Response to Defra's request for further information in support of our draft WRMP statement of response

In February 2019 Defra wrote to us asking for further information in support of our Water Resources Management Plan. The Environment Agency also asked some further supplementary questions about our plan. Our response to these information requests is below.

Environmental Reporting

What Defra said:

The company has not provided a revised Strategic Environmental Assessment, Water Framework Directive Assessment or Habitats Regulation Assessment with its statement of response. Therefore there are a number of issues which Natural England and the Environment Agency raised in representations that cannot be reviewed whether they have been addressed.

These issues include:

- Water Framework Directive assessment of preferred options such as the Ladyflatte borehole
- Impact of construction of pipelines on various SSSIs as a result of scheme Ref: WTW05
- Justification for selection of options
- Detail around the monitoring plan
- Combined impact of the options relying on Carsington and Derwent Water
- Information around the risks of water transfers
- No assessment of the in-combination impacts

Furthermore, the company has made a number of relatively significant changes since its preferred plan. Without these environmental assessments the Environment Agency is unable to determine whether the impact of these schemes are acceptable or whether the company has addressed the environmental concerns in our representation and that of others, including Natural England.

The company should provide these assessments prior to it finalising its plan so we can review the implications of the company's assessments and determine whether the environment is sufficiently protected.

Our Response

When we published our draft WRMP in 2018, we also published the accompanying Strategic Environmental Assessment (SEA), Water Framework Directive (WFD) Assessment and Habitats Regulation Assessment (HRA) reports. As we have now updated our WRMP to reflect stakeholders' feedback, we have also updated the SEA, HRA and WFD reports to reflect the changes described in the Statement of Response and to provide additional environmental evidence in response to queries raised by the Environment Agency. We had always intended to publish these updated assessments alongside the final WRMP once we received permission from the Secretary of State.

In response to Defra's request for further information, we have now provided the EA with early sight of the updated SEA, WFD and HRA documents in order that they can better assist Defra with advising to the Secretary of State on whether we are able to publish our final WRMP.

The final SEA, WFD and HRA documents will be published on our website alongside the final WRMP once we receive approval from the Secretary of State.

Transfer from Canal & River Trust

What Defra said:

The Canal & River Trust's representation objected to a preferred scheme in Severn Trent Water's draft plan which diverted effluent from the canal.

As a result of this representation the company has modified the option. The revised option involves transferring water from the Birmingham supply network. This is water that the Canal & River Trust has also offered to Thames Water and is in Thames Water's revised draft plan which the company has recently consulted on. Therefore this water appears to have been double-counted in the two plans.

The resources to support this scheme are in areas we have assessed as 'no water available' and therefore there is a risk around availability of water at low flows. The operation of this scheme is likely to increase abstraction above recent actual quantities. There is no evidence that this risk of deterioration has been assessed. In addition, the company does not appear to have considered the impact of new authorisations, which might also affect water availability. This scheme is due to be online in 2027 with work commencing in 2022. The transfer from the Canal & River Trust provides 15 Ml/d towards the option total of 35 Ml/d.

Severn Trent Water should work with the Canal & River Trust and Thames Water to ensure that this water is available and that the abstraction does not adversely affect the environment. It should update its plan if necessary.

Our Response

During consultation on the draft WRMP the Canal & River Trust (C&RT) had raised concerns over our proposed new supply – side option WIL05, which involved the expansion of an existing water treatment works and new transfer main supported by raw water augmentation of the River Trent. We had initially proposed supporting this abstraction by diverting Barnhurst sewage treatment works final effluent into the River Penk (a tributary of the River Trent) rather than the Staffordshire and Shropshire Union canal. However C&RT raised specific concerns regarding the impact on the River Penk, Staffordshire and Shropshire canal and Aqualate Mere SSSI.

We have therefore redesigned the option so that it no longer relies on diverting Barnhurst final effluent from the canal. Instead we have explored several alternative means of supporting the River Trent abstraction and raw water supply to the expanded WTW.

In our Statement of Response we explained that the potential alternatives included:

- Procurement of existing third party abstraction licences.
- Supporting the River Trent abstraction from an alternative source.
- Making greater use of the Derwent Valley system and Carsington reservoir to support abstraction.
- Provision of raw water resource from third party suppliers

As we redesigned the scheme to remove the reliance on Barnhurst, we continued dialogue with C&RT and they offered up an alternative option using their 15Ml/d surplus, delivered to Fradley from the Birmingham Canal Navigations, supported by their Bradley and Chasewater sources. As the donor, C&RT are responsible for undertaking any WFD appraisal and quantification of deterioration risks. Section 4.4 of the EA's Water Resources Management Guidelines states "*Bulk transfers – if you are a supplier, it is your responsibility to take account of the impact of the abstraction on the water body objectives, including deterioration risk, when considering new or changed bulk transfers*." If this means of support were to be taken forward as part of our preferred WRMP solution, then we would extend our SEA, HRA and WFD appraisal to take it into account. However, this C&RT bulk supply does not form part of our preferred means of supporting the additional River Trent abstraction.

Instead, our preferred means of supporting this scheme is to use existing abstraction rights on the River Trent. We completed negotiations with another third party on 29th March 2019 to purchase their River Trent abstraction rights. When transferred this licence will provide all the raw water necessary for this scheme, ensuring there is no increase to the overall licensed abstractions from the River Trent.

Therefore, we do not envisage utilising the C&RT transfer of surplus water to Fradley, and as such there is no conflict with the use of this water source in Thames' WRMP. We understand that Thames Water have identified a use for this surplus C&RT water in their dWRMP.

