Drought Plan 2022
Annex 7: Environmental Monitoring Plan

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WATER for LIFE from Southern Water

Contents

Glossary

Abstraction Licence
The authorisation granted by the EA (England) to allow the removal of water from a source.

Biodiversity Action Plan
Principles laid down in the "Biodiversity: The UK Steering Group Action Plan" document (1995) which aims to protect and enhance diversity between and within ecosystems and habitats, diversity of species and genetic variation within individual species.

Biochemical Oxygen Demand (referred to as BOD)
The amount of oxygen that would be consumed if all the organic material in one litre of water were oxidised by bacteria and protozoa.

Compensation Releases
Water company licences that authorise abstractions from a reservoir may have conditions imposed, whereby a specified amount of water has to be released into the watercourse, downstream of the reservoir in order to compensate the river for the abstraction.

Discharge Consent
A written consent issued by the EA permitting the discharge of specific pollutants into the aquatic environment. Discharge consents have conditions attached to them that limit the amount and concentration that can be discharged to ensure that there is no threat to the environment.

Drought Order
An authorisation granted by the Secretary of State under legally defined drought conditions which (amongst other powers) gives a water company the power to temporarily abstract and/or impound and/or discharge water outside of the normal abstraction licence regulatory process, or to temporarily modify the conditions of any existing abstraction licence/legal authorisation.

Drought Permit
An authorisation granted by the EA under legally defined drought conditions which gives a water company the power to temporarily abstract and/or impound water outside of its normal abstraction licence permissions.

Environmental Drought
Environmental droughts arise from reduced water flows in rivers and streams. In the summer raised temperatures may further exacerbate drought conditions. Such conditions cause physiological stress to living organisms, the degree of stress increasing with drought severity and time.

European Protected Species
European Protected Species and their habitats receive full protection through inclusion within Schedule II of the Conservation of Habitats and Species Regulations 2010 (as amended), which transposes Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora into national statute.

Lotic-Invertebrate Index Flow Evaluation (referred to as LIFE)
LIFE is a method that allows the aquatic invertebrate community recorded at a site to be scored according to its dependence on current velocity. The LIFE value obtained can be compared to that predicted for the site under normal flow conditions and may show if the invertebrate community experiencing flow related stress. Comparing observed and predicted scores for each gives an Environmental Quality Index (EQI) that is used as a measure of stress experienced at a site from low flow. A value of 1.0 indicates that the invertebrate community has the flow sensitivity predicted for the site. A value of less than 0.975 indicates the possibility of significant stress due to low flow.

Macroinvertebrate
Macroinvertebrates are small, but visible with the naked eye, animals without backbones (insects, worms, larvae, etc.). Waterbodies have communities of aquatic macroinvertebrates. The species composition, species diversity and abundance in a given waterbody can provide valuable information on the relative health and water quality of a waterway.

Natural Environment and Rural Communities (NERC) Act Section 41
In England, many rare and most threatened species are listed under Section 41 (S41) of the 2006 Natural Environment and Rural Communities (NERC) Act. Outcome 3 of the Government's Biodiversity 2020 strategy contains an ambition to ensure that *'By 2020, we will see an overall improvement in the status of our wildlife and will have prevented further human-induced extinctions of known threatened species.'* Protecting and enhancing England's Section 41 species is key to delivering this outcome.

pH
A measure of the acidity of alkalinity of a liquid based on a logarithmic scale of concentration of hydrogen ions: < 7 is acidic; > 7 is alkaline.

Protection of Habitats and Species
Certain habitats and species receive protection in the UK as a result of inclusion within legislative or policy frameworks. The hierarchy of protection is:

- European Protected: Natura 2000 sites (Ramsar, Special Area of Conservation and Special Protection Area) and European Protected Species.
- National Protection: Sites of Special Scientific Interest and species included under national legislation (including, but not limited to, the Wildlife and Countryside Act 1981 (as amended))
- Biodiversity Action Plan: Habitats and Species of national and regional importance due to rarity at the national or regional scale. Biodiversity Action Plan Habitats and Species do not receive any specific legislative protection through inclusion (unless included within European or National protection level).

Ramsar site
Ramsar sites support internationally important wetland habitats and species and are listed under the Convention on Wetlands of International Importance, especially as waterfowl habitat (Ramsar Convention, 1971). Nationally planning policy indicates that Ramsar sites should be afforded the same level of protection as Special Areas of Conservation and Special Protection Areas.

Site of Special Scientific Interest
Designated under the Wildlife and Countryside Act 1981 (as amended), with additional protection afforded through the Countryside and Rights of Way Act (2000) and Environmental Damage (Prevention and Remediation) Regulations (2009), to protect habitats and the habitats of species that are considered to be of national importance.

Special Area of Conservation
Designated under the Habitats Directive and implemented through the Habitats Regulations (1994) to protect important European Habitat, especially those of threatened species, in sites of community importance.

Special Protection Area
Designated under the Birds Directive and implemented through the Wildlife and Countryside Act (1991) to protect important European Habitat for birds.

Walley Hawkes Paisley Trigg (referred to as WHPT)
A method that allows the aquatic invertebrate communities recorded at a site to be scored according to their tolerance to environmental pressures such as organic pollution. WHPT can be expressed as a score (the sum of values for each taxon in a sample), as an average score per taxon (ASPT) and as the number of scoring taxa (N-taxa). WFD status is based on ASPT and N-taxa. WHPT was introduced as the basis for the UK's river invertebrate status classification under the Water Framework Directive in the second River Basin Management Plans, published in 2015.

Water Framework Directive (WFD)
Water Framework Directive: Council of the European Communities 2000 Directive 2000/60/EC (OJ No L 327 22.12.2000) (establishing a framework for Community action in the field of water policy). As transposed into UK law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Statutory Instrument 2003 No. 3242

Abbreviations

BAP	Biodiversity Action Plan
BOD	Biochemical Oxygen Demand
CEH	Centre for Ecology and Hydrology
CPUE	Catch Per Unit Effort
EA	Environment Agency
EMP	Environmental Monitoring Plan
EQI	Ecological Quality Index
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
LIFE	Lotic invertebrate Index for Flow Evaluation
LNR	Local Nature Reserve
MORECS	Meteorological Office Rainfall and Evaporation Calculations
MRF	Minimum Residual Flow
NE	Natural England
NFU	National Farmers Union
NNR	National Nature Reserve
NVC	National Vegetation Classification
RHS	River Habitat Survey
RIVPACS	River Invertebrate Prediction and Classification System
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SPA	Special Protection Area
SRP	Soluble Reactive Phosphorous
SSSI	Site of Special Scientific Interest
WeBS	Wetland Bird Survey
WSW	Water Supply Works
WTW	Wastewater Treatment Works
UKAS	United Kingdom Accreditation Service
WFD	Water Framework Directive

1. Introduction

1.1. Purpose of the Environmental Monitoring Plan

This Environmental Monitoring Plan (EMP) accompanies Southern Water's draft Drought Plan 2022 and provides a framework for monitoring and mitigation activities linked to relevant drought management measures included in the Drought Plan, in particular drought permits/orders to allow temporary increases in abstraction.

In accordance with the Environment Agency's Drought Plan Guidance[1], Southern Water is responsible for understanding the effects of its drought management actions on the environment and establishing the monitoring and mitigation measures for relevant identified effects. The EMP presents a monitoring framework to differentiate the impacts of implementing the drought plan measure from those caused by environmental drought conditions. It also sets out the framework and principles for baseline monitoring to improve understanding of the baseline environment. Additionally, the EMP sets out the mitigation measures to be considered during implementation of a drought plan measure.

The Southern Water draft Drought Plan 2022 sets out the various measures that will be considered for implementation during drought conditions. This EMP considers those measures that may have adverse effects on the environment, setting out the baseline, within drought and post-drought environmental monitoring requirements and potential mitigation measures. It also includes details of the survey methodologies to be used and the exchange of data between Southern Water, the Environment Agency (EA) and Natural England (NE).

The EMP should be considered as a 'live' working document and subject to an annual review to ensure that it remains fit for purpose, especially where new data/evidence becomes available and as baseline monitoring activities are carried out.

1.2. Background and basis of the EMP

The EMP has been prepared in support of Southern Water's Drought Plan and in compliance with the requirements for environmental monitoring and mitigation set out in the EA's drought plan guidance.

This detailed EMP and the encompassing Southern Water Drought Plan 2022 should be viewed in conjunction with the relevant EA Drought Plans, which aim to reconcile the interests of public water supplies, other abstractors and the environment during a drought, at both national and regional/ local levels. Like water company Drought Plans, the EA's Drought Plan is also reviewed on an annual basis.

1.2.1. EMP guidance

Relevant EA guidance on the objectives and content of the EMP includes:

- Water companies are responsible for understanding the effects of a drought and its drought management actions on the environment. Companies must assess the impacts of its drought management actions during and after a drought and completing environment assessments.
- Companies should ensure that adequate arrangements for environmental monitoring are detailed in an EMP within its drought plan.
- Surveys may be needed to support/inform the decisions on environmental sensitivity and likely impact or to ascertain baseline conditions.

[1] Environment Agency (July 2020). Environmental assessment for water company drought planning supplementary guidance. LIT 55303.

- Monitoring during drought permit/order implementation is required to assess the impact on the environment and the management of mitigation actions.
- Post-drought permit/order monitoring is required to assess recovery of impacted features.
- The level of monitoring needed should be risk-based. Not all sites will require in-drought and post-drought monitoring.
- Sites with moderate to major environmental risk should focus monitoring on those feature(s) sensitive to the likely impacts from implementing drought management actions. For Habitats Directive sites, data collected will be sufficient to demonstrate there is no adverse effect on the interest features. For Sites of Special Scientific Interest (SSSIs), data collected will need to be sensitive enough to pick up the likelihood of damage at the site.
- Control sites are important to provide a comparison between the 'natural' impacts of the drought and the impacts of the drought management action.
- The EMP should include details of any surveys to support the environmental assessment, in-drought and post-drought data needs, including:
    - the feature/s to be monitored and the methods used
    - the location of survey sites
    - the timing and frequency of monitoring
    - who will undertake the monitoring
- Separating the 'natural' impacts of a drought from those resulting from the implementation of drought management actions can be complex and made more difficult where data problems and/or a lack of hydro-ecological understanding exists. Water companies must ensure that their EMP is adequate to assess the most significant environmental impacts of its proposed drought actions and associated mitigation measures.
- The EMP needs to be agreed with the EA. Consultation with NE and the EA (in relation to any proposals that may affect any Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Nature Reserves (NNRs), SSSIs or Ramsar sites) should be undertaken to ensure that the monitoring proposed within the EMP to assess the potential impacts at these sites is adequate.
- A water company must provide details in the Drought Plan of likely mitigation needed against serious impacts on the environment or other water users of any proposed drought action. The EMP should assist in identifying sites that may require mitigation. In some cases, mitigation actions may be necessary to prevent derogation of other abstractions (for example, by providing alternative supplies or releasing compensation water flow into watercourses to limit the impact of reduced flows).

1.2.2. Consultation

Consultation with the EA and NE was undertaken during the preparation of the draft Drought Plan (see Annex 1) and comments received have been considered in developing this EMP. Further discussion with the EA and NE (where applicable) have been ongoing to agree the precise location of monitoring sites and confirm the acceptability of monitoring methods and mitigation measures. Discussions have also included which organisations are best placed to carry out the identified surveys and mitigation measures (Southern Water retains responsibility for ensuring monitoring and mitigation takes place but others may be better placed to physically deliver), as well as taking account of likely future changes to the EA's monitoring programmes (to be discussed on a regular basis each year with the EA). The timetable for this ongoing refinement of the monitoring and mitigation measures is set out in Sections 2 and 4 of this Annex.

1.3. Report structure

This EMP has been divided into the following sections:

PART A. KEY CONSIDERATIONS

2. Baseline data and monitoring

2.1. Introduction

Baseline data and monitoring are required to provide the context for assessing the potential environmental impacts of the relevant drought plan measures over and above the effects of environmental drought. A comprehensive review of existing baseline data and information relating to Southern Water's drought plan measures has been carried out in preparation of the Southern Water draft Drought Plan, Environmental Assessment Reports (EARs), Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessments. The adequacy of the data and information have been reviewed and consideration has been given as to whether there is a need for further baseline data acquisition and/or monitoring to reduce uncertainty regarding the presence, distribution, composition and/or quality of the physical environment and relevant environmental features (including heritage, recreation, navigation and landscape), which will can inform future updates to the environmental assessments once acquired.

The use of existing monitoring sites and standard methodologies applied in data collection are recommended wherever possible to give a long-term perspective over different weather and physical environment conditions as well as to provide continuity of datasets. It should be noted, however, that not all existing monitoring sites are necessarily proposed for the acquisition of baseline data where evidence gaps exist as the baseline monitoring programme is customised to the individual sites associated with a particular drought management measure and the sensitive features requiring assessment. Where initial assessment of sensitive features has identified a lack of data to inform full assessment, further surveys may be recommended to inform detailed assessment where this is proportionate to the risk of adverse effects.

2.2. Existing baseline data and monitoring

EA Drought Plan guidance states that the EMP should detail the surveys required to inform the environmental assessments as well as for in-drought, during drought permit/order implementation and post-drought monitoring and assessment. Section 3 of this EMP details the monitoring measures that will be undertaken during each progressive stage of a drought: on-set of drought; during drought permit/order implementation; post-drought. This section focuses on the existing baseline data and environmental evidence.

In developing the draft Drought Plan 2022, and in particular to inform the EARs, HRA and WFD assessments, a wide range of hydrological, hydrogeological and environmental data have been collated from various sources, including the EA and NE, as well as historic Southern Water studies and nationally available environmental datasets. This information has largely provided up-to-date and relevant evidence to inform the environmental assessments.

In support of the WFD and the management of international designated sites and SSSIs, monitoring is undertaken by the EA, NE and site owners – data from these monitoring programmes have been collated and it is currently assumed that such monitoring programmes will continue and data will be available in the future (noting that none of the monitoring bodies can provide a guarantee due to the reliance on funding streams which are not confirmed into the future). In a similar manner, hydrological and hydrogeological data are collated on a regular basis from monitoring stations relevant to the drought permit/order and it is assumed these will also to continue to function with the same funding caveats. For these routine monitoring programmes, a data exchange protocol has been discussed with the EA to ensure appropriate frequency of providing updated data to inform future drought plans or in the event of an actual drought arising. Section 5 of this EMP provides more details and sets out the relevant datasets.

It is understood that River Habitat Surveys (RHS) or similar surveys are unlikely to be routinely repeated by the EA in the future and this will necessitate some primary walkover surveys to be carried out periodically for impacted river reaches or sites in the future to take account of potential changes over time. These actions have therefore been included in the baseline EMP for relevant drought plan measures.

Following completion of the environmental assessments for each drought plan measure, a number of data gaps have been identified that can be addressed through discussions with local stakeholders or site owners, or through further targeted data requests (e.g. for bird species using the Wetland Bird Survey (WeBS) system; data on specific vulnerable species from local record centres run by the Wildlife Trusts). These data or information acquisition actions have been included in the baseline EMP for each drought plan measure as applicable.

In other cases, evidence gaps have been identified where no reliable and/or recent data exists. These gaps are discussed in Section 2.3 below.

2.3. Further baseline data and monitoring

Following completion of the environmental assessments for each drought plan measure, a number of data or evidence gaps have been identified that require additional data acquisition or primary surveys, studies and/or discussions with site owners or stakeholders.

Table 2.1 summarises the data and evidence gap analysis carried out for each of the potential drought permit/order options included in the Drought Plan based on the position in February 2021. The table indicates where robust baseline data or evidence exist, where more existing baseline data/information needs to be acquired and where there are no or insufficient baseline data available, as follows:

Y – Robust existing baseline data or evidence
Y – More existing baseline data to be acquired
N – No or insufficient baseline data available (for one reach/site or multiple reaches/sites)
N/A – Not applicable - feature is either not present or does not require monitoring

This table provides an overview of the scale and geographical extent of additional baseline data acquisition and surveys to be carried out. Specific details as to the required baseline monitoring activities are provided in Part B of this Annex. Discussions have been held with the EA, NE and other stakeholders (as appropriate) to agree the precise locations and nature of the monitoring activities and subsequent analytical methods (or the necessary datasets to be acquired). This has included discussion about suitable control sites that will not be impacted by the drought permits/orders so as to provide a baseline for comparison with impacted sites both during and following a drought.

These baseline activities will be implemented during the life of the Drought Plan subject to specific constraints, for example the occurrence of sufficiently low flow conditions to collect baseline information under representative low flow conditions. All activities are the responsibility of Southern Water but the company may work with other parties to actually deliver the activities taking account of which organisations are best placed to carry out the requirements. Where relevant, appropriate licences and approvals will be needed to carry out the monitoring and Southern Water has responsibility to ensure that all surveyors have the appropriate licences, approvals and experience to carry out the monitoring to the required standards.

Baseline hydrological and groundwater monitoring should be carried out alongside the baseline environmental monitoring to provide the required river flow and water level data to help provide context to the observed environmental conditions. Except where identified in Part B of this Annex, it is assumed that the existing hydrological and groundwater monitoring sites will continue to be available at the current frequency

(noting that this activity is shared across Southern Water and the EA and is dependent on both parties being adequately funded in the future to maintain the operation of the monitoring sites).

Discussions will continue with the EA (and NE where appropriate) to finalise or review the detailed site specific baseline monitoring schedules for each drought permit/order, including the timing and frequency of sampling. For river water quality baseline monitoring, spot sampling has been proposed for some river reaches, whilst automated continuous monitoring is proposed for other reaches.

In addition to the water quality monitoring parameters focused on environmental effects set out in Part B of this Annex, Southern Water will also carry out enhanced drinking water quality monitoring of groundwater sources where additional abstraction would be authorised by a drought permit/order. Abstraction beyond daily and/or annual licence limits does potentially increase the risk of drawing lower quality groundwater to the borehole sources from beyond the normal groundwater protection zone/safeguard zones. Depending on the actual duration and magnitude of the actual abstraction under the Permit/Order, there is a consequent increased risk to raw water quality and treatment requirements for parameters such as pesticides and nitrates. Additional water quality sampling at the boreholes along with enhanced groundwater protection activities will be carried out to help minimise this risk.

Section 5 discusses the main considerations in respect of environmental protection and biosecurity when planning for the monitoring activities.

Section 6 sets out the data exchange protocol for baseline monitoring and data acquisition.

Appendix A sets out the main survey methods and analytical approaches for the main identified monitoring activities. Standard methodologies should be used for data collection, wherever possible, to ensure maximum compatibility with existing datasets and other monitoring activities elsewhere in the catchment. Appendix A also identifies any specific licences or approvals necessary to carry out the survey method.

Table 2.1: Summary of baseline data and evidence gap analysis.

Drought permit/order	Hydrology	Geomorphology	Water Quality	Ecology								Habitat Surveys	Designated Sites	Recreation	Landscape	Invasive non-native species	Heritage features	Other
				Macro-invertebrates	Macrophytes	Fish	Estuarine Macroalgae and phytoplankton	Blue green algae	Water vole	Estuarine macro-invertebrates	Estuarine fish							
Darwell	Y	Y	Y	Y	Y	Y	Y	N	N/A	Y	Y	N	N	N	N/A	Y	N/A	N/A
Pulborough	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	N/A	N	N/A	N/A	Y	N/A	N/A
North Arundel	Y	Y	N	Y	N	N	N/A	N	N	N/A	N/A	N	N	N	N/A	Y	N/A	N/A
East Worthing	Y	Y	Y	Y	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Weir Wood	Y	Y	Y	Y	Y	Y	N/A	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lukely Brook	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A	N	N	N/A	N/A	N/A	N	N/A
Caul Bourne	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	Y	Y	N	N	N	N	N/A	N/A	N/A
Eastern Yar	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	N	N	N/A	N/A	N/A	N/A	N/A
River Medway Scheme	Y	Y	Y	Y	Y	Y	N/A	N	Y	Y	N/A	N	N	N	N	Y	N	N
Lower Itchen	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	N/A	N/A	N/A	N/A
Candover	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	N/A	N/A	N/A	N/A
Test Surface Water	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	N/A	N/A	N/A	N/A

We have removed the Sandwich and Faversham drought permits from this table. We have done this because we have recently varied these abstraction licences so that there would no longer be a benefit from these drought permits.

2.4. Monitoring programme timetable

Table 2.2 sets out the timetable for finalising and agreeing the details of the baseline monitoring programme (as well as in-drought monitoring) with the EA (and NE, where applicable), together with a prioritised timetable for carrying out the agreed programme of baseline monitoring, as agreed for the 2019 Drought Plan. Implementation of the baseline monitoring has been prioritised with each drought permit/order source allocated to one of three priority categories (highest, higher and lower priority) as shown in Table 2.3, taking account of the likelihood of the drought permit/order being required and/or the potential magnitude of any environmental effects.

The drought permit/orders for the Test Surface Water, Candover Augmentation Scheme and Lower Itchen sources are categorised as being of higher importance (Table 2.3). This reflects the agreements reached with the EA and NE during the 2018 Public Inquiry, and the prioritisation takes account of the environmental sensitivity of the River Test and River Itchen to drought permits/orders, as well as the elevated risk of needing the Test Surface Water Drought Permit. The monitoring packages and implementation timetables have been agreed, and work commenced for some sites and parameters in summer 2018 (see Appendices B, D and F for the agreed Monitoring Plans). Similarly, the Bewl Water Reservoir/River Medway Scheme has been agreed as being of higher priority with the EA given the frequency of drought permit applications (most recently in winter 2017-18) and the strategic regional importance of this water source.

The timetable for baseline monitoring set out in Table 2.2 was also provided in Drought Plan 2019, premised on an initial 3-year monitoring programme: some monitoring being one-off surveys and therefore not repeated (e.g. habitat walkover), other surveys carried out once in three years (e.g. some macrophyte surveys) and others annually (e.g. fish in sensitive water environments) or seasonally (e.g. macroinvertebrate sampling). Reviews of this baseline monitoring took place at the end of each calendar year to take account of monitoring findings and any issues (e.g. survey site suitability, confounding factors, etc.). Baseline monitoring is proposed to continue in subsequent years of the Drought Plan 2022 period based on the findings from the first three to four years (including picking up any sites/features not surveyed in earlier years due to weather conditions or other limitations etc). The baseline monitoring findings will also inform development of the next Drought Plan.

Discussions have been ongoing with the EA, and NE where applicable, to agree specific monitoring locations and survey methods. Meetings were held with the Kent and South London (KSL), and Solent and South Downs (SSD) EA areas in July 2018 and March 2019, respectively, to agree the way forward. Discussions were also held with NE and the EA regarding the best approach for survey and monitoring of the designated habitats and species that are qualifying features of the Solent Maritime SAC in relation to drought orders on the Isle of Wight and Dungeness, Romney Marsh and Rye Bay Ramsar site in relation to the Darwell Drought Permit.

