Appendices and Glossary

Appendices

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Glossary

Appendix A: Ofwat's duties under the Water Industry Act 1991

1. This appendix sets out Ofwat's general duties under the WIA91.

2. Ofwat's general duties are set out in Part I WIA9I.[1] Section 2, as amended, sets out Ofwat's general duties applicable when exercising its powers and duties.

3. The general duties in section 2 are split into primary and secondary duties. Ofwat's primary duties are detailed in sub-section (2A) with additional definitions and provisions in sub-sections (2B) to (2E). Ofwat's secondary duties are detailed in sub-section (3).

4. Section 2A sets out the power of the Secretary of State, in relation to England, and the Assembly, in relation to Wales, to issue guidance to Ofwat on its strategic priorities and objectives, and requirements of them in formulating such guidance for England.[2]

5. Under section 12(3) WIA91 the CMA is required to carry out the redeterminations in accordance with the general duties in Part 1 WIA91.[3]

6. In the remainder of this appendix, we set out the relevant elements of sections 2 and 2A WIA91.[4]

Section 2 General duties with respect to water industry

(1) This section shall have effect for imposing duties on the Secretary of State and on the Authority[5] as to when and how they should exercise and perform the powers and duties conferred or imposed on the Secretary of State or the Authority by virtue of any of the relevant provisions.

(2A) The Secretary of State or, as the case may be, the Authority shall exercise and perform the powers and duties mentioned in subsection (1) above in the manner which he or it considers is best calculated–

(a) to further the consumer objective;

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[1] WIA91, Part I
[2] WIA91, section 2A
[3] WIA91, section 12
[4] WIA91, sections 3-5 set out environmental duties which are not discussed further here.
[5] The Authority is defined in WIA91, section 219 as the Water Services Regulation Authority (Ofwat)

(b) to secure that the functions of a water undertaker and of a sewerage undertaker are properly carried out as respects every area of England and Wales;

(c) to secure that companies holding appointments under Chapter 1 of Part 2 of this Act as relevant undertakers are able (in particular, by securing reasonable returns on their capital) to finance the proper carrying out of those functions;

(d) to secure that the activities authorised by the licence of a water supply licensee or sewerage licensee and any statutory functions imposed on it in consequence of the licence are properly carried out and

(e) to further the resilience objective.

(2B) The consumer objective mentioned in subsection (2A)(a) above is to protect the interests of consumers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the provision of water and sewerage services.

(2C) For the purposes of subsection (2A)(a) above the Secretary of State or, as the case may be, the Authority shall have regard to the interests of–

(a) individuals who are disabled or chronically sick;

(b) individuals of pensionable age;

(c) individuals with low incomes;

(d) individuals residing in rural areas;

(e) customers, of companies holding an appointment under Chapter 1 of Part 2 of this Act, whose premises are household premises (as defined in section 17C); and

(f) customers, of companies holding an appointment under Chapter 1 of Part 2 of this Act, whose premises are below the consumption threshold and in the area of a relevant undertaker whose area is wholly or mainly in Wales, but that is not to be taken as implying that regard may not be had to the interests of other descriptions of consumer.

(2D) For the purposes of subsection (2C) above, premises are below the consumption threshold if the total quantity of water estimated to be supplied to the premises annually for the purposes of subsection (2) of section 17D below is less than the quantity specified in that subsection.

(2DA) The resilience objective mentioned in subsection (2A)(e) is—

(a) to secure the long-term resilience of water undertakers' supply systems and sewerage undertakers' sewerage systems as regards environmental pressures, population growth and changes in consumer behaviour, and

(b) to secure that undertakers take steps for the purpose of enabling them to meet, in the long term, the need for the supply of water and the provision of sewerage services to consumers, including by promoting—

(i) appropriate long-term planning and investment by relevant undertakers, and

(ii) the taking by them of a range of measures to manage water resources in sustainable ways, and to increase efficiency in the use of water and reduce demand for water so as to reduce pressure on water resources.

(2DB) For the purposes of subsection (2DA)—

(a) the reference to water undertakers' supply systems is to be construed in accordance with section 17B;

(b) the reference to sewerage undertakers' sewerage systems is to be construed in accordance with section 17BA(7).

(2E) The Secretary of State and the Authority may, in exercising any of the powers and performing any of the duties mentioned in subsection (1) above, have regard to–

(a) any interests of consumers in relation to electricity conveyed by distribution systems (within the meaning of the Electricity Act 1989);

(b) any interests of consumers in relation to gas conveyed through pipes (within the meaning of the Gas Act 1986);

(c) any interests of consumers in relation to communications services and electronic communications apparatus (within the meaning of the Communications Act 2003), which are affected by the exercise of that power or the performance of that duty.

(3) Subject to subsection (2A) above, the Secretary of State or, as the case may be, the Authority shall exercise and perform the powers and duties mentioned in subsection (1) above in the manner which he or it considers is best calculated–

(a) to promote economy and efficiency on the part of companies holding an appointment under Chapter 1 of Part 2 of this Act in the carrying out of the functions of a relevant undertaker;

(b) to secure that no undue preference is shown, and that there is no undue discrimination in the fixing by such companies of water and drainage charges;

(ba) to secure that no undue preference (including for itself) is shown, and that there is no undue discrimination, in the doing by such a company of—

(i) such things as relate to the provision of services by itself or another such company, or

(ii) such things as relate to the provision of services by a water supply licensee or a sewerage licensee;

(c) to secure that consumers are protected as respects benefits that could be secured for them by the application in a particular manner of any of the proceeds of any disposal (whenever made) of any of such a company's protected land or of an interest or right in or over any of that land;

(d) to ensure that consumers are also protected as respects any activities of such a company which are not attributable to the exercise of functions of a relevant undertaker, or as respects any activities of any person appearing to the Secretary of State or (as the case may be) the Authority to be connected with the company, and in particular by ensuring–

(i) that any transactions are carried out at arm's length;

(ii) that the company, in relation to the exercise of its functions as a relevant undertaker, maintains and presents accounts in a suitable form and manner;

(e) to contribute to the achievement of sustainable development.

(4) In exercising any of the powers or performing any of the duties mentioned in subsection (1) above in accordance with the preceding provisions of this section, the Secretary of State and the Authority shall have regard to the principles of best regulatory practice (including the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed).

(5) In this section the references to water and drainage charges are references to—

(a) any charges in respect of any services provided in the course of the carrying out of the functions of a relevant undertaker; and
(b) amounts of any other description which such an undertaker is authorised by or under any enactment to require any of its customers or potential customers to pay.

(5A) In this section–

'consumers' includes both existing and future consumers; and

'the interests of consumers' means the interests of consumers in relation to–

(a) the supply of water by means of a water undertaker's supply system to premises either by water undertakers or by water supply licensees acting in their capacity as such; and

(b) the provision of sewerage services either by sewerage undertakers or by sewerage licensees acting in their capacity as such.

(6) For the purposes of this section—

(a) subject to subsection (6A) below, the reference in subsection (1) above to the relevant provisions is a reference to the provisions contained in—

(i) Part 2 of this Act (except section 27A and Schedule 3A),

(ii) any of sections 37A to 38, 38ZA, 39, 39ZA, 39B to 39D, 40E to 40J, 42, 51CD to 51CG, 63AC to 63AF, 66B, 66CA to 66H, 66K, 66L, 66O(2), 95, 95ZA, 96, 96ZA, 99, 105ZF to 105ZI, 110F to 110J, 110L to 110O, 117E to 117O, 117R, 117S, 143B to 143E, 144ZA to 144ZF, 153, 181, 182, 185, 192A, 192B, 195, 195A and 201 to 203 below, and

(iii) any of sections 42 to 54 of the Water Act 2014.

(6A) Subsections (2A) to (4) above and sections 2A and 2B below do not apply in relation to anything done by the Authority in the exercise of functions assigned to it by section 31(3) below ('Competition Act functions').

(6B) The Authority may nevertheless, when exercising any Competition Act function, have regard to any matter in respect of which a duty is imposed by any of subsections (2A) to (4) above and sections 2A and 2B] below, if it is a matter to which the CMA could have regard when exercising that function.

(7) The duties imposed by subsections (2A) to (4) above and sections 2A and 2B below do not affect the obligation of the Authority or, as the case may be, the

Secretary of State to perform or comply with any other duty or requirement (whether arising under this Act or another enactment, by virtue of any EU obligation or otherwise).

Section 2A Strategic priorities and objectives: England

(1) The Secretary of State may from time to time publish a statement setting out strategic priorities and objectives for the Authority in carrying out relevant functions relating wholly or mainly to England.

(2) The Authority must carry out those functions in accordance with any statement published under this section.

(3) In formulating a statement under this section, the Secretary of State—

(a) must have regard to the duties imposed on the Authority under section 2,

(b) must have regard to social and environmental matters, and

(c) may have regard to such other matters as the Secretary of State thinks fit.

(4) Before publishing a statement under this section, the Secretary of State must consult—

(a) the Authority,

(b) the Council,

(c) relevant undertakers,

(d) water supply licensees and sewerage licensees,

(e) the Environment Agency,

(f) the Welsh Ministers,

(g) the NRBW, and

(h) anyone else the Secretary of State thinks appropriate.

(5) Before publishing a statement under this section the Secretary of State must—

(a) lay a draft of the statement before Parliament, and

(b) then wait until the end of the 40-day period.

(6) The Secretary of State may not publish the statement under this section if, within the 40-day period, either House of Parliament resolves not to approve it.

(7) ‘The 40-day period’ means the period of 40 days beginning with the day on which the draft is laid before Parliament (or, if it is not laid before each House on the same day, the later of the days on which it is laid).

(8) When calculating the 40-day period, ignore any period during which Parliament is dissolved or prorogued or during which both Houses are adjourned for more than 4 days.

(9) In this section ‘relevant functions relating wholly or mainly to England’ means the functions mentioned in section 2(1) so far as they relate to appointment areas wholly or mainly in England.

(10) In subsection (9) ‘appointment area’ means an area for which an appointment is held under Chapter 1 of Part 2.

Appendix B: List of enhancement categories, and Ofwat FD assessment methodology

Table 1: Water enhancement, Ofwat FD methodology by category

Category	*WINEP?*	*Starting Point*	*Light-touch approach*	*More detailed approach*
Drinking Water Protected Areas	Yes	Business Plan	Shallow dive	Deep dive
Eels Regulations	Yes	Business Plan	Shallow dive	Deep dive
Invasive non-native species	Yes	Business Plan	Shallow dive	Deep dive
Investigations	Yes	Business Plan	Allow full	Deep dive
Making ecological improvements at abstractions	Yes	Business Plan	Shallow dive	Deep dive
Water Framework Directive measures	Yes	Business Plan	Shallow dive	Deep dive
Meeting lead standards	No	Model	Median of model	Deep dive
Metering (excluding new connections)	No	Model	Median of model + frontier shift	Deep dive
Supply/demand: 2020–25 (excl. metering)*	No	Model	Median of model	Deep dive
Supply/demand: Internal interconnections*	No	Business Plan	Shallow dive	Deep dive
Supply/demand: Investigations and future planning*	No	Business Plan	N/A (no totex allowed)	N/A (no totex allowed)
Supply/demand: Leakage (only allowed if at frontier, based on outcomes model)*	No	Business Plan	Shallow dive (if above median unit cost)	N/A
Supply/demand: Long-term*	No	Business Plan	Compared with industry median costs	Deep dive
Improvements to river flows	No	Business Plan	Allow full	N/A (none material)
Improving taste/odour/colour	No	Business Plan	Shallow dive	Deep dive
Investment to address raw water deterioration	No	Business Plan	Shallow dive	Deep dive
Resilience	No	Business Plan	N/A (conducted deep dive on all)	Deep dive
SEMD and non-SEMD	No	Business Plan	Allow full / allow none	Deep dive
Aggregated free form lines	No	Business Plan	Shallow dive	Deep dive

*Although Supply/Demand was a single cost category, it was assessed as a combination of 5 components
Source: Relevant enhancement feeder models (available on Ofwat website)

Table 2: Wastewater enhancement, Ofwat FD methodology by category

Category	*WINEP?*	*Starting Point*	*Light-touch approach*	*More detailed approach*
Chemical removal schemes	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Event durations monitoring at int. dis.	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Flow monitoring at STW	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
P-removal	Yes	Model	Median of model + WINEP catchup + frontier shift	Median of model (incl. alternative) + WINEP catchup + frontier shift
Schemes for FTFT	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Storage at STW	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Storage in the network	Yes	Model	Median of model + WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Chemical investigations	Yes	Business Plan	WINEP catchup + frontier shift	N/A (none material)
Conservation drivers	Yes	Business Plan	WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Eels regulations	Yes	Business Plan	WINEP catchup + frontier shift	N/A (none material)
Groundwater schemes	Yes	Business Plan	N/A (only 1 company with totex)	Deep Dive + WINEP catchup + frontier shift
N-removal	Yes	Business Plan	WINEP catchup + frontier shift	N/A (none material)
Reduction in sanitary parameters	Yes	Business Plan	WINEP catchup + frontier shift	N/A (none material)
UV disinfection	Yes	Business Plan	WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Wastewater investigations	Yes	Business Plan	WINEP catchup + frontier shift	Deep Dive + WINEP catchup + frontier shift
Discharge relocation	Yes (NEP)	Business Plan	N/A (only 1 company with totex)	Deep Dive + WINEP catchup + frontier shift
Monitoring pass forward flows	Yes (NEP)	Business Plan	N/A (no totex allowed)	N/A (no totex allowed)
P-removal technology	Yes (NEP)	Business Plan	N/A (only 1 company with totex)	Deep Dive + WINEP catchup + frontier shift
First time sewerage (s101A)	No	Model	Median of model	N/A (all used model)
Odour	No	Business Plan	Shallow dive	N/A (none material)
Resilience	No	Business Plan	N/A (conducted deep dive on all)	Deep dive
Security	No	Business Plan	Allow full	Deep dive
Sludge quality and growth	No	Business Plan	Shallow dive	Deep dive
Aggregated free form lines	No	Business Plan	Shallow dive	Deep dive

Source: Relevant enhancement feeder models (available on Ofwat website)

Appendix C – Base 2019/20 Costs Data

Introduction

1. The econometric models for base costs published at Provisional Findings were based on cost and cost drivers data from 2011/12 up to 2018/19, the most up to date data available at the time. In July 2020, Ofwat completed its quality assurance process on 2019/20 data. This, and the extension of our timetable for the determinations, made it possible for us to consider including 2019/20 data in our base cost models.

2. In January 2020, we published a working paper on 2019/20 data for base cost models for consultation.[6] Our provisional decision at that stage was to include 2019/20 data only for the cost drivers' forecasts, but not for the independent and dependent variables in base costs. We also consulted on how to model the merger between Severn Trent Water and Dee Valley Water, whether to change the level of efficiency catch-up challenge, and how to apply frontier shift.

3. In the remainder of this annex, we present:

    - the Main Parties' submissions;
    - our assessment of the evidence on this topic;
    - our decision;
    - the consequences of including 2019/20 data on our models; and
    - the final model results with 2019/20 data.

Main Parties' submissions

4. In this section, we present:

    - the Disputing Companies' initial submissions;
    - Ofwat's initial submissions;
    - the Disputing Companies' responses to Ofwat;

[6] Working paper: 2019/20 data for base cost models

- other submissions on the potential inclusion of 2019/20 data that preceded our consultation on 2019/20 data for base cost models;
- the responses following our consultation on 2019/20 data for base cost models; and
- Third Parties' submissions on this topic.