Diddlebury Option

What Defra said:

The Diddlebury option is dependent on abstractions which are currently exempt from licensing. It is due to be online by 2030. It cannot be assumed that we will be able to issue a licence for the quantity the company has assumed and therefore there is a risk to this option.

The company must assess the sustainability and environmental impact of these sources under new authorisations. In its final plan it should set out any implications that this assessment might have for this option and overall deployable output.

Our Response

Diddlebury is an existing source of supply that has historically been exempt from abstraction licensing legislation. The WRMP option will secure this source for the long term, and invest in new offsite distribution that will allow an increase in peak output from the site. We have not simply assumed that this abstraction quantity will be available, and we have assessed this scheme in the same way as other WRMP options, taking account of the associated environmental and abstraction licensing risks using our scheme option screening and SEA approach.

This supply scheme is to upgrade off site distribution assets to allow an additional flow from Diddlebury into the local distribution service reservoir, in order to meet peak demands within our Ludlow control group. This will enable the outputs from Diddlebury and Munslow groundwater sources to be used more effectively. The solution will allow us to increase the output from the sources during AMP8 by removing the existing distribution constraints.

Diddlebury currently has rising Nitrate levels and needs to be blended with the raw water from Munslow. The blending of water from these two sources is an integral part of the existing and proposed treatment process. It has been assumed that the Diddlebury and Munslow boreholes will continue to operate as currently, and have the additional flexibility to increase output to meet peak demand as necessary. No investment is planned to increase the capacity or number of boreholes at this groundwater site or to increase its yield.

In parallel to developing the WRMP option for future use of Diddlebury, we are also in the process of applying for "new authorisations" for these currently exempt groundwater sources and we are working to the EA's national deadline of licensing all exempt sources by 1 Jan 2020. We are following the EA's guidance on the transitional arrangements for licensing previously exempt sources within the statutory timetable, and so our current licence application is for the 'recent actual' quantities recorded within the qualifying seven year period only.

The WRMP scheme will remove the existing distribution constraints, and means that we would need to increase or vary the licensed abstraction quantities at a future date as part of the WRMP scheme delivery. We will be proactively investigating the abstractions in AMP7 under our WFD No Deterioration programme, and these investigations will provide supporting evidence to accompany any future licence variation. Through these ongoing investigations we will work with the Environment Agency to determine their long term sustainable abstraction rates. This is no different to any other WRMP scheme that requires new or varied abstraction licences, and we take the licensing risk into account when we carry out our screening of unconstrained / feasible options.

We believe there is a low risk of WFD status deterioration as the scheme only involves removal of network constraints with no need for new abstractions or discharges to WFD water bodies. In addition, the groundwater body the boreholes abstract from (Teme - Secondary Combined) has a classification of "Good" for the quantitative status element and the overlying surface water bodies have a hydrological regime that is classed as High. This means that surface water flows support "Good Ecological Status".

In our preferred programme the supply scheme is due to start outline design in 2025 with delivery by 2030. The outcomes from the WFD No Deterioration investigations and any constraints from the new authorisations will be factored into the design. If applicable, we will implement mitigation measures and if we are unable to secure the necessary deployable output from this scheme we will investigate alternative options in WRMP24.

Overall, we believe that by following the EA's guidance for transitional licensing of currently exempt sources, combined with the outputs from our proactive AMP7 WFD investigation programme, this scheme presents a low risk to the environment.

Peak Demands

What Defra said:

The demand of Severn Trent Water's customers this summer was significantly above its forecast dry year demand. The company has undertaken some work to consider peak demands, however we recommend the company undertakes further work to assess its vulnerability to peak demands, taking into account the experience of this year.

The event also indicated potential concerns with maintaining its assets to ensure the resilience of its supply system. Maintaining its assets is important to ensure that the company reduces the risk of high outage which could affect resilience.

The company should provide a programme of work that it will undertake as a result of its experience of the summer in its final plan and provide updates of this work in its annual reviews.

Our Response

Our initial analysis of 2018/19 demand shows that summer demand was comparable with those previous extreme hot weather and high water demand events, such as 2003 and 2016, that have informed our plan. Early analysis shows that the annual average demand was at a level comparative to the dry year uplift assumptions used in our WRMP. We are therefore confident that our dry year planning assumptions are consistent with the 2018 experience. With regard to summer peaks, we are currently participating in a cross industry collaborative study to understand better the customer use and behavioural aspects of the demand peaks seen in the 2018 summer period, and the issues and questions it poses for future planning and demand management. The outputs of this study are expected in May 2019, and they will inform our future planning.

Our WRMP sits alongside our wider PR19 business plan, in which we describe our plans to protect and enhance water supply resilience for our customers. Our PR19 plan sets out how our approach considers 'resilience in the round' in order to provide holistic, risk based plans for ensuring resilient water supplies. Through the PR19 process, Ofwat has recently asked us to provide more information to further improve our approach to resilience planning. Ofwat has asked us for a commitment that we will, by 22 August 2019, prepare and provide an action plan to develop and implement a systems based approach to resilience and ensure that we can demonstrate an integrated resilience framework.

We have agreed to make this commitment, and we are currently updating our resilience planning and asset management approach to better demonstrate our systems based thinking. We will be incorporating the learning from the 2018 freeze / thaw and hot weather experiences and what these mean for our approach to asset maintenance and resilience planning. We will also include the plans we are putting in place to improve our measurement and management of unplanned outages, as per our new AMP7 performance commitment. This is work in progress and while it is not yet complete, we have committed to submitting this updated resilience plan to Ofwat by 22 August 2019, and we will now also share this with Defra and EA. This will include details of our new asset management framework, and our latest plans to maintain asset health through AMP7. In response to Defra's request for further information, we will now also report on progress through our annual WRMP report.

