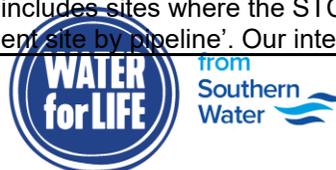


BIO1- Bioresources sludge data	
Line description	Commentary
1	<p>Total sewage sludge produced, treated by incumbents</p> <p>From 2023/2024 to 2029/2030, all sludge produced is expected to be treated 'by incumbent'.</p> <p>For the 2022/2023 tax year, the forecast sludge production was 112.8 ttDS, however due to operational issues toward year end raw sludge produced during this tax year was stored onsite and treated in the 2023/2024 tax year. Hence 111.2 was reported for 2022/2023. The difference in these two numbers (e.g., 1.6 ttDS) is equal to the total quantity of stored sludge that was produced in 2022/2023 but is being treated in the 2023/2024 tax year. The original forecast sludge production in 2023/2024 was 114.1, however this was uplifted by the quantity of stored sludge from tax year 2022/2023.</p> <p>Confidence Grade: B2</p>
2	<p>Total sewage sludge produced, treated by 3rd party sludge service provider</p> <p>The value for year 2022/2023 is as per APR23. For subsequent years for this line is "0" until the 2028/2029 tax year</p>
3	<p>Total sewage sludge produced</p> <p>1. APR calculation</p> <p>For APR23 total sludge treatment was measured through daily sampling at our 16 sludge treatment centres (STC). To calculate sludge production at each wastewater treatment works (WWTW), each site's population equivalent is multiplied by process-specific theoretical sludge makes (g/h/d) detailed in our asset standards. A correction factor is calculated by dividing measured sludge treatment by the total theoretical sludge make. This factor is then applied onto the theoretical sludge make for each site.</p> <p>Sludge Density meters have been installed at our 16 STCs which allows us to measure the total amount of sludge processed more accurately, compared to our current daily sludge sampling and analysis method. Commissioning issues and data acquisition/processing have delayed the project, but outputs should be validated over the Summer 2023 and automatic measurements will become BAU. Please see SRN36 Bioresources Strategy Technical Annex for a detailed comparison of forecasts with historical sludge production growth rates.</p> <p>2. Sludge Forecast: Growth</p> <p>EDGE analytics provide Southern Water with a population equivalent (pe) for each WWTW, the methodology used has been specifically developed to meet water industry guidelines and includes demographic trends and the impact of policy interventions (e.g., house building). The total pe is calculated as a sum of household, tourist, trade and Cess population equivalents. To account for growth, the year-on-year change in total pe for each WWTW is calculated and applied directly onto the preceding year. The base year (2022/2023) is derived from the sludge estimate for each WWTW. The total load received (BOD5/day - CWW7a.7) is calculated using the same methodology whereby expected growth (EDGE forecast) in population equivalent (household, tourist, trade and cess) is applied onto historic BOD5 loads. As a result, the sludge forecast and total load received are directly correlated except where there are</p>