Agreement on the specific baseline monitoring packages was reached in late 2019. Monitoring began for highest/higher priority permits or orders in 2019 and for the remaining drought permits or orders in 2020. The monitoring packages are being kept under review with NE and the EA to adapt to changing circumstances, for example, where the detail of a proposed drought permits/orders has changed.

Table 2.2: Drought permit/order monitoring programme timetable (excluding Test Surface Water, Candover Augmentation Scheme and Lower Itchen sources).

Target date	Drought permits/orders	Action	Progress
June 2018 to July 2019	All permits/orders	Agree and sign-off survey sites, control sites, delivery approach (e.g. EA, Southern Water, River Trusts), frequencies of monitoring and analytical methods/reporting for baseline and in-drought monitoring	Completed
August 2018 to July 2019	All - Higher priority permits/orders first followed by lower priority	Contracting and delivery plan development	Completed
Late September to November 2018	Highest priority permits/orders	Autumn baseline monitoring for appropriate features and/or species (where locations. methods and land access agreed in sufficient time)	Autumn baseline completed for the following schemes: Bewl Reservoir.
Spring 2019 to Autumn 2019	Higher priority permits/orders	Baseline monitoring for Year 1 (where locations, methods and land access agreed in sufficient time)	Year 1 monitoring completed for the following schemes: Bewl Reservoir, Pulborough and Lukely Brook.
Summer 2019 to December 2019	Higher priority permits/orders	Review Year 1 findings and confirm sites and activities for Year 2	Completed
Spring to Autumn 2020	All permits/orders	Baseline monitoring for Year 2 (including those features not surveyed in Year 1)	Year 1 and Year 2 monitoring completed for the following schemes: Year 1 - Eastern Yar, Caul Bourne, Darwell Reservoir, Powdermill Reservoir (now removed), Shalcombe (now removed), Test Valley (now removed), Weirwood Reservoir, North Arundel, East Worthing. Year 2 - Bewl Reservoir, Pulborough and Lukely Brook.
Summer 2020 to December 2020	All permits/orders	Review Year 1 and Year 2 monitoring findings and confirm sites and activities for Year 3	Completed
Spring to Autumn 2021	All permits/orders	Baseline monitoring for Year 1-3, including any missed monitoring not already undertaken.	Planned for 2021
Spring 2021	All permits/orders	Include monitoring results to date in updated drafts of EARs for Drought Plan 2021	EARs updated with data recorded to date
Spring 2021	All permits/orders	Review Year 1 and Year 2 monitoring and agree future monitoring to develop the updated Drought Plan 2021 EMP draft for	EMP updated to current baseline

		consultation (and as part of updates to the Environmental Assessment Reports)	monitoring commitment
Summer 2021 to December 2021	All permits/orders	Review Year 1 to Year 3 monitoring findings and confirm sites and activities for Year 4, taking account of any agreed changes made for the Drought Plan 2021 EMP	Planned
Spring 2022 to Summer 2022	All permits/orders	Continue with agreed monitoring for Year 4	-
Summer to Autumn 2022	All permits/orders	Review Year 1 to Year 4 monitoring and agree future monitoring for Year 5, taking account of any agreed changes made for the Drought Plan 2021 EMP	-
Summer 2022 to December 2022	All permits/orders	Review Year 1 to Year 4 monitoring findings and confirm sites and activities for Year 5	-
Spring 2023 to Summer 2023	All permits/orders	Continue with agreed monitoring for Year 5	-
Summer 2023 to December 2023	All permits/orders	Review Year 1 to Year 4 monitoring findings and confirm sites and activities for Year 5	-

We have removed Sandwich from this table. We have done this because we have recently varied the abstraction licence so that there would no longer be a benefit from this drought permit.

Table 2.3: Priority order for baseline monitoring programme.

Option name	Priority#
Test Surface Water	Highest
Bewl Water Reservoir/River Medway Scheme	Highest
Pulborough	Highest
Candover Augmentation Scheme	Higher
Lower Itchen Sources	Higher
Eastern Yar	Higher
Caul Bourne	Higher
Lukely Brook	Higher
Darwell Reservoir	Lower
Weir Wood Reservoir	Lower
East Worthing	Lower
North Arundel	Lower

As explained earlier, this priority order has taken account of the likelihood of the drought permit/order being required and/or the potential magnitude of any environmental effects from its implementation.
We have removed the Sandwich and Faversham drought permits from this table. We have done this because we have recently varied these abstraction licences so that there would no longer be a benefit from these drought permits.

3. Monitoring during drought

3.1. Monitoring requirements

The EA Drought Plan guidance states that the EMP should detail surveys to inform environmental assessment of the prevailing conditions at the on-set of drought, during drought permit/order implementation and post-drought. This section details the proposed monitoring measures to be undertaken during each of these three stages of drought. The monitoring during the on-set of drought will contribute to dialogue with the EA, NE and other stakeholders as appropriate as to the selection and application of potential mitigation measures should a drought permit/order be implemented. This monitoring will also help to confirm the relevant triggers for the application of mitigation measures or other relevant decisions to help protect environmental features. The EA Drought Plan guidance states that the EMP should detail the likely mitigation needed to reduce adverse impacts on the environment as a result of implementation of drought management actions.

Monitoring during implementation of a drought permit/order will help assess the actual impacts on environmental features and help to determine when mitigation measures should be applied, informed where applicable by the agreed trigger conditions. The evidence collected will also help to verify the impacts predicted in the EARs and used to subsequently update the EARs.

Monitoring post-drought will help to assess any impacts that continue despite the cessation of the drought permit/order and to assess the rate and nature of recovery of the environment. It will also help to establish any damage or loss linked to the drought permit/order implementation and guide any applicable mitigation or post-implementation compensation measures.

A range of quantitative and qualitative monitoring surveys are recommended for each of the different stages of the drought monitoring process as discussed in sub-section 3.1.2.

3.1.1. Control site selection

The use of control sites during impact monitoring is essential to assess additional impacts of implementing drought permits/orders over and above those due to environmental drought conditions alone. These un-impacted sites will enable a comparison with impacted sites both during and following a drought. The precise location of these control sites will be determined in discussion with the EA, NE or other stakeholders as appropriate, ideally consistent with the baseline control sites. Ideally, control sites will be located on un-impacted reaches within the same catchment, but this may not be possible in all cases, and comparable sites in other catchments may constitute valid control sites in these circumstances. The total number of sampling sites should ideally be split equally between control and impact locations to provide a balanced statistical design to give the most robust assessment. A list of agreed control sites are included in detailed site-specific monitoring schedules shared with the KSLES and SSD EA areas. In some cases, notably on the Isle of Wight, discussions with the EA have concluded that it has not been feasible to identify suitable control sites for all parameters, but in these circumstances other surrogate monitoring site data will need to be used where available; it is noted that the Shalcombe drought order is now excluded from the 2022 Drought Plan and this may result in suitable control/surrogate monitoring points for the Caul Bourne Drought Permit.

3.1.2. Specific monitoring requirements

Part B of this report sets out the required specific environmental monitoring requirements at the on-set of environmental drought conditions, during drought permit/order implementation and post-drought where moderate or major impacts are predicted to the environmental feature.

In many cases, habitat and features walkover surveys are recommended as part of the monitoring requirements for each of the three drought stages. These would build on the recommended walkover

surveys carried out for the baseline monitoring and enable a rapid review of the prevailing environmental conditions and to identify those features likely to be at greatest risk in the specific drought conditions arising (e.g. risks in winter will be different to those in summer). In some cases (e.g. fish), the walkovers are a substitute for in-river monitoring of the feature as the monitoring would lead to additional stress on the feature under drought flow conditions.

All the monitoring activities are the responsibility of Southern Water but the company may work with other parties to actually deliver the activities taking account of which organisations are best placed to carry out the requirements. Where relevant, appropriate licences and approvals will be needed to carry out the monitoring and Southern Water has responsibility to ensure that all surveyors have the appropriate licences, approvals and experience to carry out the monitoring to the required standards.

Section 4.4 discusses the main considerations in respect of environmental protection and biosecurity when planning for the monitoring activities.

Section 5 sets out the proposed data exchange protocol for in-drought and post-drought monitoring and data acquisition.

Appendix A sets out the main survey methods and analytical approaches for the main identified monitoring activities. Standard methodologies should be used for data collection, wherever possible, to ensure maximum compatibility with existing datasets and other monitoring activities elsewhere in the catchment. Appendix A also identifies any specific licences or approvals necessary to carry out the survey method.

3.1.3. Monitoring at the on-set of drought conditions

The monitoring at the on-set of an environmental drought will establish the environmental conditions prevailing prior to any drought permit/order implementation. This monitoring activity will be used to confirm and agree applicable mitigation measures relevant to the prevailing drought conditions (taking account of the mitigation measures proposed in this EMP, but which may need modification in light of the actual prevailing conditions). The monitoring should also help confirm appropriate triggers for implementation of the agreed mitigation measures. Mitigation measures are discussed further in Section 4 and detailed for each specific drought permit/order in Section 6.

Baseline hydrological and groundwater monitoring should also continue to be carried out alongside the environmental monitoring to provide the required river flow and water level data that will be used to monitor the progression of the drought and help to explain any impacts on environmental features.

3.1.4. Monitoring in the River Test and River Itchen pre-drought order implementation

In Annex 1 of the Section 20 Agreement signed in March 2018 between Southern Water and the EA, specific reference is made to the consideration of monitoring findings to inform the final sequence of implementation of the Test Surface Water, Candover Augmentation Scheme and Lower Itchen sources drought orders. This reflects our general Drought Plan principles whereby we will take account of the prevailing environmental conditions when making decisions on implementing our Drought Plan measures in any future drought event. Under the Section 20 Agreement we will take into account the potential greater vulnerability of fish seasonally because of their migration patterns as well as reviewing and assessing the most up to date data from the monitoring installed pursuant to the Environmental Monitoring Plan, and the latest up to date information on macrophytes and invertebrates.

3.1.5. Monitoring during drought permit/order implementation

Surveys will be undertaken to monitor the potential impacts highlighted by the EARs during implementation of drought permits/orders. This monitoring should be initiated when the drought permit/order is actually implemented (rather than granted) and will be used to compare to the impacts identified during the on-set of

drought. This will particularly include targeted walkover surveys, building on the same surveys carried out during the on-set of drought.

During the implementation of the drought permits/orders, the agreed trigger levels will be monitored to inform the application of mitigation measures in dialogue with the EA, NE or other stakeholders as appropriate. Monitoring will continue until the drought permit/order ceases to be implemented, and the cessation of monitoring will be agreed with the EA and NE.

Baseline hydrological and groundwater monitoring should also continue to be carried out alongside the environmental monitoring to provide the required river flow and water level data that will be used to monitor the progression of the drought and help to explain any impacts on environmental features.

3.1.6. Monitoring post-drought

Post-drought monitoring should ideally be undertaken when the hydrological and hydrogeological indicators show the start of the recovery back to 'normal' conditions for the time of year so that the rate of recovery and the extent of recovery can be tracked over a period of time. The extent of the impact of the environmental drought and drought permit/order implementation should be carefully documented using the information gathered from the monitoring alongside the baseline hydrological and groundwater monitoring activities. Other meteorological data (e.g. rainfall, Meteorological Office Rainfall and Evaporation Calculations (MORECS) soil moisture deficit and air temperature) should also be captured for the drought and post-drought period from the relevant data providers to further inform the understanding of the physical drought conditions and the nature of the recovery.

Post-drought monitoring, analysis and assessment will inform the extent to which environmental features were affected by the environmental drought compared to the drought permit/order. The results will determine whether any compensation measures need to be implemented to address identified loss or damage due to the drought permit/order implementation. Potential compensation measures are detailed for each drought permit/order in Section 6.

4. Mitigation measures

4.1. Mitigation measures requirements

The development of mitigation requirements has been based upon the assessment of sensitive features identified in the EARs as having a significant risk of impact as a result of implementing drought permits/orders. Significant risk has been considered to be where the likely impacts are identified as being moderate or major in the EARs (particularly for sites of national or international importance).

Walkover surveys and other in-drought monitoring will provide information on the effects of the drought and drought permit/order implementation (see Section 3) to inform decisions on the application of any mitigation measures. Further targeted surveys would then be required following implementation of mitigation measures to assess their benefit and make adjustments as may be necessary (or to suspend the mitigation measure if it is shown to have an adverse effect).

Monitoring at the onset of environmental drought will inform the risks of adverse effects of any drought permit/order implementation and inform the agreement as to the precise mitigation measures to consider and the appropriate trigger for their implementation in dialogue between Southern Water, EA, NE and other stakeholders, as appropriate.

The mitigation measures set out in this EMP are based on the likely impacts to sensitive features and these should be further reviewed in a drought, particularly if monitoring identifies additional 'new' risks or indicates that the stated measures are not appropriate in the specific drought conditions faced. Similarly, post-drought monitoring should inform the precise nature of any required post-drought compensation measures; the compensation measures in this EMP (except for statutory compensation measures required under the Habitats Regulations (as set out in Annex 8 of the Drought Plan) which must normally be 'secured' prior to damage occurring) are therefore not precisely defined as they will necessarily need to reflect the precise nature of the loss or damage identified post-drought.

The potential mitigation measures specific to each drought permit/order are detailed in Section 7 (Part B of this EMP).

4.2. Potential mitigation measures

The mitigation recommendations adopt a hierarchy of approach which follows the general principle of: 1) reducing the pressure at source; 2) pressure management in the water body; and 3) direct ecological interventions (which require careful consideration before implementation and consequently should not be the 'first resort').

The implementation of mitigation measures during the in-drought and post-drought periods should follow this principle, with movement to mitigation measures in the next hierarchy dependent upon the success or failure of mitigation in the lower hierarchy.

Table 4.1 sets out the range of mitigation measures identified in relation to the drought permits/orders and these are detailed in Section 7 of this document (as well as in the specific EARs and HRA).

Some of the mitigation measures do carry a level of risk (for example the capture and relocation of vulnerable species), and for this reason full consultation with the EA and NE will take place at the onset of drought triggers to agree whether a particular mitigation action is the best option in the actual prevailing drought situation and that it will have the greatest chance of success. Whilst no mitigation measure can claim to provide a 100% success rate, there is evidence from elsewhere in the UK that the measures set out

in this EMP can have a positive, beneficial effect. Section 5.2 sets out requirements in respect of environmental protection and biosecurity in delivery of mitigation measures.

Non-ecological features
Mitigation actions may be necessary to prevent derogation of other abstractions (for example, by lowering pumps in third party boreholes and/or providing alternative water supplies). Compensation may be agreed otherwise in accordance with the provisions of Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).

4.3. Mitigation programme

Mitigation measures have been finalised and agreed with the EA and NE for the higher priority Drought Permits and Drought Orders. The Lower Itchen Sources Drought Order, Candover Drought Order and Test Surface Water drought permit/order details are provided in Appendices C, E and G, respectively. We have also agreed the mitigation measures for Stages 1 and 2 (highest priority) of the Bewl Water/River Medway Scheme.

Table 4.1 sets out the timetable for developing details of the drought permit/order mitigation measures with the EA (and NE, where applicable).

Table 4.1: Mitigation measures timetable (excluding Test Surface Water, Candover Augmentation Scheme, Lower Itchen sources and Bewl Water/River Medway Scheme Stages 1 and 2).

Target Dates	Drought permits/orders	Action	Progress
Summer 2021	All permits/orders	Review of Southern Water projects and plans that provide drought resilience mitigation	In progress
Autumn 2021	All permits/orders, with the highest / higher priority sites addressed first	Develop mitigation options for each scheme based on consultation with EA and NE, outputs from walkovers surveys from 2019-20, cost benefit and business planning	In progress
Throughout 2021/22	All permits/orders, with the highest / higher priority sites addressed first	Engage delivery partner to develop delivery options and opportunities.	In progress
Summer 2022	Highest / higher priority permits/orders	Agree full package of embedded mitigation options with EA and NE	To be completed
2021 to Summer 2022	All permits/orders, with the highest / higher priority sites addressed first	Agree during and post drought permit/order requirement mitigation.	In progress.

During consultation with the EA and NE for the 2019 Drought Plan, it was proposed that for the remaining drought permits/orders (i.e. with the exception of the Lower Itchen Sources Drought Order, Candover Drought Order, Test Surface Water Drought Order and Stages 1 and 2 of Bewl Water/River Medway Scheme), the mitigation measures should be developed following baseline walkover surveys of the impacted reaches, as these surveys are needed to more definitively agree site-specific mitigation measures beyond the more generic mitigation measures already included in the EARs. These walkover surveys were completed in 2019 and 2020 as such the original programme included in the 2019 Drought Plan has been updated to enable suitable time to reflect and develop mitigation options.

The prioritisation follows the same prioritisation of drought permits/orders as shown earlier in Table 2.3. The drought permits/orders for the Test Surface Water, Candover Augmentation Scheme and Lower Itchen sources are categorised as being of the higher importance, reflecting the agreements reached with the EA and NE during the Hampshire Abstraction Licences Public Inquiry (see Appendices C, E and G). Stage 1 and 2 of Bewl Water/River Medway Scheme is also categorised of being of higher importance, as agreed with the EA.

For the Calbourne and Eastern Yar drought orders on the Isle of Wight, details of the proposed baseline survey work to inform mitigation measures were issued to NE in February 2019 for agreement, with some work having already been completed during winter 2018-19 within the optimal survey window (wintering bird surveys). The outline for the mitigation package has been agreed, as detailed in the HRA Stages 1 and 2 (see Annex 8 of the Drought Plan).

5. Permits and approvals

5.1. Introduction

The Drought Plan (England) Direction 2020 and EA guideline specifies that the Drought Plan should include details of the permits and approvals that the water undertaker expects to need in order to implement its drought management measures, including for monitoring and mitigation. Many of the mitigation (and compensation) measures will require specific permits and/or approvals to be obtained by Southern Water (or its agents acting under contract to Southern Water) prior to implementation as summarised in Table 5.1. Irrespective of the need for a permit or permission, all planned mitigation measures would be discussed with the EA in advance of implementation, as well as with NE, other authorities, stakeholders and site or land owners as appropriate.

All works will have regard to the requirements of protected species legislation and any necessary licences will be obtained in accordance with the provisions of the Wildlife and Countryside Act 1981 (as amended).

Where assent is required for works on SSSIs under section 28I of the Wildlife and Countryside Act 1981 (as amended), this assent will be obtained as properly required under legislation.

Table 5.1: Mitigation and compensation measures - permits and approvals.

Mitigation Measure	Likely permits or approvals required
Modification to pump levels in third party abstraction boreholes and/or financial compensation by Southern Water due to derogation of abstraction rights.	None, but agreement between the licence holder and Southern Water will clearly be required. Compensation payments are provided for in Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).
Modification to abstraction intakes at third party surface water abstractions and/or financial compensation by Southern Water due to derogation of abstraction rights.	May require an abstraction licence minor amendment and/or Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) as appropriate. Agreement between the licence holder and Southern Water will clearly be required. Compensation payments are provided for in Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).
Provision of alternative water supply where derogation of abstraction rights occurs.	No specific requirements for a mains water supply or provision of water bowser/tanker. May require abstraction licence if alternative source of raw water supply proposed from a controlled water.
Provision of compensation flows to the river from a borehole to maintain a minimum residual flow.	Requires a discharge permit for the discharge to river; may require planning permission for laying of discharge pipe as well as approval from landowners and riparian owners.
Improving the effluent quality from a Wastewater Treatment Works.	Generally none and within Southern Water's control assuming the improvement does not require major construction or construction adjacent to a watercourse when planning permission, Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) may be necessary. Liaison with the EA is

Mitigation Measure	Likely permits or approvals required
	however recommended in respect of discharges to controlled waters.
Address point sources of effluent or nutrient loading that may be causing adverse water quality at times of very low flow.	This will generally require dialogue with the site owner to assess what measures could be carried out. This might include temporary tankering of the effluent to a wastewater treatment works. No specific approvals are likely to be required.
Creation of alternative refuges in deeper water (e.g. fish, white-clawed crayfish).	May require Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) from EA depending on nature of the work and/or NE consent if works are in a SSSI or European site
Provision of in-stream structures and flow baffles to create functional refuges to support flow sensitive species.	Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) from EA and/or NE consent if works are in a SSSI or European site.
Artificial channel narrowing to provide functional refuges and support habitat requirement for species, enabling a quick natural recolonisation of the reach post-drought (e.g. fish, macroinvertebrates).	Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) from EA and/or NE consent if works are in a SSSI or European site.
Modification of flow structures across barriers to retain favourable conditions to facilitate the movement/migration of species (fish).	Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) from EA and/or NE consent if works are in a SSSI or European site, plus permission from the owner of the barrier/structure will be required.
Provision of piscivorous 'visual' bird scaring measures (e.g. using streamers in riparian trees) to control predation upon species using refuges (fish).	None – but consultation with EA, NE, bird specialists and RSPB would be important to ensure compliance with other nature protection legislation. Implementation would need to balance benefits to in-river species with maintenance of food sources for birds. Unlikely to be acceptable in SPA or Ramsar sites or associated functional habitat for birds.
Aeration or oxygenation of watercourse where significant mortality or change in species abundances are likely to be attributed to water quality deterioration	Discussion with the EA on aeration and/or oxygenation methods necessary to determine whether any permits or formal permissions are required.
Capture and relocate individuals across significant barriers, taking into account migratory periods (immigration and emigration) (fish).	EA consultation and consent required (with consultation with NE for designated conservation sites or species).
Rescue of individuals or groups, in consultation with the EA or NE as appropriate, and relocation to suitable habitat where they are seen to be in distress or where artificially high densities are likely to result in significant impacts (e.g. fish, white-clawed crayfish).	EA consultation and consent required for fish movement and crayfish licence required (with consultation with NE)
Rescue of individuals or groups, in consultation with the EA or NE as appropriate, and retention for later release where they are seen to be in distress or	EA consultation and consent required for fish movement and crayfish licence required (with consultation with NE).

Mitigation Measure	Likely permits or approvals required
where artificially high densities are likely to result in significant impacts (e.g. fish, white-clawed crayfish).	
Enhancement of habitat beyond the impacted reach (e.g. macroinvertebrates, fish).	May require Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses) from EA depending on nature of the work and/or NE consent if works are in a SSSI or European site.
Restocking using juvenile lamprey ammocoetes within the catchment where monitoring indicates loss of lamprey abundance or recruitment.	EA consent required (with consultation with NE for designated conservation sites and as a European and NERC species).
Restocking using offspring from broodstock from the catchment where monitoring indicates loss of fish abundance or recruitment.	EA consent required (with consultation with NE for designated conservation sites or species).
Restocking of coarse fish from the catchment where monitoring indicates loss of fish abundance or recruitment.	EA consent required (with consultation with NE for designated conservation sites or species).
Removal/treatment of Himalayan balsam (or other floral INNS) where monitoring indicates an increase in abundance or distribution due to the drought permit/order.	EA consent may be required (with consultation with NE for designated conservation sites or species) depending on the nature of the removal and/or treatment, as well as the subsequent method of disposal.
Protection to heritage features through specific mitigation works.	Requires approval and agreement of site owner and may require approval and/or guidance from Historic England.
Mitigation measures to support water sports and boating/navigation facilities– various measures such as modifying boat slipways/moorings or provision of alternative sites, or local dredging; or otherwise compensation.	Requires dialogue with relevant owners/members of water sports organisations as well as riparian owners. May require Flood Risk Permit (Main River) or Land Drainage Consent (Ordinary Watercourses), dependent on nature of the works. Local dredging to be minimised and will invariably require consent and agreement of relevant regulator (dependent on location). Compensation is provided for under Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).
Mitigation measures to support angling – various measures such as provision of alternative fishing sites, or otherwise compensation for loss of angling.	Requires dialogue with relevant owners of fishing rights/members of angling associations/clubs. Compensation is provided for under Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).
Mitigation of predicted ecological risks to rivers and associated habitats and species. River restoration, re-connection to floodplains, and enhancement work to be provided pre-drought in order to build up ecological resistance to and recoverability from the effects of drought. To include reversing historic degradation from over-grazing, impoundments, simplification of the channel form, and removal of	EA consent required (with consultation with NE for designated conservation sites or species).

