PR24

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A3-12 WASTEWATER TREATMENT GROWTH

NES26

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1. INTRODUCTION

Under Section 94 of the *Water Industry Act 1991* it is our duty to provide, improve and extend sewage disposal works to facilitate new development. The consequence of too much new development is that the dry weather flow (DWF) and quality parameters of the wastewater treatment works (WwTW) discharge permit will be exceeded, causing environmental harm to the rivers or the sea.

This business case forms part of our Drainage and Wastewater Management Plan (DWMP) and describes the enhanced investment required to upgrade five WwTWs. This will deliver existing service levels to new customers as a result of new development and provide monitoring at six WwTWs. Investment relating to this case is recorded in the PR24 enhanced data tables lines entitled “growth at sewage treatment works (excluding sludge treatment)”.

In the final methodology guidance Ofwat has stated that it intends to assess, where possible, new development at WwTWs using new enhancement models. Therefore, we have prepared this business case on the basis that costs will be assessed as enhancement costs. We have assumed that where the preferred option is to remove infiltration from the network to increase headroom at the WwTW to accommodate new development, this will be funded through base expenditure.

Our preference is that the DWMP and the analysis behind it should be used to determine allowances through an engineering assessment / deep dive. We intend to invest £51.698m capex and £2.257m opex over the AMP8 period to upgrade 5 sites and provide monitoring at a further 6 sites.

This expenditure is set out in Table CWW3 in lines CWW3.153 to CWW3.155; and lines CWW3.181 to CWW3.182. We have used the extra expenditure lines CWW3.181 to CWW3.182 to separate the additional flow monitoring to measure whether growth is required at sewage treatment works.

2. NEED FOR ENHANCEMENT INVESTMENT

2.1. ALIGNMENT WITH STATUTORY PLANNING FRAMEWORKS

We have developed our plan for assessing the capacity of WwTWs as part of the drainage and wastewater management plan (DWMP) framework. Table 1 provides a high-level overview of how we have incorporated the DWMP principles into this business case.

TABLE 1: MEETING DRAINAGE WASTEWATER MANAGEMENT PLAN PRINCIPLES

Expectation	How this has been met
Be comprehensive, evidence based and transparent in assessing, as far as possible, current capacity and actions needed in 5, 10 and minimum 25-year periods considering risks and issues such as climate change. Plans should also align, as far as possible, with other strategic and policy planning tools.	We have assessed the impact of new development in 2030, 2045 and 2060. We have extrapolated data points to 2035. Further detail is contained in section 2.2.3.
Strive to deliver resilient systems - that will meet operational and other pressures and minimise system failures.	Before we consider upgrading of our WwTWs to accommodate growth, we firstly consider whether a works has been optimised to work according to its design parameters. Where high levels of infiltration are present in the network then it is removed from the network to create extra headroom for growth at the treatment works. Both of these items are carried out from base allowances. Further detail is contained in sections 2.3.1 and 3.1.
Consider the impact of drainage systems on immediate and wider environmental outcomes including habitats and in developing options for mitigation to include consideration of environmental net gain and enhancement Improve customer outcomes and awareness and that solutions and actions provide both value for money and consider societal benefits	Our assessment of benefits takes into account a wide range of environmental and social outcomes such as amenity and biodiversity which form part of our value framework. While we have considered wetlands as a potential option, for accommodating growth they do not represent best value for customers in this instance and have not been selected as the preferred option. We have made these decisions using customer valuations and external benchmarks of the benefits (including the impact on wider environmental outcomes, see section 3.3). Our research shows that although customers do support wider environmental and social benefits, they are not able to pay for these in the context of other priority (and “must do” investments). In some areas of our plan – such as storm overflows – there are some “near miss” options which include the opportunity for wider benefits at a relatively low marginal cost (but technically exceed best value by a small margin), and we have subsequently asked customers their views on these in the round too. However, there are no “near miss” options for growth at WwTWs.
Be collaborative - recognising the importance of sectors working together to consider current and future risks and needs and to deliver effective solutions, setting out how they will do this, how they have engaged with and responded to stakeholders	Our optioneering process considers a broad range of options including how we can collaborate with customers to reduce demand, how we can work with local authorities to understand the rate of new development and how we can collaborate with other stakeholders to deliver projects which deliver wider benefits to communities. For example, at Morpeth we are working with Coca Cola to remove a trade effluent discharge which is removing unused spring water from a borehole and discharging it into the surface water systems in AMP7. This will increase the amount of headroom at the WwTW and reduce the size of the upgrade required in AMP8. Section 10.1 on page 45 of our DWMP technical summary explains how we have engaged with stakeholders.

Expectation	How this has been met
Show leadership - in considering the big picture for an organisation's operational capacity to develop and deliver the plan, and be mindful of linkages with other strategic planning frameworks.	Our DWMP and this business case takes into account a multi driver approach considering the overlaps with: • the WINEP programme; • the resilience of treatment works to factors such as increasing risk from fluvial/pluvial flooding and loss of power during storms; • the removal of infiltration from the sewerage system. We applied a geographical catchment-based approach to our planning. Browney also has a WINEP P removal driver which requires a TAL of 0.25 mg/l. We have developed a solution that addresses the growth driver at Browney and also the WINEP driver. There would be efficiency realised if interventions required were delivered at the same time. We have assessed the capacity of the supply chain to deliver and have appointed our strategic partner for AMP8 delivery. We intend to deliver two of the projects as early start.

The consequence of having too much new development is that the DWF and quality parameters of the WwTW. Our plan considers the impact of growth on DWF permit conditions as set out in WISER guidance[1] which has two changes for AMP8:

- There is a statutory obligation for the 2025-2030 period to have 100% compliance with flow conditions, including DWF at WwTWs. We started shadow reporting in AMP7, with the first reference year being 2022, and the Environment Agency expects that DWF will be included in the discharge compliance metric from 2026[2], when we must achieve DWF compliance for three out of five years.
- The Environment Agency are reviewing compliance with descriptive discharge permit conditions for 2026 to 2030, and they expect to consult on this during the EPA review in 2024/25[3]. Six sites within this investment case have descriptive permits. The Environment Agency may consider compliance reporting either within an existing EPA metric or for reporting separately. For 2026 to 2030, they will consider reporting on compliance with descriptive conditions of wastewater discharge permits that have numeric conditions. For example, descriptive or non-numeric permit condition breaches could include those associated with the management system condition. They may also include non-compliances of Operator Self Monitoring (OSM) conditions.

[1] WISER Requirements, Environment Agency, May 2022
[2] Water and sewerage company Environmental Performance Assessment Methodology V9 2021-2025 – section 8.2.1, Environment Agency, May 2021
[3] Water and sewerage company Environmental Performance Assessment Methodology V9 2021-2025 – section 8.2.1, Environment Agency, May 2021

2.2. PROCESS FOR IDENTIFYING NEED FOR ENHANCEMENT EXPENDITURE IN AMP8

2.2.1 Approach to forecasting new development

Our DWMP modelling uses BRAVA[4] planning horizons of 2030, 2045 and 2060. It forecasts when WwTWs are likely to exceed their DWF permit as a result of growth, climate change, urban creep and other factors.

We work in partnership with local government, developers, landowners, local communities and other key stakeholders to make sure every opportunity is taken through the planning system to protect our operational assets and fully support growth within our region by ensuring that infrastructure capacity is available by influencing decisions.

We used data from a third party, Edge Analytics, for our population forecasts. This data brings together population, property and occupancy forecasts derived from local plans published by local councils and unitary authorities. These are consistent with the requirements in the water resources planning guidelines for WRMPs, and so are consistent with our Water Resources Management Plan (WRMP) and Ofwat's **long-term delivery strategy guidance**. These provide the most accurate forecast data at a local level, whereas ONS forecasts are at a regional level and do not provide a detailed understanding of where there are likely to be new developments – particularly important for modelling small treatment works where new developments can have a large impact.

We wanted to test that this data was sufficiently robust, and so we cross-referenced this to development sites in Local Development Plans. Our Developer Services Team monitor any proposed developments of 10 housing units and above in size (or floorspace equivalent, for commercial and industrial development) from the initial pre-planning enquiry stage, through the planning approval process and discharge of planning conditions. We record this on our GIS system, which allows us to see anticipated development by location, by date, by size and by certainty. This helps to understand the magnitude and rate of development.