		<p>changes to onsite wastewater treatment processes (see below), for example due to changing permit conditions (phosphate/ammonia) or growth.</p> <p>3. Sludge Forecast: Process</p> <p>As detailed above ('APR calculation') the 'sludge make' for each WWTW is used to estimate sludge production, however, over time the processes used on WWTWs change to meet new permits driven by the WINEP/NEP programmes or growth. Expected sludge make is process specific, for example our asset standards (PSWWT 4019) state a site with no primary treatment and extended aeration produces 55g sludge per head per day however if ferric dosing is introduced (e.g., to meet a new P permit) the sludge production increases to 75g sludge per head per day (a 36% increase). When comparing total load received (BOD5) with the sludge forecast, the differences in year-on-year growths are similar (<0.6% difference) except for 22/23 to 23/24 and 28/29 to 29/30 (both 1.5% difference). The difference between 22/23 to 23/23 is different because of the adjustment made to the sludge forecast for these years (see below). The change between 28/29 to 29/30 is because of the large number of expected WINEP schemes delivered that year.</p> <p>To account for the process and corresponding sludge make changes, the percentage difference in estimated sludge make is applied onto the forecast tDS. For example, if site sludge make is expected to increase 5%, this increase is applied onto the year the process change occurs. We have quantified the impact of WINEP in AMP8, overall WINEP/NEP is expected to account for just under 50% of sludge growth in AMP8.</p> <p>For 2022/23, the forecast sludge production was 112.8 ttDS, however due to operational issues toward year end raw sludge produced during this tax year was stored onsite and treated in the 2023/2024 tax year. Hence 111.2 was reported for 2022/2023. The difference in these two numbers (e.g., 1.6) is equal to the total quantity of stored sludge that was produced in 2022/2023 but is being treated in the 2023/2024 tax year. The original forecast sludge production in 2023/2024 was 114.1, however this was uplifted by the quantity of stored sludge from tax year 2022/2023.</p> <p>Confidence Grade: B2</p>
4	Total sewage sludge produced from non-appointed liquid waste treatment	Even though it is not considered as material, the variation between 2023/2024 and 2024/2025 is due to a slight increase in population equivalent in CESS values.
5	Percentage of sludge produced and treated at a site of STW and STC co-location	<p>For 2022/23, the APR states that the percentage of sludge produced and treated at a site of STW and STC co-location was 73.1%. However, we have reviewed this during the PR24 business planning process and believe this incorrect due to a misinterpretation of the guidance document. We have therefore submitted a different value in BIO1.5 for 2022/23 derived from the same dataset used to calculate the APR values.</p> <p>All data (2022/23 to 2029/30) has been calculated according to the following interpretation of the guidance document:</p> <ul style="list-style-type: none"> - The word 'produced' is taken to mean indigenous sludge that is produced at a site of STW and STC co-location. - The guidance states 'The percentage of the sludge quantity reported in BIO1.3 that is produced at co-located sites. "co-located" includes sites where the STC is physically separate, but the sludge is transferred from a wastewater treatment site by pipeline'. Our interpretation is that only sites where the WWTW and STC are co-



		<p>located (e.g., on the same site) should be included, except for Slowhill Copse and Millbrook where sludge is transported across Southampton Water via pipeline to Millbrook. In this case, only the indigenous sludge produced at Slowhill Copse is included.</p> <ul style="list-style-type: none"> - The guidance states 'STC means any site where sludge is treated to a standard such that it can be recycled to the environment or disposed of without any further treatment' since STCs are the only sites we operate that produce such a material only these sites were included. The previous 2022/23 calculation included sludge, that had been dewatered at WWTWs (e.g. physio-chemical treatment) but was not suitable for recycling because it had not been digested yet and needed to be imported by truck to STCs for further treatment. <p>There are no material changes in stated values for line BIO1.5 in the BIO1 table. Confidence Grade: B2</p>
6	Total sewage sludge disposed by incumbents	<p>In 2021/22 and 2022/23 Southern Water treated 116.6 and 111.2 ttDS of sludge respectively and this generated 72.0 and 66.0 ttDS of treated sludge per annum which was disposed of by incumbents. The amount of sludge requiring disposal is proportional to the sludge being treated, because existing technologies (e.g. conventional or advanced anaerobic digestion) produce relatively predictable rates of dried solids destruction although some degree of inter-year variation is always expected for a variety of factors (e.g. weather, site performance and secondary treatment etc.). Forecast sludge disposal (2023/24 to 2029/30) is expected to increase as sludge produced increases. For example, in 2024/25 and 2029/30 sludge production/disposal are 116.9 ttDS/72.4 ttDS and 122.9/76.2 ttDS respectively.</p> <p>From 2024/25 onwards Goddards Green STC is expected to be upgraded from conventional to advanced anaerobic digestion (AAD) which will increase dried solids destruction at this site. However only approximately 5% of total sludge will be processed at Goddards Green so it will have a relatively small impact on the overall sludge disposed. In AMP8, we plan to begin implementing AAD in Kent, however we anticipate the impact on sludge disposal will only be realised from the 2030/2031 tax year onwards.</p> <p>Confidence Grade: B2</p>
7	Total sewage sludge disposed by 3rd party sludge service provider	<p>In AMP7 and AMP8 we do not expect to dispose of sludge via 3rd party sludge service providers.</p> <p>Confidence Grade: B2</p>
8	Total sewage sludge disposed	<p>Confidence grade: B2 (see section 6 – total sewage sludge disposed by incumbents)</p>
9	Total measure of intersiting 'work' done by pipeline	<p>In 2022/23 pipeline intersiting was temporarily reduced because of closure and repairs in Feb 2023. From 2023/24 onwards, the pipeline is expected to be operational hence there is a material increase compared to the 2022/23 baseline.</p> <p>Confidence grade: B2</p>
10	Total measure of intersiting 'work' done by tanker	<p>We assessed whether material changes occurred when year-on-year variance minus sludge tDS growth was equal to more than (+/-) 3%. Using this definition, no material changes occurred. Using this definition, changes occur between 2024/25 and 2025/26 likely because of differences in forecast method. However, between 2025/26 and 2027/28 there are continued material changes in tankering, because of increased liquid imports at Ford, Goddards Green, Hailsham</p>