Mitigation Measure	Likely permits or approvals required
bankside and riparian shade in chalk streams in order to improve drought resilience.	
Retaining of water via control structures for water dependent features within designated sites.	EA consent required (with consultation with NE for designated conservation sites or species).
If it is considered likely that a drought permit needs to be extended beyond 6 months, a river corridor survey should be undertaken of the medium and high risk reaches to note down features and their locations. This survey can then be used to help assist recovery in locations where it is not occurring naturally, by repeating the survey post drought and then at subsequent intervals (e.g. one year later).	EA consent required (with consultation with NE for designated conservation sites or species).

5.1.1. Groundwater source abstraction

Where it is necessary for groundwater abstractions to be 'run to waste' to a watercourse in order to comply with drinking water regulations for testing the raw water prior to putting it into the public water supply system, Southern Water will seek the appropriate consent/permit for such discharges (for example, Water Industry Act 1991, Section 165/166 consent or permanent discharge permits).

5.1.2. Land access

Monitoring plays a critical part in informing those decisions that aim to ensure the supply and quality of water is preserved, and the wider natural environment and any vulnerable species is sufficiently protected. Water companies need to consider any risks to land access that may preclude such monitoring activities.

Securing landowner permissions for access to enable activities such as monitoring (and mitigation) to take place is recognised by Southern Water as not just essential in practical terms but as a fundamental part of our wider engagement plan. Southern Water will work with landowners, stakeholders and regulators on securing access rights where needed. Where landowners simply will not give their consent, we will look at what alternative options and locations are available, including asking or partnering with other bodies who already have secured access or who are otherwise is a better position to consider undertaking the activities on our behalf.

Following historic land access issues for monitoring, this approach is currently being adopted for the delivery of the monitoring, mitigation and compensation measures developed from the Hampshire Abstraction Licences Public Inquiry, although in that scenario the discussions with the landowners in respect of granting land rights are still active. This approach has identified a series of locations which provide sufficient data to assess the state of the environment at the time of making an application.

The Section 20 Agreement includes specific provisions to cover the risks of land access agreements not being achieved and data therefore not being acquired which is necessary to support the Drought Permit application. Paragraph 17.3 of the Section 20 Agreement states:

"For the avoidance of doubt, as far as the Agency is concerned, in respect of any Test Surface Water Drought Order or Permit, Candover Drought Order or Lower Itchen Drought Order:

a. the Company will not be required to install monitoring points on land outside its ownership, or to undertake monitoring activity where landowner consent is withheld.

b. The Agency will have regard to any inability of either the Company or the Agency to obtain monitoring data resulting from the actions of third parties, when considering whether any application is 'application

ready' and whether such an application should be granted. The Agency will not refuse any application for lack of evidence or decide that the Company is not 'application ready' where landowner consent is withheld without first having considered its own use of the powers under section 172 of the WRA 1991 to obtain the necessary evidence in the regular 6 monthly reviews."

In respect of the Test Surface Water Drought Permit and Order, since the Public Inquiry in March 2018 Southern Water has been continuing dialogue with relevant landowners and seeking an agreement within which drought baseline monitoring and pre-drought or during-drought mitigation works can be carried out within their area of the Lower River Test. Since the Public Inquiry, progress has been made in terms of mutual understanding of principles and expectations. Indeed, a full day of ecological monitoring and reconnaissance took place in April 2019 under compensation agreed by Southern Water. Further access was agreed to complete monitoring in summer and autumn 2019. Full agreement is yet to be secured for ongoing monitoring. Southern Water will continue to work with the landowners in order to reach a reasonable agreement, noting that the proposed agreement does not guarantee access, but will provide a framework for gaining access permission. In the interim, the Section 20 Agreement clause referenced above will apply.

5.2. Measures to ensure environmental protection and biosecurity

5.2.1. Environmental protection

Some of the sites, species, habitats or features to be monitored and/or requiring mitigation measures are very sensitive and/or are legally protected. It is therefore imperative that appropriate planning and control measures are considered to ensure their protection during monitoring and implementation of mitigation measures. Guidance should be sought from the relevant regulatory body, site owner or relevant expert in developing an environmental protection risk assessment and plan to set out the required measures to avoid damage or loss. These plans should be shared with site owners, EA, NE and other relevant stakeholders in advance of carrying out the activities so that any issues or additional guidance can be discussed.

5.2.2. Biosecurity

Biosecurity is a major issue across the UK to prevent disease and pathogen transfer and the spread of invasive species; drought conditions can increase some of these risks but reduce others. It is important that prior to commencing any monitoring or implementing any mitigation measures, a biosecurity risk assessment is completed to highlight the risks relating to the proposed activities and ensure good working practice is followed. A biosecurity plan should be prepared to set out the risks and the prevention measures (or mitigation measures should adverse effects arise). It is recommended that biosecurity is also included in site risk assessment procedures alongside other environmental and health and safety risks. The biosecurity plan and site risk assessments should be shared with site owners, EA, NE and other relevant stakeholders.

During a drought, Southern Water will work with the EA, NE, land owners (e.g. Country Land and Business Association (CLA)) and the agriculture sector (e.g. National Farmers Union (NFU)) to promote the importance of biosecurity measures at times of low flows. This could include joint press releases and website messages, as well as articles in appropriate magazines and journals. A joint message is likely to have the greatest impact, rather than one organisation working in isolation.

6. Data Exchange Protocol

6.1. Baseline data exchange

Outside of drought events, key routine baseline environmental monitoring data relevant to the Drought Plan (e.g. river flows, groundwater levels, water quality and ecological data) should be exchanged between Southern Water, EA and NE on a regular basis (suggested at 6-monthly to annual intervals for agreed monitoring sites plus Southern Water's baseline monitoring programme set out in this EMP). The agreed monitoring sites should be set out in a data exchange spreadsheet and a nominated contact agreed for each party to co-ordinate the exchange, taking account of the frequency of carrying out monitoring at each site. Data should be exchanged electronically wherever possible and only after the appropriate QA checks have been carried out. Any issues with the data should be identified as part of the exchange process.

Each party is responsible for notifying the other parties of any planned changes to the monitoring programmes as early as possible such that the other parties have an opportunity to address any gaps in the dataset that this may cause.

Where required, any licensing arrangements should be put in place to enable efficient exchange of the datasets.

6.2. In-drought data exchange

During a drought, Southern Water will liaise closely with the EA and NE, including in respect of the in-drought monitoring programmes of each party. In the initial stages of a developing drought, there will be regular communication established and the on-set of drought environmental monitoring will be confirmed so that each party is aware of planned activities.

As far as practicable, any relevant environmental data collected by each party will be made available to the other parties (subject to appropriate licensing arrangements where necessary which are assumed to have been agreed as part of the baseline data exchange process) through electronic transfer wherever possible in a timely manner (suggested as normally within 1 working week of the necessary data compilation and/or analysis having been completed).

In addition to the data exchange, each party shall share as early as possible their planned in-drought monitoring programmes together with any triggers established to enhance or extend the monitoring frequency and/or spatial coverage. Any changes to the plans should be communicated in a timely manner so that other parties can react accordingly.

Southern Water will also establish communications with relevant contacts in the EA and NE to discuss potential mitigation measures in respect of proposed drought permits/orders and agree the specific monitoring and trigger conditions for their implementation, building on the information within this EMP but taking account of the prevailing environmental conditions.

6.3. Post-drought data exchange

Post-drought, Southern Water will continue to liaise closely with the EA and NE to agree and confirm the targeted, specific post-drought monitoring programmes of each party. For Southern Water, this will be based on the proposed monitoring measures set out in this EMP and further informed by the findings of the specific in-drought monitoring activities and the prevailing environmental conditions. Given that compensation measures may be required in light of the in-drought and post-drought monitoring of impacts linked to drought

permits/orders, it is considered appropriate that the data exchange timeframes set out for the in-drought monitoring should apply in the initial weeks following the cessation of the drought permits/orders, but reverting to the baseline frequency once drought recovery has been agreed to have occurred (noting this will vary from location to location, and from feature to feature).

The post-drought monitoring data should be pooled by all parties and meetings arranged to review and agree the key findings arising from the data on a regular basis (frequency to be agreed dependent on the prevailing conditions) until it is agreed that environmental recovery has largely occurred. It is recommended that a joint summary paper is produced to set out the key findings of fact in relation to any damage and subsequent recovery of relevant key environmental features. This should be used to direct and target any required post-drought compensation measures which should be recorded for future reference.

All data collated during the drought and post-drought (to the point of recovery of the relevant environmental features) should be reviewed by Southern Water and used to update the Environmental Assessment Reports, HRA and WFD assessment reports as necessary in advance of the next Drought Plan submission.

PART B: MONITORING AND MITIGATION DETAILS FOR EACH DROUGHT PLAN SUPPLY-SIDE OPTION

7. Monitoring and mitigation for each drought permit/order

The following tables set out the drought permit/order site-specific baseline data acquisition and monitoring, in-drought monitoring and mitigation and post-drought monitoring and compensation measures in line with the EA's drought planning guidance.

Monitoring and mitigation has been recommended where likely impacts have been assessed as moderate or major (particularly where sites are identified as being or national and international importance). The monitoring and mitigation for impacts is set out in tables below. The majority of this monitoring has either begun or is scheduled to be delivered from spring 2021.

IT IS IMPORTANT THAT THESE TABLES ARE READ IN CONJUNCTION WITH THE RELEVANT ENVIRONMENTAL ASSESSMENT REPORT FOR THE DROUGHT PERMIT / ORDER AS THESE REPORTS PROVIDE THE NECESSARY BACKGROUND AND CONTEXT TO THE PROPOSED MEASURES SET OUT IN THESE TABLES.

IT SHOULD ALSO BE NOTED THAT THESE TABLES COVER THE MAXIMUM EXTENT OF THE IN-DROUGHT MONITORING REQUIREMENTS WHERE DROUGHT PERMITS / ORDERS HAVE MULTIPLE STAGES OF IMPLEMENTATION AND/OR DIFFERENT SEASONS FOR IMPLEMENTATION: FOR SOME OF THE EARLIER STAGES OF IMPLEMENTATION OR SOME SEASONS, A REDUCED SCALE OF MONITORING WILL BE APPROPRIATE.

7.1. Western area drought permits/orders

7.1.1. Lukely Brook

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit implementation period		Post drought permit	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Solent Maritime SAC Medina Estuary SSSI Medina Estuary (Transitional Water Body)	Changes in habitat structure due to decreased freshwater input	To establish a baseline, monitoring should incorporate: Walkover survey to assess the level of low tide hydrological connectivity between the aquatic habitats (mudflats, sandflats, estuaries) and bird counts Once to establish baseline. May need to resurvey prior to application if the data is older than 2 years Obtain any available site-specific water level/flow monitoring evidence.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought.	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought permit implementation compared to the antecedent environmental drought conditions.	None applicable.	In year following drought permit implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought permit, consider scope for regeneration of habitats or otherwise consider compensatory habitat options.	Southern Water in agreement with EA and NE.
Solent and Southampton Water SPA and Ramsar site Medina Estuary SSSI Medina Estuary (Transitional Water Body)	Habitat degradation as a result of decreased river velocity, or level and velocity due to lower flows. Bird assemblages: Decrease in food sources as a result of changes in water quality. Changes in food sources as a result of changes in water quality. Population impacts as a result of adverse conditions during breeding season.	To establish a baseline, monitoring should incorporate: Walkover survey to assess the level of low tide hydrological connectivity between the aquatic habitats (mudflats, sandflats, estuaries) and bird counts. Once to establish baseline. May need to resurvey prior to application if the data is older than 2 years Obtain any available site-specific water level/flow monitoring evidence. Obtain any bird monitoring data available.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought. Carry out monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations).	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought permit implementation compared to the antecedent environmental drought conditions. Carry out further monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations).	None applicable.	In year following drought permit implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought permit, consider scope for regeneration of habitats or otherwise consider compensatory habitat options. In the year following the drought permit continue monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations).	Southern Water in agreement with EA and NE.
Fish community, including Brown Trout, European eel, river lamprey and Bullhead Lukely Brook (Reach 1)	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Electric-fishing surveys to monitor populations at each year. Sampling to occur at 1 confirmed site to compliment previous EA surveys (as agreed with the EA). Complete one sample per year between spring and autumn. Repeat every 3 years. Collate any further information from local knowledge and EA local staff, plus local biological records.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach/water body, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in stream sections/water bodies known to contain high fish densities.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure].	In the year following drought permit implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA. Three years post drought permit monitoring at baseline monitoring sites to determine relative health of year classes which are influenced by this impact. Including fish scale analysis.	Southern Water in agreement with EA.

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit implementation period		Post drought permit	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macrophytes Lukely Brook (Reach 1)	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate any available local macrophyte data. Carry out walkover and river macrophyte surveys at 2 sites. Ideally, surveys will take place over both a normal year and dry years and will complement existing EA monitoring, as discussed with the EA). Complete one sample per year between June-September period once per year. Repeat surveys every 3 years.	Seasonal walkover and carry out macrophyte surveys at the baseline survey sites (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes identified (if drought permit implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions.	Carry out post-drought permit implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA.
Macroinvertebrates Lukely Brook (Reach 1)	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate available local records to improve baseline datasets. Carry out seasonal macroinvertebrate surveys each year for both spring and autumn seasons. Sampling to occur at 2 confirmed sites to provide appropriate coverage and compliment previous EA surveys (as agreed with the EA). Identify specimens to species/mixed taxonomic level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA.
Water Quality Lukely Brook Medina Estuary (Transitional Water Body)	Potential reductions in water quality due to reductions in flow.	Lack of data for these reaches. Water quality monitoring at 1 site in each impacted reach during low flows/low tide conditions. Parameters to be sampled for are soluble reactive phosphorous (SRP), dissolved oxygen, ammoniacal nitrogen (freshwater), Dissolved Inorganic Nitrogen (DIN) for transitional water, pH, turbidity, conductivity, salinity (for transitional water only) and water temperature. Repeat surveys twice annually at low flow conditions / low tide conditions.	Water quality monitoring at 1 site in each impacted reach during low flows/low tide conditions. Parameters to be sampled for are soluble reactive phosphorous (SRP), dissolved oxygen, ammoniacal nitrogen (freshwater), Dissolved Inorganic Nitrogen (DIN) for transitional water, pH, turbidity, conductivity, salinity (for transitional water only) and water temperature.	Carry out water quality monitoring at the baseline survey sites in each impacted reach during low flows / low tide conditions to assess impacts of drought permit. Monthly sampling regime during drought permit implementation. Parameters to be sampled for are soluble reactive phosphorous (SRP), dissolved oxygen, ammoniacal nitrogen (freshwater), Dissolved Inorganic Nitrogen (DIN) for transitional water, pH, turbidity, conductivity, salinity (for transitional water only) and water temperature.	Consider measures to address identified point sources of nutrient loading if SRP readings are high.	Repeat water quality sampling activity for 3 months after cessation of the drought permit or until flows in Lukely Brook recover above Q95 flows. No other action required outside of routine baseline monitoring programmes.	Southern Water in agreement with EA.
Scheduled Monument Clatterford Roman Villa	Potential reduction in river flows having adverse effect on water-dependent features of this site.	Discuss potential impacts on any water-dependent features of this heritage asset with the site owner and understand how the drought permit might impact on these features. Agree scope for any monitoring or mitigation measures.	Discuss prevailing drought conditions with site owner and assess current impacts of drought on water-dependent features. Implement any agreed monitoring, including any triggers for implementing any agreed mitigation measures.	Regular contact with site owner to understand how the drought permit may be affecting any water-dependent features and monitor against any agreed triggers for implementation of any mitigation measures.	Implement agreed mitigation measures.	Post-drought permit monitoring of any water-dependent features to assess recovery from any adverse effects due to drought permit implementation. Agree any post-drought permit compensation measures as appropriate with site owner and implement as may be agreed.	Southern Water in agreement with site owner and/or Historic England.

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit implementation period		Post drought permit	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Groundwater level Observation boreholes BH1, BH2, HA1, HA2, HA3	Lack of groundwater level data.	Long term groundwater monitoring (water level loggers set at a minimum of daily level readings) at key observation boreholes where feasible (loggers originally installed as part of the 2006 drought permit application).	Continue monitoring the groundwater levels for the listed observation boreholes.	Continue monitoring the groundwater levels for the listed observation boreholes.	Not applicable.	Continue monitoring the groundwater levels for the listed observation boreholes.	Southern Water in agreement with EA.

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise baseline breeding and wintering bird surveys, and otter and water vole surveys. Further information regarding these measures is detailed in the relevant Habitats Regulations Assessment.

7.1.2. Eastern Yar

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During Drought Order Implementation Period		Post-drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Solent Maritime SAC Medina Estuary SSSI Medina estuary (Reach 3)	Changes in habitat structure due to decreased freshwater input	To establish a baseline, monitoring should incorporate: Walkover, transects, elevation profile and quadrats - NVC. April to August. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years Obtain any available site-specific water level/flow monitoring evidence. Continuous water level monitoring at one site for one year following which a review of the data is required to determine the need for further monitoring.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought.	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought order implementation compared to the antecedent environmental drought conditions.	None applicable.	In year following drought order implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options.	Southern Water in agreement with EA and NE
Solent and Southampton Water SPA and Ramsar site Medina Estuary SSSI Medina estuary (Reach 3)	Habitat degradation as a result of decreased freshwater flow inputs to the estuary. Bird assemblages: Changes in food sources as a result of changes in water quality and ecology Population impacts as a result of adverse conditions during breeding season	To establish a baseline, monitoring should incorporate: Walkover, transects, elevation profile and quadrats - NVC. April to August. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years. Obtain any available site-specific water level/flow monitoring evidence. Continuous water level monitoring for one year following which a review of the data is required to determine the need for further monitoring. Obtain any bird monitoring data available. Carry out low tide counts using WeBS method between October and March. Once to establish baseline. May need to resurvey prior to application if the data is older than 2 years	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought. Carry out monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations).	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought order implementation compared to the antecedent environmental drought conditions. Carry out further monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations).	None applicable.	In year following drought order implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options. In the year following the drought order continue monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations)	Southern Water in agreement with EA and NE

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During Drought Order Implementation Period		Post-drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Water Quality **All reaches including estuarine**	Increases in nitrogen and phosphorous concentrations	Lack of data for impacted reaches including Medina Estuary. Water quality monitoring at 1 site in each of the reaches 1 to 3 during low flows/low tide conditions. Parameters to be sampled are ammoniacal nitrogen (freshwater) or Dissolved Inorganic Nitrogen (DIN) (for transitional water). Twice throughout the year during low flow conditions, annually. Medina Estuary: Spot flow and water quality sampling to be carried out on four occasions throughout year at 4 sites; i. approximately equally distributed throughout the year, capturing at least one visit during spring low tide in hot weather conditions, and one at low tide during the winter period; ii. at low environmental flows (i.e. flows equal to or less than Q80 and after a prolonged period of little precipitation) and; iii. at times without spill of excess water from upstream e.g. Southern Water reservoirs, mills. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years.	Monitor for dissolved inorganic nitrogen and SRP in estuarine reaches and ammoniacal nitrogen and SRP in freshwater reaches	Monitor for dissolved inorganic nitrogen and SRP in estuarine reaches and ammoniacal nitrogen and SRP in freshwater reaches	No action required outside of routine baseline monitoring programme.	Monitor for dissolved inorganic nitrogen and SRP in estuarine reaches and ammoniacal nitrogen and SRP in freshwater reaches	Southern Water in agreement with EA and NE

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During Drought Order Implementation Period		Post-drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macrophytes **Reaches 1 and 3**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macrophyte populations are not well understood as a result of lack of data Collate any available local macrophyte data. Reach 1: Carry out annual walkover and river macrophyte survey at 1 site (deemed most suitable after consultation with the EA) between June and September Surveys ideally to be completed in normal and a dry years[2] and will compliment previous EA Monitoring, as discussed with the EA. Repeat survey every 3 years. Estuarine: One set of sampling between June and September to inform baseline. May need to resurvey prior to application if the data is older than 2 years.	Seasonal walkover and carry out macrophyte surveys at the baseline survey sites (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes identified (if drought order implemented in plant growing season). Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions.	Carry out post-drought order implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA
Estuarine macroalgae and phytoplankton **Transitional water body Reach 3**	Alteration to community composition as a result of water quality deterioration Decrease in habitat availability as a result of algal blooms	Carry out spring and summer macroalgal surveys using WFD fucoid extent tool at upstream limit and median salinity (ideally complementing the existing EA monitoring, in discussion with the EA). Carry out phytoplankton surveys (chlorophyll-a 90th percentile, elevated count and seasonal succession) in spring and summer at 1 x baseline site (ideally complementing the existing EA monitoring, in discussion with the EA). One visit per season to inform baseline. May need to resurvey over a period of 3 years to establish suitable baseline.	Carry out macroalgae/phytoplankton surveys at the baseline survey site Carry out water quality sampling at same time including samples for SRP. Identify any key sources of nutrient loading.	Survey to be undertaken of macroalgae/ phytoplankton at baseline monitoring site every month during the drought order implementation. Carry out water quality sampling at same time including samples for SRP.	Consider measures to address identified point sources of nutrient loading.	Carry out post-drought order implementation surveys at the baseline monitoring site on a monthly basis for 6 months to understand the extent of recovery from any adverse impacts. Revert to the annual baseline monitoring programme thereafter. No specific post-drought permit / order mitigation measures identified.	Southern Water in agreement with EA

[2] Environment Agency (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During Drought Order Implementation Period		Post-drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macroinvertebrates River Medina Reach 1 and 2 (Freshwater) Transitional water body Reach 3	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate available local records to improve baseline datasets. Reaches 1 and 2: Carry out seasonal (spring and autumn) macroinvertebrate surveys. Agreed coverage with EA is 1 site in reach 2 and 2 sites in reach 1. Sampling to be undertaken every year in spring and autumn, respectively. Identify to species/mixed taxonomic level. Estuarine: One set of sampling to inform baseline (April to October). May need to resurvey prior to application if the data is older than 2 years. Standard 3min kick sample in riffle habitat.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA
Freshwater fish community (Reaches 1 and 2), including European eel, Brown trout, bullhead and brook lamprey Estuarine fish community (Reach 3)	Decreased growth, morphological change and / or alteration to feeding as a result of decreased estuarine productivity Increased mortality as a result of predation. Mortality as a result of water quality deterioration Increase in significance of barriers as a result of decreased flows Salinity gradient will alter which will affect primary productivity of the estuary and therefore their food source.	Fish populations are not well understood as a result of lack of recent survey data. Electric-fishing surveys for monitoring populations to be conducted. Agreed coverage with EA is 1 site in reach 2 and 2 sites in reach 1. Sampling locations will also complement existing EA monitoring, as discussed with the EA) 1 survey round between spring and autumn. Repeat every 3 years. Collate any further information from local knowledge and EA local staff, plus local biological records. There is a need for further discussion with the EA regarding the need for Reach 3 surveys.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach/water body, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in stream sections/water bodies known to contain high fish densities.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought permit implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA. Three years post drought permit monitoring at baseline monitoring sites to determine relative health of year classes which are influenced by this impact. Including fish scale analysis.	Southern Water in agreement with EA
Mudflats **Transitional water body Reach 3**	Decrease in habitat quality and extent as a result of decreased freshwater input Changes in sediment dynamics as a result of decrease freshwater input Changes in nutrient dynamics as a result of decreased freshwater input Decrease in buffering capacity Changes in water quality, especially SRP altering community structure and food webs	To establish a baseline, monitoring should incorporate: Walkover survey to assess the level of low tide hydrological connectivity with the mudflat habitats. Carry out one set of sampling of benthic cores in Spring, Autumn and Winter. May need to resurvey prior to application if the data is older than 2 years. Obtain any available site-specific water level/flow monitoring evidence.	Surveillance walkover of mudflat habitats and investigate scale of any hydrological effects at low tide during environmental drought.	Surveillance walkover of mudflat habitats and investigate any changes due to reduced freshwater inflows during drought order implementation compared to the antecedent environmental drought conditions.	None applicable.	In year following drought order implementation, carry out appropriate monitoring of mudflat habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options.	Southern Water in agreement with EA and NE

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise baseline breeding and wintering bird surveys, river habitat surveys, and otter and water vole surveys. Further information regarding these measures is detailed in the relevant Habitats Regulations Assessment.