We have assessed the impact of growth on WwTW DWF permit compliance in our DWMP. This has been assessed against the existing per capita consumption (PCC) of water and our ambitious targets to reduce PCC to 110 litres per head per day by 2050. Our ambitious target is our preferred plan, and the existing PCC is identified as an adaptive plan.

Every year we use the flow data from our MCERTS monitors to cross check our actual DWF against our projected flow to make sure our headroom against permitted flow is accurate, and that we can plan in sufficient time to provide services to new developments. Table 2 shows the increases in population for the WwTWs which will require an intervention in 2025-30.

[4] Baseline Risk and Vulnerability Assessment

TABLE 2: POPULATION FORECAST

Treatment Works	2025	2030		2035		2045		2060		LP Development sites
	PE	PE	%	PE	%	PE	%	PE	%	No of props to 2045
Aldin Grange	2,474	3,014	21.8	3,050	1.2	3,166	3.8	3,257	2.8	288
Birtley North Tyne	69	117	70.7	129	10.3	146	13.0	151	3.2	32
Bowburn	12,506	12,910	3.2	13,082	1.3	13,560	3.7	13,942	2.7	439
Brasside + transfers	1,255	5,928	372	6,365	7.4	6,566	3.2	6,758	2.8	1766, major site at Sniperley Park. (Transfer 2026.) 871
Browney	22,248	22,466	1.0	22,759	1.3	23,405	2.8	24,751	4.2	482
Eglingham	134	173	28.5	182	5.6	189	3.7	197	4.1	23
Great Whittington	206	223	8.1	261	17.1	275	5.3	282	2.6	37
Gunnerton	178	178	0.0	206	16.1	244	18.2	252	3.4	28
Morpeth	20,986	21,674	3.3	22,454	3.6	23,719	5.6	24,751	4.2	2127. 1700 by 2036 in three major development sites 1139
Newton on the Moor	126	126	0.0	140	11.4	163	16.4	169	3.6	16
Rennington	199	210	5.8	217	3.3	229	5.2	234	2.2	24

2.2.2 Approach to forecasting impact of new development on DWF

Table 3 shows the results of our modelling for population increase on DWF consent, which reflects the timing and magnitude of the need. We have used the 80th percentile figure, which is the flow value that is exceeded 20% of the measured total daily flow and is used to represent the DWF[5]. When designing a new works or assessing the future capacity needs, we use the 80th percentile value. To assess compliance, we use the 90th percentile value.

TABLE 3: MODELLED EXCEEDANCE OF DWF AGAINST PERMIT DUE TO POPULATION GROWTH BASED ON 80TH PERCENTILE

Treatment Works	Consent m³/d	2020-2022 80th percentile rolling average	2023-2025 80th percentile rolling average	2025 80th percentile m³/d	2030 80th percentile m³/d	2035 80th percentile m³/d	2045 80th percentile m³/d	2060 80th percentile m³/d
Aldin Grange North	576	476	489	497	581	579	583	592
Bowburn	2,618	2486	2590	2768	2814	2816	2841	2882
Brasside + transfers from 2026	1,054	581	624	622	1376	1421	1408	1426
Browney	4,676	4580	4605	4676	4704	4739	4805	4900
Morpeth	4,400	3948	4107	4371	4452	4533	4631	4749

[5] The Environment Agency Guidance for calculating DWF at WwTWs (8 May 2019) states that the non-parametric 20th percentile value of a time series of total daily volume data provides a good estimate of DWF.

The 80th percentile represents 365*3 *0.80 = 876 day. Guidance is 80th percentile over 3 years as a dry day.

Our forecast for **Aldin Grange** is our based-on Edge analytics data which is consistent with the data in the WRMP. This has a large increase by 2030 and a small increase subsequent to that. We will continue to monitor the local plans for development information to make sure our that we are providing capacity in line with the rate that development is continuing.

Bowburn is not currently exceeding its DWF consent in 2023, but we are currently forecasting that the DWF will exceed it in 2024 as the first out of three years. This is due to 825 properties which currently have planning permission, with some construction starting on site. Our business plan includes transition expenditure in 2024-2025 to make sure DWF is met for three out of five years from 2026.

Brasside + transfers – there is major development planned at Sniperly Farm, which will drain to Brasside. In 2026 the transfer of two small works Pity Me and Plawsworth to the Brasside outfall pipe will be complete. This transfer is being carried out using AMP7 investment to avoid the WFD WINEP driver for P removal at Pity Me and Plawsworth and the Ammonia limit at Pity Me. Any further reduction to an increase in DWF would not be permitted as it would deteriorate the waterbody. Therefore, the only option is to close Pity Me and discharge to a much larger water body – the river Wear. The upgrade of Brasside for the purpose of growth in AMP will be requested under this business case.

Browney is not currently exceeding its DWF consent in 2023, but we are currently forecasting that the DWF will exceed it early in AMP8. Our business plan includes transition expenditure in 2024-2025 to make sure DWF is met for three out of five years from 2026.

Morpeth – Population has been growing steadily and is forecasting to increase by 3% between 2025 and 2030 and by a further 4% before 2035. There are three major development sites planned for the area. Our forecasts up to 2025 for DWF take account of a 138 m^3/d reduction in flows treated at the works due to the removal of a trade effluent discharge from Coca Cola which is removing unused spring water from a borehole and discharging it into the surface water systems in AMP7. This has been approved on appeal and a revised permit application has been submitted and is currently being processed by the Environment Agency. Our business plan includes transition expenditure to make sure DWF is met for three out of five years from 2026.

Table 4 shows we have six small sites which have permits ranging from 15 m^3/day to 37 m^3/day. Using Edge analytics data, they are forecasting to exceed their permits, but development is more likely to be from infill developments. Therefore, it is more difficult to track. For these sites we are intending to install flow monitoring to be able to track development more easily.

TABLE 4: WWTW TREATING LESS THAN 37 M3/DAY

Treatment Works	Consent m^3/d	2025 80 percentile[6] m^3/d	2030 80 percentile m^3/d	2035 80 percentile m^3/d	2045 80 percentile m^3/d	2060 80 percentile m^3/d
Birtley North Tyne	15	12	24	24.3	25	26
Eglingham	28	24	30	30	30	32
Great Whittington	37	32	38	38	38	40
Gunnerton	36	29	41	41	41	42
Newton on the Moor	25	20	34	34	34	36
Rennington	32	32	36	40.3	49	51

2.2.3 Impact of new development on quality parameters

Table 5 sets out our assessment of future quality standards in the discharge permit as a result of new development. We used the most stringent of the following two criteria for each site:

- **Water Framework Directive** (no deterioration) – ammonia, phosphorus, and biochemical oxygen demand (BOD) levels were assessed using the SAGIS model and the River Water Quality Planning Tool. The assessment considered maintaining river classification status and preventing current quality performance from deteriorating by >10% of the current measured mean.
- **Pro rata ratcheting** – where measured in-river water quality data was not available for suspended solids and BOD, we applied a percentage reduction to current permit requirements, based on the growth in flow at the WwTW.

The future permit assessment was based on DWF 2040, as we carried out RQP (River Quality Planning) tool runs for 2040.

TABLE 5: CHANGE IN QUALITY CONSENT AS A RESULT OF NEW DEVELOPMENT

Treatment Works	Existing consent				Future consent (2040)				
	SS (mg/l)	BOD (mg/l)	NH4-N (mg/l)	P (mg/l)	SS (mg/l)	BOD (mg/l)	NH4-N (mg/l)	P (mg/l) No deterioration	With WFD P driver
Aldin Grange	70	50	30	0.7	69	32	5.2	0.6	
Bowburn	70	10	5	0.25	67	6	2	0.25	
Brasside + transfers	60	40	30	/	40	17	7.5	1.6	0.25
Browney	30	20	5	1	29	16	1.78	0.7	0.25
Morpeth	35	25	11	2	33	11	2.8	0.7	0.25

For Bowburn, it is proposed to relocate the outfall as part of the WINEP chemicals programme, therefore the ammonia and BOD will not need to perform at this level so a relaxation could be agreed with the Environment Agency.

