

WSX-C18 – Bioresources and the Industrial Emissions Directive (IED)

Response to
Ofwat's PR24 draft
determination



Wessex Water
YTL GROUP

FOR YOU. FOR LIFE.

Representation reference: **WSX-C18**

Representation title: **Bioresources and the Industrial Emissions Directive (IED)**

CONTENTS

1.	Summary	1
2.	Updates in Bioresources in AMP8	4
2.1.	Sludge production forecast	4
2.2.	Rationalisation	4
2.3.	Sludge treatment process	5
3.	WINEP Cake storage	6
3.1.	Ofwat’s approach to setting allowances for cake storage	6
3.2.	Fit of Ofwat’s chosen model	6
3.3.	Additional factors to be considered	6
3.4.	Required adjustment to cost allowance	8
3.5.	Rationale	8
3.6.	Why the change is in customers’ interests	11
4.	Industrial Emissions Directive (IED)	12
4.1.	Ofwat’s approach to IED enhancement costs	12
4.2.	Goodness of fit of Ofwat’s chosen benchmarking models	12
4.3.	Additional factors not considered	15
4.4.	Benchmarking “Other IED costs”	17
4.5.	Choice of efficiency benchmark	19
4.6.	Reliability of data sources	21
4.7.	Changes to IED programme	21
4.8.	Required adjustment to cost allowance	22
4.9.	Rationale	23
4.10.	IED base costs	24
4.11.	Why the change is in customers’ interests	25
5.	EPR / “non-IED” waste permit compliance costs	26
5.1.	Required adjustment to cost allowance	26
5.2.	Why the change is in customers’ interests	26
6.	Bioresources growth enhancement	27
6.1.	Ofwat’s cost assessment approach	27
6.2.	Required adjustment to cost allowance	28

6.3.	Why the change is in customers' interests	28
7.	Bespoke uncertainty mechanism for bioresources	29
7.1.	FRfW compliance and landbank availability	30
7.2.	Review of Ofwat's proposed notified item	32
7.3.	Wessex Water's proposed uncertainty mechanism	33
8.	Sludge treatment innovation	34
Annex 1 – Alternative IED secondary containment models		35
Annex 2 – IED secondary containment scope of works and layout		36
A2-1.	Avonmouth	36
A2-2.	Berry Hill	39
A2-3.	Poole	41
A2-4.	Trowbridge	43
Annex 3 – IED tank covering scope of works		45
A3-1.	Avonmouth	45
A3-2.	Berry Hill	46
A3-3.	Poole	47
A3-4.	Trowbridge	48
Annex 4 – Triggers for landbank uncertainty mechanism		49
Annex 5 – Cost implication due to loss of landbank		54

1. Summary

This document contains all our representations for Bioresources:

- WINEP cake storage allowance
- IED enhancement allowance
- IED base allowance
- EPR / “non-IED” waste permit compliance allowance
- Bioresources growth enhancement allowance
- Landbank availability uncertainty mechanism
- IED cost sharing mechanism
- EPR / “non-IED” waste permit compliance uncertainty mechanism
- Sludge treatment innovation

For our WINEP cake storage submission, we do not consider that the median unit cost approach used to set our allowance appropriately reflects the true drivers of efficient cost due to the broad range of storage solutions submitted by all companies. A more appropriate approach would be to treat our submission based on odour-controlled barns as an outlier and assess it through a deep dive. We have provided a detailed scope breakdown of our submission to demonstrate that our proposed cost is efficient.

In reviewing our IED enhancement submission, Ofwat used econometric models to set our secondary containment and tank covering allowances, and a simple unit cost comparison to set our allowance for other IED costs. Whilst there is validity in this approach to a degree, we believe that the secondary containment and tank covering models do not account for the site-specific variations that determine efficient costs at scheme level. With these limitations in mind, we therefore consider a more appropriate approach would be to undertake a deep-dive assessment of our secondary containment and tank covering submissions. We have provided further detail to the evidence presented in our October submission to further support this approach. For other IED costs, considering the variety of heterogeneous investments that have been grouped in this category, we believe a unit cost approach based on sludge volumes does not appropriately reflect the drivers of efficient cost, and an appropriate alternative approach would be to benchmark each investment sub-category separately.

For IED base costs, the costs from our cost adjustment claim were reallocated to IED enhancement and then excluded from the assessment, to reflect the view that additional IED base capital expenditure is already accounted for in the base allowance. We do not believe the base cost models appropriately account for the step-change in capital maintenance expenditure that is driven by IED compliance. Therefore, we believe the additional expenditure would need to be reflected in an additional base allowance as an unmodelled base cost, as in the case of IED base operating cost.

Our submission for EPR / “non-IED” waste permit compliance was not assessed due to a lack of enhancement driver. Whilst not currently in the WINEP, this will be a statutory obligation and one we expect the EA to implement within AMP8. Without a PR24 cost allowance for this new statutory compliance requirement, this would be an unfunded need in AMP8 and not one that we believe should be managed through cost sharing. Therefore, we consider an enhancement allowance for this need is appropriate.

For bioresources growth enhancement, we consider that the inclusion of this investment within base cost models and allowances do not appropriately reflect the drivers of cost. We understand this approach is reflective of the desire for market-based 3rd party solutions, but we believe these do not currently exist due to poor market development, as demonstrated in our 2022-23 joint investigation with Severn Trent. Additionally, we believe this approach promotes bolt-on solutions that might not necessarily be optimal or efficient solutions over a long term. Therefore, we consider that an assessment of bioresources growth allowance outside of the base cost models would be more appropriate.

The uncertainty around landbank availability in AMP8 is a significant risk for bioresources recycling and management across England and Wales. We do not consider the approach proposed for a notified item to be effective in managing this risk due to limitations in the scope and trigger. Our preferred approach is a targeted reopening of the bioresources price control.

Given recent discussions with the Environment Agency and the water industry, we believe there is high likelihood that the scope of requirements to be imposed on the industry to maintain IED compliance will increase in AMP8. We welcome the proposed cost sharing mechanism to manage the risk of cost changes in the assessed IED scope for existing requirements, but given the risk of these requirements increasing, we suggest that this cost sharing should also apply to any additional requirements added to the IED scope by the EA in AMP8.

The lack of allowance for EPR / “non-IED” waste permit compliance creates a significant downside skew in the totex risk, as highlighted above. As in other areas, we believe these asymmetries are best mitigated at source. Our preference would be a well-considered cost allowance. However, recognising the uncertainty in this area we are also proposing to include this in our uncertainty mechanism.

The following is included in the draft determination:

“Four alternative sludge treatment projects have been funded through the Innovation Fund. We welcome further Innovation Fund submissions in this area going forward.”

We support this approach, as alternative sludge treatment technologies will be crucial in our bioresources strategy for PR29 to increase resource recovery, value realisation, move towards a more circular economy and significantly mitigate the risks from a reduction or loss of the existing landbank recycling routes. We will continue to collaborate with the industry to identify opportunities for technology development, market outlets and contribute to innovation bids as a named partner or lead on the bids where appropriate.

Table 1 summarises the requested amendments to our PR24 allowances for bioresources.

Table 1 – Summary of changes requested

Data table line	Line description	Draft Determination allowance	Our requested allowance	Difference	Further details
CWW3.139	Sludge storage - Cake pads / bays /other; (WINEP/NEP) bioresources totex	£21.502m	£44.672m	£23.170m	See Section 3 – <i>WINEP Cake storage</i>
CWW3.164	Sludge enhancement (growth); enhancement totex	Included in base allowance	£21.441m	-	See Section 6 – <i>Bioresources growth enhancement</i>
CWW3.187 & CWW3.188	Sludge enhancement (quality); enhancement wastewater/bioresources capex & opex	IED enhancement - £50.783m	IED enhancement - £117.500m	£66.717m	See Section 4 – <i>Industrial Emissions Directive (IED)</i>
		EPR / “non-IED” waste permit compliance – not assessed and not funded.	EPR / “non-IED” waste permit compliance – £29.964m	£29.964m	See Section 5 – <i>EPR / “non-IED” waste permit compliance costs</i>

CWW18.47	Total net value of the claim (wastewater) CAC5	IED base – not assessed and not funded.	IED base – £23.581m	£23.581m	See Section 4 – <i>Industrial Emissions Directive (IED)</i>
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2. Updates in Bioresources in AMP8

In this section, we describe the changes in our AMP8 sludge production forecast and bioresources strategy that are reflected in our representation for bioresources enhancement and base costs.

2.1. Sludge production forecast

Due to issues identified with our sludge volume measurement methodology during the 2023-24 APR period, we have revised and restated our historic APR sludge production volumes for 2020-21, 2021-22 and 2022-23. We have also used these revised historic values to update our sludge production forecast model for AMP8. No changes were made to the forecast methodology.

Our revised sludge production volumes in AMP8 are 10% higher overall than previously stated values. Table 2 summarises the changes in volume for each year in AMP8.

Table 2 – Forecast of sludge production volumes

Sludge production (ttds/yr)	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8 total
Business Plan submission	65.9	66.2	66.6	67.7	69.2	335.6
Revision in Draft Determination submission	72.9	73.3	73.7	74.2	74.7	368.8
% increase	11%	11%	11%	10%	8%	10%

We have updated all of our BIO data tables to reflect this increase in forecast sludge volumes. The marginal increase in sludge volume does not affect the scope of our bioresources enhancement proposals.

2.2. Rationalisation

Since our Business Plan was submitted in October 2023, there have been 3 significant changes or updates to the regulatory landscape affecting bioresources:

- The scope of IED compliance has continued to increase due to further clarification from the EA on their expectation of site improvements to achieve compliance.
- The application of the Farming Rules for Water (FRfW) on biosolids and the timing of the changes coming into effect remain uncertain.
- The risk of landbank closure has increased due to the FRfW and the presence of contaminants in sludge.

This has resulted in the need to review our bioresources strategy to ensure we meet the regulatory expectations and maintain our efficiency in AMP8. We have assessed the strategic alignment of our bioresources assets with the long-term ambitions of our bioresources strategy and identified two areas for rationalisation:

- **Closure of the anaerobic digestion (AD) plant at Taunton.** We will be decommissioning the AD plant in 2025-26 and converting the site to lime treatment. We will be surrendering the IED permit after the AD plant is decommissioned. Taunton will not be an IED site in AMP8 and we have removed the scope of Taunton's IED improvements from our Business Plan. We have included the cost of decommissioning the AD plant as IED enhancement expenditure because this rationalisation is driven by the implementation of IED.

- **Deferring a portion of capital maintenance on AD assets on sites that may be closed or converted to advanced thermal treatment (ATC) in AMP9.** This will result in c.£140m reduction in our bioresources base totex in AMP8, focussing on least regrets investment and providing the flexibility in PR29 to pivot to adaptive pathways as outlined in our bioresources long-term strategy (see WSX03 – Long term delivery strategy).

We have proposed an uncertainty mechanism to manage all unfunded bioresources risks in AMP8 (see Section 7 – Bespoke uncertainty mechanism for bioresources).

2.3. Sludge treatment process

We are now forecasting a larger proportion of our sludge will be treated through lime stabilisation in AMP8 compared to our previous forecast in our Business Plan submission. This is because of:

- the closure of Taunton’s AD plant from 2025-26, and
- planned digestion capacity outages at other AD sites (Avonmouth, Trowbridge and Berry Hill) to enable capital maintenance and IED improvement works.

The updated sludge treatment process percentage split for AMP8 is provided in table BIO4.

Our sludge treatment strategy in AMP8 is to treat as much as our sludge through AD to reduce the cost and carbon footprint of bioresources and rely on lime treatment for short-term capacity whilst our AD plants are out of service. While lime treatment does not provide long-term financial and carbon benefits, it is an efficient short-term solution for treatment due to its low capex and ease of installation. Considering the uncertainties around the landbank availability and IED compliance, our strategy to treat sludge using a combination of AD and lime in AMP8 is a low-regrets approach that provides the best efficiency for bioresources in AMP8. This strategy also provides the flexibility in AMP9 to transition to ATC or market solutions, as described in our long-term delivery strategy for bioresources.

3. WINEP Cake storage

In this section, we set out our representation on the enhancement cost allowance for the provision of additional sludge (cake) storage under the WINEP (CWW3.139).

3.1. Ofwat's approach to setting allowances for cake storage

The investment for this line has been assessed using a median unit cost approach, with a %age uplift applied to companies' allowances to allow for differences in scope. The unit cost used is £/m² which is based upon the area of cake pad required (m²) reported in BIO5.5.

Other cost assessment approaches considered were:

- Separation of proposals based on scope complexity – but the range of solutions were too broad, and this approach was therefore discounted,
- Linear or log regression models – but the models were deemed unsuitable, and this approach was also discounted.

A cost allowance of £21.5m has been proposed, compared to our Business Plan proposal of £44.7m.

3.2. Fit of Ofwat's chosen model

In principle, we are supportive of the use of cost benchmarking where it can be shown to produce reliable estimates of efficient costs, and where the results are interpreted alongside other relevant information. However, we do not consider the median unit cost approach to be sufficiently robust to reliably set efficient allowances for cake storage schemes. There are significant gaps between the requested cost and modelled allowance for several companies, including Wessex Water. The scale of this variation indicates that scope complexity is likely contributing to significant variations in cake storage costs that are not being explained by the median unit cost approach. These variations demonstrate that this approach is not robust enough to capture all the factors that determine efficient costs, and potentially leads to companies being underfunded for cake storage schemes.

While we welcome the use of a %age uplift to allow for differences in scope, we do not consider this to be sufficient to compensate the potential underfunding resulting from the median unit cost approach.

We are also concerned about the suitability of cost driver used. We do not consider the area of cake pad required to be an appropriate cost driver. A more suitable approach would be to base the unit cost on tonnes of dry solids of cake to be stored and estimated number of days of storage due to the following reasons:

- The scope and cost of cake storage solution would be directly driven by storage volume and duration.
- The area of cake pad required would not be a significant cost driver for solutions based on covered storage (which was proposed by 6 companies).

We have provided our data on storage volume and duration through Query OFW-OBQ-WSX-133.