7.1.3. Caul Bourne

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Solent Maritime SAC Newtown Harbour SSSI and NNR	Changes in habitat structure due to decreased freshwater input	To establish a baseline, monitoring should incorporate: Walkover, transects, elevation profile and quadrats – NVC. April to August. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years. Carry out one set of sampling of benthic cores in Spring, Autumn and Winter. May need to resurvey prior to application if the data is older than 2 years. Obtain any available site-specific water level/flow monitoring evidence. Carry out a baseline water quality survey and spot flow gauging at 3 sites. Sampling to be carried out on four occasions throughout year; i. approximately equally distributed throughout the year, capturing at least one visit during spring low tide in hot weather conditions, and one at low tide during the winter period; ii. at low environmental flows (i.e. flows equal to or less than Q80 and after a prolonged period of little precipitation) and; iii. at times without spill of excess water from upstream e.g. Southern Water reservoirs, Shalfleet Mill. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought. Repeat baseline survey of Shalfleet Creek at spring low tide to confirm impact of environmental drought on hydrological and water quality conditions.	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought order implementation compared to the antecedent environmental drought conditions. Carry out monitoring of water dependent species that are linked to these habitats Repeat baseline survey of Shalfleet Creek at spring low tide to confirm impact of drought order on hydrological and water quality conditions.	Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne.	In year following drought order implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. Repeat baseline survey of Shalfleet Creek at spring low tide to confirm recovery from any impacts of drought order on hydrological and water quality conditions. Carry out monitoring of water dependent species that are linked to these habitats. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options.	Southern Water in agreement with EA and NE
Solent and Southampton Water SPA and Ramsar site	Habitat degradation as a result of decreased freshwater flow inputs to the estuary. Bird assemblages: Changes in food sources as a result of changes in water quality and ecology Population impacts as a result of adverse conditions during breeding season	To establish a baseline, monitoring should incorporate: Obtain any bird monitoring data available. Also see Estuarine Wintering Bird community row.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought. Carry out monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations)	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought order implementation compared to the antecedent environmental drought conditions. Carry out further monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations)	Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne.	In year following drought order implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options. In the year following the drought order continue monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird	Southern Water in agreement with EA and NE

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
						populations)	
Fish community, including Brown/Sea Trout, Brook/River Lamprey, European eel and Bullhead **Caul Bourne (Reach 1 and 2)** Estuarine fish community, including European eel, grey mullet and bass **Newtown transitional water body**	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Recent fish populations are not well understood as a result of lack of survey data. Electric-fishing surveys for monitoring populations to be conducted in freshwater reaches with a possible further trawl survey in the downstream estuary. Agreed coverage with EA includes 2 sites in the River Caul Bourne (upstream and downstream reaches) and 1 possible estuarine site in Newtown Harbour. Sampling locations will also complement existing EA monitoring, as discussed with the EA) 1 survey round per site between spring and autumn. Repeat every 3 years. Collate any further information from local knowledge and EA local staff, plus local biological records.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach/water body, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkover surveys, if situation is expected to deteriorate in stream sections/water bodies known to contain high fish densities. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought order implementation, undertake post-drought fish surveys at the baseline monitoring site to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA. Three years post drought order monitoring at baseline monitoring sites to determine relative health of year classes which are influenced by this impact. Including fish scale analysis.	Southern Water in agreement with EA
Macrophytes **Caul Bourne (Reach 1)** Estuarine Macrophytes **Newtown transitional water body**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macrophyte populations are not well understood as a result of lack of data Collate any available local macrophyte data. Carry out walkover and river macrophyte surveys at 2 sites in the Caul Bourne (upstream and downstream). Surveys will ideally be undertaken in both normal and a dry years[3]. They will complement existing EA monitoring, as discussed with the EA). To be carried out June-September period once a year. Repeat every 3 years. Carry out one estuarine macrophyte survey at 1 site in the Newtown transitional water body between June-September period, in order to establish a baseline. May need to resurvey prior to application if the data is older than 2 years.	Seasonal walkover and carry out macrophyte surveys at the baseline survey site (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes identified (if drought order implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline site including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions.	Carry out post-drought order implementation surveys at the baseline monitoring site for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA
Estuarine macroalgae and phytoplankton	Alteration to community composition as a result of water quality deterioration	Carry out macroalgal surveys using WFD fucoid extent tool at upstream limit and median salinity (ideally complementing the existing EA monitoring, in discussion with the EA).	Carry out macroalgae/phytoplankton surveys at the baseline survey site Carry out water quality sampling at same	Survey to be undertaken of macroalgae/ phytoplankton at baseline monitoring site every month during the drought order	Consider measures to address identified point sources of nutrient loading. Seek to manage the operation	Carry out post-drought order implementation surveys at the baseline monitoring site on a monthly basis for 6 months to understand the	Southern Water in agreement with EA

[3] Environment Agency (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Newtown transitional water body	Decrease in habitat availability as a result of algal blooms	Carry out phytoplankton surveys (chlorophyll-a 90th percentile, elevated count and seasonal succession). One visit per season (summer and winter) to inform baseline. May need to resurvey over a period of 3 years to establish suitable baseline.	time including samples for SRP. Identify any key sources of nutrient loading.	implementation. Carry out water quality sampling at same time including samples for SRP.	of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne.	extent of recovery from any adverse impacts. Revert to the annual baseline monitoring programme thereafter. No specific post-drought order mitigation measures identified.	
Freshwater Macroinvertebrates **Reach 1** **Caul Bourne**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate available local records to improve baseline datasets. Carry out seasonal (spring and autumn) macroinvertebrate surveys. For adequate coverage across the reach, 3 sites have been agreed with the EA with 1 further site, subject to walkover and confirmation of need. Per site, sampling will occur every year in spring and autumn. Survey sites will complement the existing EA monitoring, as discussed with the EA. Identify to species/mixed taxonomic level.	Seasonal monitoring of macroinvertebrates at the baseline survey site. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey site. Samples to be collected and identified to species level.	Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal baseline monitoring programme.	Southern Water in agreement with EA
Estuarine Wintering Bird community (including Black-tailed godwit, Ringed plover, curlew) **Newtown transitional water body**	Loss of habitat during incidences of decreased water levels during over-wintering period Decrease in food sources as a result of changes in water levels and water quality during over-wintering period	Carry out low tide counts using WeBS method. Carry out one survey between October to March to establish a baseline. Identify any key point sources of nutrient loading. May need to resurvey prior to application if the data is older than 2 years.	Habitat walkover survey and carry out wintering bird surveys at the baseline survey sites (if during over-wintering period) Identify any key point sources of nutrient loading.	Habitat walkover survey and carry out wintering bird surveys at the baseline survey sites (if during over-wintering period) Identify any key point sources of nutrient loading.	Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne.	Carry out post-drought order implementation surveys for 2 consecutive over-wintering periods to understand the extent of recovery from any adverse impacts. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA and NE
Estuarine Macroinvertebrates **Newtown transitional water body**	Reduction in abundance or distribution as a result of decreased freshwater input.	Estuarine macroinvertebrate populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets. Carry out seasonal (between April to October) macroinvertebrate surveys using standard 3min kick sample in riffle habitat. One set of sampling to inform baseline. May need to resurvey prior to application	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne. Consider possible in-situ measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal baseline monitoring programmes.	Southern Water in agreement with EA

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
		if the data is older than 2 years.					
Chalk river and priority headwater habitat	Increase in dry section of river	Targeted walkover survey (RHS and risk mapping) to identify habitats sensitive to drought and any refuge habitats which will not be impacted. Carry out between May and July. Once to inform baseline. May need to resurvey prior to application if the data is older than 2 years. Spot flow and water quality monitoring.	Repeat targeted walkover survey to assess conditions under prevailing baseline drought conditions. Spot flow and water quality monitoring.	Monthly check of habitats identified as sensitive to drought in baseline work and refuge areas, to monitor any deterioration during implementation of drought order. Spot flow and water quality monitoring at selected sites.	None applicable.	In year following after drought order implementation, carry out repeat targeted walkover survey to assess any damage to the habitat that may have arisen due to the drought order and assess extent of recovery. Due to the chemistry of the chalk streams, “concredation” of riffle habitat may occur and therefore physical works may be required to break this up.	Southern Water in agreement with EA
Groundwater Monitoring **Observation boreholes for Caul Bourne**	Frequency of data collection not accounting for impacts on monthly dip record	Increase monitoring from monthly to daily for: Observation boreholes at three locations, installing water loggers where appropriate or feasible. Long term monitoring.	Continue baseline monitoring activities	Continue baseline monitoring activities	Not applicable	Continue baseline monitoring activities	Southern Water in agreement with EA
Water Quality **All reaches including estuarine (Caul Bourne and Newtown Transitional Waterbody)**	Increases in nitrogen concentrations	Lack of data for impacted reaches including Shalfleet Creek. Water quality monitoring at 1 site in each impacted reach during low flows/low tide conditions. Parameters to be sampled for are ammoniacal nitrogen (freshwater) and Dissolved Inorganic Nitrogen (DIN) (for transitional water). Repeat surveys twice annually at low flow conditions / low tide conditions.	Monitor for dissolved inorganic nitrogen in estuarine reaches and ammoniacal nitrogen in freshwater reaches	Monitor for dissolved inorganic nitrogen in estuarine reaches and ammoniacal nitrogen in freshwater reaches	No action required outside of routine baseline monitoring programme.	No action required outside of routine baseline monitoring programme.	Southern Water in agreement with EA and NE
Landscape **Isle of Wight Area of National Beauty (AONB)** **Isle of Wight National Character Area (NCA)**	Potential impact on water related features	Collation of appropriate data as part of the baseline monitoring programme to inform a landscape impact assessment in dialogue with AONB officers and NE. Repeat assessment every 5 years (or unless material changes to the landscape)	Repeat landscape assessment from baseline activities to establish any changes arising from the environmental drought to provide a drought baseline.	Repeat landscape assessment to establish any changes arising from the drought order.	No specific measures but other mitigation measures for other features may help to ameliorate adverse effects of the drought order.	None applicable.	Southern Water in agreement with AONB officers and NE
Heritage **Impacted Mill**	Potential impacts on mill operation and water setting of the heritage feature	Discuss operation of the mill with site owner and understand how the mill would operate in drought conditions.	Discuss prevailing drought conditions with site owner and assess current impacts of drought on mill operations. Confirm how the mill will operate if the drought order implemented and whether it can be optimised to help protect the water environment.	Regular contact with site owner to understand how the drought order may be affecting mill operations.	Seek to manage the operation of impacted Mill with the site owner where feasible to optimise flows to the estuary from Caul Bourne.	None applicable	Southern Water in agreement with site owner and EA

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise baseline breeding and wintering bird surveys, and otter and water vole surveys. Further information regarding these measures is detailed in the relevant Habitats Regulations Assessment

7.1.4. Lower Itchen sources

As set out earlier, a programme of mitigation and monitoring has been agreed with the EA and NE for the Lower Itchen sources Drought Order as part of the Section 20 Agreement. These monitoring and mitigation packages are included in Appendix B and C, respectively.

7.1.5. Candover Augmentation Scheme

As set out earlier, a programme of mitigation and monitoring has been agreed with the EA and NE for the Candover Augmentation Scheme Drought Order as part of the Section 20 Agreement. These monitoring and mitigation packages are included in Appendix D and E, respectively.

7.1.6. Test Surface Water

As set out earlier, a programme of mitigation and monitoring has been agreed with the EA and NE for the Test Surface Water Drought Permit and Drought Order as part of the Section 20 Agreement. These monitoring and mitigation packages are included in Appendix F and G, respectively.

7.2. Eastern area drought permits/orders

7.2.1. River Medway Scheme

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Medway Estuary and Marshes SPA and Ramsar Site **Reach 6 (Medway estuary)**	Habitat degradation as a result of decreased freshwater flow inputs to the estuary. Bird assemblages: Changes in food sources as a result of changes in water quality and ecology Population impacts as a result of adverse conditions during breeding season	To establish a baseline, monitoring should incorporate: Walkover survey to visually assess the level of low tide hydrological connectivity between the aquatic habitats (mudflats, sandflats, estuaries). Carry out between April and September. One set of sampling to inform baseline. May need to resurvey prior to application if the data is older than 2 years Obtain any available site-specific water level/flow monitoring evidence. Obtain any bird monitoring data available. Establish water quality baseline in upper estuary at times of low freshwater flow input to the estuary and at low tide. One month's worth of continuous monitoring at three sites during low flow conditions (ideally at flows around Q95). Parameters to be surveyed: SRP, dissolved inorganic nitrogen, dissolved oxygen, salinity, temperature and conductivity. Spot samples to completed annually thereafter.	Surveillance walkover of habitats and investigate scale of any hydrological effects at low tide during environmental drought. Carry out monitoring of water dependent species that are linked to these habitats (Over-Wintering birds and summer Breeding Bird populations). Water quality survey in upper estuary at low tide: dissolved oxygen concentration; DIN; SRP and salinity. Installation of continuous water quality monitoring at three estuarine sites and Ham Hill WwTW during 2018 to monitor estuarine WQ. Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114). Set Ammonia trigger levels for WWTW.	Surveillance walkover of habitats and investigate any changes due to reduced freshwater inflows during drought permits/order implementation compared to the antecedent environmental drought conditions. Carry out further monitoring of water dependent species that are linked to these habitats (Over-Wintering and Summer Breeding Bird populations). Water quality survey in upper estuary at low tide: dissolved oxygen concentration; DIN; SRP and salinity. Installation of continuous water quality monitoring at three estuarine sites and Ham Hill WwTW during 2018 to monitor estuarine WQ. Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114).	Consider potential for alternative operation of flows from the Allington locks at low tide to reduce the potential for lower water levels at low tide. Performance enhancements to WwTW.	In year following drought permits/order implementation, carry out appropriate monitoring of habitats to assess any changes to the baseline survey conditions. In the year following the drought order continue monitoring of water dependent species that are linked to these habitats (Winter and Summer Breeding Bird populations). Water quality survey in upper estuary at low tide: dissolved oxygen concentration; DIN; SRP and salinity. Maintain continuous water quality monitoring at three estuarine sites and Ham Hill WwTW for 1 year after drought to monitor estuarine WQ. If existing habitats have been lost or damaged due to the drought order, consider scope for regeneration of habitats or otherwise consider compensatory habitat options in dialogue with NE.	Southern Water in agreement with EA and NE
River Beult SSSI **Reach 3b**	Reduction in habitat availability in river channel due to reduced river flow, water depth and wetted area. Risk of water quality deterioration due to low flows. Impact to macroinvertebrate community including: water beetle *(Haliplus laminatus*); hairy dragonfly (*Brachytron pratense*); white-legged damselfly (*Platycnemis pennipes*); ruddy darter dragonfly (*Sympetrum sanguineum*); aquatic snail (*Bithynia leachi*)	Establish baseline environmental conditions, comprising: Further discussions with site owners and walkover survey to assess habitat condition of the impacted reach and relevant water-dependent habitat. One survey between April and September. Establish baseline monitoring of river level at a suitable section in dialogue with site owner and NE. Instigate spot gauging at low flow conditions (Q_{95} flow or lower) and water level logging. Obtain at least 5 low flow spot gauging readings linked to the water level reading (and note the regulation release rate from Bewl Water and abstraction rate at Smallbridge at the time of gauging). Gauging to be confirmed. Obtain any available site-specific evidence on sensitive designated features (macroinvertebrate and macrophyte community).	Surveillance walkover of river habitats and establish any habitat impacts due environmental drought. Where possible (taking care not to disturb in-river habitats), repeat flow gauging at the same site as the baseline survey, noting the regulation releases from Bewl Water and abstraction rate at Smallbridge. Continue to note the river level at the baseline monitoring site. Carry out water quality monitoring for DO, SRP, ammonia and suspended sediment. Identify any key point sources of nutrient loading. Repeat macroinvertebrate sampling and macrophyte survey (if during plant growing season) subject to agreement with NE (depending on the vulnerability of the species in drought conditions, survey may be detrimental to the species).	Surveillance walkover of river habitats and establish any habitat impacts due to drought permits/order implementation. Where possible (taking care not to disturb in-river habitats), repeat flow gauging at the same site as the baseline survey, noting the regulation releases from Bewl Water and abstraction rate at Smallbridge. Continue to note the river level at the baseline monitoring site. Carry out water quality monitoring for DO, SRP, ammonia and suspended sediment. Identify any key point sources of nutrient loading. Repeat macroinvertebrate sampling and macrophyte survey (if during plant growing season) subject to agreement with NE (depending on the vulnerability of the species in drought conditions, survey may be detrimental to the species).	Consider potential local habitat protection or habitat improvement measures, as well as potential for any localised in-river measures to improve local water level/flow velocity in dialogue with NE and EA and where feasible and appropriate. If water quality is adversely affected, consider potential for addressing any point sources of nutrient loading or pollution.	In year after drought permits/order implementation, repeat habitat condition survey to assess any impact of the drought permits/order on river habitat. In the year following cessation of the drought permits/order, repeat macrophyte monitoring to establish any effects of the drought permits/order on these communities. Revert to baseline 3x per year macroinvertebrate surveys. Repeat water quality surveys at the same time as ecology surveys. If existing habitats or species have been lost or damaged, consider scope for replacement / re-creation of habitats or consider compensatory habitat options in dialogue with NE.	Southern Water in agreement with EA and NE

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
	Impact on macrophyte community	Carry out macrophyte survey ideally in a normal year and a dry year[4]. To be carried out June-September (ideally complementing any existing EA or NE monitoring, in discussion with the EA/NE). Identify any key point sources of nutrient loading and carry out water quality sampling including samples for SRP. Repeat each year. Carry out seasonal (spring and autumn) macroinvertebrate surveys[5]. 1 site in the impacted SSSI reach (ideally complementing any existing EA/NE monitoring, in discussion with the EA/NE). Repeat each year.					
Holborough to Burham Marshes SSSI **Reach 5** **River Medway**	Reduction in extent or quality of important flood plain/marsh habitats that are linked to the key designated species including standing water, ditches and dykes, reed beds and associated littoral sediment. Potential impact on designated macrophyte and macroinvertebrate communities due to impacts on habitat.	Establish baseline environmental conditions, comprising: Assess habitat condition of the impacted reach and relevant water-dependent habitat through walk over survey. Carry out between April-September. Establish baseline monitoring of standing water levels at the site in dialogue with NE (e.g. water depth gauge readings). Investigate spot gauging at low flow conditions (Q95 flow or lower) and water level logging. Obtain at least 5 low flow spot gauging readings linked to the water level reading (and note the regulation release rate from Bewl Water and abstraction rate at Smallbridge at the time of gauging). Frequency and timing to be confirmed. Obtain any site-specific evidence on sensitive designated features (macroinvertebrate and macrophyte community). Carry out annual macrophyte survey ideally in a normal year and a dry year[6]. To be carried out June-September (ideally complementing any existing EA or NE monitoring, in discussion with the EA/NE). Identify any key point sources of nutrient loading and carry out water quality sampling including samples for SRP, noting any algal blooms.	Surveillance walkover of water-dependent habitats and investigate if hydrological connectivity is lost or reduced during environmental drought. Carry out appropriate monitoring of standing water habitat using Common Standards Methodology criteria for assessing habitat condition in discussion with NE. Repeat standing water level monitoring to provide a drought baseline. Repeat macroinvertebrate sampling and macrophyte survey (if during plant growing season) subject to agreement with NE (depending on the vulnerability of the species in drought conditions, survey may be detrimental to the species). Identify any key point sources of nutrient loading and carry out water quality sampling including samples for SRP, noting any algal blooms. Continuous water quality monitoring at three estuarine sites and Ham Hill WwTW proposed to improve baseline understanding of estuarine WQ. Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114). Spot WQ sampling in standing water within the SSSI for parameters specified in January 2018 Drought Permit EA Ref: DP201802114). Set Ammonia trigger levels for WWTW.	Surveillance walkover of water-dependent habitats and investigate if hydrological connectivity is lost or reduced during drought permits/order implementation. Carry out appropriate monitoring of standing water habitat using Common Standards Methodology criteria for assessing habitat condition in discussion with NE to identify any effects due to the drought permits/order. Repeat standing water level monitoring to assess changes from the natural drought baseline. Repeat macroinvertebrate sampling and macrophyte survey (if during plant growing season) subject to agreement with NE (depending on the vulnerability of the species in drought conditions, survey may be detrimental to the species). Identify any key point sources of nutrient loading and carry out water quality sampling including samples for SRP, noting any algal blooms. Continuous water quality monitoring at three estuarine sites and Ham Hill WwTW proposed to improve baseline understanding of estuarine WQ. Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114).	Consider potential local habitat protection or improvement measures in dialogue with NE where feasible and appropriate. If water quality is adversely affected, consider potential for addressing any point sources of nutrient loading or pollution. Performance enhancements to WWTW.	In year after drought permits/order implementation, carry out a repeat of the habitat walkover surveys, water quality, macroinvertebrate and macrophyte surveys and water level readings to assess scale and extent of any impact due to the drought permits/orders and extent of recovery post-drought. If existing habitats or species have been lost or damaged, consider scope for replacement / re-creation of habitats or consider compensatory habitat options in dialogue with NE.	Southern Water in agreement with EA and NE

