Drought Plan 2019
Annex 9: Options appraisal approach

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from Southern Water

Contents

Introduction

This annex describes the options appraisal process to determine which options could feasibly be implemented to maintain supplies to customers during a drought.

What are drought management options?

Drought plans and water resource management plans (WRMPs) overlap to some extent, in that they share the broad objective of maintaining a secure and sustainable supply of water for customers.

Options needed for water resource management planning purposes are required to meet forecast deficits in supplies over at least a 25 year time horizon. The WRMP contains a long-term strategy that incorporates large, long lead time resource development options alongside short and long-term sustainable plans for demand management through metering, water efficiency and leakage management.

The options selected aim to strike a balance between the frequency of drought interventions and the costs of having additional supply or demand measures in place to reduce the frequency of those drought interventions.

In contrast, the drought plan describes how the company will operate during a drought. Hence, drought management options describe short-term operational or tactical steps that will be taken as a drought progresses to enhance available supplies, manage customer demand and minimise environmental impacts.

Droughts in the south east of England typically impact water supplies over one to three years. The introduction of supply side options is limited to those that can be achieved within this timescale. Thus, some of the larger scale schemes identified within the WRMP, which are strategic in nature and involve other permissions for their implementation (e.g. planning permission), may not be feasible within the timeframe of a single drought plan. However, some of the smaller scale schemes which have been already identified in the WRMP can be prioritised for completion during a drought and the timescale for implementation brought forward in order to alleviate the constraints on water availability caused by the drought.

A drought management measure is any additional operation or action taken by a water company to enhance yield / deployable output or reduce demand during a time of drought. Drought management options therefore cover the following:

- Options to reduce demand during a drought
- Statutory temporary restrictions on water use
- Options to maintain or modify infrastructure or existing assets, or to increase supplies during a drought
- Drought Permits or Drought Orders to increase water supply availability during a drought

The company then has a number of intervention options, which include the acceleration of schemes and/or demand management options from the WRMP but also include a range of temporary, drought-specific responses that can be lifted once the threat of drought on supplies has receded. The range of possible intervention options that may be adopted during drought situations aim to balance the needs of customers (demand-side options) with those of the environment (supply-side options).

The feasible demand-side intervention options are described in more detail in Annex 3 of this Drought Plan, while feasible supply-side intervention options are described in Annex 4.

Options appraisal process

The approach to identifying and developing drought management options aligns with the process that is used for the Water Resource Management Plan. The approach that is being applied is therefore consistent with the Environment Agency's Drought Planning Guideline and with the Water Resource Planning Guideline, and also with industry best practice guidance (i.e. the UKWIR 2012 WR27 Water Resources Planning Tools report which provided a comprehensive list of water management options, and which built on the original list set out in the earlier UKWIR Economics of Balancing Supply and Demand report).

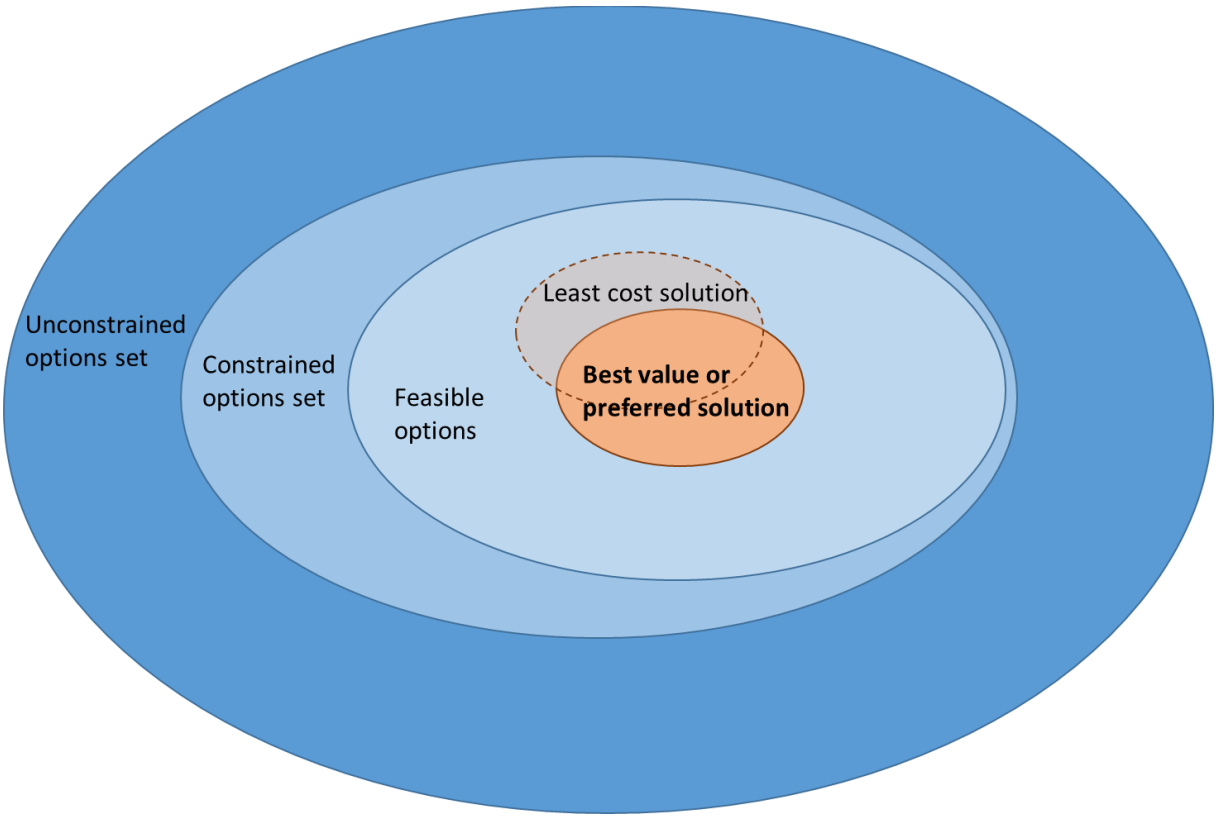
The process for defining options to include for water resource planning purposes consists of three principal stages:

