
# Thames Water

# Strategic Environmental Assessment of Thames Water's Draft Drought Plan 2016

Draft Environmental Report

30th September 2016

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# NON TECHNICAL SUMMARY

Under the Water Industry Act 1991, Thames Water Utilities Ltd (TWUL) is required to prepare and update a Drought Plan (DP) every 4 years 3 months. TWUL's previous Final DP was published in 2013 and this Strategic Environmental Assessment (SEA) has been undertaken on TWUL's revised Draft DP in 2016. Following a period of public consultation, a Final DP will be published, this is expected to be in 2017. The DP provides a comprehensive statement of the actions TWUL will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact. It is consistent with TWUL's Water Resources Management Plan (WRMP), the objective of which is to set the strategic plan for the delivery of water resources to balance supply and demand over a 25 year period.

DPs encompass a number of drought options that will only be implemented if and when required. Each drought is different in terms of its severity, season, location and duration and each combination of these factors may require a different response in terms of measures. In the context of drought planning, individual drought options are taken to constitute alternatives. TWUL's Draft DP comprises a total of 51 drought options (10 supply side options, 6 demand options and 35 drought permit/order options).

SEA of certain plans and programmes is a statutory requirement under Directive 2001/42/EC, as transposed into UK law by the Environmental Assessment of Plans and Programmes Regulations 2004. The purpose of SEA is to provide high level and strategic protection of the environment by incorporating environmental considerations into the preparation of plans and policy. The nature of TWUL's Draft DP means that SEA is not a mandatory requirement in this case. However, the company has undertaken SEA to assist in the identification of the likely significant environmental effects of its drought options and to determine how any adverse impacts might be avoided or mitigated.

The SEA provides information on the relative environmental performance of alternatives, and is intended to make the decision-making process more transparent. The SEA can, therefore, be used to support the timing and implementation of drought options within the DP.

TWUL has also undertaken a Habitats Regulations Assessment (HRA) of its Draft DP 2016, which has been carried out in parallel with the SEA and is reported separately in the HRA Screening Report. The HRA screening process identifies whether each drought option in the DP (either alone, in combination or with other plans or projects) is likely to have significant effects on the integrity of European designated

sites, i.e. sites of international conservation importance. The findings of both the SEA and HRA have fed into the revision of the DP in an iterative process.

An SEA Scoping Report was issued in June 2016, and provided an opportunity for the statutory consultees to provide views on the proposed scope and level of detail of this SEA Environmental Report. Issues raised by consultees have been considered in preparing this report.

The findings of the SEA are presented within this Environmental Report, which accompanies TWUL's submission of the Draft DP to Defra and will be subject to public consultation.

## ASSESSMENT METHODOLOGY

The assessment has been 'objectives-led'. SEA objectives have been derived from environmental objectives established in law, policy or other plans and programmes, and from a review of the baseline information. The SEA objectives have been categorised under the following topic areas: biodiversity, flora and fauna; population and human health; material assets and resource use; water; soil, geology and land use; air and climate; archaeology and cultural heritage; and landscape and visual amenity; and inter-relationships.

The overall findings of the SEA describe the extent to which objectives for each topic are met by each of the drought options.

The outputs of the assessment are a completed appraisal framework table for each drought option, and a colour coded summary matrix (ranging from major beneficial impacts to major adverse impacts) which provides a comparative assessment of the residual environmental effects of implementing each drought option (i.e. those impacts remaining after the implementation of mitigation measures).

A cumulative, or in-combination, assessment has also been undertaken which has involved examining the likely significant effects of each of the drought options in combination with each other and in combination with the implementation of other relevant plans and programmes.

## FINDINGS OF THE ASSESSMENTS

### Demand side options

Overall, demand side measures serve to reduce pressure on water resources within each water resource zone by reducing customer demand for water, and therefore reducing the abstraction at source. This will in turn contribute to reducing the amount of energy needed for water abstraction, treatment and distribution. Demand

side measures typically provide moderate beneficial effects such as protecting and enhancing health and well-being through maintaining water supplies for essential use, and promoting efficient and sustainable use of water. Adverse impacts have been identified with respect to some businesses (e.g., landscaping, horticulture, recreation and tourism) where restrictions of water use are involved, particularly for ordinary or emergency drought orders.

**Supply side options**

Most of the ten supply side options in TWUL's DP are groundwater sources which require little, if any, construction works to operate. Overall, these options are expected to have minor to major beneficial impacts associated with benefits to security of public water supply. The North London Artificial Recharge Scheme, Thames Gateway Water Treatment Works and West Berkshire Groundwater Scheme have the greatest beneficial effects, as they would deliver large volumes of water during drought events

The Thames Gateway Water Treatment Works, reduction in lowest residual flow on the Lower Thames Control Diagram at Teddington Weir from 300Ml/d to 200Ml/d and West Berkshire Groundwater Scheme options have some moderate adverse effects. This is due to waste streams and air emissions from the Thames Gateway Water Treatment Works, deterioration in water quality in the River Thames, and reductions in freshwater flows into the Lower Thames and Upper Tideway, and associated water quality and biodiversity effects, due to reducing lowest residual flows at Teddington Weir. In addition, the West Berkshire Groundwater Scheme may have moderate adverse effects on other abstractors.

**Drought permit/order options**

Many of the drought permit/order options involve extensions of existing licences and do not involve any construction works. Reductions in groundwater and surface water levels also have the potential for adverse impacts on the SEA topics of Biodiversity, Population and Human Health, Archaeology and Cultural Heritage, and Landscape and Visual Amenity. Beneficial effects are also identified for some options mainly associated with the maintenance of water supplies. The assessment showed that for Water Resource Zones (WRZs) with a number of drought options available, some options would be considered more sustainable than others within the same WRZ. Therefore, in the event of a drought, the findings of the SEA can be reviewed and can contribute towards an informed assessment of the options proposed for implementation at that time. They will contribute to how TWUL will use them in accordance with the DP.

## Cumulative Impacts

The cumulative impacts assessment identified the potential for adverse impacts if two or more drought options were to be implemented at the same time, either intra- or inter-water resource zone. For the majority of combinations, impacts are considered unlikely, but in some cases, impacts have been identified where, for example, both options draw on the same water resource (e.g. same groundwater catchment or same river). Due to the uncertainty of timing of implementation of drought options, an assessment of each drought option against all other drought options has been undertaken. In the event of a drought, the findings of the SEA can be reviewed and a cumulative assessment made of the specific options proposed for implementation at that time, based on the findings of the one-on-one assessments.

Assessment of TWUL's Draft DP with other plans and programmes, including Environment Agency National Drought Plan, other water company DPs and WRMPs, identified potential cumulative impacts.

For example, cumulative impacts have been identified between the Waddon option and the Sutton and East Surrey Drought Plan.

The assessment of cumulative effects was subject to limitations because other plans are currently being updated or consulted upon. In-combination effects will, therefore, be reviewed and re-assessed as necessary between the draft and final stages of TWUL DP when the Plans are available.

## Mitigation and Monitoring

Consideration of mitigation measures has been an integral part of the SEA process. The SEA appraisals have been based on residual impacts, i.e. those impacts likely to remain after the implementation of reasonable mitigation.

During implementation of one or more drought options, appropriate monitoring will be undertaken to track any potential environmental effects which will in turn trigger deployment of suitable and practicable mitigation measures. Prior to implementation, TWUL will review the specific requirements for environmental monitoring in consultation with the Environment Agency and Natural England.

## Going Forward

The Draft DP and the SEA Environmental Report will be issued for public consultation. Once comments have been received through this consultation, TWUL may make changes to the Draft DP, and these changes will also be assessed using the approach to SEA set out in this report before the final DP is issued. When the DP is implemented during an actual drought event, TWUL will monitor its effects on the

environment, helping to ensure that the potential impacts identified in the SEA are considered in practice.

The Consultation period for this SEA Environmental Report will run concurrently with consultation on TWUL's draft DP. Comments should be sent by email:

consultations@thameswater.co.uk

Or by post :

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# 1 INTRODUCTION

## 1.1 BACKGROUND AND PURPOSE OF REPORT

Thames Water Utilities Limited (TWUL) is revising its Statutory Drought Plan (DP). TWUL is undertaking Strategic Environmental Assessment (SEA) of its draft DP and Habitats Regulations Assessment (HRA) screening is being undertaken in parallel.

SEA is a statutory requirement for plans or programmes which could have significant environmental implications, and helps to identify where there are potential impacts and how any negative impacts might be mitigated. More information about SEA, and the rationale for applying it to the draft DP, is provided in Section 1.2 below.

This Environmental Report is the second output of the SEA. In July 2016, a Scoping Report was issued for consultation[1] which summarised the baseline and framework that would be used for the assessment. Issues raised by consultees have been considered in preparing this Environmental Report (see Section 1.8 Consultation).

The Environmental Report presents the baseline information that sets the context for the assessment (Section 3) and provides details of the methods employed in undertaking the assessment (Section 4). The potential impacts of the various DP options are outlined in Section 5, with the impacts of the combinations of options included in the draft DP set out in Section 6. Information regarding mitigation and monitoring is provided in Section 7. A quality assurance checklist is provided in Section 8.

The SEA Environmental Report accompanies TWUL's submission of their draft DP to Defra. Section 1.8.3 provides details of how to comment on this Environmental Report.

## 1.2 APPLICATION OF SEA TO DROUGHT PLANNING

### 1.2.1 Overview of Strategic Environmental Assessment

SEA became a statutory requirement following the adoption of Directive 2001/42/EC (the SEA Directive) on the assessment of effects of certain plans and programmes on the environment. The Directive was transposed into UK legislation by The Environmental Assessment of Plans and Programmes Regulations 2004 (referred to as the SEA Regulations)[2].

The objectives of SEA are set out in Article 1 of the SEA Directive as follows:

1 Cascade Consulting (2016) Strategic Environmental Assessment of Thames Water Utilities Ltd Draft Drought Plan. Scoping Report. Prepared by Cascade Consulting for Thames Water Utilities Ltd. July 2016.
2 The Environmental Assessment of Plans and Programmes Regulations 2004 (Statutory Instrument 2004 No. 1633) apply to any plan or programme which relates solely or in part to England.

'*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'.*

The SEA Directive requires preparation of an Environmental Report in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and geographical scope of the plan or programme, are identified, described and evaluated.

It should be noted, however, that as stated in the Office of the Deputy Prime Minister (ODPM) SEA Guidelines[3] *"It is not the purpose of the SEA to decide the alternative to be chosen for the plan or programme. This is the role of the decision-makers who have to make choices on the plan or programme to be adopted. The SEA simply provides information on the relative environmental performance of alternatives, and can make the decision-making process more transparent."* The SEA can, therefore, be used to support the timing and implementation of actions within the plan, although this needs to be set in the context of applying SEA to drought planning, as described in Section 1.2.2 below.

The range of issues to be included in an SEA is set out in the regulations, and includes biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, and landscape.

SEA is usually focused mainly on environmental impacts. However, it is current best practice within the water industry to examine the broader social effects of water resource management planning, in addition to the environmental effects. As such, the full range of environmental and social effects which are likely to arise from implementation of TWUL's Draft DP 2016 are considered.

As identified above, the Government has produced SEA guidance which sets out the stages of the SEA process[4]. This, together with guidance for undertaking SEA of DPs, which has been produced on behalf of United Kingdom Water Industry Research (UKWIR)[5], has been used to inform the methodology for the SEA. These documents remain the recommended best practice guidance for preparation of SEAs of DPs.

A DP Guideline was published by the Environment Agency in 2011[6] and includes recommendations for SEA of DPs. A revised guideline was published by the

3 Office of the Deputy Prime Minister (2005) A Practical Guide to the Strategic Environmental Assessment Directive.
4 Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.
5 UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A). Prepared by Cascade Consulting.
6 Environment Agency (2011) Water Company Drought Plan Guideline.

Environment Agency in December 2015[7] and this and the guideline on extra information on Environmental Assessment for Water Company Drought Plans[8] and the Drought Plan Direction[9] has informed TWUL's Draft DP 2016 and the SEA.

### 1.2.2 Requirement for SEA and HRA of TWUL's Drought Plan

TWUL took the decision to undertake SEA (without performing a specific SEA screening exercise) as it was considered that an SEA would be useful in informing the Drought Plan and the options contained within.

The SEA Scoping Report which was subsequently consulted on in June/July 2016 contained a description of the route through screening. The conclusion was that SEA is required taking into account a precautionary approach and uncertainties associated with whether it sets a framework for future development consent and an unknown outcome of the Habitats Regulations Assessment screening (HRA) screening at that time.

An HRA has since been undertaken[10], and the outcome of the HRA screening is presented in a separate report.

Undertaking SEA of the DP helps guide TWUL's decision making both in preparation of the DP and during DP operation. Because every drought is different in terms of severity, location, duration and hence impact, the output of the SEA and HRA for each option helped to guide option selection specific to the characteristics of any potential drought. The SEA and HRA also include cumulative or in-combination assessments to ensure that options are not mutually exclusive, or that combinations of options, either within the DP or with other plans and programmes, would not cause significant adverse impacts. This therefore informs decision making at DP development stage and ensures important strategic decisions are made early on in the process.

## 1.3 THAMES WATER UTILITIES LTD WATER SUPPLY SYSTEM AND DROUGHT PLANNING

### 1.3.1 Introduction

TWUL supplies around 2,600 million litres of water per day to over 9 million people and some 450,000 businesses. In a typical day, Thames Water supplies around 2,000Ml/d to its London Water Resource Zone (WRZ) (2,300Ml/d peak), and

7 Environment Agency (2016*) How to write and publish a drought plan,* December 2015. Available at https://www.gov.uk/guidance/drought-plans-environmental-assessment-and-monitoring#carry-out-an-environmental-assessment, Accessed 1 March 2016.
8 Environment Agency (2016) Drought Plan Guidance Extra Information: Environmental Assessment for Water Company Drought Plans. May 2016.
9 Defra (2016) Drought Plan Direction 2016
10 Conservation of Habitats and Species Regulations 2010 (as amended)

around 600Ml/d to the remaining WRZs (710Ml/d peak). Some 77% of TWUL's water supply is derived from surface water abstraction (largely from the upper and lower Thames and the River Lee) and the remainder is derived from groundwater abstraction[11]. However, as for most of South East England, during periods of prolonged low rainfall leading to a serious drought, water supply is largely sustained by groundwater abstraction, groundwater derived baseflow within rivers and available water stored in reservoirs.

TWUL sets out how it will maintain planned levels of service in its Water Resources Management Plan (WRMP). The latest WRMP was published in 2014 and sets out a "twin-track" approach of demand management measures together with timely development of new water sources to ensure a positive supply/demand balance during prolonged dry weather. The 2014 WRMP sets out the actions Thames Water will take to maintain its customer levels of service for water supply reliability, in particular planning for a Temporary Use Ban and/or a non-essential use ban on selected water uses to only be implemented, on average, once in every 20 years and planning with the objective that rota cuts or standpipes will never be required. The TWUL DP complements the WRMP (published 2014) and is focused on the actions that TWUL will take during drought conditions when there are increased risks of temporary water use restrictions being required along with implementing temporary measures to augment water supply availability in order to maintain essential water supplies to all customers. The DP generally includes tactical information around short term measures specifically related to droughts whereas long term water resource measures are addressed in the WRMP. TWUL is currently preparing an updated WRMP due for publication in 2019. Where available, TWUL WRMP proposals are considered in the SEA of the TWUL DP (in combination and cumulative assessment).

The DP covers the period 2017 to 2022. Assuming that the Final DP will be published in 2017, subject to the requirements of the Drought Direction 2016, the next DP will be submitted within 4 years and 3 months after the date on which the last DP is published, or sooner, if a material change of circumstances occurs (see below and Section 1.4.1). The 2017 DP is, therefore, being prepared before the WRMP19. For the purposes of this Environmental Report, reference is made to key elements of WRMP14 (as the current published plan) and emerging issues from WRMP19 that are in the public domain (such as those on the Thames Water website) in carrying out the cumulative assessment between the DP and WRMP. Given the timeframes that the 2017 DP covers, it is unlikely that there will be significant changes to it arising from the Final WRMP19 once published. However, in the event of a minor change, this would be reflected in the annual drought plan review – these might include

11 Average abstraction rate, 2010-2015

minor changes to the possible terms of a drought permit/order application or minor changes to drought trigger control lines, etc. If there is a material change, TWUL would need to review this with the EA as to how best to approach it and would be dependent on level of materiality.

For water resource and drought planning purposes, the TWUL water supply area is divided into six water resources zones (WRZs) reflecting the different characteristics of the supply areas and associated risks associated with meeting demand within the TWUL area (see **Figure 1-1**). The largest of these zones is the London WRZ, which covers the Greater London area, followed by Swindon and Oxfordshire (SWOX). The water resources for both of these zones are largely based on abstraction from the River Thames, with the abstracted water stored in reservoirs. The other zones to the west of London are Kennet Valley (including Reading and Newbury); Henley; Slough/Wycombe/Aylesbury (SWA) and Guildford. These latter four zones are largely reliant on groundwater abstraction although there are significant abstractions directly from local rivers, notably the River Kennet in Reading and the River Wey near Guildford. The TWUL DP describes these WRZs from a drought perspective as follows:

### 1.3.2 London and SWOX Water Resource Zones

The water resources for London and SWOX WRZs are derived from a combination of river abstraction, raw water reservoir storage and groundwater sources. For both zones, the critical element in the system is the level of reservoir storage, which in turn is dependent upon river flow and during drought this is primarily made up of the baseflow from the catchment's major aquifers.

### 1.3.3 Kennet Valley and Guildford Water Resource Zones

Although groundwater provides a major contribution in these zones, the critical drought elements are the surface water sources on the River Kennet and River Wey for Kennet Valley and Guildford zones, respectively. Consequently, the protocol for these zones consists of a trigger mechanism for implementing drought measures based on river flows receding to critical low levels.

### 1.3.4 SWA and Henley Water Resource Zones

These two zones are entirely supplied by groundwater sources, which historically have remained robust during drought. That is to say, the critical point at which source outputs decline below their deployable output has never been reached. The approach in these zones, therefore, is to track groundwater levels in key regional observation boreholes as well as the linked performance of selected groundwater sources in relation to their deployable output. Stonor Park observation borehole has

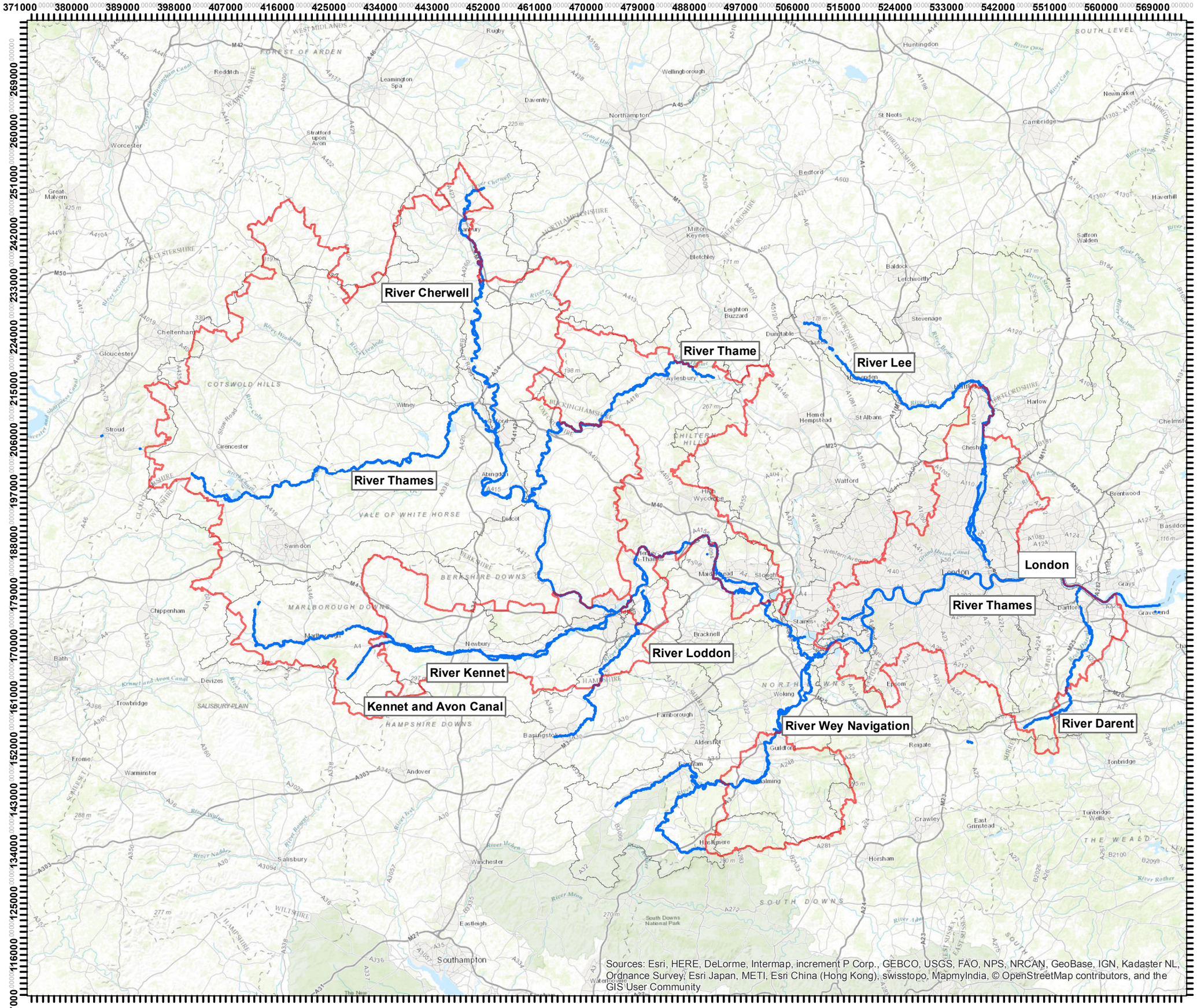
been chosen for tracking groundwater levels in the Chilterns and forms the basis for defining drought management guide levels for both the SWA and Henley zones.

Through the Environment Agency's Restoring Sustainable Abstraction (RSA) programme and requirements of European Directives, TWUL has made sustainability reductions in the SWOX, SWA and London WRZs. TWUL is currently investigating the requirement for potential sustainability reductions in the supply area.

### 1.3.5 Area under consideration for the SEA

The area under consideration for the SEA reflects the spatial scope of the DP which necessarily extends beyond the boundaries of the Thames Water supply area (**Figure 1-1**) to include the whole of the Thames river basin (reflecting the natural catchment area for Thames Water's existing water supplies).

**Figure 1-1 SEA Area under Consideration**




## Legend

- Surface Water Features
- Thames Water Supply Area
- Thames management catchment

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1:620,000

Note: All locations are approximate

This drawing incorporates Ordnance Survey Information



Project Title: Thames Water Draft Drought Plan SEA Environmental Report

Figure Title: SEA Area Under Consideration

Figure Number: Figure 1.1

Date: August 2016

## 1.4 TWUL DROUGHT PLANNING PROCESS

### 1.4.1 Overview and timetable

Water companies in England and Wales are required to prepare and maintain Statutory DPs under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003, which set out the short operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a DP as '*a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits*'.