		North and Scaynes Hill. The main driver for this is constrained digester capacity, particularly in Kent resulting in increased liquid tankering distances. Confidence grade: B2
11	Total measure of intersiting 'work' done by truck	We assessed whether material changes occurred when year-on-year variance minus sludge tDS growth was equal to more than (+/-) 3%. Using this definition, no material changes occurred. Using this definition, changes occur between (i) 2022/23 and 2023/24 (ii) 2024/25 and 2025/26 because of differences in forecast method. Confidence grade: B2
12	Total measure of intersiting 'work' done (all forms of transportation)	Confidence grade: B2
13	Total measure of intersiting 'work' done by tanker (by volume transported)	We assessed whether material changes occurred when year-on-year variance minus sludge tDS growth was equal to more than (+/-) 3%. Using this definition, material changes occur between (i) 2022/23 and 2023/24 (ii) 2024/25 and 2025/26 because of differences in forecast method. Confidence grade: B2
14	Total measure of 'work' done in sludge disposal operations by pipeline	N/A for Southern
15	Total measure of 'work' done in sludge disposal operations by tanker	
16	Total measure of 'work' done in sludge disposal operations by truck	We assessed whether material changes occurred when year-on-year variance minus sludge tDS growth was equal to more than (+/-) 3%. Using this definition, minor but material changes occur between 2022/23 and 2023/24 because of differences between actual measurements and forecast methodology. From 2025/26 onwards there is a material year-on-year increase in sludge disposal because of assumed increases in required transport distances which is in line with the results of external consultancy work assessing the capacity. Confidence grade: B2
17	Total measure of 'work' done in sludge disposal operations (all forms of transportation)	
18	Total measure of 'work' done by tanker in sludge disposal operations (by volume transported)	N/A for Southern
19	Chemical P sludge as % of sludge produced at STWs	There is a degree of uncertainty in AMP8 as to whether sites identified as requiring ferric dosing to meet effluent consents will ultimately adopt this process - biological P removal may be implemented instead. Likewise, sites not currently being considered for ferric dosing may implement the process if required. Confidence grade: B2

BIO2- Water resources asset and volumes data

Line description		Commentary
	Sludge transport method	
1	Power	
2	Income treated as negative expenditure	
3	Discharge consents	
4	Bulk discharge	
	Other operating expenditure	
5	Renewals expensed in year (Infrastructure)	
6	Renewals expensed in year (Non-Infrastructure)	
7	Other operating expenditure excluding renewals	
8	Total functional expenditure	
9	Local authority and Cumulo rates	
10	Total operating expenditure (excluding 3rd party)	
	Sludge treatment type	
11	Power	
12	Income treated as negative expenditure	
13	Discharge consents	
14	Bulk discharge	
	Other operating expenditure	
15	Renewals expensed in year (Infrastructure)	
16	Renewals expensed in year (Non-Infrastructure)	
17	Other operating expenditure excluding renewals	
18	Total functional expenditure	
19	Local authority and Cumulo rates	
20	Total operating expenditure (excluding 3rd party)	
	Sludge disposal route	
21	Power	
22	Income treated as negative expenditure	
23	Discharge consents	
24	Bulk discharge	
	Other operating expenditure	
25	Renewals expensed in year (Infrastructure)	
26	Renewals expensed in year (Non-Infrastructure)	
27	Other operating expenditure excluding renewals	

Our 24-25 forecast has been used as a baseline for our base opex. Any changes to opex will therefore be caused by principal use asset recharges, AFCs (arising from capital expenses) and enhancement.