- **Unconstrained option list**: this is a high level list of options including generic option types as well as options which take account of government policy and aspirations, where appropriate. This list is populated with options from previous studies from past drought plans as well as new option ideas.
- **Constrained option list**: This is an initial screened version of the unconstrained list to filter out options that are impracticable or have unacceptable environmental or economic impacts, and, where feasible taking account of our water supply duties, to exclude options that may adversely affect European designated sites (Habitats Directive) or lead to permanent deterioration of water body status under the Water Framework Directive.
- **Feasible option list**: this is the final set of options that have passed the screening tests. A Strategic Environmental Assessment (SEA), Habitats Regulation Assessment (HRA) and Water Framework Directive (WFD) assessment is also produced through this process providing details of the assessment of environmental and social costs and benefits, and impacts upon European designated sites and WFD water bodies.

The process of options appraisal can therefore be seen in terms of the gradual screening of a wide options set to reach a preferred basket of robust options, as set out in Figure 1 below.

In the WRMP process the feasible option list is ultimately used to derive a preferred programme of options to meet a given supply-demand balance deficit, taking into account costs as well as other criteria, such as environmental impacts and customer acceptance.

Figure 1 Stages of options appraisal used for water resource planning



For drought planning purposes, the feasible options set form a pool of options that a company can draw on as a drought progresses. The phasing of when these options would be implemented is developed and tested through scenario analysis of differing drought events (both historic droughts seen in the last 120 years or so, or stochastically generated more severe drought events that could occur).

No drought will exactly repeat the characteristics of previous droughts. Thus, it is necessary to consider the potential effects of different types of drought occurring, be it in terms of severity, or within the drought sequence of rainfall and/or demands that could occur. As a result of the differing nature of droughts, there is no absolute fixed order in which drought management interventions are introduced, but there are some options that will tend to be implemented before others are considered. For instance, supply-side options that are potentially environmentally damaging, or demand-side options with larger social impacts, will tend to be reserved for only the most severe droughts, or to prevent the risk of the resource situation deteriorating to such an extent that the ability to supply customers could become seriously compromised unless Emergency Drought Orders are granted.

Unconstrained list of options

The unconstrained options list for the draft Drought Plan was generated using the guidance provided in the UKWIR WR27 Water Resources tools project, the existing Southern Water assets list, the 2013 Drought Plan, information provided from the 2014 WRMP and the options appraisal process for the 2019 WRMP (WRMP19). Throughout this process, options were considered and assessed against the technical feasibility of the options and environmental and planning risks.

Customer and stakeholder engagement was also a key element of the options appraisal process as a whole. Information and options collated through pre-consultation activities were included in the unconstrained options list.

Screening and filtering options

A process of screening and filtering was applied to the Drought Plan unconstrained options in order to generate a constrained set of feasible Drought Plan options that the company could use during periods of drought. The filter criteria were broadly the same as that used for the WRMP, albeit with a slightly different focus because of the short term operational requirements of a drought plan and to address the specific supply deficit in drought conditions that may arise during the next few years that this Drought Plan covers:

1. **Is the option likely to be technically feasible?** For example, certain options may not be technically achievable in some locations (the location of Aquifer Storage and Recovery options would be limited to locations with suitable geology).
2. **Does the option help address the drought supply deficit problem?** For example, can it provide water or water saving in the WRZ with a potential supply deficit during a drought at the appropriate time of year and in suitable quantities? The issue of timing to develop and implement an option is critical for drought planning purposes.
3. **Is the option likely to meet both customer and regulator expectations?** For example, if an option is likely to meet overwhelming public resistance; may contravene environmental and planning restrictions or government policy; or impact upon WFD ‘no deterioration’ objectives, then it may need to be omitted if feasible (taking due account of our water supply duties), or consideration given to a longer timeline before it could be implemented (in which case it may be unsuitable for drought planning purposes, or could only be implemented under longer duration drought events).
4. **What is the indicative cost and capacity of the option and what is the timing for it becoming available?** For example, is the option disproportionately expensive or is the capacity too small to be suitable/practicable to meet the potential drought supply deficit or some part of it? How does the earliest start year (for achieving yield from the scheme or achieving water savings) compare to the timing of potential drought supply deficits occurring and is it within the period covered by this drought plan? How quickly could the option be implemented during a drought event?
5. **Is the option likely to be particularly risky to implement, or the output highly uncertain, such that it may fail to be implemented, or implemented in time?** For example, is land or land access likely to be available to allow the option to proceed? Can the option be successfully and reliably delivered and operated to achieve an expected water output? Is the option based on dependable and proven technology? Does the company have experience of operating similar schemes? Does it have a particularly long lead-in time, or is there low confidence / high uncertainty in the lead-in time? What is the profile for pre-planning environmental work, planning, engineering and delivery?