3.3. Additional factors to be considered

We suggest that all open storage (cake pad) submissions are assessed in one category and all covered storage submissions without odour control (Dutch barns) in another. If a company proposes a mix of open and covered storage solutions, this would require an indication of the proportions to each so that the solutions can be separated and assessed accordingly.

Due to the small number of submissions based on odour-controlled sealed barns/buildings (which were from Wessex Water and Northumbrian Water) and the associated distinct drivers of cost for these solution types we suggest they are treated as outliers, and assessed through a deep dive.

The rationale for this approach is that there is clear step change in the cost between cake pads and Dutch barns, and another step change in the cost between Dutch barns and odour-controlled barns which is not reflected by the cost driver used. This is illustrated in Table 3, which is a summary of the scope breakdown of our odour-controlled barn solution that we have provided through the response to Query OFW-OBQ-WSX-157. The cost of a Dutch barn is around double the cost of an open cake pad of the same area. The conversion of a Dutch barn to an odour-controlled barn increases the cost by a further 66%.

Table 3 – Comparison between open cake pads, Dutch barns and odour-controlled barns

Storage solution	Scope of works	Totex (£m)	% additional cost
Open cake pad	Earthworks, pad foundations, concrete floor, external hardstanding and access, kerbs and edgings, site drainage, manholes, soakaways, drainage pumping station, and M&E.	£13.1m	-
Dutch barn	All the above, plus structural steel frame, cladding, roof, gutter, downpipes, concrete push walls and roller shutter door.	£26.8m	100% more than open cake pad
Odour-controlled barn	All the above, plus odour control, ducting, enhancements to steel frame for odour, additional power, and chemicals.	£44.7m	66% more than covered cake barn

3.3.1. Scope of permit compliance

The storage of cake is a permitted activity that will be regulated by the EA under the Environmental Permitting Regulations (EPR). Storage facilities will therefore need to comply with the EA's Biological waste treatment: appropriate measures for permitted facilities (Appropriate Measures) guidance, which stipulates that:

“You must consider at the design stage where there is an opportunity to cover storage areas and where possible contain, treat and abate air using appropriately engineered plant.

To prevent emissions (including ammonia) you must cover digestate stores and compost liquor. Where fixed covers are used these must have a system that can remove and effectively treat emissions.”

Based on the wording of the above guidance, we consider that the requirement for odour control and covered storage is mandatory for storing sewage sludge and the EA will only provide a permit for storage facilities that meet these requirements and allow them to operate under EPR. Therefore, we have proposed to provide odour-controlled barns as an “EA compliant” solution for cake storage.

Our review of companies' cake storage submissions shows the following:

- Northumbrian Water has adopted a similar approach to us of providing odour-controlled barns.
- Some companies have opted to not provide odour control, which is not an approach that we would consider due to the risk that the EA will reject these storage solutions for failing to comply with the Appropriate Measures guidance.

- Severn Trent has opted to provide open cake pads, but for storage of pelletised sludge which has a lower risk of odour compared to biosolids at 25% dry solids.

We note that open cake pads would appear to be an efficient storage solution if the cost assessment only includes the cost of the cake pads. However, the feasibility of open cake pads as a storage solution is dependent on the provision of enhanced treatment upstream of the storage, e.g. pelletisation. If the cost of the pelletisation is included in assessment, the efficiency for the overall storage solution would decrease significantly due to the large cost of pelletisation.

3.4. Required adjustment to cost allowance

Considering the arguments presented in the previous sections, **we believe that the cost allowance for our cake storage schemes should reflect the level proposed in our Business Plan, which is £44.7m.**

Due to the broad range of solutions in companies' cake storage submissions, we do not consider the median unit cost approach to be sufficiently robust in setting efficient allowances for cake storage schemes. Submission of odour-controlled barns is clearly an outlier compared to the other submissions based on open cake pads or Dutch barns. Therefore, **we suggest that it is more appropriate our submission is assessed through a deep dive.**

We have provided a detailed scope breakdown of our cake storage submission in the response to Query OFW-OBQ-WSX-157 to justify our proposed scope and demonstrate the efficiency of our proposed cost. We are confident that a deep dive assessment will confirm this, providing justification for full allowance for our cake storage investment.

3.5. Rationale

We request that Ofwat consider the further rationale and evidence below when assessing our cake storage submission.

3.5.1. Best option of customers

In developing our cake storage submission, we have considered a range of different storage options including open cake pads and Dutch barns. However, as cake storage is regulated by the EA under the Environmental Permitting Regulations (EPR), we are only able to take forward options that comply with the EA's Appropriate Measures guidance which requires all cake storage facilities to be covered and provided with sufficient abatement of emissions¹. Based on these requirements, we have based our submission on odour-controlled buildings. We have discounted the other options of open cake pads or Dutch barns because they do not meet the requirements in the Appropriate Measures guidance, and therefore would not be allowed a permit to operate by the EA.

We have considered enhancements to our existing cake storage barns to provide additional capacity. However, a review of our existing cake storage barns showed that extending or rebuilding them to provide additional storage is not feasible due to their layout and lack of available adjacent land.

¹ The EA's Biological waste treatment: appropriate measures for permitted facilities (Appropriate Measures) guidance states the following:

"You must consider at the design stage where there is an opportunity to cover storage areas and where possible contain, treat and abate air using appropriately engineered plant.

To prevent emissions (including ammonia) you must cover digestate stores and compost liquor. Where fixed covers are used these must have a system that can remove and effectively treat emissions."

We have discounted market solutions of storage provision as a service from 3rd party operators due to the lack of facilities that allow long-term storage of sewage sludge.

We have also discounted the option of not providing any additional storage and relying on operational interventions (such as seeking emergency 3rd party storage) as this would put a significant risk on our bioresources supply chain and our ability to effectively manage our bioresources to avoid harm to the environment. Additionally, the cost impact of unplanned emergency storage will be high and not efficient.

Our proposed solution of providing new odour-controlled barns is the best-value feasible option that meets the EA's expectation of compliance with their Appropriate Measures guidance. Therefore, we consider this to be the best option for customers.

Table 4 below summarises our assessment of storage options and why our submission of odour-controlled buildings is the best option for customers.

Table 4 – Cake storage options.

Storage option	Proposed / Discounted	Rationale
Odour-controlled buildings (sealed barns)	Proposed	Best-value and compliant with Appropriate Measures guidance.
Open cake pads	Discounted	Does not comply with Appropriate Measures guidance.
Dutch barns without odour control	Discounted	Does not comply with Appropriate Measures guidance.
Extending or rebuilding existing cake storage barns to provide more capacity	Discounted	Not feasible (as explained above).
3 rd party storage service	Discounted	Not feasible (as explained above).
No additional planned storage; reliance on emergency interventions	Discounted	Not cost efficient and high risk on bioresources resilience.

3.5.2. Cost efficiency

In our response to Query OFW-OBQ-WSX-157, we have provided a detailed scope breakdown of our cake storage submission. The scope of works is summarised in Table 5 below.

Table 5 – Scope of works of our cake storage submission.

Scope of works	Cost Per Category (£m)
Earthworks	£1.929
Substructure and Pad Foundations	£5.277
Structural Steel Frame	£5.877
Cladding, Roof, Gutter and Downpipes	£2.339
Internal Concrete Floor	£2.754

Precast Concrete Push Walls	£1.407
External Hardstanding and Access	£1.941
Kerbs and Edgings	£0.116
Site Drainage (Surface Water)	£0.541
Foul Water Drain (Internal)	£0.550
Manholes	£0.499
Soakaways	£1.163
Drainage Pumping Station	£0.869
M&E	£0.103
Cable Ducting and Drawpits	£0.065
Roller Shutter Door	£0.350
Enhancements to Steel Frame for Odour Control Ducting	£0.994
Odour Control and Ducting	£13.725
Power and Distribution	£0.665
Capex (£m) (as reported in CWW3.137)	£41.165
Opex (£m) (as reported in CWW3.138)	£3.507
Totex (£m) (as reported in CWW3.139)	£44.672

The following section in our response to Query OFW-OBQ-WSX-157 explains the cost efficiency of our cake storage submission.

“We have ensured cost efficiency through the use of actual cost data from the scheme that provided our most recently constructed barns. The chosen contractor was selected as the most economically advantageous, being 20% lower than the two other tenderers. Tendering is a competitive and auditable commercial process which selects suitable contractors from a framework list. In order to be on the framework list, contractors have to be selected via another competitively tendered process to be on our framework.”

We also approached ChandlerKBS who have provided their benchmark breakdown which is based on detailed pricing information contained within Spon’s 2024 (which is compiled by AECOM and is used industry-wide). Their estimate is 23% higher than the contract sum on which we have based our cost data. This provides us with confidence in the figures we have submitted.”

3.5.3. Other relevant evidence

Evidence provided previously:

- Business Plan Supporting Document WSX18 – Bioresources strategy and investment
- Response for Query OFW-OBQ-WSX-157 (additional information on the scope of our cake storage submission)

3.6. Why the change is in customers' interests

The allowance for our cake storage submission is around 50% of our proposed cost. As we have demonstrated, the cost of our proposed storage is efficient and the scope is based on an “EA compliant” solution, therefore we consider that this allowance will only enable 50% of our proposed storage to be delivered in AMP8. The lack of storage for around 50% of our sludge will likely result in the following risks in AMP8 for bioresources:

- significant interruptions in our biosolids recycling operation when access to landbank is restricted by wet weather or FRfW compliance,
- the need to seek emergency storage options which will be inefficient and unsustainable,
- in the worst case, enforcement action from the EA for failure to comply with permit requirements and/or causing a pollution due to the lack of resilience in the biosolids supply chain.

We do not consider any of the risks above to be acceptable in AMP8, in the interest of providing our customers with a reliable and efficient bioresources service and providing sufficient environmental protection in our bioresources operations.

While we welcome the proposed cost sharing for bioresources, we do not consider it to be sufficient in managing the risks above. Therefore, we request that Ofwat allow our full cost allowance of £44.7m for our cake storage schemes.

4. Industrial Emissions Directive (IED)

4.1. Ofwat's approach to IED enhancement costs

In the draft determinations the cost assessment for IED enhancement is based primarily on cross-company benchmarking of forecast IED costs submitted by companies. Ofwat has divided IED enhancement costs into three categories:

1. secondary containment costs;
2. tank covering costs; and
3. other IED costs.

The first two categories were assessed using scheme-level econometric models in the draft determination, while for the last a simple unit cost comparison was used with each company's sludge volumes as the normaliser.

In addition, an upper quartile efficiency challenge was applied when calculating allowances for secondary containment costs and other IED costs, calculated separately for each of these categories. Deep dives were carried for schemes assessed as outliers in a small number of cases.

We support the use of cost benchmarking where it can be used to derive reliable estimates of efficient costs. However, we consider that the features of IED requirements are too complex and unique for a simple benchmarking model or a unit cost comparison to be relied upon to predict efficient expenditure in this area, particularly at scheme level. As explained in WSX-C02, and in further detail below, the econometric models for IED perform worse against Ofwat's own tests for model robustness than enhancement models used elsewhere in the draft determination. These models do not cover factors that we consider to be important drivers of efficient costs, based on engineering rationale. Furthermore, around a quarter of IED costs are bundled together into the "other IED" costs category which covers very different types of investment, each with different drivers of cost which are not accounted for within the unit costs model.

We also have concerns about the use of upper quartile cost benchmarks for any of the IED categories.

We explain this in more detail below and set out what we consider to be a more appropriate approach to set allowances that better balance the need to secure cost efficiency, while ensuring that companies are adequately funded to deliver their IED enhancement programmes.

4.2. Goodness of fit of Ofwat's chosen benchmarking models

The chosen IED models used in the draft determination have the lowest adjusted R squared values of all models used to inform PR24 enhancement cost allowances – ranging between 0.078 (tank covering) and 0.201 (secondary containment). In both areas, the majority of variation in costs is not explained by the chosen cost drivers. The scale of this is very unlikely to be explained by inefficiency (particularly when it is apparent at scheme level) and creates a high likelihood that two tank covering schemes (for instance) with a similar surface area but very different efficient costs will be given a similar cost allowance that doesn't reflect the true efficient costs of either scheme. Reflecting this, Ofwat's own test states that if a model failed to explain a significant share of the costs of the industry, it would be inappropriate to use it for the estimation of costs.

We have also considered evidence on the range and dispersion of the efficiency scores calculated for each company. Looking at efficiency scores in this context provides another way to compare goodness of fit particularly in cases where models have different dependent variables (e.g. for different IED areas), or where an R-squared value is not defined / applicable for the case (e.g. where cost benchmarking is a simple unit cost comparison). For the secondary containment and tank covering models, the efficiency scores are reported in the spreadsheets published as part of the draft determinations. For 'other' IED costs, as the efficiency scores were not published in

the draft determinations, we calculated the efficiency score for each company using unit cost per company (using ttds as the denominator as per the approach used) divided by the median unit cost.²

On this basis we found that the range of the efficiency scores (i.e. minimum to maximum) were as follows:

- A range from 0.43 to 3.99 for the secondary containment costs
- A range from 0.07 to 2.14 for tank covering cost
- A range from 0.16 to 3.13 for the other IED costs

When considering these ranges even as an approximate indicator of the efficiency differences across companies' business plan costs for IED enhancements, we consider this demonstrates the limitations in the approach used. These results are highly suggestive that the benchmarking analysis is not making like-for-like comparisons across companies.