28	Total functional expenditure	
29	Local authority and Cumulo rates	
30	Total operating expenditure (excluding 3rd party)	



BIO3a- Bioresources energy analysis

Line description		Commentary
	Energy	
1	Energy consumption - bioresources	<p>During the 2022-23 financial year we undertook a bioresources submetering programme, and by the years end had successfully submetered 61% of our bioresources electricity usage. Unfortunately we were unable at that point to submeter any of the heat generated. As we estimate heat as representing circa 65% of our total MWH bioresources consumption, that left our total meter coverage at only 21%.</p> <p>We have used the results of the 2022-23 data that we do have as a baseline for bioresources power (both electricity and heat), and projected it forward to 2029-30.</p> <p>From 2023-24 we expect to have increased electricity meter coverage, as well as processes in place to meter heat usage, enabling us to meet the 80% threshold. As these meters are not all yet in place our coverage remains at 21-22% in table BIO3b, a lower level of data quality that we had hoped for (B4)</p> <p>No impact expected by implementation of AAD in Kent as no beneficial use expected until the very end of AMP8 beginning of AMP9</p>
2	Energy generated by and used in bioresources control	
3	Energy generated by bioresources and used in network plus control	
4	Energy generated by bioresources and exported to the grid or third party	
5	Energy generated by bioresources that is unused	
6	Energy bought from grid or third party and used in bioresources control	
	Energy (AMP 7 shadow reported values)	
7	Energy consumption - bioresources	
8	Energy generated by and used in bioresources control	
9	Energy generated by bioresources and used in network plus control	
10	Energy generated by bioresources and exported to the grid or third party	
11	Energy generated by bioresources that is unused	
12	Energy bought from grid or third party and used in bioresources control	

BIO3b- Bioresources; income, liquors and metering analysis		
Line description	Commentary	
	Income from renewable energy subsidies	
1	Income claimed from Renewable Energy Certificates (ROCs)	Forecast subsidy are not impacted by our PR24 bio expenditure and overall strategy as ROCs are fixed and decreasing based on data presented in BIO3.b. We are not forecasting to obtain any other subsidies (e.g. RTFO) as – as explained in our SRN36 Bioresources Strategy Technical Annex, the economics currently do not favour Biogas upgrade to Biomethane (with injection into the grid for example).
2	Income claimed from Renewable Heat Incentives (RHIs)	
3	Income claimed from [other renewable energy subsidy (1)]	
4	Income claimed from [other renewable energy subsidy (2)]	
5	Income claimed from [other renewable energy subsidy (3)]	
6	Total income claimed from renewable energy subsidies	
7	% of total number of renewable energy subsidies due to expire in the next 2 financial years	
8	This year's value of renewable energy subsidies due to expire in the next 2 financial years	
	Bioresources liquors treated by network plus (shadow reported)	
9	BOD load of liquor or partially treated liquor returned from bioresources to network plus	We assessed whether material changes occurred when year-on-year variance minus sludge tDS growth was equal to more than (+/-) 3%. Using this definition, no material changes occurred. Although not material (using the above definition), in 2029/30 BOD and ammonia increases more than in other years. This is due to several WINEP schemes completing which is forecast to increase the sludge generated that year. The sludge forecast shows that approximately 50% of sludge growth in AMP8 is due to schemes rather than population growth.
10	Ammonia load of liquor or partially treated liquor returned from bioresources to network plus	In 2024/25, the increase in BOD generated is largely due to population changes, with EDGE estimating a 2.1% increase in pe growth compared to an average increase of 0.9% between 2022/23 and 2029/30. Confidence grade: B2
11	Recharge to Bioresources by network plus for costs of handling and treating bioresources liquors	Calculated using the shadow method
	Metering	
12	Percentage of bioresources energy consumption that is metered	See BIO3a.1 commentary above