The feasible set of drought options

A 'fact file' was generated for each option, under a series of standard headings to provide a consistent set of information for all the options. The fact file also provides a record of the decisions under each of the filters above (i.e. whether the option is considered feasible for inclusion as part of the range of drought measures the company could use in a drought or whether it is excluded).

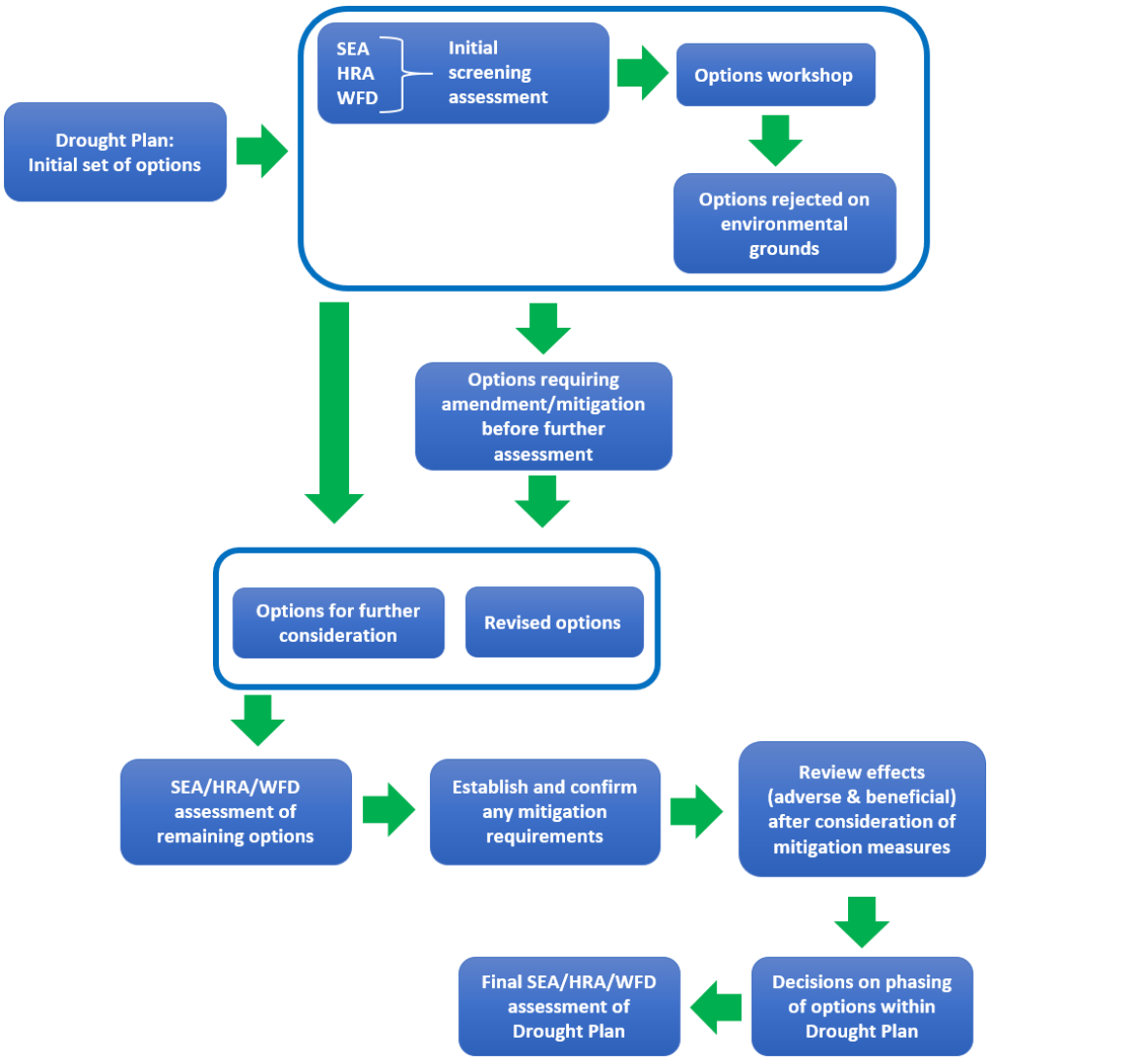
Appendix A describes all of the options that were considered during the options appraisal process. Appendix B provides the fact files for all the feasible options that form part of the company's Drought Plan.

In addition, the feasible options set were further assessed for their potential environmental impacts under each of the following statutory processes:

- Strategic Environmental Assessment
- Habitats Regulations Assessment
- Water Framework Directive assessment.

The process followed in relation to these statutory assessment processes is summarised in Figure 2.