Disputing Companies' initial submissions

5. All the Disputing Companies said 2019/20 data should be included in our base cost models. They said that including the new data:[7]
   - increased the number of observations, making the estimation of the coefficients of the models more accurate;
   - included the most recent data, which improved the estimates of the efficiency catch-up challenge;
   - improved, to some extent, the assessment of the capital maintenance cycle as it used a full AMP: 2015/16 to 2019/20;
   - was consistent with what the CMA wrote in our Provisional Findings regarding its assessment of the consequences of COVID-19 on the industry. In our Provisional Findings, we said that 'when taking decisions regarding the determination, we should use the most up to date information available. Therefore, where new information becomes available that was not available at the time of Ofwat's FD, which has an impact on the water industry and, specifically, the price control, the CMA should take account of these changes in circumstance.'[8]
   - was in line with Ofwat's approach: between Draft Determination and Final Determination, Ofwat updated its models with newly available 2018/19 data;[9]

[7] See Northumbrian's response to the provisional findings, paragraphs 36-37; Yorkshire's response to the provisional findings, section 5.4; Bristol's response to the provisional findings, paragraph 5; Anglian's response to the provisional findings, paragraphs 76–77
[8] Provisional findings report, paragraph 3.53
[9] Anglian's response to the provisional findings, paragraph 76; Anglian's reply to responses to the provisional findings, paragraph 62

- was consistent with other components of our Determinations. For example, we considered data from 2019/20 in setting service performance targets;[10] and

- was necessary in order to avoid a disconnect between AMP7 costs and service targets.[11]

Ofwat's initial submissions

6. Ofwat said 2019/20 data should not be included for the following reasons.

   - The PR19 performance targets had an impact on the level of investment made by the companies in 2019/20, therefore increasing the companies' costs for that year. Ofwat said there was substantial risk from using material new information which was endogenous to the recent price control. Ofwat said that in 2019/20, the sector delivered an unprecedented 7% average reduction in leakage, with some companies delivering reductions in excess of 10%. Ofwat said this pace of change was well above that required by a 15% reduction and spending in the 2019/20 period, such as installing acoustic loggers, would have substantial benefits in future years.[12]

   - In wholesale water, atypical spending would lead to the companies' allowances being increased by a non-credible amount: £980 million higher compared to the allowance under the CMA Provisional Findings, or £1.5 billion higher than companies requested in their response to Ofwat's Draft Determination in August 2019. This contrasted with wholesale wastewater where expenditure in 2019/20 was not higher than the average of the AMP and the inclusion of 2019/20 data implied a reduction in sector allowances compared to Ofwat's Final Determination by £300 million.[13]

   - Results from a version of the econometric models which included a dummy variable for the year 2019/20 indicated the uniqueness of this year of costs. The dummy variable was statistically significant and greater in magnitude than any dummy related to previous years in the sample.

7. Ofwat said that the commentary companies provided on 2019/20 data suggested substantial investments were brought forward from the AMP7

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[10] Bristol's response to the provisional findings, paragraph 211; Northumbrian's response to the provisional findings, paragraph 37
[11] Bristol's response to the provisional findings, paragraph 179 and 212
[12] Ofwat's response to the provisional findings – cost and outcomes, paragraph A6.5
[13] Ofwat's response to the provisional findings – cost and outcomes, paragraph A6.7

period, as preparation to meet performance commitments in AMP7.[14] In response to a request for information from the CMA, Ofwat submitted the following commentary from companies.

- Dŵr Cymru incurred £9 million (2% of wholesale base costs in 2019/20)[15] of capital investments in readiness for AMP7, most of which related to reducing external sewer flooding.

- Hafren Dyfrdwy said that it had accelerated investments in maintenance activities to deliver immediate improvements as well as benefits into AMP7 and beyond, such as targeted mains renewal to improve leakage, supply interruptions and mains bursts. However, it was difficult to quantify the elements specifically relating to AMP7 targets.

- Severn Trent Water said that it had used the benefit of being fast-tracked to get a head start on its AMP7 commitments. The company said that it was not straightforward to quantify which investment was specifically for AMP7 targets, as many of its AMP7 performance commitments continued on from its AMP6 performance commitments.

- South West Water said it had made capital investments totalling £19 million (7% of wholesale base costs in 2019/20)[16] to ensure it was in the best possible position to deliver AMP7 targets and customer expectations, in areas such as capital maintenance, leakage, sewer flooding and IT infrastructure.

- Southern Water said that it had invested around £44 million (8% of wholesale base costs in 2019/20)[17] in improving its operational effectiveness, performance and IT capabilities in preparation for AMP7 targets.

- United Utilities confirmed it invested £96 million (roughly 11% of wholesale base costs in 2019/20)[18] in its 'Flying Start' investment programme, designed to improve performance for both AMP6 and AMP7. United Utilities explained to Ofwat that the investment programme was incremental investment in 2019/20, in readiness for AMP7, rather than

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[14] Ofwat's response to the provisional findings – cost and outcomes, paragraph 2.46; Ofwat's reply to responses to the provisional findings – costs and outcomes, paragraph A6.4
[15] Ofwat noted that while the majority of this expenditure may be base costs, there may have been some enhancement as well, so the percentages may not be accurate.
[16] Ofwat noted that while the majority of this expenditure may be base costs, there may have been some enhancement as well, so the percentages may not be accurate.
[17] Ofwat noted that while the majority of this expenditure may be base costs, there may have been some enhancement as well, so the percentages may not be accurate.
[18] Ofwat noted that while the majority of this expenditure may be base costs, there may have been some enhancement as well, so the percentages may not be accurate.

investment brought forward. The majority of this expenditure was related to improvements in the water network infrastructure, leakage and sewer flooding performance, and IT systems.

8. Ofwat said that three Disputing Companies also provided similar comments.

- Anglian said that totex outperformance in the AMP was strong, albeit with a lower level of outperformance in years four and five, as a result of the shareholder decision to reinvest £165 million into company resilience.
- Bristol said that its analysis of 2019/20 data showed clear evidence, for the water service, that costs were increasing because of the need to meet new and more challenging performance commitments.
- Yorkshire said that it had exceeded its internal sewer flooding targets in each year of AMP6, and it invested its outperformance rewards in the latter part of AMP6 in order to undertake an 'early start' to improve its internal sewer flooding performance ahead of AMP7. This had put it on the front foot to meet the challenges ahead.

9. At the Main Party Hearing, Ofwat said that companies felt challenged by PR19 performance commitments and this was why they had started investing in 2019/20. Ofwat said this was particularly true in wholesale water where companies had invested to meet leakage targets. It said that the increase in expenditure may have been driven by some companies finding it more profitable to target performance than it was previously. This had led them to shift their focus from cost efficiency to achieving higher service levels. Ofwat also said that bringing forward investment could be disruptive to the modelling and forecasting, and that there was a lagged relationship between the investment and the benefits from that investment. On this occasion including 2019/20 data would capture only the former, but not the latter.

10. Ofwat said that it was possible, in theory, to include 2019/20 data, but that we should then recalibrate performance in terms of water or wastewater spending. Ofwat said that this would be challenging as we would need to rethink about the efficiency challenge, performance outcomes and the overall approach to cost assessment.[19] Ofwat said it was unable to suggest an appropriate set of adjustments to accommodate the inclusion of 2019/20 data.

[19] Ofwat's reply to responses to the provisional findings – introduction, paragraph 1.12

Responses to Ofwat's initial submissions from the Disputing Companies

11. The Disputing Companies responded to Ofwat's arguments against the use of 2019/20 data. In summary, the Disputing Companies said that:

- Costs in 2019/20 were not atypically high.[20]
- There was no evidence to suggest that investments brought forward created a bias in the assessment.[21]
- There was evidence that bringing forward investment was not unique to 2019/20. Investment was also brought forward at the end of AMP5 as well as in 2018/19.[22] Indeed, this was endemic in the price control mechanism, for example, 'fast-track' companies were rewarded by receiving an early draft determination in March or April 2019 helping to accelerate the delivery of company plans.[23]
- Ofwat's argument was inconsistent with its own position that there was no link between costs and performance.[24]
- The fact that companies' cost allowances might increase or not with the incorporation of the new data could not in itself be an argument for not using the data.[25] In any case, contrary to Ofwat's statements, incorporating the new data still granted lower base allowances than companies had forecast in their plans.[26]
- The use of several years of data minimised the impact of atypical years and any discontinuities introduced by price control period boundaries.[27]
- Ofwat had not provided convincing arguments against using 2019/20 data and the latest data should be used.[28]

12. In the Main Party Hearings, the Disputing Companies added the following points:

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[20] Northumbrian's reply to responses to the provisional findings, paragraph 36; Yorkshire's reply to responses to the provisional findings, paragraph 4.5.5
[21] Northumbrian's reply to responses to the provisional findings, paragraph 36; Yorkshire's reply to responses to the provisional findings, paragraph 4.5.5
[22] Northumbrian's reply to responses to the provisional findings, paragraph 37 and Table 1; Anglian's reply to responses to the provisional findings, paragraph 60
[23] Anglian's reply to responses to the provisional findings, paragraph 59, quoting Ofwat (2017), *Delivering Water 2020: Our final methodology for the 2019 price review*, p245
[24] Northumbrian's reply to responses to the provisional findings, paragraph 36
[25] Yorkshire's reply to responses to the provisional findings, paragraph 4.5.6; Northumbrian's reply to responses to the provisional findings, paragraph 40
[26] Anglian's reply to responses to the provisional findings, paragraph 65
[27] Anglian's reply to responses to the provisional findings, paragraph 62
[28] Bristol's reply to responses to the provisional findings, paragraph 16

- Anglian said that that the addition of 2019/20 data was valuable because it provided the most up to date information. The increase in expenditure was a consequence of the sector being asked to deliver a higher level of service. The industry spending in wholesale water in AMP6 was unusual as, instead of following a dome-shaped curve, it increased stepwise across the five years. This explained the increase in costs in 2019/20.

- Bristol said that using 2019/20 data mitigated the need for the CMA to consider making separate allowances for Bristol's starting position of having higher levels of service. If investment was brought forward to improve leakage, it would have been enhancement spending, not base costs. The 2019/20 expenditure was evidence of the service-cost relationship, and that extra costs in wholesale water were related to more staff employed to fix leaks. The increase in expenditure was due to companies underspending and underachieving in leakage performance in the first two years of the AMP, and compensating after summer 2018. As such, the increase in expenditure in 2019/20 was not due to investment brought forward from 2019/20, but due to reaching a level playing field in performance. It was good practice to use the latest data, and that the level of spending in 2019/20 was influenced by the totex regime of PR14.

- Northumbrian said that the expenditure for transition in PR19 was lower than in PR14 (about £129 million, against £407 million for PR14), and that it was normal for companies to spend more in the last year of the AMP to get ahead on the next AMP. It said that quite a lot of the additional expenditure appeared to be for above ground assets unrelated to leakage performance improvement. Northumbrian's own increase in expenditure was due to back loaded capital expenditure, not investment to improve leakage. It had not done detailed calculations, but disputed Ofwat's claim that using 2019/20 data would result in companies receiving £1.5 billion more than the companies' asked for. It said that the application of asymmetric cost sharing rates had encouraged companies to under report their costs at the Draft Determination and that the amount companies requested in their original business plans was likely to be in line with the allowances including 2019/20 data. The 2019/20 data was the most recent information available on current cost pressures and the current scope for efficiency, and therefore the CMA should use the data. It said that the additional year would lengthen the panel of data and provide a full five-year regulatory cycle for assessing efficiency – which was important in the context of capital investment cycles. Using 2019/20 data would not result in bill increases for Northumbrian's customers, but if the CMA was concerned about the overall effect of the new data on the determination, it should look at an affordability package for customers. In response to a

question in the Hearings, Northumbrian said that the CMA could not conclude that the new data was invalid because some companies had accepted Ofwat's FD.

- Yorkshire said that that performance and cost were connected, and the 2019/20 expenditure reflected the improvement in performance. Expenditure was lumpy, and peaks reflected the time it took for investment programmes to move from design to delivery stage. It had invested in wastewater as well as well as water and there had been higher investment in wastewater in the last year of the AMP period.

13. We also note that submissions from the Main Parties included other arguments on more detailed topics (such as the timely availability of the data, the inclusion of booster pumping stations forecasts instead of outturn, and the exclusion of non-section 185 diversion costs). These have now been superseded by Ofwat's revised data. The only methodological issues on the inclusion of 2019/20 data that were disputed between the Main Parties were the time of application of the allowance for a frontier shift, whether the efficiency challenge should be adjusted, and the modelling of the merger between Severn Trent Water and Dee Valley Water. On the latter, Anglian noted that depending on what assumptions were made, the predicted allowance could vary by £46 million.

Other pre-consultation submissions

14. Before we issued our paper for consultation on 2019/20 data for base cost models the Main Parties provided further submissions relating to the use of 2019/20 data.

15. Anglian said that Ofwat's analysis of wholesale water base cost aggregate spending was misleading because:

- It focused on wholesale water, not wastewater. Wholesale wastewater costs were 0.1% lower in 2019/20 than the average for the rest of the AMP6. Anglian noted that when considering both wholesale water and wastewater services, 2019/20 costs were only 6.5% higher than the first four years and this increase was mostly driven by wholesale water. Ofwat's analysis appeared to imply that, while expenditure was supposedly brought forward in water, this was not the case for wastewater despite companies also needing to meet stretching targets and performance commitments over AMP7.[29]

[29] Anglian's submission following the second main party hearings: Annex 2, paragraph 28

- The increase in expenditure in 2019/20 was due to the gradual increase in spending over AMP6, not a sudden increase in costs in 2019/20.[30] This gradual increase in expenditure was due to:
  - Companies deferring spending from the early years of AMP6 to later years in order to adjust to the new totex regime.
  - Underlying cost drivers increasing costs over the period.
  - Companies investing to meet a larger number of performance commitments in the last year of AMP6.31
- A proportion of the 13% difference between 2019/20 expenditure and the annual average expenditure over the first four years of AMP6 calculated by Ofwat was attributable to real price effects over the period which were higher in AMP6 compared to AMP5.[32]

16. Anglian said that around 40% of 'botex plus excluding growth, maintenance and renewals' could not be brought forward and represented in-period spending. In addition, expenditure in several other areas was already at, or close to, 2019/20 levels by 2018/19 and therefore it could not represent brought forward expenditure.[33]

17. Anglian re-stated its support for the use of 2019/20 data. In addition to the arguments presented in paragraphs 15–16, Anglian said:
    - The efficiency benchmark would be based on AMP6 only.[34]
    - The additional year would provide valuable new data on how companies had responded to the introduction of the outcome delivery incentive and totex regime, which would continue in AMP7.[35]
    - Alternatively, model estimation and benchmark estimation could both be based only on five years of data for the AMP6 period – 2015/16 to 2019/20. This would ensure consistency between the estimation period of the model and the calculation of the efficiency benchmark (at the possible expense of some accuracy in cost prediction), while also maintaining all the other advantages of focusing on AMP6.[36]

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[30] Anglian's submission following the second main party hearings: Annex 2, paragraph 29
[31] Anglian's submission following the second main party hearings: Annex 2, paragraph 30
[32] Anglian's submission following the second main party hearings: Annex 2, paragraph 33
[33] Anglian's submission following the second main party hearings: Annex 2, paragraph 34
[34] Anglian's submission following the second main party hearings: Annex 2, paragraph 36
[35] Anglian's submission following the second main party hearings: Annex 2, paragraph 36
[36] Anglian's submission following the second main party hearings: Annex 2, paragraph 37

- Anglian's allowance remained well below the forecast in its plans, even after adding the impacts of updating models with 2019/20 data calculated by Oxera. The same was true for Yorkshire, while Northumbrian's allowance exceeded its forecast by a modest amount.[37]

18. Northumbrian said that it was uncontroversial that the 2019/20 wastewater costs were neither atypical nor distortive compared to previous years. [38]

19. Northumbrian said that the increase in wholesale water costs for some companies was due to either meeting AMP6 targets or diversion costs related to High Speed 2.[39] Transitional totex[40] for 2019/20 showed that water expenditure in 2019/20 advanced from AMP7 was £24m, 0.6% of 2019/20 water base costs.[41] Northumbrian's analysis did not support the view that 2019/20 data had a distortive effect on the base costs allowance.[42]

20. Ofwat said that transitional totex was irrelevant because it related almost exclusively to enhancement schemes, with base transition expenditure being lower than £1 million.[43] Ofwat said that the increase in wholesale water base costs in 2019/20 was unrelated to the transition programme.

21. Bristol and Yorkshire did not submit additional arguments in relation to the inclusion of 2019/20 data post-hearing.[44]

Post-consultation submissions

22. All the Main Parties provided responses following our consultation on 2019/20 data for base cost models. Our paper proposed it was inappropriate to use 2019/20 data due to the presence of investment brought forward and the risk of biasing our predicted allowances for companies' base costs.

