring at all input points for both flow and dry solids on the basis our current method of measurement at the point of treatment meets Ofwat's revised requirement as stated in the DD response documents. We have removed these investments from our plan.

We challenge Ofwat's DD on removing our investments at Whitlingham and Pyewipe for additional sludge treatment capacity to cater for planned growth and the impacts of additional sludge resulting as a consequence of implementation of the AMP7 WINEP programme for phosphorus removal.

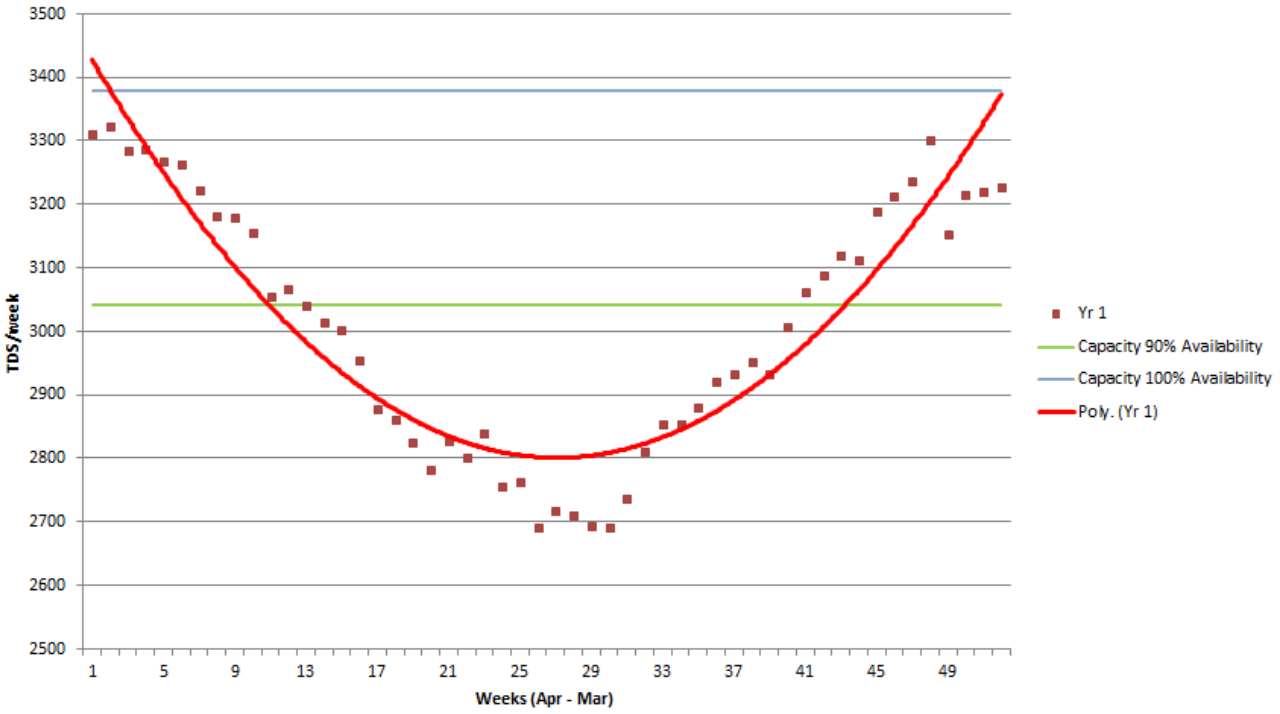
Figure 3 below is taken from our April IAP Response document showing our planned investments over time with the impacts of growth and WINEP. The basis of this plan is that we invest in additional capacity as impacts of growth and WINEP take us above 90% of our design average capacity of our STC asset base. Previously the trigger for additional capacity was 80% of the design average capacity and we acknowledge by increasing to 90% that use of markets and trading will provide a significant role in our strategy and production planning going forward.