[6] The Environment Agency Guidance for calculating DWF at WwTWs (8 May 2019) states that the non-parametric 20th percentile value of a time series of total daily volume data provides a good estimate of DWF.

2.2.4 Overlaps with AMP7 or historical investment

The proposed enhancement investment does not overlap or duplicate with activities already funded at previous price reviews. Table 6 shows the WwTWs where we are providing existing services to new customers as a result of new development during AMP7 and the range of options we have considered. Based on the PR19 models we estimate at the end of last year there is an implicit allowance of ~£20m over an AMP for growth at WwTWs. Our analysis of DRSA indicates there could be a further £11m for AMP7 at the end of the from the true up for growth and sewer flooding which we intend to spend.

TABLE 6: INTERVENTIONS TO ACCOMMODATE NEW DEVELOPMENT PLANNED FOR AMP7

Upsizing of treatment works	Removal of infiltration to increase headroom at WwTW	Transfer of flows to alternative WwTW with existing headroom
Embleton	Nenthead	Plawsworth and Pity Me to Brasside (funded under WINEP)
Howdon (part delivered)	Chilton Lane	
Lynemouth	Miilfield	
Rothbury	Trimdon Village	
Wolsingham	Powburn	
Morpeth (no longer required)	Ulgham	
Carlton and Redmarsh (no longer required)	Thropton and Snitter	
Shilbottle (no longer required)		
Longhirst (no longer required		

2.3. NEED FOR ENHANCEMENT EXPENDITURE IN AMP8

2.3.1 Base vs enhancement

Table 7 sets out our assumptions for what we have included within our base and enhancement cases. This table assumes that the following conditions are met:

- Growth is assessed through a separate econometric model for enhanced expenditure,
- There is no overlap between items funded at previous price reviews,
- We are not requesting funding for historical growth,
- We are delivering upgrades to WwTW failing their DWF permit limit in AMP7,
- We are spending growth allowances this AMP taking into account DRSA and true-ups (£31m).

TABLE 7: OUR ASSUMPTIONS AROUND BASE AND ENHANCEMENT

Base	Enhancement
• Ensuring a WwTW is operating as it should be • Items funded at previous price reviews • Historical growth • Upgrades to WwTW failing DWF permit limits in AMP7 • Removal of infiltration from the network to release headroom at the WwTW	• Provision of existing service to new customers. We have clearly linked all increases in flow back to planned new development.

We have used our infiltration tool, which reports the minimum nightly flow in each WwTW catchment, to identify the level of infiltration at each of our WwTW's. Where infiltration is high, we have removed the site from our enhancement case and put it in our base investment programme. For example, we removed Thropton and Snitter from our AMP8 Enhanced programme to start in our AMP7 base programme. All of the remaining sites have low levels of infiltration. Finding and removing low levels of infiltration can be complex and costly to achieve particularly if infiltration is spread throughout the catchment. This would require detailed CCTV surveys and installation of flow monitoring at different points within the catchment to trend flows over time. This may also mean extensive relining of pipes. Unless infiltration is high and concentrated in a limited number of areas the realisation of benefits and the cost of removal is uncertain.

2.3.2 Link to long term strategy

In our DWMP, we modelled the future investment needs for maintaining compliance through to 2060, using the Ofwat scenarios for long-term delivery strategies to test against climate change and demand. This identified that these investments were needed in 2025-2030, and also identified further risks for monitoring.

This investment is needed under both the benign and adverse climate change and demand Ofwat common reference scenarios. We therefore consider this to be a 'no regrets' investment, and so it is included in our core pathway in our long-term strategy. This investment is needed under all of our five plausible scenarios considered in our long-term strategy.

We have also identified several other treatment works where monitoring is required to provide more confidence that we can meet our DWF permit conditions in alternative scenarios, and this is also included in our core pathway. This supports switching to alternative plans if needed, such as where one or more of these treatment works is expected to meet its DWF consent before 2030 (in this situation, we would share the risk with customers through cost sharing).

There are no alternative pathways that are relevant to this investment. We have modelled the level of investment over time. The exact requirements over the long term could change, as there will be individual developments that can have a major impact on specific treatment works, but over a large area the investment need is broadly consistent over time.

2.3.3 Factors outside of our control

The rate and size of development is outside of our control. Growth can occur later than expected, earlier than expected or not at all. Our MCERTS monitoring and tracking of developments as they occur allows us to understand how development and therefore flows arriving at WwTWs is changing over time. To increase the confidence of achieving our DWF permit conditions we intend to bring forward investment in process modelling rather than do it at the time we implement a project. This will allow us to react quicker to emerging development ensuring we are always compliant with all permit conditions.

We also intend to install MCERTS on sites of < 50m^3/d where development is forecast but the impact of growth on sites is less certain. This will allow us to adopt a least regrets approach to investment.

2.4. CUSTOMER SUPPORT FOR THE NEED

Customers expect us to understand and manage the risks of climate change and population growth – including the need for upgrades at WwTWs to continue meeting our obligations to meet the DWF and quality parameters of the WwTW discharge permit.

Although we have consulted on our approach through the DWMP, we have not discussed the specific needs with customers. That's because our research shows that customers expect us to meet our statutory obligations, and it is not appropriate to discuss delaying or phasing investment where there are no alternatives to meet the statutory requirement to keep to our permits. Instead, we have based the need for investment on modelling that shows that otherwise, these permits would be breached.

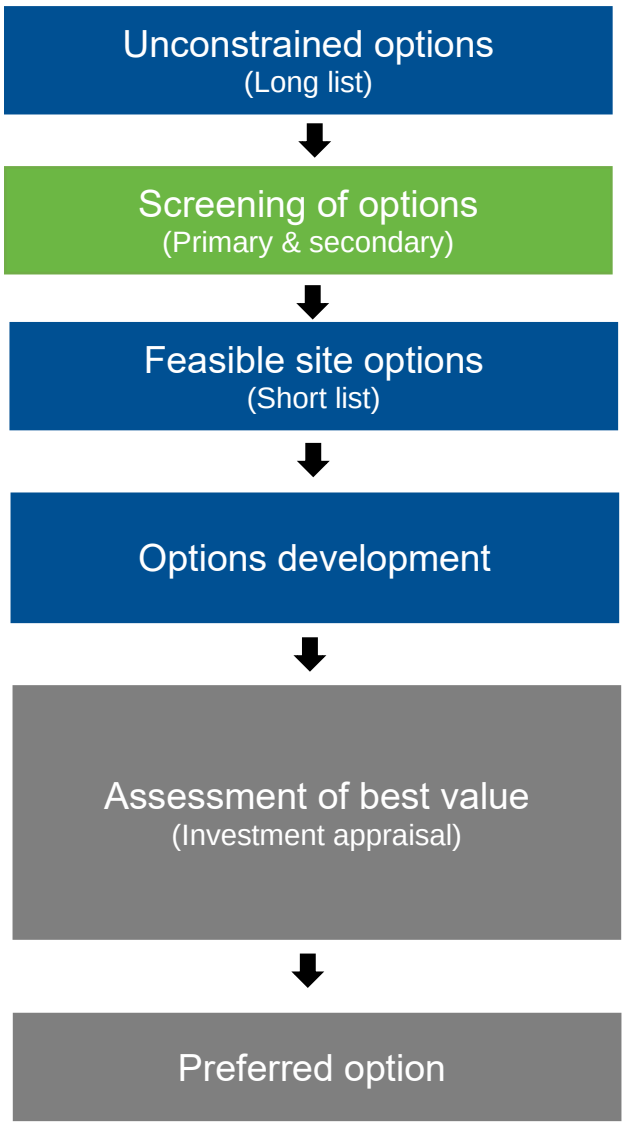
We explain how we have used customer evidence to select the right option in Section 3.7 and explain how customers are protected through a price control deliverable if these investments are not required in Section 5.1.