We have also committed to updating our Drought Plan to incorporate the learning from 2018. We will be reviewing our drought triggers and drought management options in the Drought Plan, and we intend to publish the updated plan for consultation in autumn 2019.

WRMP Direction Compliance (STWL)

What Defra said:

Severn Trent Water must demonstrate compliance with Directions 3 (b), (e) and (h) in its final plan.

3 (b) for the first 25 years of the planning period, its estimate of the average annual risk, expressed as a percentage, that it may need to impose prohibitions or restrictions on its customers in relation to the use of water under each of the following— (i) section 76; (ii) section 74(2)(b) of the Water Resources Act 1991(b); and (iii) section 75 of the Water Resources Act 1991, and how it expects the annual risk that it may need to impose prohibitions or restrictions on its customers under each of those provisions to change

over the course of the planning period as a result of the measures which it has identified in accordance with section 37A(3)(b);

The company sets out the planned annual risk for temporary use bans and non-essential use bans, however it does not set out the annual risk that it may need to impose restrictions due to emergency drought orders. Instead it states that 'we consider the use of emergency drought orders unacceptable and therefore we do not provide an annual average risk value for this type of drought restriction'. The company must provide the planned annual risk of emergency drought orders, in percent, to meet Direction 3(b).

Our Response

In our draft WRMP we stated the planned annual risk for temporary use bans and non-essential use bans as a single figure across the planning period. As part of our Statement of Response (SoR) we split this information out across the planning period to show the annual risk during each AMP. For both the draft WRMP and the SoR we did not state a risk of emergency drought orders as we do not feel these are acceptable to include in our 'business as usual' planning, and therefore they would only be used as part of our Emergency Plan.

However to fully comply with direction 3(b) we have calculated the likelihood of this level of restriction. The following updated commentary and table will be included in the final WRMP.

Our level of service may be represented as risk over time in the coming AMP periods as demonstrated in the table below.

Annual Average Risk of Drought Restrictions for each AMP from 2020 to 2045

Drought Restriction	Our levels of services	2020-25	2025-30	2030-35	2035-40	2040-45
Temporary Water Use Ban	3 in 100 years (3% annual risk)	3%	3%	3%	3%	3%
Ordinary Drought Orders (Non-Essential Use Restrictions)	3 in 100 years (3% annual risk)	3%	3%	3%	3%	3%
Emergency Drought Orders	We consider these unacceptable	<0.2%	<0.2%	<0.2%	<0.2%	<0.2%

Our drought resilience analysis demonstrates that we are able to meet DEFRA's reference level of service (a 1 in 200-year drought) without the use of emergency drought orders. As described previously, we consider planning on the basis of relying on the use of emergency drought orders as unacceptable. However, for reporting purposes we have supplied the likelihood of requiring these in the table above.

This has been calculated using the data included in Table 10 -Drought plan links, of our final WRMP. These tables show that where we have drought vulnerability, even if there is a drop in deployable output under a 1 in 300 (0.33%) or 1 in 500 (0.2%) year drought scenario this would be offset by the use of drought actions (such as Drought Permits and emergency sources) that we would put into place before an emergency drought order would be used. Under a 1 in 1000 (0.1%) year the drop in deployable output is too large to be managed using these drought actions. Therefore, our likelihood of requiring an emergency drought order is between 0.2% and 0.1%.

Further information on our drought resilience work can be found in Section A9. We have also ensured alignment of these figures with our current Drought Plan 2014 and our draft Drought Plan 2018.

With regards to how the percentage risk for emergency drought orders in the above table matches with our Ofwat common performance commitment (PC) for severe drought resilience; there is specific guidance on how to calculate the OFWAT PC which asks for the average risk over 25yrs. Our understanding of this guidance is that base risk (ie the % risk in our base plan before we add in solutions to any deficit) for the 25yrs stays the same until the year that an solution is confirmed to be put in place. Therefore the first few years of our business plan show us with a high 25yr average risk of population being effected; until we take the actions outlined in our plan. Though in reality the risk in each single year is very low as per our table above as long as we take the actions outlined in our plan by the time we get to that year.

What Defra said:

3 (e) the assumptions it has made as part of the supply and demand forecasts contained in the water resources management plan in respect of— (i) the implications of climate change, including in relation to the impact on supply and demand of each measure which it has identified in accordance with section 37A(3)(b);

The company has assessed the impact of climate change on supply side schemes, however it has not provided the impact of climate change on its preferred demand management schemes. The statement of response refers to impact of climate change on its demand forecast rather than on its selected demand management options. The company must clearly state the impact of climate change on each preferred (final plan) demand option individually, including the assumptions made in the assessment, to meet Direction 3(e).

Our response:

In our draft WRMP we did not explicitly consider the climate change uncertainty associated with our demand management measures. Instead, we focussed on the more significant climate change uncertainty associated with our supply side options. To fully comply with direction 3(e) we have extended our analysis to our demand management measures.

Our WRMP uses demand forecasts that reflect our assumptions around 'dry-year' demand for water, and so they reflect the impacts of hot, dry weather conditions on customers' water consumption. We also make a further allowance for the likely climate change impacts on household water consumption using the data and guidance given in *UKWIR 13/CL/04/12 Impact of Climate Change on water demand*. In the UKWIR study, median percentage climate change impacts on household demand at 2040, relative to 2012 are published for each river basin within the UK - the Severn and South Humber basins are used for Severn Trent. For our WRMP, the annual average forecasts use the average of the factors for these basins, therefore have a 0.905% increase in consumption over that period. As the base year for our modelling is now 2015/16 and the final forecast year is 2044/45 the percentage change is shifted along as there has been no further evidence since this report.