Figure 3 Planned investments over time with the impacts of growth and WINEP



We believe Ofwat has not taken into account the seasonal nature of raw sludge production, assuming that sludge production is consistent across the year. Figure 4 below shows the seasonal nature of production based on four years on historic operational sludge stock data. The graph also shows available sludge treatment capacity at the design average throughput of our STC's at 90% availability, allowing for 10% for planned and unplanned downtime across the asset base. This graph shows when operating the STC's at 90% of the design average capacity for approx. 24 weeks of the year production can be expected to outstrip available treatment capacity. We manage these periods by flexing our assets, balancing sludge production through storage and working with markets for potential trades or by use of mobile treatment plants.

Figure 4 2020-21 Production vs STC available capacity

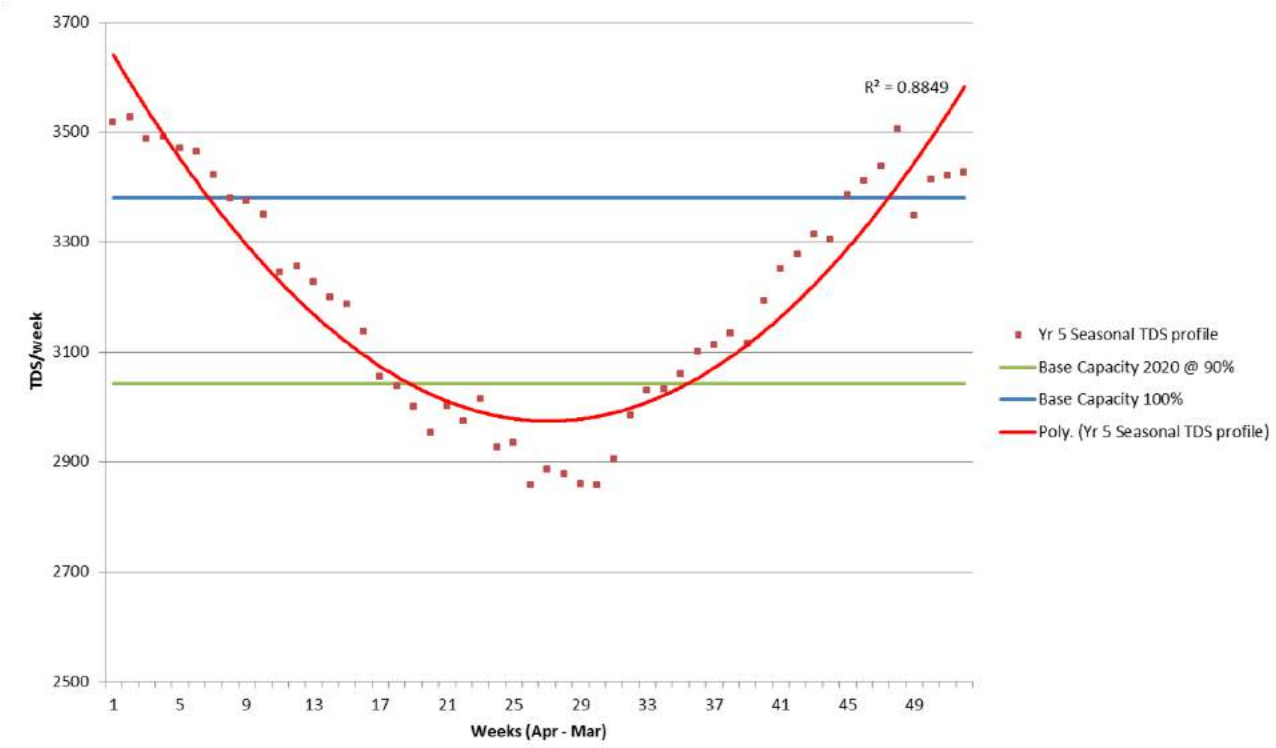


The allowance of no enhancement funding for additional capacity is not sustainable and presents a significant risk to our service, customers and the environment. It is also contrary to the views expressed by customers and stakeholders from our market engagement included as supporting information in our September 2018 plan and our April IAP response demonstrates they were in favour of providing additional capacity to cater for growth.