TWUL last published its Statutory DP in 2013. The Drought Plan Direction 2016, which reflects changes made by the Water Act 2014 regarding the publication frequency of drought plans, states that revised DPs should be submitted according to the following schedule:

*4 (b) for a revised drought plan*

*(i) If section 39B(6)(a) of the Act applies, within 6 months after the date on which the material change of circumstances occurs; and*

*(ii) If section 39B(6)(c) of the Act applies, within 4 years and 3 months after the date on which its drought plan, or its last revised drought plan, is published.*

On 1 October 2010, Section 76 of the Water Industry Act 1991 was amended by the commencement of Section 36 of the Flood and Water Management Act 2010. The Water Use (Temporary Bans) Order 2010 also commenced on 1 October 2010 and provides definitions and clarifications on these activities.

The period encompassed by the Draft DP 2016 is 2017 to 2022. The next revision of the DP would be published in 2022.

Permission to abstract water, granted through licences issued by the Environment Agency and held and operated by TWUL, was subject to a 'Review of Consents' in accordance with Regulation 63 of the Conservation of Habitats and Species Regulations 2010 (as amended) (referred to as the Habitats Regulations). This Review of Consents was undertaken by the Environment Agency and included screening to determine a likely significant effect and Appropriate Assessment where likely significant effects are identified, to either affirm an abstraction licence or recommend action to amend the licence conditions. This was in order to ensure that the integrity of European protected sites is not at risk from the impacts of abstraction. Information provided by the outcomes of the Review of Consents was

used to support the HRA screening of TWUL's DP 2013[12]. This identified that none of the drought options included in the 2013 Final DP required an "Appropriate Assessment" for a Habitats Directive European site. As part of the 2016 update to the Draft DP, a HRA screening has been undertaken for all drought options to identify any requirements for Appropriate Assessment. This was undertaken in parallel with the SEA.

Only those drought options which are relevant to the period encompassed by the Draft DP 2016 (2017 to 2022) are considered in the SEA and HRA process. To this end, environmental effects of the Draft DP options are considered within the context of the current licence operating conditions. Potential new sources (which TWUL may bring on line in the future), new drought options, or revisions to existing options which are only envisaged to become operational post 2022 have, therefore, been excluded from the SEA and HRA screening process. The same approach has also been taken with respect to cumulative plans, projects and programmes, in that only those that are likely to be effective in the period to 2022 are considered in the SEA.

### 1.4.2 TWUL's Drought Options

In the 2013 Final DP, TWUL identified four triggers that act as decision-points for implementing drought management actions and options. The triggers correspond to TWUL's four customer Levels of Service for water supply reliability which set out the maximum frequency of imposing different types of water use restrictions on customers during drought conditions. These Levels of Service, together with the maintenance of a supply-demand balance in each WRZ, form the guiding principles of the TWUL water supply strategy, as set out in the Water Resources Management Plan (WRMP) and DP.

Drought management actions may be applied either company wide, by WRZ or to target a specific geographic area depending on the nature of the drought event prevailing at that time. The Draft DP 2016 contains a range of potential drought management options available to TWUL, for example bringing reserve water sources into use, implementation of drought permits/orders and temporary use bans. As specified in the Drought Plan Guidance[13] individual drought permits/orders are valid for up to six months. However, a more severe drought may require implementation of options beyond six months and TWUL is currently looking at a strategy to address this.

There are two broad categories of drought options: demand side options and supply

12 Thames Water Utilities Limited (2013) Habitats Regulations Assessment of Thames Water Utilities Limited Final Draft Statutory Drought Plan Screening Report (Final). Prepared by Cascade Consulting
13 Environment Agency (2016*) How to write and publish a drought plan,* December 2015. Available at https://www.gov.uk/guidance/drought-plans-environmental-assessment-and-monitoring#carry-out-an-environmental-assessment, Accessed 1 March 2016.

side options. These are described below.

### *Demand side options*

Demand side options are designed to reduce the demand for water and the options available to TWUL are consistent across all resource zones (see **Table 1-1**). Demand side options have been included in both the SEA and HRA screening. **Table 1-1** sets out the demand-side options that have been considered and the corresponding level of service: it should be noted that the planned measures in the TWUL Drought Plan and WRMP 2014 are designed to ensure that the Level 4 Emergency Drought Order option shown in the table will not be required in a repeat of the worst drought on record for the Thames catchment.

**Table 1-1 Demand side options (all water resource zones)**

| Measure | Description of Measure | Company Level of Service |
|---|---|---|
| Media /water efficiency campaign | Wide-scale media activity and advertising to encourage voluntary reduction in water usage | 1 |
| Leakage reduction | Increased leakage activity / Network pressure management | Not applicable |
| Sprinkler and unattended hose pipe ban | Sprinkler ban and unattended hose pipe ban | 2 |
| Temporary use ban | Temporary use ban | 3 |
| Drought Order to ban Non-Essential Use | Application to Defra to grant Non Essential Use Bans, as part of DD11 Ordinary Drought Order application | 3 |
| Emergency Drought Order | Application to Defra to grant an Emergency Drought Order to authorise water supply via temporary rota cuts or standpipes | 4 |

The above measures include a sub-set of TWUL's baseline demand management (leakage reduction, metering and water efficiency) in the WRMP. During the course of a drought, leakage reduction and water efficiency can, to some extent, be enhanced.

### *Supply side options*

Thames Water categorise the full range of supply side measures into the following:

- Optimisation of existing sources
- Strategic drought water resource schemes
- Bulk supplies
- Drought permits / orders
- Recommissioning of disused sources
- *In extremi*s options

Supply side measures are measures available to Thames Water to introduce during the course of a drought to increase the amount of water available for supply. Supply

side drought options that do not require drought permits/orders are listed in **Table 1-2.**

**Table 1-2 Supply side drought options**

| Option | Description | Trigger level |
|---|---|---|
| **London Water Resource Zone** | | |
| North London Artificial Recharge Scheme | The scheme is licensed for 275Ml/d peak and 150Ml/d average. | Drought Event Level 1 |
| Thames Gateway Water Treatment Works (TGWTW) | There is an Operating Agreement governing use of the scheme. The TGWTW would take between 4-6 weeks to ramp up to full output. The scheme is maintained in a state of readiness at the beginning of the year and so it does not need to be increased to full output from zero output. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| Hoddesdon Transfer Scheme (River Lee Flow Augmentation) | 12.5 Ml/d in any month - transfer of additional flow from Deephams sewage treatment works (STW) to Rye Meads STW for treatment, and which increases the discharge to the River Lee. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| Chingford Artificial Recharge Scheme (CHARS) | 16Ml/d average, 16Ml/d peak - CHARS is a water treatment works (WTW) using a number of the NLARS boreholes. It is not restricted to use under the NLARS Operating Agreement but can be used under any conditions, although its use is primarily to meet peak demands and drought demands. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| Reduction in lowest residual flow on the Lower Thames Control Diagram at Teddington Weir from 300Ml/d to 200Ml/d | 100Ml/d - increased abstraction from the River Thames, reducing residual flow over Teddington Weir. | Agreed between the Environment Agency and TWUL during potentially severe drought. |
| Earlier reduction in residual flow at Teddington Weir on the Lower Thames Control Diagram | The gain in abstraction capability would be equal to the difference in reduction agreed at each stage on the Lower Thames Control Diagram, for the period when that flow band is operable. | Agreed between the Environment Agency and TWUL during potentially severe drought. |
| East London Resource Development (ELRED) | ELRED comprises a number of groundwater abstraction locations along the route of the Channel Tunnel Rail Link which can be used to meet demand for water in London as well as contributing to the management of groundwater level rises. The licence held allows for abstraction of 18 Ml/d average and 20.57Ml/d peak. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| Stratford Box | Stratford Box is a groundwater source in East London which is run at low level of baseload output in order to keep groundwater levels suppressed to protect Stratford International Station. The option available during a drought is to increase the output from 5Ml/d to 8 Ml/d in aggregate with Edmeston Close. The baseload groundwater level management is not carried out by Thames and is for de-watering. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| Old Ford | Old Ford is a groundwater source in East London which abstracts from the Chalk aquifer. The licence allows for the abstraction of 4.5 Ml/d peak and average to meet peak demands and demand during drought conditions. | Drought Event Level 1 and naturalised Teddington flows below 3000Ml/d for 10 days |
| West Berkshire Groundwater Scheme (WBGWS) | Provides up to 66Ml/d benefit to London. The scheme also provides benefit to the Fobney abstraction during a severe drought. | Level 2 on the Lower Thames Control Diagram |

### *Supply Side Drought Permit/Order Options*

Potential drought permit/order sites are identified in **Table 1-3**.

**Table 1-3 Supply side drought permit/order options**

| Water Source | Potential Drought Permits/Orders |
|---|---|
| **London Water Resource Zone** | |
| Sundridge 1 | 0 - 6.64 Ml/d - relax the annual average licence rate so that for the 6 months of the drought order, 8Ml/d could be abstracted each day (1,470Ml over 6 months). |
| Sundridge 2 | 10.64Ml/d -relax the annual average licence rate and increase the peak licence rate so that for the 6 months of the drought order, 12Ml/d could be abstracted each day (sequential to Sundridge 1). |
| Lower Thames | 100 - 200Ml/d – depending on agreement with the Environment Agency and water availability. |
| Crayford | 2.8Ml/d - increase in abstraction beyond existing licence limit. |
| Horton Kirby (Aquifer Storage & Recovery) | 2.6Ml/d - the option would be to bring forward the Aquifer Storage and Recovery (ASR) scheme which abstracts from the Greensand aquifer. |
| Eynsford | Increase in peak rate of abstraction to 11.6Ml/d and relaxation of annual licence limit to allow 6 months of abstraction at peak daily rate (equating to 2,505.8Ml/y). |
| Wansunt | 6.0Ml/d - increase in abstraction beyond existing licence limit. |
| Increase in M2 annual licence | Increase the annual maximum abstraction permitted under the M2 licence by up to 5%. Abstractions would still be restricted when flows are medium to low (as per normal operations). |
| Waddon | 0 – 7Ml/d - increase in abstraction beyond existing licence limit (average rate per year of 7.6Ml/d). |
| **Swindon Oxford Water Resource Zone** | |
| Baunton 1 | 6.3Ml/d - re-establish abstraction from existing boreholes (revoked through sustainability reductions). |
| Baunton 2 | 17Ml/d – an additional abstraction of up to 10.7Ml/d above the additional 6.3Ml/d from Baunton 1. |
| Latton | 5Ml/d increase in average licence limit. |
| Meysey Hampton | 11.37Ml/d - additional abstraction from the Great Oolite boreholes when preceding flow (mean 5 days before) in the River Coln at Bibury is less than 68 Ml/d (i.e. as per the terms of the revoked 'summer' licence). |
| Farmoor | 10 - 30Ml/d - additional abstraction direct from the river in addition to that allowed by the existing licence. |
| Axford | Option would be to increase from the constrained level of 6 Ml/d peak and average to unconstrained abstraction of 13.1Ml/d peak and average. i.e. to go from 6 to 13.1Ml/d a gain of 7.1Ml/d. |
| Axford 2 | Option would be to increase from 6 Ml/d to 20 Ml/d peak and average i.e. an increase of 14 Ml/d. |
| Bibury | Up to 5Ml/d - Increase abstraction at the current boreholes by up to 5Ml/d. The arrangement for river flow augmentation would continue. |
| Blewbury | 5Ml/d- recommissioning of abstraction from boreholes (revoked in 2007). |
| Gatehampton | 3.5Ml/d - continuation of abstraction from boreholes beyond licence conditions. |
| Ogbourne emergency boreholes | Abstract 4 Ml/d from existing boreholes located 1 km away from the boreholes used in Thames Water's pre-existing licence |
| Oxford Canal - Banbury | 5 -10Ml/d - abstraction from Oxford Canal with the permission of the Canal and River Trust and transfer to Grimsbury Reservoir for storage and supply. |

| Water Source | Potential Drought Permits/Orders |
|---|---|
| Sor Brook | 4.546Ml/d - direct surface water abstraction - continuation of existing licence beyond flow constraint conditions. |
| Childrey Warren | 4.5Ml/d - resume historical abstraction to previous licence limit. |
| Ogbourne | Abstract 3.5 Ml/d from the existing Ogbourne boreholes used in the pre-existing licence. |
| **Kennet Valley Water Resource Zone** | |
| Compton 1 | 5Ml/d – re-establish abstraction from existing boreholes (revoked due to high nitrate concentrations). |
| Compton 2 | 8.6Ml/d – extending abstraction established from Compton 1 to abstract to the maximum possible yield of 13.6Ml/d. |
| Fobney Emergency Boreholes | 12 - 30Ml/d - manipulation of control mechanisms restricting maximum allowable abstraction. |
| Pangbourne | 7Ml/d – removes flow constraint and allows the full amount of the Pangbourne licence to be abstracted. |
| Playhatch | 2.8 - 4.1Ml/d - increase in peak abstraction of existing licence from 8.2Ml/d to 12.3Ml/d. |
| Fobney Direct | Variable, up to 20Ml/d – manipulation of the Arrowhead control structure at extreme low flows (<173Ml/d gauged at Theale) to allow abstraction from River Kennet at expense of flows to Holy Brook. |
| **Guildford Water Resource Zone** | |
| Albury | 6.8 - extension of abstraction beyond a lower limit of flow in associated Law Brook. |
| Shalford | 5Ml/d - extension of existing surface water abstraction from the River Wey. |
| **SWA Water Resource Zone** | |
| New Ground | 6.5Ml/d – resume historical abstraction from boreholes currently operating through emergency licence (10 days only at a rate of 8.138Ml/d through agreement with the Environment Agency). |
| Pann Mill | Increase from revised licence of 9.5 Ml/d up to old deployable output of 16.8 Ml/d (i.e. an option providing 7.3 Ml/d) |
| **Henley Water Resource Zone** | |
| Harpsden / Sheeplands | 6Ml/d – aggregate abstraction from multiple sources. |

### *Supporting Information*

Drought options included in the SEA and HRA screening will be documented by TWUL in the Draft DP 2016, accompanied by drought management action forms as set out in the Environment Agency DP Guideline[14]. Blank forms/tables are provided in **Appendix A** of this Environmental Report for information.

It is noted that some drought options may have different environmental effects depending on the season of implementation (for example a summer versus a winter drought). As drought measures can theoretically be required and implemented at any time of year, overall impacts have been assessed where possible on a worst-case basis.

Environmental assessment studies of TWUL's drought permit / order sites have been carried out and information from these studies were used to inform the SEA and HRA (see Sections 1.4 and 4).

14 Environment Agency (2015) How to write and publish a Drought Plan, December 2015. Available at https://www.gov.uk/government/collections/how-to-write-and-publish-a-drought-plan.

## 1.5 DROUGHT PERMIT/ORDER ENVIRONMENTAL STUDIES

Environmental Assessment Reports (EARs) have been prepared for the drought permits / order sites identified in Table 1-3, to support TWUL's DP.

The aim of these studies was to produce environmental reports that have been agreed with the Environment Agency and Natural England such that in the event of a drought, they are readily available for updating based on the prevailing drought situation at that time. The environmental studies consider all potentially affected habitats and species including, but not limited to, Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar features as well as any Site of Special Scientific Interest (SSSI) or species/habitats of principal importance for the conservation of biodiversity in England (identified in the Natural Environment and Rural Communities (NERC) Act 2006 Section 41). The reports also include Environmental Monitoring Plan (EMP) recommendations for each drought permit/order site. These environmental studies, undertaken outside of an actual drought event, are intended to be used as the basis for the EAR to be prepared in support of a specific drought permit/ order application, should the need arise.

Information from the assessments has been used to inform the SEA and HRA.

## 1.6 STAGES OF SEA PROCESS

**Table 1-4** is an extract from the Government's SEA guidance, the Practical Guide[15] that sets out the main stages of the SEA process and the purpose of each task within the process. This Scoping Report represents Stage A: Tasks A1 to A4 of the SEA process. Specific guidance on the application of the SEA process to DPs is provided in a best practice publication by UKWIR (2012)[16].

15 Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.
16 UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A). Prepared by Cascade Consulting.

## Table 1-4 SEA Stages and Tasks

| Stages in the SEA Process | |
|---|---|
| **SEA Stages and Tasks** | **Purpose** |
| **Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope** | |
| Task A1. Identifying other relevant plans, programmes and environmental protection objectives | To establish how the plan or programme is affected by outside factors to suggest ideas for how any constraints can be addressed, and to help identify SEA objectives |
| Task A2. Collecting baseline information | To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SEA objectives |
| Task A3. Identifying environmental problems | To help focus the SEA and streamline the subsequent stages, including baseline information analysis, setting of the SEA objectives, prediction of effects and monitoring. |
| Task A4. Developing SEA Objectives | To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed. |
| Task A5. Consulting on the scope of the SEA | To ensure the SEA covers the likely significant environmental effects of the plan or programme. |
| **Stage B: Developing and refining alternatives and assessing effects** | |
| Task B1. Testing the plan or programme objectives against SEA objectives | To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SEA objectives and help in developing alternatives. |
| Task B2. Developing strategic alternatives | To develop and refine strategic alternatives |
| Task B3. Predicting the effects of the plan or programme, including alternatives | To predict the significant environmental effects of the plan or programme and its alternatives |
| Task B4. Evaluating the effects of the plan or programme, including alternatives | To evaluate the predicted effects of the plan or programme and its alternatives and assist in the refinement of the plan or programme |
| Task B5. Mitigating adverse effects | To ensure that adverse effects are identified and potential mitigation measures are considered. |
| Task B6. Proposing measures to monitor the environmental effects of plan or programme implementation | To detail the means by which the environmental performance of the plan or programme can be assessed. |
| **Stage C: Preparing the Environmental Report** | |
| Task C1. Preparing the environmental report | To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers. |
| **Stage D: Consulting on the Draft Plan or programme and the Environmental Report** | |

| **Stages in the SEA Process** | |
|---|---|
| **SEA Stages and Tasks** | **Purpose** |
| Task D1. Consulting the public and consultation bodies on the draft plan or programme and the Environmental Report | To give the public and the consultation bodies an opportunity to express their opinions on the findings of the Environmental Report and to use it as a reference point in commenting on the plan or programme.<br><br>To gather more information through the opinions and concerns of the public |
| Task D2. Assessing significant changes | To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account |
| Task D3. Making decisions and providing information | To provide information on how the Environmental Report and consultees opinions were taken into account in deciding the final form of the plan or programme to be adopted |
| **Stage E: Monitoring the significant effects of the plan or programme on the environment** | |
| Task E1. Developing aims and methods for monitoring | To track the environmental effects of the plan or programme to show whether they are as predicted; to help identify adverse effects |
| Task E2. Responding to adverse effects | To prepare for appropriate responses where adverse effects are identified. |

## 1.7 STRUCTURE OF ENVIRONMENTAL REPORT

This SEA Environmental Report presents the findings of Tasks B1 to C1 set out in **Table** 1-4 and provides the consultation bodies with an opportunity to express their opinions on the findings of the assessment.

This Section (**Section 1**) of the report describes the overall purpose and process of the SEA and background to TWUL's water supply system and drought planning process. It also gives details of consultation on the SEA. The remainder of the report is structured as follows:

**Section 2** – Policy Context, provides a review of other policies, plans and programmes which influence the DP.

**Section 3** – Environmental Baseline Review, sets out the key environmental issues TWUL has considered in the SEA, drawing on information on the current state of the environment within TWUL's water supply area.

**Section 4** – Methodology, provides details of the methods employed in undertaking the assessment including the cumulative effects assessment methodology.

**Section 5** – Assessment of Drought Options, presents the potential impacts of the various DP options against the SEA framework.

**Section 6** – Cumulative Effects Assessment, discusses the potential in-combination impacts of drought options (intra-zone and inter-zone), demand management options and other plans and projects in the region.

**Section 7** – Mitigation and Monitoring, discusses measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the DP and monitoring to track the environmental effects to show whether they are as predicted, to help identify any adverse impacts and trigger deployment of mitigation measures.

**Section 8 –** Quality Assurance – provides a checklist of requirements from the ODPM guidance.

## 1.8 CONSULTATION

### 1.8.1 Overview

Two opportunities are available for consultation bodies to be formally involved during the SEA process: during the scoping process; and at the environmental reporting stage. These are discussed below.

When the revised DP is approved by the regulators and adopted by TWUL, the company will prepare an SEA Statement setting out how the SEA and any views expressed by the consultation bodies or the public have influenced the DP.

### 1.8.2 Consultation on the Scoping Report

Consultation bodies were invited to express their views on the Scoping Report and the scope of the SEA proposed in accordance with SEA Regulation 12(5).

The Scoping Report was issued on 1st June 2016 to the Environment Agency, English Heritage and Natural England and was made available to other consultees. The consultation period ran until 7th July 2016. The Statutory consultees were invited to comment on the report and the proposed scope of the SEA. The issues raised and responses to comments are presented in **Appendix B**.

### 1.8.3 Consultation on the Environmental Report

This Environmental Report has been produced in accordance with the approach agreed by TWUL and taking into consideration the responses received from consultation bodies in response to the Scoping consultation. It provides assessments of the likely significant effects of the drought options considered and selected by TWUL.

The consultation bodies, as well as the public, are invited to express their views on this Environmental Report and can use it as a reference point in expressing their views on TWUL's draft 2016 DP.

The Consultation period for this SEA Environmental Report will run concurrently with consultation on TWUL's draft DP. Comments should be sent by email:

consultations@thameswater.co.uk

Or by post :

Steve Tuck
Thames Water
Clearwater Court (Ground East)
Vastern Road
Reading
RG1 8DB

# 2 POLICY CONTEXT

## 2.1 INTRODUCTION

Annex 1 of the SEA Directive (Directive 2001/42/EC) requires the following specific baseline information to be included within the Environmental Report to identify the environmental characteristics of areas likely to be significantly affected by the DP:

- *"an outline of the…relationship with other plans and programmes"*
- *"the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme*"
- *"the environmental characteristics of areas likely to be significantly affected"*
- *"any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC (the 'Birds Directive') and 92/43/EEC (the 'Habitats Directive')*
- *"the environmental protection objectives, established at international, (European) Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation".*

In accordance with the SEA Directive, a summary of the key policy messages from the review of relevant policies, plans and programmes is presented in Section 2.2 (full review is presented in **Appendix C**). A summary of environmental baseline key issues is presented in Section 3 (full environmental baseline is presented in **Appendix D**).

## 2.2 REVIEW OF POLICIES, PLANS AND PROGRAMMES

One of the first steps in undertaking SEA is to identify other relevant policies, plans, programmes and environmental protection objectives. The review of these other plans sets out to establish how TWUL's DP might be affected by other plans, to identify other environmental protection objectives which the DP should consider and to help to identify the objectives for the SEA.

Potentially relevant plans and programmes were identified at the international, national, regional and local level. If the plan or programme does not have a significant effect on achieving the objectives of the DP or the DP does not have a significant effect on achieving the objectives of the other plan or programme, it was

not included.

