

IAP Response

Ref B2.WSH.CMI.A1

Bioresources Plan

1 April 2019

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WSH.CMI.A1 Bioresources Plan

Nature of Adjustment (Summarise how you have responded to this action)

1.1. Sludge production forecast outcomes

Between 2011-12 and 2017-18 our sludge production increased by 11% from 62.5 TTDS/year to 69.4 TTDS/year as shown in Figure 1 below. During the same period, the population equivalent served by our wastewater treatment works increased by just 2.7%. The comparatively rapid expansion in sludge production per population equivalent during this period was driven by three factors:

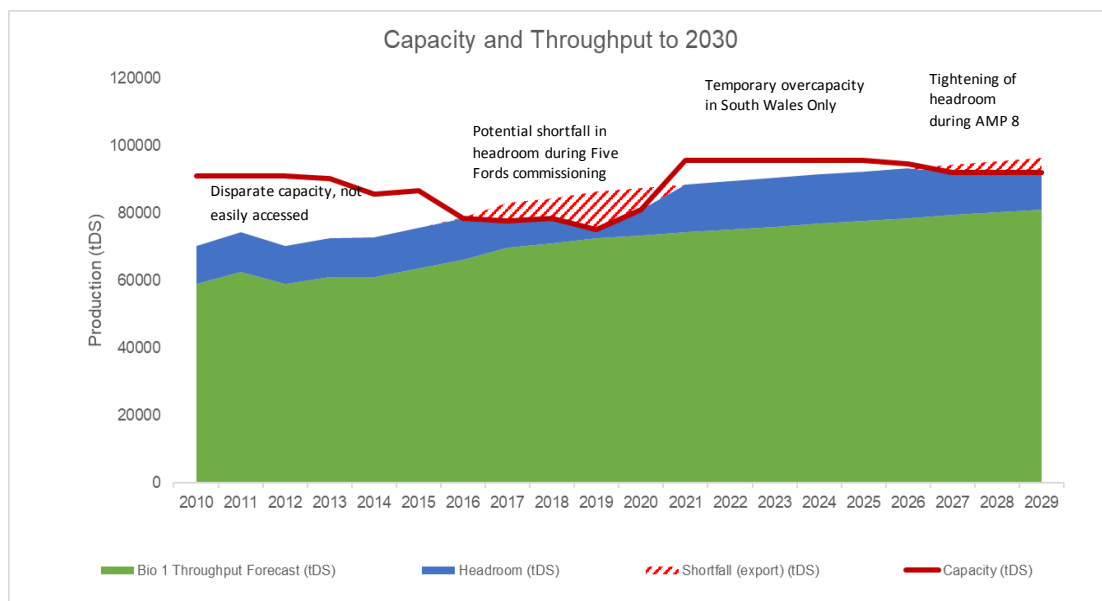
- New P-reduction schemes at our works.
- Investment to improve compliance at our works.
- Improvements in our network to reduce CSO spill frequency.

Since 2011 we have reduced non-compliant sewage treatment works from 26 to just two in 2018. Over the same period, we have reduced urban wastewater exceedances from 26 down to one, and operator self-monitoring exceedances from 144 to 50. This improvement in performance has been driven by investment in our assets which has, in turn led to a larger capture of sludge per population equivalent than we have previously experienced, up from 20.8g/PE in 2011 to 23.3g/PE in 2018.

We recognise that room for improvement remains, but we have a smaller performance gap to close than ever before and the growth in sludge production per population equivalent over the next AMP will be slower as a result (50% of the growth per population equivalent that we have experienced historically).

We forecast that the population equivalent served by our works will continue to steadily increase by 50,000 PE, or 1.3%, over AMP 7. This will contribute proportionally to our forecast sludge production growth. The P-reduction schemes planned to come online during the AMP will add 1.9% to our sludge production. The remaining 1.2% will come from our £34m enhancement programme for reducing CSO spills to the environment. Total sludge growth is forecast to be 4.4% over AMP 7, compared to an estimate of 11.4% for AMP 6.