As per the UKWIR technical guideline, the additional demand caused by climate change has been added to the external use micro-component only, which means that the overall effect is relatively small. Table 6 of the WRMP data submission (Customer side management) shows the volumetric demand management benefit of our metering strategy and includes a climate change impact equivalent to 0.9% by 2045. The annual percentage impact profile is as per line '27- Percentage of consumption driven by climate change' in Table 3.BL.

Consistent with the conclusions of the UKWIR study, because the impacts of our water efficiency activities on our demand forecasts already reflect the impacts of hot, dry weather any additional effects of climate change are small and only apply to external use of water. Therefore, in our WRMP we assume that climate change have no impact on our internal household water efficiency measures

Period	2020-25	2025-30	2030-35	2035-40	2040-45
Climate change impact on demand management options	zero	zero	zero	zero	zero

What Defra said:

3 (h) its assessment of the cost-effectiveness of domestic metering as a mechanism for reducing demand for water by comparison with other measures which it might take to meet its obligations under Part III of the Act;

The company has not provided a clear assessment of the cost-effectiveness of each metering type. The company must provide an assessment of the cost-effectiveness of the following types of metering to meet Direction 3(h): Selective, Change of occupancy and Optant.

An assessment of cost-effectiveness should include an estimate of the costs for the above types of metering together with the associated reductions in demand, to enable comparison between options.

Our response:

Our draft WRMP and SoR included a written description of our preferred metering plan, but did not explicitly lay out the costs and benefits of the different options. In our assessment of metering options, all types of metering were considered: selective (proactive metering), change of occupier, compulsory and optant. To fully comply with directive 3(h), we have now expanded Appendix D of the WRMP to provide greater detail of the assumptions, cost estimates, benefits and constraints for each option.

We know that our historic approach to metering will not achieve our ambition to reach 100% coverage, proactively help customers reduce demand for water or support our leakage reduction targets. We have explored the costs and benefit of a range of different metering growth strategies that could accelerate the required pace of meter coverage.

The table below is taken from the latest version of WRMP Appendix D, and demonstrates the costs and benefits of the different options considered.

Option	Comments	Potential option	Number of meters in plan	Cost per installation*	Demand benefit
Optant	Customer demand led programme	YES	AMP7 138K AMP8 82K AMP9 16K	£205	10%
Change of occupier	Installation on change of occupier	YES	zero	£276	10%
Selective (proactive metering)	Area by area approach, non-chargeable install	YES	AMP7 359k AMP8 686k AMP9 428k	£205	10%
Compulsory	Area by area compulsory meter installation and charging	No (not classified as water stressed)	zero	£205**	10%

*Note that these unit costs will not be included in the public version of the WRMP due to commercial confidentiality

**costs as per proactive (Selective) metering model

Former Dee Valleys Water Area

Leakage

What Defra said:

Severn Trent Water is committed to achieving 15% across all its areas. The company should consider the government aspirations regarding leakage with regards to its new area.

Response:

The draft WRMP for former Dee Valley Water proposed an ambitious leakage reduction target that went well beyond that set at WRMP14. For the final Hafrren Dyfyrdwy and Severn Trent WRMPs, we have adopted leakage reduction targets that are even more challenging.

Whilst there is no supply / demand driver to reduce leakage in the former Dee Valley Water area, we want to do so in recognition of the views expressed by our customers and stakeholders. Throughout the draft WRMP and PR19 consultation processes, we have heard that leakage is a key concern and that we should do more to reduce it. At the same time, Ofwat and other key stakeholders have given a clear message to the water industry that they expect to see ambitious and innovative leakage reduction programmes in PR19.

Therefore, our Business Plan and final WMRP now include a performance commitment to reduce Severn Trent's leakage in AMP7 by 15%, and by 50% by 2045. Our plan includes AMP7 and longer term leakage reductions in the Chester zone to contribute towards this overall company target. Our leakage performance commitment is stretching and significantly beyond the sustainable economic level of leakage. Our commitment will drive leakage down in all of the former Dee Valley Water water resources zones, even though they are expected to remain in supply / demand balance surplus throughout the current water resources planning horizon.

Sustainability reductions in the Chester Zone

What Defra said:

The company should consider the impact of sustainability reductions across the whole planning period. Currently the Chester zone includes a sustainability reduction for one AMP cycle only. The water company needs to consider in its plan when these licence changes may take effect. The company needs to provide more robust evidence (such as supply diagrams) to show that any reduction in supply from Plemstall can be balanced by supply from other parts of the Water Resource Zone. The company needs to present a supply-demand balance scenario for Chester Water Resource Zone over the course of the water resource management plan including both this likely licence change and the impact of climate

Response:

The impact of climate change for the Chester WRZ was discussed in Appendix A of the draft WRMP and included in the relevant data table. We therefore do not believe that any further work is required on this aspect.

As stated in section A2.1.2 of our draft WRMP, we don't yet know what a voluntary licence reduction would look like. WINEP3, issued in March 2018, set out a driver (ref. 7DV201824) for investigating impacts of groundwater abstraction in the Wirral and West Cheshire Permo-Triassic Sandstone Aquifers and its surface waterbodies, against our groundwater abstraction near Chester. This investigation is due to be delivered by March 2022 and any future licence reductions will be dependent on the outcome of this investigation.