23. Anglian said the following.

- In PR14 there were substantial regulatory changes, including a shift to totex allowances, companies were assessed on a comparison of expenditure and allowances over the five years, and the level of

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[37] Anglian's submission following the second main party hearings: Annex 2, paragraph 39
[38] Northumbrian's submission following the second main party hearings, paragraph 6
[39] Northumbrian's submission following the second main party hearings, paragraph 8
[40] We understand this to be accelerated capital expenditure water companies make to secure delivery of proposed performance commitments in the first years of the next price control period: Ofwat (2013), *Setting price controls for 2015-20 – final methodology and expectations for companies' business plans, Appendix 5: Guidance on business plan tables*, p15
[41] Northumbrian's submission following the second main party hearings, paragraphs 9-10
[42] Northumbrian's submission following the second main party hearings, Appendix 1, paragraph 2
[43] Ofwat's submission following the second main party hearings – costs and outcomes, paragraph 2.2
[44] We acknowledge Yorkshire's arguments about the link between 2019/20 data and leakage, but we do not cover them here.

performance commitments becoming more onerous over time. These changes had led to a different expenditure pattern in AMP6 compared to previous AMPs.[45]

- The decision not to update the base cost models with 2019/20 data was disproportionate.[46]

- The CMA's conclusion relied on the statements by a small proportion of the industry. In those statements, the relevant companies were imprecise about the targets and timing of their expenditure. Where there were sums quoted, they were relatively immaterial – around 2.15% of total industry base expenditure.[47] The 2019/20 data did not include a substantial proportion of brought forward AMP7 expenditure.[48]

- The proportion of AMP6 expenditure incurred in year five (2019/20) was unusually high compared to earlier years in AMP6. However, this was because it included a substantial proportion of expenditure deferred from earlier years of the AMP6 period. In comparison to previous AMP periods, the proportion of AMP6 expenditure incurred in years one and two was unusually low. [49]

- It would be inconsistent if the CMA excluded 2019/20 data because it included AMP7 expenditure, without recognising there was AMP6 expenditure which would be in AMP7.[50] Anglian's analysis showed that £18m of its AMP6 expenditure was coded for schemes in AMP7, while £15m of its AMP6 expenditure was coded for schemes in AMP5.[51] The £165m which was cited by Ofwat as brought forward expenditure was not brought forward by Anglian and was, instead, a share of the outperformance it achieved in years one to three of AMP6 which the Board elected to reinvest for resilience and customer service enhancements.[52]

- The increase in expenditure in the final year of AMP6 was consistent with Anglian's view that increased service quality standards – such as those delivered by the end of AMP6 – came with cost increases.[53]

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[45] Anglian's response to the 2019/20 data for base cost models working paper, paragraphs 3, 35-36 & 40
[46] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 2
[47] Anglian's response to the 2019/20 data for base cost models working paper, paragraphs 2 & 11iii
[48] Anglian's response to the 2019/20 data for base cost models working paper, section 2. See also Anglian's final submission: Annex 1, paragraph 20
[49] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 3 and Figures 3 & 5
[50] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 14
[51] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 15
[52] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 16
[53] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 3

- Not including 2019/20 data would lead to bias because 2019/20 was the year in which the greatest proportion of AMP6 expenditure was made. In the absence of 2019/20 data, total AMP6 expenditure would not be accurately represented.[54]

- Excluding 2019/20 data would mean the CMA would be placing greater weight on the early years of expenditure in the data panel (for example, 2012/13) which pre-dated AMP6. Expenditure in those years had not been scrutinised in any detail.[55]

- If, after the reviewing the evidence provided by Anglian, the CMA remained concerned about the introduction of bias from including 2019/20 data it could cap any company's allowance at the lower of the allowance resulting from the updated models and the expenditure that company sought in its business plan.[56]

- Anglian supported the CMA's proposals on frontier shift and the application of the efficiency challenge.[57] Anglian said the correct approach to dealing with the merger was that proposed by Oxera (see paragraphs 110–111 and 115).[58]

24. Bristol said the following.

- The 2019/20 data should be used, in accordance with good regulatory practice, and the data confirmed Bristol's view of the service-cost relationship. The data improved the reliability of the models, and the outcome was material to Bristol's cost allowances.[59]

- The cost increase in 2019/20 was below the AMP6 trend, which undermined the assertion that costs in 2019/20 were atypically high.[60]

- Including the latest data did not reduce the statistical performance of the models. Indeed, one of the model coefficients became statistically significant with the inclusion of the data.[61] More generally, increasing the number of observations should increase the accuracy of the coefficient estimates.[62] Further, if the inclusion of 2019/20 data was distortive, one

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[54] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 4
[55] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 4
[56] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 53
[57] Anglian's response to the 2019/20 data for base cost models working paper, paragraphs 47-48 & 51-52
[58] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 50
[59] Bristol's final submission, paragraph 5a
[60] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 2 and Figure 1
[61] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 2& 19
[62] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 17

would expect to see a deterioration in model performance, which did not occur.[63]

- The potential examples of brought forward base costs were speculative. There was not a single robust case of water service base expenditure definitely being brought forward from AMP7.[64]

- While some companies may have brought forward some expenditure to 2019/20 from AMP7, the CMA had ignored the fact that its models included data from 2014/15, the last year of AMP5. The CMA had provided no assessment of whether a similar phenomenon happened in 2014/15.[65] Northumbrian had provided examples of companies bringing forward spend to 2014/15, which the CMA had not included in its paper for consultation on 2019/20 data for base cost models.[66] Bristol had provided examples of Affinity Water and Severn Trent Water bringing forward expenditure.[67]

- An explanation for the higher expenditure in 2019/20 was that some companies may have back-end loaded their AMP6 programmes, or there had been slippage in their delivery. The underspend in the first two years of AMP6 supported the inclusion of 2019/20 data and was important context which the CMA should account for. This spending pattern was not seen in AMP5.[68]

- There was no pattern of outperformance of service levels in 2019/20, which would be expected if the companies had brought forward material levels of AMP7 expenditure to improve service levels.[69]

- When setting performance targets the CMA considered outturn service levels for 2019/20. By considering the performance but not the costs, the CMA was being inconsistent and creating a further disconnect between costs and service levels.[70] This disconnect was particularly acute for Bristol as it had higher performance than other companies.[71]

- The CMA had not carried out any cross-checks or sensitivity analysis.[72]

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[63] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 19
[64] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 2 and Annex 1
[65] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 2
[66] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 23 and Table 1
[67] Bristol's response to the 2019/20 data for base cost models working paper, Table 2
[68] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 25
[69] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 26
[70] Bristol's response to the 2019/20 data for base cost models working paper, paragraphs 2 & 5 and Section 1.4
[71] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 35
[72] Bristol's response to the 2019/20 data for base cost models working paper, paragraphs 3-4 & 13

- Not including 2019/20 data would leave Bristol underfunded to deliver its AMP7 performance targets and if the CMA were to leave Bristol underfunded that would be a breach of the Finance Duty.[73] Omitting the data did not avoid bias, it allowed existing bias to persist.[74]

- The CMA had failed to engage with Bristol's bottom-up approach and instead solely used Ofwat's approach for determining costs.[75]

- Using the most recent data was a well-established regulatory precedent.[76]

- The more recent data reflected the totex/outcomes framework more than the cost base prior to 2015, when the regulatory framework did not target service improvements other than through enhancement expenditure.[77]

- If 2019/20 data was used, frontier shift should not be applied to 2020/21. The CMA should also consider not applying the frontier shift adjustment to 2019/20 costs even if it decided to not include the 2019/20 cost in the model. The increase in expenditure in 2019/20 suggested that delivering net efficiency gains of 1% was not deliverable in that year.[78]

- In relation to the appropriate way of modelling the Severn Trent Water/Dee Valley Water merger, the CMA's proposed approach of excluding Hafren Dyfrdwy from the base modelling was wrong.[79] Including Hafren Dyfrdwy and 2019/20 data did not result in the base cost models performing worse than models which excluded 2019/20 data nor models which included 2019/20 data but excluded Hafren Dyfrdwy. [80]

25. Northumbrian said the following.

- The CMA's decision to not use the latest data was inconsistent with the CMA's own well-established precedent and the decisions of other regulators.[81] Allowing regulators to pick and choose which data to use would undermine confidence in the CMA's process.[82]

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[73] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 6
[74] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 12
[75] Bristol's response to the 2019/20 data for base cost models working paper, paragraphs 10-11
[76] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 15
[77] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 20
[78] Bristol's response to the 2019/20 data for base cost models working paper, paragraphs 20-21
[79] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 20
[80] Bristol's response to the 2019/20 data for base cost models working paper, Annex 2
[81] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 2 and Appendix 1. See also Northumbrian's final submission, paragraph 28
[82] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 3

- The CMA was using the most recent data elsewhere in its provisional findings, including using 2019/20 data in its cost of capital working paper.[83]

- By rejecting 2019/20 data, the CMA was saying that the cost information from 2011/12, which was nine years old, was more relevant than data from 2019/20.[84]

- While there was clear evidence that some expenditure had been brought forward this did not introduce the degree of bias envisaged by the CMA. Northumbrian estimated that £100m–£200m had been brought forward, which Northumbrian said represented 2% to 5% of totex for the year.[85] The volume and value of this expenditure was immaterial by Ofwat's own cost adjustment thresholds and was consistent with expenditure shifting at the end of the last control period in 2014/15. Analysis of 2019/20 data, either independently or relative to 2018/19, did not support the view that it was atypical. The 2019/20 data was accurate and had been subject to the appropriate quality checks.[86]

- There were substantial benefits to the inclusion of 2019/20 data, including providing more observations for the modelling, using a full AMP for the calculation of the efficiency challenge, minimising the impacts of atypical years, and better reflecting the trend of increasing spend over AMP6.[87]

- Excluding the data would result in a clear downward bias, which contributed to the existing asymmetry in the package that the CMA had recognised. This downward bias (£800m–£900m) was far higher than any upward bias resulting from its inclusion (£100m–£200m).[88]

- Other factors were driving the material increase in company expenditure, including growth in non-infrastructure maintenance and higher performance commitment levels. [89]

- Little could be deduced from any comparison of actual spend vs forecasts for 2018/19 and 2019/20. Any differences could be due to multiple reasons, including delays to investment or maintenance programmes.[90]

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[83] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 12
[84] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 11
[85] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 4 and section 1.4. See also Northumbrian's final submission, paragraph 28
[86] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 4
[87] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 5 and section 1.3
[88] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 5 and section 1.5
[89] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 26 to 28
[90] Northumbrian's response to the 2019/20 data for base cost models working paper, section 1.6

- There was evidence of similar transitional spend in 2014/15, yet the CMA had not rejected the use of the 2014/15 data.[91]

- The CMA's arguments on wastewater were particularly weak. None of the Main Parties argued the inclusion of the 2019/20 wastewater data would result in distortions. The suggestion that investment was brought forward in light of AMP7 wastewater commitments was inconsistent with performance observations for the key wastewater common performance commitments of internal flooding, sewer collapses and pollution. The industry average and upper quartile positions deteriorated between 2018/19 and 2019/20. Consistent with this, the 2019/20 wastewater expenditure was the second lowest year of expenditure in AMP6 and almost exactly at the average for the AMP6 period. Further, little weight could be placed on the CMA's comments on shared costs and inconsistency, as the water and wastewater revenue controls and the associated ODIs were entirely separate.[92]

- Northumbrian had considered viable alternatives to including 2019/20 data but had found that including the data was the best option.[93]

- The CMA should apply the frontier shift from 2020/21, address the impacts of the merger as suggested in the working paper and set an upper quartile efficiency challenge based on the quality of the econometric models.[94]

- The 2019/20 data had confirmed that Ofwat's FD package was too stretching and that companies were underfunded.[95]

26. Ofwat said the following.

- It strongly supported the decision not to include 2019/20 data. The 2019/20 data was unrepresentative and insufficiently robust to be safely relied upon. It therefore fell squarely within the categories of data which the CMA had rightly and regularly excluded from past analyses.[96]

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[91] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 38
[92] Northumbrian's response to the 2019/20 data for base cost models working paper, section 1.7
[93] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 5 and Section 1.9
[94] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 5 and Section 1.8
[95] Northumbrian's final submission, paragraph 11
[96] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 2.2

- It agreed with the CMA view that a company specific adjustment to the 2019/20 data would not mitigate the risk of biased estimates. Using a dummy variable would also not address the bias.[97]

- It agreed with the decision to use the 2019/20 cost driver data to update the CMA's cost drivers' forecasts for 2020 to 2025.[98]

- If the CMA included 2019/20 data and applied the frontier shift from 2020/21 onwards, this would be a material softening of the frontier shift challenge. If this was done the CMA should revisit the scale of the frontier shift.[99]

- With regard to modelling the merger of Severn Trent Water and Dee Valley Water, Ofwat agreed with the CMA's approach for wholesale wastewater. In wholesale water, Ofwat agreed that post-merger Severn Trent Water should be included and treated as a separate entity but did not agree with the exclusion of Hafren Dyfrdwy. This was because in water the sample of companies was more varied and Hafren Dyfrdwy was similar in size to Dee Valley Water, which was included in the sample.[100]

- The 2019/20 data should not be used as it contained brought forward expenditure.[101]

- The CMA was correct to scrutinise the data before using it and in the past other regulators had not adopted the most up to data information, including the CMA in its Bristol decision.[102]

- It disagreed with the reasons the Disputing Companies gave to justify the higher costs in 2019/20 data. In particular:

  - backloading of expenditure could not explain the higher 2019/20 cost data;

  - stretching performance targets did not drive the higher 2019/20 cost data;

  - leakage improvements were consistent with expenditure being brought forward;

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[97] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 2.6
[98] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 2.9
[99] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 3.2
[100] Ofwat's response to the 2019/20 data for base cost models working paper, paragraphs 3.3-3.6
[101] Ofwat's final submission, paragraph 1.9.1
[102] Ofwat's final submission, section 2.1

- the CMA's comparison of 2018/19 and 2019/20 forecasts provided important insights; and
- there were few parallels between the 2014/15 data and 2019/20 data. For example, the model included data after 2014/15, so the issue of bringing forward investment was not relevant.[103]

- The 2019/20 expenditure was materially biased by preparations for PR19. For example, the companies had an incentive to bring forward investment to AMP6 as customers would share a greater proportion of overspend.[104]
- The companies' APR responses showed 2019/20 data was distorted. For example, Southern Water described a £44 million investment across water and wastewater, which it described as preparation for AMP7 targets.[105]
- There was no downward bias in the CMA's current modelling. Any companies receiving an allowance lower than their requested costs was the result of inefficiency, adding 2019/20 data did not change substantially the Disputing Companies' efficiency rankings and 2018/19 was already a high cost year.[106]
- Not using 2019/20 data was consistent with the CMA's position on setting performance commitment levels.[107]
- There were no substantial improvements in the econometric models which justified the use of 2019/20 data. For example, data submitted by Oxera showed the overall R-squared marginally decreased in the wholesale water models when 2019/20 data was included.[108]
- Any adjustments to 2019/20 data would be arbitrary and not robust and here Ofwat agreed with Northumbrian.[109]
- There was evidence of material investments brought forward in wholesale wastewater data. For example, Yorkshire had indicated large investments in sewer flooding.[110]
- Including 2019/20 data would lead to an unacceptable outcome for customers as, if it was applied to the industry, it would result in 13 out of

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[103] Ofwat's final submission, section 2.2
[104] Ofwat's final submission, section 2.3
[105] Ofwat's final submission, section 2.4
[106] Ofwat's final submission, section 2.5
[107] Ofwat's final submission, section 2.6
[108] Ofwat's final submission, section 2.7
[109] Ofwat's final submission, section 2.8
[110] Ofwat's final submission, section 2.9

17 water companies receiving a higher wholesale water allowance than they requested in August 2019.[111]

- If the CMA used 2019/20 data it would need to review the interaction with other parts of the price review framework, including the efficiency challenge, cost adjustment claims, enhancement and performance commitments.[112]

27. Yorkshire said the following:

- The decision to exclude 2019/20 data represented a divergence from the CMA's stated principle to use the most up to date data available.[113]
- The working paper highlighted the lack of engagement with the issues surrounding the links between service and costs.[114]
- Failing to include 2019/20 data would mean the CMA could not include a complete year of AMP6 data in its models.[115]
- The CMA's analysis suggested the companies had overspent in the last year, even when, over the five years, the companies were efficient compared to their regulatory allowances.[116]
- The evidence on investment being brought forward was anecdotal and it was not clear whether this evidence related to base or enhancement or water or wastewater.[117]
- The CMA seemed to assume that base expenditure could be readily transferred from one period to another. Instead, items like power, labour and chemicals could only be incurred in-period. Only enhancement, growth and some aspects of maintenance and renewals could be brought forward.[118]
- Excluding 2019/20 data would set poor incentives as it would be clear to companies that investment brought forward would be excluded from the

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[111] Ofwat's final submission, section 2.10
[112] Ofwat's final submission, section 2.10
[113] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.4
[114] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.4
[115] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.9a
[116] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.9a
[117] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.9b. See also Yorkshire's final submission, paragraph 3.3.2
[118] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.10

cost models. This was different to the message Ofwat promoted, which was to encourage companies to bring forward investment.[119]

- While 2019/20 data should be used unadjusted, there were ways of adjusting the data if the CMA had concerns:
  - adjusting costs where there was clear and robust evidence of costs being moved forwards; and/or
  - triangulating between models including and not including 2019/20 data.[120]
- If 2019/20 data was used, then frontier shift should only be applied from 2020/21 onwards.[121]
- The CMA had not robustly investigated whether:
  - other years of data had similar investment issues;
  - there was a downward bias from not including 2019/20 data, as well as disregarding a full AMP of performance;
  - there were alternative ways of mitigating these issues.[122]
- Omitting 2019/20 data resulted in a material bias in Yorkshire's cost allowance and an inherent inconsistency with its service commitments.[123]

28. Oxera, advisors to Yorkshire, said the following.

- The CMA analysis in its paper for consultation on 2019/20 data for base cost models was limited because it had not:
  - undertaken analyses of other years to see if investment was atypical;
  - balanced any upward bias of including the data with any downward bias from excluding the data;
  - considered fully the implications of its decision; and
  - explored in detail alternative ways of mitigating potential issues.