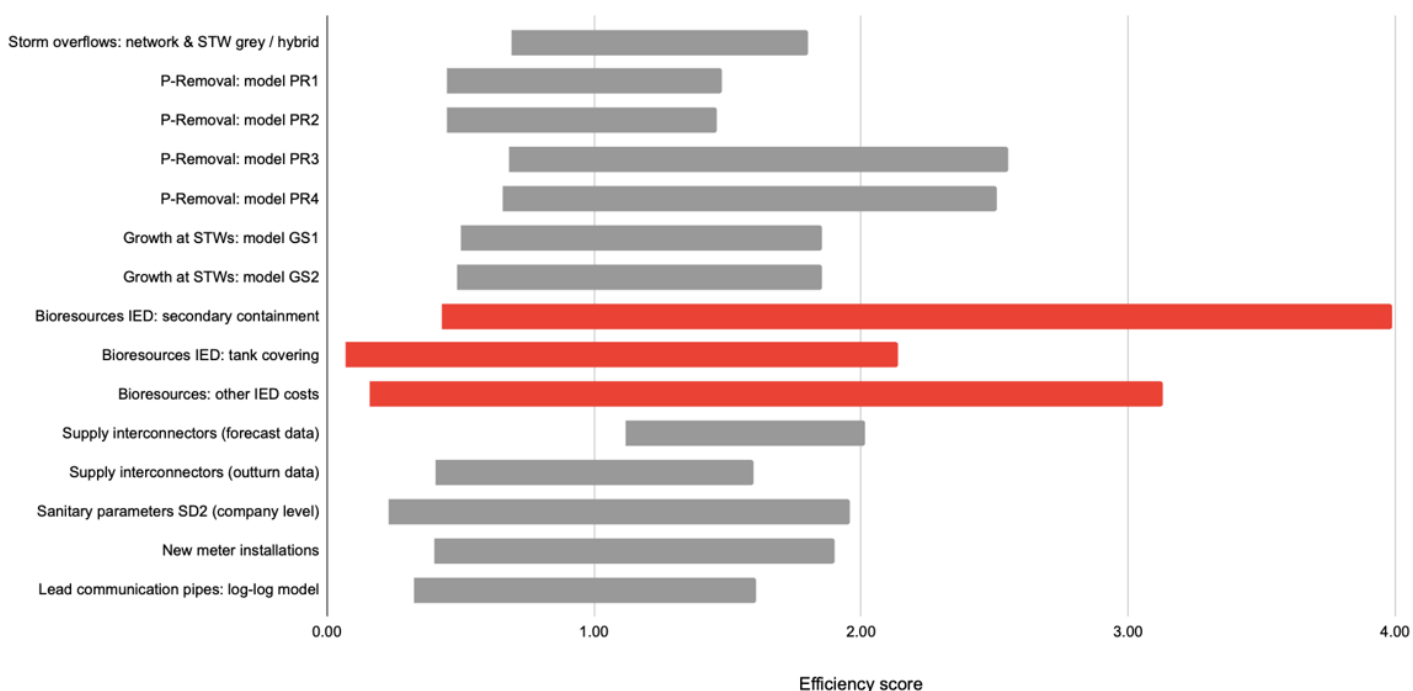
We have also considered these efficiency scores in the context of the other enhancement models used in the draft determinations. These cover the models from each of the main enhancement expenditure categories from the draft determination "Enhancement cost modelling appendix".³ In some cases, the efficiency scores reported here are after the application of adjustments to remove outliers from the econometric models; similarly the efficiency scores reported for the IED econometric models are post adjustments to exclude outliers.

Figure 1 compares the range of efficiency scores across different enhancement models. Where econometric modelling was done at the level of individual schemes, we used the efficiency ratios reported at the company level (i.e. reflecting modelling costs aggregated across each company's schemes). The range for the three IED categories is shown in red.

² In setting allowances Ofwat's approach has the effect of adjusting costs to the upper quartile unit cost, rather than median, but for consistency with the other categories (and Ofwat's broader practice) efficiency scores are calculated before upper quartile adjustments.

³ For storm overflows, Ofwat used separate models for grey/ grey hybrid solutions across both network and STWs, but the figures report here reflect the implied efficiency ratios across both network and STW models (and after application of an upper quartile adjustment for the network models).

Figure 1 – Range of efficiency scores for a set of draft determination models



As illustrated above, the ranges of efficiency scores for the three IED categories are notably higher than for the other enhancement benchmarking models presented.

In the context of the base cost econometric modelling, “efficiency score distribution” has been identified as one of the tests of model robustness that it uses to assess econometric models, stating that:

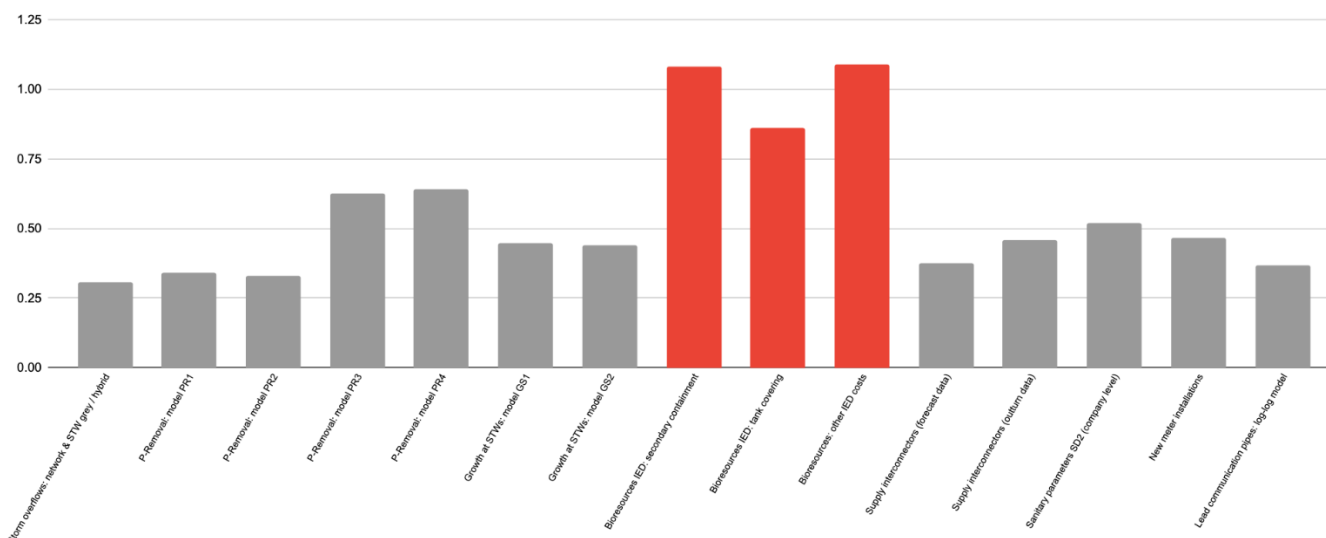
“A large range of efficiency scores could indicate the presence of issues in the underlying model, such as the presence of omitted variables”.⁴

This comparison indicates that such issues are present for IED (i.e. drivers of companies’ efficient IED expenditure requirements that differ between companies and are not captured by the drivers in these models or unit cost comparisons).

A further approach to considering efficiency score distribution is to calculate the standard deviation of efficiency scores across companies. This has the advantage of reflecting efficiency scores from the whole dataset rather than being driven by the maximum and minimum values which could be outliers compared to the rest of the data. In Figure 2 we compare the standard deviation of efficiency scores across the same set of enhancement models as used for the chart of ranges above. As before, the three IED categories are marked in red.

⁴ Ofwat (2024) PR24 draft determinations: Expenditure allowances - Base cost modelling decision appendix, page 73.

Figure 2 – Standard deviation of efficiency scores for a set of Ofwat draft determination models



As with efficiency score ranges, the standard deviation of efficiency scores for each of the three categories of IED enhancements used in the draft determination is considerably higher than that for each of the other enhancement models or categories from the chart.

As expected, due to the variety of heterogeneous types of investment (liquor sampling, control and monitoring, permit application and other investments), there is a very large standard deviation seen for the “other IED cost” category using companies’ sludge volumes to normalise these data points. The models for the other two categories of IED costs also show a significant spread of efficiency scores. For instance, the standard deviation of efficiency scores for the secondary containment model is between around 70% and 350% higher than that of the models for enhancements outside of IED.

We recognise that some deep dives for undertaken for IED costs where they were considered to be outliers, including costs at Avonmouth. However, our view is that the limited number of outliers considered at draft determinations is too narrow given the significant range of efficiency scores that still remain after excluding outliers. Furthermore, there seem to be underlying limitations with the models used for IED that cannot be adequately addressed through an approach based on outliers.

4.3. Additional factors not considered

The econometric models used to assess secondary containment costs and tank covering costs include a single explanatory variable:

- the length of bund wall for the model relating to secondary containment, and
- the surface area of tank coverings in the case of tank covering costs.

In each of those cases, the draft determination outlines that those variables explained the highest variation in costs, compared to other variables. The discussion of the models implies that other explanatory variables were considered as *alternative* to the one included in the selected models. In the case of models for secondary containment costs, for example, it is not clear whether models that controlled for more than one potential cost driver were considered amongst the set for which data was available. Further to length of bund wall, these include (i) volume of tanks, (ii) impermeable surface area upgraded, (iii) bund wall weighted average height, (iv) volume of bund, and (v) sludge

produced. Similarly, the discussion suggests that only linear models were considered, and it appears models with, for example, square terms of the potential drivers were not explored.

In the light of the weak goodness of fit of the model settled on – as evidenced by the range and standard deviation of the efficiency ratios discussed above – we sought to relax the apparent constraints within the modelling was developed with a view to identifying models that would perform better. We set out the alternative models in Annex 1.

We draw from our analysis a view that, even considering a wider set of drivers or exploring alternative, more flexible, functional forms, even the better performing models are still relatively poor in explaining the variation in the relevant enhancement costs across schemes. This would imply that neither the simpler model used in the draft determination nor the more flexible models we explored provide a reasonable approach to assess companies' costs. In this context, we consider that it would be more appropriate to carry out deep dives on each of these schemes, allowing it to consider more carefully the specific factors of each from an engineering perspective.

4.3.1. Site-level variations

A technical review of IED⁵ conducted by Atkins in 2023 has found significant site-level variations in companies' IED solutions, which were driven by sites having different starting points in terms of technologies employed, required standards at the time the site was constructed, local receptors and the guidance given by local EA teams to individual companies. These variations are not explained by the cost driver data and would therefore not be reflected in the econometric modelling.

Atkins also said the following in their report:

“Site variability within companies also varied significantly, validating that the starting point and site-specific geographies were a significant factor. The variability in the per-site numbers for each company is also striking. The number of sites where interventions were required as a proportion of a WaSC's total number of digestion sites was highly variable. There was also no consistency in treatment process, with interventions seen on sites with both advanced and conventional anaerobic digestion. This lack of consistency is to be expected due to the significantly different starting positions and receptors present on each site.

Overall, there is not a standardisation of interventions by site, which makes comparison of costs across companies challenging when the assessment of risk is performed in isolation for each site. The risk assessment process which drives interventions being proposed (such as CIRIA C736 and fugitive emission prevention) is an area where a standardised approach across England could be achieved.”

A few examples of existing site variability that will have a significant impact on the required investment for IED compliance are:

- Site layout – The secondary containment for sludge tanks in a cluster will be more efficient than for tanks located in different areas of a site.
- Site location and topography – The location of a site near a sensitive waterbody or receptor would result in additional measures required in secondary containment solutions.
- Starting point of a site – as there is no industry standard for AD, all sites, including ours, have been designed differently which results in different starting points and different gaps to achieve IED compliance.

⁵ Atkins was asked by Water UK in May 2023 to provide an impartial technical supporting document on IED that will be used to support Director-level discussions between the water industry, EA and Ofwat to agree an approach to deliver IED compliance in a consistent manner.

Sites designed with odour control systems and additional monitoring equipment would require less investment to achieve compliance compared to sites without odour control systems and sufficient monitoring equipment.

There are site variability factors on all our sites that have impacted the efficient cost of their IED solutions. A few examples are:

- As explained in our response for Query OFW-OBQ-WSX-204, the height of a section of bund wall for Avonmouth had to be increased to protect a nearby Scheduled Monument from jetting effects in the event of tank failure. This has increased the efficient cost of the secondary containment solution for Avonmouth.
- At Avonmouth and Poole, there are sludge / liquor holding tanks located outside of the main sludge treatment area, which has resulted in the need for separate bunds to be constructed for these tanks. This has increased the efficient cost of the secondary containment solutions for Avonmouth and Poole.
- At Berry Hill, the only viable secondary containment solution is to bund the entire site due to the layout of the tanks and the lack of space in between clusters of tanks. This has increased the efficient cost of the secondary containment solution for Berry Hill.
- At Trowbridge, two separate containment areas are required to accommodate the spill volume because the site is located on a hill. This has increased the efficient cost of the secondary containment solution for Trowbridge.
- A large number of open sludge tanks at Berry Hill cannot be retrofitted with tank covers due to their rectangular shape and design. These tanks will need to be rebuilt to accommodate tank covers. This has increased the efficient cost of tank covering at Berry Hill.
- None of our AD sites have a requirement for odour control prior to IED, which affects the starting point of our sites for IED compliance. All our sites will need to be provided with new odour control units, which increases the efficient cost for compliance at all sites.

As the site-level variations are significant, not explained by the cost drivers and therefore not reflected in the modelling, we do not consider that the models used for assessing efficient costs for secondary containment and tank covering to be appropriate.