Since the SoR we have taken the opportunity to do scenario modelling of the potential impact of a licence reduction to our ground water source in the Chester zone, using the same assumptions that we have used in our WRMP for all other Severn Trent abstractions being investigated during Amp 7. That is that we have assumed a reduction of 50% of the difference between the current deployable output and recent actual abstraction of the source. Deployable Output for the source is 2.2Ml/d and recent actual abstraction has been 1.32Ml/d, we have therefore modelled the source with reduced annual average constraint of 1.76Ml/d. The resulting modelled deployable output reduction for the zone was 0.4Ml/d

For the final WRMP we have now included this assumed reduction in our planning tables for Chester from 2025, and we can confirm that this assumed reduction does not cause the supply demand balance to go into deficit. The final deployable output reductions won't be known until we have completed out investigation.

Per capita consumption in the Chester zone

What Defra said:

The company's average per capita consumption in the Chester zone is high (144 l/h/d in 2020 reducing to 129 l/h/d by 2045) relative to other areas of the Severn Trent Water operating area (131 l/h/d reducing to 121 l/h/d by 2044/45).

We assume that the company will implement its metering programme in the Chester zone, and therefore we would expect this to have some impact on its demand. The plan should set out what impact the metering programme will have on its new company areas.

Response:

The former Dee Valley Water draft WRMP assumed that we would continue with our past metering policy of providing free optional water meters in the Chester zone at a pace set by our customers' demand for these devices. However, in response to feedback on our draft WRMP we have revised our long term metering strategy for Chester to align with the wider Severn Trent region. We will now adopt a proactive approach to household metering for the new Severn Trent region, and we aim to achieve full meter coverage by the end of AMP9. Although we haven't undertaken a separate consultation for metering of customers in the Chester zone, the sampling of customers for the initial consultation is representative of the entire Severn Trent region, and applicable to customers in Chester. WRMP24 will provide an opportunity to re-consult customers.

Our strategy is to deliver this metering programme in an affordable way over three AMP periods, prioritising those parts of our region facing the greatest water resources pressures. Given our favourable supply / demand balance position, our current plan is for proactive metering to commence in Chester in early AMP 9.

We see metering as key to delivering the long term demand reductions and lower per capita consumption (PCC) ambition set out in the UK Government's 25 Year Environment Plan, as well as the ambition of our stakeholders and customers to use water wisely. When assessing the benefits of a persuaded optant strategy (implementing metering through engagement and collaboration with householders), we have taken a precautionary approach to the demand management impact and we have assumed that there will be an average 10% demand reduction. Our current thinking is that to secure the full demand saving benefits of metering would require us to adopt an external metering policy and combine this with a policy of helping customers tackle supply pipe leakage at their properties.

Based on this metering approach and consumption reduction assumption, we have updated our final WRMP for the Chester zone to project dry year annual average PCC of 144 l/h/d in 2020, reducing to 118 l/h/d by 2045, and normal year annual average PCC of 134 l/h/d in 2020 reducing to 110 l/h/d.

Present a 1 in 200 year reference level of service for Chester

What Defra said:

The water resources planning guideline asks that companies wholly or mainly in England present a reference level of service which shows the resilience of the company to a drought that it might expect with an annual probability of 1 in 200 years. There is no such assessment for the Chester zone as at draft plan stage it was part of Dee Valley

Water as it was not wholly or mainly in England. The company should provide an assessment of the Chester zone to 1 in 200 year reference event.

Response

At the draft plan stage the Chester water resource zone was part of Dee Valley Water and therefore was not part of a WRMP that was wholly or mainly in England. Thus, in the draft WRMP and SoR we did not present our deployable output or level of service under a 1 in 200 year drought scenario for the Chester zone. .

For our final WRMP, Chester has now been incorporated into the wider Severn Trent plan, and we have carried out the modelling necessary to understand the level of service for the Chester zone during a 1 in 200 year drought scenario.

The only sources in the Chester water resource zone are the River Dee and the Mickle Trafford borehole. The borehole is resilient to drought and the River Dee abstraction is protected from Dee General Direction (DGD) cut-backs by augmentation from the Pen Y Cae Lower reservoir in the Wrexham WRZ. Stochastic modelling of the NRW River Dee model has showed that flow levels in the River Dee have high resilience to droughts and abstractions from River the Dee are not affected by severe and extreme droughts. This indicates that Chester water resource zone deployable output and levels of service during severe and extreme droughts will only be determined by the resilience and capability of Pen Y Cae Lower reservoir to augment the River Dee as per the DGD rules.

To assess this, testing was undertaken by running the stochastic data that has been prepared for deployable output modelling (i.e. 8,700 years) through the Wrexham water resources model, with the Wrexham zonal demand set at a level above forecast demand plus target headroom for that zone.

In our modelled scenarios, augmentation from Pen Y Cae Lower reservoir was fully maintained throughout all plausible severe and extreme droughts in the stochastic data. Therefore, the Chester water resource zone was found to be resilient to plausible severe and extreme droughts, and the deployable output at all return periods is consistent with the historic, asset capacity / licence-based deployable output of 29.3 Ml/d. Therefore we can conclude that the 1 in 200 year deployable output for Chester is 29.3Ml/d and the Level of Service remains consistent with the baseline level of service.

A raw water transfer has been agreed between Hafren Dyfrdwy and Severn Trent to enable the augmentation from the Lower Pen-y-Cae Reservoir. Hafren Dyfrdwy are anticipating that there may be potential impacts on the stream bed of Trefechan Brook if they use it to augment the River Dee with water from their Lower Pen-y-Cae Reservoir. To try and further understand this, they are going to test and monitor the discharge from Lower Pen-y-Cae Reservoir and the corresponding inflow into the River Dee. We will continue to work with Haffren Dyfrdwy, Natural Resources Wales and the Environment Agency to plan and coordinate these trials.