In our **qualitative affordability and acceptability testing** (NES49), customers supported our "preferred" plan which included growth at wastewater treatment works. Customers found this plan acceptable because it focused on the right things, is good for future generations, and is environmentally friendly. Customers who did not find this plan acceptable said that this was expensive, and water companies should pay out of their own profits. We did not ask specifically about growth at wastewater treatment works (as our individual items were limited only to the largest investments), but customers supported maintaining rivers and reducing pollution (NES49). In our **quantitative research** (NES50), 74% of customers supported our preferred plan, including this investment.

3. BEST OPTION FOR CUSTOMERS

Figure 1 shows our process for identifying the best option for customers which is based on the principles of HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*[7]. A full description of each of the steps and the output from it is contained in the following sections.

FIGURE 1: PROCESS FOR DEVELOPING AND FILTERING OPTIONS



Unconstrained list of technology options (section 3.1)

We have developed a broad range of potential technology options in accordance with the DWMP principles.

Constrained list of technology options (section 3.2.1)

We have screened the unconstrained list of technology option against:
1) expected to meet statutory requirements to accommodate new development and keep to our DWF permit requirements, and
2) technically feasible

Where we have multiple options of a similar type, we have then used a proportional approach to screen out technology options which are obviously less natural capital benefits, higher costs and higher carbon.

Options development (section 0)

We have developed scope to level 2 from a desktop assessment. Process models will be updated as part of the design work.

Assessment of best value (section 3.3)

We have carried out an assessment of benefits and net present value for each of the options from the constrained list at each site, in accordance with the DWMP principles.

We have used the CiRIA B£st tool[8] for assessing the impact of amenity and biodiversity as this provides more practical quantification and monetization of metrics. We have carried out a deliverability assessment in accordance with the DWMP principles.

Preferred option (section 3.3.2)

We have evaluated the least cost and best value options and included our rationale for selecting the least cost option.

[7] The Green Book: Central Government Guidance on Appraisal and Evaluation, HM Treasury, 2022
[8] Construction Industry Research and Information Association Benefits Estimation Tool, ciriabest

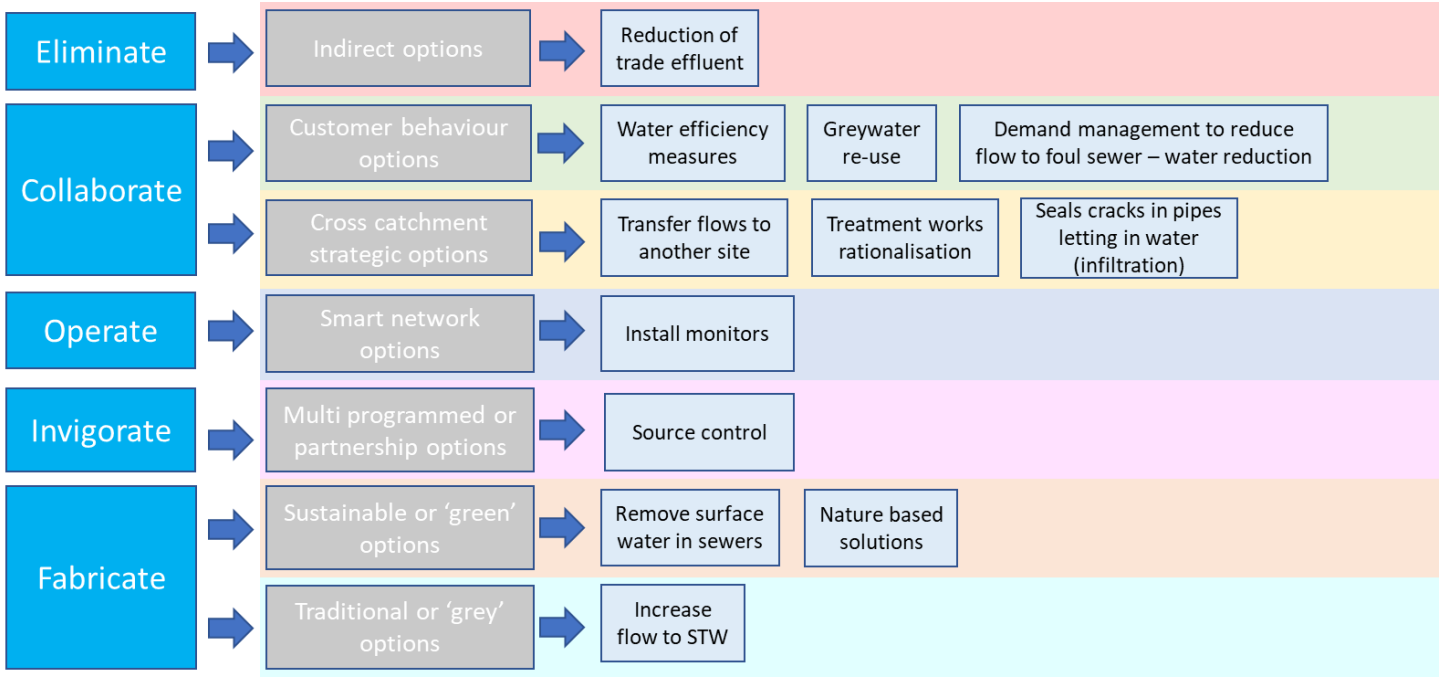
3.1. BROAD RANGE OF OPTIONS

3.1.1 Range of options to meet the need

To determine the best option for customers to address the need, we have followed an options identification and screening process. Firstly, we identified a broad list of options (as shown in Figure 2) which we have considered to increase or release headroom capacity at WwTWs. Our interventions hierarchy includes operational actions, nature-based solutions and influencing customer behaviour. Our hierarchy focuses on minimum and low carbon interventions first.

In accordance with our asset standards, our design horizon for options is 2040. This makes sure we do not fail our DWF permit in the following AMP.

FIGURE 2: INTERVENTIONS FRAMEWORK CONSIDERING RANGE OF APPLICABLE INTERVENTIONS



Our broad range of options considers options with differing levels of costs and benefits categorised as follows:

- Eliminate - identification of processes and practices that can be stopped possibly by stakeholder management or other, and by challenging the need for existence. Eliminate options are likely to have the lowest costs to deliver the benefit. They may be used in combination with other options.
- Collaborate - work with stakeholders to re-assign the issue or co-fund. Costs can be shared with third parties either to deliver the same or an extra level of social and environmental benefit.
- Operate - improved operational management practices to enhance existing capacity.
- Invigorate - invest in the existing infrastructure to improve performance. These options will provide an increased level of benefit but may be of a lower cost than fabricate options.

- Fabricate - new assets to augment or replace existing. These options are likely to have the highest costs. Green options will have lower carbon and potentially higher biodiversity and amenity benefits. Traditional grey options are likely to have highest certainty that service-related benefits will be realised. Innovative options have the potential for greater benefits and lower costs but have the lower certainty that benefits will be realised.

3.1.2 Treatment Works with < 50m³/day

These needs have a single option. Table 8 shows there are six sites which have a descriptive consent and currently treat less than <50m³/d. Due to their small size, they do not currently have a flow meter. We plan to install one early in AMP8 to gain a better understanding of the flow and the impact of any potential growth with a view to upsizing the works in AMP9 if required. This makes sure we are applying a least regrets approach in AMP8 but are keeping options open for the future. Should growth occur this would be accommodated via true up process.

TABLE 8: SITES WITH ONE MONITORING OPTION

Site	Option	NPV over 30 years £m	Type of option
Birtley North Tyne	Install MCERTS Flow monitoring	-0.073	Least cost
Eglingham	Install MCERTS Flow monitoring	-0.089	Least cost
Great Whittington	Install MCERTS Flow monitoring	-0.086	Least cost
Gunnerton	Install MCERTS Flow monitoring	-0.086	Least cost
Newton on the Moor	Install MCERTS Flow monitoring	-0.087	Least cost
Rennington	Install MCERTS Flow monitoring	-0.086	Least cost

3.2. PRIMARY AND SECONDARY SCREENING OF OPTIONS

3.2.1 Results of primary screening

For each of the needs with >50m³/d we undertook primary screening to determine a shorter list of options based on two criteria:

1) Does the option meet the statutory requirement to accommodate new development and keep to the DWF permit conditions?
2) Is the option technically feasible to implement?