4.4. Benchmarking “Other IED costs”

In its assessment, Ofwat brings together a subset of IED-related enhancement costs under the heading of “Other IED costs”. Leaving aside costs relating to “cake pad/cake storage covering”, for which no costs are reported by any of the schemes, these other costs cover a number of sub-categories, namely:

- Control and monitoring enhancement costs
- Permit application enhancement costs
- Liquor sampling enhancement costs
- Other enhancement costs

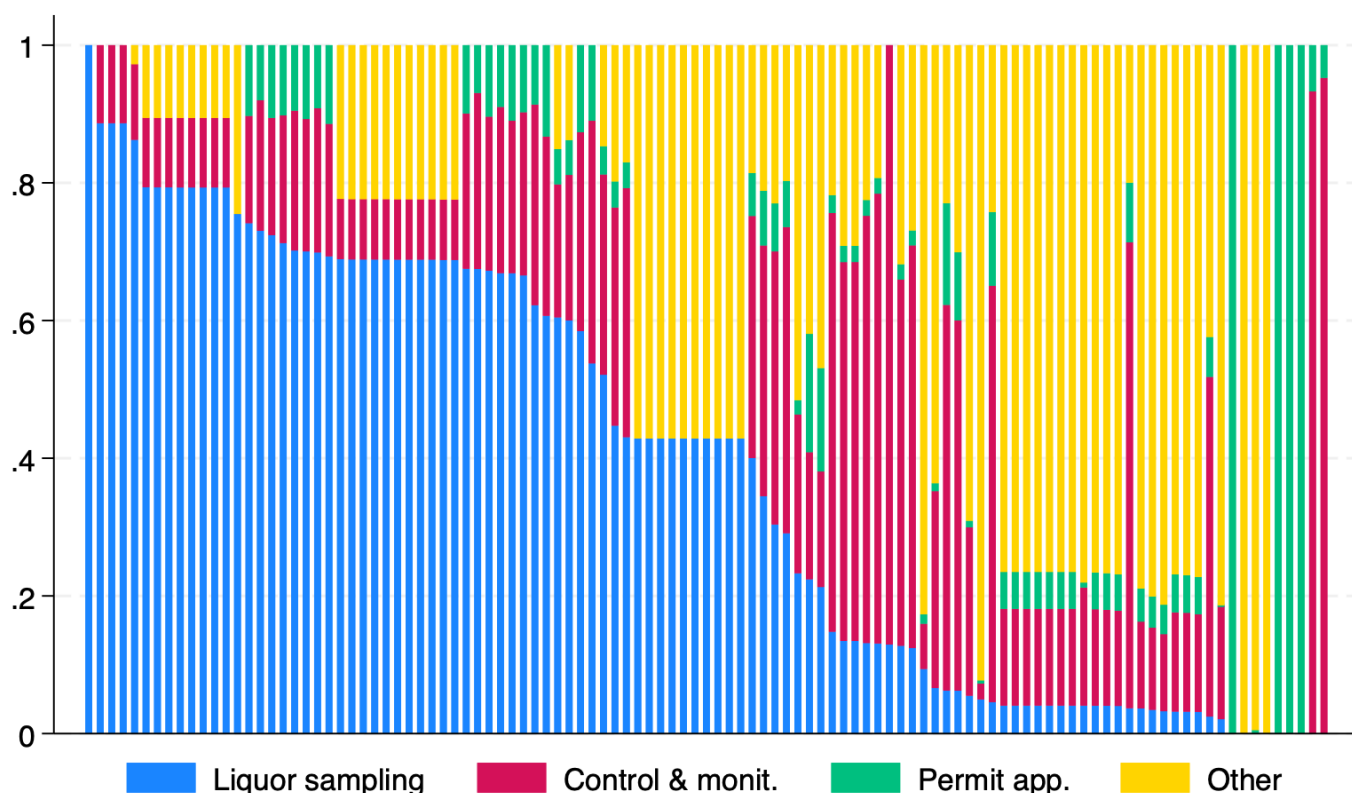
“Other IED costs” have been assessed by benchmarking “Other IED costs” per tonne of dry solid sludge and the efficient allowance for these costs determined by reference to the upper quartile (at the company level) of the unit cost. We do not consider this approach to be reasonable because of the following reasons:

- The investments to which the different cost sub-categories relate to are not substitutable; it is not within a company’s control to do more of one rather than of the other. For example, investing more in control and monitoring will not mean that we can invest less in liquor sampling.

- There is no reason to expect the unit cost – expressed in £ per tonne of dry solid sludge – would be the same for each of those sub-categories of enhancements, e.g. that the liquor sampling unit enhancement costs would be the same as the permit application unit enhancement cost.
- There is very significant variation across schemes in terms of the contribution that those sub-categories of enhancement costs make to “Other IED costs”.

Figure 3 captures this last point. For each scheme within the dataset drawn on in the assessment, the figure shows the proportion of each of the sub-categories of enhancement costs falling within the “Other IED costs” category. It is evident from the chart that there is much variation across schemes.

Figure 3 – Proportion of components of “Other IED costs” across schemes



In light of the above considerations, we do not see the basis for the approach used in benchmarking “Other IED costs”.

A potential improvement on the approach would be to benchmark each cost sub-category separately. The data collected by Ofwat includes information on variables that are better proxies of a relevant scale variable than tonnes of dry sludge. For example:

- Data on the number of monitors can be used as a candidate scale variable to control for the variation in control and monitoring enhancement costs,
- Data on the variables relating to the number and frequency of sampling might provide useful controls for benchmarking liquor sampling enhancement costs,
- Data on the number of IED sites can be used to benchmark permit application costs, as the number of IED permit applications directly scale with the number of IED sites.

We expect that considering such drivers, which are more closely linked to the enhancement activity itself, would provide a more reasonable and robust benchmarking than the blunt use of tonnes of dry solid as the scale variable across all components of “Other IED costs”.

4.5. Choice of efficiency benchmark

We do not agree with the application of an upper-quartile efficiency challenge for secondary containment and other IED costs. We consider this creates a material risk of setting allowances that are significantly below what would be spent by an efficient company.

Firstly, for the reasons set out in WSX-C02, we consider the available evidence from PR19 demonstrates there are major risks to basing efficiency challenges on upper quartile forecasts in general, as these have proven to be less reliable than others.

Secondly, in choosing what type of cost benchmark to apply when setting specific allowances (e.g., predicted values without adjustment, or benchmarks based on median or upper quartile efficiency scores) a key consideration is the quality and statistical performance of the model(s) from which modelled costs and efficiency scores are obtained.

- In its determination in the PR19 appeals, the CMA viewed “overall model effectiveness” as one of the main considerations affecting the choice of benchmark for an efficiency adjustment applied to benchmarking results, referring to the statistical performance of the models being used.⁶
- As highlighted above, Ofwat has recognised that a large range of efficiency scores could indicate the presence of issues in the underlying model, such as the presence of omitted variables. We agree with this statement and consider it highly relevant to the choice of benchmark (as well as model selection); omitted variables will tend to mean that the relative efficiency of some companies is over-estimated and for other companies under-estimated. In turn, in the presence of omitted variables, an adjustment based on the upper quartile efficiency score will tend to lead to downward adjustments to cost allowances for all companies that reflect an over-estimation of the efficiency of the companies with upper quartile efficiency scores.
- Our view is that the wider the distribution of efficiency scores, the higher is the risk that using an upper quartile benchmark leads to *under-estimation* of the actual efficient levels of costs.

This type of risk is always present to some degree in the cost benchmarking as the types of models used will not fully allow for all relevant underlying cost drivers. But this risk seems very high in the case of the IED cost benchmarking, given the available evidence set out above on the goodness of fit of the chosen models. In this context, there is an even greater risk that an upper quartile challenge to IED costs will lead to allowances set below the true forward-looking efficient cost of delivery. This is especially so given that in other areas the benchmark has generally been set based on the efficiency of the median company.

Thirdly, while we recognise the reasons that a greater efficiency challenge was considered appropriate for these IED categories, the following points need to be considered as well.

- Ofwat says there is still a level of uncertainty, which appears to have led to higher IED totex requests for some companies. We do not consider there to be any material uncertainty in the areas of secondary containment and tank covering because the EA has confirmed their expectations for compliance. We also

⁶ CMA (2021) *Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: final report*, paragraph 4.492

do not consider there to be any material uncertainty in the cost of our proposed secondary containment and tank covering solutions because we have built our scope using a bottom-up approach and based our cost estimations on dimensions obtained from our scope assessment. Furthermore, our costs have been externally benchmarked for efficiency. Therefore, we would consider that our requested costs for secondary containment and tank covering are efficient and justified.

There may be greater uncertainty in the category of ‘Other IED costs’ as the EA has not confirmed that the scope of certain areas (such as liquor sampling, digestate stability monitoring and emissions control) would not change in the future. However, we have developed our solutions in these areas with a balanced view of risk and remaining uncertainty to ensure that our costs are efficient.

- Ofwat said that the application of a more stringent challenge is based on companies that are further progressed in IED implementation and are likely to have greater cost certainty. We do not consider that the lower costs proposed by some companies are due to their progress on IED compliance, but rather the variations in scheme-level solutions driven by site-specific factors such as site layout or site topography in the case of secondary containment. This is evident in the case of Northumbrian Water’s requested secondary containment costs, which are ranked 5th in efficiency when compared to the modelled costs, despite the company having received £12m in IED funding at PR19. In fact, the company with the most efficient IED costs is Anglian Water, who did not receive any prior IED funding. Therefore, we do not believe there is any correlation between a company’s IED cost and its progression in IED compliance. The variability in companies’ IED costs is most likely driven by site-level variations, as explained in the Atkins IED report⁷ in Section 4.3.1.
- Ofwat said it is providing cost sharing of 25:25 to recognise the higher cost uncertainty compared to other costs. While this reduces the financial impact of over- and under-spends against ex ante allowances, compared to other enhancement cost sharing rates, it does not remove the need for Ofwat to set a fair and reasonable ex ante allowance in the context of the cost uncertainty. The use of an upper quartile does not seem to provide a “fair bet” ex ante and the cost-sharing does not resolve that issue.

Fourthly, we consider the risk that Ofwat is rightly seeking to address – i.e. that companies are being sufficiently challenged to deliver IED upgrades efficiently – can be mitigated in other ways. For instance, the following could be actioned:

- Undertake a deeper dive into IED costs where modelled costs are well below proposed costs (e.g. other outliers)
- In the specific case of IED, cap a company’s overall allowance at its forecast costs such that no single company is allowed more than requested in its business plan; or alternatively apply caps to enhancement allowances across a wider scope (e.g. all wastewater enhancements).
- Introduce an uncertainty mechanism to adjust allowances based on information on industry-wide IED costs revealed ex-post, rather than forecast ex-ante. We discuss uncertainty mechanisms for IED in more detail in Section 7. As part of our response to the Draft Determination, we have proposed two types of uncertainty mechanism. The inclusion of these mechanisms in the PR24 settlement would help to reduce the information asymmetry that exists not just between companies and the regulator but also between

⁷ Atkins was asked by Water UK in May 2023 to provide an impartial technical supporting document on IED that will be used to support Director-level discussions between the water industry, EA and Ofwat to agree an approach to deliver IED compliance in a consistent manner.

companies and their own supply chains, by allowing aspects of the PR24 determination to be set when there is much greater certainty over efficient cost allowances.

All these options would allow Ofwat to challenge companies to continue delivering IED upgrades efficiently, while significantly mitigating the risks associated with setting an efficiency benchmark based on a set of IED models which have identified robustness issues.

Taking all the above into consideration, and given the particular risk in this context that an adjustment based on the upper quartile efficiency score will set allowances that are significantly below what would be spent by an efficient company, we request that Ofwat reconsiders its approach to setting an efficiency challenge in this area, so as to balance the benefits of incentivising efficiency against the risk of excessive disallowance of costs.

4.6. Reliability of data sources

We are concerned about the consistency in how the industry has interpreted the categories in Ofwat's IED data table request, and the impact on how costs are allocated within the categories and the data reported under each cost driver. Two notable examples are:

- Tank covering – The covering of post-digestion sludge tanks will require a subsequent gas handling solution. We have included the costs for gas extraction and handling under the 'Tank Covering' category, along with a few other companies. However, some companies appear to have allocated these costs under the 'Other' category. This inconsistency would have impacted the tank covering model and affected the modelled efficient cost.
- Control and monitoring – The grouping of different monitors with a large range of costs in 'Number of monitors' reduces its reliability as a cost driver. The additional monitors required for BAT compliance range from small instruments such as flowmeters and pH monitors to more sophisticated instruments such as methane and ammonia analysers. Therefore, their costs are unlikely to be comparable.

4.7. Changes to IED programme

Our proposed rationalisation in AMP8 has prompted a review of our IED programme. The changes made to the programme are:

- The removal of Taunton's IED improvement scope from the programme due to the planned closure of Taunton's AD plant in 2025-26,
- The addition of Taunton's c.£7m AD decommissioning cost in the programme, as the closure of the AD plant is driven by IED compliance, and
- The revision and reprofiling of IED costs for other sites due to the changes at Taunton.

Separately, the EA has provided further clarification on their expectations for compliance in liquor sampling and monitoring since the Business Plan was submitted. We have therefore revised the associated scope for all IED sites to align with the EA's approach to compliance. This has resulted in a change in the costs for the categories of 'Liquor Sampling' and 'Control and monitoring'.

We explain these changes in further detail in the commentary document for Table ADD14 (see **WSX-D13 – Data tables commentary – Additional tables**).

Table 6 summarises the revised IED costs (by site and assessment category) that will be submitted in our Draft Determination response, compared to the costs submitted in the Business Plan.

Table 6 – IED costs by site and assessment category

Site	IED costs in Business Plan submission (£m)				Revised IED costs for Draft Determination submission (£m)			
	Secondary containment	Tank covering	Other IED costs	Total	Secondary containment	Tank covering	Other IED costs	Total
Poole	£8.9	£7.6	£4.5	£21.0	£9.0	£7.7	£4.4	£21.0
Trowbridge	£5.9	£1.4	£6.1	£13.4	£7.3	£1.5	£6.7	£15.5
Berry Hill	£8.8	£21.3	£11.3	£41.4	£12.1	£21.0	£11.5	£44.6
Taunton ⁸	£8.4	£17.1	£7.6	£33.1	£0.0	£0.0	£0.0	£0.0
Avonmouth	£21.5	£11.0	£6.7	£39.2	£18.8	£11.4	£6.2	£36.4
Total	£53.5	£58.4	£36.2	£148.1	£47.1	£41.5	£28.9	£117.5

4.8. Required adjustment to cost allowance

For secondary containment, we request that our allowance is set to £47.1m. We do not consider the scheme-level econometric model to be sufficiently reliable in determining efficient costs for secondary containment because there are site-level variations that cannot be explained through econometric modelling. As these site-level variations can have a significant impact on efficient costs, **we request that Ofwat undertake a deep-dive assessment of all secondary containment proposals** (as was done for Avonmouth). This would remove the need for an upper-quartile efficiency challenge.