For the final WRMP, table 10 - *Drought plan links* has now been updated to show this result.

WRMP Direction compliance 3b and 3c

What Defra said:

3 (b) for the first 25 years of the planning period, its estimate of the average annual risk, expressed as a percentage, that it may need to impose prohibitions or restrictions on its customers in relation to the use of water under each of the following— (i) section 76; (ii) section 74(2)(b) of the Water Resources Act 1991(b); and (iii) section 75 of the Water Resources Act 1991, and how it expects the annual risk that it may need to impose prohibitions or restrictions on its customers under each of those provisions to change over the course of the planning period as a result of the measures which it has identified in accordance with section 37A(3)(b);

The company sets out the planned annual risk for temporary use bans and non-essential use bans, however it does not set out the annual risk that it may need to impose restrictions due to emergency drought orders. The company must provide the planned annual risk of emergency drought orders, in percent, to meet Direction 3(b).

Our Response

For both the draft WRMP and the SoR we did not quantify a risk of emergency drought orders as we do not feel these are acceptable to include in our 'business as usual' planning, and therefore they would only be used as part of our Emergency Plan.

However, to fully comply with direction 3(b) we have calculated the likelihood of this level of restriction and Or drought resilience analysis demonstrates that we are able to meet DEFRA's reference level of service (a 1 in 200-year drought) without the use of emergency drought orders. The following table will be included in the fWRMP:

Chester WRZ Annual Average Risk of Drought Restrictions for each AMP from 2020 to 2045

Drought Restriction	DGD Stage	Our levels of services	2020-25	2025-30	2030-35	2035-40	2040-45
Temporary Water Use Ban	Stage 2 /3	1 in 40 (2.5% annual risk)	2.5%	2.5%	2.5%	2.5%	2.5%
Ordinary Drought Orders (Non-Essential Use Bans)	Stage 3	We do not plan for NEUB	0.47%	0.47%	0.47%	0.47%	0.47%
Emergency Drought Orders	NA	We consider these unacceptable	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%

What Defra said:

3 (c) the assumptions it has made to determine the estimates of risks under sub-paragraph (b), including but not limited to drought severity;
It is unclear how the company has calculated and assessed its planned risk of restrictions. The company must set out the assumptions and methodology used to estimate the planned annual risk of (i) temporary water use restrictions; (ii) ordinary drought orders; and (iii) emergency drought orders, set out under Direction 3(b). The company must include assumptions about drought severity and reference the percentage risk of restrictions to meet Direction 3(c).

Our Response

The only sources in the Chester water resource zone are the River Dee and the Mickle Trafford borehole, with the River Dee supplying 92.5% of the total zonal supply. Thus, decisions to impose ordinary demand management restrictions (TUB & NEUB) in the event of droughts in our Chester zone are made based on availability of water in the Dee Storage System as stated in the Dee General Direction. We have carried out drought resilience modelling of the River Dee catchment using stochastically generated weather datasets. Modelling results have been analysed to determine return periods using the number of times the different Dee Storage System's triggers would have been crossed and/or demand restrictions would have been implemented over the whole number stochastic years (17400 years). These return periods have been used to inform estimation of annual risk of TUB and NEUB restrictions.

Stochastic modelling of the River Dee catchment has also showed that flow levels in the River Dee have high resilience to droughts and abstractions from River Dee are not affected by severe (1 in 200 year return period) and extreme (1 in 1000 year return period) droughts. Moreover, as described above augmentation from Pen Y Cae Lower reservoir was fully maintained throughout all plausible severe and extreme droughts in the 8700 years of stochastic dataset (for DO modelling we have only used half of the whole 17400 stochastic years). The modelling results have showed that Chester water resource zone abstractions from the River Dee will not be affected even if the Dee storage system drops into emergency storage due to flows from other upstream catchments. Thus, we are unlikely to implement emergency drought orders while 92.5% of the total Chester zonal supply is not affected even if the Dee storage system drops into emergency storage and hence we do not plan to use an emergency drought order and consider it unacceptable in Chester zone.

WRMP Direction Compliance (Dee Valley)

What Defra said:

3 (d) the emissions of greenhouse gases which are likely to arise as a result of each measure which it has identified in accordance with section 37A(3)(b), unless that information has been reported and published elsewhere and the water resources management plan states where that information is available;

The company has not provided an estimate for greenhouse gas emissions associated with demand management measures in its preferred programme. The company must state its estimate of greenhouse gas emissions associated with each preferred (final plan) demand option individually to meet Direction 3(d).

Our response:

Our draft WRMP included an assessment of the greenhouse gas emissions associated with our supply side schemes, but it did not explicitly consider the greenhouse gas effects of the demand management measures.

In response to this Defra query, we are now carrying out additional work that will allow us to state the greenhouse gas emissions associated with our demand management schemes. We are considering the embedded carbon associated with the demand management products, and the operational carbon associated with travelling to and from customers' properties plus the benefits of reducing the amount of treated water put into supply.

This new work was started as a result of this Defra query and so is not yet completed. We will be finalising calculations and assumptions which will be included in the final WRMP publication. This work will make transparent the associated greenhouse gas emissions, but it will not change our planned water efficiency activities or ambitions as these are needed to achieve the per capita consumption targets set out in our WRMP and to meet Defra's long term challenge and deliver on customer expectations for water efficiency activity.

The process we are following is described below with provisional values provided.

The carbon components considered are as follows:

- Embodied carbon of the scheme/option
- Scheme/option ongoing carbon – assumed future component replacements/repairs, as a result of implementing the scheme
- Congestion Carbon – CO2 emissions as a result of anticipated travel and congestion associated with the scheme.