The results of the primary screening are shown in Tables 9 to 13.

TABLE 9: SCREENING OF OPTIONS FOR ALDIN GRANGE

Option	Meets statutory requirements?	Technically feasible?	Reason for discarding
Continue business as usual	No	Yes	**Discarded –** DWF permit condition will be exceeded
Reduction of trade effluent – reduce discharge to WwTW to increase headroom	Part	No	**Discarded –** there is no trade effluent flow within the catchment.
Water efficiency measures – install water efficient devices in households to reduce flow	No	No	**Discarded –** alone it is unlikely to be able to achieve DWF compliance.
Greywater re-use Install re-use devices/equipment in households to reduce flow	No	No	**Discarded** – the level of reuse within the domestic only catchment is too high to be viable.
Transfer to another site/rationalise treatment works – divert flows to an alternative WwTW and either use existing headroom or upgrade at alternative works	Yes	Yes	**Carried forward** in primary screening **Discarded** at secondary screening – During AMP7 project a transfer to Browney was considered but was not cost effective and had risk of sewer flooding. Browney also requires an upgrade in AMP8.
Infiltration reduction/source control - Remove surface water or other sources of water from sewers to reduce flow arriving at WwTW.	Part	No	**Discarded** – Infiltration reduction would meet the statutory obligation if 169 m^3/d of flows could be removed. Our desktop assessment of infiltration confirms that this catchment does not have high levels of infiltration. A significant catchment study would be required, to identify the sources and there is no guarantee that infiltration could be removed without incurring excessive costs compared to other options.
Nature based solutions – construction of integrated constructed wetlands	Yes	Yes	**Carried forward –** Significant land purchase would be required for a wetland and adjacent land is unlikely to be suitable as in the flood plain and land is also used by horse owners and re-enactment festivals. This option is carried forward although at high risk.
Traditional upgrades to site – Modification of the permit to incorporate the higher DWF value and upgrades to achieve compliance with the permit.	Yes	Yes	**Carried forward**

Two options to increase flow and capacity at Aldin Grange WwTW have been taken forward for consideration. The nature based solution is high risk, but we have carried this forward so there are two options for consideration.

TABLE 10: SCREENING OF OPTIONS FOR BOWBURN

Option	Meets statutory requirements?	Technically feasible?	Reason for discarding
Continue business as usual	No	Yes	**Discarded –** DWF permit condition will be exceeded
Reduction of trade effluent – reduce discharge to WwTW to increase headroom	No	No	**Discarded –** there is no trade effluent flow within the catchment.
Water efficiency measures – install water efficient devices in households to reduce flow	No	No	**Discarded –** alone it is unlikely to be able to achieve DWF compliance.
Greywater re-use Install re-use devices/equipment in households to reduce flow	No	No	**Discarded** – the level of reuse within the domestic only catchment is too high to be viable.
Transfer to another site/rationalise treatment works – divert flows to an alternative WwTW and either use existing headroom or upgrade at alternative works	No	No	**Discarded** - The WwTWs in the locality are small sites without numeric consents, so are unable to accommodate extra flow. During AMP7 a transfer to Browney was considered but was not cost effective and had a risk of sewer flooding. Browney STW also requires an upgrade in AMP8.
Infiltration reduction/source control - Remove surface water or other sources of water from sewers to reduce flow arriving at WwTW.	No	No	**Discarded** – The infiltration assessment shows this is a catchment with low levels of infiltration and there are no obvious sources of infiltration to be removed. There are also no other visible sources of flow going into the network which we can remove.
Nature based solutions – construction of integrated constructed wetlands	No	Unlikely	**Discarded –** The volume of land required and topography which requires integrated constructed wetlands to be on a flat gradient make this unfeasible. Durham has steep hills and land purchase values are high.
Traditional upgrades to site (upgrade existing assets) – Modification of the permit to incorporate the higher DWF value and upgrades to achieve compliance with the permit.	Yes	Yes	**Carried forward**
Traditional upgrades to site (upgrade existing assets and add tertiary treatment) – Modification of the permit to incorporate the higher DWF value and upgrades to achieve compliance with the permit, including tertiary treatment.	Yes	Yes	**Carried forward**

Two options to increase flow and capacity at Bowburn WwTW have been taken forward for consideration.

TABLE 11: SCREENING OF OPTIONS FOR BRASSIDE

Option	Meets statutory requirements?	Technically feasible?	Reason for discarding
Continue business as usual	No	Yes	**Discarded –** DWF permit condition will be exceeded
Reduction of trade effluent – reduce discharge to WwTW to increase headroom	No	No	**Discarded –** there is no trade effluent flow within the catchment.
Water efficiency measures – install water efficient devices in households to reduce flow	No	No	**Discarded** – magnitude of flow reduction required means it is not possible to meet the statutory obligation.
Greywater re-use Install re-use devices/equipment in households to reduce flow	No	No	**Discarded** – the level of reuse within the domestic only catchment is too high to be viable.
Transfer to another site/rationalise treatment works – divert flows to an alternative WwTW and either use existing headroom or upgrade at alternative works	No	No	**Discarded** – Brasside is the larger of works in the vicinity. Pity Me and Plawsworth are transferring to Brasside by the end of AMP7. Any further relocation of Brasside would involve a costly river crossing.
Infiltration reduction/source control - Remove surface water or other sources of water from sewers to reduce flow arriving at WwTW.	No	No	**Discarded** – The infiltration assessment shows Pity Me, Plawsworth and Brasside have low levels of infiltration and there are no obvious sources of infiltration to be removed. There are also no other visible sources of flow going into the network which we can remove.
Nature based solutions – construction of integrated constructed wetlands	Yes	Yes	**Carried forward**
Traditional upgrades to site - large works upgrade, 2 New Primary Tanks, 2 New Humus Tanks, inlet works and storm capacity improvements	Yes	Yes	**Carried forward**

Two options to increase flow and capacity at Brasside WwTW have been taken forward for consideration.

TABLE 12: SCREENING OF OPTIONS FOR BROWNEY

Option	Meets statutory requirements?	Technically feasible?	Reason for discarding
Continue business as usual	No	Yes	**Discarded –** DWF permit condition will be exceeded
Reduction of trade effluent – reduce discharge to WwTW to increase headroom	No	No	**Discarded –** There are no opportunities to reduce flow with the existing trade effluent and the current trade effluent flow of 91m3/day would be insufficient to release sufficient headroom at the works to accommodate growth.
Water efficiency measures – install water efficient devices in households to reduce flow	No	No	**Discarded –** alone it is unlikely to be able to achieve DWF compliance.
Greywater re-use Install re-use devices/equipment in households to reduce flow	No	No	**Discarded** – the level of reuse within the domestic only catchment is too high to be viable.
Transfer to another site/rationalise treatment works – divert flows to an alternative WwTW and either use existing headroom or upgrade at alternative works	No	No	**Discarded** – not feasible as the site is significantly larger than surrounding WwTWs.
Infiltration reduction/source control - Remove surface water or other sources of water from sewers to reduce flow arriving at WwTW.	Part	No	**Discarded** – Infiltration reduction would meet the statutory obligation if flows could be removed. Our desktop assessment of infiltration confirms that this catchment does not have high levels of infiltration. A significant catchment study would be required, to identify the sources and there is no guarantee that infiltration could be removed without incurring excessive costs compared to other options.
Nature based solutions – construction of integrated constructed wetlands	No	No	**Discarded** – not feasible as the required wetlands would be unfeasibly large.
Traditional upgrades to site (upgrade existing assets) – Modification of the permit to incorporate the higher DWF value and upgrades to achieve compliance with the permit.	Yes	Yes	**Carried forward**
Traditional upgrades to site (upgrade existing assets and add tertiary treatment) – Modification of the permit to incorporate the higher DWF value and upgrades to achieve compliance with the permit, including tertiary treatment.	Yes	Yes	**Carried forward**

Two options to increase flow and capacity at Browney WwTW have been taken forward for consideration.