BIO4- Bioresources sludge treatment and disposal data		
Line description		Commentary
	Sludge treatment process	
1	% Sludge - untreated	Nil reported for Southern
2	% Sludge treatment process - raw sludge liming	
3	% Sludge treatment process - conventional AD	2022/23 aligns with APR23. For The forecast, 2022/23 is used as a base and population growth forecast is applied. The reduction in percentage from 2023/24 to 2024/25 is due to our Goddards Green AAD plant coming online in 2024. Confidence grade: B2
4	% Sludge treatment process - advanced AD	The increase in percentage from 2023/24 to 2024/25 is due to our Goddards Green AAD plant coming on line in 2024. Confidence grade: B2
5	% Sludge treatment process - incineration of raw sludge	Nil reported for Southern
6	% Sludge treatment process - other (specify)	
	(Un-incinerated) sludge disposal and recycling route	
8	% Sludge disposal route - landfill, raw	Nil reported for Southern
9	% Sludge disposal route - landfill, partly treated	
10	% Sludge disposal route - land restoration/ reclamation	
11	% Sludge disposal route - sludge recycled to farmland	We have assumed 100% of biosolids will be recycled to farmland for years 2023/24 to 2029/30. Confidence grade: B2
12	% Sludge disposal route - other (specify)	

BIO5- Bioresources - additional treatment and storage data

Line description		Commentary
	Bioresources data	
1	Tonnes of dry solids treated via main sludge treatment	Nil reported for Southern
2	Tonnes of dry solids undertaking thickening/dewatering	
3	Additional sludge storage - tank volume (pre-thickening/pre-dewatering/untreated sludge)	
4	Additional sludge storage - tank volume (thickened/dewatered/treated sludge)	
5	Additional sludge storage - cake pads/bays area or equivalent (cake)	<p>2 schemes related to additional cake storage are part of Bioresources WINEP (1. Hants/Sussex (incl. loW) and 2. Kent).</p> <p>Whilst the phasing of one of the schemes (1. Hants/Sussex) is believed to be carried out over the last 4 years of AMP8, the material year-on-year variation is linked to the phasing of the Kent scheme, which is linked to other non-WINEP schemes (namely 2x AAD plants in Kent). The large change in year 2029-30 is due to the Ham Hill & Ashford cake pads coming online.</p> <p>Quality of data provided: B4</p> <p>NOTE: The figures presented here are the WINEP element of each scheme (e.g. excluding the Growth element which is part of BOTEX)</p>
6	Total number of sludge treatment schemes providing sludge storage	<p>The assumption is that "sludge treatment schemes providing sludge storage" includes additional cake storage (cake pads/bays area or equivalent)</p> <p>"1" is added at the year each scheme starts delivering (2 schemes for cake storage in total in Bioresources WINEP). For phasing, see comment for line 5 above.</p> <p>Quality of data provided: B4</p>
7	Total number of sludge treatment schemes providing sludge thickening and dewatering	Nil reported for Southern
8	Total number of sludge treatment schemes providing main sludge treatment enhancement	
9	Volume of sludge processed via thickening or dewatering	
10	Landbank availability	From National Landbank study (Grieve Strategic/ADAS), we assume AMP8 follows Scenario 3 and each year, landbank available remains the same as previous years. Although Scenario 3 indicates enough landbank is available for SWS and the rest of the industry, it suggests a larger distance to be



		<p>travelled (compared to Scenario 2 - Current situation) which suggests an increased stress on landbank, hence the decision to stay at 100% instead of using higher %.</p> <p>As this is a national study, the quality of the outputs depends on the quality of the data given by each WaSC during this collaborative work.</p> <p>There is also a significant risk that Scenario 3 becomes obsolete if and how EA/DEFRA decide to full apply Farming Rules for Water as early as 2025, potentially reducing the available landbank for Biosolids across the UK by 2/3 (leading to Scenario 4).</p> <p>Quality of data provided: B4</p>
11-15	Sludge management/sludge treatment/ Bioresources cost drivers	BLANK as no information to add.