The full list of international, national, regional and local policies, plans, programmes and strategies reviewed and the key messages, targets and how they relate to SEA topics and SEA objectives are provided in **Appendix C** and listed in **Table 2-1.**

## Table 2-1 Key Policy Messages derived from the review of Plans, Policies and Programmes

| SEA Topic | Key Messages | Policies |
|---|---|---|
| **Biodiversity, flora and fauna** | Conservation and enhancement of the natural environment and of biodiversity, particularly internationally and nationally designated sites whilst taking into account future climate change. | International:<br>The Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979)<br>The Bonn Convention on the Conservation of Migratory Species of Wild Animals (1983)<br>European Commission, Birds Directive (2009/147/EC)<br>European Commission, Directive on Animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals (2006/88/EC)<br>European Commission, Habitats Directive (1992/43/EEC)<br>Ramsar Convention The Convention on Wetlands of International Importance (1971)<br>United Nations (1992) Convention on Biological Diversity (CBD)<br>National:<br>Conservation of Habitats and Species Regulations 2010 (as amended by the Conservation of Habitats and Species (Amendment) Regulations 2011 and 2012)<br>The Countryside and Rights of Way (CROW) Act 2000<br>Environmental Protection Act 1990<br>Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 SI3104<br>Wildlife and Countryside Act 1981 (as amended)<br>DCLG (2012) National Planning Policy Framework<br>Defra (2002) Working with the grain of nature: a biodiversity strategy for England<br>Defra (2005) Securing the Future: Delivering UK Sustainable Development Strategy<br>Defra (2010) Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network<br>Defra (2011) Water for Life - Water White Paper<br>Defra (2011) The Natural Choice: Securing the value of nature. The Natural Environment White Paper<br>Defra (2011) Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services<br>Defra (2011) UK National Ecosystem Assessment and Defra, 2014, UK National Ecosystems Assessment Follow on, Synthesis of Key Findings Defra, 2011, Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services<br>Defra (2015) The Great Britain Invasive Non-native Species Strategy Defra (2008), England Biodiversity Strategy –climate change adaptation principles<br>Defra (2015) The government's response to the Natural Capital Committee's third State of Natural Capital report<br>Defra (2016) Single Departmental Plan 2015-202017<br>Environment Agency (undated) Hydroecology: Integration for modern regulation<br>Environment Agency (undated) WFD River Basin Characterisation Project<br>Natural England (2014) Information for planners on reviewing development proposals that might affect protected species and sites, including standing advice. |
| | Promote a catchment-wide approach to water management to ensure better protection of biodiversity. | |
| | To achieve favourable condition for priority habitats and species. | |
| | Avoidance of activities likely to cause irreversible damage to natural heritage. | |
| | Ensure maintenance and/or support provision of fish passage for migratory fish. | |
| | Support well-functioning ecosystems, respect environmental limits and capacities, and maintain/enhance coherent ecological networks, including provision for fish passage and connectivity for migratory/mobile species. | |
| | Strengthen the connections between people and nature and realise the value of biodiversity. | |
| | Protection, conservation and enhancement of natural capital. Ecosystem services from natural capital contributes to the economy and therefore should be protected and, where possible, enhanced.<br><br>Avoidance of activities likely to cause the spread of Invasive Non-Native Species (INNS)<br><br>A need to protect the green infrastructure network. | |

17 The SEA will also take account of any emerging policy and strategic direction from Defra's development of its 25 year plan for the Environment (publication date not yet confirmed)

| SEA Topic | Key Messages | Policies |
|---|---|---|
| | | Regional/Local:<br>Natural England Site Improvement Plans (SIPs): Thames River Basin District (2014): Cothill Fen, Greater Thames Complex, Kennet Valley Alderwoods, Lee Valley, little Wittenham, Mole Gap to Reigate Escarpment, North Meadow & Clattinger Farm, Oxford Meadows, Peters Pit, River Lambourn and Kennet-Lambourn Floodplain, Shoreheath Common, South West London Waterbodies, Wealten Heaths Woolmer Forest. Natural England National Character Area (NCA) Profiles<br>Biodiversity Action Plans<br>Environment Agency, Catchment Abstraction Management Strategy (various dates for relevant catchments)<br>(see Appendix C)<br>Environment Agency (2004) Thames Salmon Action Plan (SAP)<br>Environment Agency (2006) Thames Regional Fisheries Strategy: A Bright Future for Our Fish 2006 – 2011.<br>Environment Agency (2008) Thames Eel Management Plan.<br>Environment Agency and Defra, (2016) Thames River Basin District River Basin Management Plan<br>Environment Agency and Defra, (2016) River Severn River Basin District River Basin Management Plan<br>The Environmental Damage (Prevention and Remediation) (England) Regulations 2015<br>London Biodiversity Partnership (2009) London Biodiversity Action Plan<br>Natural Environment and Rural Communities Act 2006<br>Salmon and Freshwater Fisheries Act 1975<br>South East England Biodiversity Forum (2009) South East Biodiversity Strategy |
| **Population and human health** | Water resources play an important role in supporting the health and recreation needs of local communities and businesses.<br>To ensure all communities have a clean, safe and attractive environment in which people can take pride.<br>To ensure secure, safe, reliable, sustainable and affordable supplies of water are provided for all communities.<br>Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities.<br>Promotion of healthy communities and protection from risks to health and wellbeing.<br>Promotion of a sustainable economy supported by access to essential utility | International:<br>The Environment Noise Directive (Directive 2002/49/EC)<br>European Commission, Drinking Water Directive (1998/83/EC)<br>United Nations Economic Commission for Europe (1998) Aarhus Convention - Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters<br><br>National:<br>The Countryside and Rights of Way (CROW) Act, 2000<br>Environmental Protection Act 1990<br>DCLG (2012) National Planning Policy Framework<br>Defra (2005) Securing the Future; Delivering UK Sustainable Development Strategy<br>Defra (2011) Water for Life -Water White Paper<br>Defra (2011) The Natural Choice: securing the value of nature. The Natural Environment White Paper<br>Environment Agency (2014) Corporate Plan 2014 – 2016<br>Environment Agency (2015) Creating a Better Place: Environment Agency Corporate Strategy 2014-2016<br>HM Treasury (2015) Fixing the Foundations: Creating a More Prosperous Nation<br>HM Treasury Infrastructure UK (2014) National Infrastructure Plan<br>The Natural Environment and Rural Communities (NERC) Act (2006) |

| SEA Topic | Key Messages | Policies |
|---|---|---|
| | and infrastructure services. | Regional/Local:<br>Mayor of London (2011) Managing Risks and Increasing Resilience The Mayor's Climate Change Adaptation Strategy<br>Mayor of London (2011), The London Plan Spatial Development Strategy for Greater London. Minor Alterations to London Plan 2015<br>Mayor of London (2011) The London Plan - Spatial Development Strategy for Greater London (minor alterations 2015)<br>Thames Water (2009) Taking care of water - Strategic Direction Statement 2010-2035)<br>Other Strategic Direction Statements from other water companies – including United Utilities and Severn Trent Water<br>Thames Waterways Plan 2015 – 2021 (2015), EA for the River Thames Alliance<br>Lee Valley Regional Park Authority (2007) Park Development Framework<br>Port of London Authority (2016) The Vision for the Tidal Thames<br>Mayor of London (2011) Securing London's Water Future The Mayor's Water Strategy<br>Public Rights of Way Improvement Plans (ROWIPs) |
| **Material assets and resource use** | Promote sustainable management of natural resources, sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently.<br>Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources<br>Contribute to a resource efficient, green and competitive low carbon economy. Maintain a reliable public water supply and ensure there is enough water for human uses whilst seeking to maintain a healthy water environment<br>Minimise the production of waste, ensure waste management is in line with the 'waste hierarchy', and eliminate waste sent to landfill.<br>Promote the sustainable management of natural resources. | International:<br>United Nations (2002) Commitments arising from the World Summit on Sustainable Development, Johannesburg<br><br>National:<br>DCLG (2012) National Planning Policy Framework<br>Defra (2011) Government Review of Waste Policy in England 2011<br>Defra (2011) The Natural Choice: securing the value of nature, The Natural Environment White Paper<br>Environment Agency (2009) Water Resources Strategy for England and Wales<br>Environment Agency (2010) Water Resources Action Plan for England and Wales<br>Environment Agency (2009)Water Resources Strategy – A Regional Action Plan for Thames Region<br>Environment Act 1995<br>Environmental Protection Act 1990<br>HM Treasury Infrastructure UK (2014) National Infrastructure Plan Defra (2008) Future Water: the Government's water strategy for England<br>HM Treasury (2015) Fixing the Foundations: creating a more prosperous nation. |
| **Water** | Promote sustainable water resource management including a reduction in water consumption<br>Maintain and improve water quality (surface waters, groundwater and bathing waters).<br>Expanding the scope of water quality protection measures to all waters, | International:<br>European Commission Floods Directive (2007/60/EC)<br>European Commission The Water Framework Directive (2000/60/EC)<br>European Commission Drinking Water Directive (1998/83/EC)<br>European Commission Environmental Liability Directive (2004/35/EC)<br>European Commission The Groundwater Directive (Protection of Groundwater Against Pollution Caused by Certain Dangerous |

| SEA Topic | Key Messages | Policies |
|---|---|---|
| | surface waters and groundwater. | Substances) (80/68/EEC) |
| | Improve the quality of the water environment and the ecology which it supports, and continue to provide high levels of drinking water quality. | European Commission Revised Bathing Water Quality Directive (76/160/EEC)<br>European Commission Urban Waste Water Treatment Directive (91/271/EEC) |
| | Ensure appropriate management of abstractions and protect flow and level variability across the full range of regimes from low to high conditions. | National:<br>Defra (2005) Making Space for Water<br>Defra (2008) Future Water: the Government's water strategy for England<br>Defra (2011) Water for Life - Water White Paper<br>Defra (2011) The Natural Choice: Securing the value of nature. The Natural Environment White Paper<br>Defra (2012) The UK Climate Change Risk Assessment 2012 Evidence Report<br>Defra and Environment Agency (2015) How to Write and Publish a Drought Plan<br>Environment Agency (1999) Restoring Sustainable Abstraction Programme<br>Environment Agency (2010) National Flood and Coastal Risk Management Strategy for England<br>Environment Agency (2010) Water Resources Action Plan for England and Wales<br>Environment Agency (2009) Water Resources Strategy for England and Wales<br>Environment Agency Flood Risk Management Plan<br>Flood and Water Management Act (2010)<br>HM Treasury Infrastructure UK (2014) National Infrastructure Plan<br>The Water Act (2003)<br>The Water Environment (WFD) (England and Wales) Regulations 2003<br>The Water Resources Management Plan Regulations 2007<br>Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 SI3104<br>Water Industry Act 1991 was amended by the commencement of Section 36 of the Flood and Water Management Act 2010<br><br>Regional/Local:<br>The Port of London Act 1968<br>Drought Plans by Affinity Water, Anglian Water, Essex and Suffolk Water, Severn Trent Water, South East Water, Southern Water, Sutton and East Surrey and Wessex Water<br>Environment Agency, Catchment Abstraction Management Strategy (various dates for relevant catchments) (see Appendix C)<br>Environment Agency (2015) Drought Response: our framework for England<br>Environment Agency (2006) River Thames Alliance: Thames Waterway Plan 2006-2011<br>Environment Agency (2007) Water for the Future - Managing Water in the South East of England<br>Environment Agency (2009) Water Resources Strategy – A Regional Action Plan for Thames Region<br>Environment Agency (2011) Water Resources Strategy – A Regional Action Plan for Thames Region<br>Environment Agency (2013) Managing Water Abstraction<br>Environment Agency and other lead authorities Shoreline Management Plans<br>Environment Agency (2014) Thames Catchment Abstraction Licencing Strategy<br>Environment Agency and Defra, (2016) Thames River Basin District River Basin Management Plan |
| | Steer new development to areas with the lowest probability of flooding and manage any residual flood risk, taking account of the impacts of climate change. | |
| | Promote measures to enable and sustain long term improvement in water efficiency. | |
| | Ensure a sustainable balance between the supply and demand for water. | |

| SEA Topic | Key Messages | Policies |
|---|---|---|
| | | Environment Agency (2016) River Thames Scheme: reducing flood risk from Datchet to Teddington<br>Mayor of London (2011) Managing Risks and Increasing Resilience The Mayor's Climate Change Adaptation Strategy<br>Mayor of London (2011) Securing London's Water Future, The Mayor's Water Strategy<br>Mayor of London, London Infrastructure Plan 2050 A Consultation<br>Mayor of London (2011) Securing London's Water Future The Mayor's Water Strategy.<br>Other relevant water company WRMPs (2014/2015) and Drought Plans (2013-2014)<br>Thames Water (2013) Business Plan. Thames Water 2015 to 2020<br>Thames Water (2014), Water Resource Management Plan, 2015-2040<br>Thames Water/Environment Agency (2015) National Environment Programme for Thames Water 2015-2020<br>UKTAG WFD Guidance Documents (various dates)<br>Water resources management plans by other water companies in adjacent areas.<br>Water UK (2016) Water Resources Planning Framework (2015-2065)<br>Environment Agency (2016) River Thames Scheme: reducing flood risk from Datchet to Teddington |
| **Soil, geology and land use** | Protect and enhance the quality and diversity of geology (including geological SSSIs) and soils, including geomorphology and geomorphological processes which can be lost or damaged by insensitive development.<br>Ensure that soils will be protected and managed to optimise the varied functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage, supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development.<br>Promote catchment-wide approach to land management by relevant stakeholders, in order to benefit natural resources, reduce pollution and develop resilience to climate change.<br>Promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions.<br>Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value. | International:<br>Council of Europe (2003) European Soils Charter<br>European Commission (2006) Thematic Strategy for Soil Protection<br><br>National:<br>DCLG (2012) National Policy Planning Framework<br>Defra (2004) The First Soil Action Plan for England<br>Defra (2004) Rural Strategy 2004<br>Defra (2006) Sustainable Farming and Food Strategy: Forward Look<br>Defra (2009) Safeguarding our Soils – A Strategy for England<br>HM Treasury Infrastructure UK (2014) National Infrastructure Plan<br>Mayor of London, London Infrastructure Plan 2050 A Consultation<br>The Countryside and Rights of Way (CROW) Act (2000)<br>Wildlife and Countryside Act 1981 (as amended).<br><br>Regional/local:<br>National Character Area (NCA) profiles |
| **Air and** | Reduce greenhouse gas emissions. | International: |

| SEA Topic | Key Messages | Policies |
|---|---|---|
| **climate** | Targets include: reduce the UK's greenhouse gas emissions by at least 80% (relative to 1990 levels) by 2050 and cut London's CO2 emissions by 60% by 2025.<br>Reduce the effects of air pollution on ecosystems.<br>Improve overall air quality.<br>Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change.<br>Build in adaption to climate change to future planning and consider the level of urgency of associated risks of climate change impacts accordingly.<br>Need for adaptive measures to respond to likely climate change impacts on water supply and demand. | The Cancun Agreement (2011) & Kyoto Agreement (1997)<br>European Commission (2008) Ambient Air Quality Directive (2008/50/EC)<br>European Commission (2009) Promotion of the use of energy from renewable sources Directive (2009/28/EC)<br>European Commission (2005) Thematic Strategy on Air Pollution<br><br>National:<br>The Climate Change Act (2008)<br>DECC (2007) Energy White Paper: Meeting the Energy Challenge<br>DECC (2009) UK Renewable Energy Strategy<br>DECC (2011) Planning our electric future: a White Paper for secure, affordable and low carbon electricity<br>DCLG (2012) National Planning Policy Framework<br>Defra (2008) England Biodiversity Strategy –climate change adaptation principles<br>Defra (2012) The UK Climate Change Risk Assessment 2012 Evidence Report<br>Defra (2007) The Air Quality Strategy for England, Scotland and Wales<br>Defra (2013) The National Adaptation Programme: Making the country resilient to a changing climate<br>The Energy Act (2013)<br>Environment Agency (2014) Corporate Plan 2014 - 2016<br><br>Regional/Local:<br>Defra (2015) Climate adaptation reporting second round: South East Water<br>London Climate Change Partnership (2009) Adapting to Climate Change, Creating Natural Resilience.<br>Mayor of London (2011) Managing Risks and Increasing Resilience The Mayor's Climate Change Adaptation Strategy<br>UKCIP (2009) UK Climate Projections UKCP09 (2009) |
| **Archaeology and cultural heritage** | Built development in the vicinity of historic buildings and Scheduled Monuments could have implications for the setting and/or built fabric and cause damage to any archaeological deposits present on the site.<br>Ensure active management of the Region's environmental and cultural assets.<br>Ensure effects resulting from changes to water level (surface or sub-surface) on all water dependent historical and cultural assets are avoided.<br>Promote the conservation and enhancement of the historic environment, including the promotion of heritage and landscape as central to the culture of the region and conserve and enhance distinctive characteristics | International:<br>The Convention for the protection of the architectural heritage of Europe (Granada Convention)<br>The European Convention on the protection of archaeological heritage (Valetta Convention)<br><br>National:<br>Ancient Monuments and Archaeological Areas Act 1979<br>DCLG (2012) National Planning Policy Framework<br>Department for Culture, Media and Sport (2001) The Historic Environment – A Force for the Future<br>English Heritage (2010) Heritage at Risk, English Heritage (2008), Climate Change and the Historic Environment<br>Historic England (2013) Strategic Environmental Assessment, Sustainability Appraisal and the Historic Environment<br>Historic England (2015) Historic Environment Good Practice Advice in Planning Note 3<br>Planning (Listed Buildings and Conservation Areas) Act 1990 |

| SEA Topic | Key Messages | Policies |
|---|---|---|
| | of landscape and settlements. | |
| | Conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations'. | |
| | Consider effects on important wetland areas with potential for paleo-environmental deposits | |
| **Landscape and visual amenity** | Protection and enhancement of landscape (including designated landscapes, landscape character, distinctiveness and the countryside) | International:<br>European Landscape Convention (Florence Convention)<br>Council of Europe (2006) European Landscape Convention<br><br>National:<br>The Countryside and Rights of Way (CROW) Act (2000)<br>DCLG (2012) National Planning Policy Framework<br>Defra (2010) Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network<br>Defra (2011) The Natural Choice: Securing the value of nature. The Natural Environment White Paper<br>Wildlife and Countryside Act 1981 (as amended)<br><br>Regional/Local:<br>Natural England National Character Area (NCA) Profiles<br>Cotswolds AONB Management Plan 2013-2018<br>Chiltern Hills AONB Management Plan 2014-2019<br>Kent Downs AONB Management Plan 2014-2019<br>The North Wessex Downs AONB Management Plan 2014-2019<br>South Downs National Park (2013) Partnership Management Plan, Shaping the future of your south downs national park 2014-2019.<br>Surrey Hills AONB Management Plan 2014-2019<br>Thames Landscape Strategy (2012) Our Guidance Document: The Thames Landscape Strategy Review 2012 |
| | Abstraction and low river flows could negatively affect landscape and visual amenity. | |
| | Enhance the value of the countryside by protecting the natural environment for this and future generations. | |
| | Improve access to valued areas of landscape character in sustainable ways to enhance its enjoyment and value by visitors and stakeholders. | |

# 3 ENVIRONMENTAL BASELINE REVIEW

## 3.1 INTRODUCTION

An essential part of the SEA process is to identify the current baseline conditions and their likely evolution. It is only with knowledge of existing conditions that impacts of the DP can be identified, mitigated and subsequently monitored.

The SEA Directive (Directive 2001/42/EC) requires that the evolution of baseline conditions of the plan area (that would take place with or without implementation of the plan) is identified. This is useful when determining impact significance, particularly with regards to baseline conditions that may already be improving or worsening and the rate of such change.

Full environmental baseline data is presented in **Appendix D** and have been drawn from a variety of sources, including a number of the plans and programmes reviewed as part of the SEA process given in **Table 2-1**. This environmental baseline review also summarises the likely future trends for the environmental issues being considered (where information is available). The key issues arising from the review of baseline conditions are summarised in Section 3.4.

## 3.2 LIMITATIONS OF THE DATA AND ASSUMPTIONS MADE

The Thames Water supply area is large and covers a number of regions, which makes establishing a baseline at the sub-regional level challenging. There are also challenges around extrapolating information from data collated at differing spatial resolutions. Spatial data have been obtained for most of the SEA topics, and the baseline is presented graphically as mapped information where appropriate. In some instances, reporting cycles mean that available information is dated.

## 3.3 OVERVIEW

The Thames Water supply area is approximately 12,900 km$^2$ in area. Approximately two-thirds of the catchment is permeable, consisting of chalk, middle Jurassic limestones and river gravels, and is thus subject to direct recharge from rainfall. The Thames river basin is conventionally divided into four zones: the tidal, lower, middle and upper Thames. The upper Thames flows through a predominantly rural landscape and does not pass through any major towns. The middle Thames, from its confluence with the River Windrush to Teddington at the head of the Thames estuary, is also rural, passing through some towns, and becomes predominantly urban as it heads towards London.

The Thames Valley and London normally receive less than 650mm of rainfall per year[18]. Average yearly rainfall is greater in the west than the east of the region. According to the previous River Basin Management Plan (RBMP)[19] the Thames River Basin District is one of the driest in the UK, and is classified as 'water stressed'. The River Thames is an important water source for TWUL and other water companies for supplying drinking water to the Thames Valley and providing two-thirds of London's drinking water. Water demand in the region is high relative to other parts of the country. Groundwater, particularly the chalk aquifer, is also an important source providing around 40% of public water supplies. Current assessments show that groundwater sources are fully utilised over most of the Thames River Basin District.

The Thames Water supply area spans four NUTS (nomenclature of territorial units for statistics)[20] regions; the South East, London, East and South West (see **Figure 1-1**). The baseline information has been presented at local, regional and national levels where possible for comparative reasons and to aid the assessment during Stage B of the SEA:

- Local: The baseline within the Thames Water supply area or within a specific WRZ. These data are usually sourced directly from Thames Water. Spatial analysis also allows the presentation of data that lie within the Thames Water supply area or scheme source area. In some circumstances London is discussed separately from the rest of the supply area due to its characteristics and importance as the capital.

- Regional: The baseline in the counties or regions that the Thames Water supply region and scheme source areas cover. The Thames Region RBMP is a valuable source of information that includes the Thames Water supply region as well as the remainder of the Thames catchment.

- National: The baseline for the UK, England or in some cases the agglomerated baseline for the four regions that the Thames Water supply region intersects.

The baseline has been reviewed for each of the SEA topics, and is presented in full in **Appendix D**. Key issues identified from the baseline are presented in **Section 3.4**.

18 Met Office (2012) Accessed at http://www.metoffice.gov.uk/climate/uk/so/
19 Environment Agency (2009) River Basin Management Plan., Thames River Basin District (updated 2015).
20 In England, the region is the highest tier of sub-national division used by central Government. They are defined as first level NUTS regions ("NUTS 1 regions") within the European Union. Regional Government offices were abolished in 2011.

## 3.4 KEY ISSUES

### 3.4.1 Biodiversity, Fauna and Flora Key Issues

The key sustainability issues arising from the baseline assessment for biodiversity are:

- The need to protect or enhance the region's biodiversity, particularly within designated sites, protected species and habitats of principal importance. The need to avoid activities likely to cause irreversible damage to natural heritage.
- The need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors and maintain fish passage.
- The need to maximise prevention of the spread of invasive species and ensure management practices allow early detection and eradication of any introduced invasive species.
- The need to recognise the importance of allowing wildlife to adapt to climate change.
- The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services.

### 3.4.2 Population and Human Health Key Issues

The key sustainability issues arising from the baseline assessment for population and human health are:

- The need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water for health and wellbeing.
- The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas.
- The need to ensure public awareness of drought conditions and importance of maintaining resilient, reliable public water supplies without the need for emergency drought measures.
- The need to ensure water quantity and quality is maintained for a range of uses including tourism, recreation, navigation and other use such as agriculture.
- The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists, including opportunities for access to, protecting and enhancing

recreation resources, green infrastructure and the natural and historic environment.

- The need to accommodate an increasing population.
- Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and wellbeing and the economy.

### 3.4.3 Material Assets and Resource Use Key Issues

The key sustainability issues arising from the baseline assessment for Material Assets and Resource Use are:

- The need to minimise the consumption of resources, including water and energy
- The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill.
- The need to continue to reduce leakage from the water supply system to help reduce demand for water.
- Daily consumption of water is higher than the national average in the area and consequently there is a continued need to encourage more efficient water use.