TABLE 13: SCREENING OF OPTIONS FOR MORPETH

Option	Meets statutory requirement?	Technically feasible?	Reason for discarding
Continue business as usual	No	Yes	**Discarded –** DWF permit condition will be exceeded
Reduction of trade effluent – reduce discharge to WwTW to increase headroom	Part	Yes	**Carried forward** for delivery in AMP7. The statutory obligation will be partially met through a reduction in flows received from trade. **Discarded** for AMP8 – This modification will not fully meet the statutory obligation.
Water efficiency measures – install water efficient devices in households to reduce flow	No	No	**Discarded** – this intervention is unlikely to fully meet the statutory obligation.
Greywater re-use Install re-use devices/equipment in households to reduce flow	No	No	**Discarded** – the nature of traders in this catchment makes this unlikely as primary traders are beverages and health care.
Transfer to another site/rationalise treatment works – divert flows to an alternative WwTW and either use existing headroom or upgrade at alternative works	No	No	**Discarded** – this was evaluated as part of our AMP7 plan for Morpeth. The most cost-effective solution is to reduce trade effluent discharges and then upgrade Morpeth to accommodate growth.
Infiltration reduction/source control - Remove surface water or other sources of water from sewers to reduce flow arriving at WwTW.	No	No	**Discarded** – Through desktop studies it is not possible to confirm that the solution is technically feasible. Our desktop assessment of infiltration confirms that this catchment does not have high levels of infiltration. A significant catchment study would be required to identify the sources and there is no guarantee that infiltration could be removed without incurring excessive costs compared to other options. This option is also unlikely to realise the benefit before the DWF is exceeded
Nature based solutions – construction of integrated constructed wetlands,	Yes	Yes	**Carried forward**
Traditional upgrades to site (standalone package plant) – new dedicated small treatment works in the catchment to treat flows from the new developments	No	No	**Discarded –** Unlikely to be viable as unlikely to be issued with an additional permit from EA which discharges treated effluent so close to an existing STW
Traditional upgrades to site (new side stream) – new dedicated side stream at the existing WwTW for the flows from the new developments	Yes	Yes	**Carried forward**
Traditional upgrades to site (upgrade existing treatment stream) – upsize existing treatment processes so that it will treat existing flows through the same process stream.	Yes	Yes	**Carried forward**

For Morpeth, two different technology options to increase flow and capacity at WwTW and one nature-based solution have been taken forward.

3.2.2 Options Development process

For each of the options taken forward, the required scope was identified by undertaking a gap analysis for the process requirements for each option. The exercise was informed by use of satellite photography to inform the geospatial context of the sites and interview with the operations teams for the sites to understand issues and current performance.

Proposals for interventions at each site was then tested at a 'scrutiny session' held for this driver which was attended by our principal wastewater stakeholders who assessed and approved the methodologies carried out and the recommended interventions for each site.

Further detailed growth prediction and site performance data was obtained and a number of sites were screened out. Sites that were taken forward were subject to a detailed Level 2 scoping and costing exercise. This was carried out to improve the confidence in the Level 1 costing models. For sites taken forward for level 2 costing, scoping was developed in more detail. Single items identified in the Level 1 scope were broken down into the constituent parts to enable these to be costed and dimensions provided where pertinent. For example, a Level 1 costing for a Primary Settlement Tank (PST) requires the PE serviced by the PST asset. For a Level 2 costing this was broken down to identify the number of PSTs, the diameter, depth and scraper type and drawings prepared to support this analysis. Information about the existing assets was identified where possible to inform the performance and capability of the existing assets. In some cases, historic quotes for new assets were identified. The Level 2 scope therefore included more detail to inform the estimating team for the cost and carbon build-up.

3.3. BEST VALUE

3.3.1 Benefit Scoring

For each of the options carried forward to this stage we conducted a benefits assessment using our value framework. Our value framework is embedded into our portfolio optimisation tool, Copperleaf, and contains a mixture of benefits which reflect to performance commitments or other social and environmental benefits. First, we score the impact of continuing business as usual and then we score each of the options. Benefits are scored over time for a 30-year time horizon. This scoring takes into account the certainty of benefits being realised for different types of options. Table 14 shows the range of benefits, the quantification and monetisation values we have used for the assessment of growth projects. These include carbon impact (operational and embedded), natural capital and other benefits. All values in our value framework reflect PR19 values, but as they have been used consistently across options, they do not affect the choice of option.

TABLE 14: RANGE OF BENEFITS IDENTIFIED FOR DWMP GROWTH[9]

Value measures	Description	Unit	Value	Performance Commitment
Improved flow compliance Biodiversity net gain	Improved discharge permit compliance (80% exceedance)[1]	Num	£6,479.82 (250-50,000 population) £8,335.10 (>50,000 population)	No
	Improved Discharge Permit Compliance (90% exceedance)[2]	Num	£26,479.82 (250-50,000 population) £88,335.10 (>50,000 population)	Yes
Operational Carbon	t/CO2e /year	tCO2e	£256.2*	Yes – GHG
Embedded Carbon	t/CO2e /year	tCO2e	£256.2*	No
Biodiversity	Native woodland	£/ha	£279.75**	Yes
	Wet reed beds	£/ha	£171.89**	
	Arable Fields	£/ha	£2.52**	
	Low calc grassland	£/ha	£24.84**	
Amenity	No. of detached houses <450m from park	% Increase in property value	2.71%	No
	No. of other houses <450m from park	% Increase in property value	0.44%	
	No. of flats <450m from park	% Increase in property value	4.70%	

Notes: *£ value per tonne of CO2e in 2025/26, annual increase (varying rate) reaching £378.6/t CO2e in 2024/55

1. Sites <50m3/day
2. Sites >50m3/day

The flow monitoring options have been scored against embedded carbon emissions only, since there are no interventions for which benefit will be realised in AMP8. Flow permit compliance and carbon emissions utilise embedded monetary values within the Copperleaf optimiser while biodiversity and amenity benefits are scored using the CIRIA B£ST tool[8]. This is a publicly available benefits assessment tool which has been developed by the Construction Industry Research and Information Association to assess green infrastructure. We have also used it as it is easier than some other tools to quantify the measures.

3.3.2 Cost benefit appraisal to select preferred option

For each of the options taken forward from primary screening we have carried out a robust cost benefit appraisal within our portfolio optimisation tool to select the preferred option. This calculates an NPV over 30 years in accordance with the PR24 Guidance.

[9] B£ST (susdrain.org)

Costs and benefits have been adjusted to 2022-2023 prices using the CPIH Index financial year average. The impact of financing is included in the benefit to cost ratio calculation. Capital expenditure has been converted to a stream of annual costs, where the annual cost is made up of depreciation/RCV run-off costs and allowed returns over the life of the assets. Depreciation (or run-off) costs are calculated using the straight-line depreciation over the appraisal period. To discount the benefits and costs over time, we have used the social time preference rate as set out in 'The Green Book'.

We have run optimisations to select the least cost based on private values only and the best value using private and societal values. The output of this assessment and the cost benefit ratios are included in Table 15. In this case the least cost options have been chosen for all sites. The wetlands options are significantly more expensive than traditional treatment and do not represent best value to customers. For Aldin Grange, Morpeth and Brasside the cost of the wetlands 84%, 54% and 49% more expensive than traditional solutions.