7.3 Ofwat's DD

Figure 5 below shows the impact at the end of AMP7 with no additional capacity in line with Ofwat's DD. In this scenario with the impacts of growth and WINEP as per our September Plan raw sludge production outstrips available capacity approximately 34 weeks per year and for 14 weeks of the year production outstrip total available capacity with assets 100% available. Whilst we acknowledge use of markets presents opportunity and needs thorough evaluation in comparison to building additional capacity we do not believe at present the market is able to provide guaranteed resilient capacity, any contract for guaranteed capacity with a neighbouring WASC would also be on the basis of a fully loaded gate fee which would include capital costs elements as opposed to short term non-committed trades which typically have gate fees for the marginal operating cost plus fees only. The seasonal variance in sludge production will be broadly similar across all WASCs limiting available capacity for trading during peak sludge production, at present viable trades are largely limited to our three directly neighbouring WASCs as a result of the legislative restrictions and challenges surrounding co-treatment.

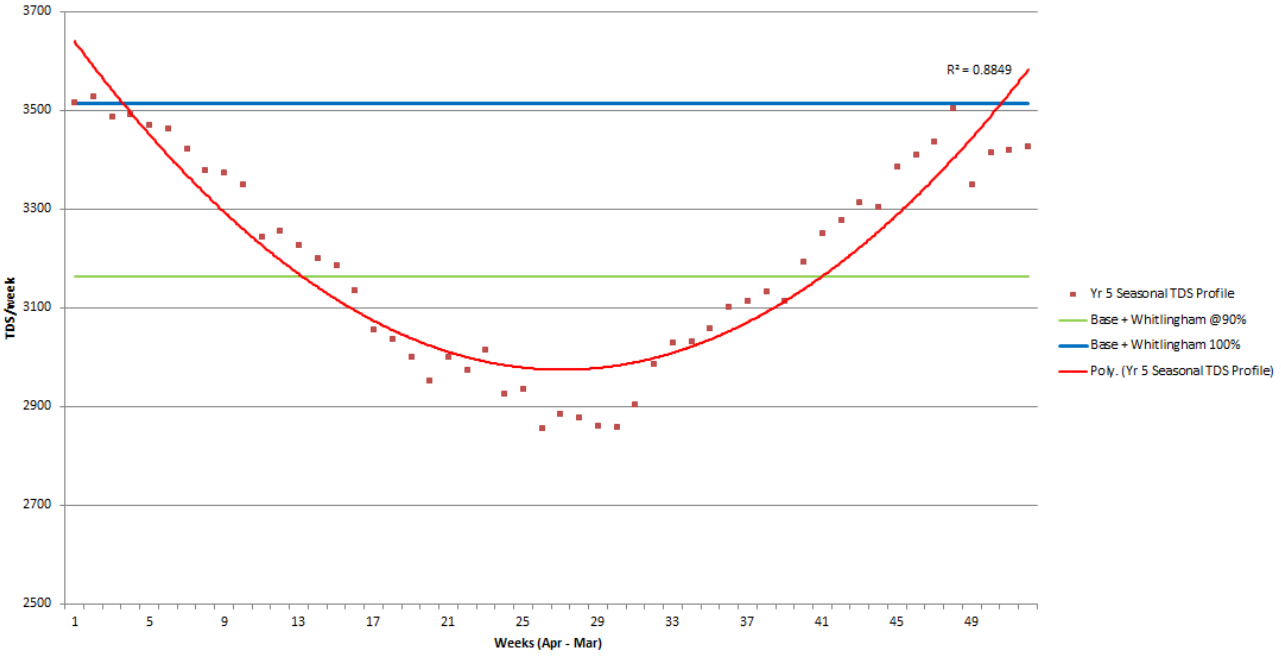
Figure 5 2024-25 Production vs STC available capacity (no additional capacity)