### 3.4.4 Water Key Issues

The key issues arising from the baseline assessment for water are:

- The need to further improve the quality of the regions river, estuarine and coastal waters taking into account WFD objectives.
- The need to maintain quantity and quality of groundwater resources taking into account WFD objectives.
- The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters.
- The need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply.
- The need to ensure that people understand the value of water.

### 3.4.5 Soil, Geology and Landscape Key Issues

The key sustainability issues arising from the baseline assessment for soil, geology and land use are:

- The need to protect and enhance geological features of importance (including geological SSSIs) and maintain and enhance soil function and health.
- The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources).
- The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.

### 3.4.6 Air and Climate Key Issues

The key sustainability issue arising from the baseline assessment for air and climate is:

- The need to reduce air pollutant and greenhouse emissions and limit air emissions to comply with air quality standards.
- The need to reduce greenhouse gas emissions (industrial processes and transport).
- The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity) as well as accommodating potential opportunities afforded by climate change.

### 3.4.7 Archaeology and Cultural Heritage Key Issues

The key sustainability issue arising from the baseline assessment for archaeology and cultural heritage is:

- The need to conserve or enhance sites of archaeological importance and cultural heritage interest, particularly those which are sensitive to the water environment.

### 3.4.8 Landscape and Visual Amenity Key Issues

The key sustainability issue arising from the baseline assessment for landscape and visual amenity is:

- The need to protect and improve the natural beauty of the region's AONBs, National Parks and other areas of natural beauty.

- The need to protect and improve the character of landscapes and townscapes.

### 3.4.9 Inter-relationships

It is noted that there are inter-relationships between SEA topics. These include impacts of changes to water flows and quality on biodiversity, the economy, recreation, tourism, navigation, cultural heritage and landscape. Inter-relationships that result in changes to individual effects are considered by evaluation of synergistic effects throughout the assessment.

# 4 METHODOLOGY

## 4.1 INTRODUCTION

This section describes the methodology that has been used to undertake the SEA of the drought options in TWUL's draft DP.

**What the SEA Regulations require:**

According to Regulation 12:

*(2) The report shall identify, describe and evaluate the likely significant effects on the environment of –*
*(a) implementing the plan or programme; and*
*(b) reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme*

and according to Schedule 2, the Environmental Report should include:

*6. The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects and secondary, cumulative and synergistic effects.*

*8. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.*

## 4.2 ASSESSMENT METHODOLOGY AND SEA FRAMEWORK

The environmental assessments of the drought options are 'objectives-led'. Establishing assessment objectives is a recognised way of considering the environmental effects of a plan and comparing the effects of alternatives. SEA objectives are often derived from environmental objectives established in law, policy or other plans and programmes, or from a review of baseline information and environmental problems (based on the SEA topics).

An assessment framework of objectives has been developed based on:

- The current state of the environment in the TWUL water supply area (see Section 3).
- The key environmental issues identified in Section 3.

- The key policy messages and environmental protection objectives identified in the review of policies, and other plans and programmes (see Section 2). It was important that the assessment took these objectives into account as this helped to highlight any area where the DP will help or hinder the achievement of the objectives of other plans.

SEA objectives are set out in **Table 4-1.** The following sections describe how TWUL have used these SEA objectives in the assessment of the environmental effects of the drought options. These SEA objectives are intended to reflect changes that contribute to sustainability. By assessing each drought option against the objectives, it is more apparent where drought options might have a negative impact, and where options could be developed to reduce potential impacts.

As well as the overall SEA objectives, a number of key questions have been developed for each SEA topic. These key questions (included in Error! Reference source not found.**)** prompted the assessment and ensured that it considered all the relevant aspects. The assessment of each option required the following information, some of which was available from the DP (e.g. Appendix A forms):

- Option components and location;
- Likelihood of deployment;
- Construction and operation details;
- Amount of water provided (taking yield uncertainty into account); and
- Key elements of the baseline environment, such as location of designated sites.

## Table 4-1 SEA objectives and assessment approach

| SEA topic | SEA objective | Key questions | Sources of information |
|---|---|---|---|
| **Biodiversity, fauna and flora** | 1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species).<br><br>1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy.<br><br>1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services.<br><br>1.4 To avoid introducing or spreading INNS. | • Will it protect and enhance the most important sites for nature conservation?<br>• Will it protect and enhance aquatic, transitional and terrestrial species and habitats?<br>• Will it introduce or allow the spread of Invasive Non-Native Species (INNS)?<br>• Will it contribute to the sustainable management of natural habitats and ecosystems, i.e. within their limits and capacities taking into account climate change adaptability?<br>• Will it affect WFD compliance e.g. good ecological potential/status?<br>• Will it ensure maintenance or support provision of fish passage with respect to migratory fish functioning habitat connectivity?<br>• Will it protect or enhance natural capital and ecosystem services?<br>• Will it maintain or enhance access to areas of natural heritage conservation interest?<br>• Will it engage more people in biodiversity issues and strengthen their connections with nature? | EARs:<br>• Significance of effects on environmental features assessment.<br>• WFD status<br>• Hydrological assessment<br><br>HRA screening<br><br>DP information<br><br>Spatial analysis (GIS) |

| SEA topic | SEA objective | Key questions | Sources of information |
|---|---|---|---|
| **Population and human health** | 2.1 To protect and enhance health and well-being (including raising awareness of the importance and value of the water environment for health and well-being).<br><br>2.2 To protect and enhance the water environment for other users including recreation, tourism and navigation, as well as terrestrial recreational resources (including National Trails and Public Rights of Way).<br><br>2.3 To promote a sustainable economy with good access to essential services, including a resilient, high quality and affordable supply of water over the long term. | • Will it help to ensure provision of access to a secure resilient and affordable supply of drinking water?<br>• Will it help to protect or improve drinking water quality?<br>• Will it raise awareness of the importance and value of the water environment for health and well-being?<br>• Will it protect or enhance opportunities for recreation and tourist activities such as public rights of way, including navigation?<br>• Will it help to promote healthy communities and protect from risks to health and wellbeing (for example through nuisance or resulting from traffic or transport changes, disruption to safe and reliable water/sewerage services)?<br>• Will it assist in ensuring provision of essential services to support health and well-being?<br>• Does it protect and enhance the green infrastructure network? | DP information<br><br>EARs:<br>• Recreation assessment<br>• Navigation assessment<br><br>Spatial analysis (GIS) |
| **Material assets and resource use** | 3.1 To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill.<br><br>3.2 To promote the sustainable management of natural resources including efficient and sustainable use of water; ensure resilient water supplies for homes and industry in the area is maintained. | • Will it help to minimise the demand for resources (including water)?<br>• Will it minimise the use of energy and promote energy efficiency?<br>• Will it make use of existing infrastructure?<br>• Will it help to encourage sustainable design or use of sustainable materials (e.g. supplied from local resources)?<br>• Will it reduce the amount of waste generated and increase the proportion sent to reuse or recycling?<br>• Will it enable efficient water resource management and ensure maintenance of water supplies?<br>• Will it encourage the productive reuse of waste including energy recovery? | DP information<br><br>Professional judgement |

| SEA topic | SEA objective | Key questions | Sources of information |
|---|---|---|---|
| **Water** | 4.1 To avoid adverse impact on surface and groundwater levels and flows, including when this impacts on habitats and/or navigation.<br><br>4.2 To protect and enhance surface and groundwater quality and protect and enhance estuarine waterbodies.<br><br>4.3 To ensure appropriate and sustainable management of abstractions to maintain water supplies whilst protecting ecosystem functions that rely on water resources including contributing to the achievement of WFD objectives<br><br>4.4 To promote measures to enable and sustain long term improvement in water efficiency. | • Will it lead to a change in river flows, wetted width or river level?<br>• Will it alter the flow regime or residence time of surface waters?<br>• Will it lead to changes in groundwater levels and recharge?<br>• Will it present a risk to water quality of groundwater and surface water or estuarine waters?<br>• Will it ensure sustainable abstractions, taking account of water resources availability status?<br>• Will it contribute towards improving the awareness of water sustainability and its true value?<br>• Will it promote measures to enable improvements in water efficiency and assist in balancing supply and demand?<br>• Will it prevent water pollution?<br>• Will it affect water quality compliance?<br>• Will it affect WFD protected areas?<br>• Will it achieve WFD compliance? E.g. good ecological potential/status, prevent deterioration of WFD status between status classes?<br>• Will it prevent the introduction of impediments to the attainment of WFD good status or potential?<br>• Will it minimise impacts on, or contribute to achievement of, RBMP objectives?<br>• Will it achieve an appropriate balance of supply with other functions and services (including agriculture)? | EARs:<br>• Hydrological assessments<br>• Water quality assessments<br>• WFD status<br><br>DP information<br><br>Spatial analysis (GIS) |

| SEA topic | SEA objective | Key questions | Sources of information |
|---|---|---|---|
| **Soil, geology and land use** | 5.1 To protect and enhance geology, geomorphology and the quality and quantity of soils.<br><br>5.2 To protect and enhance the ecosystem services functions of land, soils and geology, including carbon sequestration, flood attenuation, pollutant filtration and nutrient cycling.<br><br>5.3 To promote a catchment-wide approach to catchment land management. | • Will it avoid damage to and protect geologically important sites?<br>• Will it protect and enhance geomorphology and geomorphological processes?<br>• Will it protect and enhance the quality of soils?<br>• Will it ensure efficient use of land (e.g. make use of previously developed land)?<br>• Will it contribute towards a catchment-wide approach to land management?<br>• Will it protect and enhance geological SSSIs or similar nationally protected sites? | EARs:<br>• Geomorphology assessments<br>• Hydrological assessments<br>• Soils assessments<br><br>DP information |
| **Air and Climate** | 6.1 To reduce air pollutant emissions.<br><br>6.2 To reduce greenhouse gas emissions.<br><br>6.3 To adapt and improve resilience to the threats of climate change. | • Will it reduce or minimise air pollutant emissions?<br>• Will it reduce or minimise greenhouse gas emissions?<br>• Will it increase emissions to air in an areas sensitive to emissions (e.g. in proximity to an AQMA or to sensitive habitat)?<br>• Will it result in an increase in greenhouse gas emissions over and above that that would be produced to supply an equivalent quantity of water in non-drought conditions?<br>• Will it reduce vulnerability to risks associated with climate change effects (e.g. reduce the adverse effects of droughts and floods)?<br>• Will it improve resilience/adaptability to likely effects of climate change, e.g. by increasing water storage capacity, or transferring water from areas with surplus?<br>• Will it create opportunities to benefit from potential effects of climate change?<br>• Will it make use of renewable energy? | Spatial analysis (GIS)<br><br>DP information |

| SEA topic | SEA objective | Key questions | Sources of information |
|---|---|---|---|
| **Archaeology and cultural heritage** | 7.1 To conserve and enhance the historic environment, heritage assets and their settings and protect archaeologically important sites.<br><br>7.2 To protect, enhance and manage the character and appearance of historic and cultural assets and their settings including maintaining and strengthening local distinctiveness and sense of place. | • Will it avoid damage to and protect the historic environment, heritage assets and their settings, places and spaces that enhance local distinctiveness?<br>• Will it maintain and enhance the historic environment, including palaeo-environmental deposits?<br>• Will the hydrological setting of water-dependent assets be altered, such as important wetland areas with potential for paleo-environmental deposits?<br>• Will it improve access, value, understanding or enjoyment of heritage assets and culturally/historically important assets in the region? | EARs:<br>• Hydrological assessment<br><br>Spatial analysis (GIS)<br><br>Professional judgement<br><br>DP information |
| **Landscape and visual amenity** | 8.1 To protect, enhance the quality of and improve access to designated and undesignated landscapes, townscapes and the countryside. | • Will it avoid adverse effects and enhance designated landscapes?<br>• Will it help to protect and improve non-designated areas of natural beauty and distinctiveness (e.g. woodlands) and avoid the loss of landscape features and local distinctiveness?<br>• Will it improve access to valued areas of landscape character? | EARs:<br>• Hydrological assessment<br><br>Spatial analysis (GIS)<br><br>DP information |

## 4.3 PRIMARY ASSESSMENT

The appraisal framework set out in **Table 4-2** has been used to assess each of the drought options against the SEA objectives. The appraisal framework was applied to test the performance of the drought options against the SEA objectives to see how far they go towards meeting the latter. The performance of options will be used to inform the priority of drought options for inclusion in TWUL's Draft DP 2016 and inform the selection of options should a drought result in the DP to be put into operation.

In the context of drought planning, individual drought options are taken to constitute alternatives. TWUL's Draft DP comprises a total of 51 drought options (10 supply side options, 6 demand options and 35 drought permit/order options). Each of these 'alternatives' (individual drought options) were therefore assessed using the appraisal framework set out in Table 4-2. The assessment therefore provides information on the relative environmental performance of alternatives, and is intended to make the decision-making process more transparent. The SEA can, therefore, be used to support the timing and implementation of drought options within the DP.

The first and second columns of **Error! Reference source not found.** set out the SEA topics and objectives. The third column provides a brief commentary and evaluation of the impact of the drought option on the objectives for each topic, with reference to the key questions proposed in Error! Reference source not found.. This brief commentary assumes the implementation of best practice in implementing the option, therefore the effects are referred to as residual and are largely temporary. Potential mitigation measures for any identified adverse effects arising from each option are identified within the appraisal framework.

The fourth column identifies the magnitude of the effect on a scale of low, medium and high. The value/sensitivity of the receptor(s) is identified in the fifth column on a scale of low, medium and high. The scale of the effect, which might relate to either geographical scale or the size of the population affected, is identified in the sixth column on a scale of small, medium to large. The impact evaluation included consideration of the nature of the impact, likelihood, duration and permanence (seventh, eighth and ninth columns of **Table 4-2**) in compliance with criteria for determining the likely significance of effects specified in the SEA Directive Article 3(5) and Annex II, and the SEA Regulations Part 2, Regulation 9(2a) and Schedule 1. With respect to duration of temporary effects, short-term impacts are defined as those that last for up to six months, medium term impacts are those that extend for six months to two years whilst longer term temporary impacts are assessed as those that extend to two to five years. A "significant long term" temporary impact category is used for those temporary effects that continue beyond five years in duration.

The residual adverse and beneficial effects (after application of best practice

approaches and any appropriate mitigation measures) are identified in the tenth and eleventh columns respectively. These were identified separately so as to avoid mixing adverse and beneficial effects.

Where qualitative and/or quantitative information is available for an option (e.g. as identified by an EAR etc.), this was used to inform the assessment.

As described in Section 1.5, EARs have been produced for the supply side drought permit options and these were used to inform the SEA for these options. The EARs define the significance of effects on identified sensitive features based on fragility of the receptors and the likely magnitude of impact experienced. The assessment of effects on water quality described in the EARs took into consideration the requirements of the WFD. Important information held within the EARs is borne out in the commentary of the assessment table if relevant, and the level of significance largely guided the SEA level of significance for the objectives that are informed by the EARs (see Error! Reference source not found. above).

Objectives or key questions that are not supported by information presented in the EARs are evaluated using spatial analysis, professional judgement and appropriate guidelines.

Equally, where detailed environmental and socio-economic assessments of non-drought permit/order options were carried out (e.g. in relation to water use restrictions), these were also used to inform the SEA.

## Table 4-1 SEA appraisal framework completed for each drought option

| Topic | SEA objective | Potential residual effect on sensitive receptors (assuming good practice construction methods) Commentary | Magnitude of effect (Low/ Medium/ High) | Value/ sensitivity of receptor (Low/ Medium/ High) | Scale of effect: (Small/ Medium / Large) | Certainty of effect (Low/ Medium/ High) | Duration (short/ medium/ long term) | Permanence of effect (permanent/ temporary) | Residual Adverse Effect Significance (those likely to remain after reasonable mitigation) | Residual Beneficial Effect Significance (those likely to remain after reasonable mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| Biodiversity fauna and flora | 1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species). | | | | | | | | | |
| | 1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy. | | | | | | | | | |
| | 1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services. | | | | | | | | | |
| | 1.4 To avoid introducing or spreading INNS. | | | | | | | | | |
| Population and human health | 2.1 To protect and enhance health and well-being (including raising awareness of the importance and value of the water environment for health and well-being). | | | | | | | | | |
| | 2.2 To protect and enhance the water environment for other users including recreation, tourism and navigation, as well as terrestrial recreational resources (including National | | | | | | | | | |

| Topic | SEA objective | Potential residual effect on sensitive receptors (assuming good practice construction methods) Commentary | Magnitude of effect (Low/ Medium/ High) | Value/ sensitivity of receptor (Low/ Medium/ High) | Scale of effect: (Small/ Medium / Large) | Certainty of effect (Low/ Medium/ High) | Duration (short/ medium/ long term) | Permanence of effect (permanent/ temporary) | Residual Adverse Effect Significance (those likely to remain after reasonable mitigation) | Residual Beneficial Effect Significance (those likely to remain after reasonable mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Trails and Public Rights of Way). | | | | | | | | | |
| | 2.3 To promote a sustainable economy with good access to essential services, including a resilient, high quality and affordable supply of water over the long term. | | | | | | | | | |
| Material assets and resource use | 3.1 To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill. | | | | | | | | | |
| | 3.2 To promote the sustainable management of natural resources including efficient and sustainable use of water; ensure resilient water supplies for homes and industry in the area is maintained. | | | | | | | | | |
| Water | 4.1 To avoid adverse impact on surface and groundwater levels and flows, including when this impacts on habitats and/or navigation. | | | | | | | | | |
| | 4.2 To protect and enhance surface and groundwater quality and protect and enhance estuarine waterbodies. | | | | | | | | | |
| | 4.3 To ensure appropriate and sustainable management of abstractions to maintain water supplies whilst protecting | | | | | | | | | |

| Topic | SEA objective | Potential residual effect on sensitive receptors (assuming good practice construction methods) Commentary | Magnitude of effect (Low/ Medium/ High) | Value/ sensitivity of receptor (Low/ Medium/ High) | Scale of effect: (Small/ Medium / Large) | Certainty of effect (Low/ Medium/ High) | Duration (short/ medium/ long term) | Permanence of effect (permanent/ temporary) | Residual Adverse Effect Significance (those likely to remain after reasonable mitigation) | Residual Beneficial Effect Significance (those likely to remain after reasonable mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| | ecosystem functions that rely on water resources including contributing to the achievement of WFD objectives | | | | | | | | | |
| | 4.4 To promote measures to enable and sustain long term improvement in water efficiency. | | | | | | | | | |
| Soil, geology and land use | 5.1 To protect and enhance geology, geomorphology and the quality and quantity of soils. | | | | | | | | | |
| | 5.2 To protect and enhance the ecosystem services functions of land, soils and geology, including carbon sequestration, flood attenuation, pollutant filtration and nutrient cycling. | | | | | | | | | |
| | 5.3 To promote a catchment-wide approach to catchment land management. | | | | | | | | | |
| Air and climate | 6.1 To reduce air pollutant emissions. | | | | | | | | | |
| | 6.2 To reduce greenhouse gas emissions. | | | | | | | | | |
| | 6.3 To adapt and improve resilience to the threats of climate change. | | | | | | | | | |
| Archaeology and | 7.1 To conserve and enhance the historic environment, heritage assets and their settings and protect | | | | | | | | | |

| Topic | SEA objective | Potential residual effect on sensitive receptors (assuming good practice construction methods) Commentary | Magnitude of effect (Low/ Medium/ High) | Value/ sensitivity of receptor (Low/ Medium/ High) | Scale of effect: (Small/ Medium / Large) | Certainty of effect (Low/ Medium/ High) | Duration (short/ medium/ long term) | Permanence of effect (permanent/ temporary) | Residual Adverse Effect Significance (those likely to remain after reasonable mitigation) | Residual Beneficial Effect Significance (those likely to remain after reasonable mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| | archaeologically important sites. | | | | | | | | | |
| | 7.2 To protect, enhance and manage the character and appearance of historic and cultural assets and their settings including maintaining and strengthening local distinctiveness and sense of place. | | | | | | | | | |
| Landscape and visual amenity | 8.1 To protect, enhance the quality of and improve access to designated and undesignated landscapes, townscapes and the countryside. | | | | | | | | | |

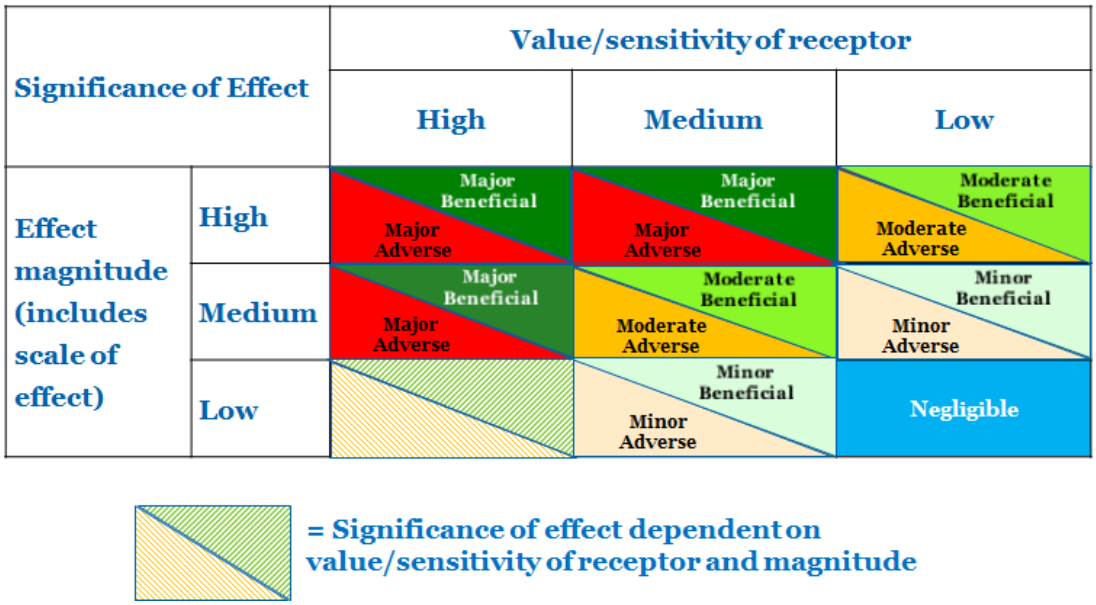
The SEA appraisal framework was used to capture the assessment for each drought option. The results of the option assessments are provided in Section 5.

Varying levels of uncertainty are inherent within the assessment process. Through the application of expert judgement the uncertainty was minimised. The level of uncertainty of the option assessment for each SEA objective was included in the appraisal framework. Where there was significant uncertainty which precluded an effects assessment category being assigned for a particular drought plan option and SEA objective, an "uncertain" residual effects assessment label was applied to that specific SEA objective.

For each SEA objective, a residual effects assessment was determined against a significance matrix (**Figure 4-1**) which took into account the value/sensitivity of the receptor (e.g. air quality, river water quality, landscape value) and the magnitude of the assessed effect. This significance matrix comprised effects from 'major beneficial' to 'major adverse'. For the box signifying low magnitude and high receptor value/sensitivity, this could result in a greater than 'moderate' effects being assigned dependent on the sensitivity/value of the receptor. This colour coding was used to complete the columns for residual effects in the appraisal framework.

The resulting significance of effects is used in the prioritisation of options. Also, where major adverse effects are predicted, broad measures envisaged to prevent, reduce and as fully as possible offset these effects on the environment (as a result of implementing the DP) are outlined where relevant/appropriate.

**Figure 4-1 Significance matrix**




The definitions for 'significance' ratings as identified in the table above are provided below:

**Major** - effects represent key factors in the decision-making process. They are generally associated with sites and features of international, national or regional importance. If adverse, such resources/features are generally those which cannot be replaced or relocated.