TABLE 15: BENEFIT TO COST RATIO AND SELECTED OPTIONS

Site	Option	Value 30 year NPV £m	Least cost	Chosen option
Aldin Grange	Traditional upgrades to site	-7.963	Y	Preferred
Aldin Grange	Upgrade with integrated constructed wetlands	-13.158	N	Alternative
Bowburn	Increase flow & Capacity - upgrade works with Additional Primary Tank and tertiary Submerged Aerated Filter, to increase flow and capacity	-12.463	Y	Preferred
Bowburn	Increase flow & Capacity (tertiary biological only) - upgrade works with upsizing of existing plant (excluding biofilter upgrade and including full tertiary Submerged Aerated Filter replacement)	-16.836	N	Alternative
Brasside	Traditional upgrades to site	-19.623	Y	Preferred
Brasside	Upgrade with integrated consulted wetlands	-34.871	N	Alternative
Browney	Upgrade works with upsizing of existing plant	-14.881	Y	Preferred
Browney	Upgrade works with upsizing of existing plant (excluding Activated Sludge Plant upgrade and including full tertiary Submerged Aerated Filter addition)	-34.871	N	Alternative
Morpeth	Sidestream Submerged Aerated Filter - upgrade works with additional Primary Tank, upgrades to inlet works and storm and sludge storage. New Tertiary Solids Removal system and a sidestream Submerged Aerated Filter unit.	-12.535	N	Alternative
Morpeth	Sidestream wetland - construct an additional Primary Tank and a sidestream wetland	-22.731	N	Alternative
Morpeth	Upgrade works with additional Primary Tank, upgrades to inlet works and storm and sludge storage. New Tertiary Solids Removal system.	-11.798	Y	Preferred

The benefits and investment for our preferred options are included in Table 16 and Table 17. Profiling of benefits and expenditure will continue to be refined as we continue to work with our strategic delivery partner to carry out further design work and optimisation of the programme for delivery.

TABLE 16: INPUTS FOR TABLE CWW15 – BENEFITS BEST VALUE OPTION

EA/NRW environmental programme	Benefit	Units	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030	Total
Growth at sewage treatment works (excluding sludge treatment)	Embedded carbon	t/CO2e	1930.690	196.688	786.748	1730.840	236.025	4880.990
	Operational carbon	t/CO2e	20.845	80.780	68.685	52.675	59.215	282.200

No benefits have been assigned to monitoring so as to be consistent with guidance in other programmes such as WINEP.

TABLE 17: INPUTS FOR TABLE CWW3 - ENHANCED EXPENDITURE

EA/NRW environmental programme		2023-2024 £m	2024-2025 £m	2025-2026 £m	2026-2027 £m	2027-2028 £m	2028-2029 £m	2029-2030 £m	Total
growth at sewage treatment works (excluding sludge treatment)	Capex	0.300	8.851	10.480	1.679	3.184	23.513	3.184	51.192
	Opex				0.562	0.562	0.562	0.562	2.247
	Totex		8.851	10.480	2.241	3.746	24.075	3.746	53.439
Extra flow monitoring to measure whether growth is required at sewage treatment works (excluding sludge treatment) – three	Capex			0.507					0.507
	Opex				0.002	0.002	0.002	0.002	0.010
	Totex			0.507	0.002	0.002	0.002	0.002	0.617

These numbers are slightly different than what has been included in lines 13ci -13cii of our drainage and wastewater management plan data tables which include investment for Howden which is being delivered under base expenditure. We have also now adjusted the profile to account for early start investment.

3.4. UNCERTAINTY

The nature of the sites under consideration for this driver are of a more modest scale and interventions tend to be of a binary nature and not at a scale where modular solutions are appropriate. We have requested £9.151m of transition expenditure to make sure we are able to meet DWF permit requirements.

3.5. THIRD PARTY FUNDING

The DWMP is identifying collaborative opportunities that aim to bring greater joint benefits from working together. No such benefits have been identified for the WwTW's in this programme. Opportunities for co-funding are more likely to arise from nature-based solution opportunities, however these options are significantly more expensive than the alternative options.

3.6. DIRECT PROCUREMENT FOR CUSTOMERS

We have considered direct procurement for customers (DPC) for these investments, as set out in our **DPC assessment report** (KPMG, NES38). None of the projects are above £200m whole life totex, even if taken together and spread over several control periods. It would be more difficult to effectively manage maintenance and operations where parts of the function of wastewater treatment would need to be managed by more than one party on a single site. This investment case is therefore not suitable for DPC, as it does not meet the size or discreteness tests.

3.7. CUSTOMERS VIEWS INFORMING OPTION SELECTION

Customers expect us to understand and manage the risks of climate change and population growth – including the need for upgrades at WwTWs to continue meeting our obligations to meet the DWF and quality parameters of the WwTW discharge permit.

We have not discussed the selection of proposed solutions with customers directly. This is because our research shows that customers expect us to meet our statutory obligations, and it is not appropriate to discuss delaying or phasing investment where there are no alternatives to meet statutory requirements. It is difficult to discuss technical solutions and their costs and benefits with customers, where customers often feel that they are not equipped to make these decisions.

To make sure we can still reflect customer views in selecting the right options, we did two things:

- We consulted on our draft DWMP, discussing these options with customers and explaining the modelling we had done to establish the need for investment (including looking at climate change and population growth over the long-term, and following the scenarios in Ofwat's guidance for the long-term delivery strategy). In our customer research, we concluded that customers generally consider public value is important and that this is firmly embedded within Northumbrian Water (for example, **People Panel 8**). Customers recognise social and environmental benefits, but some customers thought that investments should be prioritised elsewhere due to the current cost-of-living crisis.
- We used customer valuations from our PR24 research (Phase 2) to establish the Northumbrian Water valuation framework. This helps to reflect customer views in the decision making between options, by including these explicitly within the cost-benefit assessment of options. The framework also includes some external values, particularly for biodiversity, amenity, and carbon – where these are either difficult to derive from customer valuations, or where there are already standardised valuation frameworks.

When we compared the costs and benefits of each option for each need and have selected the least cost options.

In our **qualitative affordability and acceptability testing** (NES49), customers supported our "preferred" plan which included growth at wastewater treatment works. Customers found this plan acceptable because it focused on the right things, is good for future generations, and is environmentally friendly. Customers who did not find this plan acceptable said that this was expensive, and water companies should pay out of their own profits. We did not ask specifically about growth at wastewater treatment works (as our individual items were limited only to the largest investments), but customers supported maintaining rivers and reducing pollution (NES49). In our **quantitative research** (NES50), 74% of customers supported our preferred plan, including this investment.

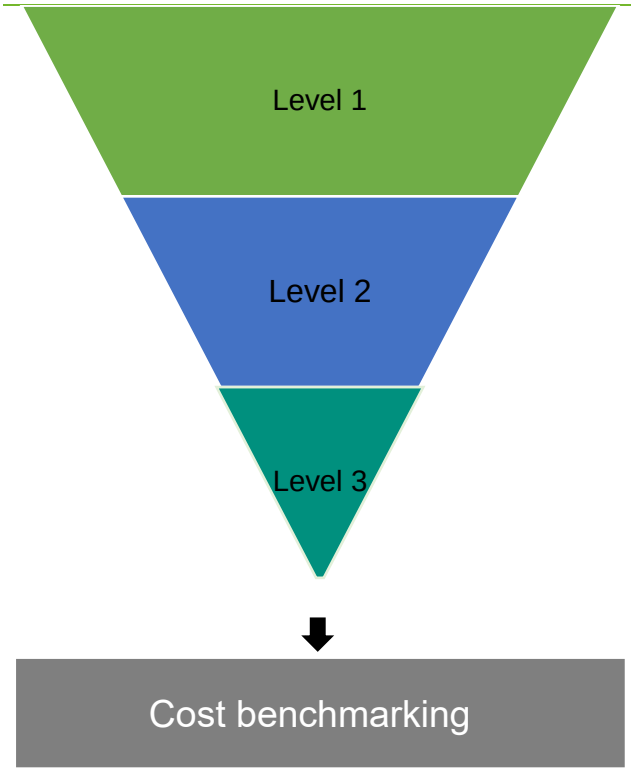
4. COST EFFICIENCY

4.1. APPROACH TO COSTING

4.1.1 Cost methodology

A full description of our costing methodology is contained in Appendix A3 - Costs (NES04). In Figure 3, our sewage treatment upgrades have been costed to Level 2 and our monitors to Level 3. This level is appropriate for a Price Review as a level 3 estimate would require a level of detailed design to be carried out which would incur significantly more cost which is not appropriate until delivery is confirmed.

FIGURE 3: PROCESS COST ESTIMATION



Level – 1 (confidence: – 50% to +100%)

Costing is carried out using Northumbrian Water's costing curves. Costing occurs at an overall asset level. For example, a treatment works to serve a specific population.

Level – 2 (confidence: - 50% to + 50%) – Chosen approach

Costing is carried out using Northumbrian Water's costing curves. Costing occurs for each of the main items of scope. For example, the type of treatment process, a power supply, the size of pumps.