Figure 2 Option assessment process with SEA, HRA and WFD considerations



The outcomes of the environmental assessments of the drought management options are described, as applicable, in Annex 11 (Habitats Regulations Assessment), Annex 12 (Strategic Environmental Assessment), and Annex 13 (WFD assessment). In summary, the application of these processes, together with the development of Environmental Assessment Reports (EARs) for Drought Permits and Orders, has:

- Informed dialogue with the Environment Agency and Natural England as to the options to be included in the Drought Plan and their sequencing in relation to the Drought Plan to reflect their environmental or social effects (see Annex 4 for the sequencing of Drought Permit and Drought Order implementation)
- Identified a small number of options that have been excluded from the Drought Plan where this is feasible (taking account of our supply duties) due to environmental concerns, including some drought management options on the Isle of Wight (for example, a Drought Permit for the Rookley source) and in Hampshire (for example, options to develop new satellite boreholes associated with existing licensed sources)
- Identified a number of HRA risks with which has either led to:
    a) the option being modified and/or additional mitigation measures being included to address these risks to ensure no adverse effects on any designated European sites (for example, the provision of mitigation measures for the Caul Bourne, Shalcombe and Eastern Yar augmentation scheme Drought Orders as described in Annex 11).
    b) the option being retained in the Drought Plan with consideration of Imperative Reasons of Over-riding Public Interest (IROPI) after demonstrating there are no other feasible alternative options available in severe drought: Candover Augmentation Scheme and the Lower Itchen sources Drought Orders only
- Identified risks in relation to temporary deterioration to WFD status for some of the water supply augmentation options and consideration of mitigation measures (for example, for the Bewl Water reservoir / River Medway Scheme Stage 4 Drought Permit)
- Identified various environmental impacts through the SEA process for some of the supply-side options (including Drought Permit / Order options), mainly on the water environment and associated aquatic habitats, flora and fauna
- Identified where additional environmental baseline monitoring, studies or data are required to better understand the potential environmental risks relating to implementation of various Drought Plan measures, both to support future drought management planning and during an actual drought event (see Annex 5)
- Identified potential mitigation measures to address identified environmental effects of various Drought Plan measures to reduce the risks of the effects arising during a drought (see Annex 5)
- Identified no impacts of the demand-side measures sufficient to exclude any options on environmental grounds, but noting that two options are likely to have major adverse effects on human health and safety, economic activity and livelihoods:
    a) those water use restrictions to be implemented under the Phase 2 Temporary Use Ban powers and Phases 1 and 2 of the Non-Essential Use Ban Drought Order that impact on small businesses that are entirely dependent on using water; and
    b) an Emergency Drought Order to ration essential supplies by use of standpipes or rota cuts.

  Consequently, the more onerous water use restrictions are only planned to be introduced when the Severe Drought stages (3 and 4) are reached, whilst the Emergency Drought Order is only included as a 'last resort' option in a civil emergency (i.e. in conditions that are worse than a 1 in 500 year drought), as set out in Annex 1. Conversely, the Phase 1 Temporary Use Ban would normally be implemented before the implementation of Drought Permits /

Orders, although this may not be the case for a winter Drought Permit / Order given the negligible demand savings that would be achieved.

In particular, the phasing of some of the Drought Permits and Orders was modified during the development of the plan due to the findings from the environmental assessments:

- The reduced MRF drought permit options for Darwell were amended to be set against the Severe Drought stage trigger for Sussex Hastings WRZ. The MRF reduction options would also be phased such that the option with the greatest environmental impact is phased last.
- For the Pulborough surface water Drought Permit/Order options, the MRF reductions on the River Rother have been phased according to environmental impact, with the 10Ml/d MRF reduction option set against the Drought stage trigger and the other two options set against the Severe Drought stage trigger.
- The Drought Permit for Powdermill reservoir to reduce the MRF for the River Brede abstraction has been changed from the Drought stage to the Severe Drought stage trigger in view of the assessed scale of the environmental effects.
- Bewl Water reservoir / River Medway Scheme Drought Permits / Order have been separated into different stages linked to different drought severity triggers to reflect the differences in environmental impact. A first stage of the Drought Permit with the least adverse environmental effects has been set against the Drought stage trigger. The remaining three stages of this option were amended so that they are triggered in the Severe Drought stage and phased such that the stage with the greatest environmental effects is only considered in the most severe droughts.
- The East Worthing Drought Permit trigger was amended to the Drought stage rather than Severe Drought stage so as to help minimise the need for the North Arundel Drought Order (Severe Drought stage trigger) in Sussex Worthing WRZ which has greater environmental effects.

Overall, the main principle in phasing the Drought Plan measures is to minimise the environmental and social effects. The precise phasing during a drought will take into account the prevailing environmental conditions informed by the in-drought monitoring activities set out in Annex 5. These principles are reflected in Annex 1 of the Section 20 Operating Agreement between the Environment Agency and Southern Water signed on 29 March 2018 in relation to the implementation of the Test surface water Drought Permit and Drought Order, Candover Augmentation Scheme Drought Order and Lower Itchen sources Drought Order. Aquatic environmental monitoring of prevailing drought conditions in the River Test and River Itchen will be used to help inform the final sequencing of Drought Order implementation in any future drought event, as well taking account of Southern Water's supply duties.

The Section 20 Agreement also sets out the required sequencing of water use restrictions relative to the Drought Permit and Drought Orders and their environmental effects. Level 1 and Level 2 (Temporary Use Ban Phase 1) water use restrictions are required to be in place before implementation of the Test Surface Water Drought Permit. A Drought Order application must be made to the Secretary of State to authorise partial Non-Essential Use Ban (NEUB) restrictions (Level 3, Phase 1 NEUB restrictions) before implementing any of the supply side Drought Orders. Level 3, Phase 2 restrictions (for Temporary Use Bans and NEUB) are to be implemented when river flows in the River Itchen fall below 200 Ml/d at Allbrook & Highbridge (subject to the Drought Order authorising the NEUB restrictions having been granted).