BIO6- Bioresources - NMEAV for capital enhancement schemes		
Line description		Commentary
	Sludge storage -Tanks (pre-thickening, pre-dewatering or untreated); (WINEP/NEP)	
1	CPIH / CPIH lagged	Not applicable
2	NMEAV (Opening)	Not applicable
3	Capex	Not applicable
4	CCA Depreciation	Not applicable
5	Disposal adjustment	Not applicable
6	Other adjustments	Not applicable
7	NMEAV (Closing)	Not applicable
	Sludge storage - Tanks (thickened/dewatered or treated); (WINEP/NEP)	
8	CPIH / CPIH lagged	Not applicable
9	NMEAV (Opening)	Not applicable
10	Capex	Not applicable
11	CCA Depreciation	Not applicable
12	Disposal adjustment	Not applicable
13	Other adjustments	Not applicable
14	NMEAV (Closing)	Not applicable
	Sludge storage - Cake pads / bays; (WINEP/NEP) bioresources	
15	CPIH / CPIH lagged	Calculated based on PD1
16	NMEAV (Opening)	Nil
17	Capex	Additions used in the table are at outturn prices as indicated. These figures are derived by taking the relevant input from CWW3 (at 22-23 price base) and indexing using CPIH average from table PD1.
18	CCA Depreciation	We have one scheme driving value under the heading 'Sludge storage - Cake pads / bays; (WINEP/NEP) bioresources' which covers multiple sites across the region. We have assumed a continuous delivery across AMP8 in calculating the CCD figure. This assumes 50% of spend in the year is added to the historic cumulative.
19	Disposal adjustment	As these are new assets, there are no entries for disposals related to them in the time period covered.

20	Other adjustments	None
21	NMEAV (Closing)	CCD has been calculated on a straight-line basis using 28.5 years as the average asset life. This asset life is consistent with data supplied in September 2022 as part of the OFWAT data collection exercise update.
	Sludge treatment - Anaerobic digestion and/or advanced anaerobic digestion; (WINEP/NEP) bioresources	
22	CPIH / CPIH lagged	Not applicable
23	NMEAV (Opening)	Not applicable
24	Capex	Not applicable
25	CCA Depreciation	Not applicable
26	Disposal adjustment	Not applicable
27	Other adjustments	Not applicable
28	NMEAV (Closing)	Not applicable
	Sludge treatment - Thickening and/or dewatering; (WINEP/NEP) bioresources	
29	CPIH / CPIH lagged	Not applicable
30	NMEAV (Opening)	Not applicable
31	Capex	Not applicable
32	CCA Depreciation	Not applicable
33	Disposal adjustment	Not applicable
34	Other adjustments	Not applicable
35	NMEAV (Closing)	Not applicable
	Sludge treatment - Other; (WINEP/NEP) bioresources	
36	CPIH / CPIH lagged	Calculated based on PD1
37	NMEAV (Opening)	Nil
38	Capex	Additions used in the table are at outturn prices as indicated. These figures are derived by taking the relevant input from CWW3 (at 22-23 price base) and indexing using CPIH average from table PD1. Although IED (Industrial Emission Directive) is not covered by WINEP, it was included within this line as it is considered as an environmental enhancement and has been included in CWW3.
39	CCA Depreciation	The schemes included under the heading 'Sludge treatment - Other; (WINEP/NEP) bioresources' are major undertakings beginning in 2024-25 completing construction at the end of 2026-27. CCD for these starts at 1 st April 2027.



40	Disposal adjustment	As these are new assets, there are no entries for disposals related to them in the time period covered.
41	Other adjustments	None
42	NMEAV (Closing)	CCD has been calculated on a straight-line basis using 28.5 years as the average asset life. This asset life is consistent with data supplied in September 2022 as part of the OFWAT data collection exercise update.
	Sludge investigations and monitoring (WINEP/NEP) bioresources	
43	CPIH / CPIH lagged	Not applicable
44	NMEAV (Opening)	Not applicable
45	Capex	Not applicable
46	CCA Depreciation	Not applicable
47	Disposal adjustment	Not applicable
48	Other adjustments	Not applicable
49	NMEAV (Closing)	Not applicable