Level – 3 (confidence: - 20% to +30%)

Detailed bottom-up cost of all items taking into consideration factors such as ground conditions.

Cost benchmarking

We have benchmarked 3 sites which represents 50% of the preferred options against the available cost curves from other companies. Further detail is provided in section 4.1.3.

Our costing has been carried out by our costing partners (Mott MacDonald) using our cost models. They have then been benchmarked against our costing partner's cost database and independently assured by PwC and internal audit as they have been loaded into data tables.

4.1.2 Options providing cost efficiencies

We have identified and accounted for the following opportunities for efficiencies:

- At Bowburn the relocation of the outfall to the Wear as part of WFD Chemicals framework will remove the need for us to meet a tighter permit.
- Monitors will be delivered as a single project.

4.1.3 Cost benchmarking

We have benchmarked direct costs for each of the key asset types and indirect costs against the cost curves for other companies in our costing partner's database. For growth our costing partner has benchmarked where it is possible to carry out an equitable comparison and this ranges between two and five companies as shown in Table 18.

TABLE 18: NUMBER OF COMPARATORS USED FOR BENCHMARK

Scope item analysed	Comparators used for benchmark	Data points per curve	Total data points per benchmarked item
Caustic Dosing (Wastewater)	4	99	396
Ferric Dosing	4	73	290
Humus Tanks -Upward Flow	4	145	580
Primary Tanks Desludging and Scrapers, Circular	4	184	734
Packaged SAF	3	96	288
Storm Tanks, Circular	2	316	632
Trickling filter (Biofilter Tanks - (combined))	2	46	92
Wet Well Sewage PS	3	181	543
Wet Well Sewage PS - Only pumps/ panels and instruments	3	181	543
Sewer - Rising Main	3	1600	4799
Ducts and Draw pits	3	250	750
Chamber	4	270	1078
Distributor Arms	3	12	36
Tertiary Treatment - Deep Bed Sand Filter	3	100	300
Tertiary Treatment - SAF	3	99	296
Panels	3	201	603
Kiosks	3	468	1403
Combined STW Inlet Screens	3	175	525
Package pumping station	2	42	84
Activated Sludge Plant	3	190	570
Crossflow Detritor	4	171	684
Final Tanks, Circular	2	587	1173
Sludge Pumping Station	5	289	1443

Scope item analysed	Comparators used for benchmark	Data points per curve	Total data points per benchmarked item
Fine screen STW Inlet Screens	3	389	1166
Tertiary Treatment - Deep Bed Sand Filter/ MECANA Pile Cloth Filter	2	101	201
Combined Sewer Overflow CSO	1	28023	28023
Centrifuge	3	104	312
Sludge Tanks, Pre-Fabricated, Circular	3	179	537
Total			**48,079**

A mean average of these companies has been used as the benchmark with a 25% percentile and 75% percentile provided as a suitable range.

For growth we have benchmarked three of the five projects in Table 19. A mean average of these companies has been used as the benchmark with a 25th percentile and 75th percentile provided as a suitable range. The benchmarked costs have been adjusted for inflation using CPIH and have a price base of Q2 2022.

TABLE 19: BENCHMARK OF DIRECT COSTS

Investment Name	Option Type	Northumbrian £	Benchmark £	25th Percentile £	75th Percentile £	Delta* £	Delta %**
Bowburn	Upgrade works with upsizing of existing plant	£3,497,461	£4,021,591	£3,234,142	£4,541,579	-£524,133	-13%
Browney	Upgrade works with upsizing of existing plant	£4,197,949	£4,471,811	£3,554,436	£5,263,490	-£273,862	-6%
Morpeth	SAF option	£4,324,712	£4,464,829	£3,697,499	£5,051,985	-£140,117	-3%
Total		£12,020,122	£12,990,709	£10,486,077	£14,857,054	-£938,109	-7%

Notes: * Delta = Northumbrian – Benchmark
** Delta % = Delta ÷ Benchmark

We have benchmarked on direct costs which are directly attributable to the project such as plant, labour material and equipment and on indirect costs which are related to design, site setup, professional support and other costs not directly related to the construction aspect of a project. Our indirect costs have been bench marked as 63.4% of direct costs 10.46% below the industry average as we describe in our **A3 Cost Appendix** (NES04).

When taking into account both direct and indirect costs for the selected projects, Table 20 shows we are 12% more efficient overall than our comparators.

TABLE 20: SUMMARY FOR DWF INCLUDING INDIRECT COSTS

Investment name	Option type	Northumbrian £k	Benchmark £k	Delta* £k	Delta %** £k
Bowburn	Upgrade works with upsizing of existing plant	£5,714,851	£6,991,938	-£1,277,087	-18%
Browney	Upgrade works with upsizing of existing plant	£6,859,449	£7,774,691	-£915,242	-12%
Morpeth	SAF option	£7,066,580	£7,762,552	-£695,972	-9%
Total		£19,640,880	£22,529,181	-£2,888,301	-12%

Notes: * Delta = Northumbrian – Benchmark
** Delta % = Delta ÷ Benchmark

We are proposing to install monitors that are equivalent to those in our **WINEP Monitoring Enhancement Case**, NES30. Table 21 shows that when direct and indirect costs are combined, we are 14% below the cost benchmark for these types of monitors.

TABLE 21: SUMMARY FOR MONITORING INCLUDING INDIRECT COSTS

Investment name	Option type	Northumbrian	Benchmark	Delta*	Delta %**
Rookhope	MCERTS certified FFT monitors	£306,017	£363,183	-£57,166	-16%
Bishopton	MCERTS certified FFT monitors	£19,760	£22,739	-£2,979	-13%
Norham	MCERTS certified FFT monitors	£307,252	£342,445	-£35,193	-10%
Carlton in Cleveland	MCERTS certified FFT monitors	£82,207	£109,725	-£27,518	-25%
Newfield	MCERTS certified FFT monitors	£25,907	£19,669	£6,238	32%
Total		**£741,142**	**£857,761**	**-£116,618**	**-14%**

Notes: * Delta = Northumbrian – Benchmark
** Delta % = Delta ÷ Benchmark

4.1.4 Factors affecting cost allowances

Ofwat is anticipating that a new enhancement model will be developed for growth at WwTWs, and we do not currently have sufficient visibility of its content to be able to assess whether there are any omissions for it. At the present time we are not presenting any evidence to demonstrate that there are any extra costs which are not represented in the enhancement model approach, or which require adjustment for any special circumstances.

5. CUSTOMER PROTECTION

5.1. PERFORMANCE COMMITMENT

The ability of the WwTWs to treat an increased load will be covered under the discharge permit compliance (numeric) metric which is a common performance commitment. This measure is based on a calendar year and has an underperformance payment should the commitment not be achieved.

Compliance against DWF permit measures are not currently covered by a performance commitment but these will become a statutory requirement which will form part of the Environment Agency's Environmental performance assessment during AMP8 leaving companies open to prosecution should they fail to meet statutory requirements.

5.2. PRICE CONTROL DELIVERABLE

Our approach to determining Price Control Deliverables (PCD) is outlined in Section 12.3 of **A3 – Costs** (NES04). In Table 22 below, we assess our wastewater growth enhancements to test if the benefits are linked to PCs, against Ofwat's materiality of 1%, and to understand if there are outcome measures that can be used.

TABLE 22: ASSESSMENT OF BENEFITS AGAINST THE PCD CRITERIA

Enhancement scheme	Benefits linked to PC?	Materiality	Possible outcomes?
Growth as wastewater treatment works (NES26)	Pass – benefits are not related to PCs	Pass – 1.7%	Outcome difficult to measure except for meeting compliance.

Our assessment has highlighted that the benefits we expect to deliver will not be measured through PCs, and this is a material investment.

However, we do not propose a PCD for this enhancement investment at this stage. This is for two reasons:

1. We must comply with our permits or face enforcement action – so we must deliver these improvements to meet these permits.
2. Ofwat has not yet decided if growth at wastewater treatment works will be treated as enhancement expenditure or base modelled costs. If this is treated as base costs, then a PCD would not be appropriate.