Further details on the phasing of the Drought Permits and Orders is provided in Annex 4.

Environmental assessment of the temporary emergency desalination options was also used to determine the phasing of these measures relative to Drought Permit / Orders in the Severe Drought stage taking account of the relative environmental impact. The Sheerness emergency desalination plant has the greatest environmental risks of the three desalination options and would be phased for introduction only after implementation of the River Medway Scheme Drought Permits / Orders (Stages 1 to 3).

We have taken the environmental assessments into account in selecting the Drought Plan options in order to seek to minimise the likelihood of significant adverse environmental effects. However, the Drought Plan must also ensure that essential water supplies can be maintained to customers in line with our statutory supply duties. Wherever feasible, we have either excluded measures that may have significant adverse environmental effects or have phased these measures so that they would only be implemented in a severe drought. However, the Drought Plan has included two Drought Orders where it is not possible to rule out adverse effects on the River Itchen SAC: the Candover Augmentation Scheme and Lower Itchen sources Drought Orders. These are necessary measures to include in the Drought Plan due to recent changes to the abstraction licence conditions for the River Test and River Itchen water sources, which reduce the reliable volume of supply available in drought. Specific environmental mitigation packages have been agreed for each of these Drought Orders and compensation measures have been developed with Natural England and the Environment Agency to meet the requirements of the Habitats Directive and associated national regulations. Our WRMP19 includes a strategy to reduce the need for these Drought Orders in the medium term by developing new water resources in parallel with continuing our actions to reduce leakage and customer water consumption.

Mitigation measures are also set out or are being developed for other Drought Plan measures to reduce the residual effects on the environment where adverse effects have been identified (see Annex 4).

Appendix A: Drought management options screening

The following table presents a summary of all those options that were initially consulted on with Natural England and the Environment Agency in April 2016 and sets out those options that have been excluded from the Drought Plan and those which have been included. The table has been updated following the official consultation period to reflect the updates that have been made to the plan.

Table 1 Options appraisal summary

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Company	Construction of new satellite boreholes	New boreholes at existing sources (where appropriate) to spread the load of abstraction & reduce the risk of existing boreholes failing	Yes	No – timescales required to implement are too long for a drought event and risk that environmental impacts due to lower groundwater levels in drought may not be acceptable
Company	Engineering works to develop new water supplies	Further engineering works to provide additional supplies	No	No – timescales required to implement are too long for a drought event
Company	Indirect wastewater recycling	Enhanced treatment of treated effluent from wastewater treatment works for discharge to river system upstream of a Southern Water abstraction intake where flows are depleted to allow increased river abstraction, or discharge at MRF measuring location to maintain MRF.	No	No – timescales required to implement are too long for a drought event
Company	Distribution network modifications	Further engineering works to transfer water around the water supply area	No	No
Western	Reduce transfer to other water company	In the event of a drought, the company would hold discussions with Wessex Water in relation to the respective water resources positions and the potential for reduced transfers	Yes	Yes [Level 1 fact file reference – BS_Wsx]
Western	Tankering	Tankering water from adjacent WRZs or other water companies would be considered in severe droughts	Yes	Yes [Level 1 fact file reference – SI_Tan]
Western	Andover - increase licensed volumes	Increase current licensed quantity	No	No
Western	Re-commissioning of unused source (near Salisbury)	As part of the AMP4 Water Resource Investigations, the company reviewed the option of re-commissioning of a borehole near Salisbury (DO increment of about 0.3Ml/d). The	No	No Not considered to be feasible.

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
		WRMP09 strategy selected the rehabilitation this borehole at the end of the plan		
Western	Use of alternative sources (Candover Augmentation)	Flows in the River Itchen can be supported by groundwater abstracted from the Candover augmentation scheme. Candover is owned and operated by the Environment Agency, and could be used to increase flows in the Itchen during times of drought.	Yes	Yes [Level 1 fact file reference – SI_CAN]
Western	Commercial supply (Fawley)	In the event of a drought, the company would hold discussions with a commercial customer with regards to the resources position and their supply.	Yes	Yes [Level 1 fact file reference – BS_Faw]
Western	Re-commissioning of source (Test Valley)	WSW in Test Valley was abandoned for environmental purposes. However, in severe drought conditions, and with the Test and Itchen sustainability reductions in place, the source could be considered for temporary re-introduction under a Drought Order. The boreholes, building, water mains and power supply are still largely intact. Up to 4.36Ml/d could be available during a severe drought subject to short-term rehabilitation of the source, (new pump(s), control panel, power reconnection, disinfection and access bridge.).	No	Yes Reconsidered and included as a Drought Order option within drought plan. [Level 1 fact file reference – BR_Bro]
Western	Additional inter-company bulk water transfer	In the event of a severe drought, an additional bulk water transfer from Portsmouth Water could be sought beyond the existing transfers already in place (including the new 15Ml/d transfer from Itchen source).	Yes	No – insufficient additional spare resources in Portsmouth Water area to export to Western Area; in longer term additional bulk supply options will be implemented through the WRMP
Western	Test Surface Water Drought Permit	Reduce the Hands Off Flow from 355 Ml/d to 265 Ml/d	Yes	Yes [Level 1 fact file reference – SI_TSP]
Western	Test Surface Water Drought Order	Reduce the Hands Off Flow from 355 Ml/d to 200 Ml/d	Yes	Yes [Level 1 fact file reference – SI_TSO]
Western	Lower Itchen sources –	Reduce the Hands Off Flow which will control the abstraction from these sources (Southern Water and Portsmouth Water sources).	Yes	Yes [Level 1 fact file reference – SI_LIS]
Western	Temporary emergency desalination	Desalination (temporary) would be considered from the Solent or Southampton Water.	No	No – operationally very difficult to implement a temporary solution.
Western	Re-commissioning of unused sources on Isle of	There are five de-commissioned groundwater sources on the Isle of Wight. The feasibility of re-commissioning these sources was reviewed as part of the 2006 drought plan options	No	No