[119] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.11-1.16
[120] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.18
[121] Yorkshire's response to the 2019/20 data for base cost models working paper, paragraph 1.19
[122] Yorkshire's final submission, paragraph 3.3.2.
[123] Yorkshire's final submission, paragraph 3.3.2.

- The 2019/20 data would reflect: more accurately current expenditure and efficiency levels; likely lead to more precise coefficient estimates; and help account for lumpy cost items.
- The CMA should assess the impact of 2019/20 data by carrying out additional analysis to verify whether dropping particular years of data led to large changes in results, examine whether there had been structural breaks in the data and limit the analysis to AMP6 data.
- The CMA should not select data to fit its model, but instead select a model to fit the data.
- If the CMA considered service quality to be a material driver of expenditure, then failing to account for service quality would lead to bias.
- The CMA had not investigated if there was a lagged relationship between investments and performance.
- If 2019/20 data was included, then frontier shift should be applied only to forecast data. In addition, in wholesale wastewater Hafren Dyfrdwy and post-merger Severn Trent Water should be modelled as a single entity and a continuation of pre-merger Severn Trent Water.
- There were three principles that should be applied when modelling the industry and estimating the efficiency challenge benchmark. The approach adopted should:
  - reflect the operational reality of the industry;
  - avoid arbitrarily weakening the efficiency challenge benchmark; and
  - use the same industry structure for estimating coefficients and efficiency scores.
- Oxera disagreed with the CMA's proposed approach to modelling the merger in wholesale water.
  - Hafren Dyfrdwy should not be dropped as it was not too dissimilar to Dee Valley and was not disproportionately smaller than other smaller companies. Dropping Hafren Dyfrdwy could also lead to an unnecessary loss of information.
  - Instead, Hafren Dyfrdwy should be included as a separate company in the cost regressions in 2019/20. However, Hafren Dyfrdwy should be dropped for the efficiency challenge and Dee Valley Water's efficiency score should be used, based on four years of data.

- Changing the period of analysis did not have a consistent impact on the overall R-squared but including 2019/20 data improved the within R-squared.

- The CMA was correct to place little weight on the analysis of trends in expenditure.

- The evidence on investment being brought forward did not adequately differentiate between enhancement and base and therefore it was unclear whether base expenditure was being brought forward. There could also have been investment that was delayed from AMP6 to AMP7. Yorkshire had delayed £37m of expenditure.

- Comparisons between outturn data and business plans was inappropriate as spend would have been based on allowed expenditure levels and performance commitments. The CMA over-spend analysis was also one sided as it did not look at underspend in previous years, although the CMA had acknowledged 2015/16 was a low cost year. The CMA had assumed all base spend could be transferred across years.

- The CMA was inconsistent when it used a comparison of outturn versus business plan expenditure as evidence that the amount of expenditure brought forward was material, while simultaneously arguing that it was not possible to quantify the investment brought forward.

- Oxera's analysis showed the smallest 'bias corrected' estimate of Yorkshire's cost allowance was £1,403 million, which was £40 million higher than Yorkshire's allowance at Provisional Findings. This showed a material downward bias in Yorkshire's cost allowance.

- The CMA was inconsistent in its treatment of data. For example, the CMA gave less weight to post-2008 data when estimating the frontier shift because it was not a full cycle, while not considering similar issues when considering whether to use 2019/20 data.

- It was undisputed that 2019/20 data should be used to update the cost drivers for AMP7 and used in the wholesale wastewater models.

- Any overspend in wholesale wastewater could be driven by allocation issues across the two services.

- It would not be intrinsically wrong to adopt different approaches for wholesale water and wastewater if these approaches could be robustly explained.

Third parties' submissions

29. CCWater said that including 2019/20 data may introduce bias in the cost allowances.[124]

30. Icon Infrastructure said it supported the use of 2019/20 data. It was concerned that any decision to exclude the data would be influenced by subjective narrative, rather than objective data integrity. Any decision to exclude would be inconsistent with the approach taken during the CMA's Bristol PR14 Determination. It said the evidence on investment being brought forward was anecdotal. The 2019/20 data was complete and robust, updated information which was highly relevant to the determinations.

31. Thames Water said it assumed that the CMA would be updating the analysis to include 2019/20 data and it would encourage the CMA to do so.[125]

32. Water UK and Global Infrastructure Investor Association said it supported the use of 2019/20 data.[126]

CMA assessment

33. In this section, we assess the evidence and arguments on whether to include 2019/20 data. We presented our provisional assessment in our consultation on 2019/20 data for base cost models where we provisionally decided to update the cost driver forecasts with 2019/20 data.[127] That provisional view was not disputed by the Parties. Therefore, we focus our assessment on whether we should include 2019/20 cost data. We updated our assessment after reviewing the Parties' post-consultation submissions.

34. As we explained in our consultation on 2019/20 data for base cost models, Ofwat said that including 2019/20 data in our models would introduce a potential upward bias in our estimates due to several companies bringing investment forward from AMP7. This additional spending would increase the dependent variables of our models, creating an increase in costs that was not explained by changes in the explanatory variables. We were concerned that the scale of the investment brought forward reflected in 2019/20 cost data would substantially bias our estimates of the base cost allowances. The scale of this additional spending (and therefore bias) might potentially be large

[124] CCWater's response to the 2019/20 data for base cost models working paper
[125] Thames Water's response to the provisional findings, paragraph 27
[126] Water UK's response to the provisional findings, p3
[127] Working paper: 2019/20 data for base cost models; GIIA's response to the cost of capital working papers, p3

given that, under several metrics (for example, leakage), PR19 was a more demanding determination than others have been in the past.

35. In the following sub-sections, we start our assessment with a review of the arguments on our overall approach to the decision on whether to include 2019/20 data. Second, we assess the impact of the data on the models' performance. Third, we analyse expenditure data. Fourth, we review the evidence on investment brought forward from AMP7 to 2019/20. Finally, we assess whether excluding 2019/20 data introduces downward bias.

Overall approach

36. In this sub-section, we assess the Parties' arguments on whether excluding 2019/20 data would be consistent with our redetermination process.

37. The Disputing Companies and Ofwat presented contrasting views on regulatory precedents related to the inclusion of additional data in regulatory models. We note that regulators, including the CMA, often use the most recent data available.[128] However, Ofwat provided three examples from the CMA, Ofgem and ORR where the latest data was not included.

38. We recognise the value of adding data to our models. For example, the use of the most recent information is one of the main benefits of the inclusion of 2019/20 data. In June 2020, we published a document discussing our approach to the redeterminations which stated that 'where there is additional and updated information available, produced since Ofwat's determination, and which is relevant to the redeterminations, we will take account of this to inform our redeterminations.'[129] However, it is also in line with good economic practice to assess whether this data may bias our estimated allowances. Indeed, in the same document, we said we would also 'consider whether information is complete and robust so that we can place reliance on it.'[130]

39. Anglian said that including 2019/20 data would be in line with the inclusion of 2018/19 data, which Ofwat added between Draft Determination and Final Determination.[131] We place little weight on this argument because no party has claimed that using the 2018/19 data might introduce any potential bias and we have found no evidence that it does so.

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[128] For example, Northumbrian listed nine precedents from the CMA, Ofwat and Ofgem where the most recent data was included.
[129] CMA approach to water redeterminations, paragraph 58
[130] CMA approach to water redeterminations, paragraph 58
[131] Anglian's response to the provisional findings, paragraph 76; Anglian's reply to responses to the provisional findings, paragraph 62

40. Some Disputing Companies said that including 2019/20 data would be consistent with the CMA accounting for 2019/20 data in setting service performance targets.[132] Ofwat said that if we were to include 2019/20 data, we should rethink several elements of our Final Determination.[133]

41. In deciding whether to include 2019/20 data, we looked at the advantages and risks of doing so. We recognised that the use of 2019/20 data required updating other parts of our analysis and ensuring our overall approach was consistent.[134]

42. The Disputing Companies highlighted some advantages of including 2019/20 data in our base cost models.[135] We found these improvements to be important in our overall assessment of whether to include the data. The advantages included, among others,

(a) increasing the number of observations, which would possibly increase the precision of our estimates;

(b) reducing the impact of atypical years; and

(c) including all of AMP6 in our data, which is particularly relevant for lumpy costs such as capital maintenance.

43. We also found that the inclusion of more recent data allowed our models to include the most up-to-date information. This was a key benefit for our models because it allowed our estimates to reflect the latest developments in the industry.

Impact on models' performance

44. In this sub-section, we assess the impact of including 2019/20 data on the performance of our econometric models.

45. The Disputing Companies said that the inclusion of 2019/20 data improved the performance of our models. They pointed to the increased significance of a variable in model specification WRP2.[136]

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[132] For example, Bristol's response to the provisional findings, paragraphs 179 & 208–212, or Anglian's response to the 2019/20 data for base cost models working paper, paragraph 44
[133] Ofwat's final submission, paragraph 2.114
[134] Albeit recognising the case-specific differences of previous determinations, including the different timelines, we note that the PR14 and the CMA's PR14 Redetermination for Bristol also did not use the last year of data available, see: CMA (2015), Bristol Redetermination Appendices, paragraph 223
[135] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 14
[136] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 15

46. Ofwat said that the statistical improvements indicated by the Disputing Companies were not strong enough to justify the inclusion of 2019/20 data. [137]

47. We find that including 2019/20 has some benefits for our models. However, overall, we did not find statistical evidence that clearly showed our models performed better or worse with 2019/20 data in terms of goodness of fit. Changes to the 'overall R-squared' (a measure of the goodness of fit of our models) were marginal, led mainly by an increase in the models' 'within R-squared'. Moreover, the coefficients (excluding the constant) and their confidence intervals were broadly in line with our results at Provisional Findings.[138] Therefore, changes in our models' statistical performance were not a determinative factor in our decision of whether to include 2019/20 data.

Expenditure analysis

48. In this sub-section, we seek to understand the extent to which 2019/20 can be considered an 'atypical' year due to its high level of expenditure. We assess two pieces of evidence:

    (a) aggregate expenditure data over time; and

    (b) the difference between outturn expenditure and companies' business plans' forecasts.

49. We then summarise our findings.

Aggregate expenditure

50. We looked separately at wholesale water and wholesale wastewater expenditure over time.

51. Appendix C Figure 1 shows that 2019/20 was a year with high levels of wholesale water base costs. Appendix C Figure 1 also shows that there is a positive trend across all five years of AMP6.

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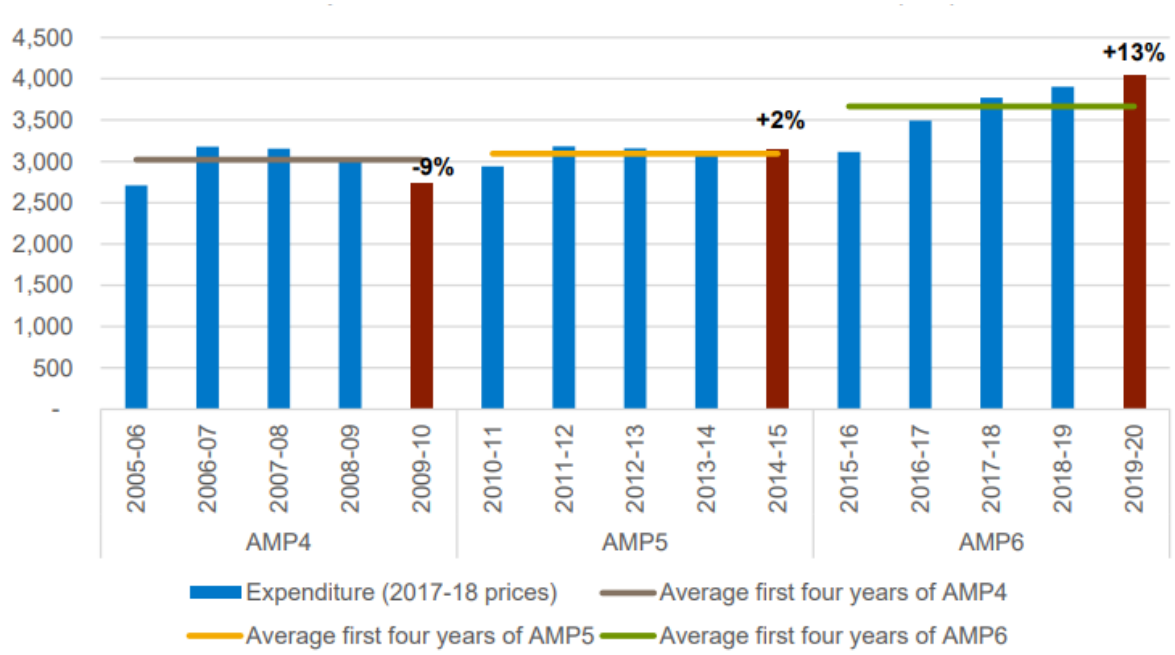
[137] Ofwat's final submission, paragraphs 2.96-2.97

[138] The R-squared is slightly higher with 2019/20 point for all wholesale water models, and six of the eight wholesale wastewater models, all by one percentage points or less. The coefficients' p-values generally remain the same; however: for wholesale water, the p-values are smaller (more precise coefficients) for five variables across the models, and larger (less precise coefficients) for two variables. For wholesale wastewater, the p-values are smaller for four variables across the models, and larger for six variables. For a technical explanation of the difference between 'overall R-squared' and 'within R-squared', see StataCorp, L. P. (2013) Xtreg—fixed-, between-, and random-effects and population-averaged linear models.