For tank covering, we request that our allowance is set to £41.5m, for the same reasons above. **We also request that Ofwat undertake a deep-dive assessment for all tank covering proposals.**

For other IED costs, we request that our allowance is set to £28.9m. We are concerned with the approach of grouping all other IED costs and using a simple unit cost comparison based on companies' sludge volumes, for the following reasons:

- sludge volume is not the driving factor behind these costs,
- the large standard deviation indicates this approach to unit cost benchmarking is unsuitable,
- other IED costs account for c.25% of overall IED costs, which means underfunding in this investment area will have a significant impact to companies achieving IED compliance.

⁸ The c.£7m decommissioning cost of Taunton's AD plant has been included in the IED costs of other sites because Taunton will not be an IED site in AMP8.

We request that granular benchmarking of individual categories is undertaken as the cost driver for each category is available.

We set out our representation on the PCD proposed for IED in WSX-O02 – Price Control Deliverables.

4.9. Rationale

We request that the rationale and evidence below is considered when assessing our IED enhancement submission.

4.9.1. Best option for customers

To ensure that our IED options provide the best value to our customers, we have considered a range of different approaches for efficient delivery of IED compliance at our sludge treatment sites.

First, we have undertaken a site rationalisation review to understand opportunities for reducing the cost impact of IED compliance and maintain our efficiency in bioresources. We identified the option to close the AD plant at Taunton convert the site to lime treatment. This allows Taunton to be removed as an IED site and reduce the cost of our IED programme.

Second, we have considered risk-based approaches to secondary containment and tank covering, due to the significant investment required for achieving compliance in these areas. For secondary containment, we proposed that for all reinforced concrete tanks that have a low probability of failure, we would provide vehicle collision protection and remove vulnerable points of failure, instead of bunding the tank; while for tank covering, we proposed that post-digestion sludge tanks are covered based on the risk of methane release. However, the EA has dismissed these approaches as they do not see them as meeting the requirements of their guidance⁹. The EA confirmed their expectations that all sludge tanks must be provided with secondary containment that is CIRIA 736-compliant and all post-digestion sludge tanks must be covered. We have therefore based our IED submission on these solutions. While we have scoped our IED solutions to align with the compliance requirements as set out by the EA in their approach to Appropriate Measures guidance, we have ensured that the scope of our solutions and their cost estimates reflect a balanced view of risk and compliance.

Third, we have also considered options for replacing and relocating sludge tanks to improve the efficiency of secondary containment and tank covering solutions. Where open sludge tanks are approaching the end of their useful life or cannot be retrofitted with covers and therefore not BAT compliant, we have reviewed the option of replacing these tanks with new covered tanks and relocating them to align with secondary containment layouts. We have allocated the cost of replacing the asset as base expenditure and the additional cost for the tank cover as enhancement expenditure.

⁹ The EA confirmed their expectations of secondary containment and tank covering requirements in a director-level industry-EA meeting in Dec 2023:

“The EA have advised it will be necessary for operators to enclose everything up to and including, de-watering as all parts of the process prior to dewatering will result in generation of methane which needs to be captured. This should also include where appropriate de-gassing either before separation (of liquors and cake) to minimise emissions or, enclosure of dewatering and capture of emissions. It is the responsibility of companies to specify the solution(s) they will put in place to achieve this.

As previously confirmed even where the risk of asset failure is negligible, if the potential for human error that could lead to any polluting activity still exists (operator error), full secondary containment including sealed surfaces within the bunded area is required. These costs should be included in the AMP 8 business plan submissions.”

4.9.2. Cost efficiency

To demonstrate cost efficiency, we have provided a scope breakdown of our proposed investment in the areas of secondary containment and tank covering in Annex 2 and 3. This information will also assist in a deep-dive assessment for these areas.

The scope of investment for the areas of control and monitoring, liquor sampling, permit application and other IED costs are provided in the commentary document for Table ADD14 (**WSX-D13 – Data tables commentary – Additional tables**).

4.9.3. Other relevant evidence

Evidence provided previously:

- Business Plan Supporting Document WSX18 – Bioresources strategy and investment
- Response for Query OFW-OBQ-WSX-204 (additional information to explain Avonmouth's secondary containment being an outlier)

Evidence provided elsewhere in our draft determination response:

- WSX-D06 – Commentary on data table changes – Bioresources
- WSX-D13 – Commentary for Table ADD14 (IED)
- WSX-O21 – Price Control Deliverables
- WSX-C01 – Base costs
- WSX-C20 – Cost adjustment claims

4.10. IED base costs

We have included our proposed IED base costs in a cost adjustment claim, CAC5 - Industrial Emissions Directive (IED) and Environmental Permitting Regulations (EPR) costs. In the CAC, we explained that our IED base costs have not been included in the base allowance modelling and therefore not included in the implicit base allowance. Our IED base costs are the additional base expenditure for maintaining our bioresources assets at IED sites to achieve higher asset condition levels than previously required. This results in a step-change increase in base costs that would have not been reflected in historic base cost models.

As reported in our Bioresources Asset Health Assessment submission, the majority of our bioresources assets on IED sites are between Grades 2-3, with some at Grade 4. Based on Appropriate Measures guidance and the Improvement Conditions of IED permits, we will need to bring most assets to Grades 1-2 to be BAT compliant. To achieve this, additional capital maintenance works will be required in AMP8, above and beyond the level that is considered industry standard. An example is the need to clean digesters once every 5 years under IED, as opposed to the industry norm of once every 10 years.

We have estimated that the additional base expenditure for improving the condition of our bioresources assets to Grade 1-2 would be c.£33.4m in AMP8. The removal of Taunton as an IED site lowers the additional cost to c.£23.6m.

In the cost adjustment claim assessment, all IED costs, including IED base costs, have been reallocated into the IED enhancement modelling. However, IED base costs have then been dropped from the IED enhancement modelling. While Ofwat acknowledged that "... *base expenditure for IED compliance is covered by base allowances*", we do not believe the base cost models appropriately account for the step-change increase in capital maintenance expenditure driven by IED compliance. Therefore, **we believe the additional expenditure would need to be reflected in an additional base allowance as an unmodelled base cost**, as in the case of IED base operating cost.

Our IED base programme is as important as our IED enhancement programme for our IED sites to achieve compliance with their permits. This is because permit compliance is based on the entire sludge AD process being compliant with Appropriate Measures guidance, which includes bringing existing assets to BAT standard (IED base) and providing new assets such as secondary containment and tank covers (IED enhancement).

4.11. Why the change is in customers' interests

The allowance for IED enhancement of £50.8m is around 43% of our requested allowance, while no allowance was made for IED base costs. We do not consider the proposed enhanced 25:25 cost sharing to be sufficient in managing the residual cost risk, considering the large gap between our requested allowance and the allowance in the draft determination.

This level of underfunding puts a significant risk on our IED compliance programme as we would not be able to deliver all the site upgrades and operational activities required for our IED sites to achieve permit compliance. This will adversely impact our performance in the following areas:

- Environmental Performance Assessment (EPA) – As waste permit compliance will be included as a metric in the EPA in 2026, any IED compliance breaches could affect our EPA rating.
- Greenhouse gas (GHG) emissions – The reduction in fugitive methane emissions from the upgrades in our IED compliance programme (such as provision of tank covers and improved leak detection) is c.4,500tCO₂e in AMP8 and accounts for 15% of our operational GHG wastewater performance commitment (PC) target. Under-delivery of these IED upgrades will likely result in underperformance of this PC, which will result in an ODI penalty of c.£1m in AMP8.

In the interest of providing an efficient and sustainable bioresources service to our customers, we do not consider the risks above to be acceptable.

5. EPR / “non-IED” waste permit compliance costs

In this section, we set out our representation on the decision to not fund any of our proposed EPR / “non-IED” waste permit compliance costs. We do not agree this decision and we explain our rationale below.

In our Business Plan supporting document titled WSX18 – Bioresources strategy and investment, we explained that we will need to apply for either bespoke or phys/chem waste permits for all our lime treatment sites when the EA reforms the T21 Exemption under their proposed Sludge Strategy. While the EA has not provided a timeframe for this change, we expect that it will likely happen sometime in AMP8. This would mean that the waste permits are likely an AMP8 obligation. However, as the EA has not included these “non-IED” waste permits in the PR24 WINEP, we had to request the permit compliance costs as non-WINEP enhancement expenditure in the Business Plan.

The scope of permit compliance requirements is similar to the scope for IED compliance, as all permit compliance is based on the EA’s Appropriate measures guidance. This would mean that for all our lime treatment sites to achieve retrospective compliance with their permits, they would need to be provided with secondary containment, tank covers and additional control and monitoring.

In the Business Plan, we submitted the permit compliance costs of c.£28.2m as non-WINEP enhancement expenditure under the data table lines of CWW3.187 and CWW3.188. We also submitted this under a cost adjustment claim, CAC5 - Industrial Emissions Directive (IED) and Environmental Permitting Regulations (EPR) costs.

Due to the planned rationalisation in AMP8 (as explained in Section 2.2), the scope and cost for “non-IED” permit compliance has been updated to £30.0m. We are defending our decision to include this cost as a non-WINEP enhancement, as there is a high likelihood of this obligation occurring in AMP8. However, we have removed this cost from CAC5. Instead, we are proposing an uncertainty mechanism (in the form of a targeted reopener of the bioresources control) to manage any residual cost risk from this investment. While we support Ofwat’s proposal for cost sharing in bioresources, we consider this to be the second-best option after our proposed uncertainty mechanism. We explain this in further detail under Section 7 – Bespoke uncertainty mechanism for bioresources.

5.1. Required adjustment to cost allowance

We request that our submission for EPR / “non-IED” waste permit compliance costs is assessed and an enhancement allowance included for it.

5.2. Why the change is in customers’ interests

We are concerned with the decision to not provide any allowance in this area, as the lack of funding would mean that our lime treatment sites cannot comply with their permit requirements, leading to a risk of enforcement from the EA. In the worst case, the EA will not allow operations to continue on these sites, which will impact our treatment capacity. Any unplanned interventions to provide short-term capacity will likely be inefficient and therefore not in customers’ interest.

The lack of funding in PR24 means that funding will be deferred to PR29, which would likely result in similar risks to those seen with IED compliance; an example being the EA’s expectation for compliance would be in advance of any funding provided.

6. Bioresources growth enhancement

In our Business Plan supporting document titled WSX18 – Bioresources strategy and investment, we explained that we are forecasting a capacity shortfall of c. 11,000tds per year in AMP8. Our proposal for providing additional capacity in AMP8 is to build two new digesters at Avonmouth to provide 7,300tds per year of new digestion capacity and install an additional 3,650tds per year of lime treatment capacity for contingency headroom. We have submitted the cost for this proposal of c.£39.6m under CWW3.164 – Sludge enhancement (growth); enhancement totex.

Since the Business Plan was submitted, we have undertaken a rationalisation review and decided to close the AD plant at Taunton and convert the site to lime treatment in 2025-26. This change allows for the lime treatment solution proposed for growth enhancement to be optimised. Therefore, the cost of our growth enhancement has been revised to £21.4m.

6.1. Ofwat's cost assessment approach

In PR19, Ofwat used a shallow and deep dive approach to assess companies' proposed bioresources growth enhancement. A separate allowance was made for growth enhancement based on evidence of population growth and the evaluated impact of this on sludge production. However, in the PR24 final methodology, Ofwat has proposed to include growth enhancement in their econometric cost benchmarking models and make no separate allowance for these costs at PR24, which was considered to be a reasonable approach. Therefore, in the draft determination, our growth enhancement expenditure has been included in the c.£160m base modelled allowance for bioresources.

While we acknowledge that there was general support for the inclusion of growth enhancement within the econometric model as mentioned in the PR24 final methodology document, we do not agree that this approach is reasonable.

The first reason is that the unit cost model based on sludge volume promotes market solutions that are perceived to be more efficient, but do not currently exist due to lack of maturity in the bioresources market. We have outlined the reasons for the poor development in the bioresources market in our Bioresources Market Monitoring Information Survey in the 2023-24 APR and WSX18 – Bioresources strategy and investment in the Business Plan. The main barriers are:

- the uncertainties in environmental regulation – landbank availability, FRfW and IED compliance,
- the requirement to commit to a contract over at least 15-20 years, which risks being locked in an inefficient solution over multiple AMPs,
- the reliance of a 3rd party solution being co-located on a WaSC site – to leverage the use of the sewage treatment on the site for liquor disposal, and
- the lack of proven technologies other than AD, e.g., ATC.

These barriers have meant that the market is unable to offer any solutions that will move us away from the current approach to bioresources or enable any step-changes in the efficiency level of bioresources services.

Another reason is that the unit cost modelling approach is not reliable in determining the best-value lowest whole-life-cost (WLC) option for growth because it only considers efficiency within the period of one AMP. Additionally, the cost drivers in this modelling approach do not account for external factors affecting bioresources such as the uncertainty around landbank availability and the additional cost associated with IED compliance. Considering these uncertainties, our proposal of additional AD and lime treatment in AMP8 is an efficient low-regrets growth solution over a 10-year period (AMP8 and AMP9), but not necessarily the most efficient over a 5-year period (AMP8).

We note that water recycling centre (WRC) growth has not been assessed within the base cost models in PR24, but as a separate enhancement programme. This was on the basis that WRC growth expenditure could be assessed separately from base costs as there is little overlap with operating and capital maintenance expenditure. We believe

this to also be true for bioresources growth – the provision of new sludge treatment capacity does not overlap with operating and capital maintenance expenditure of existing sludge treatment capacity. Therefore, bioresources growth should not be assessed within the base cost models.

6.2. Required adjustment to cost allowance

We request that our bioresources growth enhancement submission is assessed outside of the base cost models and a separate enhancement allowance made for it.

6.3. Why the change is in customers' interests

The base allowance of c.£160m will not sufficiently cover the allowance required for growth enhancement. While we welcome the cost sharing that is proposed for the bioresources price control, we do not consider it to be sufficient in allowing us to manage the underfunding risk in AMP8. The shortage of sludge treatment capacity to meet our forecast sludge volumes in AMP8 will likely result in inefficient operational interventions in AMP8 (such as increased sludge transport and disposal) and impact the scale of future growth requirements and the efficiency of future solutions.