7.4 Our proposed investment

Our Representation is based on retaining our enhancement investment at Whitlingham only, deferring the planned investment for additional digestion capacity at Pyewipe until AMP8. Figure 6 shows that this scenario with the impacts of growth and WINEP as per our September 2018 Plan, raw sludge production outstrips available capacity approximately 24 weeks per year. Therefore our revised plan means we would end AMP7 in a broadly similar position as at the start of the AMP. In this scenario we would continue with our strategy to use production planning, storage and markets to manage the variances between production and capacity. As set out in our September 2018 Plan and our April IAP response we do use markets, historically trading with Yorkshire Water importing raw sludge cake into our STC's at Great Billing (Northampton) and Pyewipe (Grimsby) and we expect these any other trades to continue this year and in the future.

Figure 6 2024-25 Production vs STC available capacity (Whitlingham only)



7.5 Summary

In summary our Representation for Bioresources Enhancement is to accept elements of the DD by removing investments for MCPD and sludge input monitoring. We have also removed the additional digestion capacity at Pyewipe by deferring this to AMP8. Our Representation retains the additional digestion capacity investment at Whitlingham in order to maintain our available operational capacity versus raw sludge production as broadly the same levels at present whilst acknowledging and supporting developments of markets. Our revised enhancement plan is £12.537m totex.

8. OTHER CHANGES TO OUR PLAN

8.1 Summary

In addition to the above change, we have provided further information on reductions we have made in our Plan since our IAP Response.

8.2 Event Duration Monitoring: Further evidence

At IAP we explained that we believed it was not correct to include HDD in the model analysis as a clear outlier. Ofwat has not followed this advice. Ofwat has however moved to a totex model as we suggested. Recognising the clear differences between WASCs approaches to costing this investment, we have taken steps to review any reasons for variance between our own assumptions and those of other water companies and the latest technologies being used in our delivery teams in AMP6. The result of this exercise has been to remove £6.4m from line 6 in WWS2. The changes have been as follows:

We have revised the EDM scope based on the latest technologies in use in our delivery alliances in AMP6 and changed the telemetry unit reprogramming to Radio link connection, this has removed around £4,239 per site

We have liaised with the Environment Agency and other WASCs and revised the fee applicable for EDM, from a complex variation at £6,029 per site to a minor variation £2,010 per site

In light of the publication of the June WINEP which has seen more obligations turn green, we have removed those investments where the confirmed obligation occurs on the same site as a U_IMP6 obligation for storm tanks, which also includes provision for EDM monitoring

8.3 s.101 A: Further Evidence

In our IAP Response we noted that given the model relies on skewed data where two companies represent the vast majority of spend and outputs, a deep dive would be more appropriate. We remain of this view. However, since April we have been able to update our First Time Sewerage programme which has resulted in changes to both costs and outputs. The changes are outlined below.

The number of connectable properties has been updated by reviewing each villages by either site visits or by the use of online maps. This has resulted in an increase in connectable properties.

We work closely with the Environment Agency to encourage uptake of the offer of a connection to the sewerage network. Our September 2018 Plan included costs for lateral connections for all properties in the duty area. In our DD Representation the number of lateral drain connections has been reduced by 20% to align with actual connection rates form recent schemes.

The Little Bealings scheme has been deferred by 1 year which effectively defers the actual delivery into AMP8. This is following a review based on the appeal through the Environment Agency and the 3 nearest Wastewater Treatment Plants do not have the capacity to accept these increased flows.

The Knapton scheme was promoted as an AMP7 transition scheme as part of our plan to smooth delivery resource. Whilst this has now been removed by Ofwat from the allowed transition expenditure, the work completed revealed that an existing rising main can be re-used. We have therefore updated the costs of this scheme removing over £1m capex.

The impact of the above changes is to reduce the spend on line 1 of WWS2 by £3.138m