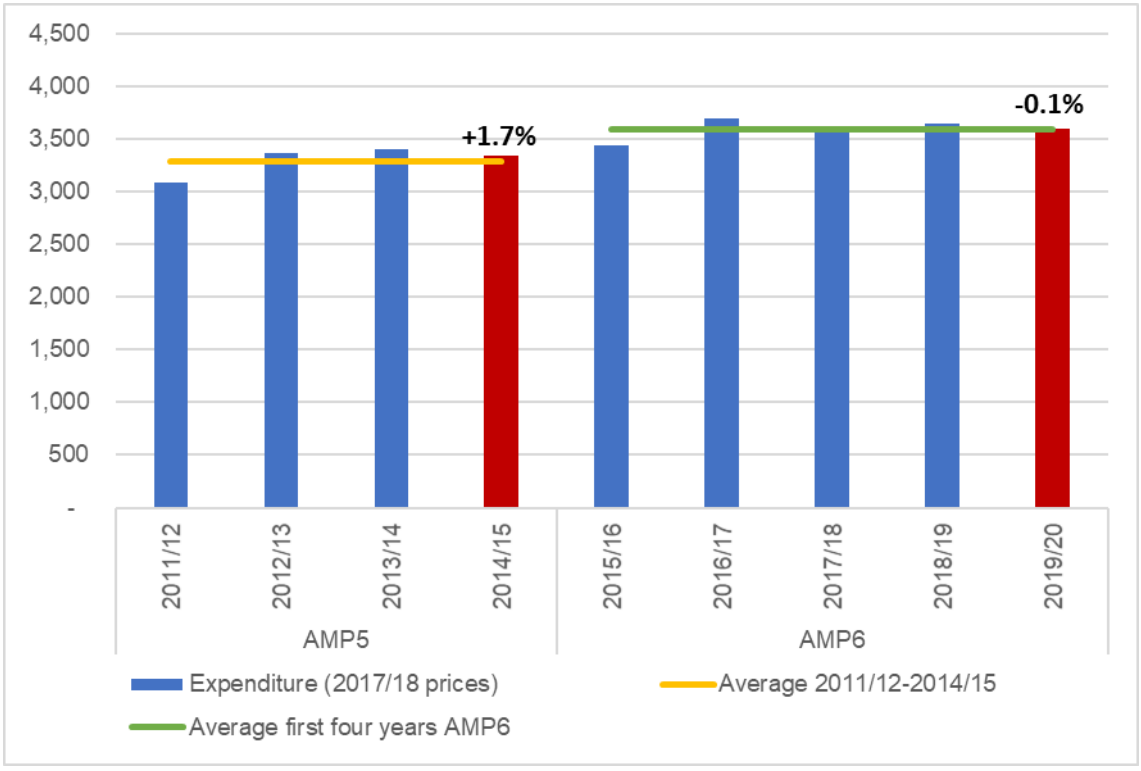
Figure 1: Wholesale water base costs, comparison of base costs in different years



Source: Ofwat Response to Request for Information, Figure 1. Ofwat's reply to responses to the provisional findings – costs and outcomes, annex 6.

52. Appendix C Figure 2 shows wholesale wastewater base costs for the years included in our base cost models. Wholesale wastewater spending in 2019/20 was in line with spending in previous years.

Figure 2: Wholesale wastewater base costs, comparison of base costs in different years (£m)



Source: CMA Analysis

53. Ofwat said that introducing a dummy variable for 2019/20 in our wholesale water models showed that 2019/20 was statistically different from previous years because its coefficient was positive and statistically significant. However, we found that in several models the coefficient of a dummy variable for 2018/19 was also positive and statistically significant. Moreover, the coefficient of a dummy variable for 2015/16 was negative and statistically significant.

54. We found that this was simply reflective of the upward trend in wholesale water base costs over AMP6. We were therefore wary of using a dummy variable to establish whether 2019/20 was 'atypical'.[139] The upward trend in wholesale water base costs was also highlighted by Anglian. Anglian said that the +13% shown in Appendix C Figure 1 was not due to a sudden increase in costs in 2019/20, but rather a gradual increasing pattern of spend over AMP6.[140]

55. Bristol said that wholesale water base costs grew at a lower rate from 2018/19 to 2019/20 than in previous years.[141] We found that the compound annual growth rate in base costs over AMP6 was 5.4%, while base costs increased by 3.6% between 2018/19 and 2019/20.

56. The Parties submitted several reasons why wholesale water base costs were higher than previous years in 2019/20. For example, the introduction of a regulatory regime based on totex, diversion costs related to High Speed 2, and the influence of PR14 performance targets.[142] Given these factors were not likely to lead to any bias in our estimates, we did not explore all these factors in detail, but focussed our analysis on evidence related to the presence and scale of bias.

57. From this aggregate analysis, we could not conclude whether 2019/20 was an 'atypical' year in expenditure terms. Overall, we observed that:

    (a) wholesale water base costs in 2019/20 were higher than in previous years, but the growth from 2018/19 to 2019/20 was not abnormally high compared to previous years; and

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[139] We also tested year dummy variables in wholesale wastewater, but 2019/20 was not statistically significant in any of our models.
[140] Anglian's final submission: Annex 2, paragraph 29; Anglian's response to the 2019/20 data for base cost models working paper, paragraph 24
[141] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 21
[142] Anglian's response to the 2019/20 data for base cost models working paper, section 4; Northumbrian's response to the 2019/20 data for base cost models working paper, section 1.6

(b) wholesale wastewater base costs in 2019/20 were in line with the AMP6 average.

Comparison outturn vs business plans

58. We compared companies' outturn spending to the respective forecasts included in their April 2019 business plans. This comparison provided useful information on actual expenditure relative to the companies' expectations. While business plans were not a perfect measure of future costs, they captured, to some extent, the companies' expectations. To provide context to our 2019/20 results, we also performed the same comparison for 2018/19.

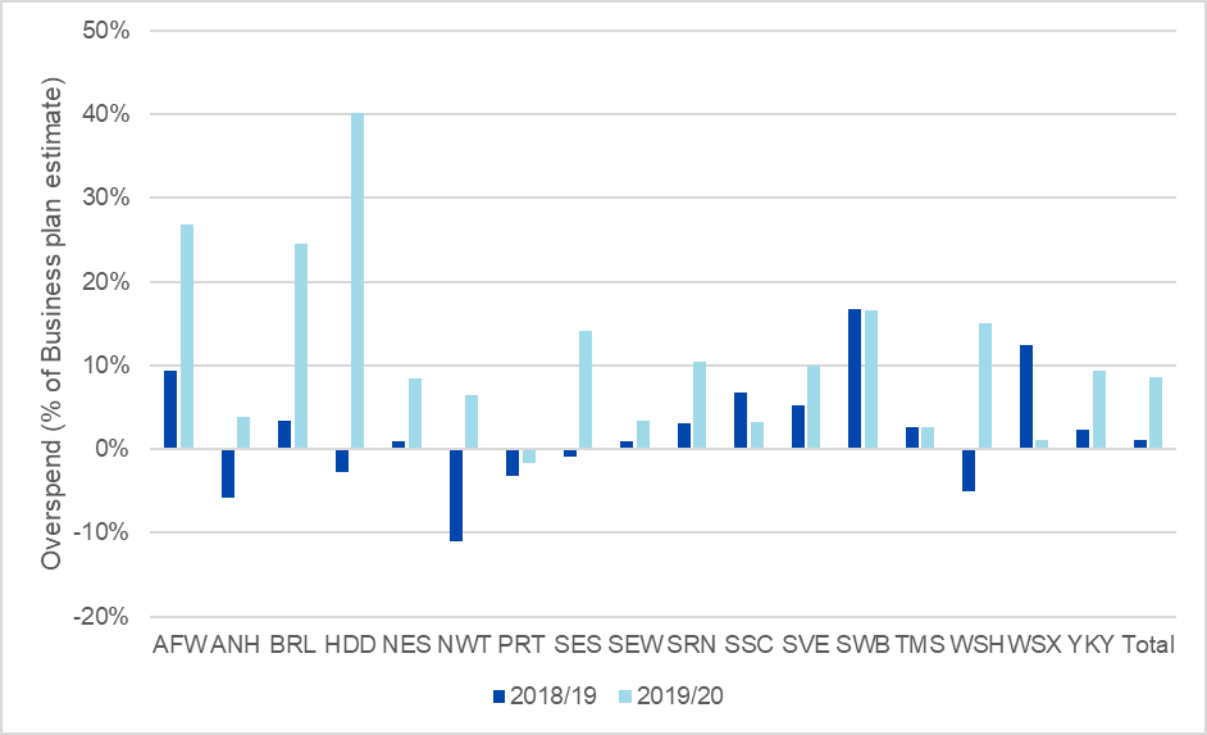
59. In response to our consultation on 2019/20 data for base cost models, the Disputing Companies argued that this comparison was of limited value, it was one-sided, and that outturn costs should instead be compared to allowances.[143] Ofwat disagreed and said the analysis provided some important insights into the extent to which 2019/20 data was influenced by the PR19 draft and final determinations.[144]

60. Consistent with what we said in the consultation on 2019/20 data for base cost models, we found that our analysis provided insights into the companies' expectations regarding 2019/20 spending. This was consistent with a statement by Northumbrian which said that business plan cost estimates represented 'a forecast and profile of expected costs'.[145]

61. Appendix C Figure 3 and Appendix C Figure 4 show the differences between outturn and business plans forecasts in 2018/19 and 2019/20 for wholesale water and wastewater respectively.

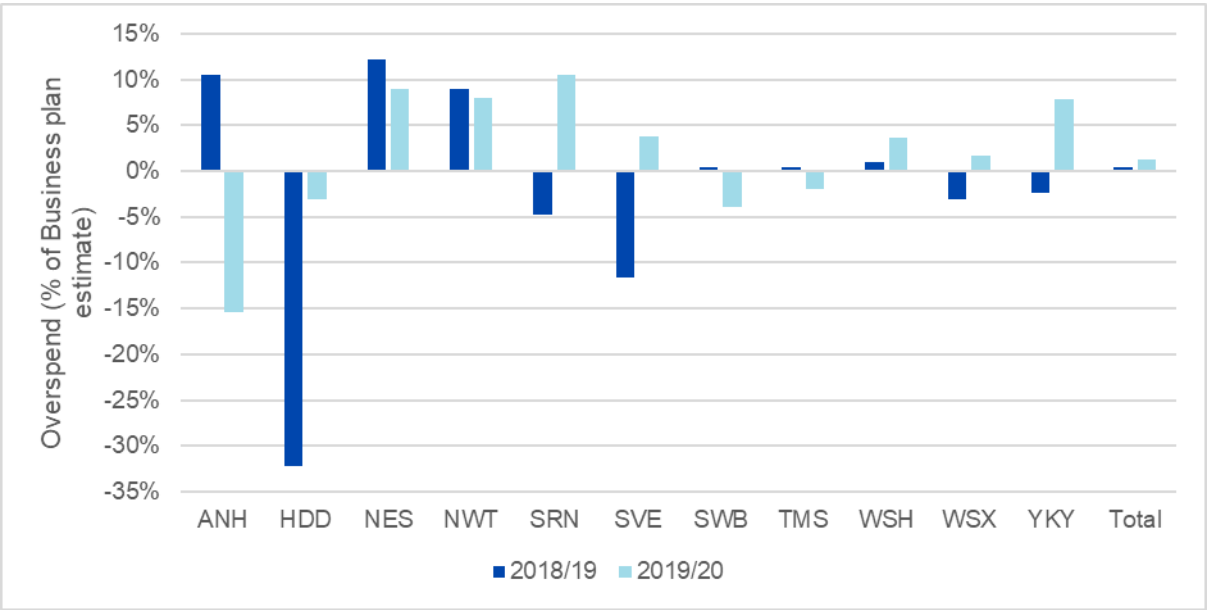
[143] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 26; Northumbrian's response to the 2019/20 data for base cost models working paper, section 1.6
[144] Ofwat's final submission, paragraph 2.59
[145] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 33

Figure 3: Overspend (as % of BP estimate) for wholesale water in 2018/19 and 2019/20 by company



Source: CMA analysis of Ofwat wholesale water base cost data
Note: For the purpose of this chart, we have assumed that post-merger Severn Trent Water (SVE) is a continuation of pre-merger Severn Trent Water, and Hafren Dyfrdwy (HDD) is a continuation of Dee Valley.

Figure 4: Overspend (as % of BP estimate) for wholesale wastewater in 2018/19 and 2019/20 by company



Source: CMA Analysis of Ofwat wholesale wastewater base cost data.
Note: For the purpose of this chart, we have assumed that post-merger Severn Trent Water (SVE) is a continuation of pre-merger Severn Trent Water, and Hafren Dyfrdwy (HDD) is a continuation of Dee Valley.

62. Appendix C Figure 3 and Appendix C Figure 4 show that in wholesale water expenditure was substantially more than expected in 2019/20. In wholesale wastewater, average expenditure was almost in line with forecasts.

63. The Disputing Companies said that this overspend was due to deferral of investment from the first years of the AMP to later years. For example, Anglian said that the industry spent a substantially lower proportion of its total expenditure in the first two years of AMP6 than it did in the first two years of any of the three previous AMPs.[146]

64. Appendix C Figure 3 and Appendix C Figure 4 use data from business plans which were submitted in April 2019. That means that companies would have already incorporated any deferral of investment made in the first years of the AMP into their forecasts. As Ofwat said, business plans 'should reflect any back loading of expenditure planned by companies.'[147] Therefore, if the higher spend in 2019/20 resulted only from deferral of investment from earlier in AMP6, we would expect to see outturn spending being in line with forecasts. The fact that outturn spending is higher than forecasts for wholesale water suggested that not all of the investment in wholesale water in 2019/20 was the result of deferral.

Summary

65. In our analysis of expenditure data, we reviewed historical aggregated expenditure and 2018/19 and 2019/20 outturn expenditure and forecasts. We found that 2019/20 showed the highest level of wholesale water base costs, and that the industry spent substantially more than it expected to. Combined, this suggests that the higher expenditure in 2019/20 was not all due to deferred investment.

Investment brought forward

66. A potential alternative explanation for the higher spend in 2019/20 is that investment had been brought forward from AMP7 to AMP6.

67. Ofwat said that this transferred investment would introduce upward bias in our estimates.[148] The additional spending would increase the dependent variable

[146] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 22. See also Bristol's response to the 2019/20 data for base cost models working paper, paragraph 25
[147] Ofwat's final submission, paragraph 2.58
[148] Ofwat's response to the provisional findings – cost and outcomes, paragraph 2.46; Ofwat's reply to responses to the provisional findings – costs and outcomes, paragraph A6.4

of our models, creating an increase in costs that was not explained by changes in the explanatory variables.

68. In this sub-section, we first assess the evidence on the presence of investment brought forward from AMP7 to 2019/20. We then seek to understand the magnitude of any investment brought forward.

Presence of investment brought forward

69. Ofwat submitted evidence on the presence of investment brought forward from AMP7 to 2019/20 based on companies' commentary to Ofwat's queries on 2019/20 outturn data.

70. Having reviewed this evidence, which is reported in paragraph 7, we find that companies have brought forward some investment in order to meet AMP7 targets. Northumbrian provided a comment supporting this finding when it said that there was clear evidence that some expenditure had been brought forward to meet AMP7 performance levels.[149]

71. Anglian said that the evidence was anecdotal.[150] We agree that the evidence is imprecise, but we consider the reported commentary in paragraph 7 to have some evidential value. We also note that these comments are from six companies, nearly half of the wholesale companies not involved in this appeal.

72. We considered whether there were differences between wholesale water and wholesale wastewater. Northumbrian said that it was uncontroversial that the 2019/20 wastewater costs were neither atypical nor distortive.[151] Ofwat said that investment was brought forward to increase performance in leakage. Both these statements suggest that any investment brought forward primarily related to wholesale water.

73. However, we found that from the companies' commentary it was not possible to distinguish whether the transferred investment was related to wholesale water or wastewater. For example:

(a) Dŵr Cymru mentioned the aim of reducing external sewer flooding;

(b) United Utilities mentioned water network infrastructure, leakage and sewer flooding performance, and IT system improvements; and

[149] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 4
[150] See for example, Anglian's response to the 2019/20 data for base cost models working paper, paragraph 12
[151] Northumbrian's submission following the second main party hearings, paragraph 6

(c) South West Water mentioned capital maintenance, leakage, sewer flooding and IT infrastructure.[152]

74. In its final submission, Ofwat supported the finding that it was not possible to distinguish whether the transferred investment was related to wholesale water or wastewater.[153]

Magnitude of investment brought forward

75. Having established that some investment was brought forward from AMP7 to 2019/20, in this sub-section we assess the evidence related to the magnitude of this brought forward investment. This assessment informed our view on how much potential upward bias the inclusion of 2019/20 data could introduce in our estimates.