7. Bespoke uncertainty mechanism for bioresources

In this section, we explain our proposed approach for managing the cost risk associated with uncertainties in bioresources.

There are 3 significant areas of uncertainties for bioresources in AMP8:

1. Farming Rules for Water (FRfW) compliance and its impact on landbank availability
2. Additional IED requirements outside of what is known, considered and modelled in PR24
3. “Non-IED” T21 Exemption sites requiring phys/chem or bespoke waste permits under the Environmental Permitting Regulations (EPR)

As all 3 areas have not been funded, the scale of unfunded risk in AMP8 for the bioresources price control will be significant and therefore unacceptable.

Our proposed approach for managing these unfunded risks is summarised in Table 7.

Table 7 – Wessex Water’s approach to managing uncertainties in bioresources in AMP8, compared to Ofwat’s.

Uncertainty / risk	Ofwat’s approach	Wessex Water’s approach	Comments
FRfW compliance and landbank	Notified item	Targeted reopener of the bioresources price control	<p>The proposed notified item has issues that will limit its efficacy:</p> <ul style="list-style-type: none"> • Only statutory changes are eligible as a trigger • FRfW compliance is excluded • Materiality is at appointee level <p>In contrast, Wessex Water’s approach is for:</p> <ul style="list-style-type: none"> • The trigger to be any event (statutory or non-statutory) that can impact landbank availability • FRfW compliance to be included • Materiality to be set at bioresources price control level <p>We explain the landbank risk and the differences between Ofwat’s approach and ours in Sections 7.1 to 7.3.</p>
Additional IED requirements	Unsure if the enhanced 25:25 cost sharing is only for cost changes in the assessed IED scope, or if it also applies to changes in IED requirements.	Extend the enhanced 25:25 cost sharing to cover the cost risk from additional requirements added to the IED scope by the EA in AMP8.	<p>IED compliance is based on compliance of the requirements stipulated in the Appropriate Measures guidance. There is a risk that changes to the guidance will change the scope of compliance.</p> <p>Updates to the guidance are iterative and we have no timetable for updates to guidance. For example, the guidance was published in September 2022. However, there have been iterative updates and in February 2024 new specifications were introduced for leak detection and repair (LDAR) monitoring. We expect further</p>

			<p>changes in guidance in AMP8 but the scope, scale and timing of those changes are unknown. The changes will impact sites permitted under the IED and non-IED permitted sites.</p> <p>Additional IED requirements resulting from changes in the Appropriate Measures guidance will be an unfunded risk in AMP8. We need confirmation from Ofwat that all additional IED scope will be covered under the proposed 25:25 enhanced cost sharing for IED.</p>
<p>“Non-IED” waste permits (EPR compliance)</p>	<p>No specific mechanism for this; assumed to be covered under the general cost sharing for the bioresources price control (60:40 for Wessex Water based on QAA)</p>	<p>Include the cost (£30.0m) as enhancement expenditure and propose a targeted reopener of the bioresources price control to cover any residual cost risk.</p> <p>A second option is to extend the enhanced 25:25 cost sharing to also cover this risk.</p>	<p>The EA’s intention to reform T21 Exemptions in the EA Sludge Strategy will mean that either a bespoke or phys/chem waste permit is required for all our lime treatment sites. While the EA has not confirmed when the EA Sludge Strategy will be implemented, we expect permit applications will be required in AMP8.</p> <p>When our lime treatment sites are permitted, they will need to comply with the Appropriate Measures guidance (which is not a requirement under current T21 Exemption). Permit compliance will result in significant costs that have not been funded in PR24 or in previous AMPs.</p>

7.1. FRfW compliance and landbank availability

As outlined in our Business Plan supporting document titled WSX18 – Bioresources strategy and investment, the uncertainty around future landbank availability poses a significant risk to bioresources as we are 100% reliant on the landbank outlet for sludge disposal. The factors that would lead to partial or complete loss of landbank come from both statutory and non-statutory sources. The main sources are:

- FRfW, which places restrictions on when and how much of certain nutrients can be spread on farmland,
- EA Sludge Strategy, which will move the regulation of sludge under EPR and therefore place sludge spreading restrictions directly onto WaSCs, rather than farmers, and
- Changes in public/farmer acceptance of biosolids – public pressure could lead to farmers no longer accepting biosolids onto farmland (as has been observed in other countries such as Germany).

It is generally accepted in the industry that landbank loss arising from FRfW is inevitable in the near term. The EA Sludge Strategy could further restrict landbank access in AMP8, but changes to public/farmer acceptance could lead to an uncontrolled closure of the landbank.

Landbank modelling¹⁰ undertaken by Grieve Strategic on behalf of water companies has shown that up to 70% of landbank will be lost under the EA's current approach to nutrient management in FRfW. This would make effectively make the landbank outlet unviable for biosolids recycling under FRfW.

There are very limited short-term alternative disposal outlets for biosolids, according to an assessment¹¹ undertaken by Atkins for the industry. Most biosolids would need to be disposed via landfill outlets which will cost billions per year. Changes in regulation will likely prohibit landfills from accepting sludge/biosolids, so this disposal route is not a sustainable long-term solution to the problem.

It is likely that the EA will enforce their interpretation of FRfW on biosolids application to land when Defra's FRfW Statutory Guidance expires in September 2025. Additionally, the High Court ruling on the 2024 River Wye pollution case would mean that the EA's interpretation of FRfW is now legally endorsed.

There are also uncertainties around FRfW that have yet to be resolved:

- The EA/Defra have yet to confirm how and when FRfW will be implemented, so the timing of when landbank access would be affected is unknown.
- The EA have not accepted the outputs of the industry landbank model, which means the exact extent of the landbank restrictions is unknown and water companies have not been able to form a consistent planning assumption for AMP8.
- The EA has confirmed FRfW compliance is not in the scope of the PR24 WINEP sludge drivers, which left water companies with no appropriate WINEP drivers to request for investment to sufficiently address the landbank risks in AMP8.

The industry has held multiple collaborative meetings¹² with the EA, Defra and Ofwat to seek clarification on these uncertainties around FRfW and landbank availability in AMP8. EA/Defra acknowledged the uncertainty in the outlook of landbank availability in AMP8, but they were not able to provide further information to resolve the outstanding uncertainties.

Given that these issues would unlikely be resolved in time for PR24 Final Determination, we are proposing the use of a bespoke uncertainty mechanism to ensure that the landbank risks in AMP8 can be properly managed.

¹⁰ National Landbank Assessment by Grieve Strategic updated in August 2024 to reflect updated sludge volumes from companies and include new landbank scenarios to test the impact on different factors in isolation. The assessment found that the factor that has the most significant impact to landbank availability is the EA's approach to N and P applied to biosolids and other organic manures. According to the landbank model, this approach results in the loss of up to 70% of available landbank.

¹¹ Atkins undertook a review of the resilience of biosolids outlets in England, Wales and Scotland. In the event of abrupt loss of landbank, immediate alternative capacity is available in the form of landfill, but the longevity if this capacity is critically dependent on the outcome of the landfill ban consultation in England and how the ban will apply to biosolids. Apart from landfills, there is limited alternative capacity in the outlets of energy-from-waste plants and land restoration.

¹² Five bioresources collaborative meetings have been held (from Nov 2022 to July 2024) between the water industry, EA, Defra and Ofwat to agree on the approach for FRfW compliance, the planning assumptions around landbank availability in PR24, and how the landbank risk should be managed in AMP8.

7.2. Review of Ofwat’s proposed notified item

Ofwat is proposing a notified item (NI) in all wastewater companies draft determinations in respect of potential increases to bioresources costs over the 2025-26 to 2029-30 period. Whilst we welcome the recognition of the uncertainty faced in bioresources, there are 3 significant issues impacting the likely efficacy of this NI proposal.

Issue 1

It only relates to “costs reasonably attributable to any new or changed legal requirements in relation to the application to agricultural land of fertiliser derived from sludge”, which is very restrictive, as landbank availability could be impacted by non-statutory changes (such as changes in EA’s interpretation of FRfW or changes in public perception / farmer acceptance of biosolids explained above).

It may also be considered that the “legal change” has already in place, and that we have not yet finalised an agreed position on how to proceed during AMP8, which would then move us towards action (including any investment requirements).

Issue 2

The proposed NI explicitly excludes any impact of FRfW, on the basis of its “understanding that the resilience of the biosolids supply chain to agriculture is included in the PR24 WINEP for the 2025-30 period (intending to address FRfW compliance).”

We do not believe this to be true, as there is written evidence from EA that confirms that FRfW compliance has not been included in company WINEPs:

- *The sludge (use in agriculture) driver seeks environmental enhancements in sewage sludge (biosolids) to deliver contingency measures (such as storage) when business as usual is disrupted.* (Information Letter: EA/12/2023¹³)
- *“The biosolids supply chain to agriculture (addressing in year disruption) was included in PR24 WINEP. However, the scope of the driver was not inclusive of the broader changes in landbank availability and landbank required.”* (Bioresources Collaborative Meeting 4 minutes)

It is essential to recognise that water companies do not have FRfW compliance within their WINEP programmes and have not previously been funded to achieve FRfW compliance. The scope of the WINEP sludge drivers only included the following actions:

Storage+ is a hybrid assessment in the sewage sludge (biosolids) supply chain. It includes both storage and other actions which deliver environmental improvements of sludge quality and handling prior to storage and before supply to agriculture, such as enhanced dewatering and pelletisation. (Information Letter: EA/12/2023)

The storage investment may reduce our costs to meet adapt to the loss of landbank, but the WINEP sludge drivers do not provide for full FRfW compliance – hence FRfW needs to be included within the scope of the NI.

¹³ The EA issued an information on 19th May 2023 to all water companies to clarify the purpose and scope of the WINEP sludge drivers. The EA explained that the sludge drivers only allowed for actions that improved the resilience of biosolids recycling to land, i.e., provision of additional sludge storage, enhanced dewatering or pelletisation. This meant that FRfW compliance and all actions relating to landbank loss have not been included in the WINEP.

Issue 3

Ofwat is following the standard condition B rules for sizing triviality and materiality (i.e., 2% and 10% respectively of appointee turnover).

The IDoK rules were set, and predominantly used, during a time prior to the disaggregation of price controls. Price review methodology has moved on substantially from this, with separate price controls, and separate cost assessment for four wholesale price controls and household retail services. It therefore seems logical to update the IDoK rules to enable claims to be made against each price control.

7.3. Wessex Water's proposed uncertainty mechanism

Due to the limitations in the proposed NI, we are proposing an alternative approach – a targeted reopener of the bioresources price control to cover the uncertainty of FRfW compliance and landbank loss. We explain our proposed uncertainty mechanism in further detail in **WSX-M07 – Uncertainty Mechanism**.

Cost materiality threshold

Our proposed approach to triviality and materiality is relative to bioresources revenue. In the event of landbank loss, we will need to landfill all our biosolids, which we have estimated to cost **£8-16m of additional opex per year** (see Annex 5 for further details on our estimated landfilling cost). This investment will likely meet the materiality threshold if set at the level of the bioresources price control.

Potential triggers

We propose that the main trigger is **any event that results in a loss of available landbank** and a subsequent need for significant investment. This will ensure that all relevant causes, statutory and non-statutory are eligible for the UM. As explained above, changes in the EA's interpretation of FRfW and changes in public/farmer acceptance of biosolids are two examples of non-statutory causes that have the potential to significantly impact landbank availability in AMP8.

The water industry has produced a list of potential leading and lagging indicators that can be used as trigger events for change in landbank availability (Annex 4). While the triggers in the list are suggested for a notified item, they would be applicable to our proposed approach of a targeted reopener of the bioresources price control.

We suggest that that landbank availability is monitored in the APR. This can be achieved by:

- Including additional lines in the bioresources APR tables to report required landbank, available landbank, and % landbank headroom.
- An annual survey to monitor changes in the leading and lagging indicators of landbank availability in Annex 3 (similar to the survey on bioresources market monitoring)

8. Sludge treatment innovation

The draft determination included the comment that:

“Four alternative sludge treatment projects have been funded through the Innovation Fund. We welcome further Innovation Fund submissions in this area going forward.”

We are pleased that these have been funded in the fourth Water Breakthrough Challenge of the Innovation Fund. We are involved as named partners in two of the four projects approved:

- Severn Trent’s ‘Transforming Bioresources – the Benefits of Biochar’, and
- Yorkshire Water’s ‘Advanced Thermal Conversion (ATC) Gasification Technology’.

Apart from the projects above, we are also involved in a WINEP-approved ATC project focused on microplastic investigation that is in collaboration with the EA and water industry.

Our innovation strategy in AMP8 will have a focus on bioresources, particularly on ATC development, biochar and innovative land uses. This is aligned with our bioresources strategy which is to identify viable ATC solutions that can be considered in PR29 to allow for diversification of our sludge disposal outlets and reduce reliance on our sole landbank outlet.

We are involved in a collaborative approach with the industry to develop a PR29 action plan to identify a roadmap for bioresources innovation to inform PR29. We will lead on bids for ATC demonstration trials where possible; otherwise we aim to be involved as named partners.

We aim to be an early adopter of ATC technologies in AMP9 to achieve our ambition of diversification as early as possible.

Annex 1 – Alternative IED secondary containment models

Table 8 sets out the model that was drawn on for the draft determination benchmarking secondary containment costs together with two other models which we consider produce robust and intuitive results. In estimating these two alternative models, we followed the draft determination approach of excluding observations for Welsh Water and in excluding those schemes which it had considered to be outliers. Like the draft determination model, the alternative models imply efficiency ratios which have a very wide range, and their standard deviations are similar.