[4] EA (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)
[5] EA (2012). Freshwater macro-invertebrate sampling in rivers. Operational instruction 018_08. (Unpublished procedures manual)
[6] EA (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Medway Estuary MCZ **Reach 6** **Medway Estuary**	Impact on the protected tentacled lagoon worm *(Alkmaria romijni*) due to risk of increased salinity as a consequence of reduced freshwater flow inputs to the estuary.	Establish baseline environmental conditions, comprising salinity readings in those locations inhabited by the tentacled lagoon worm plus licensed monitoring of the species condition and abundance. Continuous water quality monitoring for one month at three estuarine sites. Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114). Carry out 3 yearly Tentacled Lagoon Worm survey (Alkmaria romijni) to identify spatial distribution of the species within the Medway estuary.	Carry out licensed monitoring of species condition and habitat, alongside repeat of salinity monitoring at same sites as the baseline surveys. Continuous water quality monitoring at three estuarine sites Includes spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114). Carry out Tentacled Lagoon Worm survey (Alkmaria romijni) to identify status of the species within the Medway estuary.	Carry out licensed monitoring of species condition and habitat, alongside repeat of salinity monitoring at same sites as the baseline surveys. Trigger caused by significant increase in salinity.	Consider local protection measures in dialogue with NE where feasible and appropriate. Translocation.	Repeat tentacled lagoon worm population survey and salinity surveys in the year following cessation of the drought permits/order. If there is loss or damage to the population, consider scope for restoration or otherwise consider compensatory measures in dialogue with NE	Southern Water in agreement with EA and NE
Fish community, including Brown Trout, Lamprey species, European eel and Bullhead **Reaches 1 to 5**	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Fish populations are not well understood as a result of lack of recent survey data. Electric-fishing surveys to monitor fish populations at 1 site in each of the impacted reaches (1-5) between spring and autumn, NEP scheme monitoring 3 sites (see report) one site should be selected for long term monitoring. 1 survey round every 3 years at same sites. Collate any further information from local knowledge and EA local staff, plus local biological records. Conduct eel and elver monitoring during spring 2018 at specified abstraction intakes (3).	Walkover survey to identify potential risks to the fish community, including approximation of the number of each fish species (e.g. 10s, 100s) in any ponded reaches due to drought conditions where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment and through continuous WQ monitoring installations. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion. Conduct eel and elver monitoring during drought period at specified abstraction intakes (3).	Additional walkover surveys if situation is expected to deteriorate in river sections known to contain high fish densities. Automated alarm triggers if DO falls below 60% Weekly fish distress monitoring with increased frequency of monitoring during very low flows and periods of low DO.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure] Cease abstraction for time limited period. Consider reservoir release.	In the year following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Three consecutive years post drought order monitoring at baseline monitoring site to determine relative health of year classes which may be influenced by the drought order/permit. Including fish scale analysis. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA
Macrophytes **Reaches 1 to 4** **River Beult SSSI**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macrophyte populations are not well understood as a result of lack of recent data along entire reach. Collate any available local macrophyte data. Carry out walkover and river macrophyte survey at 1 site in each of the impacted freshwater reaches (Reaches 1 to 4, River Beult SSSI plus control) ideally in a normal year and a dry year[7]. To be carried out	Seasonal walkover and carry out macrophyte surveys at the baseline survey sites (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes identified (if drought order implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions. Operation of key flow control	Carry out post-drought order implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP.	Southern Water in agreement with EA

[7] EA (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
		June-September (ideally complementing the existing EA monitoring, in discussion with the EA) Identify any key point sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP. Repeat surveys every 3 years.			structures to maintain water levels in key reaches/water bodies where applicable.	No specific post-drought order mitigation measures identified.	
Blue-green algae **Bewl Water Reservoir** **Stage 3 drought permit (summer)**	Increased proliferation of blue green algal blooms at the reservoir due to risk of increased nutrient loading from additional abstraction at Yalding at low flow conditions in summer (Stage 3 drought permit)	SWS undertake monthly water sampling to look for any increases in blue-green algae cells within the reservoir. SWS undertake weekly visual checks for algal blooms. Data is stored unless certain triggers are breached.	Walkover survey of locations in reservoir previously established as at risk of algal blooms. Visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Monthly survey for visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Mitigation of blue-green algal blooms should centre around reporting all blooms to the EA to ensure that appropriate action can be taken to inform the public. If major risk identified, consider treatment of algal bloom if appropriate in dialogue with EA.	Upon cessation of the drought order and/or or permit, baseline conditions will return. No further monitoring will be required post-drought order/permit implementation. Continue vigilance during standard baseline drought permit monitoring activities.	Southern Water in agreement with EA
Macroinvertebrates **Reaches 1 to 5**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate available local records to improve baseline datasets. Carry out seasonal (spring and autumn) macroinvertebrate surveys[8]. 1 site in each of the impacted reaches (Reaches 1 to 4 plus control site) (ideally complementing the existing EA monitoring, in discussion with the EA) Reach 5 to be included in EA airlifting monitoring programme Surveys to be repeated every year in spring and autumn. Identify to species level. Carry out one off RHS survey at the same time.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of baseline seasonal monitoring programmes.	Southern Water in agreement with EA
Water Vole River Medway	Reduced habitat availability and/or food sources (Holborough and Burham Marshes SSSI)	Discuss with EA/Kent Wildlife Trust the planned frequency of future surveys following the 2017 survey. Repeat survey every 3 years.	Review baseline data and carry out further survey of water vole presence and habitat conditions. Install gauge boards and monitor water levels	Carry out further survey to assess any risk to local population. Monitor water levels.	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Kent Wildlife Trust.	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA & NE
Depressed river mussel **Reaches 1 to 6**	Reduction in abundance or distribution as a result of reduced water quality / habitat. . Freezing is the major risk to the species if exposed during draw down when air temperature is below 4 Celsius. Monitoring of air temperature should precede any planned draw down of navigation pens for	Depressed river mussel populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets. Carry out 1 survey every 5 years. 1 site above Yalding as a control and 1 site below Yalding within the impacted reaches (Reaches 4 and 5) (ideally complementing the existing EA monitoring, in discussion with the EA). Continuous WQ monitoring and spot WQ sampling for parameters	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Continuous WQ monitoring and spot WQ sampling for parameters specified in January 2018 Drought Permit EA Ref: DP201802114).	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Continuous WQ monitoring with DO trigger levels set at 60% as specified in January 2018 Drought Permit EA Ref: DP201802114).	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. Cease abstraction for a time limited period if a DO “sag” arises. Consider reservoir release. For Reach 6, seek agreement with Navigation authorities to cease any	No action required outside of baseline seasonal monitoring programmes.	Southern Water in agreement with EA and NE

[8] EA (2012). Freshwater macro-invertebrate sampling in rivers. Operational instruction 018_08. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
	the purposes of this drought permit/ order Low DO is a major threat to the species if water quality deteriorates. The proposed monitoring for DO will help assess this risk during drought permit/ order operation.	specified in January 2018 Drought Permit EA Ref: DP201802114) during 2018.			planned activities that may adversely affect the species during the drought permit implementation.		
Invasive non-native species (INNS) Himalayan balsam and surveys for any other INNS **All reaches**	Risk of increasing the potential for this species to spread along watercourse	Collate available local records to improve baseline datasets. Baseline surveys required for spatial distribution of Demon Shrimp *Dikerogammarus haemobaphes* Once to inform baseline between May and September. May need to resurvey prior to application if the data is older than 2 years	Routine visual monitoring and shrimp trapping of INNS at key water transfer points including Bewl Water specified in January 2018 Drought Permit EA Ref: DP201802114)	Presence detected of INNS at key water transfer sites.	Depending on findings of walkover survey and risk assessment, agree with EA any appropriate risk reduction or control measures taking account of national INNS advice prevailing at the time on control and risk management measures. Eradicate INNS Contribute to Medway Valley Countryside Partnership INNS control programme at level proportionate to extent of impact.	Complete walkover survey of impacted reaches post drought to understand any changes to the coverage of species. Carry out clearance where appropriate to do so in dialogue with the EA and taking account of national INNS advice prevailing at the time on control and risk management measures. Eradicate INNS Contribute to Medway Valley Countryside Partnership INNS control programme at level proportionate to extent of impact.	Southern Water in agreement with EA
Marina and port navigation and boating activities **Chatham Maritime Marina** **Port Werburgh** **Gillingham Marina** **Allington Marina**	Potential for a reduction in connectivity at low tides and therefore impacts to navigation	Discuss potential risks with marina/port owners and boating stakeholders and carry out low tide survey at low flow conditions to determine any potential risks during drought permits/order implementation. Update drought permit risk assessment as appropriate. Consider applicable mitigation measures that may be required in discussion with marina/port owners and boating stakeholders.	Proactive stakeholder engagement. Repeat baseline survey and update risk assessment as necessary in dialogue with marina/port owners and boating stakeholders to inform of them of possible need for a drought permit/order. Update and review applicable mitigation measures in discussion with marina/port owners and boating stakeholders.	Maintain contact with marina/port owners and boating stakeholders to inform of them of potential changes in connectivity during low tide.	Implement any applicable mitigation measures as agreed with marina/port owners and boating stakeholders (e.g. modifications to moorings). Put forward signage indicating slow refill. Cease abstraction or make flow releases for time limited period	Discuss any residual impacts due to the drought permits/order with marina/port owners and boating stakeholders as appropriate and any potential compensatory measures.	Southern Water in agreement with site owners
Heritage Features **Moats and/or Ponds at Allington Castle;** **Old Scotney Castle** **and Share Farm**	Potential reduction in amenity value due to lower water levels in moats and/or ponds or risk of drying up	Discuss hydrological controls on water levels in moats and ponds with site owners and understand how drought conditions may impact the water levels. Consider potential drought order/permit mitigation measures with the site owners.	Discuss prevailing drought conditions with site owners and assess current impacts of drought on water levels. Confirm how the moats/ponds will be sustained if the drought permit/ order is implemented and review mitigation measures.	Regular contact with site owners to understand how the drought permits/order may be affecting water levels in the moats/ponds and the need for instigation of any agreed mitigation measures.	Implement any agreed mitigation measures in agreement with site owners.	Dialogue with site owners as to any impacts or damage due to the drought permit/order implementation. If damage or loss has occurred, consider appropriate compensation measures with site owners.	Southern Water in agreement with site owners
Landscape **Low Weald NCA** **Greater Thames Estuary NCA**	Potential impact on water related features of the NCAs	Collation of appropriate data as part of the baseline monitoring programme to inform a landscape impact assessment in dialogue with NE. Repeat assessment every 5 years (or unless material changes to the landscape)	Repeat landscape assessment from baseline activities to establish any changes arising from the environmental drought to provide a drought baseline.	Repeat landscape assessment to establish any changes arising from the drought order.	No specific measures but other mitigation measures for other features may help to ameliorate adverse effects of the drought order.	None applicable.	Southern Water in agreement with NE

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Other Freshwater Abstractors **Various locations in Reaches 1 to 5**	Low river flows may derogate other protected abstraction rights	Dialogue with potentially affected abstractors to understand the precise location of the abstractions and the source of water and to assess the potential impact on their abstraction rights during a drought order/permit. Update risk assessment as appropriate and discuss any potential mitigation measures that could be put in place during drought permit/order implementation.	Proactive stakeholder engagement. Dialogue with potentially affected abstractors to understand existing abstraction conditions during environmental drought. Review potential mitigation measures that could be put in place during drought permit/order implementation.	Maintain dialogue with potentially affected abstractors to assess any impacts of the drought permit/order on abstraction capability beyond that due to the natural drought. Agree any mitigation (or compensation) measures to be implemented if high risk of derogation.	Implement mitigation and/or compensation measures as agreed with the abstractor.	Following cessation of drought permits/order discuss any claims for compensation due to confirmed derogation of abstraction due to drought permit/order implementation. Compensation payments are provided for in Section 79 and Schedule 9 of the Water Resources Act 1991 (as amended).	Southern Water in agreement with abstractors and EA
Angling activities **Reaches 1 to 5**	Potential for a reduction in connectivity and therefore impacts to angling.	Discuss potential risks with EA, angling clubs and stakeholders and assess likelihood of angling at low flow drought conditions to determine any potential risks during drought permit/order implementation. Update drought permit/order risk assessment as appropriate. Consider applicable mitigation measures that may be required in discussion with EA, angling clubs and stakeholders.	Proactive stakeholder engagement. Update risk assessment as necessary in dialogue with EA, angling clubs and stakeholders to inform of them of possible need for a drought permits/order. Update and review applicable mitigation measures in discussion with EA, angling clubs and stakeholders.	Maintain contact with angling clubs and stakeholders to assess any implications of the drought permits/order on any remaining angling activities.	Implement any applicable mitigation measures as agreed with EA, angling clubs and stakeholders. (e.g. no angling periods)	Discuss any residual impacts due to the drought permits/order with EA, angling clubs and stakeholders as appropriate and any potential compensatory measures.	Southern Water in agreement with EA and owners of fishing rights/angling associations

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise estuarine fish and estuarine macrophytes surveys. Further information regarding these measures is detailed in the relevant Habitats Regulations Assessment.

Faversham sources

We have removed the table that was labelled 7.2.2 in previous versions of this drought plan. We have done this because we have recently varied these abstraction licences so that there would no longer be a benefit from this a Faversham drought permit.

7.2.2. Darwell

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Dungeness, Romney Marsh and Rye Bay SPA, Ramsar and SSSI – wetland habitat and associated species.	Wetland habitat degradation as a result of decreased river flow and/or water levels within ditch network. Impacts to: aquatic vegetation, marsh mallow, greater water parsnip, invertebrates, water vole, great crested newt, breeding and wintering birds.	Establish baseline environment comprising: • Susceptibility of ditches to drying. Undertake spot sampling for water level and water quality (salinity, DO, pH and temperature). • CSMG for ditches – sample survey including sampling of aquatic vegetation and recording of bankside vegetation. • Water vole – desk study, habitat suitability assessment, sampling survey to determine water vole presence • Medicinal leech – desk study, habitat suitability assessment, sampling survey. Targeted splash sampling and nest search surveys to be undertaken if necessary (by licenced surveyor) • Invertebrate sampling[9,10] • Breeding and wintering bird surveys to supplement existing WeBS data (Desk based study and data collection). Randomised point count (record everything seen within 100m for 10mins) approach to be taken with incidentals recorded as move between points. Collect river level data to determine how frequently the 0.8m limit is reached, and pumping volumes that are discharged into the Royal Military Canal. Use of spot checks for water levels and water quality whilst completing the survey work for the ditches feature. Install gauge boards at a distinguished inflow to each SPA/Ramsar unit to record levels - subject to land owner permission and permissions from EA, IDB and NE	Surveillance walkover of aquatic habitats and investigate if hydrological connectivity is lost during environmental drought. Carry out appropriate monitoring of standing water habitats using Common Standards Methodology criteria for assessing habitat condition where appropriate, in dialogue with NE. Carry out monitoring of water dependent species that are linked to these habitats as identified from the surveillance walkover survey as potentially at risk of the drought permit.	Surveillance walkover of aquatic habitats and investigate if hydrological connectivity is lost during drought order implementation, if not already lost due to antecedent environmental drought conditions. Carry out appropriate monitoring of aquatic habitats using Common Standards Methodology criteria for assessing habitat condition, in discussion with NE. Carry out further monitoring of water dependent species as identified as being at risk from the drought order.	Consider local habitat protection measures in dialogue with NE where feasible and appropriate. Retaining of water via control structures for water dependent features within designated sites. Water sharing protocol to be established between Southern Water and marsh system pre-drought.	In year after drought order implementation, carry out appropriate monitoring of standing water habitats using Common Standards Methodology criteria for assessing habitat condition. Carry out further monitoring of water dependent species to identify any adverse effects of the drought order. If existing habitats have been lost or damaged by the drought permit, consider scope for replacement / re-creation of habitats, or consider compensatory habitat options in dialogue with NE.	Southern Water in agreement with EA and NE
Dungeness, Romney Marsh and Rye Bay Ramsar and SSSI – saltmarsh and mudflats	Decrease in habitat quality and extent as a result of decreased freshwater input Changes in sediment dynamics as a result of decrease freshwater input	Map areas of littoral sediments within estuaries using available aerial photography and onsite walkover survey. Stratified sampling programme following the Marine Monitoring Handbook Procedural Guideline No. 3-6. Quantitative sampling of intertidal sediment species using cores (2001)	Repeat baseline survey at low tide to assess prevailing drought conditions at low tide in relation to habitat composition and quality.	Repeat baseline survey at low tide every 2 months to assess any changes due to the drought order implementation at low tide in relation to habitat composition and quality.	None applicable.	In year following after drought order implementation, repeat baseline survey at low tide to establish any adverse effects that may be due to the drought permit. If existing habitats have been lost or damaged, consider scope for re-creation of habitats or consider	Southern Water in agreement with EA and NE

[9] C.M. Drake, D.A. Lott, K.N.A. Alexander & J. Webb (2007) NE Research Report NERR005 Surveying terrestrial and freshwater invertebrates for conservation evaluation.
[10] Palmer M, Drake M, Stewart N (2013) A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of grazing marsh ditch systems Version 6.

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
	Changes in nutrient dynamics as a result of decreased freshwater input Decrease in buffering capacity Changes in water quality, especially SRP altering community structure and food webs	will be used for the benthic community analysis and sediment particle size analysis. Walkover, transects, elevation profile and quadrats - NVC Survey once to establish baseline, survey between April and August to record annuals				compensatory habitat options.	
Fish community, including Brown Trout, Lamprey species, European eel and Bullhead **Reaches 1-5**	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Fish populations are not well understood as a result of lack of recent survey data. PDC surveys to monitor fish populations at 1 site in each of the impacted reaches of the River Rother and the transitional River Rother (reaches 1-4). At reach 5 use seine netting. Complete between spring and autumn annually. 1 survey round every 3 years at same sites. Collate any further information from local knowledge and EA local staff, plus local biological records.	Walkover survey to identify potential risks to the fish community, including approximation of the number of each fish species (e.g. 10s, 100s) in any ponded reaches due to drought conditions where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkover surveys if situation is expected to deteriorate in river sections known to contain high fish densities.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Three consecutive years post drought order monitoring at baseline monitoring site to determine relative health of year classes which may be influenced by the drought order/permit. Including fish scale analysis. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA
Macrophytes **River Rother** **(Reach 1-4)**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macrophyte populations are not well understood as a result of lack of recent data along entire reach. Collate any available local macrophyte data. Carry out walkover, river macrophyte survey and survey for *Ranunculus* at 1 site in each of the impacted freshwater reaches (Reaches 1 to 4 plus control site) ideally in a normal year and a dry year[11]. To be carried out June-September annually (ideally complementing the existing EA monitoring, in discussion with the EA) Identify any key point sources of nutrient loading. Carry out annual water quality sampling at the Reach 6 sites including samples for SRP plus 1 month's worth of continuous monitoring data at	Seasonal walkover and carry out macrophyte surveys and *Ranunculus* surveys at the baseline survey sites (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes and *Ranunculus* identified (if drought order implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable.	Carry out post-drought order implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP. No specific post-drought order mitigation measures identified.	Southern Water in agreement with EA

[11] Environment Agency (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
		several sites which would support the point sample data. Monitoring to ideally be undertaken at spring low flows in hot weather.					
Estuarine macroalgae and phytoplankton **River Rother Transitional Water Body**	Alteration to community composition as a result of water quality deterioration Decrease in habitat availability as a result of algal blooms	Carry out summer macroalgal surveys using WFD fucoid extent tool at upstream limit and median salinity, plus WFD opportunistic macroalgae tool at the upper, mid and lower estuary sites (ideally complementing the existing EA monitoring, in discussion with the EA). Survey using UKTAG Biological Status methods Coastal and Transitional Waters. Also survey using the WFD-UKTAG Coastal Water Assessment Method Phytoplankton: Coastal Water Phytoplankton. Repeat survey every year in summer.	Carry out macroalgae/phytoplankton surveys at the baseline survey site Carry out water quality sampling at same time including samples for SRP. Identify any key sources of nutrient loading.	Survey to be undertaken of macroalgae/ phytoplankton at baseline monitoring site every month during the drought order implementation. Carry out water quality sampling at same time including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider potential measures to reduce any nutrient loading from Rye Wastewater Treatment Works.	Carry out post-drought order implementation surveys at the baseline monitoring site on a monthly basis for 6 months to understand the extent of recovery from any adverse impacts. Revert to the annual baseline monitoring programme thereafter. No specific post-drought permit / order mitigation measures identified.	Southern Water in agreement with EA
Blue-green algae **Darwell Reservoir**	Increased proliferation of blue green algal blooms at the reservoir due to increased abstraction from the River Rother for discharge to the reservoir	Collate any historic evidence of blue-green algae from EA and other local knowledge to better assess risks. Initial walkover survey of reservoir to identify any algal blooms. Where identified, water samples to be taken to analyse the algae and water quality conditions, following EA guidance on assessing blue green algae blooms. EA to be notified. Monitoring to be carried out in summer low flow conditions once to inform the baseline. May need resurvey if application is required.	Walkover survey of locations in reservoir previously established as at risk of algal blooms. Visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Monthly survey for visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Mitigation of blue-green algal blooms should centre around reporting all blooms to the EA to ensure that appropriate action can be taken to inform the public. If major risk identified, consider treatment of algal bloom if appropriate in dialogue with EA.	Upon cessation of the drought order and/or or permit, baseline conditions will return. No further monitoring will be required post-drought order/permit implementation. Continue vigilance during standard baseline drought permit monitoring activities.	Southern Water in agreement with EA
Macroinvertebrates **Reaches 1-5**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macroinvertebrate populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets. Carry out seasonal (spring and autumn) macroinvertebrate surveys[12]. 1 site in each of the impacted reaches (Reaches 1 to 5 plus control) (ideally complementing the existing EA monitoring, in discussion with the EA). Surveys to be repeated every year in spring and autumn. Identify to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of baseline seasonal monitoring programmes.	Southern Water in agreement with EA