**Moderate** - effects are likely to be important considerations at a regional or district scale. If adverse, they are likely to be of potential concern.

**Minor** - effects are not likely to be decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.

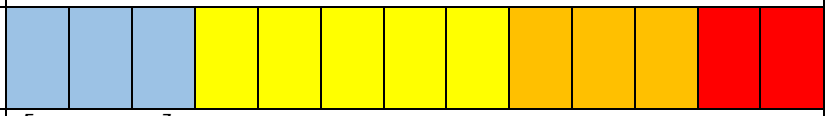
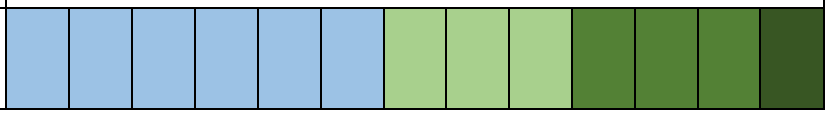
**Negligible** - effects which are not perceptible, being within normal bounds of variation or the margin of forecasting error.

For the '**high' effect magnitude** (top row), a major effect significance is assigned for both high and medium value receptors to reflect the magnitude of the effect.

For the **'low' effect magnitude and 'high' value receptor** (bottom left box), the significance of effect could be minor, moderate or major dependent on the precise nature of the impact or benefit.

The appraisal framework for each option includes a summary comprising an overview of the adverse and beneficial effects. The assessment matrices are provided in Appendix E.

**Table 4-2 Example SEA appraisal framework summary**

| Option | *[name of option]* |
|---|---|
| Summary commentary of scheme adverse effects | *[summary]* |
| SEA objectives adverse effects summary |  |
| Summary commentary of scheme beneficial effects | *[summary]* |
| SEA objectives beneficial effects summary |  |

An appraisal framework table (example provided in **Table 4-1**) including the summary (example provided in **Table 4-2**) has been completed for each drought option (as identified in Section 1) and presented in full in **Appendix E**. The summary of the assessment is presented in Section 5 as a colour-coded visual evaluation (VE) matrix. The VE matrix summarises the likely significance of impacts (which are discussed in full in the completed appraisal framework tables in Appendix E).

## 4.4 SECONDARY, CUMULATIVE AND SYNERGISTIC ENVIRONMENTAL EFFECTS ASSESSMENT

Schedule 2(6) of the SEA Regulations requires the assessment of "*The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects….*" From here on in "*cumulative effects*" is taken to include secondary and synergistic effects.

Because the combination of options that would be deployed in any one drought cannot be predetermined (Section 1.4.2) a dedicated cumulative effects assessment in order to ensure that options are not mutually exclusive, or that combinations would not cause significant adverse impacts has been undertaken. This involved examining the likely significant effects of each of the drought options individually, in combination with each other, and in combination with the implementation of other

plans and programmes. A matrix has been used to help consider interactions between options. In assessing these effects, consideration has been given to other factors which may affect the receiving environment in the short, medium and long term.

The following cumulative assessments have been undertaken (see Section 6):

1. Within TWUL's entire water supply area, assessment of **cumulative impacts of each demand management option that could potentially be implemented at the same time**. Note that demand management options are consistent across the whole of TWUL's region, and it is proposed that the assessment takes into account the implementation of each option across the whole of TWUL's supply region. However, there may be instances when demand management measures are implemented in part of a supply area rather than the whole region. Demand management measures serve to reduce pressure on water resources and will have a positive influence on both supply side and drought permit/order options within each water resource zone (by reducing the demand for water). Therefore, demand management measures will not be assessed in detail against each supply side option, other than to acknowledge that they will have a net positive effect by reducing pressure on water resources unless the assessment identifies an effect that could have in-combination effects with a supply-side option.

2. Within and between each of TWUL's WRZs, assessment of cumulative impacts of those **supply side options, including drought permit / order options that could potentially be implemented at the same time** (intra-zone and inter-zone). Mutually exclusive options (e.g. those that draw the same resource or use the same site) will also be identified.

3. Assessment of cumulative impacts of the TWUL DP with the TWUL WRMP (including future proposals where available), other water company DPs and WRMPs, River Basin Management Plans (RBMPs) and Environment Agency's National DP (and any other drought plans prepared by other bodies, such as the Canal & River Trust). The potential for a neighbouring company implementing options under its DP simultaneously has been considered. Neighbouring water companies will be included as consultees to the DP and associated SEA Environmental Report in order to identify any trans-boundary issues.

4. Assessment of potential cumulative impacts of the **TWUL DP with any other identified relevant programmes, plans and projects** that may be in place / implemented during the period of the DP (i.e. up to 2022), for example the Thames Tideway scheme.

Neighbouring water companies will be invited to consult on the draft DP and Thames Water will also communicate with neighbouring companies regarding the schemes in their respective plans. Potential effects with other plans will be identified, particularly in the context of spatial and temporal proximity. This is especially important in identifying potential water resources impacts, although licence changes would always be subject to further investigation by the companies themselves and the Environment Agency. Potential cumulative effects with wider plans will also be assessed. If effects are identified they can be ameliorated with early stage mitigation and associated monitoring.

DPs comprise a basket of measures, the implementation of which are dependent on the particular drought conditions experienced and are subject to temporal, spatial and other factors. The exact timing of implementation of drought options will not be known until a drought is experienced.

One of the limitations of the cumulative or in-combination assessment of Thames Water's draft DP is that whilst an environmental appraisal of each drought option can be undertaken, the lack of predictability of which options will be implemented in any particular drought event means that it may be impossible to provide an accurate cumulative assessment of the impacts of the plan for a possible future drought event.

Cumulative assessments of drought options with each other have been undertaken assuming as a worst case that the operation of the two options could occur simultaneously. Spatial proximity and therefore potential impacts on a common receptor is the primary consideration (e.g. the same designated area or reach of river).

Due to the uncertainty of timing of implementation of drought options, assessment of each drought option with every other drought option have been undertaken with the intention that in the event of a drought, the findings of the SEA be reviewed and a cumulative assessment made of the options proposed for implementation at that time, based on the findings of the one-on-one assessments presented in Sections 5.4 and 5.5.

## 4.5 LIMITATIONS OF THE STUDY

SEA is a high level assessment aimed at highlighting potential environmental concerns. The environmental data used in this assessment is based on that which is readily available from existing sources, e.g. statutory organisations, and environmental assessments of drought permit/order options already undertaken by TWUL. No primary research or survey work has been carried out specifically to inform the SEA and therefore it is possible that at the individual option level, there may be additional environmental issues that could have an influence on a drought

option.

Limitations of the cumulative, or in-combination assessment of TWUL's draft DP should also be noted as discussed in Section 4.4, as implementation of drought options are dependent on the particular drought conditions experienced meaning that it may be impossible to provide an accurate cumulative assessment of the impacts of the plan for a possible future drought event.

It should be noted that the EARs which have been prepared for the drought permits / order sites to support TWUL's DP (see Section 1.5) have been undertaken in accordance with the revised Environment Agency Drought Plan Guidance. This states that the level of detail included in the EAR should be based on the level of risk posed by the action that is being assessed (e.g. based on the scale of the impact, the expected frequency of use or the importance or sensitivity of the site). The required level of assessment has been undertaken to help inform any potential residual effects of each drought option. The assessment does not, however, address local wildlife sites. The level of risk of a local wildlife site being significantly affected by the implementation of a drought permit / order is considered to be low and the implications on local wildlife sites will be considered in more detail in the EARs at the time of a potential application for a drought permit / order. For the SEA, assessment is undertaken at the strategic level and it is, therefore, not practical to assess each local wildlife site.

Where particular limitations or outstanding issues are known, these are briefly described in the SEA appraisal tables for the relevant drought option concerned.

# 5 ASSESSMENT OF DROUGHT OPTIONS

## 5.1 DROUGHT OPTIONS UNDER CONSIDERATION

Demand management schemes which have been assessed are common to all zones and are listed in **Table 1-1**. Supply side and drought permit/order drought options which have been assessed for each of the four WRZs are listed in **Table 1-2** and **Table 1-3**.

## 5.2 ASSESSMENT OF SCHEMES AGAINST SEA OBJECTIVES

Assessment of drought options has been carried out in accordance with the methodology described in Section 4. Appraisal framework assessment tables have been completed for each drought option, and are presented in full in **Appendix E**. A summary of the assessment is presented in this section as colour-coded VE matrices. For each drought option and each SEA topic and SEA objective listed in the left hand column of Error! Reference source not found., the VE matrix summarises the likely significance of residual impacts. The colour coding represents a range from significant adverse impact in red through to significant beneficial impacts in dark green.

### Legend

| Colour | | Significance of Effect |
|---|---|---|
| | Dark Green | Major Beneficial |
| | Mid Green | Moderate Beneficial |
| | Light Green | Minor Beneficial |
| | Negligible | Negligible |
| | Yellow | Minor Adverse |
| | Orange | Moderate Adverse |
| | Red | Major Adverse |
| | NONE | NOT APPLICABLE |

## 5.3 DEMAND SIDE OPTIONS

A visual summary of SEA conclusions for each of the demand side options in TWUL's draft DP is provided in

**Table** 5-1. The completed appraisal tables for each of the drought options are provided in **Appendix E**.

Overall, demand side measures serve to reduce pressure on water resources within each WRZ by reducing customer demand for water, and therefore reducing abstraction at source. This will in turn contribute to reducing the amount of energy needed for water abstraction, treatment and distribution. Demand side measures typically provide moderate beneficial effects such as protecting and enhancing health and well-being through maintaining water supplies for essential use, and promoting efficient and sustainable use of water. Minor adverse effects on landscaping and horticulture businesses may be associated with sprinkler and temporary use bans, and impacts on businesses due to water use restrictions would increase in severity and spread to other sectors (e.g., recreation and tourism) should ordinary or emergency drought orders be implemented. Impacts from implementation of drought orders could also extend to archaeology and cultural heritage, due to the influence on the setting of cultural assets. Minor adverse effects may also be associated with emissions of air pollutants and greenhouse gas emissions from leakage reduction programme activities.

**Table 5-1 Visual evaluation matrix summary for demand side options**

Table 5.1 Demand Side Options: Visual Evaluation Matrix

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| Media /water efficiency campaign | Adverse | | | | | | | | | | | | | | | | | | | | | | | No adverse impacts have been identified for this drought plan option. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include reducing demand for water, securing supply of water for customers/businesses. Reducing the demand for water will also have beneficial effects on maintaining surface water and groundwater levels/flows, sustainable management of abstractions and enabling long term improvements in water efficiency. Reducing water demand will also help to improve the resilience of water supplies to drought. |
| Leakage reduction | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects identified are associated with emissions to air (air pollutants and greenhouse gas emissions) as a result of construction activities and vehicle movements. All other adverse effects identified are negligible. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Minor to moderate beneficial effects have been identified with respect to sustainable provision of water through water savings that would have otherwise been lost to leakage after having been abstracted at source. These effects are generally considered to be long term and permanent in nature. |
| Sprinkler and unattended hose pipe ban | Adverse | | | | | | | | | | | | | | | | | | | | | | | No major adverse effects have been identified for this option. A minor adverse effect has been identified in terms of promoting a sustainable economy due to the sprinkler ban affecting some businesses that rely on sprinklers/hosepipes in their line of work (e.g., landscaping/horticulture). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include reducing the demand for water, securing supply of water for customers/businesses. Reducing the demand for water will also have beneficial effects on maintaining surface water and groundwater levels/flows, sustainable management of abstractions and enabling long term improvements in water efficiency. Reducing water demand will also help to improve the resilience of water supplies to drought. |
| Temporary use ban | Adverse | | | | | | | | | | | | | | | | | | | | | | | No major adverse effects have been identified. A minor adverse effect has been identified in terms of promoting a sustainable economy due to the temporary use ban affecting some businesses that rely on sprinklers/hosepipes in their line of work (e.g., landscaping/horticulture). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include reducing the demand for water, resulting in securing the supply of water for customers/businesses. Reducing the demand for water will also have beneficial effects on maintaining surface water and groundwater levels/flows, sustainable management of abstractions and enabling long term improvements in water efficiency. Reducing water demand will also help to improve the resilience of water supplies to drought. |
| Drought Order to ban Non-Essential Use | Adverse | | | | | | | | | | | | | | | | | | | | | | | No major adverse effects are predicted relating to the implementation of the ordinary drought order. Adverse effects associated with restriction of water use and impacts on recreation and tourism assets, and businesses/economy, may be minor and moderate respectively. They may also be minor adverse effects on heritage assets, such as visual impacts on parks and gardens and/or grounds of listed buildings. All adverse impacts identified are short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include a reduction in the demand for water and associated efficient resource use, maintenance of water flows/levels, maintenance of supply to consumers, and improving the resilience of water supplies to drought. |
| Emergency Drought Order | Adverse | | | | | | | | | | | | | | | | | | | | | | | Significant adverse effects are predicted relating to the implementation of the emergency drought order, restricting water use with impacts for recreation and tourism assets, and businesses/economy (population and human health. Other adverse effects include potential minor impacts on heritage assets (e.g. visual impacts on parks and gardens and/or grounds of listed buildings). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include a reduction in the demand for water and associated efficient resource use, maintenance of water flows/levels, maintenance of supply to consumers, and improving the resilience of water supplies to drought. |

## 5.4 SUPPLY SIDE OPTIONS

A visual summary of SEA conclusions for each of the supply side options is provided in **Table 5-2**. The completed appraisal tables for each of the drought options are provided in **Appendix E.**

Nine of the ten supply side options in TWUL's Draft DP are within the London WRZ. WBGWS abstracts water from the Kennet Valley WRZ to supply the London WRZ. All of these supply side options are actions within existing licensed limits.

The NLARS, TGWTW and WBGWS options have the greatest beneficial effects, as they would deliver large volumes of water during drought events. These options all provide major beneficial effects with respect to SEA objectives regarding protecting and enhancing health and well-being, enabling access to essential services, and improving resilience to droughts.

Adverse impacts associated with supply side options typically relate to additional energy requirements, emissions and materials used to maintain supply. Groundwater abstraction drought options, for example NLARS, CHARS, ELRED, Stratford Box and Old Ford, generally perform well against the SEA objectives when considering drought conditions, with typically only minor adverse effects identified due to increased energy requirements, emissions and materials used. There may be potential for effects on local groundwater levels and quality, however, it is assumed that the existing abstraction licences would not have been granted if these options resulted in unsustainable abstraction or the licences would have been identified on the Environment Agency's RSA programme.

WBGWS has potentially both beneficial and adverse effects, because during a drought (assessed here as short-term) it provides potential benefits against several SEA objectives due to positive impacts on flows in the River Kennet. However, over the long term the drawdown of the groundwater levels for river augmentation has the potential for adverse impacts, and there could be a prolonged recovery period after WBGWS stops operating. The HRA Screening Report concluded that once the operational licence is in place it is considered unlikely that the drought option would have a significant effect on the designated features of the sites as water levels could be maintained more effectively during drought conditions.

Thames Gateway Water Treatment Works, reduction in lowest residual flow on the Lower Thames Control Diagram at Teddington Weir from 300Ml/d to 200Ml/d and WBGWS options have some moderate adverse effects. The Thames Gateway Water Treatment Works is identified as causing moderate adverse impacts on material assets and resource use, and air and climate, due to its waste streams and emissions. The reduction in the lowest residual flow at Teddington Weir (300Ml/d to 200Ml/d)

option has moderate adverse impacts on water and biodiversity, fauna and flora due to deterioration in water quality in the Lower Thames and Upper Tideway that is known to occur in certain conditions when flow over Teddington Weir falls below 400 Ml/d. In addition, the WBGWS may have moderate adverse effects on other abstractors.

**Table 5-2 Visual evaluation matrix summary for supply side options**

Table 5.2 Supply Side Options: Visual Evaluation Matrix

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| North London Artificial Recharge Scheme | Adverse | | | | | | | | | | | | | | | | | | | | | | | Adverse effects identified are associated with energy use and materials required for the re-abstraction of stored water and its treatment. Adverse effects are also likely with respect to emissions to air (air pollutants and greenhouse gas emissions) as a result of the additional pumping and treatment requirements. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Major beneficial effects are identified with respect to sustainable provision of a large quantity of water (at a rate of up to 190Ml/d) during periods of drought, and improving the resilience of water supplies to drought. |
| Thames Gateway Water Treatment Works (TGWTW) | Adverse | | | | | | | | | | | | | | | | | | | | | | | The scale of water abstraction, treatment including RO, and waste stream pumping required for implementation of this option will have moderate adverse effects on air emissions, moderate effects on resource consumption, and minor effects on greenhouse gas emissions. The treatment process would also have minor waste management impacts, due to discharge of brine from the desalination plant and generation of sludges from clarification and filtration units and RO membranes. Impacts should be short term and temporary, assuming the plant was only ramped up to full output in drought situations. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Use of the TGWTW would have major beneficial effects regarding maintenance of supply reliability in drought conditions through provision of up to 150Ml/l supply, the availability of which is not influenced by the effects of drought. |
| Hoddesdon Transfer Scheme (River Lee Flow Augmentation) | Adverse | | | | | | | | | | | | | | | | | | | | | | | There is potential for a minor reduction in flow in this reach. All other adverse effects identified were negligible in significance, and all adverse effects are short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are associated with maintenance of water supply, and minor beneficial effects are expected with regard to promotion of sustainable management of water resources by enabling reuse of treated water, and improved resilience of water supplies to drought. |
| Chingford Artificial Recharge Scheme (CHARS) | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects may occur due to air emissions associated with energy use for the re-abstraction of stored water and its treatment. Negligible adverse impacts are possible with respect to greenhouse gas emissions, material use and groundwater quality. However, all adverse effects identified are short term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are identified with respect to sustainable provision water (up to 12Ml/d), thus providing improvements in the resilience of water supplies to drought. |
| Reduction in lowest residual flow on the Lower Thames Control Diagram at Teddington Weir from 300Ml/d to 200Ml/d | Adverse | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought option would have moderate adverse effects on flows in the lowest reaches of the fluvial Thames, mainly in terms of velocity reduction. Freshwater flows to the upper Thames Tideway will reduce. Moderate adverse effects are predicted on water quality in the fluvial Thames (reduced dissolved oxygen saturation and reduced phosphate dilution), which may exacerbate water quality issues in the upper Tideway with the potential for moderate adverse effects. Moderate adverse effects are expected on a range of aquatic ecological receptors, such as macroinvertebrates, macrophytes and fish. The adverse effects include those associated with fish, including migration. Moderate adverse effects may occur on navigation. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought option would have a major beneficial effects for populations and human health in terms of ensuring supply of water and other customers/businesses. Major beneficial effects are also expected in regard to improved resilience of water supplies to drought. |
| Earlier reduction in residual flow at Teddington Weir on the Lower Thames Control Diagram | Adverse | | | | | | | | | | | | | | | | | | | | | | | If implemented, the measure would result in minor adverse effects due to reduced flows passed forward over Teddington Weir earlier and for longer than would be the case without implementation of the measure. Therefore, all identified effects are extensions of what could occur under baseline conditions. In addition to the flow impacts (mainly in the form of velocity reduction) in the fluvial Lower Thames, minor adverse effects relate to the reduction in freshwater flows to the upper Thames Tideway. As a result there is potential for minor adverse effects regarding extended periods of water quality impacts in the fluvial Thames (reduced dissolved oxygen saturation and reduced phosphate dilution), which may exacerbate water quality issues in the upper Tideway. Minor adverse effects are expected on a range of aquatic ecological receptors, such as macroinvertebrates, macrophytes and fish, as a result of the extended periods of flow and water quality impacts. Minor adverse effects may occur on navigation as a result of extended periods of restrictions on lock use than would have occurred without the option. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | If implemented, the measure would have a moderate beneficial effects regarding ensuring supply of water to customers and businesses. Minor beneficial effects are also expected through improved resilience of water supplies to drought. |
| East London Resource Development (ELRED) | Adverse | | | | | | | | | | | | | | | | | | | | | | | Negligible adverse effects identified are associated with energy use and materials required for the re-abstraction of stored water and its treatment. Adverse effects are also likely with respect to emissions to air (air pollutants and greenhouse gas emissions) as a result of the additional pumping and treatment requirements. There is also the potential for minor, temporary adverse effects on other abstractors, however, these effects are uncertain. All adverse effects are short to medium-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are identified with respect to sustainable provision of a moderate quantity of water (at a rate of up to 21Ml/d) during periods of drought, and minor improvements in the resilience of water supplies to drought. |
| Stratford Box | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse, temporary effects identified are associated with emissions to air (air pollutants) as a result of the additional pumping and treatment requirements and proximity to sensitive receptors (AQMAs). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are identified with respect to sustainable provision of water (at a rate of up to 5Ml/d) during periods of drought, and minor improvements in the resilience of water supplies to drought. |
| Old Ford | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse, temporary effects identified are associated with emissions to air (air pollutants) as a result of additional pumping and treatment requirements and proximity to sensitive receptors (AQMAs). There is also the potential for minor, temporary adverse effects on other abstractors, however, these effects are uncertain. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are identified with respect to maintaining public health and sustaining the economy, as are minor benefits due to improved resilience of water supplies to drought. |
| West Berkshire Groundwater Scheme (WBGWS) | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse short-term effects associated with extensive pumping is likely to lead to suppressed groundwater levels in the months following the drought, which might cause a reduction in groundwater levels at some sites, and discharge of groundwater may cause impacts to river water quality. Moderate adverse effects associated with the potential to impact on other abstractors. Negligible adverse impacts are anticipated on biodiversity, flora and fauna, as it was considered in the HRA Screening Report, that the drought option is unlikely to have a significant effect on the designated features of the Kennet and Lambourn Floodplain SAC and the River Lambourn SAC as water levels could be maintained more effectively during drought conditions with the reduction of an existing licence and a new sluice to maintain flows to the SAC. Minor adverse effects due to air emissions associated with additional abstraction and proximity to nature conservation sites. All adverse effects are temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects on population and human health are anticipated due to maintenance of water supplies for customers and economic activity. Maintaining flow in watercourses during a prolonged drought may have a minor beneficial effect, and may also avoid declines in water quality in affected resources. |

## 5.5 DROUGHT PERMIT/ORDER OPTIONS

A visual summary of the findings of the SEA for each of the drought permit/order options in each WRZ is provided in **Table 5-3**. The completed appraisal tables for each of the drought options are provided in **Appendix E.**

### 5.5.1 London Water Resource Zone

The assessment of drought permit/order options in the London WRZ has highlighted the following options as having moderate to major environmental effects:

- Sundridge 1
- Sundridge 2
- Lower Thames
- Eynsford
- Waddon

The Lower Thames has the highest number of major adverse effects in this WRZ. It would have major adverse effects on flows in the lowest reaches of the fluvial Thames. Major adverse effects are predicted on water quality in the fluvial Thames (reduced dissolved oxygen saturation and reduced phosphate dilution) which may exacerbate water quality issues in the upper Tideway. For biodiversity, major adverse effects are predominantly associated with adverse effects to fish, including migration. Major adverse effects may occur on navigation.

Three options, (Sundridge 1, Sundridge 2 and Eynsford) could have major significant adverse impacts on water flows, including the potential to cause adverse effects on the reaches of the River Darent. Sundridge 1 and 2 would also have major adverse effects on biodiversity associated with the potential spread of invasive species whereas Eynsford would have a moderate adverse effect.

Waddon would have major adverse hydrological effect, as under a worst case scenario, Waddon ponds may dry up (for up to 3 months) when they would otherwise not have done so without a drought permit.

The assessment highlights options with lower impacts that could be selected in preference for this WRZ. These comprise, Crayford, Wansunt, the Horton Kirby ASR and Increase in M2 annual licence drought permits. However, these options provide less water than the Lower Thames drought permit.