76. As mentioned in paragraph 23, in response to our consultation on 2019/20 data for base cost models, Anglian highlighted the imprecise nature of the comments reported in paragraph 7. For example, Anglian said that:[154]

(a) only four companies, representing less than a third of the industry by revenue, quoted any figures, and the total sums quoted by these companies were only £168 million, which represented only 2.1% of total botex incurred by the industry in 2019/20.

(b) United Utilities' comment referred to investment aimed at improving performance both in AMP6 and AMP7.

(c) Severn Trent Water highlighted the difficulties of identifying what expenditure was brought forward specifically in relation to AMP7 targets.[155]

77. From the limited instances in which companies reported the amount of investment brought forward, we found the following.

(a) On the one hand, some of the spending identified was substantial for some of the companies. For example, Southern Water said it invested around £44 million in preparation for AMP7 targets. This represented 8% of its total wholesale base costs in 2019/20.

[152] See paragraph 7
[153] Ofwat's final submission, paragraphs 2.105–108
[154] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 11
[155] See paragraph 7

(b) On the other hand, the total investment explicitly quantified in paragraph 7 amounted to £168 million, which represented roughly 2% of the industry base costs in 2019/20.

78. Three of the Disputing Companies said that any investment brought forward could not have been large.

(a) Anglian said that around 40% of 'botex plus excluding growth, maintenance and renewals' could not be brought forward and represented in-period spending.[156]

(b) Oxera, on behalf of Yorkshire, said that only costs related to renewal, maintenance and growth could be brought forward.

(c) Northumbrian offered some evidence that suggested that, if investment was brought forward in wastewater, the magnitude was not substantial enough to increase the industry performance on internal flooding, sewer collapses and pollution.[157]

79. We placed little weight on Anglian's argument because even if 40% of botex excluding growth, maintenance and renewals could not be brought forward, this still left 60% that could be brought forward. Similarly, we found that the cost items identified by Oxera represented more than half of base costs.

80. Based on the evidence we have received, we found it difficult to estimate the precise amount of investment that had been brought forward. The companies' commentary identified an upper bound of £168 million. Part of this £168 million was likely to contain investment related to performance targets within AMP6 (hence not leading to any bias). Moreover, it was difficult for us to identify exactly what proportion of these investments were related to water or wastewater. Hence, it was not clear if the potential bias was concentrated only (or even predominately) in either wholesale water or wholesale wastewater.

81. Therefore, we considered that £168 million represented an upper bound of the estimate for the amount of investment brought forward from AMP7 to 2019/20. The identified upper bound represented roughly 2% of 2019/20 total wholesale base costs.

82. The Disputing Companies argued that, if we were concerned about bias due to the inclusion of 2019/20 data, we should also assess whether 2014/15, the last year of AMP5, was subject to the same issue.[158] However, the inclusion

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[156] Anglian's final submission: Annex 2, paragraph 34
[157] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 43
[158] See for example Bristol's response to the 2019/20 data for base cost models working paper, paragraph 2

of several years of data after 2014/15 would make the issue of bringing forward investment to 2014/15 less prone to lead to biased estimates. This was in line with Ofwat's submissions.[159]

Summary

83. Based on our assessment, we found that the evidence suggested that there might be a potential bias due to investment brought forward from AMP7 to 2019/20. However, we considered this potential bias to be relatively limited.

Downward bias

84. While the analysis in paragraphs 66–82 suggested that including 2019/20 data was likely to lead to some upward bias, it was also possible that excluding 2019/20 data may lead to downward bias in our estimates.

85. Three of the Disputing Companies said that excluding 2019/20 data would lead to downward bias in our estimated allowances.

(a) Northumbrian said 2019/20 expenditure reflected the substantial increase in expenditure in wholesale water and that not using this most recent data would result in a downward bias.[160]

(b) Oxera, on behalf of Yorkshire, provided an analysis of Yorkshire's estimated allowances and said that Yorkshire's estimated cost allowance without 2019/20 data remained downwardly biased as the benchmark period did not reflect a full AMP.

(c) Bristol said that omitting 2019/20 data would allow the existing gap between its cost assessment and Ofwat's models to persist.[161]

86. Ofwat disagreed and said that where companies received an allowance lower than their requested costs at Final Determination (or in the CMA Provisional Findings) it was because companies were inefficient relative to the industry benchmark, not because the allowances were biased.[162]

87. Some of the Disputing Companies provided evidence of expenditure being deferred both between and within AMPs. For example,

(a) Anglian said that £18 million of the expenditure it reported for 2019/20 was coded to schemes from the AMP7 programme. However, it also

[159] Ofwat's final submission, section 2.2
[160] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 5
[161] Bristol's response to the 2019/20 data for base cost models working paper, paragraph 12
[162] Ofwat's final submission, paragraph 2.80

found that £15 million of the expenditure it reported for the five years of AMP6 was coded to schemes from the AMP5 programme. Anglian said this showed expenditure brought forward from AMP7 was offset by the expenditure deferred from the previous period.[163]

(b) Anglian said it re-invested the outperformance it achieved in the first three years of AMP6.[164]

(c) Northumbrian said that Non-Infrastructure Maintenance (NIM) grew throughout AMP6 year-on-year suggesting that it may have been back-loaded or delivered late.[165]

(d) Oxera said that Yorkshire deferred around £37 million to AMP7.

88. Ofwat was not able to identify the deferred expenditure identified by Anglian and said it was not clear whether the expenditure identified by Anglian related to enhancement expenditure – which did not concern base cost models. In response to Northumbrian, Ofwat said that the late increase in NIM was due to Severn Trent Water which said it decided to re-invest efficiencies in leakage, energy and process automation in preparation of AMP7.[166]

89. This evidence suggested that it was possible for companies to defer and re-invest outperformance within and across AMPs. This suggested that the transfer of expenditure across years was not a unique feature of 2019/20. Anticipating or deferring expenditure may lead to different types of potential biases (upward or downward).

90. We found that excluding 2019/20 could lead our wholesale water models to underestimate the Disputing Companies' base cost allowances because base costs increased over AMP6. Indeed, according to our spending analysis, 2019/20 was a year with relatively high base costs.

91. Therefore, we conclude that excluding 2019/20 data was likely to introduce some potential downward bias in our wholesale water estimates. Given the increase in costs in 2019/20, this potential bias could be substantial, but we were unable to quantify it with any reasonable degree of accuracy.

92. This potential bias was likely to be less relevant for wholesale wastewater. Indeed, Appendix C Figure 2 shows that 2019/20 wholesale wastewater base costs were in line with the AMP6 industry average. Therefore, excluding

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[163] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 15
[164] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 16
[165] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 26
[166] Ofwat's final submission, paragraph 2.38

2019/20 was less likely to introduce potential downward bias in our wastewater models.

Decision on 2019/20 data

93. This Appendix presented our assessment of the evidence and arguments on the inclusion of 2019/20 cost data in our base cost models.

94. In considering how to account for 2019/20 data, we weighed the advantages and risks of including the new data.

95. We found that there were several important advantages from including 2019/20 cost data. These were:

    (a) increasing the number of observations in our models, which would possibly increase the precision of our estimates;

    (b) allowing our models to cover the entire AMP6;

    (c) softening the impact of the variation of lumpy cost items, such as capital maintenance;

    (d) accounting for the most recent information available; and

    (e) avoiding a source of potential downward bias.

96. We also considered there is a potential risk in including 2019/20 cost data: we may introduce a potential bias which could lead to overestimation of the companies' allowances. However, we found that the scale of any potential upward bias was too limited to justify excluding 2019/20 data from our models. Moreover, other sources of potential bias due to anticipated or deferred expenditure may work in the opposite direction and offset any potential upward bias.

97. In assessing whether to include 2019/20 data, we have weighed the advantages described in paragraph 95 against the risk of potential bias described in paragraph 96. In weighing them, we recognised that we could not quantify precisely the advantages and risks of including 2019/20 data. However, on balance, we found that the advantages of including 2019/20 data outweigh the potential risks. For this reason, we decide to include 2019/20 cost data.

98. We considered a variety of methods that could correct our models' estimates for any potential upward bias. Some of these methods were also assessed by the Main Parties.[167] We considered the following approaches.

- Imposing an ex-post adjustment to directly correct for the potential bias. While attractive from a theoretical perspective, this method would rely on the quantification of the potential bias effect from including 2019/20 data in our models. Neither we nor the Parties were able to quantify this potential bias with any reasonable degree of accuracy.

- Imposing an ex-ante company-specific adjustment to companies' 2019/20 costs to reflect the investment brought forward from AMP7. However, we could not identify a reliable methodology to quantify the amount of investment brought forward and consequently the adjustments we should apply to companies' costs in 2019/20.

- Limiting the base cost allowances to a maximum equal to the companies' business plans. Ofwat said that doing this would undermine the incentive for companies to seek efficiencies and submit stretching cost forecasts.[168]

- Adjusting the efficiency challenge and/or frontier shift. However, we did not think the evidence base for our decisions on either of these areas had changed with the inclusion of 2019/20 data.

- Using a dummy variable for the year 2019/20. As explained in paragraph 54, we were wary of using dummy variables to identify 'atypical' years. Moreover, a 2019/20-specific dummy variable would not be able to isolate the effect of the investment brought forward from other increases in expenditure.

- Triangulating models with and without 2019/20 data. However, this method did not directly correct for the potential bias and relied on an arbitrary choice of the weight given to different models.

- Including 2019/20 data and use business plans for cost items where there was evidence of potential bias. However, we found it was not possible to identify accurately such cost items.

- Including 2019/20 data and using business plans for cost items that could be brought forward (renewal, maintenance, growth enhancement). We did

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[167] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 53; Northumbrian's response to the 2019/20 data for base cost models working paper, paragraphs 48–50; Yorkshire's response to the 2019/20 data for base cost models working paper, paragraphs 1.17–1.18; Ofwat's final submission, paragraph 2.102

[168] Ofwat's final submission, paragraph 2.104

not rely on this method because it assumed that 100% of 2019/20 renewal, maintenance, and growth enhancement were affected by potential bias and that, as a result, business plans were more accurate than outturn data. We did not have sufficient evidence to convince us that this was the case.

- Replacing 2019/20 data with either 2018/19 data (in part or in its entirety), or the average expenditure of AMP6. We found these methods would arbitrarily modify the data without reflecting the operational reality of the industry.

99. Based on our assessment in paragraph 98, we were not satisfied by any of these methods. Northumbrian and Ofwat arrived at a similar conclusion. Therefore, we decide not to apply any correction to our base cost models.

100. We reflected our decision to include 2019/20 data in other decisions of this redetermination.

Consequences of including the data

101. As discussed in our consultation on 2019/20 data for base cost models,[169] the use of 2019/20 data implied four consequent methodological issues strictly related to the base cost models.

(a) How should we model the merger between Severn Trent Water and Dee Valley Water in our base cost regressions?

(b) How should we treat this merger when calculating efficiency scores for benchmarking?

(c) Should we adjust the catch-up efficiency challenge?

(d) Which years should we apply frontier shift to?

102. The question of how we should model the merger between Severn Trent Water and Dee Valley Water is considered in the next sub-section. The decision on efficiency scores is discussed in paragraphs 4.431 to 4.439. The decision on catch-up efficiency challenge is discussed in paragraphs 4.440 to 4.495. The decision on frontier shift is discussed in paragraphs 4.639 to 4.644.

[169] Working paper: 2019/20 data for base cost models, paragraph 67

How should we model the merger between Severn Trent Water and Dee Valley?

103. Severn Trent Water and Dee Valley Water merged and re-organised to become Severn Trent Water serving English customers, and Hafren Dyfrdwy, serving Welsh customers. Dee Valley Water was a water-only company, but after the merger, Hafren Dyfrdwy provided water and some wastewater activities. Pre-merger Severn Trent Water and post-merger Severn Trent Water both operated water and wastewater services.

104. This was a new issue that arose with the inclusion of 2019/20 data since, up to and including 2018/19, the data for Dee Valley Water and pre-merger Severn Trent Water was available. In 2019/20, data was only available for Hafren Dyfrdwy and post-merger Severn Trent Water.

105. There were several ways to model the merger. They differed mainly in their assumptions on whether the operational reality was best represented by assuming the post-merger companies were a continuation of the pre-merger companies or new companies.

106. In the remaining sub-sections, we summarise the submissions on these topics, present our assessment of the evidence, and then present our decision.

Main parties' arguments

107. Some of the Main Parties changed their views following our consultation on 2019/20 data for base cost models. Therefore, we present arguments before and after this consultation separately. The Main Parties also proposed different approaches for water and wastewater. Therefore, we deal with them separately.

Pre-consultation submissions

- *Water*

108. Ofwat said that Hafren Dyfrdwy was best treated as a new company in wholesale water, rather than a continuation of Dee Valley Water.

109. Ofwat said that in wholesale water post-merger Severn Trent Water should be treated as a new company, rather than a continuation of pre-merger Severn Trent Water. It said that post-merger Severn Trent Water's efficiency scores demonstrated that the company's efficiency was structurally different from pre-merger Severn Trent Water's efficiency. It said that across the five

wholesale water models, pre-merger Severn Trent Water's efficiency scores in 2018/19 ranged from 1.07 to 1.19, whereas post-merger Severn Trent Water's efficiency scores in 2019/20 ranged from 1.31 to 1.36. Therefore, it would be inappropriate to model post-merger Severn Trent Water as a continuation of pre-merger Severn Trent Water.

110. Oxera, on behalf of Yorkshire, also said that Hafren Dyfrdwy should be a new company, not a continuation of Dee Valley Water, because the re-organisation surrounding the Welsh border represented a substantial change for a small company. It gave the example that Dee Valley Water had 23% more connected properties than Hafren Dyfrdwy and this was a substantial change to Dee Valley Water.

111. Oxera said that post-merger Severn Trent Water should be a continuation of pre-merger Severn Trent Water. It said that the re-organisation around the Welsh border represented a small change to pre-merger Severn Trent Water's total operating environment. Oxera gave the example that there was only a 1% difference in connected properties between pre-merger and post-merger Severn Trent Water.

112. Anglian supported Oxera's views. It said that pre-merger Severn Trent Water and post-merger Severn Trent Water served a similar number of customers, similar areas and had similar cost drivers. The population change between pre-merger and post-merger Severn Trent Water was no greater than what was observed within pre-merger Severn Trent Water from one year to the next within the modelled period.

113. Northumbrian said there were arguments in favour of both treating post-merger Severn Trent Water as a continuation of pre-merger Severn Trent Water and treating it as a new company. On the one hand, post-merger Severn Trent Water was largely similar to pre-merger Severn Trent Water, so could be treated as a continuation. On the other hand, the geographical operating areas were different. Northumbrian said that the results on efficiency scores submitted by Ofwat showed that the companies might not be comparable.

- *Wastewater*

114. Ofwat's initial submission proposed to merge post-merger Severn Trent Water and Hafren Dyfrdwy to form one company and treat this company as a new observation in the wholesale wastewater base cost models.

115. Oxera, on behalf of Yorkshire, proposed aggregating the data from post-merger Severn Trent Water and Hafren Dyfrdwy to form a new company. It

proposed to treat this new company as a continuation of pre-merger Severn Trent Water. Oxera said this represented operational reality because the operating environment of the aggregated company had similar characteristics to pre-merger Severn Trent Water. It also said that Hafren Dyfrdwy represented a small proportion of the aggregated company's total service area. Therefore, any differences in the efficiency of the management team at Hafren Dyfrdwy compared to that of post-merger Severn Trent Water would have had only a minor impact on the aggregated company's efficiency.

116. Anglian and Northumbrian supported Oxera's approach. Anglian said that the customers, area, and operating circumstances were the same for pre- and post-merger Severn Trent Water. They said the only change was represented by 0.5% of pre-merger Severn Trent Water's customers being now served by Hafren Dyfrdwy.

117. Northumbrian said, first, that the operating area for pre-merger Severn Trent Water was identical to the 2019/20 combined operating areas for post-merger Severn Trent Water and Hafren Dyfrdwy. It said the two were essentially the same company, undertaking the same activities, within the same area. Second, Northumbrian said that there was no evidence of a substantial change in efficiency scores before or after the merger. It said that the average efficiency score for pre-merger Severn Trent Water in the first four years of AMP6 (0.87) was similar to the aggregated company score in 2019/20 (0.91).