Table 8 – Secondary containment models

	PR24 DD model	Model SC1	Model SC2
Dependent variable	Secondary containment enhancement costs (£m)	Secondary containment enhancement costs (£m)	Ln of [Secondary containment enhancement costs (£m)]
Explanatory variables			
Bund wall length (m)	.005*** (0.000)	0.005*** (0.000)	
Volume of bund (m3)		0.140*** (0.042)	
Ln of [Bund wall length (m)]			0.933*** (0.000)
Constant	0.789 (0.354)	0.236 (0.788)	-4.808*** (0.000)
Observations	90	90	90
R2	0.192	0.221	0.281
Range of efficiency ratio	[0.43 to 3.99]	[0.41 to 3.80]	[0.44 to 4.52]
Std. deviation of efficiency ratio	1.09	1.03	1.26

Annex 2 – IED secondary containment scope of works and layout

A2-1. Avonmouth

Scope of works	Cost (£m)
800mm x 300mm Containment bund wall – 1,330m length	£6.782
Impermeable surface area upgraded – 21,400m ² area	£7.565
Attenuation tank (for drainage) – 1,600m ³ volume	£4.435
Total Capex	£18.782
Total AMP8 Opex	£0.010
AMP8 Totex	£18.793

Secondary containment requirements for Avonmouth:

- Main BC Area – 18,132m² x 0.82m = 14,805m³; Bund wall length = 1,015m (25% rule applied¹⁴)
- Sludge Import Reception Bund – 2,400m² x 0.4m = 960m³; Bund wall length = 160m (110% volume)
- SAS Balancing Tank Bund – 830m² x 0.6m = 498m³; Bund wall length = 140m (110% volume)

Other secondary containment solutions considered but could not be taken forward:

- Other solutions involving bunding individual groups of tanks as opposed to a wider area solution (as in the case of the Main BC Area) was not deemed to be feasible because of unacceptable required wall heights and the impact on the safe operation and maintenance of these tanks.
- We have proposed to not bund the SAS balancing tank because it is a reinforced concrete tank with a low probability of failure. However, the EA have said this approach is unacceptable because there is still a risk of failure, albeit very small.

¹⁴ All containment areas, as required by CIRIA C736, have been designed to accommodate the higher of 110% of the largest single tank, or 25% of the total volume of the tanks.

Figure 4 – Avonmouth Main BC Area

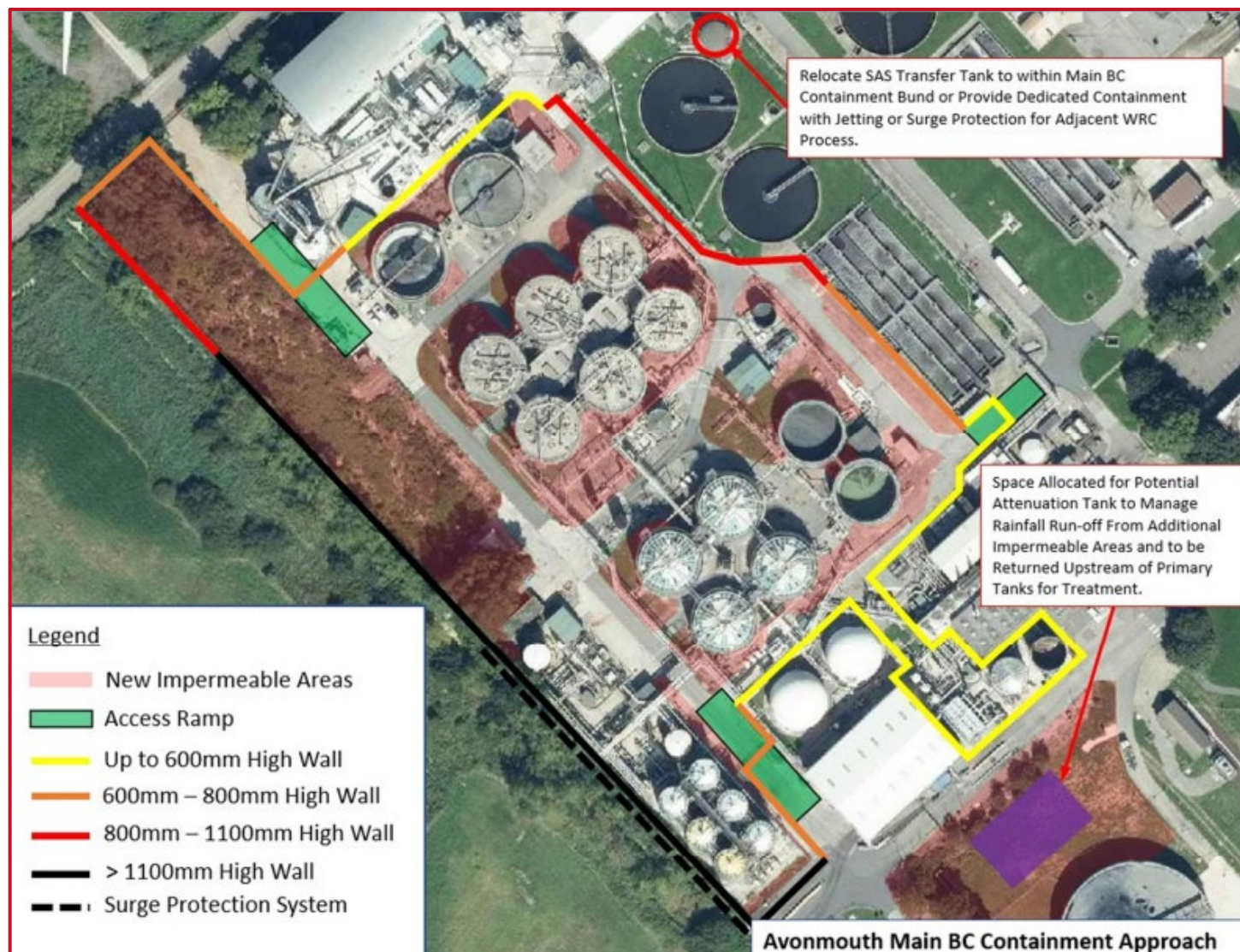


Figure 5 – Avonmouth Sludge Import Reception Bund



Figure 6 – Avonmouth SAS Balancing Tank Bund



A2-2. Berry Hill

Scope of works	Cost (£m)
900mm x 300mm Containment bund wall – 800m length	£5.130
Impermeable surface area upgraded – 31,200m ² area	£6.156
1.8 x 1.3m 5kW Pumping Station	£0.770
Total Capex	£12.056
Total AMP8 Opex	£0.005
AMP8 Totex	£12.061

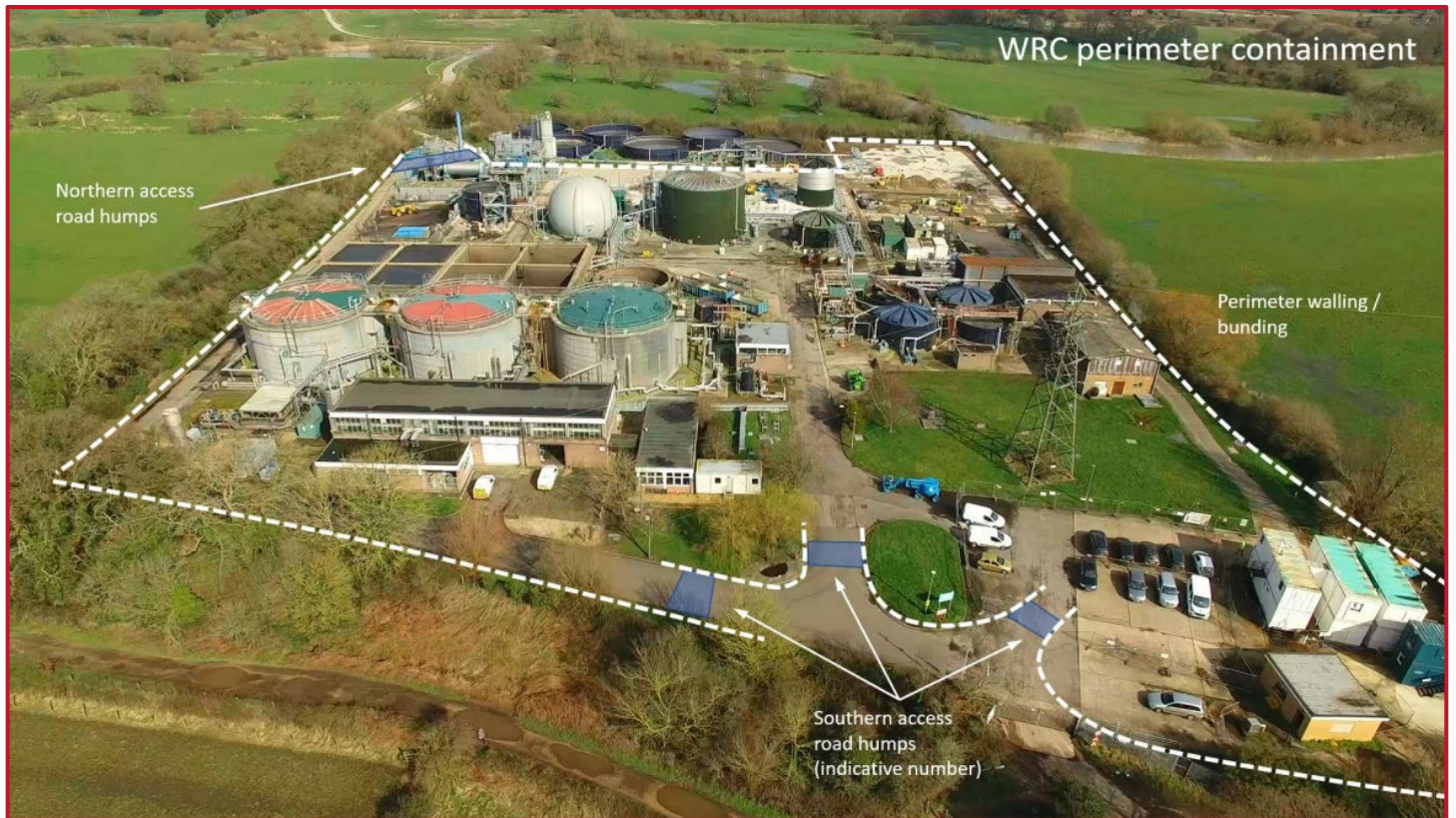
Secondary containment requirements for Berry Hill:

- Site-wide perimeter containment – 31,138m² x 0.89m = 27,712m³; Total bund wall length = 800m (25% rule applied)

Other secondary containment solutions considered but could not be taken forward:

- Other solutions involving bunding individual groups of tanks as opposed to a wider area solution was not deemed to be feasible because of unacceptable required wall heights and the impact on the safe operation and maintenance of these tanks. The proximity of assets such as the primary digesters and secondary digesters to the existing site boundary reinforces the benefit of a perimeter containment solution.

Figure 7 – Berry Hill site-wide perimeter containment



A2-3. Poole

Scope of works	Cost (£m)
500mm x 300mm Containment bund wall – 1,090m length	£4.602
Impermeable surface area upgraded – 14,800m ² area	£4.359
Total Capex	£8.961
Total AMP8 Opex	£0.026
AMP8 Totex	£8.986

Secondary containment requirements for Poole:

- Main BC Area – 11,894m² x 0.5m = 5,947m³; Bund wall length = 671m (25% rule applied)
- Secondary Tanks Area – 1,508m² x 1.5m = 2,262m³; Bund wall length = 190m (110% volume)
- DEMON Tank Bund – 1,667m² x 1.9m = 3,167m³; Bund wall length = 225m (110% volume)
- Other secondary containment solutions considered but could not be taken forward:

Other secondary containment solutions considered but could not be taken forward:

- Other solutions involving bunding individual groups of tanks as opposed to a wider area solution was not deemed to be feasible because of unacceptable required wall heights and the impact on the safe operation and maintenance of these tanks.
- We have proposed to not bund the DEMON liquor reactor tank because it is a reinforced concrete tank with a low probability of failure. Instead, we proposed to provide vehicle collision protection and remove vulnerable points of failure such as the pipework entries and exist. However, the EA have said this approach is unacceptable because there is still a risk of failure, albeit very small.

A2-4. Trowbridge

Scope of works	Cost (£m)
900mm x 300mm Containment bund wall – 960m length	£5.309
Impermeable surface area upgraded – 8,800m ² area	£1.137
1.8 x 1.3m 5kW Pumping Station	£0.853
Total Capex	£7.299
Total AMP8 Opex	£0.015
AMP8 Totex	£7.314

Secondary containment requirements for Trowbridge:

- Main BC Area – 2,696m² x 0.8m = 2,933m³ (110% volume)
- Tertiary containment – Skip Storage Area – 3,800m² x 1.2m = 4,421m³ (110% volume)
- Tertiary containment – Transfer Road Area – 1,250m² x 0.5m = 609m³ (110% volume)
- Total bund wall length = 960m

Other secondary containment solutions considered but could not be taken forward:

- Other solutions involving bunding individual groups of tanks as opposed to a wider area solution was not deemed to be feasible because of unacceptable required wall heights and the impact on the safe operation and maintenance of these tanks.
- A purely secondary containment solution for the Main BC Area was discounted as this solution would result in excessive wall heights. Therefore, a tertiary containment solution as suggested by CIRIA 736 has been adopted. A prime factor in this extent of tertiary containment required is the sloping topography of the site.

Figure 11 – Trowbridge secondary containment areas – Main BC Area, Skip Storage Area, and Transfer Road Area.



Annex 3 – IED tank covering scope of works

BAT and Appropriate Measures as identified by the EA require that all post-digestion tanks to be covered and extracted to the biogas recovery system. Therefore, we have included gas extraction and recovery in the scope of our tank covering solutions for post-digestion tanks. We have included these costs in the 'Tank covering' category in Table ADD14.

For pre-digestion (raw sludge) tanks, the EA required these tanks to be covered and routed to appropriate odour abatement systems. We have included odour control units in our tank covering solutions for raw sludge tanks, however, we have included the cost of odour control units in the 'Other' category in table ADD14.