The following options also have moderate to major beneficial effects including those

associated with maintaining public water supplies during times of drought:

- Sundridge 1
- Sundridge 2
- Lower Thames
- Crayford
- Horton Kirby
- Wansunt
- Eynsford
- Increase in M2
- Waddon

Major beneficial effects are for Lower Thames for maintenance of water supplies and air and climate due to drought permits/orders being a key component of the draft DP, the aim of which is to ensure resilience of water supplies to drought. The increase in M2 annual licence also has major beneficial effects for maintenance of supplies and water provisioning.

### 5.5.2 SWOX Water Resource Zones

The assessment of drought permit/order options in the SWOX WRZ has highlighted the following options as having moderate to major adverse significant environmental effects:

- Baunton 1
- Baunton 2
- Latton
- Meysey Hampton
- Farmoor
- Axford 1
- Axford 2

- Blewbury
- Sor Brook
- Childrey Warren
- Ogbourne
- Ogbourne Emergency

Of these, major adverse effects are identified for Meysey Hampton for water flows; Farmoor for water flows and water quality; Axford 2 for water flows; Blewbury for biodiversity, water flows, water quality and landscape; Childrey Warren for biodiversity and other abstractions. Blewbury therefore has the highest number of major adverse effects.

The assessment highlights options with lower impacts that could be selected in preference for this WRZ and these would normally be implemented first. These comprise Bibury, Gatehampton and Oxford Canal that would have negligible to minor adverse effects.

Moderate to major beneficial effects, including those associated with maintaining public water supplies during times of drought, are identified for:

- Baunton 1
- Baunton 2
- Latton
- Farmoor
- Axford 1
- Axford 2
- Bibury
- Blewbury
- Gatehampton
- Oxford Canal
- Sor Brook

- Childrey warren
- Ogbourne

None of the options in this WRZ have major beneficial effects.

### 5.5.3 Kennet Valley and Guildford Water Resource Zones

The assessment of drought permit/order options in the Kennet Valley WRZ has highlighted the following options as having moderate to major significant environmental effects:

- Compton 1
- Compton 2
- Fobney Emergency Boreholes
- Pangbourne
- Fobney Direct

Of these, major adverse effects are identified for Compton 1 and Compton 2 for effects associated with other abstractions; Pangbourne on Water with respect to flows, water quality and other abstractions, and also for Population and Human Health in relation to effects on another abstractions; Fobney Direct for hydrology. Pangbourne therefore has the highest number of major adverse effects for the WRZ.

The assessment highlights one option with lower impacts that could be selected in preference for this WRZ and this is Playhatch, although this option provides a smaller volume of water.

Moderate to major beneficial effects including those associated with maintaining public water supplies during times of drought, for:

- Compton 1
- Compton 2
- Fobney direct
- Fobney Emergency
- Pangbourne
- Playhatch

None of the options in this WRZ have major beneficial effects.

### 5.5.4 Guildford Water Resource Zone

There are two drought permit/order options in the Guildford WRZ (Albury and Shalford). There are moderate and minor adverse effects associated with Albury. Moderate effects are associated with biodiversity and hydrology and water quality. However Shalford has only negligible adverse effects.

Both options have beneficial effects.

### 5.5.5 SWA and Henley Water Resource Zones

There are three drought permit/order options in the SWA and Henley WRZ. Pann Mill has major and moderate adverse effects. Major adverse for hydrology and moderate for water quality and biodiversity. New Ground has Minor to Moderate adverse effects for water, soil and biodiversity. Whereas Harpsden/Sheeplands has negligible adverse effects.

All three options have beneficial effects.

**Table 5-3 Visual evaluation matrix summary for drought permit/order options**

Table 5.3 Drought Permit/Order Options: Visual Evaluation Matrix

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| **London Resource Zone** | | | | | | | | | | | | | | | | | | | | | | | | |
| Sundridge 1 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major adverse short-term effects are predicted due to reduced flows, velocities and levels in three reaches of the River Darent (Impacts are major on one reach, minor on one reach and negligible on one reach). This would result in minor adverse effects to water quality, as one reach has more variable dissolved oxygen saturations with a clear association between low concentrations and low river flows. The feasibility of the surface water abstraction at Sevenoaks Wildfowl Reserve may being limited with the drought order in place, a moderate adverse short-term impact. Moderate adverse short term effects are anticipated on the Sevenoaks Gravel Pits SSSI due to reduction in lake levels, potential impacts on breeding birds, and potential reduction in suitability or distribution of habitats which support Cordulia aenea. The significance of impacts on NERC fish species were identified as moderate for brown/sea trout and eels based on fragmentation of habitats, with reduced river flows inhibiting migration. Moderate adverse impacts on WFD status are likely based on the impact of the drought option on fish. Major adverse effects due to increased distribution of the invasive species signal crayfish in the catchment, increasing the likelihood of interaction between signal and the native white clawed crayfish (NERC species), resulting in a high magnitude impact that is considered irreversible. Minor adverse short term effects may occur on landscape values, as a significant reduction in river or lake level will have a visual impact on the landscape setting of the area and the Darent Valley Path National Trail, which may be noticeable by walkers. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects associated with the maintenance of essential public water supplies and improved resilience of water supplies to drought. |
| Sundridge 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major short-term hydrological effects may occur due to reductions in flows, velocities and levels in three reaches of the River Darent (Impacts are major on one reach and minor on two other reaches). This would also result in minor adverse effects to water quality, as one reach may have higher SRP concentrations associated with low river flow. A moderate short-term impact on the feasibility of surface water abstraction at Sevenoaks Wildfowl Reserve may occur with the drought order in place. Moderate adverse short-term effects associated with reduced lake levels on the Sevenoaks Gravel Pits SSSI are possible, as are impacts on breeding birds and a reduction in suitability or distribution of habitats which support Cordulia aenea. The significance of impacts on NERC fish species are likely to be moderate for brown/sea trout and eels based on the fragmentation of habitats, with reduced river flows inhibiting migration. Moderate adverse impacts may occur on WFD status due to the impact of the drought option on fish. Major adverse effects due to the possibility that an implementation of the drought order could encourage movement of the invasive species signal crayfish in the catchment, increasing the likelihood of interaction between signal and the native white clawed crayfish (NERC species), resulting in a high magnitude impact that is considered irreversible. Minor adverse short term effects may occur on landscape values, as a significant reduction in river or lake level will have a visual impact on the landscape setting of the area and the Darent Valley Path National Trail, which may be noticeable by walkers. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects associated with the maintenance of essential public water supplies during times of drought, and improved resilience to the drought effects. |
| Lower Thames | Adverse | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought permit would have major adverse effects on flows in the lowest reaches of the fluvial Thames, mainly in terms of velocity reduction. Freshwater flows to the upper Thames Tideway will reduce, potentially completely. Adverse effects are predicted on water quality in the fluvial Thames (reduced dissolved oxygen saturation and reduced phosphate dilution) which may exacerbate water quality issues in the upper Tideway with the potential for major adverse effects. Moderate to major adverse effects are expected on a range of aquatic ecological receptors, such as macroinvertebrates, macrophytes, fish and algae. The major adverse effects are predominantly associated with adverse effects to fish, including migration. Adverse effects also identified with respect to Langham Pond SSSI, Dumsey Meadow SSSI and Syon Park SSSI. Major adverse effects may occur on navigation. The combination of maintenance of water levels, restrictions on lock use, and small restrictions regarding navigability in the Thames Tideway would result in major adverse effects on boats that are navigating between the Tideway and the fluvial River Thames. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought permit would have a major beneficial effects for populations and human health in terms of ensuring supply of water and other customers/businesses. Major beneficial effects are also expected in regard to improved resilience of water supplies to drought. |
| Crayford | Adverse | | | | | | | | | | | | | | | | | | | | | | | Hydrological impacts on two reaches of the River Cray are considered to be negligible, as no reduction in the surface (fresh) water contribution to the tidal reaches of the lower Cray are expected as a result of increased abstraction. Other effects associated with the drought plan option are also largely negligible, excluding a minor, short-term effect associated air emissions due to increased energy use, given the area of influence is within an AQMA. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial impacts are expected with regard to ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts associated with improved resilience of water supplies to drought. |
| Horton Kirby (Aquifer Storage & Recovery) | Adverse | | | | | | | | | | | | | | | | | | | | | | | Negligible adverse hydrological effects are predicted as recharge and abstraction would be from the heavily confined Greensand aquifer, and it is anticipated that there is no hydraulic link with surface water features. The construction phase is restricted to the area within the existing site, and as such, it is not anticipated that any impacts associated with construction. Minor adverse short-term air quality effects are possible, as the option will increase emissions associated with abstraction and treatment of water and the drought option is located less than 1km from the M20 AQMA. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects comprise maintenance of essential public water supplies during times of drought. |
| Eynsford | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major adverse short-term effects are predicted on one reach of the River Darrent as part of it could dry up as a result of drought option implementation. This would result in minor, short-term adverse effects to water quality because higher SRP concentrations are associated with lower river flow. Minor short-term impacts may occur on one Southern Water Services abstraction and other smaller abstractors. Moderate short-term effects on navigation associated with lower river levels are possible, through restricting the size of boats able to use the river. Short-term effects are possible on NERC fish species (brown trout and eels - moderate, sea trout - major) due to fragmentation of habitats and reduced river flows inhibiting migration. Moderate adverse impacts on WFD status are anticipated based on the impact of the drought option on fish and macroinvertebrates. Moderate adverse effects associated with the spread of the invasive species (Australian swamp stonecrop, parrots feather and floating pennywort) are possible. Minor adverse short-term visual impact may occur on the landscape setting of the area and the Darent Valley Path National Trail reduction in river level will have, which may be noticeable by walkers. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought permit would have moderate beneficial effects for populations and human health in terms of ensuring supply of water and other customers/businesses. Minor beneficial effects are also expected in regard to improved resilience of water supplies to drought. |
| Wansunt | Adverse | | | | | | | | | | | | | | | | | | | | | | | Hydrological impacts on Reach 1 of the River Cray are uncertain and assumed to be negligible, and effects on Reach 2 are also negligible as no reduction in the surface (fresh) water contribution to the tidal reaches of the lower Cray is expected as a result of increased abstraction. Other effects associated with the drought plan option are also largely negligible, excluding a minor, short-term effect associated air emissions due to increased energy use, given the area of influence is within an AQMA. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial impacts are expected with regard to ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts for associated with improved resilience of water supplies to drought. |
| Increase in M2 annual licence | Adverse | | | | | | | | | | | | | | | | | | | | | | | Adverse effects identified are limited to negligible, temporary adverse effects from emissions of air pollutants and greenhouse gases associated with additional water pumping and treatment requirements. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Major beneficial effects are identified with respect to the population and human health, water and air and climate. These relate to helping with the sustainable provision of a large quantity of water (at a rate of 91Ml/d) during periods of drought. The drought option achieves this by enabling recovery of storage in the Thames reservoirs after a period of summer drought. This will help ensure that the reservoirs can be full by the end of the calendar year rather than being restricted by the annual total abstraction limit, in case there is a drought period following on in the next year. Abstractions would still be restricted when flows are medium to low (as per normal operations) and therefore the benefits are achieved with no adverse effects on environmental features or other abstractors. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| Waddon | Adverse | | | | | | | | | | | | | | | | | | | | | | | Under a worst case scenario, Waddon Ponds may dry up (for up to 3 months) when they would otherwise not have without a drought permit (significant adverse effect on water levels/flows). With reduction in through-flow in Waddon Ponds, there is a risk of increased water temperature and reduction in dissolved oxygen saturation. Moderate adverse effects are also identified with respect to the River Wandle downstream of the ponds, where the drought permit would extend the recovery of levels and flows by up to one month. These hydrological affects could result in moderate adverse, short term effects with respect to biodiversity, including moderate to minor adverse effects on the Wilderness Island, Spencer Road Wetlands, and Wandle Valley Wetland LNRs. Overall moderate adverse effects on fish communities are predicted, with potential for major adverse impacts on European eel (NERC fish species) and moderate adverse effects to brown trout and barbel. Minor, temporary adverse effects were identified on the landscape values associated with Waddon Ponds, which form a local amenity feature in the London Borough of Croydon and an essential part of the landscape setting and character of the Wandle trail which is valued by walkers. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply. There are also likely to be minor beneficial impacts associated with improved resilience of water supplies to drought. |
| Swindon Oxford Resource Zone | | | | | | | | | | | | | | | | | | | | | | | | |
| Baunton 1 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate, adverse, short-term effects are predicted on three reaches of the River Churn, as they may remain dryer for longer as result of the drought option. Moderate, adverse, short-term effects on NERC fish species are possible, as are minor effects on the nationally designated site North Meadow SSSI as offtakes from the River Churn support the macrophyte community at the site (uncertainty surrounds the water level management practice at the site). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects associated with the drought option include maintaining essential public water supplies during times of drought. |
| Baunton 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate, adverse, short-term effects are predicted on three reaches of the River Churn, as they may remain dryer for longer as result of the drought option. Moderate, adverse, short-term effects on NERC fish species are possible, as are minor effects on the nationally designated site North Meadow SSSI as offtakes from the River Churn support the macrophyte community at the site (uncertainty surrounds the water level management practice at the site). Negligible, adverse, short-term landscape and visual effects may occur as the drought option is located in Cotswolds AONB. However due to the natural drying of the reaches in natural drought conditions, it is unlikely that drought permit implementation will have significant impacts on the local distinctiveness of the landscape. Effects are similar to those associated with the Baunton 1 option. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects associated with the drought option include maintaining essential public water supplies during times of drought. |
| Latton | Adverse | | | | | | | | | | | | | | | | | | | | | | | Minor adverse, short-term effects are predicted on three reaches of river as they may remain dryer for longer as result of the drought option. This would result in moderate adverse effects to water quality, due to reduced dissolved oxygen saturation and increased SRP concentration. Minor adverse, short-term impacts on the feasibility of some other groundwater abstractions in the study area are possible. Moderate adverse, short-term effects on NERC fish species and on the Down Ampney Pits KWS are anticipated due to reduction in abundance or distribution of species supported by the designated site or deterioration in habitat quality, causing a decline in ecological status of the site. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include those associated with maintaining essential public water supplies during times of drought. |
| Meysey Hampton | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major adverse, short-term effects are predicted on four reaches of river as they may remain dryer for longer as result of the drought option. This would result in minor short-term effects to water quality as dissolved oxygen saturation levels may be affected by lower river flow. Moderate adverse, short-term effects on NERC fish species are predicted, comprising increased stress and predation on species in refuges as a result of delay in recovery of flows, reduction in species abundance or distribution as a result of changes in water quality, and impacts on spawning potential. Minor adverse effects on the local designated site Down Ampney Pits KWS may occur, however it is resilient to the impacts of desiccation as movement of water from the aquifer to surface waterbodies often ceases in dry summers. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include maintenance of essential public water supplies during times of drought. |
| Farmoor | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse, short term effects with respect to Biodiversity, flora and fauna including moderate adverse effects regarding INNS, fish community and moderate risk of short-term deterioration to the fish component of 2 |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | WFD waterbodies. Moderate adverse, short term effects to recreational use of the River Thames due to potential effects to navigation and angling. Major adverse, short term effects to water were identified, including major reductions in velocity and high risk to water quality in both the mainstem of the River Thames and distributaries. Discharge pressures (STW discharges) pose a risk to water quality in both the mainstem of the River Thames and distributaries (this includes risks associated with the back pumping element of the scheme). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply, and minor effects are associated with improved resilience of water supplies to drought. |
| Axford 1 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse, short term reductions in flows in the River Kennet would manifest as a reduction in levels and velocities during drought permit implementation. Under dry weather conditions there would be a subsequent delay in groundwater recovery, but this is unlikely to prevent recovery occurring during the hydrological winter (October to March). Moderate adverse, short-term effects are anticipated with respect to biodiversity, flora and fauna. Impacts regarding River Kennet SSSI Conservation Objectives are considered moderate during drought permit implementation and minor during the period of groundwater recovery. The macroinvertebrate and fish component of the Middle Kennet (Marlborough to Hungerford) water body (GB106039023172) would be at moderate risk from May to December and minor risk from January to March of short-term deterioration or prevention of achieving GES with drought permit implementation. Potential moderate impacts on sea trout and brown trout (NERC Act Section 41 Species) between May and December with drought permit implementation. Potential for minor adverse effects with respect to the change in water levels in the River Kennet and the landscape it flows through, which includes the North Wessex Downs AONB and Ramsbury Manor (Registered Park and Garden). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include ensuring supply of water to local population and other customers/businesses. There are also likely to be beneficial effects through reducing vulnerability to drought. |
| Axford 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major adverse, short term effects are expected in relation to a reduction in flows in the River Kennet, that would manifest as a reduction in levels and velocities during drought permit implementation. Under dry weather conditions, there would be a subsequent delay in groundwater recovery, but this is unlikely to prevent recovery occurring during the hydrological winter (October to March). Moderate adverse, short-term effects are anticipated with respect to biodiversity, flora and fauna. Impacts regarding River Kennet SSSI Conservation Objectives are considered moderate during drought permit implementation and minor during the period of groundwater recovery. The macroinvertebrate and fish component of the Middle Kennet (Marlborough to Hungerford) water body (GB106039023172) would be at moderate risk from May to December and minor risk from January to March of short-term deterioration or prevention of achieving GES with drought permit implementation. Potential moderate impacts on sea trout and brown trout (NERC Act Section 41 Species) between May and December with drought permit implementation. Potential for minor adverse effects with respect to the change in water levels in the River Kennet and the landscape it flows through, which includes the North Wessex Downs AONB and Ramsbury Manor (Registered Park and Garden). |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply, and also minor beneficial effects associated with improving the resilience of water supplies to drought. |
| Bibury | Adverse | | | | | | | | | | | | | | | | | | | | | | | Potential adverse effects identified relate to a minor reduction in flow in the River Coln, and associated minor impacts on NERC species, WFD status and the geomorphology of the reaches. There may also be minor adverse temporary effects related to construction. All impacts identified will be short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts have been identified primarily through ensuring supply of water to local population and other customers/businesses. There are also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |
| Blewbury | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major reductions in flows are likely to occur in Mill Brook and Cholsey Brook during drought option implementation, resulting in major adverse impacts on water quality (in particular south of South Moreton and Cholsey STW), but also resulting in effects on NERC species (spawning fish - brown trout). A further major adverse effect is anticipated in relation to the near-drying out of Blewbury Pond during drought option operation, which has high amenity for local residents and visitors. Other adverse effects relate to the impacts associated with low flow, including increase in invasive flora and geomorphological impacts. All adverse impacts are considered to be short term and temporary. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts comprise ensuring supply of water to local population and other customers/businesses. There are also likely to be beneficial effects associated with improving the resilience of water supplies to drought. |
| Gatehampton | Adverse | | | | | | | | | | | | | | | | | | | | | | | There are negligible hydrological impacts associated with Gatehampton drought permit implementation. No impacts on biodiversity, geomorphology, water quality and other abstractors are expected. There may be minor adverse effects due to emissions to air associated with additional abstraction and proximity to nature conservation sites. All adverse effects identified are short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial impacts are expected with regard to ensuring supply of water to local population and other customers/businesses. There are also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |
| Ogbourne emergency boreholes | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse, short-term effects are anticipated with respect to biodiversity, flora and fauna. Impacts on fish may occur due to an extension in duration of River Og being dry, and a reduction in flows in the River Kennet. Changes in flow in the River Kennet (a designated SSSI) also have potential for moderate adverse, short-term effects on macroinvertebrates. The Middle Kennet water body is considered at moderate risk of short-term deterioration of WFD status for macroinvertebrates and fish. A minor adverse, short-term effect on angling and recreation relates is possible due to impacts on fish communities. Moderate adverse, short-term effects to water are likely as the abstraction will cause the River Og to remain dry for longer. Flow changes in the River Kennet are considered minor, however there is a high risk to water quality associated with the Marlborough STW discharge due to reduced dilution in the River Kennet during drought permit implementation. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply. Minor beneficial effects are associated with improving the resilience of water supplies to drought. |
| Oxford Canal - Banbury | Adverse | | | | | | | | | | | | | | | | | | | | | | | Small changes to flow and velocity in Reach 1 of the Oxford Canal will occur, however the hydrological impact of the drought permit is considered to be minor overall. No impacts on geomorphology, water quality and other abstractors are expected. Short-term effects on public health and air quality due to emissions associated with construction and additional abstraction may occur, and these are considered to be minor overall given proximity to the Cherwell District Council AQMA. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply. Minor beneficial effects are associated with improving the resilience of water supplies to drought. |
| Sor Brook | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects have been identified regarding reductions in velocity and wetted depth downstream of Sor Brook, and associated impacts on NERC species (brown trout, bullhead, European eel, and fine-line pea mussel). Other moderate adverse effects related to this reduction in velocity and wetted depth include the spread of invasive species (signal crayfish, New Zealand mud snail and invasive flora), geomorphological impacts, and effects on feasibility of angling due to impacts on fish communities. Water quality is also likely to be affected, particularly downstream of Heyford STW due to reduced dilution of the STW discharge. All impacts are expected to be short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include ensuring supply of water to the local population and other customers/businesses. There are also likely to be beneficial effects associated with improving the resilience of water supplies to drought. |
| Childrey Warren | Adverse | | | | | | | | | | | | | | | | | | | | | | | Short-term, temporary effects on water levels and flows are anticipated, comprising a 100% decrease in flow on Reach 1 of Letcombe Brook and associated water quality effects. This is likely to contribute to major short-term, temporary effects on biodiversity, flora and fauna (in particular effects on NERC species - brown trout). Other short-term adverse effects anticipated include changes to the distribution and abundance of invasive species (Canadian pondweed and least duckweed), declines in water quality (with regards to SRP), and geomorphological changes (shallower banks affected by drought action). There will also be minor, short-term drying-up of Letcombe Brook along existing trails and footpaths, and minor increases in energy use and waste generation due to abstraction and treatment of additional water. Negligible, short-term increases in air emissions are expected to accompany increases in energy use. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include ensuring water supply to the local population and other customers/businesses. There are also likely to be beneficial effects associated with improving the resilience of water supplies to drought. |
| Ogbourne | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse, short-term effects are anticipated with respect to biodiversity, flora and fauna. Impacts on fish may occur due to an extension in duration of River Og being dry, and a reduction in flows in the River Kennet. Changes in flow in the River Kennet (a designated SSSI) also have potential for moderate adverse, short-term effects on macroinvertebrates. The Middle Kennet water body is considered at moderate risk of short-term deterioration of WFD status for macroinvertebrates and fish. Minor adverse, short-term effects on angling and |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | recreation are possible due to impacts on fish communities. Moderate adverse, short-term effects to water are likely as the abstraction will cause the River Og to remain dry for longer. Flow changes in the River Kennet are considered minor, however there is a high risk to water quality associated with the Marlborough STW discharge due to reduced dilution in the River Kennet during drought permit implementation. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply. Minor beneficial effects are associated with improving the resilience of water supplies to drought. |
| Kennet Valley Water Resource Zone | | | | | | | | | | | | | | | | | | | | | | | | |
| Compton 1 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects are identified for biodiversity and on water quality. Effects include low groundwater flows being exacerbated, resulting in the River Pang remaining drier for longer, and resulting impacts on water quality (SRP and dissolved oxygen saturation levels), NERC species (Ranunculus spp. brown trout, fine-lined pea mussel), macroinvertebrates and fish. There is the potential for major adverse impacts in relation to other abstractors, in particular a number of significant groundwater abstractions that are used by the EA for abstraction under the WBGWS (upstream of Compton, totalling 56Ml/d), which may affect the feasibility of the abstraction. Minor effects include those on angling. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |
| Compton 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects are identified for biodiversity and on water quality. Effects include low groundwater flows being exacerbated, resulting in the River Pang remaining drier for longer, and resulting impacts on water quality (SRP), NERC species (Brown Trout, Fine-lined pea mussel, European Eel) , macroinvertebrates, macrophytes and fish. There is the potential for major adverse impacts in relation to other abstractors, in particular a number of significant groundwater abstractions that are used by the EA for abstraction under the WBGWS (upstream of Compton, totalling 56Ml/d), which may affect the feasibility of the abstraction. Minor effects include those on angling. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |
| Fobney Emergency Boreholes | Adverse | | | | | | | | | | | | | | | | | | | | | | | Four reaches will be impacted, three on the River Kennet all identified as having negligible hydrological impacts, and one on Holy Brook, identified as having a minor impact. The impact on Holy Brook would include reductions in levels and wetted width in isolated areas where channel banks are shallower, while this would not occur on the River Kennet as it is level-controlled. Moderate effects on water quality in Holy Brook may occur, comprising elevated SRP concentrations that may downgrade diatom and macrophyte status downstream. The Reading STW may present moderate a water quality pressure to the River Kennet downstream of the confluence with Foudry Brook, due to influences on ammonia, dissolved oxygen saturation and SRP. Minor declines in habitat suitability for sensitive flora and fauna species may occur, as may moderate adverse effects due to air emissions associated with increased abstraction. Moderate effect on air emissions. Holy Brook forms part of the landscape and visual amenity value of Southcote Linear Park, and impacts on river levels may adversely impact the visual amenity of the park for walkers and those who visit the park. However, all adverse effects identified are short-term and temporary, and not expected to extend beyond six months. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects include ensuring supply of water to local population and other customers/businesses, and minor benefits associated with improving the resilience of water supplies to drought. |
| Pangbourne | Adverse | | | | | | | | | | | | | | | | | | | | | | | Negligible hydrological effects are anticipated on the River Pang from the Blue Pool to the confluence with River Thames. However, temporary adverse impacts ranging from major to negligible are anticipated on Sulham Brook. Major adverse hydrological effects are predicted due to extension of the period Sulham Brook would be dry, and major effects on water quality in Sulham Brook are also expected due to low dissolved oxygen saturation and reduced dilution of Pangbourne STW discharges. Sulham Brook has high sensitivity for WFD status. Short-term major impacts on one other abstraction from Sulham Brook are also possible. Moderate impacts on the geomorphology of Sulham Brook are possible, associated with reduced flows in areas where bank slope is shallow. Minor, short-term impacts on the Sulham and Tidmarsh Woods and Meadows SSSI, NERC fish species (brown trout and European eel) and notable county and regional level species (bullhead and brook lamprey) are possible. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial impacts are expected with regard to ensuring supply of water to local population and other customers/businesses. There is also likely to be a minor beneficial effect associated with improving the resilience of water supplies to drought. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| Playhatch | Adverse | | | | | | | | | | | | | | | | | | | | | | | Overall, adverse effects associated with this drought option are minor to negligible and temporary. There would be minor adverse effects associated with emissions to air due to the abstraction of an additional 4Ml/d. Remaining adverse effects would be negligible, as they are associated with negligible hydrological effects and the use of energy for the additional abstraction. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | There would be moderate beneficial effects associated with provision of water supplies. Also, minor beneficial effects due to improving the resilience of water supplies to drought. |
| Fobney Direct | Adverse | | | | | | | | | | | | | | | | | | | | | | | If implemented, the drought permit would have a major hydrological impact on Holy Brook between the Arrowhead control structure and its confluence with the River Kennet. Impacts will manifest as a reduction in lowest flows of up to 40%, along with reductions in velocities, levels and wetted widths. There would be a moderate water quality risk for SRP during the drought permit implementation. Habitat availability would be negatively affected through reductions in loss of marginal habitats in localised areas, adversely affecting macroinvertebrates, macrophytes and phytobenthos, and fish. Holy Brook forms part of the landscape and visual amenity value of Southcote Linear Park, and impacts on river levels may adversely impact the visual amenity of the park for walkers and those who visit the park. However, all adverse effects identified are short-term and temporary, and not expected to extend beyond six months. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | If implemented the drought permit would have a minor beneficial hydrological impact on the River Kennet from the Arrowhead control structure to the Fobney WTW intake. Flows would be increased by 20 Ml/d for the duration that the drought permit is implemented. Moderate beneficial impacts associated with ensuring supply of water to local population and other customers/businesses. Minor benefits associated with improving the resilience of water supplies to drought. An increase in flow at a time of natural drought will also help to alleviate the impacts of natural drought on macrophytes, fish, mammals and birds in the habitats of the River Kennet. |
| Guildford Water Resource Zone | | | | | | | | | | | | | | | | | | | | | | | | |
| Albury | Adverse | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects on water quality may occur due to elevated SRP concentrations, and moderate adverse hydrological effects are expected on the two reaches of Law Brook. Moderate adverse effects on NERC species (brown trout) are anticipated, as are minor adverse effects due to an increase in invasive macroinvertebrates. There would be minor impacts on angling at ponds along Law Brook, and minor adverse effects associated with air and greenhouse gas emissions. Minor geomorphological changes are also expected. Adverse effects are largely limited to Reach 2 (Law Brook from Ford Cress Beds to confluence with River Tillingbourne), and are predominantly short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects are expected due to provision of additional water supply. Minor beneficial effects associated with improving the resilience of water supplies to drought. |
| Shalford | Adverse | | | | | | | | | | | | | | | | | | | | | | | Flow reductions associated with implementation of the drought permit on the River Wey upstream of the River Tillingbourne will be negligible. Downstream impacts would be proportionally less with flow contributions coming from the River Tillingbourne and Guildford STW. Negligible adverse hydrological impacts were identified, impacts on geomorphology, water quality and other abstractors are also expected to be negligible. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial impacts are expected with respect to ensuring supply of water to local population and other customers/businesses. There is also likely to be minor beneficial impacts associated with improving the resilience of water supplies to drought. |
| SWA Water Resource Zone | | | | | | | | | | | | | | | | | | | | | | | | |
| New Ground | Adverse | | | | | | | | | | | | | | | | | | | | | | | No major adverse impacts have been identified for implementation of the New Ground drought permit. Moderate adverse impacts have been identified with regard to reduced flow/levels, as the abstraction is likely to delay groundwater recovery. Minor water quality effects on dissolved oxygen quality, ammonia and reactive phosphorus may occur in Reach 1 (River Bulbourne (source at Dudswell) to confluence with Grand Union Canal). Minor impacts on macroinvertebrates, fish and bullhead are also possible due to the alteration to community composition and the reduction/loss of spawning habitat and increased stress/predation on species. There are also likely to be minor impacts on geomorphology in Reach 1, and on material assets/resource use due to increases in energy use in the increased abstraction and treatment of water. Adverse impacts are negligible to absent in the remaining reaches of the River Bulbourne, and all adverse effects identified are short-term and temporary. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts have been identified primarily through ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |

| | | SEA Topic | | | | | | | | | | | | | | | | | | | | | | Commentary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity | | | | Population and Human Health | | | Material Assets and Resource Use | | Water | | | | Soil, Geology and Land Use | | | Air and Climate | | | Archaeology and Cultural Heritage | | Landscape | |
| SEA Objective | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 7.2 | 8.1 | |
| Pann Mill | Adverse | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified in relation to a reduction in flow in the River Wye (Reach 2 - from Pann Mill PS to Little Marlow STW discharge) to its lowest level during drought permit operation. Moderate adverse effects relate to the impacts of this low flow on biodiversity (including loss of habitat and spawning areas affecting Brown Trout), and water quality (with risks for SRP in Reach 2). Minor adverse impacts have also been identified in relation to non-native invasive species (low flows and loss of habitat), and geomorphology (effects in shallow sections of reaches). However, all adverse effects identified are short-term and temporary, and not expected to extend beyond six months. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial impacts include ensuring supply of water to local population and other customers/businesses. There is also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |
| Henley Water Resource Zone | | | | | | | | | | | | | | | | | | | | | | | | |
| Harpsden / Sheeplands | Adverse | | | | | | | | | | | | | | | | | | | | | | | Negligible adverse effects are predicted for this drought option and no construction is proposed. |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | Beneficial effects include maintained of essential public water supplies during times of drought. There is also likely to be beneficial impacts associated with improving the resilience of water supplies to drought. |

## 5.6 HABITATS REGULATIONS ASSESSMENT SCREENING REPORT OF DROUGHT PLAN SUMMARY

TWUL has undertaken the first stage in the HRA process, Screening, on its draft DP options list. It has been carried out in parallel with the SEA and is reported separately in the HRA Screening Report. The screening stage establishes whether any schemes have the potential for a Likely Significant Effect (LSE) on the integrity of a European designated site. No options are considered to have LSEs on European designated sites, either alone or in combination with other drought options in TWUL's Draft DP 2016.

## 5.7 SUMMARY

In general, the demand side options were found to have beneficial impacts on SEA objectives for population and human health and material assets and resource use. Minor adverse impacts have been identified with respect to other users where restrictions of water use are involved and also for cultural heritage and emissions.

The assessment has found that supply side options would have adverse impacts associated with supply side options typically relate to additional energy requirements, emissions and materials used to maintain supply. The NLARS, TGWTW and WBGWS options have the greatest beneficial effects, as they would deliver large volumes of water during drought events. These options all provide major beneficial effects with respect to SEA objectives regarding protecting and enhancing health and well-being, enabling access to essential services, and improving resilience to the threats of climate change.

Impacts on SEA objectives for drought permit/order options were mainly associated with impacts on groundwater levels and the subsequent effects on surface waters and their ecology. Reductions in groundwater levels and surface water levels also have the potential for adverse impacts on archaeology and cultural heritage and on landscape and visual amenity. The assessment showed that for WRZs with a number of drought options to select from, a distinction can be made between options that would be considered more sustainable than the others within the same WRZ and this is used to inform the order in which they would be implemented.

# 6 CUMULATIVE ASSESSMENT

## 6.1 INTRODUCTION

The cumulative assessments presented in this section have been carried out in line with the methodology described in Section 4.

## 6.2 DEMAND SIDE OPTIONS

### 6.2.1 Cumulative effects of demand management options

The matrix in **Figure 6.1** illustrates potential incompatibility and cumulative impacts between demand management schemes.

**Figure6-1 Cumulative impacts matrix, demand management measures**

| Demand Management Options | Media / water efficiency campaign | Leakage reduction | Sprinkler and hose pipe ban | Temporary use ban | Drought order to ban non-essential use |
|---|---|---|---|---|---|
| Leakage reduction | | | | | |
| Sprinkler and hose pipe ban | | | | | |
| Temporary use ban | | | | | |
| Drought order to ban non-essential use | | | | | |
| Emergency drought order | | | | | |

**Legend:**

| | |
|---|---|
| | No cumulative effects identified or beneficial cumulative effects anticipated |
| | Adverse impacts anticipated |
| | Options are sequential |
| | Uncertain – Insufficient information available to undertake assessment |

It is acknowledged that the demand management options "Drought Order to ban Essential Use" and "Emergency Drought Order" are sequential. The "Drought Order to ban Essential Use" will remain in place while the "Emergency Drought Order" is operational but it is the worst case scenario for demand management and effects between the two options are not additive. No cumulative impacts between demand side options have been identified.

### 6.2.2 Cumulative effects with supply side and drought permit/order options

Demand management measures serve to reduce pressure on water resources and will

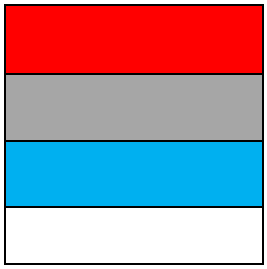
have a positive influence on both supply side and drought permit/order options by reducing customer demand for water, and therefore reducing the abstraction at source.

## 6.3 CUMULATIVE EFFECTS BETWEEN SUPPLY SIDE AND DROUGHT PERMIT/ORDER OPTIONS

Cumulative effects of each supply side and drought permit/order drought option with each other supply side and drought permit/order drought option have been assessed and are summarised in the matrix presented in Figure 5.3.

The legend used is as follows:

**KEY**



Mutually exclusive schemes, i.e. use the same site or the same resource

Potential adverse construction impacts if constructed simultaneously

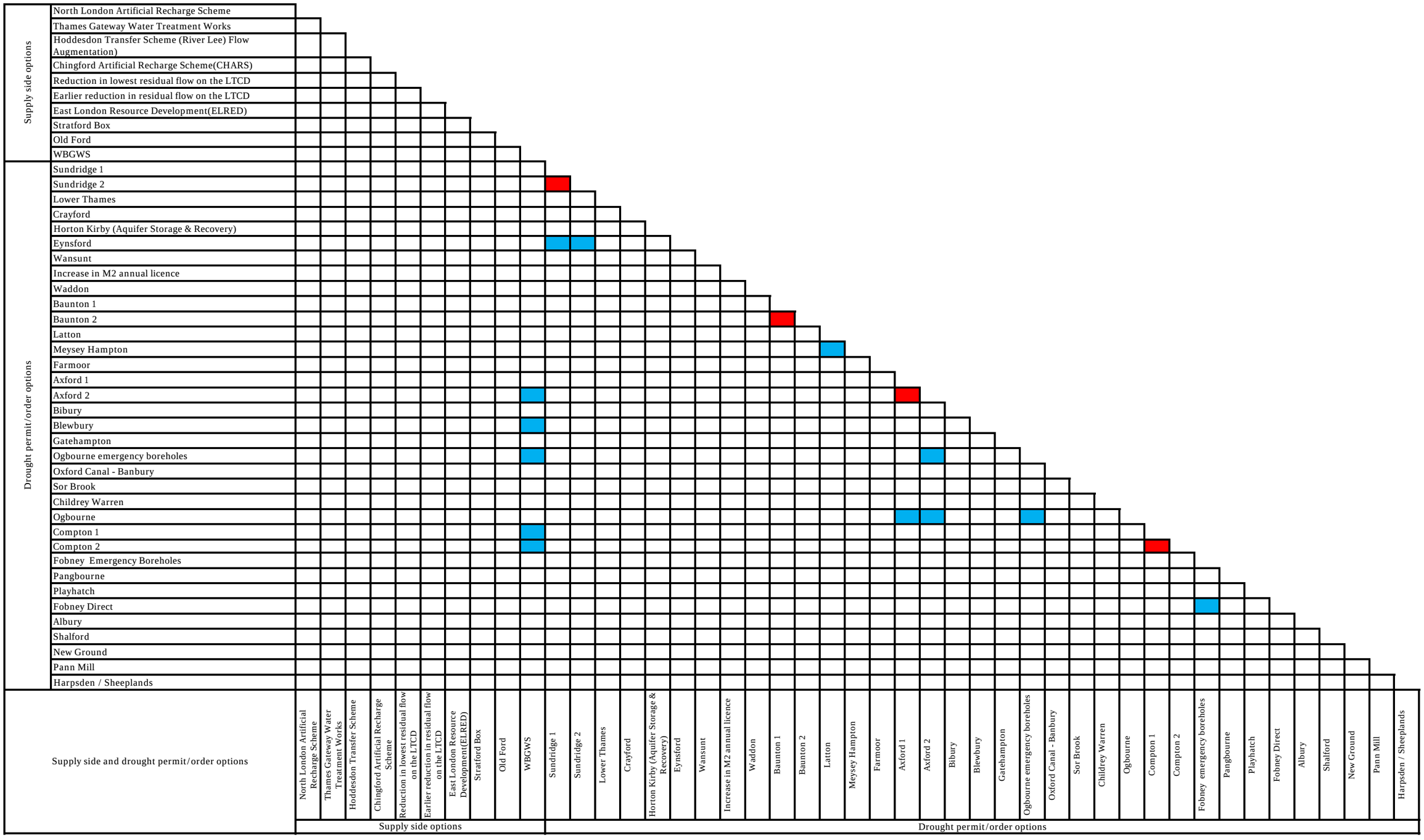
Potential cumulative impacts in operation

No cumulative impacts

The assessments have been informed by EARs, and mapping of locations of drought options, surface water and groundwater catchments.

**Figure6-2 Cumulative impacts matrix, supply-side options**

**Figure 6-2 Cumulative Impacts Matrix, Supply-side and Drought Permit/Order Options**



There are four pairs of mutually exclusive schemes – schemes that use the same site or the same resource. The second schemes use the same resource but an increased output compared with the first and therefore there is no potential for cumulative effects. These are:

- Sundridge 1 and Sundridge 2
- Baunton 1 and Baunton 2
- Axford 1 and Axford 2
- Compton 1 and Compton 2

The potential for cumulative effects with other drought options will be reviewed by TWUL should an actual drought permit application be required in the future, to reflect the situation at that time.

The potential cumulative impacts in the operation of options have been identified on Figure 6.2 and are discussed below. For the other options not discussed below, no cumulative impacts have been identified with other options.

- Latton with Meysey Hampton
    - The Latton and Meysey Hampton drought permit options individually affect the same five watercourses: Ampney Brook, Poulton Stream, Marston Meysey Brook, Blackford Barn Stream and a short reach of the River Thames (from the confluence with Ampney Brook until its confluence with the River Ray).
    - The cumulative impact of the Latton and Meysey Hampton reaches would not extend the reaches beyond that described for the Meysey Hampton drought permit.
    - Cumulatively, the magnitude of the impacts would be the same as for Meysey Hampton, i.e. there would be a **moderate** impact on Ampney Brook (from source to the confluence with the River Thames), Poulton Stream (from source to the confluence with Ampney Brook), Marston Meysey Brook (from source to the confluence with the River Thames) and Blackford Barn Stream (from source to the confluence with Marston Meysey Brook).
    - Cumulatively, there would remain a **minor** impact on flows within the River Thames reach. Overall, the cumulative impact of the drought permit would not reduce flow in the river below levels that it would

have been experienced earlier in the year.

- The cumulative impact of the Latton and Meysey Hampton reaches on water quality is not considered likely to increase from that assessed for the drought permits in isolation.
- The cumulative risk from flow pressures with both the Latton and Meysey Hampton drought permits in place is hence considered to be **low**, and there is no additional risk to the operation of these abstractions from having both drought permits in place.
- The cumulative risk from water quality pressures with both the Latton and Meysey Hampton drought permits in place is therefore assessed as **medium**.
- The cumulative impacts on the identified environmental features when operating Latton and Meysey Hampton drought permits simultaneously are summarised in the EAR and include moderate adverse impacts on fish (as an ecological community) and Brown/Sea Trout and Lamprey sp., minor effects on Down Ampney Pits KWS, macroinvertebrates, diatoms, bullhead, and ecological significant receptors.

- Axford 1 with Ogbourne 1
  - The Axford 1 abstraction lies in close proximity to the Ogbourne 1 abstraction. The Axford 1 and Ogbourne 1 drought permit options individually affect the same watercourse, the River Kennet. The Ogbourne 1 drought permit option also affects the River Og.
  - The cumulative impacts of both drought permits will manifest as a reduction in flow, although this is not expected to be beyond that experienced in the normal range of hydrological variation when compared to the Axford 1 drought permit individually.
  - Taking into consideration all discharge pressures located within the cumulative reaches of the Axford 1 and Ogbourne 1 drought permits, the risk to water quality is anticipated to be **medium**. The extended delay to the recovery of the watercourse is not considered likely to alter the impact magnitude or significance of impact identified for the environmental features when operating the Ogbourne 1 drought permit alone.

- Fobney Direct with Fobney Emergency Borehole
    - The Fobney Direct abstraction lies in close proximity to the Fobney EBH abstraction. The Fobney Direct and Fobney EBH drought permit options individually affect the same watercourses namely the River Kennet and Holy Brook.
    - An additional reach will be impacted from the confluence of the Holy Brook and the River Kennet when compared to the hydrological impact associated with the Fobney Direct drought permit individually. This reach was however, included in the EAR for the Fobney EBH drought permit.
    - No water quality risks were associated with decreases in dissolved oxygen saturations or increases in total ammonia concentrations during the joint operation of both permits.
    - The cumulative impacts on the identified environmental features when operating Fobney Direct and Fobney EBH drought permits simultaneously are similar to the impacts identified for reach 1 of the Fobney Direct drought permit when operated individually.
- Ogbourne 1 and Ogbourne Emergency Boreholes
    - There is potential for cumulative effects between Ogbourne 1 Drought Permit with Ogbourne EBH drought option. A more comprehensive assessment will be undertaken should an actual drought permit application be required in the future, to reflect the situation at that time.
- WBGWS with Axford 1 with Ogbourne 1
    - It is not anticipated that the implementation of the Axford 1 and Ogbourne 1 drought permits will have any cumulative impacts with the WBGWS due to the distance between the catchments and abstraction boreholes. Furthermore, the operation of both drought permits and the WBGWS are not considered to have a cumulative impact upon flow in the River Kennet.

Assessments for some options with potential for cumulative impacts were in progress at the time of writing. These comprehensive assessments will be supported by detailed modelling where necessary, and will be completed in time to support the final Drought Plan. The options with potential for cumulative impacts to be further assessed include:

- Axford 2 with Ogbourne
- Axford 2 with Ogbourne Emergency Borehole
- Sundridge 1 with Eynsford
- Sundridge 2 with Eynsford
- WBGWS with Compton 1 and 2
- WBGWS with Ogbourne Emergency Boreholes and Axford 2
- WBGWS with Blewbury.

## 6.4 HABITATS REGULATIONS ASSESSMENT SCREENING REPORT OF DROUGHT PLAN SUMMARY OF CUMULATIVE ASSESSMENT

TWUL has undertaken the first stage in the HRA process, Screening, on its draft DP options list. It has been carried out in parallel with the SEA and is reported separately in the HRA Screening Report. The screening stage establishes whether any schemes have the potential for a Likely Significant Effect (LSE) on the integrity of a European designated site. In-combination effects of TWUL's draft DP 2016 with its WRMP14, the Environment Agency's regional DPs, the Thames River Basin Management Plan 2015, and other water company WRMPs and DPs, were not considered likely to have significant adverse effects on European designated sites.

## 6.5 CUMULATIVE EFFECTS WITH EXISTING RELEVANT PROGRAMMES, PLANS, POLICIES AND PROJECTS

### 6.5.1 Other water company Drought Plans

Assessment of the potential for cumulative impacts of supply side and drought permit/order options listed in neighbouring water companies' DPs has been undertaken.

It should be noted that DPs for other companies/organisations are subject to review on timescales that may not be aligned with the timescales of TWULs DP revision. The information used to carry out these assessments is considered to be the most up to date information available at time of writing, but the assessments should be reviewed

at the time of drought option implementation to ensure that no changes to the neighbouring water company drought options has been made in the intervening period, and that the assessment, therefore remains valid.

The assessments have been informed by each Water Companies DP and where possible the SEAs and the details presented in the drought option details tables often presented in the appendices of the respective water company DP. As stated above, the assessment has used the most recent information available on the neighbouring water company DP.

The following neighbouring watering company DPs were considered:

- Anglian Water (2014)
- Severn Trent (2014)
- Southern Water (2013)
- Wessex Water (2013)
- Bristol Water (2012)
- Essex and Suffolk Water (2013)
- South East Water (mid Kent) (2013)
- Sutton and East Surrey Water (2013)
- Affinity Water (2013)

#### *6.5.1.1 Anglian Water*

No cumulative impacts between drought options in TWUL's Draft DP with Anglian Water's Drought Plan (2014) have been identified.