[12] EA (2012). Freshwater macro-invertebrate sampling in rivers. Operational instruction 018_08. (Unpublished procedures manual)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Water vole **Reaches 1, 2, 3, 4 and 6**	Reduced habitat availability and/or food sources resulting in population decline	Discuss with Kent Wildlife Trust the available survey data for the impacted reaches. Carry out targeted water vole habitat surveys if local data not available to understand potential risks to the species from the drought order implementation. Surveys to follow methods in the Water Vole Conservation Handbook and Water Vole Mitigation Guidelines Carry out between April-September Repeat survey every 3 years.	Review baseline data and carry out further survey of water vole presence and habitat conditions.	Carry out further survey to assess any risk to local population	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Kent Wildlife Trust.	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA
Invasive non-native species (INNS) Reaches 1-4	Risk of increasing the potential for this species to spread along watercourse	Collate available local records to improve baseline datasets. Complete walkover survey of reaches to understand coverage of species and any other INNS and assess risk of spread posed by implementing drought permit/order. Complete between May to September.	Complete walkover survey of impacted reaches 1 to 4 to understand coverage of species and other INNS and assess risk posed by implementing drought order.	Complete walkover survey of impacted reaches 1 to 4 to understand coverage of species and key locations and risk posed by implementing drought permit.	Depending on findings of walkover survey and risk assessment, agree with EA any appropriate risk reduction or control measures taking account of national INNS advice prevailing at the time on control and risk management measures.	Complete walkover survey of impacted reaches 1 to 4 post drought to understand any changes to the coverage of species. Carry out clearance where appropriate to do so in dialogue with the EA and taking account of national INNS advice prevailing at the time on control and risk management measures.	Southern Water in agreement with EA
Littoral Mudflats/ Polychaete bivalve -dominated mid estuarine mud shores **Transitional reach**	Decrease in habitat quality and extent as a result of decreased freshwater input Changes in sediment dynamics as a result of decrease freshwater input Changes in nutrient dynamics as a result of decreased freshwater input Decrease in buffering capacity Changes in water quality, especially SRP altering community structure and food webs	Map areas of littoral sediments within estuaries using available aerial photography and onsite walkover survey. Stratified sampling programme following the Marine Monitoring Handbook Procedural Guideline No. 3-6. Quantitative sampling of intertidal sediment species using cores (2001) will be used for the benthic community analysis and sediment particle size analysis. Upper, middle and lower estuary. Locations indicative based on priority habitat mapping and aerial photography. To be confirmed following initial walkover. Methods and locations also to be agreed with NE as gaps identified through HRA process.	Repeat baseline survey at low tide to assess prevailing drought conditions at low tide in relation to habitat composition and quality.	Repeat baseline survey at low tide every 2 months to assess any changes due to the drought permit implementation at low tide in relation to habitat composition and quality.	None applicable	In year following after drought permit implementation, repeat baseline survey at low tide to establish any adverse effects that may be due to the drought permit. If existing habitats have been lost or damaged, consider scope for re-creation of habitats or consider compensatory habitat options.	Southern Water in agreement with EA
Sailing activities in Rye Harbour and adjacent reaches.	Potential for a reduction in connectivity at low spring tides and therefore impacts to sailing	Discuss potential risks with sailing stakeholders and carry out low tide survey at low flow conditions to determine any potential risks during drought permit implementation. Update drought permit risk assessment as appropriate. Consider applicable mitigation measures that may be required in discussion with sailing stakeholders.	Repeat baseline survey and update risk assessment as necessary in dialogue with sailing stakeholders to inform of them of possible need for a drought permit. Update and review applicable mitigation measures in discussion with sailing stakeholders.	Maintain contact with sailing stakeholders to inform of them of potential changes in connectivity during low tide.	Implement any applicable mitigation measures as agreed with sailing stakeholders. (e.g. modifications to moorings).	Discuss any residual impacts due to the drought permit with sailing stakeholders as appropriate and any potential compensatory measures.	Southern Water in agreement with boat owners/boating organisations/ Rye Harbour Master

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise additional macrophyte surveys, additional macroinvertebrate surveys and great crested newt surveys. Further information regarding these measures is detailed in the relevant Habitats Regulations Assessment.

Sandwich - We have removed the table that was labelled 7.2.4 in previous versions of this drought plan. We have done this because we have recently varied these abstraction licences so that there would no longer be a benefit from this a Sandwich drought permit.

7.3. Central area drought permits/orders

7.3.1. Pulborough reduce MRF

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit/order implementation Period		Post drought permit/order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Arun Banks SSSI	Decrease in habitat quality as a result of decreased water levels (lowland fen) Decrease in the extent of habitat as a result of changes in water levels Changes in the abundance and/or occurrence of the rare hybrid club-rush. Decrease in abundance and distribution as a result of water quality changes	To establish a baseline, monitoring should incorporate: Desk based data collection - discuss existing surveys with NE local officer (Conservation Area Delivery Team) Walkover survey to further assess the level of hydrological connectivity between the river and the rare hybrid club-rush habitat. Carry out a monitoring of standing water habitat using Common Standards Methodology[13] criteria for assessing habitat condition where appropriate. Repeat every 3 years Obtain any available site-specific water level/flow monitoring evidence linked to the habitat of the rare hybrid club-rush. Carry out if not available including monitoring of SRP. Monitoring to be completed between May and September once.	Surveillance walkover of the habitat and investigate if hydrological connectivity is lost during environmental drought. Carry out appropriate monitoring of standing water habitat using Common Standards Methodology criteria for assessing habitat condition where appropriate.	Surveillance walkover of the habitats and investigate if hydrological connectivity is lost during drought permit / order implementation, if not already lost due to antecedent environmental drought conditions. Carry out appropriate monitoring of aquatic habitat using Common Standards Methodology criteria for assessing habitat condition in discussion with NE.	None considered viable but this requires discussion with NE.	In year following after drought permit/order implementation, carry out appropriate monitoring of standing water habitat using Common Standards Methodology criteria for assessing habitat condition. If existing habitat has been lost or damaged due to the drought permit/order, consider scope for possible translocation from other sites if feasible, in dialogue with NE or otherwise consider compensatory measures.	Southern Water in agreement with EA and NE
Fish community, including Brown/Sea Trout, Brook Lamprey, River Lamprey Grayling, European eel **River Rother**	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Fish populations are not well understood as a result of lack of recent survey data. Electric-fishing surveys to monitoring populations at 1 monitoring site for the River Rother upstream of the tidal limit (ideally complementing the existing EA monitoring, in discussion with the EA) between spring and autumn. There are two new potential sites to monitor in the reach. 1 survey round per year every 3 years at same site(s). Collate any further information from local knowledge and EA local staff, plus local biological records.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in stream sections known to contain high fish densities.	Consider deployment of aeration equipment in key reaches with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought permit/order implementation, undertake post-drought fish surveys at the baseline monitoring site to substantiate the level of impact. Three consecutive years post drought permit/order monitoring at baseline monitoring site to determine relative health of year classes which may be influenced by the drought order/permit. Including fish scale analysis. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA

[13] JNCC, Common Standards Monitoring Guidance for Freshwater Habitats and Species, Rivers and lakes guidance updated January 2014 and March 2015 respectively, ISSN 1743-8160 (Online)

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit/order implementation Period		Post drought permit/order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macrophytes **River Rother**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Macrophyte populations are not well understood as a result of lack of recent data along entire reach. Collate any available local macrophyte data. Carry out walkover and river macrophyte survey at agreed site (Pulborough Pumping Station; subject to access). Ideally surveys to take place across normal and dry years[14]. To be carried out in spring and autumn (ideally complementing the existing EA monitoring, in discussion with the EA) Identify any key point sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP. Repeat surveys every 1 year.	Seasonal walkover and carry out macrophyte surveys at the baseline survey site (if during plant growing season) Carry out water quality sampling at same time including samples for SRP.	Survey to be undertaken and macrophytes identified (if drought permit/order implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at the baseline sites including samples for SRP.	Consider measures to address identified point sources of nutrient loading. Consider scope for addressing any identified sources of nutrient loading from walkover survey, if this would help address water quality risks. Consider possible in-stream measures or adjustments to improve habitat conditions.	Carry out post-drought permit / order implementation surveys at the baseline monitoring site for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at the baseline sites including samples for SRP. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA
Estuarine macroalgae and phytoplankton **Arun transitional water body**	Alteration to community composition as a result of water quality deterioration Decrease in habitat availability as a result of algal blooms	Carry out summer macroalgal surveys using WFD fucoid extent tool at upstream limit and median salinity, plus WFD opportunistic macroalgae tool at 1 x baseline monitoring site (ideally complementing the existing EA monitoring, in discussion with the EA). Repeat survey every year in summer. Carry out phytoplankton surveys (chlorophyll-a 90th percentile, elevated count and seasonal succession) in spring and summer at 1 x baseline site (ideally complementing the existing EA monitoring, in discussion with the EA). Repeat surveys every year in summer. Identify any key point sources of nutrient loading during surveys. Carry out water quality sampling at same time as surveys, including samples for SRP.	Carry out macroalgae/phytoplankton surveys at the baseline survey site Carry out water quality sampling at same time including samples for SRP. Identify any key sources of nutrient loading.	Survey to be undertaken of macroalgae/ phytoplankton at baseline monitoring site every month during the drought order/permit implementation. Carry out water quality sampling at same time including samples for SRP.	Consider measures to address identified point sources of nutrient loading.	Carry out post-drought permit / order implementation surveys at the baseline monitoring site on a monthly basis for 6 months to understand the extent of recovery from any adverse impacts. Revert to the annual baseline monitoring programme thereafter. No specific post-drought permit / order mitigation measures identified.	Southern Water in agreement with EA

[14] Environment Agency (2011). Surveying freshwater macrophytes in rivers. Operational instruction 131_07. (Unpublished procedures manual)

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit/order implementation Period		Post drought permit/order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Estuarine fish assemblage Arun transitional waterbody	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Fish populations are not well understood as a result of lack of recent survey data. Collate any further information from local knowledge and EA local staff, plus local biological records. Baseline monitoring will follow the Inshore Fisheries and Conservation Authority Fish Survey Best Practice Guidance (2016), and relevant EA guidance. A multi-method approach will be employed, using seine netting, fyke netting and beam trawls where suitable. Three locations to be surveyed; Pulborough, Burpham and Wick (to be agreed with EA) To be surveyed annually between spring and autumn. Collate any further information from local knowledge and EA local staff, plus local biological records.	Walkover survey to identify potential risks to the fish community, including approximation of the number of each fish species (e.g. 10s, 100s) in any ponded reaches due to drought conditions where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkover surveys if situation is expected to deteriorate in river sections known to contain high fish densities.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought permit implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Three consecutive years post drought permit/order monitoring at baseline monitoring site to determine relative health of year classes which may be influenced by the drought order/permit. Including fish scale analysis. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA
Macroinvertebrates **River Rother**	Reduction in abundance or distribution as a result of reduced water quality / habitat. Reduction in abundance of the Scarce Chaser and the water snipe fly	Collate available local records to improve baseline datasets. Carry out seasonal (spring and autumn) macroinvertebrate surveys. Identify to species level (including the presence of any Scarce Chaser and Water Snipe Fly). Sites to ideally complement the existing EA monitoring, in discussion with the EA. Collate any local records on presence of Scarce Chaser and Water Snipe Fly in the River Rother.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit/order implementation Period		Post drought permit/order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Depressed river mussel **Arun transitional waterbody**	Reduction in abundance or distribution as a result of reduced water quality / habitat. Freezing is the major risk to the species if exposed during draw down when air temperature is below 4 Celsius. Monitoring of air temperature should precede any planned draw down of navigation pens for the purposes of this drought permit/ order Low DO is a major threat to the species if water quality deteriorates. The proposed monitoring for DO will help assess this risk during drought permit/ order operation.	Depressed river mussel populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets and establish if more monitoring points required Initial baseline survey at 1 site at Greatham Bridge (ideally complementing any EA monitoring, in discussion with the EA). Carry out 1 survey every 5 years. Carry out water quality surveys at the same time.	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Carry out water quality surveys at the same time.	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Carry out water quality surveys at the same time.	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. Cease abstraction for a time limited period if a DO “sag” arises.	No action required outside of baseline seasonal monitoring programmes.	Southern Water in agreement with EA and NE
INNS: Himalayan balsam and surveys for any other INNS **River Rother**	Risk of increasing the potential for this species to spread along watercourse	Collate available local records to improve baseline datasets. Complete walkover survey of Reach 1 (River Rother) to understand coverage of species and any other INNS and assess risk posed by implementing drought permit/order	Complete walkover survey of Reach 1 (River Rother) to understand coverage of species and other INNS and assess risk posed by implementing drought permit/order	Complete walkover survey of Reach 1 (River Rother) to understand coverage of species and key locations and risk posed by implementing drought permit/order	Depending on findings of walkover survey and risk assessment, agree with EA any appropriate risk reduction or control measures taking account of national INNS advice prevailing at the time on control and risk management measures.	Complete walkover survey of Reach 1 (River Rother) post drought to understand any changes to the coverage of species. Carry out clearance where appropriate to do so in dialogue with the EA and taking account of national INNS advice prevailing at the time on control and risk management measures.	Southern Water in agreement with EA
Water Vole and Otter:	Reduced habitat availability and/or food sources	River Rother and Arun Transitional water body Carry out targeted water vole and otter habitat surveys if local data not available to understand potential risks to the species from the drought order implementation. Water vole surveys (April to September) to follow methods in the Water Vole Conservation Handbook and Water Vole Mitigation Guidelines One visit. Repeat every 3 years.	Review baseline data and carry out further survey of water vole presence and habitat conditions.	Carry out further survey to assess any risk to local population.	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Sussex Wildlife Trust.	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA

Feature	Potential Impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought permit/order implementation Period		Post drought permit/order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Water quality (specifically DIN and change in salinity gradient) **Arun transitional waterbody**	Lack of baseline data for Dissolved Inorganic Nitrogen in transitional waterbody Uncertainty over how drought order/permits will impact salinity gradient	Spot sample monitoring in reach during low flows/low tide conditions (ideally around Q95). Annual monitoring at 3 sites (upper, mid and lower estuary) in reach during low flows/low tide conditions. Parameters to be sampled for are soluble reactive phosphorous (SRP), dissolved oxygen, ammoniacal nitrogen (freshwater), Dissolved Inorganic Nitrogen (DIN), pH, turbidity, conductivity, and salinity	Repeat baseline survey if over 3 years old.	Monitoring of DIN and salinity gradient at 3 baseline survey points every 2 weeks during implementation of drought order/permit.	No specific measures identified.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA
Wealden Greensand NCA	Uncertain impacts on character of area due to impacts to flora and fauna of River Rother and River Arun	Walkover survey and photographic record during summer low flow conditions and complete scoping exercise for LVIA within initial indication of significance of impacts	Update walkover survey and photographic records if required and complete full LVIA to support drought order application.	Photographic record/evidence to be taken at fixed points used during on-set of drought surveys to document changes.	Mitigation likely to be associated with that for flora and fauna species.	N/A	Southern Water in agreement with NE
Angling	Potential for a reduction in connectivity and therefore impacts to angling.	Discuss potential risks with EA, angling clubs and stakeholders and assess likelihood of angling at low flow drought conditions to determine any potential risks during drought permit/order implementation. Update drought permit/order risk assessment as appropriate. Consider applicable mitigation measures that may be required in discussion with EA, angling clubs and stakeholders.	Proactive stakeholder engagement. Update risk assessment as necessary in dialogue with EA, angling clubs and stakeholders to inform of them of possible need for a drought permits/order. Update and review applicable mitigation measures in discussion with EA, angling clubs and stakeholders.	Maintain contact with angling clubs and stakeholders to assess any implications of the drought permits/order on any remaining angling activities.	Implement any applicable mitigation measures as agreed with EA, angling clubs and stakeholders. (e.g. no angling periods)	Discuss any residual impacts due to the drought permits/order with EA, angling clubs and stakeholders as appropriate and any potential compensatory measures.	Southern Water in agreement with EA and owners of fishing rights/angling associations

Following the draft drought plan, a Habitats Regulations Assessment was conducted which identified requirements for additional monitoring in relation to European Sites. These additional measures comprise reedbed surveys, for which further information is detailed in the relevant Habitats Regulations Assessment.

7.3.2. Weir Wood

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macrophytes River Medway between Weir Wood Reservoir and Withyham (Reach 1) River Medway between Withyham and Chafford (Reach 2)	Reduction in abundance or distribution of macrophyte community as a result of reduced water quality / habitat.	Water quality (in particular SRP) is not well understood due to a lack of water quality monitoring data: Identify and collate any additional local water quality data that may be available (e.g. Local Biological Record Centre). Carry out annual water quality sampling at 1 x monitoring site in each reach at times of low flow/low water levels for: dissolved oxygen, pH, turbidity, suspended sediment, conductivity, temperature, ammonia and SRP. 2 x surveys per year at times of low flow/water levels at the same survey sites. One month's worth of continuous monitoring data at several sites which would support the point sample data	Carry out water quality sampling at baseline monitoring sites	Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at baseline monitoring site.	Consider measures to address identified point sources of nutrient loading. Consider scope for improving quality of effluent from Southern Water WTW discharges in Reach 1 if this would help address adverse water quality issues.	Carry out water quality sampling at baseline monitoring sites No specific post-drought order mitigation measures identified.	Southern Water in agreement with EA
		Macrophyte populations and species composition are not well understood due to lack of data: Collate any available local macrophyte data Carry out summer walkover and macrophyte surveys 2 sites within reach 1 and 1 site within reach 2 plus a control site. Identify any key point sources of nutrient loading. Carry out between June to September. Repeat surveys once per year every 3 years.	Seasonal walkover and carry out macrophyte surveys at the baseline survey sites (if drought onset is during plant growing season)	Macrophyte survey and walkover survey to identify any key point sources of nutrient loading (if drought order implemented in plant growing season)	Consider possible in-stream measures or channel adjustments to improve habitat conditions.	Carry out post-drought order implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of the drought (one survey each year) to understand the extent of recovery from any adverse impacts.	Southern Water in agreement with EA
Fish community, including brown trout and bullhead River Medway between Weir Wood Reservoir and Withyham (Reach 1) River Medway between Withyham and Chafford (Reach 2)	Reduction in extent or quality of important habitats, including potential exposure of marginal and bed substrates (spawning, nursery and cover habitats)	Reach 1 and 2 to be monitored using catch depletion method completed between spring and autumn. Survey repeated annually every 3 years Liaise with EA fisheries and ecology teams to determine key spawning and nursery habitat locations.	Walkover of key locations recording the number of spawning/nursery sites potentially affected if survey is undertaken at right time of year. Record extent of exposed marginal spawning and bed substrates. Photographs should be taken during each walkover. As an alternative use historic survey data to provide an approximation, if available. Appropriate trigger values to be set for level and flow for spawning habitats based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in reaches known to contain spawning habitats.	Consider any measures to locally improve water depth/flow over spawning habitat, e.g. temporary in-stream flow deflectors.	In the year following the drought order implementation, undertake fish surveys at the baseline monitoring sites to substantiate the level of impact. Repeat walkover of key locations recording the number of spawning/nursey sites potentially affected if survey is undertaken at right time of year. Record extent of exposed marginal spawning and bed substrates. Photographs should be taken during each walkover. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA
Fish community including brown trout and bullhead River Medway between Weir	Impacts on growth and/or alteration to feeding and migration	Fish populations are not well understood as a result of lack of historic surveys.	Monitoring this potential impact is not feasible during a drought (involves post drought monitoring of the fish	Monitoring this potential impact is not feasible during a drought (involves post drought monitoring of the fish population – see other	None - mitigating the impact of changes to feeding regimes and movement patterns is not considered feasible during drought order	Three years post drought order monitoring at baseline monitoring sites to determine relative health of year classes which are influenced	Southern Water in agreement with EA

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Wood Reservoir and Withyham (Reach 1) River Medway between Withyham and Chafford (Reach 2)		Walkover and electric fishing surveys and data as above.	population – see other column). No monitoring is advised during drought as this may cause further stress.	column). No monitoring is advised during drought as this may cause further stress.	implementation.	by this impact. Including fish scale analysis. Monitoring will help to determine overall health of fish population and inform measures to facilitate the recovery of the fish population. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	
Fish community including brown trout and bullhead River Medway between Weir Wood Reservoir and Withyham (Reach 1) River Medway between Withyham and Chafford (Reach 2)	Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities.	Fish populations are not well understood as a result of lack of historic survey data. Data and monitoring as above.	Surveillance walkover of key sections/water bodies with fish populations which are known to be susceptible to hydrological impacts (as informed by baseline surveys and data)	Surveillance walkover of key sections/water bodies with fish populations which are known to be susceptible to hydrological impacts (as informed by baseline surveys and data)	Consider possible in-stream measures or adjustments to barriers to support fish movement and/or improve habitat conditions.	In the 2 years following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. This will assist with determining if fish have successfully migrated back to previously impacted reaches from non-impacted tributaries/reaches. In extreme cases, following consultation with the EA, restocking of flow sensitive fish species can be considered if recovery needs to be facilitated.	Southern Water in agreement with EA
Fish community, including brown trout and bullhead River Medway between Weir Wood Reservoir and Withyham (Reach 1) River Medway between Withyham and Chafford (Reach 2)	Reduction in abundance or distribution as a result of reduced water quality.	Water quality is not well understood due to limited water quality data for the impacted reaches. Collate any local water quality data that may be available (e.g. Local Biological Record Centre). Carry out annual water quality sampling at 1 site in each impacted reach at times of low flow/low water levels for: dissolved oxygen, pH, turbidity, suspended sediment, conductivity, temperature, ammonia and SRP 2 surveys per year at times of low flow/water levels at the same survey sites.	Surveillance walkover of key sections with known water quality pressures and sections known to be susceptible to lower flows. At baseline water quality monitoring sites, measure dissolved oxygen, pH, turbidity, conductivity and temperature in the field using calibrated handheld equipment. Collect water quality samples to analyse for ammonia, suspended sediment and SRP and to confirm hand-held probe readings. Appropriate trigger values would be set for key water quality determinands (e.g. dissolved oxygen), level and flow based on local circumstances, timing, seasonality and expert opinion. Known areas of dry habitats are typically avoided during the walkover but recorded where observed to confirm and/or confirm existing knowledge.	Surveillance walkover of key sections with known water quality pressures and sections known to be susceptible to lower flows. Measure dissolved oxygen, pH, turbidity, conductivity and temperature in the field using calibrated handheld equipment. Collect water quality samples to analyse for ammonia, suspended sediment and SRP and to confirm hand-held probe readings. Frequency = fortnightly, or more frequently if water quality is shown to be critical for fish. If DO saturation becomes critical for fish, deployment of automated water quality equipment that continuously monitors for dissolved oxygen in dialogue with EA.	Consider deployment of aeration equipment if critically low oxygen levels that could place fish in distress. Consider scope for improving quality of effluent of the Southern Water WTW discharges in Reach 1 if this would help address adverse water quality issues.	Carry out water quality surveys following baseline monitoring requirements. It is considered that water quality will return back to normal following cessation of the drought conditions that necessitated the drought order implementation. No specific mitigation applicable post-drought order implementation.	Southern Water in agreement with EA