Post-consultation submissions

118. In our consultation on 2019/20 data for base cost models we proposed the following approach.[170]

(a) In wholesale water, to exclude Hafren Dyfrdwy from the cost regressions, and include post-merger Severn Trent Water as a separate entity for 2019/20.

(b) In wholesale wastewater, to aggregate post-merger Severn Trent Water and Hafren Dyfrdwy to form an aggregated company, which was treated as a continuation of pre-merger Severn Trent Water.

119. The Main Parties' responses to our working paper on 2019/20 data for base cost models for consultation are summarised in paragraphs 120–123.

[170] See Working paper: 2019/20 data for base cost models, paragraph 67, for further detail.

- *Water*

120. Ofwat, said that post-merger Severn Trent Water should be treated separately to pre-merger Severn Trent Water, especially given the differences in efficiency levels. However, it disagreed with our proposal to exclude Hafren Dyfrdwy. It said that its exclusion was not justified since other small companies were also present in our sample.[171]

121. Oxera said that Hafren Dyfrdwy should not be excluded since this would result in an unnecessary loss of information. Furthermore, Hafren Dyfrdwy's size was not too dissimilar to and not disproportionately smaller than the smaller water-only companies (for example, Portsmouth Water). It said that the correct approach for the cost regressions was to treat Hafren Dyfrdwy as a new company but treat post-merger Severn Trent Water as a continuation of pre-merger Severn Trent Water, as the two were broadly similar.[172, 173]

122. Northumbrian said that it did not have any substantial concerns with our suggested approach and said there were a number of different and credible ways to address the merger.[174]

123. Bristol said that Hafren Dyfrdwy should not be excluded. It said there was no compelling evidence its inclusion would be distortionary, and that the model coefficients remained statistically significant. It said Hafren Dyfrdwy was not an outlier in terms of its size, since it was similar to Portsmouth Water and larger than Dee Valley Water and Bournemouth Water, which were included in past cost modelling.[175]

- *Wastewater*

124. Ofwat said that, on balance, it would be appropriate to treat the aggregation of post-merger Severn Trent Water and Hafren Dyfrdwy as a continuation of pre-merger Severn Trent Water for the purpose of cost regressions.[176]

125. Oxera, on behalf of Yorkshire, said it welcomed our approach to modelling the merger in wastewater.

126. Anglian said it supported our proposal for wastewater.[177]

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[171] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 3.5
[172] Ofwat's response to the 2019/20 data for base cost models working paper, section 3.2
[173] See also Anglian's response to the 2019/20 data for base cost models working paper, paragraph 50
[174] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 47
[175] Bristol's response to the 2019/20 data for base cost models working paper, paragraphs 38–41
[176] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 3.6
[177] Anglian's response to the 2019/20 data for base cost models working paper, paragraph 50

127. Northumbrian said it had no substantial concerns with our suggested approach in wastewater.[178]

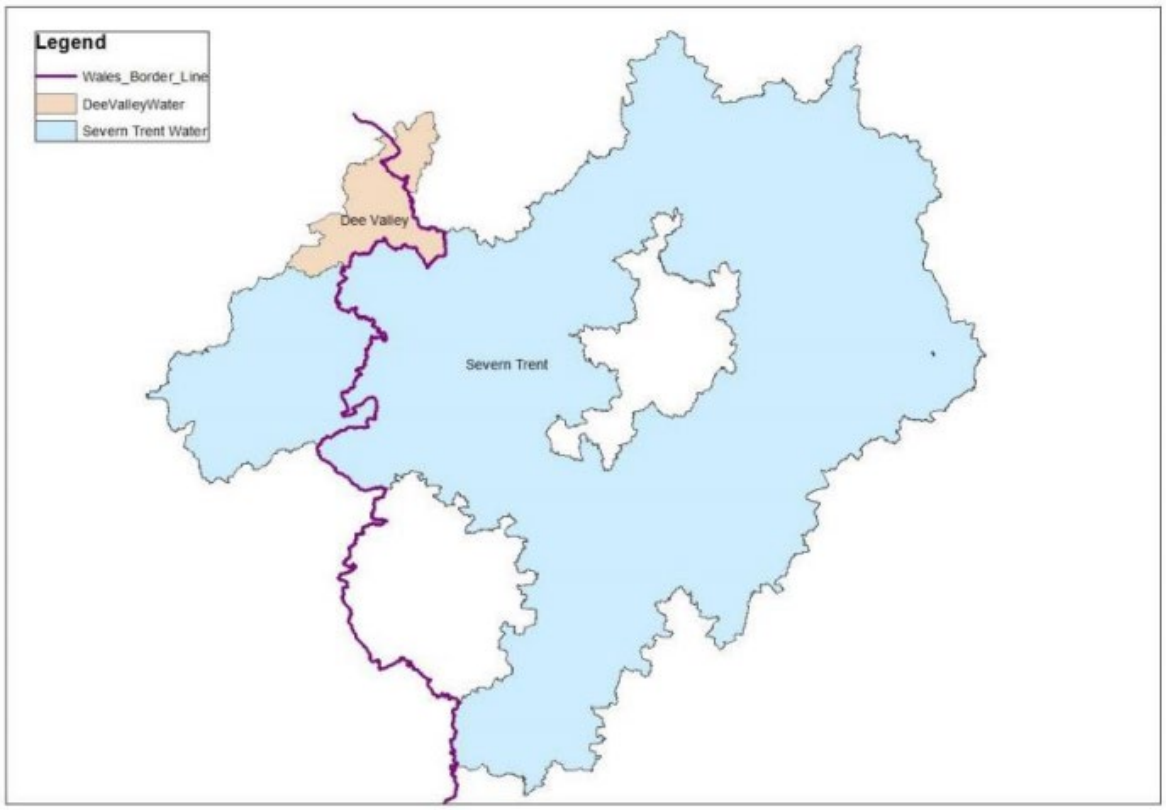
CMA assessment

128. In paragraphs 129 to 137, we summarise our assessment for water and wastewater.

Water

129. The following map provided by Anglian was helpful in assessing the merger and subsequent de-merger.

Figure 5: Service areas of Dee Valley (pink) and pre-merger Severn Trent Water (blue), with the English/Welsh border marked in purple



Source: Hafren Dyfrdwy (2019), Water Resource Management Plan 2019, accessed on 16/02/2021 at https://www.hdcymru.co.uk/content/dam/hdcymru/about-us/wrmp/2019-final/Appendix-A-Supply-fWRMP.pdf

130. Hafren Dyfrdwy, which served the Dee Valley Water and Severn Trent Water customers to the left of the purple line in the map in Appendix C Figure 5, is made up of all of pre-merger Severn Trent Water's Welsh customers (blue section left of the border), and Dee Valley Water's Welsh customers (pink

[178] Northumbrian's response to the 2019/20 data for base cost models working paper, paragraph 47

section left of the border). There was agreement between the Main Parties on how to treat Hafren Dyfrdwy in the cost regressions, which was to include it as a new company. This is justified by the fact that the changes brought by the merger were substantial.

131. Ofwat and the Disputing Companies said that Hafren Dyfrdwy should not be excluded from the modelling, as this would result in an unnecessary loss of data, and there was no compelling evidence that Hafren Dyfrdwy was an outlier due to its small size.

132. In light of the evidence summarised in paragraphs 108 to 113, 120 to 123, and 129 to 131, we decide to model Hafren Dyfrdwy as a new, independent observation in the cost regressions.

133. There was disagreement between Ofwat and Oxera on how to model Severn Trent Water following the merger. Ofwat proposed to treat post-merger Severn Trent Water as a new company, independent of pre-merger Severn Trent Water. The evidence in Appendix C Table 1 on the efficiencies scores of pre-merger Severn Trent Water (SVT) and post-merger Severn Trent Water (SVE) supported this view.

Table 1: Efficiency scores for pre-merger Severn Trent Water (SVT) (2011/12-2018/19) and post-merger Severn Trent Water (SVE) (2019/20) in the five wholesale water models

Company	*Year*	*Model*				
		WRP1	*WRP2*	*TWD1*	*WW1*	*WW2*
SVT	2011/12	0.97	0.98	0.93	0.98	1.01
SVT	2012/13	1.01	1.02	0.99	1.03	1.07
SVT	2013/14	1.01	1.03	0.95	1.00	1.04
SVT	2014/15	1.15	1.17	0.99	1.08	1.12
SVT	2015/16	1.14	1.17	0.89	1.01	1.05
SVT	2016/17	1.24	1.29	0.88	1.03	1.08
SVT	2017/18	1.09	1.13	1.02	1.06	1.1
SVT	2018/19	1.09	1.12	1.22	1.18	1.22
SVE	2019/20	1.35	1.4	1.34	1.33	1.38

Source: CMA analysis.
Note: These figures are consistent with the CMA final model including 2019/20 data and all other modelling changes.

134. Appendix C Table 1 shows a substantial increase in post-merger Severn Trent Water's (SVE's) inefficiency across the five wholesale water models compared with pre-merger Severn Trent Water (SVT). We investigated the underlying causes of these efficiency changes and found that the changes were driven by outturn costs, rather than modelled costs. This suggested that the underlying characteristics could differ substantially, and hence modelling post-merger Severn Trent Water as a new company, as we did for Hafren Dyfrdwy, could better represent operational reality.

135. In contrast, Oxera, on behalf of Yorkshire, Anglian, and Northumbrian argued that post-merger Severn Trent Water should be treated as a continuation of pre-merger Severn Trent Water. Due to Severn Trent Water being a large company, the border re-organisation represented a proportionally smaller change to its operating environment (1% change in connected properties for Severn Trent Water compared to a 23% change in connected properties for Dee Valley Water/Hafren Dyfrdwy).

136. We considered the evidence presented by Ofwat on efficiency scores to be more compelling than the data on number of connected properties. Hence, we decide to treat post-merger Severn Trent Water as a new, independent observation in our cost regressions.

Wastewater

137. Since Ofwat changed its view in response to our consultation on 2019/20 data for base cost models from treating the aggregation of post-merger Severn Trent Water and Hafren Dyfrdwy as a new observation to treating it as a continuation of pre-merger Severn Trent Water, there was agreement among the Main Parties on how to model the merger in wastewater.[179] Since Dee Valley Water was a water-only company, Hafren Dyfrdwy's wastewater presence is very small, and differences in wastewater efficiency scores between pre-merger Severn Trent Water and the post-merger aggregated compare are not substantial. Hence, we decide to treat post-merger Severn Trent Water and Hafren Dyfrdwy as a continuation.

Summary of decision

138. Having assessed the Parties' arguments, our decision is the following:

(a) In wholesale water, to include Hafren Dyfrdwy as a separate entity for 2019/20, and to include post-merger Severn Trent Water as a separate entity for 2019/20.

(b) In wholesale wastewater, to aggregate post-merger Severn Trent Water and Hafren Dyfrdwy to form a merged entity for 2019/20, which is treated as a continuation of pre-merger Severn Trent Water.

[179] Ofwat's response to the 2019/20 data for base cost models working paper, paragraph 3.6

Final model results with 2019/20 data and other changes included

139. We present the coefficients from the five wholesale water models and eight wholesale wastewater models in Table 2 and Table 3, with all our model changes (see paragraphs 4.2–4.404) and 2019/20 data included.

Table 2: Final coefficients from the five random effects models in wholesale water

Variable	*Model*				
	WRP1	*WRP2*	*TWD*	*WW1*	*WW2*
Dependent variable (log)	Water resources + distribution + Water treatment	Raw water	Treated water distribution	Wholesale water total	
Number of connected properties in logs	1.033***	1.030***		1.036***	1.024***
Percentage of water treated in water treatment works with complexity levels 3 to 6	0.008***			0.006***	
Weighted average population density in logs	-1.451***	-0.958**	-3.338***	-2.371***	-1.939***
Squared term of weighted average population density in logs	0.091***	0.055*	0.266***	0.168***	0.137***
Water treatment complexity index in logs		0.444***			0.533***
Length of mains			1.055***		
Number of booster pumping stations per length of mains in logs			0.570***	0.316***	0.324***
Constant	-5.307***	-6.979***	6.782***	-0.331	-1.948*
Observations	158	158	158	158	158
R-squared	0.929	0.916	0.962	0.973	0.975

Source: CMA analysis.
Note: * indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 3: Final coefficients from the eight random effects models in wholesale wastewater

Variable	*Model*			
	SWC1	*SWC2*	*SWT1*	*SWT2*
Dependent variable (log)	Sewage collection		Sewage treatment	
Total sewer length in logs	0.839***	0.830***		
Pumping capacity/km of sewer in logs	0.291*	0.501**		
Number of properties per km of sewer length in logs	0.976***			
Weighted average population density in logs		-2.683**		
Weighted average population density in logs (squared)		0.194**		
Load entering the STWs in logs			0.779***	0.781***
Percentage of load treated in STWs bands 1-3			0.042**	
Percentage of load with ammonia below 3mg/l			0.004***	0.004***
Percentage of load treated in STWs band 6				-0.012**
Constant	-8.030***	4.845	-5.211***	-4.118***
Observations	90	90	90	90
R-squared	0.934	0.913	0.873	0.864

Source: CMA analysis.
Note: * indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Table 3 (continued): Final coefficients from the eight random effects models in wholesale wastewater

Variable	*Model*			
	BR1	*BR2*	*BRP1*	*BRP2*
Dependent variable (log)	Bioresources		Bioresources + Sewage treatment	
Weighted average population density in logs	-0.348**			
Load entering the STWs in logs			0.768***	0.782***
Percentage of load treated in STWs bands 1-3	0.054**		0.034	
Percentage of load with ammonia below 3mg/l			0.004***	0.004***
Percentage of load treated in STWs band 6				-0.012**
Sludge produced in logs	1.294***	1.313***		
Number of STWs per property in logs		0.447*		
Constant	-0.081	1.182**	-4.766***	-3.912***
Observations	90	90	90	90
R-squared	0.818	0.788	0.912	0.918

Source: CMA analysis.
Note: * indicates significance at the 10% level; ** indicates significance at the 5% level; *** indicates significance at the 1% level.

Appendix D: Gearing Outperformance Sharing Mechanism and the Modigliani and Miller theorem

Introduction

1. In paragraph 9.1214, we note that we do not consider Ofwat's Gearing Outperformance Sharing Mechanism (GOSM) to be consistent with the theoretical underpinnings of the cost of capital calculations used by Ofwat, the CMA and broadly by regulators and financial professionals. In this short appendix, we elaborate on our assessment.

2. Ofwat, the CMA and other UK regulators calculate the cost of equity and set the overall WACC on the basis of a model that we would describe as 'Modigliani-Miller compliant'. By this we mean that regulators use models and calculations that work on the basis that the cost of capital (outside of frictions such as tax[180]) is invariant to gearing.

Theoretical background

3. In their seminal 1958 paper,[181] Franco Modigliani and Merton Miller lay out two key propositions:

   Proposition 1: That the market value of any firm is independent of its capital structure and is given by capitalising its expected return at the rate appropriate to its class; and

   Proposition 2: The expected yield of a share of stock is equal to the appropriate capitalisation rate for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity rates times the spread between the capitalisation rate and debt interest rates.