#### *6.5.1.2 Severn Trent*

The cross border supplies between Severn Trent Water and TWUL are minor in terms of drought planning. No cumulative impacts between drought options in TWUL's Draft DP with Severn Trent Water's Drought Plan (2014) have been identified.

#### *6.5.1.3 Southern Water*

No cumulative impacts between drought options in TWUL's Draft DP with Southern Water's Drought Plan (2013) have been identified.

#### *6.5.1.4 Wessex Water*

No cumulative impacts between drought options in TWUL's Draft DP with Wessex

Water's Drought Plan (2013) have been identified. No cumulative impacts between drought options in TWUL's Draft Drought Plan with Wessex Water's Drought Plan (2013) have been identified.

#### *6.5.1.5 Bristol Water*

No cumulative impacts between drought options in TWUL's Draft DP with Bristol Water's Drought Plan (2012) have been identified.

#### *6.5.1.6 Essex and Suffolk Water*

Essex and Suffolk Water obtain 20% of water supplied in their Essex water resource zone from TWUL via a raw water bulk transfer from the Lee Valley reservoirs. This would be reduced in drought conditions depending on the respective demand management measures implemented by each company. Essex and Suffolk Water's DP (2013) includes an option that would increase the bulk transfers from TWUL by agreement. The Essex and Suffolk Water Drought Plan assumes that TWUL's own resource situation would be robust and that the spatial distribution of drought impact would not cover TWUL's supply area although this would not be the case in all drought situations. No cumulative impacts between drought options in TWUL's Draft Drought Plan with Essex and Suffolk Water Drought Plan (2013) have been identified.

#### *6.5.1.7 South East Water (Mid Kent)*

The former South East Water Drought Plan (2007) included a potential drought permit/order which involves an increase in abstraction of an existing licence from boreholes at Cramptons Road, which was assessed as having the potential for cumulative effects with Sundridge (1&2) as well as Eynsford in the previous SEA. South East Water has decided not to take this option forward as part of their 2013 drought plan because of the uncertainty over potential negative impact on European designated sites such as Special Areas of Conservation and Special Protection Areas. No cumulative impacts between drought options in TWUL's Draft Drought Plan with South East Drought Plan (2013) have been identified. At the time of writing South East Water had no drought options confirmed.

#### *6.5.1.8 Sutton and East Surrey Water*

TWUL have an agreement to supply Sutton and East Surrey Water with 13.6Ml/d. The Sutton and East Surrey Water Drought Plan (2013) includes a supply side drought option where communication to TWUL would be made regarding the availability of bulk supplies and supplies would only be made if TWUL's resource situation was robust.

Cumulative impacts have been identified between the Waddon DP option and drought options in the Sutton and East Surrey Water Drought Plan.

The Sutton and East Surrey Water Draft Drought Plan (2011) includes a potential drought permit/order option which involves an increase in abstraction from three groups of groundwater abstraction sites (Hackbridge/Goatbridge group, Woodmansterne group and Kenley group). Given the proximity of these boreholes to the Waddon boreholes, there is the potential for cumulative effects, such as exacerbating the reduction in groundwater levels and associated effects, if the Sutton and East Surrey Water drought permits were to be implemented at the same time as the Waddon drought permit. This would need to be addressed with Sutton and East Surrey Water in an evolving drought situation in order to understand the likelihood of the drought permits being operated at the same time. Alternative drought options may need to reviewed in order to determine the appropriate approach according to the prevailing drought conditions.

The potential for cumulative impacts with other water company drought plans must be reviewed at the time of any potential future Waddon drought permit application as they may have been revised in the interim.

#### *6.5.1.9 Affinity Water*

Affinity Water Drought Plan (2013) notes that there is significant interaction of water resources between TWUL and their central region. It is TWULs responsibility to maintain minimum flows in the River Thames at Teddington and Affinity do not link their drought actions to surface water conditions. Affinity Water also receive bulk supplies from TWUL of up to with 12Ml/d. No cumulative impacts between drought options in TWUL's Draft Drought Plan with Affinity Water's Drought Plan (2013) have been identified.

### 6.5.2 Water Resource Management Plans

Assessment of the potential for cumulative effects with Thames Water's WRMP and neighbouring water companies' WRMPs has been undertaken.

It should be noted that all WRMPs are subject to review every five years. The information used to carry out these assessment is considered to be the most up to date information publicly available at time of writing (Periodic Review 2014 (PR14) WRMPs), but the assessments should be reviewed at the time of drought option implementation to ensure that no changes to the WRMPs has been made in the intervening period, and that the assessment, therefore remains valid. For example the PR19 WRMPs will be developed and issued during the period of Thames Water's DP.

The assessments have been informed by each Water Companies' WRMP and where possible SEAs.

The following WRMPs were considered:

- Thames Water (2014 and any established knowledge regarding WRMP19)
- Anglian Water (2014)
- Severn Trent (2014)
- Southern Water (2013)
- Wessex Water (2014)
- Bristol Water (2013)
- Essex and Suffolk Water (2014)
- South East Water (mid Kent) (2014)
- Sutton and East Surrey Water (2013)
- Affinity Water (2014)

All of Thames Water's neighbouring companies WRMPs include significant demand management components which will complement the Demand Side measures of Thames Water's DP. Improved water efficiency and leakage reduction across the country will give beneficial cumulative impacts in terms of lower energy use and carbon emissions from reduced pumping and treatment. These measures will also reduce the need to abstract new water resources, thereby ensuring ecological water requirements are maintained.

#### *6.5.2.1 Thames Water*

The DP demand side measures complement the demand management schemes included in the WRMP. While their implementation may exacerbate some of the potential adverse impacts of the demand management measures, for example in relation to vehicle movements their implementation in combination with demand management measures included in the WRMP should cause a beneficial cumulative impact on water resources (with indirect beneficial effects on environmental receptors such as biodiversity) because of improved water efficiency and less wasted water.

In terms of geographic location, possible interactions with the WRMP were identified as:

- The WRMP AR schemes use surplus water ultimately sourced from the River Thames, and the Oxford Canal Transfer and RWE Didcot Transfer would increase flows in the River Thames between Oxford and the lower Thames abstraction points. As such there could be interaction with the Oxford Canal, Lower Thames, Increase in M2 Licence and Farmoor drought options. All schemes are subject to the LTOA which will mitigate effects on the upper Tideway.
- Operation of the ELRED groundwater source as a strategic supply side drought option may be affected by the implementation of the WRMP ELRED scheme. However, licence conditions will be maintained. The same applies for the Oxford Canal drought option and Oxford Canal Transfer scheme included in the WRMP.
- The NLARS strategic supply side drought option uses the confined chalk aquifer for artificial recharge. Therefore it is considered unlikely that this would affect operation of the groundwater schemes identified in the WRMP and a new scheme would not be developed that would compromise or be compromised by NLARS.
- The WRMP includes the Beckton STW reuse scheme, the waste stream from the reuse plant will be discharged via the effluent outfall. The nearby Thames Gateway Water Treatment Works intake is designed to avoid being influenced by the STW waste stream, therefore there will be no operational cumulative effects of the reuse plant waste stream on the DP strategic supply side option.
- The renegotiation of the existing transfer to Essex and Suffolk Water included in the WRMP will affect the agreement to reduce exports included in the DP.

#### *6.5.2.2 Anglian Water (2014)*

With particular focus on the Ruthamford South, South Essex and Central Essex WRZs which border Thames Water's region, there are no likely potential cumulative effects with Anglian Water's WRMP.

#### *6.5.2.3 Severn Trent (2014)*

There are no Thames Water DP options in close enough proximity to Severn Trent Waters region to result in any construction related cumulative effects. There is no hydrological link between the options in Thames Waters DP and Severn Trent's WRMP14. No cumulative effects are, therefore, likely to occur with Thames Water's DP.

#### 6.5.2.4 Southern Water (2013)

Focussing on areas which boarder the Thames Water region it has been identified that there are no Thames Water DP options in close enough proximity to result in any cumulative effects.

#### 6.5.2.5 Wessex Water (2014)

Wessex Water has no projected deficit and as such the WRMP14 proposes no supply options. No cumulative effects are therefore likely to occur with Thames Water's DP.

#### 6.5.2.6 Bristol Water (2013)

There are no Thames Water DP options in close enough proximity to the Bristol Water region to result in any construction related cumulative effects and there is no part of the Thames region in hydrological connectivity with the Bristol Water region. No cumulative effects are therefore likely to occur with Thames Water's DP.

#### 6.5.2.7 Essex and Suffolk Water (2014)

The Essex and Suffolk Water WRMP includes no supply options, as all of the WRZs are projected to be in surplus over the plan period. No cumulative effects are, therefore, likely to occur with Thames Water's DP.

#### 6.5.2.8 South East Water (2014)

The WRMP includes the option Bray WTW extension, which involves WTW upgrades to allow increased abstraction from the Lower River Thames at licence limits. However, flows in the Thames are maintained according to the Lower Thames Operating Agreement (LTOA) and therefore the potential for cumulative effects with Thames Water's DP is considered to be negligible. The WRMP contains no supply options which could cause cumulative effects with options in Thames Water's DP, noting that the South East Water WRMP includes bulk supplies from Thames Water, which have been considered in Thames Water's final WRMP and DP.

#### 6.5.2.9 Sutton and East Surrey Water (2013)

The Sutton and East Surrey Water WRMP option R26 – UV treatment for Source 6 is in proximity and identified as having potential to cause increased drawdown on groundwater, potentially reducing springflow. However, the SEA of the Sutton and East Surrey Water WRMP states that the Environment Agency believes that increased abstraction at this source would be at the expense of northward flow to the confined Chalk rather than base flow in the Rivers Hogsmill or Wandle and that the effect on surface water is negligible.

#### 6.5.2.10 *Affinity Water (2014)*

Affinity Waters Hunton Bridge Scheme and The Grove Peak Scheme both abstract from the same groundwater body as the DP option New Ground (Mid-Chilterns Chalk) and are identified as having impacts on the River Gade downstream of Bulbourne confluence. However, they are located more than 25km away from New Ground and the impacted reach of the Bulbourne does not extend beyond the confluence with the River Gade.

### 6.5.3 Environment Agency National Drought Plan

Assessment of the potential for cumulative impacts of supply side and drought permit/order options with drought options listed in the Environment Agency national drought plan[21] has been undertaken.

The information used to carry out these assessments is considered to be the most up to date information available at the time of writing, but the assessments should be reviewed at the time of drought option implementation to ensure that no changes to the Environment Agency drought plan have been made in the intervening period, and that the assessment, therefore, remains valid.

Part of the Environment Agency's role it to reduce the impact of drought on the natural environment by taking specific actions. They can apply for environmental drought orders if the environment is suffering serious damage because of abstraction during a drought. The plan says that the Environment Agency would work with stakeholders including water companies to identify where and when it would be necessary and its potential effects on any essential public supplies or infrastructure. The Environment Agency can also restrict spray irrigation during periods of drought. Given that the Environment Agency drought actions will have a positive effect on river flows and lake levels and, therefore, the natural environment and ecology, there will be **no cumulative impacts** between it and the TW drought plan options.

### 6.5.4 Thames River Basin Management Plan

Assessment of the potential for cumulative impacts of supply side and drought permit/order options with drought options listed in the River Basin Management Plans has been undertaken.

The information used to carry out these assessments is considered to be the most up to date information available at the time of writing, but the assessments should be reviewed at the time of drought option implementation to ensure that no changes to the River Basin Management Plans have been made in the intervening period, and

21 EA (2015). Drought response: our framework for England. June 2015.

that the assessment, therefore, remains valid.

The Thames RBMP describes the planned steps to implement the measures required to achieve the environmental objectives of the Water Framework Directive (WFD). It provides the framework for protecting and enhancing the water environment. The SEA[22] of the Thames RBMP determined that the plan was likely to have significant positive effects on the environment, particularly in respect of biodiversity, water, population and human health and that any local negative effects would expect to be mitigated during implementation. Therefore, there will be **no cumulative impacts** between the Thames RBMP and the TW drought plan options.

### 6.5.5 Canal & River Trust Water Resources Strategy 2015–2020

The Canal & River Trust Water Resources Strategy[23] sets out the vision for how they intend to manage water resources across its network through to 2050. It contains their planned actions over the next five years relating to the canal network. A number of the hydrological units overlap with Thames Water's DP including the Kennet and Avon Canal, Lower Lee/Lee Navigation and South Oxford Canal.

However, the main actions for the strategy are to undertake a range of modelling scenarios for the hydrological units in order of preference. Specific restoration projects or other canal developments are not detailed, however Strategic Action 4 states that appropriate water resource assessments will be undertaken aiming for "no net impact on long term water resource levels of service."

No cumulative impacts between the Canal and River Trust Water Resources Strategy and drought options in TWUL's Draft Drought Plan have been identified.

At the time of writing the Canal & River Trust had not published their drought plans.

### 6.5.6 Cumulative effects with any identified relevant projects

There are a number of infrastructure priorities identified in regional and local planning documents in addition to national programmes. These include the improvement of existing infrastructure by extension, redevelopment or increasing existing capacity. With regard to other projects that may result in a cumulative effect with the TWUL draft DP, those considered to be **relevant at the strategic level** comprise large scale high profile infrastructure schemes and particularly those that may affect water flows or groundwater levels, these projects comprise:

- River Thames Scheme (reducing flood risk from Datchet to Teddington)

22 Environment Agency (2016) The River basin management plan for the Thames River Basin District Strategic Environmental Assessment: Statement of Particulars Updated December 2015. https://www.gov.uk/government/publications/thames-river-basin-district-river-basin-management-plan
23 Canal and Rivers Trust (2015) Putting the water into waterways: Water Resources Strategy 2015-2020.

- Oxford Flood Alleviation Scheme
- Abingdon Flood Alleviation Scheme
- Thames Tideway Tunnel Project
- Crossrail 1: construction (2013-2020) and westerly extension (post 2020)
- Northern Line Extension
- High Speed Two Rail Network (HS2): Construction of Phase 1 of the HS2 network from Euston station to Birmingham.

#### *6.5.6.1 The River Thames Scheme (reducing flood risk from Datchet to Teddington)*

The River Thames Scheme (reducing flood risk from Datchet to Teddington[24]) is a proposed programme of projects and investment that aims to reduce flood risk in communities near Heathrow. The scheme consists of a range of measures, including extensive engineering work to construct new flood channel, improvements to three existing weirs on the River Thames, improved flood incident response plans, creation of biodiversity action plan habitat, increasing community flood awareness and providing community resilience measures.

Weir modifications will reduce water levels between Walton Bridge and Teddington. Construction is due to commence in 2020 or 2021, and it is not due to be operational until 2024 or 2025. As the DP will only be operational until 2022, the scheme will not be operational at the same time as any of the drought options in the current Drought Plan and, therefore, **no cumulative impacts** are predicted.

#### *6.5.6.2 Oxford Flood Alleviation Scheme*

In 2009 the Environment Agency carried out the Oxford Flood Risk Management Strategy, a detailed study of the flood risk from rivers in Oxford. The strategy described how the Environment Agency can manage flood risk in Oxford over the next 100 years. Since the January 2014 floods, the project team has been working with partners to develop a scheme in line with this strategy.

Capacity was planned to be increased in Oxford's western flood plain by building a new flood relief channel, which would allow more floodwater to pass down the River Thames. However, this plan/policy was withdrawn in August 2016 and no alternative

24 Environment Agency (2016) The River Thames Scheme: reducing Flood Risk from Datchet to Teddington. https://www.gov.uk/government/publications/river-thames-scheme-reducing-flood-risk-from-datchet-to-teddington/river-thames-scheme-reducing-flood-risk-from-datchet-to-teddington

had been proposed at the time of this report. As such, a cumulative impact assessment cannot be conducted.

#### *6.5.6.3 Abingdon Flood Alleviation Scheme*

Appraisal and design of flood alleviation projects in Abingdon are underway, with construction of early projects expected to be complete by 2017. The scheme will allow more floodwater to pass down the River Ock and into the River Thames, and may also include an upstream storage project on the River Ock.

**No cumulative impacts** are envisaged with the TWUL DP, as the Abingdon Flood Alleviation Scheme would influence flows in the River Thames during flood events, whereas the TWUL drought options would be active during periods of drought.

#### *6.5.6.4 Thames Tideway Tunnel Project*

The Thames Tideway Tunnel comprises a 15-mile-long sewer beneath the River Thames. It will capture sewage that would otherwise overflow into the river, transfer it to the Beckton works for treatment and return the clean water to the environment. Construction is due to start this year and be complete by 2023.

Volume 3 of the Environmental Statement[25] reports on the project wide effects. For surface water significant beneficial effects are identified for water quality in the Thames Upper and Middle (no significant adverse effects on surface water). For groundwater, moderate adverse effects are predicted for construction associated with dewatering on the lower aquifer, two licenced abstractions (28/39/39/0141 Mantilla Ltd and TH/39/0042/023 TWUL) and mobilisation of poor quality groundwater in the lower aquifer and major adverse effects on one licenced abstraction (TH/039/0039/066 Global Grange Ltd). Cumulative effects of the Thames Tideway with Crossrail and the Northern Line Extension are addressed in the Thames Tideway Environmental Statement Volume 3 with respect to groundwater. There is expected to be an overlap of dewatering activities for Crossrail and Thames Tideway and groundwater levels in the lower aquifer are considered unlikely to have fully recovered following Crossrail construction. No drought options are located within the same WFD groundwater body as the Crossrail dewatering, therefore, **no cumulative impacts** are predicted.

The only construction activities considered to impact upon surface water quality was dredging and piling which may lead to water quality effects as a result of sediment mobilisation. Mitigation proposed involves not dredging from June to August and using techniques that limit the dispersal of intertidal sediments. The only drought

25 Thames Water Utilities Ltd (2013) Thames Tideway Tunnel Environmental Statement Volume 3: Project-wide effects assessment

option on the Tidal Thames is the Thames Gateway Water Treatment Works (TGWTW), which is a desalination plant and it is predicted to have negligible impact on water quality and flow and therefore there is no potential for cumulative adverse impacts.

Given that the Thames Tideway Tunnel project will not be operational during this drought plan timeline, **no cumulative impacts** during operation are possible.

#### *6.5.6.5 Crossrail*

Crossrail 1 is a 73 mile railway line under development in London and neighbouring counties of Berkshire, Buckinghamshire and Essex. A large portion of the line will be between Paddington in central London and Abbey Wood. The main civil engineering construction works are planned to complete in 2017 with the tunnelling under London already completed[26].

The Crossrail 1 EIS[27] predicated cumulative groundwater level impacts on the deep aquifer due to a large cone of depression in East London caused by simultaneous dewatering for an estimated three years. Up to an estimated total of 30 million cubic metres of groundwater was predicted to be abstracted from wells (mostly from the Chalk deep aquifer). They predicted that this would cause significant drawdown of water levels at 25 licensed abstractions. As the major construction is complete, **no cumulative impacts** are predicted with the DP.

Crossrail 2 is a proposed rail route in South East England and there is currently no detailed information about construction impacts for the scheme[28]. Construction on Crossrail 2 will begin in the early 2020s. Therefore, the Crossrail 2 project will have **no cumulative impacts** with this DP.

#### *6.5.6.6 Northern Line Extension*

The Northern Line Extension is an extension under construction of the London Underground Northern line to Battersea in South West London, from Kennington to the disused Battersea Power Station. The project involves tunnelling from Battersea to the new shafts at Kennington Green and Kennington Park which will begin in 2017.

The magnitude of impact on groundwater levels and flows in the upper aquifer was assessed as low and predicted not to affect the existing users and therefore **no cumulative effects** with drought options have been identified.

26 Crossrail 2016 http://www.crossrail.co.uk/construction/crossrail-construction-programme (Accessed: 31/08/2016)
27 Crossrail 2005 http://www.crossrail.co.uk/about-us/crossrail-bill-supporting-documents/specialist-technical-reports/ (Ref: r-0007-conclusion.pdf) (Accessed: 31/08/2016)
28 Crossrail 2 2016 http://crossrail2.co.uk/questions-and-answers/ (accessed 31/08/2016)

#### *6.5.6.7 High Speed Two Rail Network (HS2): Construction of Phase 1 of the HS2 network from Euston station to Birmingham.*

High Speed Two is a major rail infrastructure project planned to link London with Birmingham (Phase 1) and subsequently Leeds and Manchester (Phase 2). Construction of Phase 1 of the project is currently due to commence mid-2017, with an estimated completion date of 2025. This construction phase of HS2 coincides with the 5 year operation period of the DP.

# 7 MITIGATION AND MONITORING

## 7.1 OVERVIEW

Key stages of the SEA process comprise Task B5: *Mitigating adverse effects*, Task B6: *Proposing measures to monitor the environmental effects of plan or programme implementation* and Stage E: *Monitoring the significant effects of the plan or programme on the environment* (see Section 1.6, **Table 1-4 SEA Stages and Tasks**). The sections below describe how these tasks have been addressed and how TWUL intend to ensure that mitigation measures are implemented for any adverse effects that are identified and the means by which the environmental performance of the DP can be assessed.

## 7.2 MITIGATION

Consideration of mitigation measures has been an integral part of the SEA process. The methodology for the assessment of the drought options is provided in Section 4. The SEA appraisals have been based on residual impacts, i.e. those impacts likely to remain after the implementation of reasonable mitigation. Certain assumptions have been made regarding this:

- Where suitable mitigation measures are known and identified (e.g. as informed through EARs, where available or TWUL's drought management action forms in the Draft DP (example forms are in **Appendix A**), these have been taken into account, such that the resultant residual impact has been determined.
- In line with recommendations made in the UKWIR SEA Guidance[29] the SEA appraisals have assumed the implementation of reasonable mitigation, such as the use of good construction practice. This is particularly applicable to unused supply-side options which are currently non-commissioned and which do not operate as 'business as usual', and would require recommissioning in the event of use as a drought option.
- No mitigation is proposed for abstraction licences which are issued by the Environment Agency based on an assessment of the potential impacts on the environment. These licences already contain flow constraints at low flows or conditions associated with an operating agreement. This is applicable to all supply-side options which are actions within existing abstraction licence limits which have been subject to the Environment Agency's Review of Consents process.

29 UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A). Prepared by Cascade Consulting.

## 7.3 MONITORING

Monitoring is required to track the environmental effects to show whether they are as predicted, to help identify any adverse impacts and trigger deployment of mitigation measures.

DPs encompass a basket of measures that will only be implemented if and when required because of the unpredictable occurrence of a drought event, and thus the actual impact of the plan over its life is subject to very significant uncertainties.

TWUL's draft DP includes a range of possible measures to allow TWUL to respond to a particular drought in the most appropriate way. It is impossible to predict in advance which and how many of the measures will be required, and in which order of priority, to respond to each particular drought event. Correspondingly, it is therefore difficult to prescribe monitoring for the effects of the DP as a whole, and more appropriate to consider monitoring for drought options with significant environmental effects should these options be implemented during an actual drought.

As described in Section 1, EARs have been prepared. The EARs include detailed Environmental Monitoring Plans (EMPs). Monitoring requirements will be summarised in the draft DP drought management action forms (**Appendix A**). The DPG requires the environmental assessment and EMPs to be updated regularly. The monitoring requirements will be assessed in more detail through this process. As described in the Draft DP, in the event of a drought requiring the implementation of drought option(s), TWUL will review the requirement for environmental monitoring in consultation with the Environment Agency and Natural England.

# 8 QUALITY ASSURANCE

ODPM Guidance on SEA contains a Quality Assurance checklist to help ensure that the requirements of the SEA Directive are met. The checklist is reproduced in **Appendix F**, **Table F1**, indicating where this Environmental Report meets the requirements.