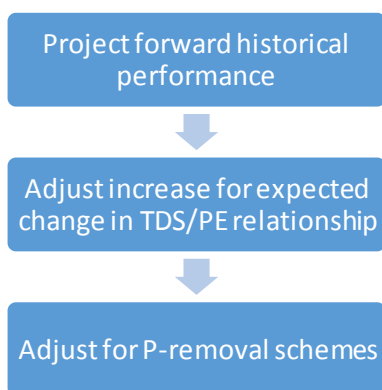
Figure 1 Historical and Future Sludge Forecasts



1.2. Sludge production forecast methodology

We projected historic sludge production growth trends forward from 2011 forward to the end of AMP 8. Based on the fact that our growth in dry solids per population equivalent is likely to be significantly less during AMPs 7 and 8 than AMPs 5 and 6, we reduced the rate of sludge growth by half. We then increased our sludge production forecast by the likely increase due to the P-removal schemes which will be commissioned in AMP 7.

Our methodology was as follows:



1.3. Headroom and resilience

In order to meet our performance commitments, we need to ensure that we can provide sufficient headroom either through the utilisation of our own assets or through use of the markets, to ensure production resilience. We have assessed the required total headroom requirement to be 19% of throughput. Our largest single failure point would be down-time

on one stream of our largest AAD plant (Cardiff). This asset is rated at around 15 TTDS per year which represents 19% of our total capacity, which we have used to provide this headroom requirement.¹

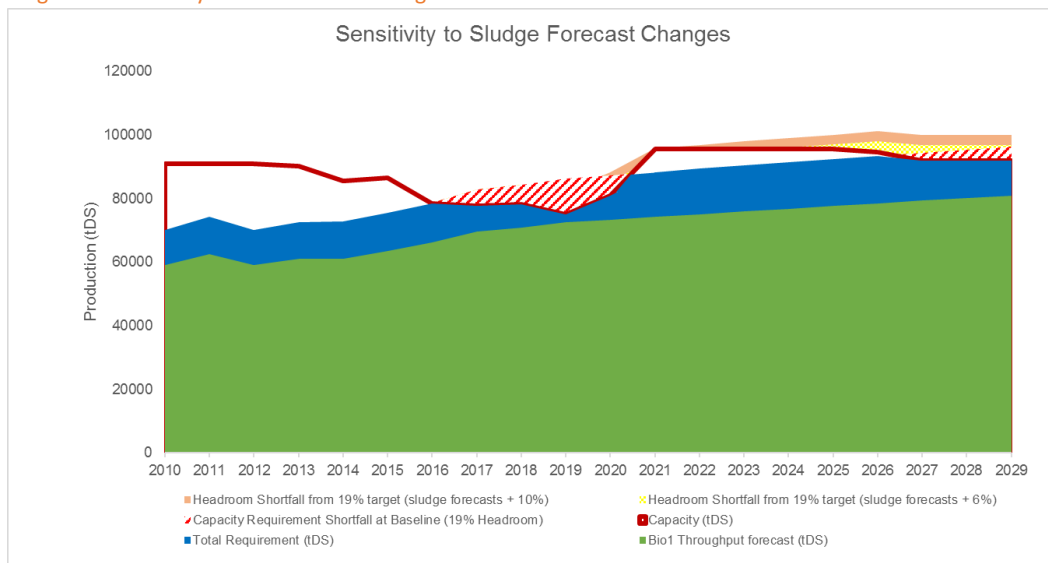
Our Advanced Anaerobic Digestion (AAD) capacity at Cog Moors will be commissioned in late 2020 providing operational headroom and resilience. Five Fords will come online during 2019 but our North region will remain capacity constrained. The Queensferry Anaerobic Digestion (AD) plant will be nearing the end of its operational life. Under certain sludge production scenarios we may, particularly in the North Wales region, run out of headroom. This is particularly a risk during the construction and commissioning of our new AAD plant at Five Fords (2019) and, under some high sludge production scenarios, during year five of AMP 8.

Actual sludge arisings may be impacted upon by such events as:

- “Cold digestion” in sewers due to dry weather, meaning less sludge is collected
- Seasonal effects, such as the “spring sloughing” effect (more sludge generated)
- Trader activity and the types of waste being received into works
- Actual population growth

As we believe a number of these events may impact upon our short-term headroom, we have undertaken a sensitivity analysis to understand how this may impact upon our operations.

Figure 2 Sensitivity of Headroom to Sludge Production Variations



The analysis shows that an increase in total sludge production of 10% would lead to further headroom shortfalls in 2020 and in Year 5 of AMP 7. This means that in the event of critical plant failures and sludge growth materialising, we may run out of capacity. We don't believe that it would be cost effective to build further capacity in AMP 7 to deal with these scenarios and we don't have a significant capacity increase planned in AMP 7. However, in order to protect the resilience of our operations we have engaged with the market and continue to

¹ We define capacity on the basis of the maximum digestion capacity on site with zero operational headroom, and retention times and effective digester volumes as set out in our response to the 2017 Throughput and Capacity Information query.

engage to find ways to alleviate our short- and long-term operational needs in the North region and to constructively use the headroom available in the South region. Some of these opportunities and activities are outlined below.