4. Proposition 1 tells us that the WACC of a firm remains constant at all levels of gearing. As described by Brealey, Myers and Allen in Principles of Corporate Finance, 'Firm value is determined on the left-hand side of the balance sheet by real assets—not by the proportions of debt and equity securities issued to buy the assets'.[182]

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[180] In competitive markets, tax would usually be considered as a factor which would lead to WACC generally falling with gearing. This is because debt interest costs are tax deductible (while costs of equity at not). However, tax is modelled and accounted for separate in water sector price controls, meaning that companies do not benefit from this debt 'tax shield'. As such, we can largely ignore the impact of tax.
[181] Modigliani, F. and Miller M (1958), 'The Cost of Capital, Corporation Finance and Theory of Investment', *The American Economics Review*, Vol. 48, No.3, pp261-297
[182] Brealey, *Myers and Allen (2011), Principles of Corporate Finance*, 10th Edition, p421

5. Proposition 2 tells us that the 'cost' of equity rises as the debt/equity ratio (or gearing) rises. In other words, the more a stream of cashflow is directed to debt payments (which are fixed and come before equity payments) the greater the risk that variation in that cashflow might lead shareholder returns to be lower than expected. As a result, the expected return to and risk borne by shareholders increases with gearing. We can see this relationship in the example in Table 1:

Table 1: Illustrative example of impact of gearing on percentage equity return under different scenarios

Total Company Capital = £1000	*Scenario 1: £100 of cashflow*	*Scenario 2: £80 of cashflow*	*Impact of £20 change in cashflow*
Structure 1: 50% gearing			
Cashflow used to pay £500 of debt at 5% interest	25	25	0
Cashflow available to the £500 of equity	75	55	-20
50% (£500) Equity Return %	15%	11%	-4%
Structure 2: 75% gearing			
Cashflow used to pay £750 of debt at 5% interest	37.5	37.5	0
Cashflow available to the £250 of equity	62.5	42.5	-20
25% (£250) Equity Return %	25%	17%	-8%

Source: CMA

6. We can see that the cashflow used to pay the debt costs does not vary with the cashflow performance of the company. By contrast, while the percentage returns to equity rise as gearing increases, as post-debt cashflows are received by a smaller pool of equity, we can also see that the rate of income is more vulnerable to changes in the underlying environment. In Scenario 2, where income drops £20, returns to equity take a bigger 'hit' in the structure with higher gearing. This dynamic is described by Berk & DeMarzo when they say, 'leverage increases the risk of equity even when there is no risk that the firm will default'.[183]

7. As a result of this relationship, while debt is generally cheaper than equity[184], increasing the proportion of this cheap debt does not decrease the overall WACC as the equity that remains costs increasingly more. This relationship of adding 'cheap' debt weight being offset increasingly by 'expensive' remaining equity ensures that WACC is invariant to gearing.

[183] Berk and DeMarzo (2014), *Corporate Finance*, 3rd Edition, p482

[184] Debt is generally considered to be cheaper than equity as debt holders have a superior claim over the cashflows and assets of a business. Debt costs have to be paid before any profits or dividends can be earned by shareholders, while if a company becomes insolvent, the debt holders have claim over any remaining assets ahead of shareholders. Only if debtholders are made whole will shareholders receive any compensation.

Practical application

8. The impact of these propositions can be seen in several of the models and formulae used in our cost of capital calculations. For example, in the standard CAPM formula:

   $K_e = RFR + \beta(TMR - RFR)$

   Where K_e is the cost of equity, β is beta, the relative exposure to systematic (undiversifiable) risk and TMR is the total return of the market.

   As gearing increases, each equity unit's exposure to systematic risk[185] increases, increasing the beta.

9. Regulators explicitly use this relationship in order to measure the cost of capital using market inputs at various levels of gearing. For example, both Ofwat and the CMA assess the raw (observed) beta at Severn Trent and United Utilities (the listed water companies). We then 'de-gear' this figure to achieve an estimate of the beta of these firms assuming that they have no gearing and then 're-gear' this estimate to match the gearing of the notional company. This approach explicitly acknowledges that the beta, and so the cost of equity, will always rise with gearing.

10. An extension of this process is the increasingly prevalent application of a debt beta, a concept that was introduced in order to ensure that any inaccuracies in the de-gearing and re-gearing process did not lead to a situation where WACC rises as a result of re-gearing betas from lower-geared observations. As noted by Europe Economics, the debt beta estimate is in some ways irrelevant – it is the 'correct' relevered equity beta that regulators are trying to achieve, ensuring that WACC does not strictly rise with gearing.

Relevance to the GOSM

11. Ofwat stated that 'according to Modigliani-Miller, investors demand higher returns as gearing increases to compensate for the increased risk of the company facing financial distress or ultimately failing'.[186] We do not consider this to be a correct interpretation of the Modigliani-Miller propositions.

12. To be clear, our approach and our assessment of the GOSM does not require that the Modigliani-Miller propositions are a perfect representation of all the

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[185] Systematic, or undiversifiable risks, are discussed more in our analysis of beta in paragraphs 9.398-9.532. For our purposes, they can be thought of as a broad and common risks faced by all companies – such as the general performance of the economy. Equity beta reflects both a firm's underlying 'unlevered' relative exposure to these risks and how equity's exposure to these risks are magnified through the use of leverage.
[186] Ofwat's response to provisional findings, risk and return, paragraph 7.31

real-life impacts on the cost of capital. There may well be 'real life' influences on an optimal level of gearing based on factors such as relative costs of debt and the benefits of particular financing structures, which can change the balance of risk between equity and debt investors independently of changes in the level of gearing.

13. Rather, our approach reflects that:

(a) The Modigliani-Miller propositions are used throughout the cost of capital calculations; and

(b) That the gearing's impact on the cost of equity is to increase to reflect a differing exposure of equity investors to systematic risks at each 'notch' of gearing.

14. As a result, we consider it to be inconsistent to base the bulk of the calculation of the allowed return on equity on the standard assumption that the cost of equity strictly increases with gearing (as Ofwat, the CMA, regulators and market participants do), and then to put in place a mechanism to recover 'outperformance' from equity investors at higher levels of gearing which is calculated on the basis that the same assumption does not hold. This is effectively the impact that Ofwat's GOSM would have.

Glossary

Affinity Water	Affinity Water Limited, a WOC
AFW	Industry acronym for Affinity Water Ltd
AICR	The Adjusted Interest Cover Ratio (AICR) is sometimes referred to by the Main Parties as the Adjusted Cash Interest Cover Ratio (ACICR). We refer to it as AICR.
ALC	Active Leakage Control activities are ongoing leak detection and repair techniques traditionally used in the water sector
AMP6	The period between 2015 and 2020, during which PR14 applies
AMP7	The period between 2020 and 2025, during which PR19 applies
Anglian	Anglian Water Services Ltd, a WASC
ANH	Industry acronym for Anglian Water Services Ltd
APH	Average pumping head
APR	Annual performance report
AWGL	Anglian Water Group Ltd, the ultimate holding company of Anglian Water Services Ltd
base costs	Routine costs that companies incur to provide a base level of service
Bespoke PCs	Company-specific PCs
botex	Botex is a measure of base expenditure equal to opex plus base capex (ie excluding capex for enhancement)
Bristol	Bristol Water plc, a WOC
BRL	Industry acronym for Bristol Water
Bristol 2010 Determination	The CC's determination in Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991 Report, of 4 August 2010

Bristol PR14 Determination	The CMA's determination in Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991 Report, of 6 October 2015
BVP	Best value plan
capex	Capital expenditures, commonly known as Capex, are funds used by a company to acquire, upgrade, and maintain physical assets such as property, buildings, an industrial plant, technology or equipment.
CAPM	The Capital Asset Pricing Model describes the relationship between systematic risk and expected return for assets, particularly stocks.
caps and collars	Limits on outperformance and underperformance for an ODI, respectively
CC	The Competition Commission
CCG	Water company customer challenge groups
CCWater	The Consumer Council for Water
CED	Consumption expenditure deflator
CEPA	Cambridge Economic Policy Associates
CMA	The Competition and Markets Authority
C-MeX	Customer measure of experience
COLI	Cost of living index
Common PCs	The PCs applying to all WASCs and the PCs applying to all WOCs
CPI	Consumer Price Index
CPIH	Consumer Prices Index Including Owner Occupiers' Housing Costs
CRI	Compliance Risk Index, a measure designed to illustrate the risk arising from drinking water compliance failures
CRT	Canal & River Trust

deadband	A range of values below a PC and/or above a PC where companies will not incur a penalty for underperformance or a reward for outperformance
Disputed Determination	Ofwat's PR19 FD in respect of the four Disputing Companies
Disputing Companies	Anglian, Bristol, Northumbrian and Yorkshire collectively
DAF	dissolved air flotation
Dee Valley Water	Dee Valley Water Plc, a WOC
Defra	Department for Environment, Food & Rural Affairs
DDM	dividend discount model
D-MeX	Developer services measure of experience
DMS	Dimson, Marsh and Staunton dataset
DSRA	Developer services revenue adjustment
DTI report	Department of Trade and Industry and HM Treasury (2004), *The drivers and public policy consequences of increased gearing*
DWI	The Drinking Water Inspectorate, which provides independent assurance on the quality of drinking water.
Dŵr Cymru	Dŵr Cymru Cyfyngedig (Welsh Water), a WASC
EBSD	Economic balancing of supply and demand modelling
EE	Europe Economics
ENA	The Energy Networks Association
Enhanced ODIs	Payments for performance that shifts the frontier of outcomes
enhancement costs	Costs required to enhance the capacity or quality of the service beyond the base level
ENWL	Electricity North West Limited - test
ERP	Equity risk premium

Financing Duty	The duty to secure that companies are able to finance the proper carrying out of their functions
FFO/net debt	Funds from Operations to net debt, a ratio used by Standard & Poor's
frontier shift	The reduction of cost allowances on an annual basis to account for the expected productivity improvements in the sector
FTFT	Flow to full treatment
G&S canal	Gloucester and Sharpness canal
GHT	Gregory, Harris and Tharyan
GOSM	Gearing Outperformance Sharing Mechanism
Hafren Dyfrdwy	Hafren Dyfrdwy Cyfyngedig, a WASC
HDD	Industry acronym for Hafren Dyfrdwy Cyfyngedig
IAP	Ofwat's initial assessment of the water companies' business plans during a periodic review, known as the Initial Assessment of Plans
IDOK	Interim Determination of K
IED	The Industrial Emissions Directive
ILGs	RPI index-linked UK government bonds, known as Index-Linked Gilts
JKM Estimator	the Jacquier, Kane and Marcus estimator, a holding period-weighted average of geometric and arithmetic averages
KTS	Kielder Transfer Scheme - a regional water grid constructed in the late 1970s which transfers water across Tyneside, Wearside, and Teeside
Main Parties	Ofwat and the four Disputing Companies collectively
MARs	Market-to-asset ratio(s)
MHCLG	Ministry of Housing, Communities and Local Government
MPE	Materials, plant and equipment

NATS/CAA Final Report	The NATS (En Route) plc /CAA regulatory appeal, which reported in July 2020
NATS	National Air Traffic Services - NATS Holdings Limited (formerly National Air Traffic Services)
NERL	NATS (En Route) plc
NES	Industry acronym for Northumbrian Water Limited
NPV	Net present value
NIUR	Northern Ireland Utility Regulator
Northumbrian	Northumbrian Water Limited, a WASC
Notified Item	An item that Ofwat notifies a water company has not been allowed for (either in full or in part) when setting price controls. Notified Items can be considered in an interim determination, along with Relevant Changes of Circumstance. Relevant Changes of Circumstance are described in companies' Licence Condition B.
OBR	Office for Budget Responsibility
OECD	Organisation for Economic Co-operation and Development
Ofwat	Ofwat is the Water Services Regulation Authority, the economic regulator of water and sewerage companies in England and Wales.
Ofwat's FD	Ofwat's PR19 final determination
Ofwat's Response	Ofwat's response of May 2020 to the Disputing Companies' Statements of Case
Ofwat's Further Submission	Ofwat's submission of June 2020 to the CMA
ODI	Outcome Delivery Incentives are the financial or reputational (non-financial) incentives for companies to outperform and avoid underperformance against each of their performance commitments

OLS	Ordinary Least Squares
ONS	The Office for National Statistics
opex	Operational Expenditure. Operating expenses are the costs a company incurs for running their day-to-day operations
P-removal	Phosphorus removal
PAYG	Pay As You Go is the proportion of total allowed expenditure that is recovered in each year of the price review period
P10	P10 is the level at which there is only an estimated 10% chance that the outcome performance level would be worse.
P90	P90 is the level at which there is only an estimated 10% chance that the outcome performance level would be higher.
PC	Performance Commitments are the level of performance that companies commit to deliver for customers and the means to hold companies to account for their service delivery. Each performance commitment has an associated outcome delivery incentive (ODI) Ofwat sets common core performance commitments for all companies. Individual companies may also have bespoke performance commitments.
PE	Population equivalent
periodic reviews (or price reviews)	Ofwat is required to carry out 5-yearly periodic reviews (sometimes referred to by the Main Parties as price reviews) designed to limit the revenue allowed to the relevant company and as a result the charges levied by it.
Portsmouth Water	Portsmouth Water Ltd, a WOC
PPE	Personal Protective Equipment
Priority Services Register	The means by which water companies identify customers who may need special assistance
Provisional Findings	The CMAs provisional determinations in relation to the Anglian, Bristol, Northumbrian and Yorkshire water price controls for 2020-2025, published on 29 September 2020.

PR14	Ofwat's periodic price review for 2014, covering the price control period from 2015-2020 and corresponding to AMP6
PR19	Ofwat's periodic price review for 2019, covering the price control period from 2020-2025 and corresponding to AMP7
PRT	Industry acronym for Portsmouth Water Ltd
RCV	Regulatory Capital Value is a component used by Ofwat to calculate price limits. It represents a measure of the capital base of a company and reflects the allowed expenditure to be recovered from future customers. Expenditure not recovered in the current period through PAYG is added to RCV and recovered in future periods through RCV run-off. The RCV is inflated each year to maintain the RCV at current prices.
RCV run-off	RCV run-off is a measure of the annual depreciation of the RCV to reflect the long term nature of the benefit to customers of the previous investment a company has made in its assets
the references	Ofwat's referral of the Disputed Determinations to the CMA
RFR	The Risk Free Rate is the theoretical rate of return on an investment with zero risk. It is the benchmark to measure other investments that include an element of risk. Government bond yields are the most commonly used risk free rates for assets
ROCE	Return on capital employed
RoRE	Return on regulated equity
RPE	Real price effects
RPI	Retail Price Index
SELL	Sustainable economic level of leakage
SEMD	The Security and Emergency Measures (Water and Sewerage Undertakers) Direction 1998 directs undertakers to maintain plans to provide a supply of water at all times.

SES	Sutton & East Surrey Water plc (trading as SES Water), a WOC
SEW	Industry acronym for South East Water Ltd
Severn Trent Water	Severn Trent Water Ltd (England), a WASC
SFA	stochastic frontier analysis
SML	securities market lines
SoC	Statement of Case
South East Water	South East Water Ltd, a WOC
Southern Water	Southern Water Services Ltd, a WASC
South Staffs Water	South Staffordshire Water plc, a WOC
South West Water	South West Water Ltd, a WASC
SPS	A strategic policy statement, setting out strategic priorities and objectives which Ofwat must act in accordance with when it is carrying out its functions
SRN	Industry acronym for Southern Water Ltd
SSC	Industry acronym for South Staffordshire Water plc
STW	Sewage treatment works
SVE	Industry acronym for Severn Trent Water Ltd
SWB	Industry acronym for South West Water Ltd
TFP	Total factor productivity
Thames Water	Thames Water Utilities Ltd, a WASC
TMR	Total market return
TMS	Industry acronym for Thames Water Utilities Ltd
totex	Total expenditure, covering both opex and capex
UKRN	UK Regulators Network

United Utilities	United Utilities Water Ltd, a WASC
UUW	Industry acronym for United Utilities Water Ltd
UWWTD	Urban Waste Water Treatment Directive
Vanilla WACC	Vanilla weighted average cost of capital The weighted average cost of capital using a pre-tax cost of debt and a post-tax cost of equity.
WACC	Weighted average cost of capital
WASC	Water and sewerage company
Wessex Water	Wessex Water Services Ltd, a WASC
WFD	Water Framework Directive
WIA91	The Water Industry Act 1991
WINEP	Water industry national environment plan
WOC	Water only company
WRc	The firm of engineering consultants assisting the CMA on technical engineering matters in this determination
WRFIM	Wholesale Revenue Forecasting Incentive Mechanism
WRMP	Water resources management plan
WRZ	Water Resource Zone
WSH	Industry acronym for Dŵr Cymru Cyfyngegid (Welsh Water)
WSX	Industry acronym for Wessex Water Services Ltd
WTW	Water treatment works
YKY	Industry acronym for Yorkshire Water Services Ltd
Yorkshire	Yorkshire Water Services Ltd, a WASC