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
	Wight (five potential groundwater sources)	assessment. The review concluded that there was no potential for re-commissioning due to concerns over water quality.		
Western	Lukely Brook	This Drought Permit is concerned with borehole abstraction from Lukely Brook Valley. The key environmental issues raised relate to the impact on the Lukely Brook from additional abstraction.	Yes	Yes [Level 1 fact file reference – LV_Bow]
Western	Rest groundwater sources	Operational strategy to limit the use of indigenous groundwater sources (as much as possible during the early stages of drought so that these groundwater supplies are available as a last resort as surface water recesses during extended drought periods.	Yes	Yes [Level 1 fact file reference – DP_RGS1]
Western	Sandown - reduce MRF	Reduce the MRF which controls the abstraction at Sandown	Yes	No Eastern Yar Augmentation Scheme Drought Order being included instead of a separate Sandown option.
Western	Eastern Yar augmentation scheme drought order to reduce MRF constraints	Modification of operational rules for the Eastern Yar scheme (reduce MRFs on the River Medina) to increase water available for abstraction at Sandown	Yes	Yes [Level 1 fact file reference – LV_Yar]
Western	Caul Bourne - reduce MRF	Drought Order to reduce the MRF which controls the abstraction from this source	Yes	Yes Although has similar issues to the Rookley source (small deployable output available for a short duration), this option was selected to give a sufficient suite of options to consider on the Isle of Wight. [Level 1 fact file reference – LV_Cal]
Western	Rookley - reduce MRF	Drought Order to reduce or remove the MRF which controls the abstraction from this source	Yes	No Not considered to be a viable option as would only be available for a short duration with a small deployable output benefit, and would impact flows in the Sheat Stream.
Western	Temporary emergency desalination for Isle of Wight (Sandown)	A number of potential options were investigated as part of the AMP4 investigations and PR09 WRMP. The best overall location for the Isle of Wight is at Sandown.	Yes	Yes [Level 1 fact file reference – DES_Eme]

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Eastern	Reduce transfer to other water companies	In the event of a drought, the company would hold discussions with other neighbouring water companies with regards to their respective water resources position and consider options for reducing water transfers (including River Medway Scheme allocation to South East Water).	Yes	Yes [Level 1 fact file reference – BS_KMT]
Eastern	Re-commissioning of unused sources (Isle of Grain / Sheerness)	The only unused sources are those with significant water quality issues. These sources, such as Sheerness and Isle of Grain, were investigated as part of AMP4 Water Resource Investigations and considered not to be viable in a drought.	No	No
Eastern	Nitrate removal plant at Gillingham	Under investigation.	Yes	No This will be progressed as a WRMP19 option as not feasible to implement in the timescales of a drought.
Eastern	Bewl Water and River Medway Scheme (winter)	Bewl Water is a pumped storage reservoir with pumped abstractions from the River Teise and the River Medway. Drought Permit or Order required to modify MRF conditions at Teston gauging station and river regulation release factor from Bewl Water reservoir. The conditions applied for will depend upon the severity and timing the drought.	Yes	Yes [Level 1 fact file reference – SI_Bew]
Eastern	Bewl (summer)	Bewl Water is a pumped storage reservoir with pumped abstractions from the River Teise and the River Medway. Drought Permit or Order required to modify MRF conditions at Teston gauging station and river regulation release factor from Bewl Water reservoir. The conditions applied for will depend upon the severity and timing the drought.	Yes	Yes [Level 1 fact file reference – SI_Bew]
Eastern	Rest specific sources during early stages of drought	During a drought where recharge of groundwater is reduced, the overall strategy is to rest groundwater sources early on in the drought for later use once supplies from surface water sources decline. Within this strategy, there are a number of sources which are constrained by abstraction licence or pump capacity.	Yes	Yes [Level 1 fact file reference – DP_RGS4]
Eastern	Tankering	Tankering water from adjacent WRZs or other water companies would be considered in severe drought	Yes	Yes [Level 1 fact file reference – SI_Tan]
Eastern	Removal of existing licence constraints	Several Drought Permits / Orders considered to enable temporary changes to abstraction licence constraints (see other rows), but permanent changes to existing abstraction licence conditions are considered unlikely to be granted.	No	No – no licences identified for permanent modification