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macroinvertebrates River Medway between Weir Wood Reservoir and Withyham (Reach 1)	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Water quality is not well understood due to lack of data for these waterbodies. Carry out water quality surveys (see above). Spot sampling plus one month's worth of continuous monitoring data at several sites which would support the point sample data Macroinvertebrate populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets. Carry out annual seasonal (spring and autumn) macroinvertebrate surveys. 3 sites within reach 1, every year in spring and autumn. Identify to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider scope for improving quality of effluent discharges from Southern Water WwTW in Reach 1 if this would help address adverse water quality issues. Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA
White-clawed crayfish (*Austropotomobius pallipes*) River Medway Reach 2	Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width, possibly resulting in the exposure of the river bed. Increased mortality (density dependant) as a result of increased predation Increased risk of mortality due to reductions in water quality	Collate available local records to improve baseline datasets and complete RHS/habitat suitability assessment to confirm survey locations. Manual searching or use of bait traps in suitable substrates at identified survey locations between July and October. Water quality sampling to be completed at the same time. Complete one sampling session. Repeat every 5 years.	Seasonal monitoring of crayfish at the baseline survey sites. Carry out water quality surveys at same time.	Seasonal monitoring of crayfish at the baseline survey sites. Carry out water quality surveys at same time	Consider possible in-stream measures or adjustments to improve habitat conditions.	In the year following drought order implementation, undertake post-drought crayfish surveys at the baseline monitoring sites to substantiate the level of impact. If white-clawed crayfish populations identified on watercourse, pre-drought mitigation measures may be required to improve resilience.	Southern Water in agreement with EA
Depressed river mussel River Medway Reaches 1 to 4	Reduction in abundance or distribution as a result of reduced water quality / habitat. Freezing is the major risk to the species if exposed during draw down when air temperature is below 4 Celsius.	Collate available local records to improve baseline datasets. Carry out seasonal surveys 1 survey every 5 years, 1 site within each impacted reach. Location to be determined following review of local records and in consultation with EA.	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Carry out water quality surveys at the same time.	Seasonal monitoring of depressed river mussel at the baseline survey sites. Samples to be collected and identified to species level. Carry out water quality surveys at the same time.	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. Cease abstraction for a time limited period if a DO "sag" arises.	No action required outside of baseline seasonal monitoring programmes.	Southern Water in agreement with EA and NE
Water Vole and Otter Reaches 1-4	Reduced habitat availability and/or food sources	Discuss with Sussex Wildlife Trust and Kent Wildlife Trust the available survey data for the impacted reaches. Carry out targeted water vole/water vole habitat surveys if local data not available to understand potential risks to the species from the drought order implementation. Water vole surveys to follow methods in the Water Vole Conservation Handbook and Water Vole Mitigation Guidelines. Otter surveys to follow guidance on.gov.uk website. One visit between April and September. Repeat survey every 3 years.	Review baseline data and carry out further survey of water vole presence and habitat conditions.	Carry out further survey to assess any risk to local population.	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Sussex Wildlife Trust and Kent Wildlife Trust.	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Hydrology River Medway between Weir Wood Reservoir and Withyham (Reach 1)	Uncertainty regarding impact magnitude, especially in Reach 1 where no contributing flow	Flow accretion survey during low flows. Determine need for further gauging on wider network with EA.	N/A				Southern Water in agreement with EA
Hydrology All reaches	Concerns regarding catchment rescaling used in assessment	Establish whether additional gauging data is available for the wider network and discuss need for monitoring points in lower reaches. Establish whether Southern Water's CATCHMOD model could be used to refine assessment conclusions	N/A				Southern Water in agreement with EA

7.3.3. North Arundel

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Arundel Park SSSI (units 1 and 2)	Habitat degradation as a result of decreased water levels or flows.	To establish a baseline, monitoring should incorporate: Discuss existing data with NE local area officer and WWT Arundel Walkover surveys to further assess the level of groundwater and/or hydrological connectivity between the aquatic habitats (standing open water; canals; fens; marsh, swamp) Carry out a monitoring of standing water habitats using Common Standards Methodology[15] criteria for assessing habitat condition where appropriate. Carry out between May to September. Once to inform baseline. May need resurvey if application is required. Obtain any available site-specific water level/flow monitoring evidence.	Surveillance walkover of aquatic habitats and investigate if hydrological connectivity is lost during environmental drought. Carry out appropriate monitoring of standing water habitats using Common Standards Methodology criteria for assessing habitat condition where appropriate.	Surveillance walkover of aquatic habitats and investigate if hydrological connectivity is lost during drought order implementation, if not already lost due to antecedent environmental drought conditions. Carry out appropriate monitoring of aquatic habitats using Common Standards Methodology criteria for assessing habitat condition in discussion with NE.	None applicable.	In year following drought order implementation, carry out appropriate monitoring of standing water habitats using Common Standards Methodology criteria for assessing habitat condition. If existing habitats have been lost or damaged due to the drought order, consider scope for replanting / re-creation of habitats or consider compensatory habitat options, in dialogue with NE.	Southern Water in agreement with EA and NE
Fish community, including European eel, Bullhead and trout in Chalk Springs fishery Reach 1: Swanbourne Lake Mill Stream	Reduction in extent or quality of important habitats, including potential exposure of marginal and bed substrates (spawning, nursery and cover habitats) in distributaries that are not level controlled	Each waterbody to be surveyed for fish habitat as part of a wider low flow/low water level habitat walkover survey, including mapping of likely spawning and nursery habitat. One walkover survey to be carried out for each waterbody once every 3 years. Liaise with EA fisheries and ecology teams to determine key spawning and nursery habitat locations.	Walkover of key locations recording the number of spawning/nursery sites potentially affected if survey is undertaken at right time of year. Record extent of exposed marginal spawning and bed substrates. Photographs should be taken during each walkover As an alternative use historic survey data to provide an approximation, if available. Appropriate trigger values would be set for level and flow for spawning habitats based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers if situation is expected to deteriorate in reaches/water bodies known to contain spawning habitats.	Consider any measures to locally improve water depth/flow over spawning habitat, e.g. temporary in-stream flow deflectors. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable.	In the year following the drought order implementation, undertake fish surveys at the baseline monitoring sites to substantiate the level of impact. Repeat walkover of key locations recording the number of spawning/nursey sites potentially affected if survey is undertaken at right time of year. Record extent of exposed marginal spawning and bed substrates. Photographs should be taken during each walkover. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA and WWT

[15] JNCC, Common Standards Monitoring Guidance for Freshwater Habitats and Species, Rivers and lakes guidance updated January 2014 and March 2015, respectively. ISSN 1743-8160 (Online)

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Fish community, including European eel and Bullhead Reach 1: Swanbourne Lake Mill Stream	Fragmentation of habitats and increased significance of obstacles	Fish populations are not well understood as a result of lack of historic survey data. Electric-fishing surveys to monitoring populations at 1 monitoring site confirmed at Swanbourne Millstream. Repeat every 3 years. Collate any further information from local knowledge and EA local staff, plus local biological records.	Walkover of key sections known to be susceptible to lower flows. Known areas of dry habitats are typically avoided during the walkover, but recorded where observed to confirm and/or confirm existing knowledge Electric-fishing surveys to monitoring populations at each of the four sites.	Additional walkovers, if situation is expected to deteriorate in stream sections / waterbodies known to contain high fish densities.	Consider possible in-stream measures or adjustments to barriers to support fish movement and/or improve habitat conditions. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable.	In the year following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA and WWT
Fish community including European eel and Bullhead Reach 1: Swanbourne Lake Mill Stream	Increased mortality (density dependent) as a result of increased predation and competition	Fish populations are not well understood as a result of survey data. Survey and data as set out in above row.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach/water body, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in stream sections/water bodies known to contain high fish densities.	Consider deployment of aeration equipment in key reaches/water bodies with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA and WWT
Fish community including European eel and Bullhead Reach 1: Swanbourne Lake Mill Stream	Impacts on growth and/or alteration to feeding and migration	Fish populations are not well understood as a result of lack of historic surveys. Surveys and data as above rows for fish.	Monitoring this potential impact is not feasible during a drought (involves post drought monitoring of the fish population – see other column). No monitoring is advised during drought as this may cause further stress.	Monitoring this potential impact is not feasible during a drought (involves post drought monitoring of the fish population – see other column). No monitoring is advised during drought as this may cause further stress.	None - mitigating the impact of changes to feeding regimes and movement patterns is not considered feasible during drought permit implementation.	Three years post drought order monitoring at baseline monitoring sites to determine relative health of year classes which are influenced by this impact. Including fish scale analysis. Monitoring will help to determine overall health of fish population and inform measures to facilitate the recovery of the fish population. Consider re-stocking options where appropriate and applicable in dialogue with the EA.	Southern Water in agreement with EA and WWT

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Fish community including European eel and Bullhead Reach 1: Swanbourne Lake Mill Stream	Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities.	Fish populations are not well understood as a result of lack of historic survey data. Data and monitoring as above rows for fish.	Surveillance walkover of key sections/water bodies with fish populations which are known to be susceptible to hydrological impacts (as informed by baseline surveys and data)	Surveillance walkover of key sections/water bodies with fish populations which are known to be susceptible to hydrological impacts (as informed by baseline surveys and data)	Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to barriers to support fish movement and/or improve habitat conditions.	In the 2 years following drought order implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. This will assist with determining if fish have successfully migrated back to previously impacted reaches from non-impacted tributaries/reaches. In extreme cases, following consultation with the EA, restocking of flow sensitive fish species can be considered if recovery needs to be facilitated.	Southern Water in agreement with EA
Fish community, including European eel and Bullhead Park Bottom tributary; Swanbourne Lake; Mill Stream	Reduction in abundance or distribution as a result of reduced water quality.	Water quality is not well understood due to limited water quality data for the impacted sites. Collate any local water quality data that may be available (e.g. from WWT). Spot sample monitoring in reach during low flows/low tide conditions (ideally at Q95). Parameters to be sampled for are soluble reactive phosphorous (SRP), dissolved oxygen, ammoniacal nitrogen (freshwater), Dissolved Inorganic Nitrogen (DIN), pH, turbidity, conductivity, and salinity 2 surveys per year at times of low flow/water levels at the same survey sites.	Surveillance walkover of key sections with known water quality pressures and sections known to be susceptible to lower flows. At baseline water quality monitoring sites, measure dissolved oxygen, pH, turbidity, conductivity and temperature in the field using calibrated handheld equipment. Collect water quality samples to analyse for ammonia, suspended sediment and SRP and to confirm hand-held probe readings. Appropriate trigger values would be set for key water quality determinands (e.g. dissolved oxygen), level and flow based on local circumstances, timing, seasonality and expert opinion. Known areas of dry habitats are typically avoided during the walkover, but recorded where observed to confirm and/or confirm existing knowledge.	Surveillance walkover of key sections with known water quality pressures and sections known to be susceptible to lower flows. Measure dissolved oxygen, pH, turbidity, conductivity and temperature in the field using calibrated handheld equipment. Collect water quality samples to analyse for ammonia, suspended sediment and SRP and to confirm hand-held probe readings. Frequency = fortnightly, or more frequently if water quality is shown to be critical for fish. If DO saturation becomes critical for fish, deployment of automated water quality equipment that continuously monitors for dissolved oxygen in dialogue with EA.	Consider deployment of aeration equipment if critically low oxygen levels that could place fish in distress. Consider scope for improving quality of effluent or reducing inputs from the trout fishery and/or the Southern Water WSW discharge, if this would help address adverse water quality issues.	Carry out water quality surveys following baseline monitoring requirements. It is considered that water quality will return back to normal following cessation of the drought conditions that necessitated the drought permit implementation. No specific mitigation applicable post-drought permit implementation.	Southern Water in agreement with EA and WWT

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macrophytes River Arun Trib to Arundel Park (Mill Stream)	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Water quality is not well understood due to lack of water quality monitoring at these water bodies. Obtain local water quality data that may be available (e.g. from WWT) Carry out water quality surveys as noted above for fish. Macrophyte populations are not well understood as a result of lack of data. Collate any available local macrophyte data (e.g. from WWT). Carry out summer walkover and macrophyte surveys. Identify any key point sources of nutrient loading. Repeat every 3 years	Seasonal walkover and carry out macrophyte surveys at the baseline survey sites (if during plant growing season) Carry out water quality sampling at same time (see fish section above for parameters).	Survey to be undertaken and macrophytes identified (if drought order implemented in plant growing season) Walkover survey to identify any key sources of nutrient loading. Carry out water quality sampling at same time (see fish section above for parameters).	Consider measures to address identified point sources of nutrient loading. Consider scope for improving quality of effluent or reducing inputs from the trout fishery and/or the Southern Water WSW discharge, if this would help address adverse water quality issues. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions.	Carry out post-drought order implementation surveys at the baseline monitoring sites for 2 consecutive summers after the last summer of a drought (one survey each year) to understand the extent of recovery from any adverse impacts. Carry out water quality sampling at same time. No specific post-drought permit mitigation measures identified.	Southern Water in agreement with EA and WWT
Blue-green algae Park Bottom tributary; Swanbourne Lake; Mill Stream; WWT reserve	Increased proliferation of blue green algal blooms at each of the four sites.	Lack of historic records. Collate any historic evidence of blue-green algae from EA and other local knowledge to better assess risks. Initial walkover survey of reach to identify any algal blooms. Carried out in Summer. Where identified, water samples to be taken to analyse the algae and water quality conditions, following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom, EA are to be notified. One survey to inform baseline. May need resurvey if application is required	Walkover of key locations previously established. Visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Walkover of key locations previously established for visual assessment of algal blooms. Samples to be collected from algal blooms which are suspected to contain blue green algae. Samples to be analysed following EA guidance on assessing blue green algae blooms. On confirmation of a blue green algae bloom EA are to be notified.	Mitigation of blue-green algal blooms should centre around reporting all blooms to the EA to ensure that appropriate action can be taken to inform the public. If major risk identified, consider treatment of algal bloom if appropriate in dialogue with EA and water body owner/riparian owners.	Upon cessation of the drought order, baseline conditions will return. No further monitoring will be required post-drought order implementation. Continue vigilance during standard baseline drought permit monitoring activities.	Southern Water in agreement with EA and WWT

Feature	Potential impact identified in EAR	Baseline monitoring	On-set of environmental drought	During drought order implementation period		Post drought order	Responsibility for monitoring and mitigation
		Key locations	Monitoring and trigger setting	Trigger and monitoring to inform mitigation action	Mitigation actions triggered by monitoring	Monitoring and post-drought mitigation (where applicable)	
Macroinvertebrates River Arun Trib to Arundel Park (Mill Stream)	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Water quality is not well understood due to lack of data for these waterbodies. Macroinvertebrate populations are not well understood as a result of lack of data. Collate available local records to improve baseline datasets. Carry out annual seasonal (spring and autumn) macroinvertebrate surveys at site. Identify to species/mixed taxonomic level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider scope for improving quality of effluent or reducing inputs from the trout fishery and/or the Southern Water WSW discharge, if this would help address adverse water quality issues. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable. Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal monitoring programmes.	Southern Water in agreement with EA and WWT
Water Vole Park Bottom tributary; Swanbourne Lake; Mill Stream; WWT reserve	Reduced habitat availability and/or food sources	Discuss with Sussex Wildlife Trust the available survey data for the impacted sites. Discuss if any survey work carried out by WWT Arundel. Carry out targeted water vole/water vole habitat surveys if local data not available to understand potential risks to the species from the drought permit implementation. Carry out between April and September. Surveys to follow methods in the Water Vole Conservation Handbook and Water Vole Mitigation Guidelines Repeat survey every 3 years.	Review baseline data and carry out further survey of water vole presence, population size and habitat conditions. **Note:** in review, data may provide guidance as to how drought permit implementation impacts water vole population structure and health.	Carry out further survey to assess any risk to local population.	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Sussex Wildlife Trust. Operation of key flow control structures to maintain water levels in key reaches/water bodies where applicable.	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA and WWT
South Downs National Park and NCA	Uncertain impacts on character of area	Walkover survey and photographic record during summer low flow conditions and complete scoping exercise for LVIA with initial indication of significance of impacts	Update walkover survey and photographic records if required and complete full LVIA to support drought order application.	Photographic record/evidence to be taken at fixed points used during on-set of drought surveys to document changes.	Mitigation likely to be associated with that for flora and fauna species.	N/A	Southern Water in agreement with NE
Swanbourne Lake recreational facility	Uncertain impacts on recreational use of lake as a result of drought option and visual amenity	Walkover survey and photographic record during summer low flow conditions and complete scoping exercise for recreational and visual amenity assessment within initial indication of significance of impacts	Update walkover survey and photographic records if required and complete full assessment to support drought order application.	Photographic record/evidence to be taken at fixed points used during on-set of drought surveys to document changes.	Mitigation likely to be associated with that for flora and fauna species.	N/A	Southern Water in agreement with local council and EA and NE as appropriate

Southern Water has discussed the above suite of environmental monitoring and in-drought mitigation measures with Portsmouth Water in relation to its nearby “Source S” Drought Permit. Southern Water will continue to work closely with Portsmouth Water and the EA as part of the programme of refining the monitoring and monitoring plans for these two Drought Permits.

7.3.4. East Worthing

Feature	Potential impact identified in EAR	Baseline monitoring Key locations	On-set of environmental drought Monitoring and trigger setting	During drought permit implementation period Trigger and monitoring to inform mitigation action	 Mitigation actions triggered by monitoring	Post drought permit Monitoring and post-drought mitigation (where applicable)	Responsibility for monitoring and mitigation
Fish community, including European eel **Teville Stream/Broadwater Stream**	Increased mortality (density dependent) as a result of increased predation and competition Impacts on growth and/or alteration to feeding and migration (particularly eels formerly recorded in waterbody) Reduction in abundance and distribution of flow sensitive species due to low flows, reduced wetted width and flow velocities. Reduction in abundance or distribution as a result of reduced water quality.	Fish populations are not well understood as a result of lack of recent survey data. Electric-fishing surveys to monitor populations in perennially flowing reaches of the Teville Stream (1 site). Fyke Netting for monitor populations in Brooklands Lake (1 site). Sites, discussed with EA, will complement existing EA fish monitoring sites. 1 survey round every 1 year at same sites between spring and autumn. Collate any further information from local knowledge and EA local staff, plus local biological records. Repeat Every 3 years.	Approximation of the number of each fish species (e.g. 10s, 100s) in each ponded reach, where safe and practical to do so. Measure dissolved oxygen, conductivity and temperature in the field using calibrated handheld equipment. Appropriate trigger values would be set for level and/or flow based on local circumstances, timing, seasonality and expert opinion.	Additional walkovers, if situation is expected to deteriorate in stream sections/water bodies known to contain high fish densities.	Consider deployment of aeration equipment in key reaches with critically low oxygen levels. Consider provision of bird scarers to deter piscivorous birds at significant locations, if appropriate taking account of the balance between bird food supply and fish requirements. Consider possible in-stream measures or adjustments to improve habitat conditions. In extreme cases, consider capture/rescue surveys for fish. It is noted these will need sufficiently sized aerated holding tanks as it is unlikely that they can be moved to elsewhere in the catchment. [to be agreed with EA if this should be a mitigation measure]	In the year following drought permit implementation, undertake post-drought fish surveys at the baseline monitoring sites to substantiate the level of impact. Consider re-stocking options where appropriate and applicable in dialogue with the EA. Three years post drought permit monitoring at baseline monitoring sites to determine relative health of year classes which are influenced by this impact. Including fish scale analysis.	Southern Water in agreement with EA
Macroinvertebrates **Teville Stream/Broadwater Stream**	Reduction in abundance or distribution as a result of reduced water quality / habitat.	Collate available local records to improve baseline datasets. Carry out seasonal (spring and autumn) macroinvertebrate surveys in perennially flowing reaches: 1 site in the Teville Stream and 1 site in Broadwater Stream every year in spring and autumn. Identify to species level. Repeat annually.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Seasonal monitoring of macroinvertebrates at the baseline survey sites. Samples to be collected and identified to species level.	Consider possible in-stream measures or adjustments to improve habitat conditions.	No action required outside of routine seasonal baseline monitoring programmes.	Southern Water in agreement with EA
Water Quality **Teville Stream/Broadwater Stream**	Potential reductions in water quality due to reductions in flow.	Very limited data set. Carry out water quality monitoring during low flow conditions for SRP, dissolved oxygen, ammoniacal nitrogen, pH and temperature. Carry out annually, twice throughout the year during low flow conditions.	Water quality monitoring at the baseline sites for the same parameters: SRP, dissolved oxygen, ammoniacal nitrogen, pH and temperature.	Water quality monitoring at the baseline sites for the same parameters: SRP, dissolved oxygen, ammoniacal nitrogen, pH and temperature.	Consider deployment of aeration equipment in key reaches with critically low oxygen levels.	No action required outside of routine baseline monitoring programme.	Southern Water in agreement with EA
River Flow **Broadwater Brook (Teville Stream)**	Lack of surface water flow gauging data	Carry out spot flow and level monitoring at same locations twice at times of low flow conditions	Repeat low flow monitoring at baseline survey site.	Repeat low flow monitoring at baseline survey site once every month.	None applicable.	Monitor rate of flow recovery over the following 6 months or until flows recover above the estimated Q95 flow values.	Southern Water in agreement with EA
Water Vole **Teville Stream and Broadwater Brook**	Reduced habitat availability and/or food sources	Discuss with Sussex Wildlife Trust the available survey data for the impacted sites. Carry out targeted water vole/water vole habitat surveys if local data not available to understand	Review baseline data and carry out further survey of water vole presence, population size and habitat conditions. **Note:** in review, data may provide guidance as to how drought permit implementation impacts water vole population structure and health.	Carry out further survey to assess any risk to local population.	Consider opportunities to create alternative habitat if significant risk identified in dialogue with EA and Sussex Wildlife Trust. Operation of key flow control structures to maintain water levels in key reaches/water	Carry out further survey of water vole presence and habitat conditions for 2 years after the drought order implementation.	Southern Water in agreement with EA and WWT

		potential risks to the species from the drought permit implementation. Surveys to follow methods in the Water Vole Conservation Handbook and Water Vole Mitigation Guidelines One survey between April and September. M Repeat survey every 3 years.			bodies where applicable.		

Appendix A: Standard Survey and Analysis Methodologies

Hydrogeology: Groundwater level monitoring

Boreholes/Wells:

The approach adopted should consider the ability to install an automatic water level logging device (preference) or otherwise manual dip readings. The datum level should be carefully determined and noted and referenced to ground level datum or other appropriate local datum.

The process for the manual dip is as follows:

- Ensure dip tape is clean (wipe tape with sterilising solution as it is lowered into borehole).
- Dip water level to the top of the welded flange ring (steel OBH), top of uPVC casing or other datum.
- Record levels to correct datum point and note time in notebook/record sheet.

Where automatic logging is installed, a manual calibration dip should be taken once every 6 months as a minimum and compared to the logger data. Any discrepancies and any re-calibration should be clearly identified in the data record. The manual calibration dip reading should be carefully recorded and retained for future reference.

If the groundwater level is being obtained from a borehole used for potable supply purposes, great care must be taken not to cause any contamination of the groundwater during installation of automatic logging equipment or manual dip readings.

Hydrology: Water level and river flow gauging

The approach adopted to water level monitoring of rivers or standing water bodies (e.g. lakes, ponds) includes continuous monitoring and ad hoc surveys which require single or repeated visits to manually collect data. A non-exhaustive list is provided below:

Continuous (auto data logging) surveys include:

- River level and flow gauging – Data is collected by the EA as part of routine monitoring of the physical environment. This data can be requested from the EA's regional data centres for analysis and many are located in the vicinity of puttable water infrastructure.
- Standing water level logging - Data is collected by Southern Water (in-reservoir), the EA or other responsible body (Wetland trusts, etc.) as part of routine monitoring of the physical environment. This data can be requested from the EA's regional data centres for analysis.
- Manual gauge board reading – Manual gauge board readings are undertaken where a weir exists, but no electronic data monitoring is currently installed. This requires the visual identification of the water level on the gauge board, which is recorded on a regular basis. This visual identification can be done via eye (visit) or via webcam.
- Wetland table monitoring – Wetland monitoring of surface water may be gauged at any outflow of wetland water body and by borehole. A surface water outflow will flow over a weir at which it is possible to ascertain a water level from the gauge board. Should the weir not have continuous data monitoring capabilities, readings from the gauge board can be taken and recorded on a regular basis.

Ad hoc surveys include:

- Spot flow gauging – Safe and effective spot flow gauging is dependent on the size and current flow of the water body. Common methods include:
    - In channel measurement using Acoustic Doppler Current Profiler (ADCP). This can be undertaken with a hand held ADCP when the water is at a suitable flow and the user can

safely wade across the water body. This involves the submersion of the unit and taking measurements at particular locations/intervals to create a flow profile.
- In channel measurement using an Electromagnetic (EM) gauge. Such a technique is employed when stream flow is extremely low and involves the submersion of the EM unit into the flow, to take a measurement, where possible.
- Measurement using a deployable unit, such as a Teledyne RDI Stream Pro, that automatically takes in-river measurements across a bridge or a tagline to collect data.

Water quality

Where specified, water quality surveys will be undertaken during low flow conditions to establish baseline conditions.

The surveys will comprise:

a) Spot measurements using a hand-held multi-sonde device to measure instantaneous pH, temperature, electrical conductivity and dissolved oxygen (% saturation and mg/l).

b) Water samples will be taken for subsequent analysis by an accredited laboratory for the following parameters:

- Alkalinity expressed as $CaCO_3$.
- Unionised Ammonia expressed as N.
- Ammonia expressed as NH_3.
- Hardness expressed as $CaCO_3$.
- Nitrate.
- Phosphate.
- Suspended Solids (Total).
- Total Oxidised Nitrogen.
- Orthophosphate.
- Temperature.
- pH.

The number and location of samples will be determined by the EMP reach length, specific water quality pressures identified within the reach and will take into account the spatial distribution and results of, all relevant EA historic water quality monitoring data. In addition, samples will be taken in areas that are targeted for ecological monitoring (particularly macro-invertebrates).

For sites downstream of reservoirs, there will be one sample taken close to the compensation flow release to assess the quality of the released water and a least one other sample towards the downstream end of the reach.

As stated above, where specific water quality pressures are identified (e.g. STW discharge), additional sample sites will be required.

Following site selection, a list of selected sites, including grid references, will be passed to the EA for information.

Sampling will be on two occasions during the sampling year. The two occasions will be required to be:

i. approximately equally distributed throughout the year,
ii. at low environmental flows (i.e. flows equal to or less than Q80 and after a prolonged period of little precipitation) and,
iii. at times without spill of excess water from upstream Southern Water reservoirs.

Geomorphology

Each relevant river reach that has a lack of geomorphological data identified in the EMP will be characterised into separate physical geomorphological sub-reaches based on key indicators of geomorphological change and their sensitivity to very low flows during drought conditions.

Geomorphological features that will be captured within these sub-reaches will include:

- Significant changes in substrate characteristics/distribution
- Significant changes in bank material
- Approximate measurements of channel widths and bank heights to provide an indication of typical low flow channel cross-sections
- An assessment of the sensitivity of the reach to drought conditions

The data collected will highlight areas considered to be at high risk of impact from very low flow conditions. Sediment has an important role to play as coarse sediments provide habitat for a range of species: fine sediment can deposit out of suspension under low flow velocities during a period of drought leading to negative impacts upon in-stream ecology. Features that will be monitored include:

- Bars – areas of both coarse and fine sediment accumulation
- Bank erosion – areas of significant bank erosion delivering fine sediment to the system
- Tributaries delivering fine sediment
- Wider catchment sediment pathways

Ecological habitats and impacts upon these habitats through modifications will be captured by the following information

- Flow types including pools, riffles, steps, runs, glides and backwaters
- Areas of significant shelter/shading including overhanging banks or vegetation
- Presence of significant in-channel vegetation
- Barriers to fish passage or channel modifications

Presence of any Wildlife and Countryside Act, Schedule 9 (as amended) species[16].

The geomorphological and habitat survey will be a one-off survey carried out under low flow conditions so that the survey is focused on drought-sensitive features. Providing flow, weather and access conditions allow, all surveys will be completed within the same year.

The data will be collected continuously for any EMP river reach less than 6 kilometres in length. A subset of the total length will be captured in longer reaches, using a desk study to focus the field surveys on key areas. Typically, any reach between 6 kilometres and 23 kilometres long will have a total of 6 kilometres of survey undertaken; 12 kilometres will be surveyed in those reaches between 24 kilometres and 47 kilometres. Any reach over 48 kilometres in length will have a total of 18 kilometres surveyed.

Fish

All fish survey work will be carried out by electric fishing methods. The electric fishing sampling protocol will follow standard electric fishing practice for operators and equipment, as developed by BS EN 14011: 2003 Water Quality Sampling of Fish with Electricity and detailed in the EA (2001) R&D Technical Report W2-054/TR. This will allow comparisons to be made with historical data sets held by the EA.

In all cases, the equipment used will be a bank-side control box with 50 or 100Hz pulsed-DC output at 220 volts and variable current. For all electric fishing equipment and modes of operation to comply with the EA Health and Safety Regulations, a minimum of a 3-person survey team will be required for the surveys, and in wider rivers this would preferably be a 4-person team.

[16] Surveyors will not be expected to survey submerged or inaccessible vegetation, however stands of emergent or floating macrophytes like Floating Penny Wort or Curly Waterweed will be noted. Species present within the riparian zone (e.g. Giant Hogweed, Japanese Knotweed) will also be recorded in a presence absence record per species per reach.

The general survey approach will be to undertake one quantitative and two semi-quantitative surveys within each reach <15 metres in width identified as requiring survey by Southern Water, with results from the former being used to calibrate results from the latter.

Quantitative sampling
Quantitative sampling will be carried out at all study sites to obtain absolute estimates of population density. This method provides more robust biomass and density estimates of fish.

Each quantitative survey site will be fished by at least a three-person team, in an upstream direction three consecutive times taken from 100 metres stretches of river. A depletion in abundance should occur between each run (consecutive runs should be undertaken if there is not a significant depletion). A period of 20 minutes will be left between each run to allow water clarity to return and fish to become naturally distributed after each disturbance. Fish to be returned to the water after all the three runs are completed.

Semi-quantitative sampling
Semi-quantitative sampling will differ from quantitative sampling only in that one run will be carried out rather than three. The total number of fish caught is given as a minimum population estimate.
At new sites, a minimum of 30 metres of river length should be sampled, but preferably 50 metres or at least 100 m2. At sites sampled previously, the same length of river must be sampled year on year. At each site, the number of fish of each species in each catch will be recorded and the length (fork length, nearest millimetre) will be measured.

The age of smaller fish from length-frequency distributions will be determined. Samples of scales will be taken from a small number of individual salmonid fish for determination of age and growth of the fish populations. Where large numbers of individuals are caught, scales will be taken from a representative sample of fish covering all size ranges (maximum of five fish from each 10 millimetre length band), and the age structure determined from comparison with length frequency data.
Following processing, fish will be placed in oxygenated recovery bins to recover, before being released at the site where they were captured following completion of data collection.

Prioritisation exercise
A prioritisation exercise to refine the drought monitoring exercise will also be carried out. The overall aim of which will be to deliver a cost-efficient, robust, ecologically relevant and legislatively appropriate monitoring program for fish. Communities, habitats and compensation flow schemes that would be sensitive to drought orders and would require monitoring will be identified. Elements will include:

- Literature review pertaining to the impact of droughts on fish communities to identify sensitive communities and habitats and define appropriate ecological responses and metrics of assessment; characterise the reservoir schemes, rivers and habitats and drought orders that are involved in Southern Water drought management to identify sensitive catchments, reaches and priority schemes (high risk of drought order) that might need monitoring, and where appropriate suitable control/reference sites.
- Support the delivery and analysis of the monitoring programme.
- Analyse existing databases for fish populations in the Southern Water catchment to identify fish population status and populations that may be sensitive to drought.
- Collate the knowledge reviewed above, pertaining to the sensitivity of fish populations/communities to drought (and flow management) and the sensitivity of habitats and schemes to drought orders, to create a weighted prioritisation matrix to determine the high priority sites and schemes requiring monitoring.
- Propose options for cost-efficient, robust, ecologically relevant and legislatively appropriate monitoring program for fish, detailing in each case the strengths, limitations and potential costs.

In summary, the exercise will involve analysing existing baseline data to identify the most appropriate metrics for assessment and the time-scales over which data would need to be collected (either as a baseline or as a

continuous annual monitoring programme) depending on the legislative (assessments for single schemes/drought orders or higher level catchment based assessment) and statistical (power/resource analysis) requirements to deliver a robust assessment.

The output of the prioritisation exercise will be shared with the EA.

Electric fishing for lamprey
In habitat suitable for lamprey ammocoetes in or adjacent to a sampling area these will be surveyed. This will involve targeted electric fishing using a single anode, but if large numbers of ammocoetes are caught sites will be surveyed following a standardised fixed framework protocol (Harvey and Cowx 2003[17]), by selecting three small (<3m^2) patches of suitable habitat (e.g. tree roots, silt substrate). Lamprey will be speciated out in the field where possible and their abundance and life-stage recorded.

Physico-chemical data
During the fish surveys the following information will also be collected: site length; average width; flow characteristics; substrate type; bankside vegetation; temperature; and conductivity.

In addition, a habitat survey will be carried out after each fish survey (on an annual basis) to meet the requirements of the HABSCORE assessment (Wyatt and Lacey 1994[18]; Wyatt et al. 1995[19]). These data will be analysed through the HABSCORE programme to evaluate the suitability of the site in terms of juvenile salmon and trout abundance and provide a measure for future assessment of the impact of any drought permit changes in compensation flow on the habitat suitability and availability for salmonids.

Three sites will be sampled in each drought permit impact reach <15 metres wide as identified as requiring monitoring by Southern Water (i.e. where the EA are not surveying or where a sufficient baseline does not already exist).

One site in each reach will be sampled using a three-catch quantitative survey and the other two sites will be sampled using single-catch semi-quantitative surveys. The efficiency of sampling effort or probability of capture (P) at quantitative sites will be used to derive relative density (N/100m^2) at semi-quantitative sites: N = ((C / P) / A) *100, where C is the total number of fish caught in the single run and A is the sampling area (Cowx 1996[20]).

This approach will establish sufficient baseline fish data to inform statistically robust impact assessments of drought option implementation, over and above the effects of environmental drought.
In order to differentiate the effects of an environmental drought and those resulting from the application of a drought permit, the monitoring will include control sites outside of the extent of influence, i.e. unregulated reaches, both before and after the drought.

Macroinvertebrates

A semi-quantitative methodology will be employed for the collection of benthic macro-invertebrates from shallow in-stream habitats. These data will provide continuity with previously gathered data and enable the use of routine biological assessment tools for rivers based on invertebrates, i.e. River Invertebrate Prediction and Classification System (RIVPACS) and Lotic-invertebrate Index for Flow Evaluation (LIFE) scores.

[17] Harvey J.P & Cow I.G. (2003) Monitoring the river, brook and sea lamprey, *Lampetra fluviatilis*, L. *planeri* and *Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough.
[18] Wyatt R.J. & Lacey R.F. (1994) Guidance notes on the design and analysis of river fishery surveys. NRA R&D Note 292, 118 pp.
[19] Wyatt R.J., Barnard S. & Lacey R.F. (1995) Use of HABSCORE V software and application to impact assessment. Report to NRA, No. 400 WRc.
[20] Cowx I.G. (1996) The integration of fish stock assessment into fisheries management. In: Cowx, I.G. (ed.) Stock Assessment in Inland Fisheries. Fishing News Books, Blackwell Science, Oxford. pp 495-506.

A three-minute kick/sweep sample will be taken, covering all in-stream habitats, followed by a one-minute hand search. This is consistent with the method set out in the EA (EA) procedure for RIVPACS/LIFE analysis (EA, 1999).

Samples collected will be preserved using a 90% industrial methylated spirits on site, allowing long term storage of samples if required. Every six months' samples need to be checked, and it may be necessary to top up the preservatives to replace losses from evaporation.

As a number of factors determine the composition and dynamics of macro-invertebrate populations, other environmental parameters will be collected at each sampling location including: pH, conductivity, dissolved oxygen concentration at the surface and near the bed, wetted width of the river, river depth, substratum composition, macrophyte cover, riparian vegetation, shading, riparian land use, altitude, slope of bank and underlying geology.

Macrophytes

The survey method used should conform to CEN 14184: 2003 Water quality – Guidance standard for the surveying of aquatic macrophytes in running waters. In order to obtain the data with which to calculate the observed values for each of the parameters, 100 metre stretches of the river should normally be sampled between 1st June and 30th September. Sampling should not be undertaken during or immediately after periods of high flow. Macrophytes should also be sampled during periods of low flows to assess the extent to which it affects the community.

Where cold weather or spring floods may have delayed the growth of macrophyte taxa, sampling should commence after 30th June. Location of the survey stretches should be selected to be representative of the water body as a whole. The number of 100 metre stretches required to adequately characterise a water body will vary depending on the water body size (length) and heterogeneity of habitat. Previous work to assess variability in river macrophytes[21] indicated that in most water bodies three 100 metre stretches would be adequate to produce a classification with 95% confidence, and in some very small or very uniform water bodies it may be possible to reduce this number. Surveying should establish the presence, and percentage of the river channel (up to the height of bank that would typically be submerged for >50% of the year) covered by, any of the macrophyte taxa listed in the UKTAG guidance[22].

Estuarine macroalgae and phytoplankton

Sampling is usually carried out during summer when blooms are at their peak, and between mean high water and mean low water of spring tides. The overall size of algal mats is estimated either from aerial imagery or by walking around the algal patches with a GPS. Randomly placed quadrats are used to assess the density of mats (% cover within the quadrats), and also biomass (g.m $^{-2}$). Weed growing within the sediment is also noted (entrainment). The more weed there is, the more likely it is to affect organisms in the sediment and birds trying to feed on them. We assess the entire intertidal area of a waterbody, but only where algae have the potential to grow; this is called the available intertidal habitat (AIH).

Estuarine macroinvertebrates

The number of samples required for an assessment is dependent on the survey aims and the variability of the EQRs in the habitat sampled. WFD water body assessments generally use single samples taken from stations spread across suitable habitats within a water body. The EQR is calculated at the sample level. (Multiple samples may be collected at a station, but the implications to the calculation of the standard error and representation of the area being assessed must be considered.). The water body status is then derived by calculating the mean EQR and relating it to the class status boundaries. Careful consideration must be given as to the aims of the survey before commencing sample selection. As for any investigation, enough samples must be taken to ensure the required degree of confidence in the final assessment is reached. In

[21] Willby, N.J., Pitt, J-A., & Phillips, G.L. (2012). The ecological classification of UK rivers using aquatic macrophytes. Science Report SC01008O/R1. EA, Bristol.
[22] Directive, W.F., 2014. UKTAG River Assessment Method Macrophytes and Phytobenthos.

habitats with high inherent variability, the IQI may not be a suitable assessment method as the number of samples required would be disproportionately high[23].

Samples are collected in areas of soft sediments. Grab size should be 0.1 m 2 for sub-tidal samples is used, while intertidal samples are taken by using a hand corer. After collection, samples are sorted in the laboratory and identified to the lowest practical taxonomic level where possible (usually species).

Blue-green algae

Water samples will be collected and analysed for chlorophyll measurements and in the summer for cyanobacteria biovolume assessment.

Breeding and wintering birds

During the breeding bird season (April-June), surveys will be carried out across determined transects and from relevant vantage points. Frequency and methodology to follow accepted guidelines used in bird monitoring surveys[24][25].

Habitat extent is mandatory for assessing condition of bird features and relates to the broad habitat type used by the species. In some cases, the habitat extent to be assessed will represent only a small part of a larger site, especially if the species habitat needs are quite specific, but in others it will effectively be the whole site as some species are more generalist in habitat use and require a mosaic of different habitats[26].

Once all of the data for each of the feature attributes has been collected and analysed/interpreted, the comparison with the baseline values for each attribute can be made to establish whether targets have been met and whether it will reduce or influence bird populations.

White-clawed crayfish

The survey method will follow the Common Standards Method (CSM) for population monitoring of white-clawed crayfish prepared by Bradley *et al* in the guidance issued by JNCC (2015)[27]. The protocol involves manual searching at all sites with suitable substrate or the use of baited traps where manual searching is not possible. In some cases, refuge traps may be used (for example where water voles are present at trapping sites and if few searchable refuges are available). Survey forms provided with the CSM guidance will be completed for each site.

In flowing water, individual monitoring sites may cover up to 200m of watercourse depending on the abundance and accessibility of refuges within the reach. Sites can be surveyed within randomly selected 500m river lengths or target lengths where the species has previously been recorded (e.g. utilising information from the EA or Local Records Centre). As a general guide between eight and 15 sites per watercourse assessment unit should be appropriate. Where the manual search technique is employed, 100 refuges should be searched and additional effort employed dependant on the initial results. The number of refuges searched should be recorded to facilitate catch per unit effort calculation. Should trapping be required, the exact number of traps will depend on the presence of suitable habitat and could expect to involve at least 10 per 500m river length.

[23] UKTAG (2014). UKTAG Transitional and Coastal Water Assessment Method Benthic Invertebrate Fauna.
[24] Gregory, R D; Wilkinson, N I; Noble, D G; Robinson, J A; Brown, A F; Hughes, J; Procter, D A; Gibbons, D W and Galbraith C A (2002) The Population Status of Birds in the United Kingdom, Channel Islands and Isle of Man: an Analysis of Conservation Concern 2002-2007. British Birds 95: 410-450
[25] Gilbert, G., Gibbons, D.W. & Evans, J (1998) Bird Monitoring Methods: a manual of techniques for key UK species. RSPB, Sandy, Bedfordshire.
[26] JNCC (2004) Common Standards Monitoring Guidance for Birds. Updated August 2004. ISSN 1743-8160 (Online)
[27] JNCC (2015) Common Standards Monitoring Guidance for Freshwater Fauna. Updated March 2015. ISSN 1743-8160 (Online)

Strict biosecurity procedures will be employed to minimise the risk of accidental spread of disease (e.g. crayfish plague) and all specimens captured should be carefully processed, recording species, sex and missing limbs or injuries on the CSM forms provided. Any evidence of invasive non-native crayfish species will be recorded and communicated to Southern Water.

A class licence to survey and handle white-clawed crayfish is required from NE and, should traps be needed, their use will require approval from the EA. Access permissions and risk assessments must be completed prior to undertaking any on-site activities.

Surveys should be undertaken between July and October (inclusive) with the optimum period from the second half of July through to late September.

Water vole

The survey will follow the strategic survey methodology described by the Water Vole Conservation Handbook 3rd edition[28] and The Water Vole Mitigation Handbook[29] and will be completed for each site (and mitigation should follow this).

The monitoring sites will be located so that they sit over known locations for water vole (e.g. from Local Records Centre, EA and Wildlife Trust). The remainder of the survey area will then be sampled every 5 kilometres within habitat which could potentially be suitable for this species with the objective of identifying previously unknown populations.

The surveys will be undertaken between April and September.

Any evidence of mink, or other Wildlife and Countryside Act Schedule 9 species, recorded during surveys will be recorded and highlighted to Southern Water.

Designated sites and habitats

The features to be monitored are known as interest features for which the site has been notified or designated. They include individual habitat types, species and physical environment features, and also complex features such as habitat mosaics and species assemblages. Each interest feature must be monitored separately and will be covered by one of the methods above in this section.

Monitoring for each specific water dependent habitat should be designed with the following aims in mind[30]:

- to cover all the attributes highlighted in the assessments indicating habitat quality
- to monitor at 'wetland' and community levels, as appropriate for each attribute.

Baseline maps of the designated site should be produced, showing the boundaries of the interest features, the extent of the structural elements and the distribution of key vegetation communities and nationally rare/scarce or locally distinctive plant species. Aerial photography can help in the production of the maps. The use of GPS to determine the position of interfaces and notable species is recommended. These maps can subsequently be used during droughts to assess change.

During monitoring, aerial photography may be adequate for making a rapid determination of the extent of features and of component wetlands, although some ground-truthing may be necessary. Aerial photographs may also be useful for assessing the overall cover of trees and shrubs. Visual assessment along a structured walk or transects is recommended for monitoring habitat and vegetation structure, and the presence of indicators of local distinctiveness. This method can also be used for assessing cover of woody species. The

[28] Gelling, M., Moorhouse, T., & Strachan, R. (2011). Water Vole Conservation Handbook.
[29] Dean M, Strachan R, Gow D, Andrews R (2016) *The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series)* Ed.s Fiona Mathews and Paul Chanin. The Mammal Society, London.
[30] JNCC, Common Standards Monitoring Guidance for Lowland Wetland updated January 2014 and March 2015 respectively, ISSN 1743-8160 (Online)

line of transects and the route of structured walks should be set using information from the baseline map, to make sure that all the necessary habitats, vegetation types, populations of notable species and other indicators of local distinctiveness can be examined.

The final assessment of the wetland interest feature should be produced by combining the information from all of the component water influenced habitats that have been monitored.

Invasive and non-native species

Collate available local records to improve baseline datasets.

Complete walkover survey of each impacted reach to understand coverage of species and any other non-native invasive species (INNS) and assess risk posed by implementing the Drought Permit or Order. Surveyors will adopt appropriate biosecurity measures in line with an agreed biosecurity method statement.

Appendix B: Specific Monitoring Package for Lower Itchen

INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST

Appendix C: Specific Mitigation Package for Lower Itchen

INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST

Appendix D: Specific Monitoring Package for Candover

INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST

Appendix E: Specific Mitigation Package for Candover

INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST

Appendix F: Specific Monitoring Package for Test Surface Water

INFORMATION IN SEPARATE PDF, AVAILABLE UPON REQUEST

Appendix G: Specific Mitigation Package for Test Surface Water

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