1.4. Currently active trading arrangements

We have a short-term agreement with Severn Trent Water for them to provide capacity to us at their Minworth works at a fixed gate fee for a fixed duration. This was agreed to cover planned downtime at our Five Fords plant during work to build and commission our advanced digestion facility.

Potential trades: United Utilities and Wessex Water

We have engaged with United Utilities and Wessex Water to discuss the possibility of sludge trades. United Utilities has limited free capacity, and due to their geographical proximity to our North region which also has limited free capacity, we do not foresee significant trades except for mutual aid to cover short-term outages. We have trade agreements with Wessex Water, however these are predominantly mutual aid agreements as they also have limited headroom.

Potential trades: Severn Trent

We are in discussions with Severn Trent for them to provide sludge treatment services in the future based on a gate fee at their Strongford and Minworth works. We have undertaken trading workshops with them to evaluate the potential for this opportunity and are drafting an agreement for a trial period based on two-day sludge load delivery notice.

We intend for this trading arrangement to allow allocation of sludge loads to the most cost-efficient treatment works.

Potential trade: Hafren Dyfrdwy

We are in discussions with Hafren Dyfrdwy to provide long-term sludge treatment services using capacity at one of our AAD plants. This could provide mutual benefits by reducing Hafren Dyfrdwy's cost to treat compared with it having to invest in its own plant, while providing additional revenue by using headroom already available in our treatment facilities.

Potential trade: Queensferry and North region market engagement

Our conventional sludge treatment plant at Queensferry is nearing the end of its operational life and we expect to retire it at the end of AMP 7. However, the age of the plant at Queensferry has brought an increasing maintenance burden. We have begun a market engagement process to determine whether any third parties are able to provide treatment at a lower cost to treat and with the same or better risk, outage, quality, and environmental outcomes as we are able to provide with our existing plant. This could allow us to make operational savings at Queensferry.

As part of the same process we are testing whether any third parties are able to provide raw cake treatment services on a short- or long-term basis in our North area. This could open opportunities for us to increase our operational resilience or reduce our operational costs.

We have begun the process by publishing an invitation for expressions of interest, which will close on 30th April 2019. If we receive expressions of interest we will continue with the

procurement process by holding telephone conversations with potential suppliers to understand their capabilities and requirements, followed by a formal procurement process.

For AMP 8, among our options for this area will be to redevelop Queensferry as an advanced anaerobic digester; add capacity to Five Fords (Wrexham); or use third party capacity. We are open to the possibility of exporting sludge to a third party and will engage with the market during AMP 7. We are also discussing with Hafren Dyfrdwy the possibility of us building additional shared sludge treatment capacity at our Five Fords works to provide treatment capacity for them.

1.5. Sludge measurement

In addition to the requirements of WSH.CMI.A1, the following line is included in the Test Question Assessment against CMI4:

“There is no evidence in the plan of sludge measurement.”

We have comprehensive measurement installed at all our advanced and conventional sludge treatment facilities. In AMP 7, most of our sludge will be processed through AAD facilities. These advanced facilities require tight control of sludge dry solids and feed rates to ensure process stability. As a part of our AMP 6 investment in AAD, we have invested significantly in the upgrade of our sludge volume and dry solids measurement. In AMP 7, our provision for measurement will therefore be as follows:

- Sludge feed volumes are continuously logged at the inlet to all digesters.
- The percent dry solids (%DS) are logged at the inlet to all digesters once per month as a check. As a high percentage of our sludge is processed with thermal hydrolysis before digestion, the %DS figures are generally stable, as is required by the process.
- All sludge and cake movements in and out of treatment facilities are logged via weighbridges, with vehicles weighed on site entry and exit.

These data allow us to calculate indigenous sludge production at each site by subtracting sludge imports from the total.

The final part of our measurement capability to be installed, weighbridges in our North area, was commissioned in early March 2019. We have no plans to add significant sludge measurement capability in AMP 7 but do anticipate that there will be an improvement in our sludge measurement accuracy because of our AMP 6 investments.