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Eastern	River Medway Scheme - further permanent changes to MRF & release factors in abstraction licence	Seek permanent change to abstraction licence to reduce the MRF for abstraction and reduce the flow regulation release factor from Bewl Water down to 1.0 (from 1.1).	Yes	No A licence change is already being progressed and no further changes likely to be granted. Not a specific drought option.
Eastern	Chatham / Sittingbourne	Increase current licensed quantity	No	No Location near Sittingbourne already undergoing licence change. Location in Chatham reconsidered but the deployable output is hydrogeologically constrained by operational considerations therefore not included.
Eastern	Drought Permit near Faversham sources	Drought Permit to remove seasonal constraint preventing abstraction during winter groundwater recharge period.	Yes	Yes [Level 1 fact file reference – SI_Ket]
Eastern	Temporary emergency desalination	Desalination (temporary or permanent) would be considered from either the Medway or Thames estuaries (brackish) or the sea. As part of the PR09 WRMP options appraisal, a number of potential locations were considered feasible: Isle of Sheppey (south of Sheerness) was considered the best available site.	Yes	Yes Location being considered at Sheerness. [Level 1 fact file reference - DES_Eme]
Eastern	Re-commissioning of unused source (Broadstairs)	The existing source at Broadstairs has not been used since 1989 when the source was contaminated with cyclohexane. Remediation of the source has been undertaken for many years and there is the potential to reinstate this source during a severe drought.	Yes	No Not a viable option due to ongoing water quality issues which cannot be resolved quickly in a drought event.
Eastern	Stourmouth - reduce MRF (Summer / Winter)	This Drought Permit is concerned with abstraction for public water supply to allow increased abstraction from the River Great Stour near Stourmouth (with appropriate construction of water supply infrastructure – temporary or permanent depending on the time available).	Yes	Yes Included to provide sufficient options during a drought, despite set up costs. [Level 1 fact file reference – SI_Plu]
Eastern	Wastewater discharge modifications	Potential to increase the discharge of wastewater from Herne Bay to Grove Ferry to enable increased surface water abstraction from River Great Stour near Stourmouth.	No	No – option to reduce MRF by a drought permit considered a more likely option.
Eastern	Stourmouth - further reduce MRF and change wastewater recycling	Further reduce the MRF for abstraction near Stourmouth or increase the discharge at Grove Ferry to further increase abstraction (with appropriate construction of water supply	No	No Drought permit to lower the MRF to 100 Ml/d will be sufficient to enable an additional 10 Ml/d abstraction.

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
		infrastructure – temporary or permanent depending on the time available).		
Eastern	North Deal – Drought Permit to increase licensed volumes	Drought Permit to increase daily peak abstraction licence limit from 2.73 Ml/d to 4.0 Ml/d.	Yes	Yes [Level 1 fact file reference – SI_Woo]
Eastern	Darwell - reduce MRF conditions	A Drought Permit/Order may be applied for to reduce the MRF to 10Ml/d to enable increased abstraction from the River Rother to Darwell reservoir.	Yes	Yes [Level 1 fact file reference – SI_Dar]
Eastern	Powdermill - reduce MRF	A Drought Permit/Order may be applied for to reduce the MRF controlling abstraction from the River Brede to refill Powdermill reservoir from 6.2Ml/d to 2.0Ml/d.	Yes	Yes [Level 1 fact file reference – SI_Pow]
Eastern	Increase Beauport WTW capacity	The output of Darwell reservoir is controlled by the capacity of the Water Supply Works (WSW) at Brede and Beauport. In the event of a drought situation where groundwater abstraction was significantly decreased, the company would review the option of increasing the capacity of Beauport WSW.	No	No – not feasible in timescales of a drought event.
Eastern	Re-commissioning of unused sources (Cadborough)	There is a de-commissioned source at Cadborough. This was investigated under AMP4 Water Resource Investigations and drought studies, but was rejected due to poor raw water quality and associated treatment requirements.	No	No – adverse water quality
Eastern	Tankering	Tankering water from adjacent WRZs or water companies would be considered in severe droughts	Yes	Yes [Level 1 fact file reference – SI_Tan]
Eastern	Darwell - reduce compensation flow	Reduce the compensation flow from Darwell reservoir to maintain water levels	Yes	No Considered but Drought Order / Permit limited to MRF reductions only
Eastern	Powdermill - reduce compensation flow	Reduce the compensation flow from Powdermill reservoir to maintain water levels	Yes	No Considered, but Drought Order/Permit limited to MRF reductions only.
Eastern	Darwell – temporarily remove freshet licence condition	Drought Permit to temporarily remove the abstraction licence condition requiring 500Ml of water to be reserved in storage in Darwell reservoir for freshet releases.	No	No – requirement to maintain capacity for freshet releases no longer forms part of the licence as of April 2018, therefore no longer required as a drought option.
Eastern	Abstraction licence trading	Option to purchase abstraction licences upstream of Southern Water abstraction sites.	Yes	Yes [Level 1 fact file reference – DI_LTR]