A3-1. Avonmouth

Scope of works	Cost (£m)
Provision of tank covers for raw sludge tanks: <ul style="list-style-type: none"> 1 Nr GBT Feed Tank (8.86m diameter) 2 Nr Consolidation Tanks (19.5m diameter per tank) 	£2.099
Provision of tank covers for post-digestion sludge tanks: <ul style="list-style-type: none"> 1 Nr Centrifuge Feed Tank (8.51m diameter) 2 Nr Secondary Digesters (18.4m diameter per tank) 	£2.983
Gas compressors (for gas extraction)	£0.552
Condensate traps, gas pipework and connection into the existing biogas system (for gas recovery)	£5.430
Total Capex	£11.065
Total AMP8 Opex	£0.052
AMP8 Totex	£11.367

A3-2. Berry Hill

Scope of works	Cost (£m)
Provision of tank covers for raw sludge tanks: <ul style="list-style-type: none"> 3 Nr Sludge imports tanks (834m² area) 	£2.768
Provision of tank covers for post-digestion sludge tanks: <ul style="list-style-type: none"> 8 Nr Rectangular secondary digesters (46.4m x 23.16m) 1 Nr Secondary digester (12.3m diameter) 1 Nr Digested sludge overflow tank (5.1m diameter) 1 Nr Centrifuge feed tank (10.24m diameter) 3 Nr Emergency secondary sludge storage tanks (834m² area) 	£10.141
Gas compressors (for gas extraction)	£1.465
Condensate traps, gas pipework and connection into the existing biogas system (for gas recovery)	£6.559
Total Capex	£20.933
Total AMP8 Opex	£0.026
AMP8 Totex	£20.959

We have identified that the 3 Nr Sludge import tanks need to be rebuilt because they cannot be retrofitted with tank covers. Rebuilding these tanks would be the more cost-effective solution compared to adapting the tanks for covering and providing secondary containment.

A3-3. Poole

Scope of works	Cost (£m)
Provision of tank covers for post-digestion sludge tanks: <ul style="list-style-type: none"> • 2 Nr Secondary digesters (14.5m diameter per tank) 	£1.905
Gas compressors (for gas extraction)	£0.595
Condensate traps, gas pipework and connection into the existing biogas system (for gas recovery)	£4.932
Total Capex	£7.432
Total AMP8 Opex	£0.196
AMP8 Totex	£7.629

The 2 Nr Secondary digesters require reconstruction because the existing digesters are predominantly below-ground assets and include design details which are not compatible with BAT.

A3-4. Trowbridge

Scope of works	Cost (£m)
Provision of tank covers for post-digestion sludge tanks: <ul style="list-style-type: none">• 2 Nr Secondary digesters (10.25m diameter per tank)	£0.915
Gas compressors (for gas extraction)	£0.401
Total Capex	£1.316
Total AMP8 Opex	£0.186
AMP8 Totex	£1.501

Annex 4 – Triggers for landbank uncertainty mechanism

Table 9 – List of leading and lagging indicators that can be used as triggers for a landbank uncertainty mechanism. 'Impact' refers to the impact the trigger has on landbank availability, and 'Probability' refers to the probability of the trigger occurring.

No.	Trigger Name	Description	Impact	Probability
	Leading indicators	We consider that leading indicators should be used to identify an event or trigger has occurred, and to enable as much time as possible to prepare for a reduction in the available agricultural outlet for biosolids.	-	-
1	Defra FRfW post implementation review	The output of this review is anticipated by the end of 2024. A Defra decision, confirmation, or change, in the management of nutrients or use of organic materials to agriculture could set different expectations for biosolids recycling than has been allowed for in the WINEP or in final determinations. This may or may not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	High
2	Defra FRFW Statutory Guidance change (or expiration)	The output of a review of the Defra Statutory Guidance, which provides protection for water companies from the full ramifications of FRfW, is anticipated by September 2025. This guidance may be changed, rescinded or simply expire (which may or may not be judged to be a legal change). The loss of this guidance would lead to a significant change in the management of nutrients or use of organic materials to agriculture could set different expectations for biosolids recycling than has been allowed for in the WINEP or in final determinations. Given that this may or may not be judged to result from a legal change, the outcome should be recognised as a trigger for the landbank notified item.	High	High
3	EA Regulatory Position Statement	The EA may issue a Regulatory Position Statement with respect to the use of biosolids in agriculture. This regulatory tool is used to modify enforcement approach and is time limited. It may or may not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	Medium
4	EA changes in land spreading guidance impacting/relating to the biosolids supply chain to agriculture (England)	The EA may issue changes in land spreading guidance impacting biosolids recycled under EPR (now or in the future) to agriculture (England). This may or may not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	Low	Low
5	National position statement relating to the biosolids supply chain to	The relevant regulatory authority may issue a Regulatory Position Statement with respect to the use of biosolids in agriculture. This regulatory tool is used to modify enforcement approach and is time limited. It may or may not	Medium	Medium

	agriculture (Wales / Scotland)	be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item. (Note: Impact scored as “medium” on the basis that land availability in just one of Wales or Scotland is less significant the loss of availability in England)		
6	Policy statement by food chain actors relating to changes in requirements for the biosolids supply chain to agriculture (e.g. British Retail Consortium, supermarkets)	Food chain stakeholders have a significant influence over the market for biosolids product as in input into agriculture. This was evidenced in 2000-01 with a concern over pathogens in biosolids. This threatened the loss of the agricultural outlet and led to the introduction of the Safe Sludge Matrix and its “layers of protection” to restore stakeholder confidence. This risk would not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	Medium
7	Policy statement by Farming quality assurance organisations relating to changes in requirements for the biosolids supply chain to agriculture (e.g. Red Tractor Assurance, Quality Meat Scotland)	Farming quality assurance organisations are stakeholders that have a significant influence over the market for biosolids product as in input into agriculture. For example, Red Tractor membership includes c90% of agricultural land. Their policy currently mandates the use of Biosolids Assurance Scheme certified biosolids as the requirement for biosolids to be accepted as a farm input. The requirement could change and support for biosolids withdrawn, driven by scientific and/ or perceived risks leading to a significant fall in demand for biosolids product. This risk would not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	Medium
8	Outcome of a legal action eg a judicial review, (e.g. Fighting Dirty /River Action, other etc)	The outcome of a court case may or may not be considered a legal change. To avoid any doubt over whether changes in requirements brought about through judgements made in courts are considered a legal change for the purpose of the notified item, it would be appropriate to set out clearly in the notified item that any such outcome should be recognised as a trigger for the landbank notified item.	Don't know	High
9	Welsh government review launched into the land spreading of organic materials including AAD digestate	The output of a review into the land spreading of organic materials including AAD digestate has been announced. A Welsh Government decision, confirmation, or change, in the management of nutrients or use of organic materials to agriculture could set different expectations for biosolids recycling than has been allowed for in final determinations. This may or may not be set out through a legal change but the outcome should be recognised as a trigger for the landbank notified item.	High	High
10	Politian/political figure statement that creates doubt over the safe and sustainable use of biosolids to agriculture	There is a risk that a statement from a political or influencing role could have an unintentional negative consequence on the market demand for biosolids. In 1988 Edwina Curry (Health minister) provoked outrage by saying most of Britain's egg production is infected with the salmonella bacteria. These claims led to a 60 percent decline in egg sales over the next few weeks. A statement that creates	High	Low

		doubt over the safe and sustainable use of biosolids to agriculture could generate a significant and long-lasting fall in demand for biosolids to agriculture. This risk would not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.		
11	Change in guidance (e.g. AHDB's Nutrient Management Guide – RB209)	Changes to good practice guidance or nutrient management guidance (e.g. RB209) could change the requirements and further restrict the available agricultural outlet. This risk would not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	High
12	Farm product exclusion clauses by food user groups	The whisky distilling industry has a rotation exclusion clause in farmer supply contracts that stipulates that biosolids must not be applied within crop rotations including malting barley. This restriction is in the baseline as it already exists. Further restrictions from other end users could reduce the available remaining landbank. This risk would not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	Don't know	Don't know
13	Landowner and farmers decide not to accept biosolids	There are instances in other countries where community groups are putting pressure on individual farmers and landowners not to accept biosolids deliveries over fears of health risks and environmental harm. These are currently low in number and impact, but the prevalence of these events could escalate. Should the number of landowners or farmers rejecting biosolids increase significantly, this would lead to a significant fall in demand for biosolids. The cumulative decisions of landowners or farmers should be recognised as a non-legal trigger for the landbank notified item.	Don't know	Don't know
14	Legislation changes to adopt 'full' EPR requirements for Biosolids disposal as delivered by the EA sludge strategy	This seems likely to be implemented as a legal change and may be eligible for classification as a relevant change of circumstance (RCC). For the avoidance of doubt, it would be helpful to retain the reference to the EA sludge strategy as a trigger for the notified item.	High	Medium
15	Outcome based regulation	An outcomes-based approach to regulation is one which stipulates a final outcome but does not prescribe how the outcome is reached. This approach can enable changes and introduce new requirements to deliver the outcome which does not require new legislation. This risk may or may not be set out through a legal change, but the outcome should be recognised as a trigger for the landbank notified item.	High	High
16	Devolved Government objections	The movement of waste between devolved nations may be an issue that leads to pressure on companies not to send waste between nations. Given that this may or may not be judged to result from a legal change, the outcome should be recognised as a trigger for the landbank notified item.	Med	Med

17	Farm incentive and payment schemes	Farmers may be incentivised to change practices or land use based on economic incentives or payments. Such schemes may already exist, but incentive rates may be modified, to influence further the participation rate of farmers. Given that this may or may not be judged to result from a legal change, the outcome should be recognised as a trigger for the landbank notified item.	Med	Med
	Lagging indicators	We consider that lagging indicators could be used as a backstop indicator to evidence that an event or trigger has occurred, leading to an observable reduction in the available agricultural outlet for biosolids.	-	-
18	Existing reported data on “disposal outlets”	Ofwat collects bioresources data from WASCs each year. There are specific reporting requirements for sludge outlets set out in BIO4 lines 18- 22. This information would show a change in the proportion of outlets used for biosolids, with a reduction in the agricultural outlet and an increase in other outlets such as restoration, landfill, Energy from Waste and incineration. The reporting will be for the previous year so this could act as a lagging indicator that a change in the agricultural outlet for biosolids has occurred. This could be used to set a threshold above base use of alternative outlets which if surpassed would be the trigger for the notified item. This risk would not be set out through a legal change, but the outcome could be recognised as a trigger for the landbank notified item.	Don't know	High
19	Actual haulage distance vs modelled haulage distance	Ofwat collects bioresources data from WASCs each year. There are specific reporting requirements for the transport of biosolids to outlets set out in BIO1 lines 26 -29. It may be possible to monitor the difference between the baseline haulage distances generated as an output of the landbank modelling and compare that to the actual haulage distances of WASCs. The reporting will be for the previous year so this could act as a lagging indicator that a change in the agricultural outlet for biosolids has occurred. This could be used to set a threshold above a base level which if surpassed would be the trigger for the notified item. This risk would not be set out through a legal change, but the outcome could be recognised as a trigger for the landbank notified item.	Don't know	High
20	Collate feedback from farm customers to identify any changes in sentiment towards the acceptance of biosolids as an input to farms.	WASCs could collect customer feedback from the farming customers they work with and allocate an area of agricultural land where the farmer or landowner has decided that they do not want any biosolids. Evidence would need to include the farmers reason and the area of land that has been excluded from receiving biosolids products. A methodology for data collection needs to be established to ensure consistency and a baseline is required to understand current sentiment, above which the change can be measured against. This risk would not be set out through a legal change, but the outcome could be recognised as a trigger for the landbank notified item.	Medium	High

	Landbank Modelling Trigger	We consider that it is the change or loss of the available agricultural outlet for biosolids that is the trigger for investment and therefore should be the trigger for the Notified Item, irrespective of which of the legal or non-legal event or events lead to the change or loss of the available agricultural outlet for biosolids.	-	-
21	Modelled Landbank Risk Ratio threshold	<p>There could be many individual or multiple compounding events that lead to a loss in the agricultural outlet for biosolids that are not related to a legal change. The changes in requirements could be beyond the extent to which costs have been allowed for at the final determination. There is a risk that in seeking to identify each and every event, one or more could be overlooked and that omission lead incorrectly to a failure to recognise a change in the available agricultural outlet for biosolids.</p> <p>The universal approach that would take account of any changes in legal and non-legal requirements for biosolids use in agriculture would be to use a landbank model. The approach could use an agreed governance and methodology to establish and agree the baseline requirements that reflect the cost allowed for at final determination.</p> <p>It could also set out an agreed threshold, which if passed regardless of the specific event or events would act as the trigger for the landbank notified item. It is the loss of the agricultural outlet for biosolids that is the trigger for increased scope and investment costs. The modelling activity would incorporate and evidence all the changes that have occurred and the inputs into the model. The governance and modelling process would involve EA/Defra and Ofwat as well as companies / water industry.</p> <p>A governance and process proposal and method to calculate the baseline and threshold for the trigger is set out in a separate document.</p>	Universal assessment	Universal applicability

Annex 5 – Cost implication due to loss of landbank

Table 10 summarises the low and high-end cost estimates (on a net opex change basis) for landfill outlets for Wessex Water's biosolids projected to 2030. This assessment was conducted by Atkins on behalf of Wessex Water.

On average, it will cost £8-16m additional opex per year to landfill all our sludge in the event of complete landbank loss. Over a period of 5 years in AMP8, the additional cost will be between £37-82m.

However, as mentioned in Section 4.7, there is uncertainty in the ability for landfills to accept sewage sludge/biosolids from 2028 due to changes in regulations.

Table 9 – Low and high-end cost estimates for landfilling Wessex Water's sludge.

Year	Low estimate (net opex change basis*; £/tds)	High estimate (net opex change basis*; £/tds)	Total sludge for disposal (BIO1.6; tds)	Low estimate for total sludge disposal (net opex change basis*; £m/a)	High estimate for total sludge disposal (net opex change basis*; £m/a)
2025	£110	£260	55.1	£6.061	£14.326
2026	£120	£270	58.9	£7.068	£15.903
2027	£130	£280	59.3	£7.709	£16.604
2028	£140	£290	59.7	£8.358	£17.313
2029	£150	£300	58.4	£8.760	£17.520
Total net opex change for 5 years in AMP8				£37.956	£81.666

* The net opex change was calculated based on Wessex Water's total cost of recycling biosolids to agriculture (c.£140/tds in 2022/23).