For each of these components the tonnage of CO2 is quantified and monetised[1] to enable the carbon impact to be assessed for each investment option. The demand side investment options are:

- Active Leakage Detection
- Metering Policy
- Water Efficiency Programme Options

Error! Reference source not found.below presents the individual GHG components and measures quantified for each demand side investment option.

The following caveats have been made in the current AIC/AISC calculations shown below in the table.

- The AIC/AISC and Tonnage/Cost values shown below are taken from Strategic Grid WRZ, except the Water Efficiency Programme which is at company level.
- The SDB leakage profile has been used for the Active Leakage Control AIC/AISC calculation.
- Both ALC and Metering Policy AIC/AISC's have been calculated over 80 years. However, the Water Efficiency Programme AIC/AISC has been calculated over 15 years.
- Carbon Assumptions still need to be finalised for Metering Policy and Water Efficiency Programme.

[1] The assumed cost of carbon used in the assessments was 48.76 £/tCO2e

Modelled GHG Components for Demand Side Investment Options

Option	GHG Component	Tonnage	Cost (£)	AIC (p/m³)	AISC (p/m³)
Active Leakage Detection	Carbon (Detection Hours)	5,057	£246,623	98	127
	Carbon (Additional Repairs)	261,151	£12,733,741		
	Additional ALC Repairs Congestion	6,591,085	£321,381,328		
Metering Policy	Embodied Carbon – Install	3,650	£178,012	349	462
	Embodied Carbon Replacement (15 yr AL)	3,347	£163,210		
	Carbon – Congestion	89,301	£4,039,252		
	Ongoing Carbon	108,401	£5,285,633		
Water Efficiency Programme(s)	Embodied Carbon – Devices	866	£42,263	144	210
	Carbon - Congestion	197,079	£9,609,598		

What Defra said:

3 (h) its assessment of the cost-effectiveness of domestic metering as a mechanism for reducing demand for water by comparison with other measures which it might take to meet its obligations under Part III of the Act;

The company has not provided a clear assessment of the cost-effectiveness of each metering type. The company must provide an assessment of the cost-effectiveness of the following types of metering to meet Direction 3(h): Selective, Change of occupancy and Optant.

An assessment of cost-effectiveness should include an estimate of the costs for the above types of metering together with the associated reductions in demand, to enable comparison between options.

Our response:

In our assessment of metering options, all types of metering were considered: selective (proactive metering), change of occupier, compulsory and optant. We have expanded Appendix D of the WRMP to provide greater detail of the assumptions, cost estimates, benefits and constraints for each option.

See our response above to this query on the wider Severn Trent plan.

EA additional queries

Egginton Intake

EA said:

The Statement of Response does address the sustainability changes required at the Eggington intake but since the solution will not be implemented until 2030 the company need to provide information on the mitigation and monitoring measures required to address any environmental impact in the meantime.

The company should detail the proposed mitigation and monitoring measures at the Eggington intake.

Our Response

Our abstraction rate on the River Dove is limited by the abstraction licence so that a residual flow of at least 159 Ml/day is left in the River Dove downstream of the intake at all times, unless storage in the reservoirs is such that the lower residual flow of 90 Ml/day applies.

Abstraction at our River Dove intake at Egginton has been the subject of Restoring Sustainable Abstraction Programme investigations in AMP5 and 6. These investigations found that abstraction rates limited by our hands off flow of 159 Ml/d do not appear to have an adverse effect on the macroinvertebrate and fish status and so does not require mitigation. However, no environmental assessment has been able to be made on the lower residual flow of 90Ml/d.

To support our SoR we provided the local EA with a technical note outlining the likely use of the 90ML/d HOF and we are continuing to work with the EA to understand the best use of this lower HOF. We met with the Environment Agency on 25 March 2019 to review progress with our RSA investigations, including this site, and we have agreed a number of actions to try and conclude the work before end AMP6. For Egginton, we intend to make any abstraction licence changes using the Agency's 'up front permitting' approach before the end of AMP6. To accompany any licence variation, we propose to develop a risk based environmental monitoring and mitigation plan which would be implemented if we were to even need to use the 90Ml/d HoF to help fill the reservoirs. As we have not yet developed this plan we cannot outline the mitigation and monitoring required, however we will work with the EA to develop the plan and will undertake not to reduce the residual flow in the river below the 159Ml/d level until we have a plan in place.

We have updated Table A4.6: WINEP RSA surface water schemes in response to this query (see below)

WRZ	RSA Investigation Site	Measure	Description of scheme
Strategic Grid	River Dove at Egginton	Sustainability Change	Upfront permitting to remove 90Ml/d HoF from licence OR provision of evidence that this is not required. A Mitigation and monitoring plan will be developed for implementation if we proposed to use the 90Ml/d HoF as a risk management measure.

Outage reduction in WRZs other than Strategic Grid

What EA said:

The Statement of Response contains a revised outage allowance for the Strategic Grid zone but still has not addressed this issue across all zones or included outage reductions as an option.

The company should outline the revised outage allowance across all zones and consider outage reductions as an option for future plans.

Our Response

Our Statement of Response explained that since the draft WRMP was published, we have improved our understanding of outage probability, and we have been able to incorporate the benefits of our PR19 capital maintenance and resilience investment plans. As a result, our final WRMP now includes our best estimate of current and future likely outage.

The largest outage quantity in our WRMP occurs in the Strategic Grid WRZ, which accounts for 92% of total company wide outage allowance with all the other 14 WRZs accounting for only 8% of total outage. This is because the majority of the water produced in the zone comes from a relatively small number of large water treatment works, and so outage events at those sources has a proportionally larger effect on the overall Ml/d number. As a result, our planned PR19 capital maintenance and investment plans for those major water treatment works generate proportionally larger benefits in the outage calculation than investment at smaller sites.

In general, the relatively small magnitude and short durations of recorded outages at the smaller sites that serve our other 14 WRZs mean that individually they contribute far less to the overall outage volume allowance. This means that the while our planned PR19 investment at these sites should reduce the likelihood and frequency of individual outage events, it leads to a far smaller improvement in the overall calculated outage Ml/d allowance.

As a result, we consider the low outage volumes in the WRZs other than the Strategic Grid are likely to remain at around current level in future AMPs, and our planned investment in these zones will help to maintain outage volumes at those relatively low levels.

WRMP tables

EA said:

The company has not submitted any revised planning tables with the Statement of Response. To fully demonstrate that the company has changed its draft plan following consultation. The company should ensure the final planning tables include all the relevant changes outlined in the Statement of Response and that the most up to date version is used.

Our Response

Our final planning tables will include all changes relevant to our statement of response. This has been through our internal assurance process to ensure all updates have been included. All planning tables are equivalent to version 15 of the tables with all relevant updates made to the tables.

We shared draft final versions of the WRMP tables with the EA in March 2019, and have received feedback from them. We have taken that feedback into account and have made minor changes to the final WRMP tables accordingly.

Extrapolation of population and property forecast in the former Dee Valley areas

EA said:

In our representation on Dee Valley's plan, we stated that the company needed to provide an explanation of how it had extrapolated population and property forecasting beyond the local authority plans to the end of the planning horizon. The company's final plan should include this information.

To demonstrate that the company has appropriately planned to meet future population needs the company's final plan should include this information

Response:

The EA and NRW WRMP (2016) technical guidance explicitly instructs to account for the local council projections of household growth for supply capacity planning purposes. In light of this, we are adopting Local council levels of growth from AMP7 onwards for the WRMP19.

We work closely with local authorities to understand their projections for future growth and alongside discussions with the local authorities we gather data on their housing trajectories from planning department's documents including:

- Assessment of Housing Needs and Objectively Assessed Housing Need
- Core Strategy
- Local Development Plan
- Annual Monitoring Report
- Site Allocation Reports
- Strategic Housing Market Assessment
- Residential Land Availability
- Land Supply Statement
- Strategic Housing Land Availability Assessment
- Housing Trajectories

However, planning horizons for Local Authorities do not reach 2045, and are only projected up to 15 years ahead. Within the planning horizon councils specify a cumulative housing need and present a yearly profile to meet this need. Beyond each council's specified planning horizon, we have extrapolated assuming the annual average housing need from the planning horizon continues to 2045.

For estimates of future total population we have used trends from the Government Local Authority population projections and applied forecast percentage rates of change to our base year data. This gives the underlying change in population due to births, deaths and migration in the region. The LA population projections do not extend to 2045, ending 5 to 10 years earlier. To extrapolate to 2045 the rate of change in the last year of data is assumed for remaining years.

No deterioration methodology

EA said:

The company should ensure the fWRMP takes account of any agreed no deterioration methodology and changes to its Buckshaft abstraction licence. The company should also continue to work with us to agree mitigation measures to ensure no deterioration of waterbodies prior to the implementation of solutions in 2030's.

The company should ensure the final plan takes account of any agreed no deterioration methodology and changes to its Buckshaft abstraction licence as well as mitigation measures.

Our Response

When developing our strategy for No Deterioration of WFD status in our WRMP we have taken account of the Environment Agency's technical guidance. We have used the strategy outlined in our WRMP as a basis to develop a more detailed methodology on how Severn Trent Water intends to manage our WFD no deterioration obligations, so our final plan takes account of our agreed no deterioration methodology. We have shared with the EA a draft of our proposed technical framework for managing WFD abstraction risks and how we intend to prioritise our activities in AMP7, and EA have fed back comments. We will continue to work with the EA to help them understand our approach so that we develop a common understanding of the risks to WFD objectives as well as risks to water supplies. The final version of the framework will also be accompanied by a set of 'recent actual' abstraction figures that we will want to agree with the EA as our WFD no-deterioration baseline figures.

We have agreed with the EA the necessary changes in abstraction licence associated with our Cinderford Brook RSA investigation which will limit our abstraction to our 'recent actual' annual abstraction at Buckshaft in our Forest and Stroud Water Resource Zone. As agreed with EA, the licence change will reduce the annual average abstraction to recent actual abstractions but further considerations will have to be made on the potential to revise the peak abstractions if this is deemed to severely impact flow and public water supply is not put at risk. Further feasibility will be undertaken in early AMP7 with the view to make any further licence changes by the end of AMP7.

It is important to note that the Buckshaft source is down in WINEP with a WFD No Deterioration driver for 2024 delivery (WINEP ID WMD00411 and WMD00412). It has a sustainability change measure which is consistent with our fWRMP categorisation of "Adaptation" and 2035 deployable output that is equal to the 3.57Ml/d recent actual value. Additionally, there are two WINEP lines (WINEP ID WMD00413 and WMD00414) with an implementation driver and a measure of "Land management" and these are also consistent with what has been agreed through the notional

solution. This change is included in WRMP Appendix A (Table A4.1: WINEP RSA groundwater schemes– Forest & Stroud WRZ) and the impact has been accounted for in our WRMP using the timing agreed through the RSA options appraisal process, (ie upfront permitting by 2024 with licence change coming into effect by 2030).

We have not made changes to the WRMP in response to this query.