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Central	Rest groundwater sources (Brighton)	Use any spare winter / spring water available from the Pulborough river abstraction to supply customers in Worthing and in Brighton via the Rock Road transfer. This allows groundwater to be rested in key 'storage' sources, which can improve drought resilience	Yes	Yes [Level 1 fact file reference – DP_RGS3]
Central	Tankering	Tankering water from adjacent WRZs or other water companies would be considered in severe droughts	Yes	Yes [Level 1 fact file reference – SI_Tan]
Central	Temporary emergency desalination	A number of potential options were investigated as part of the AMP4 investigations and PR09 WRMP and an emergency desalination plant located at Littlehampton Wastewater Treatment Works (WwTW) has been identified.	Yes	Yes Emergency desalination locations at Littlehampton WTW being considered. [Level 1 fact file reference - DES_Eme]
Central	Reduce transfer to other water company	In the event of a drought the company would hold discussions with South East Water in respect of water transfers from Weir Wood reservoir taking account of the respective water resources positions in a drought.	Yes	Yes [Level 1 fact file reference - BS_VWS]
Central	Reduction of bulk import	Southern Water receives a bulk supply from Portsmouth Water of up to 15 Ml/d. In the event of a drought, the company would hold discussions with Portsmouth Water taking account of the respective water resources positions in a drought.	Yes	Yes [Level 1 fact file reference – BS_PWR]
Central	Pulborough surface water - reduce MRF (Winter)	Drought Permit to allow a reduction in the MRF at Pulborough weir on the River Rother in winter to allow greater abstraction from the surface water intake.	Yes	Yes – 10Ml/d, 20Ml/d and 30 Ml/d MRF reduction options. [Level 1 fact file reference – SI_Har]
Central	Pulborough surface water - reduce MRF (Summer)	Drought Permit to allow a reduction in the MRF at Pulborough weir on the River Rother in summer to allow greater abstraction from the surface water intake.	Yes	Yes – 10Ml/d, 20Ml/d and 30 Ml/d MRF reduction options. [Level 1 fact file reference – SI_Har]
Central	Maximise Pulborough groundwater source availability for later stages when river flows are reduced	Maximising the use of the river abstraction in order to rest the available groundwater resources in the basin. Increase transfer of water from Portsmouth Water in order to alleviate abstraction from groundwater near Pulborough	Yes	Yes [Level 1 fact file reference – DP_RGS3]
Central	Rest Weir Wood reservoir source during early stages of drought	Maximising pumping in order to rest Weir Wood reservoir for use in later stages of a drought.	Yes	Yes [Level 1 fact file reference – BS_RWW]

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Central	Re-commissioning of unused source (Hythe Beds)	The company is considering a feasibility study to assess the re-commissioning of a small groundwater source in the Hythe Beds.	No	No – not feasible in the timeframe of a drought event.
Central	Inter-company bulk transfer	In the event of a severe drought, investigate the possibility of receiving bulk supplies from either South East Water or Thames Water.	No	No – options to maximise existing transfers already included. Not feasible to increase further in timeframe of a drought.
Central	Weir Wood reservoir – drought order to temporarily reduce compensation flow	Drought order to reduce the statutory compensation flow release from Weir Wood reservoir in summer or winter to conserve storage.	Yes	Yes [Level 1 fact file reference – SI-Wei]
Central	River Arun	Application for derogation for the licence on the Tidal abstraction, which is currently attached to a cut-off clause if flow in the Upper Arun is not supported by flow from Horsham wastewater treatment works.	Yes	No Not considered to be a drought management action as unlikely for there not to be flows from Horsham wastewater treatment works.
Central	Inter-zonal transfer and distribution	Monitor and manage carefully the transfer of water to Sussex North WRZ from Sussex Worthing WRZ	Yes	Yes [Level 1 fact file reference – IZT_SNW]
Central	Rest groundwater sources (Worthing)	Use any spare winter/spring water available from the Pulborough river abstraction to supply customers in Worthing and in Brighton via the Rock Road transfer. This allows groundwater to be rested in key 'storage' sources, which can improve drought resilience.	Yes	Yes [Level 1 fact file reference – DP_RGS2]
Central	Network distribution improvements	There is a distribution constraint in the transfer of water from the Worthing area to Shoreham (Valve No.6). This constraint is currently being reviewed, but manual adjustments to the valving are possible in the meantime.	Yes	No – operational solution in place
Central	Inter-company bulk transfer	As part of the activities undertaken during the last drought event, the company has completed a scheme to allow part of the Portsmouth Water transfer to Sussex North WRZ to be diverted to Sussex Worthing WRZ in the Arundel area	Yes	No This has already been completed
Central	Re-commissioning of unused source (Lewes district)	The company has reviewed the feasibility of using Lewes district source in the event of a drought, but there are concerns over a lack of a net benefit to supply and the operability of the scheme.	No	No – operability concerns and concern over net supply benefit
Central	North Arundel – drought permit for an increase in abstraction	Under severe drought conditions, application for a drought permit to temporarily increase the abstraction licence daily limit from 4.5 Ml/d to 7.0 Ml/d.	Yes	Yes [Level 1 fact file reference – SI_Mad]

Annex 9: Options appraisal approach

Area	Option Name	Option Description	Included in Drought Plan 2018 consultation	Final Drought Plan 2019
Central	East Worthing - increase licensed volumes	Drought Permit to increase abstraction licence daily limit from 4.5 Ml/d to 7.0 Ml/d between October and December inclusive only.	Yes	Yes [Level 1 fact file reference – DP_Nor]

Appendix B: Fact files for drought management options included in the Drought Plan 2019

RESTRICTED INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST