



Bristol Water

Final Water Resources Management Plan 2019

Habitats Regulations Assessment of the Final WRMP 2019



August 2019

Amec Foster Wheeler Environment
& Infrastructure UK Limited (now Wood)

Report for

Patric Bulmer
Head of Water Resources and Environment
Bristol Water plc
PO Box 218,
Bridgwater Road,
Bristol
BS13 7AT

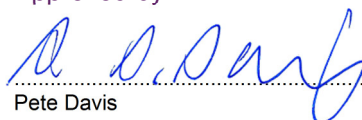
Main contributors

Mike Frost

Issued by


.....
Mike Frost

Approved by


.....
Pete Davis

Amec Foster Wheeler (now Wood)

Canon Court
Abbey Lawn
Abbey Foregate
Shrewsbury SY2 5DE
United Kingdom
Tel +44 (0) 1743 342 000

Doc Ref. S38948rr040i5

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Document revisions

No.	Details	Date
1	Draft for client review	Nov 2017
2	Issued for consultation	Nov 2017
3	Revised Draft WRMP HRA (draft)	Aug 2018
4	Revised Draft WRMP HRA	Aug 2018
5	Final WRMP HRA	Aug 2019

Executive summary

Background

All water companies in England and Wales must set out their strategy for managing water resources across their supply area over the next 25 years. This statutory requirement is defined under the Water Act 2003, which also sets out how water companies should publish a Water Resources Management Plan (WRMP) for consultation, setting out how they will balance supply and demand over the 25-year planning period. Bristol Water (BW) is currently preparing its WRMP for the period 2020 to 2045. As part of the plan development process BW issued a draft WRMP for a 12-week consultation on 8th March 2018. Following an analysis of the submissions, and further modelling, Bristol Water produced a revised draft WRMP (rdWRMP19) in August 2018 for review by the Secretary of State (SoS). This review has been completed, and BW has received direction to publish its Final WRMP 2019.

The WRMP process identifies potential deficits in the future availability of water, taking into account

- ▶ abstraction volumes allowed under current statutory licences, as impacted by actual source yield;
- ▶ any future reductions in abstraction expected under environmental improvement regimes (e.g. sustainability reductions required due to the Review of Consents or Water Framework Directive); and
- ▶ predicted future demand for water based on government data for population and housing growth plans.

It then proposed solutions ('Preferred Options') for maintaining the balance between water available and future demand for water.

Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* (the 'Habitats Regulations') states that if a plan or project is "(a) is likely to have a significant effect on a European site¹ or a European offshore marine site² (either alone or in combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site" then the competent authority must "...make an appropriate assessment of the implications for the site in view of that site's conservation objectives" before the plan is given effect.

The process by which Regulation 63 is met is known as Habitats Regulations Assessment (HRA)³. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. BW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA.

In developing the WRMP, BW has undertaken a comprehensive assessment of future available water supplies and the demand for water, extensive stakeholder engagement and a rigorous process of options

¹ Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para.176; TAN5 para. 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites. Additional information on European site designations is provided in Appendix A.

² 'European offshore marine sites' are defined by Regulation 15 of *The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended); these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

³ The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more accurately termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process.

identification and appraisal. As part of this plan preparation process, Amec Foster Wheeler Environment and Infrastructure UK Ltd (Amec Foster Wheeler, now Wood) was commissioned by BW to undertake the data collection and interpretation required to support an HRA of its WRMP for the period 2020 to 2045, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or significant adverse effects on the integrity of any European sites.

The HRA process (as applied to the WRMP) included the following steps:

- i. An initial review of the Feasible Options, to assist UU's selection of Preferred Options.
- ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanied the Preferred Options consultation.
- iii. A formal assessment of the post-consultation revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption.
- iv. A formal assessment of the Final WRMP following SoS review (this report).

Assessment Summary

Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP including further reductions in leakage, increased take up of metering and increased water efficiency. Applying the changes to the supply demand balance, BW are now forecasting a small residual supply deficit of 0.2 MI/d at 2035 rising to 9.18 MI/d at 2045. BW will address this by the use of three leakage reduction / distribution management preferred options which provide a combined yield of 9.83 MI/d:

- ▶ Option D21.1 (Active Leakage Control): yield of 2.83 MI/d in 2024/25;
- ▶ Option D21.2 (Active Leakage Control): yield of an additional 0.5 MI/d in 2029/30 and an additional 1 MI/d by 2034/35.
- ▶ Option P20 (Reduced leakage from raw water mains): enhanced leakage detection / raw mains repairs/replacement - yield of 5.5MI/d.

These options have been screened for their potential to affect European sites. In summary, the construction-phase effects of the Leakage Reduction options cannot be meaningfully assessed at the plan-level as the location (etc.) of any works required is not known and will be established as part of an ongoing programme of detection and repair. However, it is clear that the options do not have a risk of unavoidable adverse effects, based on the scale and type of works expected, and that established best-practice measures (**Appendix G**) and scheme-level assessment can be relied on to ensure that significant or significant adverse effects do not occur.

BW's WRMP will therefore have **no adverse effects, alone or in combination**. This conclusion does not remove the need for consideration of Regulation 63 at the project-level, which will be required to address those aspects and uncertainties that cannot be assessed at the plan-level, such as the effects of individual leakage-reduction schemes.



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1. Introduction

Bristol Water (BW) has set out its strategy for managing its water resources over the next 25 years in its Water Resources Management Plan (WRMP). This plan is subject to the *Conservation of Habitats and Species Regulations 2017* and so requires an assessment of its effects on European sites, known as 'Habitat Regulations Assessment' (HRA).

1.1 The Bristol Water WRMP

Since 2007 all water companies have had a statutory duty to prepare, maintain, and publish a Water Resources Management Plan (WRMP) under the Water Industry Act 1991, as amended by the Water Act 2003 and the Water Act 2014 (although informal water resources planning has been a fundamental activity for water companies for decades). A WRMP sets out how the water company intends to maintain the balance between water supply and demand to ensure the security of supply over the coming 25 years in a way that is economically, socially, and environmentally sustainable. WRMPs are revised every 5 years and Bristol Water (BW) has prepared its next plan (WRMP19) which will cover the period 2020 to 2045 (and beyond).

The WRMP process identifies potential deficits in the future availability of water and sets out the possible solutions required to maintain the balance between water available and future demand for water. The process initially reviews as many potential solutions as possible (the 'unconstrained list' of options) to identify 'feasible' options for each Water Resource Zone (WRZ) where deficits are predicted. These 'feasible' options are reviewed according to an industry standard methodology to identify 'Preferred Options' to resolve any supply deficits in relation to financial, environmental and social costing. This preferred list is based on standard assessment methodologies set out in the WRMP, as well as the Strategic Environmental Assessment (SEA) and the Habitats Regulations Assessment (HRA). The WRMP is also linked to other water resource planning and policy documents, including the Drought Plan, Water Efficiency Strategy and Leakage Strategy.

As part of the preparation of WRMP19, BW completed and issued a draft WRMP19 for a 12-week public consultation on 8th March 2018. Following an analysis of the submissions, and further modelling, BW made a number of changes which were incorporated into a 'revised draft WRMP', including:

- ▶ further reductions in leakage to ensure alignment with the Ofwat challenge of 15% reductions during AMP7 and then going beyond this by 2045;
- ▶ increasing the take up of water metering, from 66% by the start of 2020 to 87% by 2045;
- ▶ increasing water efficiency to achieve a reduction in per capita consumption (PCC) from 141 litres/head/day in 2020 to 129 litres/head/day in 2045 and 110 litres/head/day in 2050;
- ▶ further reductions in leakage from raw water systems and at water treatment works; and
- ▶ an updated assessment of the deployable output (reliable supply) of water sources in line with the new national methodology for drought resilience which was issued after completion of the 'draft WRMP'.

The 'revised draft WRMP' was submitted to the Secretary of State for approval; BW has now received direction to publish its Final WRMP 2019. The Final WRMP 2019 contains no material changes to the revised draft WRMP options.

1.2 Habitats Regulations Assessment

Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* (the 'Habitats Regulations') states that if a plan or project is "(a) is likely to have a significant effect on a European site⁴ or a European offshore marine site⁵ (either alone or in combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site" then the competent authority must "...make an appropriate assessment of the implications for the site in view of that site's conservation objectives" before the plan is given effect.

The process by which Regulation 63 is met is known as Habitats Regulations Assessment (HRA)⁶. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. BW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA.

1.3 This Report

Regulation 63 essentially provides a test that the final plan must pass; there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. the unconstrained or Feasible Options). However, it is accepted best-practice for the HRA of strategic planning documents to be run as an iterative process alongside plan development, with the emerging proposals or options assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or significant adverse effects on any European sites, either alone or 'in combination' with other plans. This is undertaken in consultation with Natural England (NE), Natural Resources Wales (NRW) and other appropriate consultees.

BW commissioned Wood (formerly Amec Foster Wheeler) to undertake the data collection and interpretation required to support an HRA of its WRMP for the period 2020 to 2045, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or significant adverse effects on the integrity of any European sites. The HRA process (as applied to the WRMP) included the following steps:

- i. An initial review of the Feasible Options, to assist BW's selection of Preferred Options.
- ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanied the Preferred Options consultation.
- iii. A formal assessment of the post-consultation revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption.
- iv. A formal assessment of the Final WRMP following Secretary of State review (this report).

This report summarises Wood's assessment of BW's Final WRMP 2019 against the conservation objectives of any European sites that may be affected, and summarises the iterative HRA process that has been undertaken to support the WRMP and ensure that it meets the requirements of Regulation 63. The report sets out:

⁴ Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para. 176; TAN5 para. 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites. Additional information on European site designations is provided in Appendix A.

⁵ 'European offshore marine sites' are defined by Regulation 15 of *The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended); these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

⁶ The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more accurately termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process.



- ▶ the approach to HRA of WRMPs, including the key issues for these strategic plans (Section 2);
- ▶ a summary of the Feasible Options review (Section 3);
- ▶ the screening and (where required) appropriate assessment of the Final WRMP options and the WRMP as a whole, including 'in combination' assessments (Section 4); and
- ▶ the conclusion of the HRA of BW's Final WRMP 2019 (Section 5).

2. Approach to HRA of WRMPs

WRMPs identify specific measures for addressing predicted deficits, but the strategic nature of the WRMP creates some challenges for HRA as there are fundamental limitations on the scheme details and data that are available at the plan-level. This section summarises the approach used for HRAs of WRMPs, and the mechanisms employed to address residual uncertainties.

2.1 Plan-Level HRA

An HRA involves determining whether there will be any LSEs on any European sites as a result of a plan's implementation, either on its own or 'in combination' with other plans or projects (referred to as 'screening'); and, if so, whether it can be concluded that these effects will not have an adverse effect on the site's integrity (referred to as 'appropriate assessment'). European Commission guidance⁷ suggests a four-stage process for HRA, although not all stages will always be required (see **Box 3**).

Box 1 – Stages of Habitats Regulations Assessment

Stage 1 – Screening:

This stage identifies the likely impacts upon a European site of a project or plan, either alone or 'in combination' with other projects or plans, and considers whether these impacts are likely to be significant.

Stage 2 – Appropriate Assessment:

Where there are likely significant effects, or where this is uncertain, this stage considers the effects of the plan or project on the integrity of the relevant European Sites, either alone or 'in combination' with other projects or plans, with respect to the sites' structure and function and their conservation objectives. Where it cannot be concluded that there will be no adverse effects on sites' integrity, it is necessary to consider potential mitigation for these effects.

Stage 3 – Assessment of Alternative Solutions:

Where adverse effects remain after the inclusion of mitigation, this stage examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of European sites.

Stage 4 – Assessment Where No Alternative Solutions Exist and Where Adverse Impacts Remain:

This stage assesses compensatory measures where it is deemed that the project or plan should proceed for imperative reasons of overriding public interest (IROPI). The EC guidance does not deal with the assessment of IROPI.

The 'screening' test or 'test of significance' is a low bar: a plan should be considered 'likely' to have an effect if the competent authority (in this case BW) is unable (on the basis of objective information) to exclude the possibility that the plan could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be 'significant' if it could undermine the site's conservation objectives.

An 'appropriate assessment' stage provides a more detailed examination of the plan (or its components) where the effects are significant or uncertain⁸, to determine whether there will be any 'adverse effects on integrity' (AEoI) of any sites as a result of the plan. It should be noted that the approach to the 'appropriate assessment' is not prescribed: it must simply be 'appropriate' to the plan being considered and the scale and nature of the likely effects; and be sufficient to remove any residual uncertainties regards the effect of the proposals on site and feature integrity.

The approach summarised in **Box 1** works well at the project-level where the scheme design is usually established and possible effects on European sites can be assessed (usually quantitatively) using a stepwise process and detailed scheme-specific data. In contrast, the fundamental nature of the WRMP presents a

⁷ *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC 2002).

⁸ i.e. 'likely significant effects', where the possibility of significant effects cannot be excluded.

number of distinct challenges for a 'strategic' HRA and it is therefore important to understand how the WRMP is developed, how it would operate in practice, and hence how it might consequently affect European sites. In particular, there is a potential conflict between the specific nature of the options; the requirement that the options (and hence the plan) have 'no likely significant effects (LSE)' or 'no adverse effects'; the level of certainty that can be established at the strategic level; and the desirability of not excluding every potential solution which cannot be conclusively investigated within the WRMP development timescales.

2.2 The WRMP

The WRMP process establishes supply and demand balances for each WRZ, identifying potential supply deficits between water available and the projected demand within the WRZ. Options are then proposed to resolve these deficits. The estimation of Deployable Output (DO) is based on:

- ▶ abstraction volumes allowed under current statutory licences, as impacted by actual source yield;
- ▶ any future reductions in abstraction expected under environmental improvement regimes (e.g. sustainability reductions required due to the Review of Consents (see **Appendix B**) or Water Framework Directive); and
- ▶ predicted future demand for water based on government data for population and housing growth plans.

Demand forecasts are completed in accordance with Water Resources Planning Guideline⁹ and consider (*inter alia*):

- ▶ Estimates of baseline demand from:
 - ▶ household customers;
 - ▶ non-household customers;
 - ▶ water leaks;
 - ▶ any other losses or uses of water such as water taken unbilled.
- ▶ Future demands which will be subject to many influences, including:
 - ▶ population changes, including changes in occupancy;
 - ▶ changes in water use behaviour (in both household and non-household customers);
 - ▶ metering;
 - ▶ increasing water efficiency and sustainable water use practices;
 - ▶ changing design standards of devices that use water (eg more efficient washing machines);
 - ▶ changes in technology and practices for leakage detection and repair;
 - ▶ climate change; and
 - ▶ weather patterns.

The WRMP therefore accounts for these demand forecasts based on historical trends, an established growth forecast model, and a thorough review of water resource policy and planning documents.

The WRMP process initially sets out an 'unconstrained list' of possible solutions regardless of cost or technical merit. This is then refined to identify '**Feasible Options**' and subsequently the '**Preferred Options**'. This filtering process is based on a range of assessments including SEA and the principles of

⁹ Environment Agency and Natural Resources Wales (2018) *Water Resources Planning Guideline: Interim Update*. Available at: <https://cdn.naturalresources.wales/media/686174/interim-wrpg-update-july18-final-changes-highlighted.pdf>

HRA. The list of Feasible Options is subject to financial, environmental and social costing, with these options then reviewed and assessed to derive 'Preferred Options' for the zones that are predicted to be in deficit within the planning horizon (25 years).

Options to resolve deficits or predicted deficits can be broadly categorised as follows:

- ▶ **Production and Resource Management** - options that vary yield (e.g. new abstractions) or which reduce/ modify usage from where it is abstracted to where it enters the network;
- ▶ **Customer-side Management** - options which reduce customers' consumption; and
- ▶ **Distribution Management** - options within or affecting the distribution network, such as leakage reduction or new distribution pipelines.

These are also characterised as '**demand-side**' measures (options which reduce consumption post-treatment, such as metering or leakage reduction) or '**supply-side**' measures (options that vary yield).

The HRA focuses on the supply-side options¹⁰ and their potential effects. The options will generally require one or more of the following:

- ▶ development of new surface or groundwater sources, or desalination of sea water ('new water');
- ▶ modification of an existing licence to alter the operational and network regime (e.g. additional abstraction);
- ▶ use of 'spare water' from existing licensed sources through operational adjustments or capital works (e.g. new treatment facilities);
- ▶ re-instatement of existing, mothballed sources (with or without current licences);
- ▶ capital works to the distribution network; or
- ▶ transferring water from adjacent water companies with a supply / demand surplus.

2.3 HRA of the WRMP

The HRA focuses on the supply-side options proposed to resolve predicted deficits. It does not assess the existing consents regime: the examination of existing individual consents was undertaken by the Environment Agency (EA) (NRW in Wales) through the Review of Consents process (now through Water Framework Directive assessments) and the HRA of the WRMP cannot and should not replicate this. Any licence amendments required by RoC or WFD (see **Appendix B**) are factored into the DO calculations, and the EA has confirmed that these are valid for the planning period. Consequently, the WRMP will only affect European sites through any new resource and production-side options it advocates to resolve deficits, and not through the existing permissions regime¹¹.

The various supply-sided options could affect European sites through their implementation (for example, construction of new pipelines) or operation (e.g. new abstractions), and these effects can broadly be categorised as:

- ▶ **direct** (activities that affect a European site directly; for example, construction of a new intake within an SPA reservoir; discharges to an SAC from a desalination plant; new or increased abstractions from an SAC river);

¹⁰ 'Demand-side' options (i.e. options designed to reduce water use such as metering or provision of water butts) are considered unlikely to have any significant or adverse effects on any European sites (see Section 2.3).

¹¹ It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria); BW are not aware of any current uncertainties regarding its abstractions or the RoC outcomes, although any such uncertainties that are subsequently identified can be addressed through the five-yearly WRMP review process.

- ▶ **indirect** (activities that affect a European site indirectly through an impact pathway; for example, construction affecting a downstream SAC through sediment release; new abstractions entraining SAC fish species away from the SAC itself); or
- ▶ **consequential** (for example, adjusting or stopping a bulk transfer between water resource zones, or between water companies, may have indirect 'consequential' effects on distant European sites if this results in additional abstraction to make up a shortfall; this is more typically a type of 'in combination' effect).

The HRA of the WRMP must consider any European sites that could be affected by the implementation of the Plan, whether they are within the geographical boundaries of the BW supply area or not. When determining this it is also necessary to consider potential 'in combination' effects; these are possible cumulative effects on European sites caused by the WRMP, together with the effects of any existing or proposed projects or plans¹². However, it must be recognised that many of the possible 'in combination' effects (particularly with respect to water resources and land-use plans) are explicitly considered and accounted for as part of the WRMP development process (see below).

As noted, the HRA of the WRMP focuses on the 'supply-side' options only. It does not explicitly consider demand- or post-distribution options designed to reduce treated water use (such as metering or provision of water butts), or leakage reduction options, as it is considered that these cannot negatively affect any European sites¹³.

The HRA process (as applied to the WRMP) therefore includes the following steps:

- i. An initial review of the Feasible Options, to assist BW's selection of Preferred Options.
- ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanied the Preferred Options consultation.
- iii. A formal assessment of the post-consultation revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption.
- iv. A formal assessment of the Final WRMP following SoS review (this report).

For each step, the assessment identifies the location and the anticipated outcomes of each option based on the option descriptions provided by BW. GIS is then used to identify all European sites within a precautionary 20km 'zone of influence', with sites beyond this considered where reasonable impact pathways are present based on the scheme description (for example, receptors downstream of significant new abstractions). This is a suitably precautionary approach that has important advantages due to the number of Feasible Options and the benefits of a consistent approach¹⁴. The possible effects of each option on European sites and their interest features is then assessed, based on

¹² *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC 2002).*

¹³ The only realistic mechanism for a negative effect would through direct encroachment or proximal effects at the local-level (for example a leaking pipe might be located in or near a SAC), but this cannot be meaningfully assessed at the strategic level since location-specific information on the options is not available without specific investigations, which would form part of the package (i.e. the precise location and severity of most leakages is not known ahead of detection). Any assessment of these effects must necessarily be deferred to the project-level (see 'Mitigating Uncertainty and 'down the line' assessment, below) and the WRMP does not imply any approval for options or remove the need for project-level assessments.

¹⁴ 'Arbitrary' buffers are not generally appropriate for HRA. However, as distance is a strong determinant of the scale and likelihood of most effects the considered use of a suitably precautionary search area as a starting point for the screening (based on a thorough understanding of both the options and European site interest features) has some important advantages. Using buffers allows the systematic identification of European sites using GIS, so minimising the risk of sites or features being overlooked, and also ensures that sites where there are no reasonable impact pathways can be quickly and transparently excluded from any further screening or assessment. When assessing multiple options it also has the significant advantage of providing a consistent point of reference for consultees following the assessment process, and the 'screening' can therefore focus on the assessment of effects, rather than on explaining why certain sites may or may not have been considered in relation to a particular option.

- ▶ the anticipated operation of each option and predicted zone of hydrological influence¹⁵;
- ▶ any predicted construction works required for each option¹⁶;
- ▶ the European site interest features and their sensitivities; and
- ▶ the exposure of the site or features to the likely effects of the option (i.e. presence of reasonable impact pathways).

Data Collection

Data on the Feasible and Preferred Options are provided by BW. These data include descriptions of each option; the likely outcomes (design yields/capacities); the scheme requirements; the type and indicative location of any works; and an outline of how the option would function. Further information on general water resources was obtained from BW (groundwater (GW) and surface water (SW) abstraction locations, source operational parameters, WRZ operation, emergency or drought plan operations) and the EA / Natural Resources Wales (NRW).

Data on European site locations; interest features; conservation objectives; and condition assessments were collected from the Joint Nature Conservation Committee (JNCC), NRW and Natural England (NE). These data were used to determine the locations of the sites relative to the options; the condition, vulnerabilities and sensitivities of the sites and their interest features; and the approximate locations of the interest features within each site (if reported). European sites within 20km of the BW supply area and their interest features are listed in **Appendix C**, although it should be noted that sites outside this area were also considered where there was a potential risk of effects from an option. **Appendix D** identifies those European site interest features considered 'water resource dependent' by the EA.

Review of Feasible Options

The Feasible Options review is reported in the following Amec Foster Wheeler Technical Note (see Appendix E):

- ▶ *BW WRMP 2019: Habitats Regulations Assessment – Initial Review of Feasible Options.*
Report Ref. S38948rr030i1

The Feasible Options reviews are not 'draft HRAs', 'screening', or similar assessment of the final plan and are not intended to provide a definitive conclusion on the likely effects of the WRMP or its options; rather, the assessment principles that underpin the HRA process are applied to the Feasible Options to:

- ▶ guide the selection of Preferred Options by BW; and
- ▶ inform the scope of any further assessments likely to be required as the options are refined and developed, including any data likely to be required to support the selection of an option as a Preferred Option.

A detailed 'in combination' assessment is not undertaken at the Feasible Options stage although the potential for options to operate 'in combination' with each other, and with other BW plans (e.g. the Drought Plan) is considered but not explicitly reported; the 'in combination' assessment is completed at the Preferred Options stage. The review of the Feasible Options assumes that normal best-practice project level planning, avoidance and mitigation measures (see **Appendix G**) will be employed at project delivery (see also 'Assessment Assumptions', below, in relation to the incorporation of mitigation).

¹⁵ Note that for groundwater sources and groundwater fed habitats, the EA consider that significant effects as a result of ground water abstractions are unlikely on European sites over 5 km from the abstraction (National EA guidance: *Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff*). This premise is applied to the option assessments.

¹⁶ Note that the location of some works, particularly pipelines outside BW-owned land, are only tentatively defined by the WRMP. In these instances, the 'to' and 'from' locations were identified and a broad study area used to identify any European sites that could potentially be affected by a route between these locations.

Preferred Options Assessment

The Preferred Options assessment employs the assessment principles used at the Feasible Option stage, with the addition of an 'in combination' assessment (see below). For each option, the Preferred Options assessment comprises:

- ▶ a 'screening' of European sites to identify those sites and features where there will self-evidently be 'no effect' (as opposed to 'no likely significant effects') due to the option¹⁷, and those where significant effects are likely or uncertain; and
- ▶ an 'appropriate assessment' of any options where significant effects cannot be excluded.

The Preferred Option assessments are set out in Section 4. Note that the 'low-bar' principle has been used for the screening of the Preferred Options; any reasonable impact pathways identified are investigated further in an appropriate assessment rather than through a more detailed 'secondary screening' or similar. Consequently, the appropriate assessment is 'appropriate' to the nature or the WRMP, and the scale and likelihood of any effects. Undertaking an appropriate assessment does not necessarily imply a conclusion of 'significant effects' for those sites or aspects that are 'screened in' since in many cases the assessment is completed due to a residual uncertainty which the assessment is intended to resolve. The 'appropriate assessment' stage may therefore conclude that the proposals are likely to have an adverse effect on the integrity of a site (in which case they should be abandoned, modified, or otherwise mitigated); or that option will have no adverse effects (i.e. an effect pathway exists, but those effects will not undermine site integrity); or that the effects will, if re-screened, be 'not significant' (taking into account the additional assessment or perhaps additional measures proposed for inclusion in the final plan).

Assessment Assumptions

Several assumptions are made during the option assessment process; in summary, the assessments assume that

- ▶ the existing consents regime (confirmed under the RoC and taking into account any required sustainability reductions) is effectively a 'no adverse effect' baseline and that options that operate within the terms of existing licences will have 'no adverse effect';
- ▶ that there is 'water available for use' where this is confirmed by the EA through the relevant Catchment Abstraction Management Strategy; and
- ▶ that all normal licensing and consenting procedures will be employed at option delivery, including HRA.

It should be noted that recent case law known as 'People Over Wind'¹⁸ has altered how avoidance and mitigation measures are accounted for by the HRA. The 'People Over Wind' judgement states that "...it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects [mitigation] of the plan or project on that site". This contrasts with established practice in this area (based on the "Dilly Lane" judgment) where avoidance and mitigation measures have typically been accounted for during screening.

There is currently little information on the practical implementation of the 'People over Wind' judgement, particularly for strategy-level HRA, although broad guidance has been issued by the Planning Inspectorate (PINS)¹⁹. In previous WRMP rounds, HRAs of WRMPs typically assumed that established best-practice avoidance and mitigation measures (see **Appendix G**) would be employed at the project level throughout scheme design and construction to safeguard environmental receptors, including European site interest features, and accounted for this at the screening stage. However, it is arguable that an assumption such as

¹⁷ Note, for options with 'no effects' there is no possibility of 'in combination' effects.

¹⁸ Case C 323/17 Court of Justice of the European Union: People Over Wind

¹⁹ PINS Note 05/2018: *Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind, Peter Sweetman v Coillte Teoranta.*

this, albeit in relation to a lower-tier project that would itself be subject to HRA, might constitute an 'avoidance measure' that the WRMP is effectively relying on to ensure that significant effects do not occur.

In this instance, therefore:

- ▶ As the Feasible Options review has no statutory basis²⁰ the established scheme-level best-practice avoidance and mitigation measures noted in **Appendix G** are accounted for when considering the likelihood of a European site or feature being affected by an option. This is to ensure that the HRA process provides robust, proportionate and pragmatic information for BW to factor in to its consideration of the Feasible Options and choice of Preferred Options.
- ▶ For the Preferred Options, which constitute the plan being proposed and assessed, the established best-practice avoidance and mitigation measures noted in **Appendix G** are not taken into account at screening, but are instead introduced at the 'appropriate assessment' stage (if required).

In combination effects

HRA requires that the effects of other projects, plans or programmes be considered for effects on European sites 'in combination' with the WRMP. There is limited guidance on the precise scope of 'in combination' assessments for strategies, particularly with respect to the levels within the planning hierarchy at which 'in combination' effects should be considered. The 'two-tier' nature of the WRMP (i.e. a plan with specific schemes) also complicates this assessment.

Broadly, it is considered that the WRMP could have the following in combination effects:

- ▶ within-plan effects - i.e. separate options within the WRMP affecting the same European site(s);
- ▶ between-plan abstraction effects - i.e. effects with other abstractions, in association with or driven by other plans (for example, other water company WRMPs);
- ▶ other between-plan effects - i.e. 'in combination' with non-abstraction activities promoted by other plans – for example, with flood risk management plans.
- ▶ between-project effects – i.e. effects of a specific option with other specific projects and developments.

In undertaking the 'in combination' assessment it is critical to note that:

- ▶ the Review of Consents (RoC) process has completed an 'in combination' assessment for all currently licensed abstractions (and many unlicensed abstractions);
- ▶ the RoC underpins the WRMP, which also explicitly accounts for land-use plans, growth forecasts and population projections when calculating future water demand (and hence areas with potential deficits);
- ▶ the detailed examination of non-BW abstraction or discharge consents for 'in combination' effects can only be undertaken by the EA or NRW through their permitting procedures; and
- ▶ known major projects that are likely to increase demand (e.g. power station decommissioning) are also taken into account during the development of the WRMP.

Therefore:

- ▶ It is considered that (for the HRA) potential 'in combination' effects in respect of water-resource demands associated with known plans or projects will not occur since these demands are explicitly considered when developing the WRMP and its associated plans. The main exception to this is other water company WRMPs, which are developed concurrently with the BW WRMP and so cannot necessarily be fully assessed at the Preferred Options stage; for these, the

²⁰ i.e. there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. the unconstrained or Feasible Options).

potential for the BW Preferred Options to operate 'in combination' is assessed and (if necessary) conclusions caveated subject to the future review of the consultation versions of the other companies' WRMPs.

- ▶ With regard to other strategic plans, the list of plans included within the SEA is used as the basis for a high-level 'in combination' assessment (see **Appendix F**). The SEA is used to provide information on the themes, policies and objectives of the 'in combination' plans, with the plans themselves are examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- ▶ With regard to projects:
 - ▶ The WRMP explicitly accounts for the water-resource demands of known major projects (e.g. power station decommissioning; large-scale housing development) during its development, and so these 'in combination' effects are not considered in detail.
 - ▶ Potential 'in combination' effects between individual options and Nationally Significant Infrastructure Projects (NSIPs) identified by The Planning Inspectorate, and other known major projects, are assessed.
 - ▶ It is not possible to produce a definitive list of minor existing or anticipated planning applications within the zone of influence of each proposed option to review possible local 'in combination' effects. The nature of the WRMP and the timescales over which it operates ensure that generating a list of local planning applications at this stage would be of very little value, and this aspect can only be meaningfully undertaken at the scheme-level.

Uncertainty and determining significant or adverse effects

The WRMP is a high-level strategy for managing water resources across the BW supply area over the next 25 years. Due to its wide geographic scale and long-term outlook there are inevitably many uncertainties inherent within it. It is therefore similar, in this respect, to a typical strategic land-use plan (such as a Core Strategy), which also has inherent uncertainties around its implementation, and hence over its likely effects. Usually, with strategy-level HRAs, uncertainty is addressed by including caveats and 'avoidance measures' or mitigation within the policy text to ensure that significant or adverse effects will not occur. This is possible because the key components of the strategic plan (i.e. the policies) are inherently malleable from the outset, and can be easily abandoned or modified if required.

This approach is more difficult to apply directly to the WRMP because:

- ▶ the strategic nature of the WRMP ensures that there are fundamental limitations on the scheme details that are available for the HRA; **but**
- ▶ its principal components (the options that are proposed to resolve actual or predicted deficits) are generally specific schemes with a clear spatial component, rather than the broad policies that are characteristic of most strategies.

This means that potential effects on specific European sites are much easier to envisage or identify (due to the specific nature of the options and the known 'sensitivities' of the interest features), but often harder to quantify and assess (due to the strategic nature of the plan and frequent absence of detailed information on each option; i.e. the 'exposure' of an interest feature to a potential effect cannot necessarily be established).

Normally, where there is uncertainty over likely effects then additional data must be obtained until that uncertainty can be resolved; or 'avoidance measures' or mitigation specified that will remove the uncertainty; or the option should be abandoned and not included in the final plan. However, this can present difficulties for plans such as the WRMP since:

- ▶ the options have to solve specific deficits but are heavily constrained by existing sources and infrastructure, the availability of new resources, and the patterns of customer demand;
- ▶ it is possible that there will be several options where the precise effects are unclear, but which BW or the EA would wish to be able to explore in more detail at a later stage (and therefore would wish to include as Preferred Options within the WRMP); and

- ▶ the WRMP itself is a key component of the regulatory mechanism by which funding is secured for the detailed design, feasibility studies and investigations required for new supply-side measures.

Consequently, for some options there may be uncertainties which cannot be fully resolved at the strategic level, which in some cases would make a conclusion of 'no significant effects' or 'no adverse effects' difficult. Indeed, for some schemes it will only be possible to fully assess any potential effects at the pre-project planning stage or permit/order application stage, when certain specific details are known; for example: construction techniques or site-specific survey information. In addition, it may be several years before an option is employed, during which time other factors may alter the likely effects of the option.

For example, an option that proposes a new water transfer main between existing pumping stations will have a limited number of feasible routes. These can be theoretically assessed at a high-level for potential impacts on European sites, and routes with obvious and unavoidable 'likely significant effects' excluded from the WRMP. However, in most instances a specific route (or even a range of routes) will not be determined at the strategic level and any route would, in any case, be largely determined by design-stage constraints (e.g. land ownership; access; engineering feasibility; and so on). If the route had to cross a SAC river then 'significant effects' (at the strategic level) are clearly conceivable and arguably likely, which would suggest that the option should be abandoned. But it is equally likely that most potential construction effects could almost certainly be avoided or suitably mitigated through project-level design (e.g. ensuring the use of existing road crossings for construction, or using trenchless techniques), which would itself be subject to an HRA at project level.

As a result, the HRA must consider and assess the specific options within the WRMP **appropriately**, whilst recognising (and mitigating) the inherent uncertainties within those options (i.e. the absence of detailed scheme design or parameters) **and** within the plan itself (i.e. so that the WRMP, as a whole, is compliant with the HRA regulations even if some residual uncertainty persists with some options). Ultimately, the plan should not create a scenario where significant adverse effects are possible ('likely') if these cannot clearly be avoided with appropriate scheme-level measures; these may be established best-practice mitigation and avoidance measures, or bespoke requirements identified at the plan-level.

Mitigating uncertainty and 'down the line' assessment

For most options, even at the strategic level, it will be clear if adverse effects are likely to be unavoidable and in these instances the option should not be included as a Preferred Option within the WRMP since plans should not include proposals which would be likely to fail the Habitats Regulations tests at the project application stage. For other options, however, the effects may be uncertain and it is therefore important that this uncertainty is addressed either through additional investigation or (if this is not possible) through appropriate mitigation measures that ensure that the *plan* is compliant with the Habitats Regulations.

For many options, particularly those involving construction, it is reasonable to assume that established mitigation measures which are typically successful can be employed at the project stage to avoid significant or adverse effects – for example, avoiding works near SPAs at certain times of the year. In these instances it is considered that the option can be included within the WRMP provided that any specific measures that are likely to be required are identified to ensure that they are appropriately addressed throughout the project planning process (e.g. constraints on the timing of construction activities).

Nevertheless, it is possible that the potential effects (or required mitigation) for some options cannot be clearly determined at the strategic-level. In these instances, current guidance²¹ indicates that it may be appropriate and acceptable for some assessment to be undertaken 'down-the-line' at a lower tier in the planning hierarchy, if:

- ▶ the higher tier plan appraisal cannot reasonably predict the effects on a European site in a meaningful way; whereas

²¹ e.g. SNH (2017). *Guidance for Plan Making Bodies in Scotland*. [Online]. Available at: <https://www.snh.scot/planning-and-development/environmental-assessment/habitat-regulations-appraisal/>

- ▶ the lower tier plan, which will identify more precisely the nature, scale or location of development, and thus its potential effects, retains sufficient flexibility over the exact location, scale or nature of the proposal to enable an adverse effect on site integrity to be ruled out (even if that would mean ultimately deleting the proposal); and
- ▶ the later or lower tier appraisal is required as a matter of law or Government policy, so it can be relied upon.

Strictly, this is less appropriate for plans that sit immediately above the project stage, although the WRMP and its options will, in most instances, meet these criteria. For some schemes – particularly those schemes requiring ‘new water’ or modifications to abstraction licences, but also larger construction schemes within or near European sites – there may be insufficient information available to determine ‘no likely significant effects’ or ‘no adverse effects’ with certainty at this level (i.e. meaningful assessment cannot be undertaken). All the Preferred Options included in the Final WRMP will, of course be subject to project-level environmental assessment as part of the normal EIA, planning and/or EA consenting processes, which will necessarily include assessments of their potential to affect European sites during their construction or operation (i.e. HRA is required by law).

It is therefore considered acceptable to include these proposals within the WRMP, but complete the assessment of those options where uncertainty persists at a later stage, provided that:

- ▶ the option is not required within the first three years of the plan period, so allowing time for additional investigations to be completed; and
- ▶ the uncertainty that this creates is mitigated by the inclusion of alternative options which:
 - ▶ will meet the required demand / deficit should the Preferred Option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
 - ▶ will not themselves have any significant or adverse effect on any European sites.

It should be noted that this flexibility is desirable in any case, since it is possible that a ‘no LSE’ option might be subsequently proven to have significant or adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations, since certainty for the plan as a whole is provided by the inclusion of alternative options with no LSE.

It is also important to recognise that, in contrast to land-use plans, the statutory framework underpinning the WRMP does not provide the same implicit approval of derived, lower tier plans and projects that are ‘in accordance’ with it; or have the same influence over the decisions made on projects; or have the same direct or indirect legal effects for the use of land and the regulation of projects. Although the WRMP provides a framework for future water resource management it is not a rigid policy document or a set of proposals that cannot be deviated from once published. Also the WRMP itself is a key component of the regulatory mechanism by which funding is secured for the detailed design, feasibility studies and investigations required for new supply-side measures. Furthermore, the WRMP is (and must be) inherently flexible due to the formal five-yearly review process, which provides a clear mechanism for monitoring performance and an opportunity to adjust the proposals to reflect any changing circumstances. These measures can therefore be relied on to ensure that adverse effects do not occur as a result of the implementation of the WRMP.

3. Feasible Options Review

The review of the Feasible Options employed the principles of HRA to help inform BW's selection of its Preferred Options, identifying those options that would appear to have an unavoidable risk of adverse effects on European sites. The Feasible Options Review is provided in Appendix F and summarised in this section.

3.1 Approach

The review of the Feasible Options is not a formal stage in the HRA process and is therefore not a 'draft HRA', 'screening', or similar assessment of the final plan. It is not intended to provide a definitive conclusion on the likely effects of the final WRMP but is primarily intended to inform BW's selection of Preferred Options, by identifying:

- ▶ those options that would appear to have an unavoidable risk of adverse effects on European sites (and which should therefore be avoided if possible);
- ▶ those options where significant or adverse effects would not appear likely, assuming established avoidance and mitigation measures can be employed at the scheme level; and
- ▶ those options where effects are uncertain, which would require additional data or information on operation / construction to support their inclusion as preferred options.

The review of the Feasible Options takes account of established project-level avoidance and mitigation measures that are known to be achievable, available and likely to be effective – for example, normal construction best-practice or project planning. These measures are identified in **Appendix G** to this report. For the operational aspects of supply-side options, potential avoidance measures are considered where these are apparent, although in most instances the mitigation likely to be required for an option (e.g. compensation releases; 'hands-off' flows) cannot necessarily be determined at this stage.

The review also assumes that the existing licensing regime is having no significant effects on any European sites, or if this is not the case, that any necessary licence amendments required (e.g. sustainability reductions etc.) have been included in any deficit modelling. The Feasible Options will therefore only affect European sites through any new resource and production-side options advocated to resolve deficits, and not through the existing permissions regime²², and it is therefore assumed that options that are 'network solutions' only (i.e. moving spare licensed volumes) will not have operational effects. The availability of water for abstraction is based on EA advice to BW and the Catchment Abstraction Management Plans (CAMS).

The Feasible Options reviews are presented in **Appendix F**. This provides a short description of each option and a narrative assessment of its likely effects, with those European sites within 20km that are most vulnerable (i.e. both exposed and sensitive) to the delivery or operation of the scheme noted in the text. It then provides broad 'recommendations' regarding progressing the options as Preferred Options based on the anticipated construction and operational effects. The criteria for these recommendations are as follows (colour coded for clarity):

²² It is recognised that, occasionally, agreed sustainability reductions have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria).

Table 3.1 Summary of criteria for considering Feasible Options as potential Preferred Options

Recommend as Preferred Option?	Notes
Yes	Option appears unlikely to have any effects on European sites as features are either not exposed or not sensitive to the likely outcomes (i.e. no or no reasonable impact pathways – for example, operational effects for a 'construction only' network solution; 'dry' habitats over (say) 2km from an option; sites in different surface water catchments; upstream sites; etc.(being mindful of mobile species)). In these instances the recommendation is 'Yes', i.e. no reason not to pursue as Preferred Option.
Yes	Options where pathways for effects are clearly identifiable (such that HRA would probably be required at the scheme level) but where the potential effects can obviously be avoided or mitigated using established measures that are known to be effective, for example: <ul style="list-style-type: none"> ▶ construction near a European site (effects avoidable with normal project planning and best-practice); ▶ minor works within European sites (e.g. works to existing assets where effects unlikely to be adverse due to absence of features); ▶ major works near / within European sites that can be completed without adverse effects (e.g. crossings of SAC rivers using existing roads or directional drilling); ▶ operational effects that are avoidable with established operational mitigation (e.g. licence controls, although at this stage potential operational effects will usually lead to an 'uncertain' recommendation to flag the need for additional information). <p>In these instances the generic measures outlined in Appendix B can be relied on if these are included within the WRMP package, although the final plan may need to include specific measures for potential 'high-impact' options (e.g. commitments to non-invasive river crossings or timing works to avoid sensitive periods).</p>
Uncertain	Options where a potential effect is conceivable and cannot be discounted, and the likely effects are therefore uncertain at the Feasible Options stage. This is typically due to limitations on the information available, either in terms of the operation of the scheme, the mitigation that might be employed, or the data available on the interest features of the sites. These options, if pursued as Preferred Options, may require <ul style="list-style-type: none"> ▶ additional investigation to determine their effects, and there may be a risk that the risk of effects cannot be quantified satisfactorily at the strategic level (for example, substantial additional modelling or site-specific investigation may be required). ▶ the identification of specific measures or requirements for scheme delivery for inclusion with the WRMP. <p>This category is therefore intended as a flag to identify those options where there is potentially additional 'cost' associated with their inclusion (either related to the data required to support a robust HRA and hence the option, or the need for specific mitigation commitments) which BW should consider when selecting the Preferred Options.</p>
No	Options where significant effects (i.e. not negligible or inconsequential) on a European site are very likely or certain due to the scale/ nature/location of the option proposals, or the vulnerability and distribution of the interest features within /near the European site. Although a full appropriate assessment is not undertaken at this stage, adverse effects may be more likely (or even certain) if the scheme is taken forward as a Preferred Option and it is likely that extensive or unproven mitigation will be required following scheme-level investigations. Feasible Options in this category are not recommended for consideration as Preferred Options (although additional information may allow a re-assessment).

3.2 Summary

BW identified 12 supply-side Feasible Options for its WRZ²³. Almost all schemes were considered potentially suitable as Preferred Options on the basis of the review, although uncertainties were identified for some options (principally around operation) which would require additional information for assessment if progressed as a Preferred Option. The Feasible Options review was used by BW to help inform the selection of Preferred Options for the BW supply area.

²³ The Feasible Options review is necessarily completed prior to the final determination of WRZs with supply-demand deficits (due to the assessment timescales and complexities), and so includes Feasible Options for WRZs subsequently determined to be in surplus.

4. WRMP Options Assessment

BW's supply area (the WRZ) has a small predicted deficit over the planning period. BW's selected options for addressing these deficits are subject to 'screening' and (where necessary) an 'appropriate assessment' of their effects 'alone'. Possible 'in combination' effects are subsequently assessed.

4.1 Overview

Following consultation on the draft WRMP and the responses from the regulators and consultees, changes were made to the WRMP, including:

- ▶ Further reductions in leakage to ensure alignment with the Ofwat challenge of 15% reductions during AMP7 and then going beyond this by 2035;
- ▶ Increasing the take up of water metering, from 66% by the start of 2020 to 87% by 2045;
- ▶ Increasing water efficiency to achieve a reduction in per capita consumption (PCC) from 141 litres/head/day in 2020 to 129 litres/head/day in 2045 and 110 litres/head/day in 2050;
- ▶ Further reductions in leakage from raw water systems and at water treatment works;
- ▶ Updated assessment of the deployable output (reliable supply) of water sources in line with the new national methodology for drought resilience (that was issued after completion of the draft WRMP).

Following dialogue with Wessex Water since publication of the draft WRMP19, BW also has agreed a reduction to its bulk supply export agreement in dry weather from 2024/25, from 11.37 MI/d to 4.4 MI/d, and so option R32 (reduce Wessex Water bulk supply) is no longer included in the final list of options.

For the Revised Draft WRMP and the Final WRMP, BW's WRZ is now predicted to have a small supply-demand deficit of 0.2 MI/d in 2035 rising to 9.18 MI/d by 2045. BW will address this by the use of three revised leakage reduction / distribution management preferred options which provide a combined yield of 9.83 MI/d:

- ▶ Option D21.1 (Active Leakage Control): yield of 2.83 MI/d in 2024/25;
- ▶ Option D21.2 (Active Leakage Control): yield of an additional 0.5 MI/d in 2029/30 and an additional 1 MI/d by 2034/35.
- ▶ Option P20 (Reduced leakage from raw water mains): enhanced leakage detection / raw mains repairs/replacement (yield of 5.5MI/d).

The effects of these options on European sites are assessed in the following sections.

4.2 Leakage Reduction / Distribution Management Options

Table 4.1 summarises the proposed leakage reduction and distribution management options. These options will have no negative operational effects on European sites as they will reduce treated water use. The only realistic mechanism for a negative effect would be through any construction required (for example the leakage reduction programme may require repair of a pipe in or near an SAC), but this cannot be meaningfully assessed at the strategic level since information on the location of leaks is not available without specific investigations, which would form part of the option package (i.e. the precise location and severity of most leakages is not known ahead of detection), and there is consequently no information on the scale (etc.) of any construction required. Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.

However, it is clear that the anticipated works associated with these options are not of a scale that would suggest that effects are potentially unavoidable at the project stage, and the WRMP requires that the standard avoidance measures in **Appendix G** be employed (which includes a requirement for the potential for European sites to be affected to be considered at the planning stage). The WRMP does not imply any approval for these options or remove the need for project-level assessments, although the measures noted in Appendix G will ensure that potential adverse effects can be identified and avoided at the project stage. **The distribution management and leakage-reduction options are therefore excluded from further assessment.**

Table 4.1 Summary of Leakage Reduction / Distribution Management Options

Option	Summary
Option D21.1	This option covers the continuation of the current leakage detection find and fix policy. The methods of this form of leakage control include using leak noise detection equipment and zonal step tests to isolate areas of leakage and then repair. This will reduce the length of time that leaks run, which will reduce leakage. This option would run over the years over the years 2020/21 -2024/25 and would have a yield of 2.83 MI/d.
Option D21.2	This option is a continuation of Option D21.2 from 2024/25 - 2034/35 and would have a yield of an additional 0.5 MI/d in 2029/30 and an additional 1 MI/d by 2034/35.
Option P20	This option would address leakage from raw water mains. It is assumed that all raw water mains would be investigated for potential leakage; Bristol Water has 94 km of raw water mains spread throughout the supply area. The work would include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period.

4.3 In Combination Effects

The assessment of 'in combination' effects in the following sections covers potential interactions between the preferred options and other schemes as individual projects, and the wider potential interactions associated with other strategies and plans.

Effects between Options

Any construction required for the Final WRMP options will clearly be small scale and significant effects will almost certainly be avoidable at the scheme level using established best-practice. On this basis there will be no significant or significant adverse 'in combination' effects between the options.

Effects with major projects

Known major projects that are likely to increase demand have been taken into account during the development of the WRMP and determination of future deficits; this is in addition to the growth scenarios used to determine the effects of local plans/housing growth (etc). By modelling these major projects when determining deficits and proposals, the WRMP can ensure that LSE 'in combination' with these projects is unlikely (in terms of water resources availability). As location information is not available for construction schemes required under the leakage options it is not possible to undertake a meaningful assessment of potential 'in combination' effects with major projects, although in reality the scale of any leakage repair schemes will ensure that 'in combination' effects are extremely unlikely.

Minor projects

It has not been possible to produce a definitive list of existing (minor) planning applications within the BW WRZ, and in reality the timescales for implementation of the Final WRMP options are such that generating a list at this stage would be of little value. Since the WRMP has been based on the most recent ONS growth projections and developed with reference to local plans, the combined effect of any minor developments on water demand has been accounted for within the WRMP projections. As a result, it is considered that there will be no impacts in terms of water resource availability (i.e. it is unlikely that a substantial water-using

development or industry would come online that had not been considered by the WRMP). It is possible that there will be 'in combination' scheme-specific construction effects associated with future planning applications, although in reality the scale of any leakage repair schemes will ensure that 'in combination' effects are extremely unlikely and in any case can only be assessed at the project level.

Effects with other strategic plans and water resource demand

The WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). This means that 'in combination' water-resource effects with growth promoted by other plans or projects are considered and accounted for during the WRMP development process and its deficit calculations. Potential 'in combination' effects in respect of water-resource demands due to other plans or projects are therefore unlikely since these demands are explicitly modelled when determining deficit zones and hence developing Feasible Options. As a result (in respect of water resources) the WRMP is not likely to make 'non-significant' effects in other plans 'significant' (indeed, other plans are arguably the 'source' of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).

Obviously local plans are not all consistent with regard to planned growth and this arguably introduces some uncertainty. However, with regard to water resources and planning uncertainty it is important to note the following:

- ▶ The WRMP safeguards against uncertainty in option yield and timing through 'Target Headroom'; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand side measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would 'suddenly' result in a deficit that might affect a European site; and (in any case);
- ▶ The WRMP is revised on a five-yearly cycle, which allows any changes in demand forecasts (e.g. as new plans come forward) to be accounted for, and for timely intervention should a measure not be performing as expected. It is also informally reviewed on an annual basis.

It is therefore considered that the Final WRMP options will not have significant 'in combination' effects with local plans in respect of water resources.

Effects with other strategic plans and development pressure

Regional and local plans have been reviewed at a high level to determine whether there are any likely significant 'in combination' effects (see **Appendix F**), with allocation sites identified where possible. This review has not indicated any potential or likely 'in combination' effects that could occur as a result of cumulative development pressure, and in reality the timescales involved in the Final WRMP options and the absence of detail on allocation proposals makes any 'in combination' assessment difficult and potentially meaningless. However, the options are not of a scale or type that would make 'in combination' effects likely.

New water and existing consents

Where 'new water' is required (i.e. a new or modified abstraction) 'in combination' water-resource demands are possible with existing abstractions. As noted, the WRMP does not explicitly consider the potential 'in combination' effects of non-BW abstraction or discharge consents since this is addressed by the EA RoC process or the licence application process (which will be subject to HRA). However, it must be recognised that the water potentially available from a source is determined by the EA, NRW and BW, based on various assessments and data sources including the relevant CAMS; options are only proposed where there is a reasonable likelihood of water being available. In most instances the potential 'in combination' effects can only be meaningfully assessed as part of the investigation works that are required for a new licence or amendment (for example, if new boreholes are required to assist with the modelling of a groundwater resource). In this instance, the WRMP does not propose any 'new water' options.

BW's Drought Plan

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 and subsequently Water Act 2014, which set out the sort of operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a Drought Plan as '*a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits*'.

BW published its last Drought Plan in October 2012. In accordance with the Drought Direction (England) 2016, BW was required to submit an updated draft Drought Plan to the Secretary of State's review and approval. The updated Drought Plan was submitted to the Secretary of State on the 29th December 2016. Subsequently, the draft Updated Drought Plan was published for public consultation on 27th March 2017 with the consultation period running for a period of eight weeks until 21st May 2017. Following consultation on the draft Updated Drought Plan and analysis of responses, the plan was amended as appropriate and re-submitted to the Secretary of State. The final Drought Plan (2018) has now been published. This was subjected to SEA and HRA.^{24,25}

BW has identified drought plan action triggers (Drought Management Zones) based on the combined storage in its major reservoirs. These triggers act as decision-points for implementation of drought management measures as reservoir storage is depleted in a drought event. There are two broad categories of drought management actions: demand management measures and supply augmentation measures.

Demand Management measures identified in the draft Updated Drought Plan include:

- ▶ Appeals for restraint;
- ▶ Temporary Use Ban (TUB);
- ▶ Non Essential Use Ban (NEUB); and
- ▶ Emergency Drought Order.

Supply augmentation measures considered by BW include bringing disused, licensed water sources back into supply and applying for drought permits to temporarily vary the conditions of abstraction licences for specific water sources. The water source identified in the Updated Drought Plan is R24R and Wellhead (R24Ra Group), which is a licensed water source that has not been in operation for approximately 20 years. In the event of a drought, it would require recommissioning before it could be used to supply water. Drought permits are drought management measures available to water companies which, if granted by the Environment Agency, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment.

The Drought Plan identifies those European sites that may be at risk and provides a mechanism for additional studies to quantify this risk and identify potential solutions that avoid or minimise adverse effects. However, it must be recognised that the Drought Plan is only ever deployed *in extremis*, when conditions are such that European sites are likely to be affected independently of the Drought Plan's operation.

Potential 'in combination' effects between the WRMP and Drought Plan are challenging to identify and assess at this level. This is because the WRMP options cannot, in theory, operate in combination with the Drought Plan options: if the WRMP options are implemented then they will become a part of the baseline against which the effects of the Drought Plan options will be assessed (with the Drought Plan options then permitted or not at the application stage); until the point of implementation, the Drought Plan options would operate 'alone' in a drought situation. Furthermore, the implementation of a WRMP option will invariably

²⁴ Ricardo Energy and Environment (2017), Bristol Water Draft Final Drought Plan 2017: Strategic Environmental Assessment Environmental Report, July 2017, <https://www.bristolwater.co.uk/wp/wp-content/uploads/2017/03/Bristol-ThWater-Draft-Final-DP-SEA-ER.pdf>

²⁵ Ricardo Energy and Environment (2017), Bristol Water Draft Final Drought Plan 2017: Habitats Regulations Assessment Screening Report, July 2017, <http://www.bristolwater.co.uk/wp/wp-content/uploads/2017/03/Bristol-Water-Draft-Final-DP-HRA-Screening-Report-REDACTED.pdf>

require that the Drought Plan for that WRZ be revised, since the fundamental operational parameters of the WRZ will have changed²⁶. Finally, the impacts will depend entirely on the nature of the drought situation.

In theory, if a WRMP option results in less 'spare' water being available to water-resource sensitive sites then drought conditions may occur more frequently, and require a longer period for recovery from any temporary effects (depending on the hydrological functioning of the system); however, this type of effect is managed through licence conditions and minimum flow requirements which are designed to protect sites under a range of conditions, and Drought Plan options to alter such flow requirements would only be deployed after substantial additional study.

It is noted that the HRA of the Drought Plan stated: '*In-combination effects of Bristol Water's Drought Plan 2017 with its Water Resources Management Plan (WRMP) 2014, the Environment Agency's regional Drought Plan, relevant River Basin Management Plans (RBMPs) and other water company WRMPs and Drought Plans are equally not considered to have LSEs on any European sites*'.

The conclusion of the HRA is that the BW's WRMP will not have any significant effects that cannot be avoided at the scheme-level with normal best-practice measures. This reflects the nature of the options selected for the Final WRMP, and the scale and type of works expected. In consequence, given the scope of the Preferred Options, the absence of likely significant effects, the complementary relationship of the WRMP with the Drought Plan, any in-combination effects with the Drought Plan are not considered likely to have significant effects on any European sites.

Other Water Company WRMPs

BW's preferred options are leakage schemes that cannot be assessed at the plan-level, and so 'in combination' effects with other WRMPs cannot be definitively excluded due to the absence of information on the works required for the leakage schemes (see Section 4.2). However, the leakage schemes will invariably be small scale, and effects will be easily avoidable using established measures. Nevertheless, the draft WRMPs from the neighbouring water companies (Wessex Water, Welsh Water, Severn Trent and Thames Water) have been reviewed for potential 'in combination' effects with the BW WRMP. Based on the options proposed, and the HRAs of these WRMPs, it is considered that there is no potential for 'in combination' effects with other water company WRMPs, principally as:

- ▶ Wessex Water are predicting a supply-demand surplus for the planning period; and
- ▶ none of the options advocated by Welsh Water, Severn Trent or Thames Water will affect European sites that are also exposed to potential effects associated with the BW plan.

²⁶ In addition, it should be noted that many of the Drought Plan options are essentially the same as WRMP options, and therefore are mutually exclusive.

5. Summary and Conclusions

BW has completed its modelling of the supply-demand balance for WRMP planning period and has predicted a small deficit. This deficit will be met through measures to optimise the use of existing water sources while continuing to reduce leakage and water consumption. This section summarises the conclusions of the HRA of the Final WRMP 2019.

5.1 Summary

BW predicts that there will be a small supply-demand deficit over the planning period. This will be resolved through the following options:

- ▶ Option D21.1 (Active Leakage Control): The continuation of the current leakage detection find and fix policy to reduce leakage over the years 2020/21 – 2024/25;
- ▶ Option D21.2 (Active Leakage Control): Continuation of Option D21.1 to reduce leakage over the period 2024/25 – 2034/35;
- ▶ Option PO20 (Reduced leakage from raw water mains): A programme of leakage detection for raw water mains.

These options have been screened for their potential to affect European sites. In summary:

- ▶ The construction-phase effects of the Leakage Reduction options cannot be meaningfully assessed at the plan-level as the location (etc.) of any works required is not known and will be established as part of an ongoing programme of detection and repair. However, it is clear that the options do not have a risk of unavoidable adverse effects, based on the scale and type of works expected, and that established best-practice measures (**Appendix G**) and scheme-level assessment can be relied on to ensure that significant or significant adverse effects do not occur.

5.2 Conclusion

BW's WRMP will have **no adverse effects, alone or in combination**, on any European sites taking into account established scheme-level mitigation and avoidance measures that will clearly be available, achievable and likely to be effective. This conclusion does not remove the need for consideration of Regulation 63 at the project-level, which will be required to address those aspects and uncertainties that cannot be meaningfully assessed at the plan-level, such as the effects of individual leakage-reduction schemes or potential 'in combination' effects with forthcoming plans or projects that may coincide with option delivery.

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Appendix A

Summary of European Site Designations

Table A1 European sites and associated designations

Designation	Abbreviation	Summary
European sites	-	Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy when considering development proposals that may affect them. "European site" is therefore used as an umbrella term for all of the above designated sites.
Special Area of Conservation	SAC	Designated under the EU <i>Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora</i> , and implemented in the UK through the <i>Conservation of Habitats and Species Regulations 2010</i> (as amended), and the <i>Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995</i> (as amended).
Site of Community Importance	SCI	Sites of Community Importance (SCIs) are sites that have been adopted by the European Commission but not yet formally designated by the government of each country. Although not formally designated they are nevertheless fully protected by <i>Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora</i> , the <i>Conservation of Habitats and Species Regulations 2010</i> (as amended), and the <i>Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995</i> (as amended).
Candidate SAC	cSAC	Candidate SACs (cSACs) are sites that have been submitted to the European Commission, but not yet formally adopted. Although these sites are still undergoing designation and adoption they are still fully protected by <i>Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora</i> , the <i>Conservation of Habitats and Species Regulations 2010</i> (as amended) and the <i>Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995</i> (as amended).
Possible SACs	pSAC	Sites that have been formally advised to UK Government, but not yet submitted to the European Commission. The Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SACs as a matter of policy.
Draft SACs	dSAC	Areas that have been formally advised to UK government as suitable for selection as SACs, but have not been formally approved by government as sites for public consultation. These are not protected (unless covered by some other designation) and it is likely that their existence will not be established through desk study except through direct contact with the relevant statutory authority; however, the statutory authority is likely to take into account the proposed reasons for designation when considering potential impacts on them.
Special Protection Area	SPA	Designated under <i>EU Council Directive 79/409/EEC on the Conservation of Wild Birds</i> (the 'old Wild Birds Directive') and <i>Directive 2009/147/EC on the Conservation of Wild Birds</i> (the 'new Wild Birds Directive', which repeals the 'old Wild Birds Directive'), and protected by Article 6 of <i>Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora</i> . These directives are implemented in the UK through the <i>Wildlife & Countryside Act 1981</i> (as amended), the <i>Conservation of Habitats and Species Regulations 2010</i> (as amended), the <i>Wildlife (Northern Ireland) Order 1985</i> , the <i>Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</i> and <i>The Conservation (Natural Habitats, & c.) (Northern Ireland) Regulations 1995</i> (as amended) and the <i>Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007</i> .

Designation	Abbreviation	Summary
Potential SPA	pSPA	These are sites that are still undergoing designation and have not been designated by the Secretary of State; however, ECJ case law indicates that these sites are protected under Article 4(4) of <i>Directive 2009/147/EC</i> (which in theory provides a higher level of protection than the Habitats Directive, which does not apply until the sites are designated as SPAs), and as a matter of policy the Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SPAs, and they may be protected by some other designation (e.g. SSSI).
Ramsar	-	The <i>Convention on Wetlands of International Importance especially as Waterfowl Habitat</i> (Ramsar Convention or Wetlands Convention) was adopted in Ramsar, Iran in February 1971. The UK ratified the Convention in 1976. In the UK Ramsar sites are generally underpinned by notification of these areas as Sites of Special Scientific Interest (SSSIs) (or Areas of Special Scientific Interest (ASSIs) in Northern Ireland). Ramsar sites therefore receive statutory protection under the <i>Wildlife & Countryside Act 1981</i> (as amended), and the <i>Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</i> . However, as a matter of policy the Governments in England, Scotland and Wales extend the same protection to listed Ramsar sites in respect of new development as that afforded to SPAs and SACs.

Appendix B

Sustainability Reductions and the Review of Consents

The WRMP accounts for any reductions or alterations to licences that are required under the Review of Consents (or the Water Framework Directive) when calculating 'Deployable Output' (DO). The Review of Consents (RoC) process was a detailed evidence-led examination of the effects (alone and in combination) of all abstraction licences and discharge consents that potentially affect European designated sites and features. This was then used as a basis for affirming or, if necessary, varying or revoking the existing consents (known as 'sustainability reductions') to protect these sites from adverse effects.

The sustainability reductions required by the RoC are fully accounted for within the modelled scenarios underpinning the WRMP (i.e. they explicitly form part of the assessment that determines which zones are in deficit). Under the RoC process and the WRMP process, the RoC changes (and non-changes to licences) are considered to be valid over the planning period (to 2044). BW use Water Available for Use (WAFU) from existing licences only (reduced through RoC and not reduced) when assessing the supply-demand balance over the planning period, incorporating increases in demand (the methods by which this is established are outlined in the WRMP). If deficits are shown, intervention options are required and implemented accordingly in the planning period.

This means that the Plan (and its underlying assumptions regarding the availability of water and sustainability of existing consents) is compliant with the RoC and so the Plan will only affect European sites through any new resource and production-side options it advocates to resolve deficits, and not through the existing permissions regime²⁷. The examination of existing individual consents can only be undertaken by NRW (in Wales) or the Environment Agency (EA) through the RoC process and the HRA of the WRMP cannot and should not replicate this.

Having said that, new permissions could obviously operate 'in combination' with the existing regime. The water potentially available from a source is determined by the EA, NRW and BW, based on various assessments and set out in the Catchment Abstraction Management Strategies, and BW must rely on these assessments when identifying options as in most cases the detailed examination of a resource can only be undertaken as part of preparatory works for a new licence (for example, if new boreholes are required to assist with the modelling of a groundwater resource). In short, options are only proposed where there is a reasonable likelihood of water being available, based on information from NRW and the EA.

²⁷ It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria); BW are not aware of any current uncertainties regarding its abstractions or the RoC outcomes, although any such uncertainties that are subsequently identified can be addressed through the five-yearly WRMP review process.

Appendix C

European sites within 20km of the BW supply area

European Sites within 20km and Interest Features	Within BW Area?
Avon Gorge Woodlands SAC	Y
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
Tilio-Acerion forests of slopes, screes and ravines	
P39R SPA	Y
Northern shoveler <i>Anas clypeata</i>	
Mells Valley SAC	Y
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
Caves not open to the public	
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	
Mendip Limestone Grasslands SAC	Y
European dry heaths	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
Caves not open to the public	
Tilio-Acerion forests of slopes, screes and ravines	
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	
Mendip Woodlands SAC	Y
Tilio-Acerion forests of slopes, screes and ravines	
North Somerset and Mendip Bats SAC	Y
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
Caves not open to the public	
Tilio-Acerion forests of slopes, screes and ravines	
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	
Severn Estuary Ramsar	Y
Crit. 1 - sites containing representative, rare or unique wetland types	
Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity	
Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge	
Crit. 5 - regularly supports 20,000 or more waterbirds	
Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds	
Crit. 8 - important source of food for fishes, spawning ground, nursery and/or migration path	
Severn Estuary SPA	Y
Tundra swan <i>Cygnus columbianus bewickii</i>	
Common shelduck <i>Tadorna tadorna</i>	
Gadwall <i>Anas strepera</i>	
Common redshank <i>Tringa totanus</i>	
Greater white-fronted goose <i>Anser albifrons albifrons</i>	
Dunlin <i>Calidris alpina alpina</i>	
Waterfowl assemblage Waterfowl assemblage	
Severn Estuary/ Môr Hafren SAC	Y
Sandbanks which are slightly covered by sea water all the time	
Estuaries	
Mudflats and sandflats not covered by seawater at low tide	

European Sites within 20km and Interest Features	Within BW Area?
Reefs Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Twite shad <i>Alosa fallax</i>	
Somerset Levels and Moors Ramsar	Y
Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 5 - regularly supports 20,000 or more waterbirds Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds	
Somerset Levels and Moors SPA	Y
Tundra swan <i>Cygnus columbianus bewickii</i> Eurasian teal <i>Anas crecca</i> European golden plover <i>Pluvialis apricaria</i> Northern lapwing <i>Vanellus vanellus</i> Waterfowl assemblage Waterfowl assemblage	
Bath and Bradford-on-Avon Bats SAC	N
Lesser horseshoe bat <i>Rhinolophus hipposideros</i> Greater horseshoe bat <i>Rhinolophus ferrumequinum</i> Bechstein's bat <i>Myotis bechsteini</i>	
Cotswold Beechwoods SAC	N
Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) Asperulo-Fagetum beech forests	
Exmoor and Quantock Oakwoods SAC	N
Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) Barbastelle <i>Barbastella barbastellus</i> Bechstein's bat <i>Myotis bechsteini</i> Otter <i>Lutra lutra</i>	
Hestercombe House SAC	N
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	
North Meadow and Clattinger Farm SAC	N
Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>)	
RI5 SAC	N
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Sea lamprey <i>Petromyzon marinus</i> Brook lamprey <i>Lampetra planeri</i> Atlantic salmon <i>Salmo salar</i> Bullhead <i>Cottus gobio</i>	
River Usk/ Afon Wysg SAC	N
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation Sea lamprey <i>Petromyzon marinus</i> Brook lamprey <i>Lampetra planeri</i> River lamprey <i>Lampetra fluviatilis</i> Allis shad <i>Alosa alosa</i> Twite shad <i>Alosa fallax</i> Atlantic salmon <i>Salmo salar</i> Bullhead <i>Cottus gobio</i> Otter <i>Lutra lutra</i>	

European Sites within 20km and Interest Features	Within BW Area?
River Wye/ Afon Gwy SAC	N
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation	
Transition mires and quaking bogs	
White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i>	
Sea lamprey <i>Petromyzon marinus</i>	
Brook lamprey <i>Lampetra planeri</i>	
River lamprey <i>Lampetra fluviatilis</i>	
Allis shad <i>Alosa alosa</i>	
Twaite shad <i>Alosa fallax</i>	
Atlantic salmon <i>Salmo salar</i>	
Bullhead <i>Cottus gobio</i>	
Otter <i>Lutra lutra</i>	
Rodborough Common SAC	N
Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)	
Salisbury Plain SAC	N
<i>Juniperus communis</i> formations on heaths or calcareous grasslands	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)	
Marsh fritillary butterfly <i>Euphydryas</i> (<i>Eurodryas</i> , <i>Hypodryas</i>) <i>aurinia</i>	
Salisbury Plain SPA	N
Hen harrier <i>Circus cyaneus</i>	
Eurasian hobby <i>Falco subbuteo</i>	
Common quail <i>Coturnix coturnix</i>	
Stone-curlew <i>Burhinus oedipnemus</i>	
Walmore Common Ramsar	N
Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds	
Walmore Common SPA	N
Tundra swan <i>Cygnus columbianus bewickii</i>	
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	N
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	N
Asperulo-Fagetum beech forests	
Tilio-Acerion forests of slopes, screes and ravines	
<i>Taxus baccata</i> woods of the British Isles	
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	



Appendix D

Water-resource dependent interest features



Appendix E

Feasible options review



Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
P01-01	Increase performance of existing sources (P01-01R) to increase deployable output to near licensed volume	<p>This scheme would involve the maximisation of the yields from existing operational source at P01-01R (which is currently constrained by the performance of the membrane plants). This option requires the upgrade of the water treatment works. The key actions include (from WR31 P01-01R TW Upgrade report):</p> <ul style="list-style-type: none"> • Refurbishment (as required) to bring the Upper Spring collection system back into use; • Upgrade of the raw water feed and low lift pumping arrangement; • Decommissioning and removal of obsolete equipment including the pressurised membrane system; • Modifications to the contact tanks to allow for use as duty/standby water storage volume; • Building extension and building services (to include building ventilation and insulation); • Installation of prefiltration (Boll filters 300µm); • Installation of submerged membrane packaged plant; • Refurbishment/modification of control and telemetry systems as required to integrate new works; • Replacement of gas chlorine with electrochlorination and static mixer. <p>Other than the upgraded treatment processes at the site, no further infrastructure requirements are expected as the pipe network already exists. The work will increase yield by 1.7 MI/d.</p>	<p>This scheme would involve the re-commissioning of the mothballed source at P01-01R. Other than the upgraded treatment processes, no further infrastructure requirements are expected as the pipe network is extant from prior to the site being mothballed. The construction works will therefore be discrete and largely within the existing operational site boundaries. The closest SAC is the North Somerset & Mendip Bats SAC (~0.6km); the bat features of this site are potentially vulnerable to construction if commuting routes etc. are affected although works are discrete and standard measures likely to be sufficient to ensure no LSE. No operational effects anticipated (existing licenced source).</p>	<p>Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures</p>	<p>Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)</p>

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
P01-02	Increase performance of existing sources (P01-02R) to increase deployable output to near licensed volume	<p>This scheme would involve the maximisation of the yield from an existing operational source at P01-02R (which is currently constrained by the performance of the membrane plants). A number of potential approaches to improving output are described in the WR30 P01-02R TVW Upgrade report, which recommends a submerged membrane. The key works include:</p> <ul style="list-style-type: none"> • Decommissioning and removal of obsolete equipment including the pressurised membrane system • Building extension and building services (to include building ventilation and insulation) • New Boll prefiltration (300 µm) • Installation of submerged membranes • Refurbishment/modification of control and telemetry systems as required to integrate new works • Condition survey of retained existing structures and repair/renovation as required • Replacement of gas chlorine with OSEC <p>Other than the upgraded treatment processes at the site, no further infrastructure requirements are expected as the pipe network already exists. The work will increase the yield by 2.6 MI/d.</p>	This scheme would involve the upgrade works at P01-02R. Other than the upgraded treatment processes, no further infrastructure requirements are expected. The construction works will therefore be discrete and largely within the existing operational site boundaries. The closest site is Mells Valley SAC (~4.4km); the bat features of this site are potentially vulnerable to construction if commuting routes etc. are affected although works are discrete and standard measures likely to be sufficient to ensure no LSE. No operational effects anticipated (existing licenced source).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
P06-01	Catchment Management for P39R and P42R Reservoir to manage outage risk from algal blooms	<p>This option would improve the outage risk resulting from P39R and P42R reservoirs which currently suffer from high algal counts, which at times affect production at P17R, P16R and P10R VVtV. Both reservoirs are part of catchment management schemes to reduce phosphorus levels, currently funded for AMP6 but not necessarily longer term; catchment schemes require long term funding in order to be effective. The option would include implementation of the catchment grant scheme to support farms investing in improved infrastructure to aid clean and dirty water separation, storage of slurry, effluent and manures. Also, advice and support towards management to reduce diffuse pollution risk, such as cultivation of over-wintering cover crops after maize, and use of an integrated manures and fertilizer management plan would be provided. A reduction in nutrients is expected to reduce algal blooms and therefore reduce the outage risk at P17R, P16R and P10R VVtV. The yield benefit has been assessed as 0.39 MI/d.</p>	There are several European sites within the catchment of this scheme or downstream; however, catchment management will have no negative effect on any European sites and may have positive effects due to reduced nutrient inputs.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)



Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
P08	P08R WTW (increased production)	The output is constrained physically by processes on site, which is the size of membranes (currently 5 Ml/d). In 2013, a feasibility assessment (P08R WTW Membrane Replacement with UV) was undertaken which assessed increasing production via an increase in membrane capacity or via UV treatment. The report recommended UV treatment to increase capacity to 7 Ml/d. Therefore the proposed works include the replacement of the current membranes to UV treatment. Note, a detailed assessment has yet to be undertaken. This scheme would result in a yield of 2 Ml/d. It is assumed the work will be undertaken over 2 years.	This scheme would involve the upgrade works at P08R WTW. Other than the upgraded treatment processes, no further infrastructure requirements are expected. The construction works will therefore be discrete and largely within the existing operational site boundaries. The closest sites are over 10km from the site and so no effects would be anticipated. No operational effects anticipated (existing licenced source).	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
P10	P10R WTW (increased production)	Production at P10R WTW is currently constrained by the operational maintenance requirements for the Slow Sand Filters which generally occur during periods of high algal blooms. This option would involve the upgrade of P10R WTW to include Dissolved Air Flotation (DAF) and Rapid Gravity Filters (RGF) in the treatment process in order to achieve near design output. The work will increase the design capacity of the works by 4 Ml/d. This is the assumed yield of the work.	This scheme would involve the upgrade works at P10R WTW. Other than the upgraded treatment processes, no further infrastructure requirements are expected. The construction works will therefore be discrete and within the existing operational site boundaries. The closest site is North Somerset & Mendip Bats SAC (~2km); the bat features of this site are potentially vulnerable to construction if commuting routes etc. are affected although works are discrete and standard measures likely to be sufficient to ensure no LSE. No operational effects anticipated (existing licenced source).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	This option will address leakage from raw water mains. It is assumed that all raw water mains will be investigated for potential leakage. Bristol Water have 94 km of raw water mains spread throughout the supply area. The work will include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period. Bristol Water indicated that a reduction in losses could result in ~3.9-5.5 MI/d.	Leakage reduction programme can only be assessed at the scheme level; however, very unlikely to have significant effects that cannot be avoided with normal established measures.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
R08-02	New water sources within Bristol Water CAMS area for the location R08-02R	This option relates to the development of a new supply source on the middle R15. Abstraction would be from the R08-02R (a new pumping station of 2.5 MI/d, 93 metres head (mhd) would be adjacent). Water would be treated on site via a new membrane plant (capacity of 2.5 MI/d). Water would be then pumped to R08-02Ra Service Reservoir via a 12.7km (300mm diameter) pipeline. A booster pumping station would be located at Bannerdown (2.5 MI/d, 93 mhd). The option was developed based on the assessment in the Bristol Avon and North Somerset CAMS that water is available for abstraction in the middle R15. Once operational, the abstraction would constitute less than 1% of the river flow (the R15 at Bathford has a Q95 flow of 249 MI/d). The option would result in a total water main length of 3.3km and would have a yield of 1.4MI/d.	This scheme would involve construction works within ~3.6km of the Bath and Bradford on Avon Bats SAC; the bat features of this site are potentially vulnerable to construction if commuting routes etc. are affected although works are discrete and standard measures likely to be sufficient to ensure no LSE. The downstream sites (Severn Estuary SAC, Severn Estuary SPA, Severn Estuary Ramsar) are potentially vulnerable to operational effects although water is available based on CAMS and operational effects would not be expected.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)
R08-03	New water sources within Bristol Water CAMS area for the location R08-03R	This option would involve the provision of a new river abstraction and intake on the R08-03R together with a raw water transfer to P13R Water Treatment Works via a 13.2km pipeline (300mm diameter). No upgrades are required at P13R treatment works. The option was developed based on the assessment in the Bristol Avon and North Somerset CAMS that water is available for abstraction. Once operational, the abstraction would constitute approximately 7% of the river flow (the River Frome at the proposed point of abstraction has a Q95 flow of 15.6 MI/d). The option would have a capacity of 1.1 MI/d.	This scheme would involve construction works within ~20km of several SACs designated for their bats, although none are in particularly close proximity and standard measures likely to be sufficient to ensure no LSE. The downstream sites (Severn Estuary SAC, Severn Estuary SPA, Severn Estuary Ramsar) are potentially vulnerable to operational effects although water is available based on CAMS and operational effects would not be expected.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
R11	PIOR Reservoir Standard WRMP14 design	<p>This option would involve the development of a new impounding/pumping storage reservoir with a capacity of 9,000 MI on land immediately south of PIOR Reservoir. The infrastructural requirements associated with the option would include the construction of the reservoir, including an inflow weir and multi-level draw-off tower. The reservoir embankments would be constructed from earth bund (clay core) lined with a concrete wave wall. Additionally, the proposed reservoir would require the redesign of intake arrangements for the monitoring weir and to increase the intake capacity to the full 250 MI/d to capture storm inflows. This would require a 10m by 20m concrete intake chamber and automated valves and compensation control. The scheme would require 5km of 1,500mm diameter HDPE pipe. In contrast to the existing reservoir, the construction of the reservoir would include environmental enhancements such as reduction of bund gradient, screening and planting and naturalising of embankments. The option would have a yield of 16 MI/d.</p>	<p>The scheme would be a major construction scheme, although construction effects would be limited to the immediate vicinity of the reservoir site, and direct construction effects on nearby sites would not be anticipated. However, the reservoir would require the permanent removal of a number of fields and associated hedges, which may interrupt commuting routes for bat species from the nearby North Somerset & Mendip Bats SAC. In addition, the construction works may have indirect effects on some of the interest features of the Somerset Levels & Moors SPA and Somerset Levels & Moors Ramsar sites. The scheme would not be expected to have any particularly significant operational effects as it would simply maximise the use of the current licence by enabling the capture of more water at times of higher flows. The Severn Estuary suite of sites are downstream receptors, but no significant effects are likely. The site may provide additional roosting areas for species from the Somerset Levels & Moors SPA and Somerset Levels & Moors Ramsar sites.</p> <p>The scheme was subject to a planning application and associated HRA in 2014, which concluded that there would be no adverse effects on any European sites; on this basis, and assuming that the scheme remains the same, there should be no significant adverse effects as a result of the scheme.</p>	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)
R23-01	Purchase water from third parties from water companies	<p>The option would involve the transfer of 'spare' resource within the capacity of Wessex Water's distribution system, would be within existing licence and would not require any 'new' abstraction licences. This option would involve a supply being made available from Wessex Water's infrastructure at Bridgwater, and transferred via a new 27.6 km main to Bristol Water's P09R treatment works. A 2.5km spur from this main would feed R23-01Rb service reservoir. A new pumping station would be required at R23-01Ra.</p> <p>The option would have a yield of 10MI/d.</p>	<p>The assessment assumes that Wessex Water has predicted a supply surplus for the planning period, and therefore will not need to develop any new supply-side options in its WRMP to service this bulk transfer. In this instance Bristol Water would be responsible for pipeline construction outside of its WRZ boundary, and therefore the whole of the likely route has been identified and assessed. The length of the pipe ensures that there are a number of sites within 15km, although most will not be affected by the scheme assuming normal best-practice; most of the route will be located directly alongside the M5. The possible exceptions are the sites supporting bats that are within 5km of the route, notably the North Somerset and Mendip Bats SAC and the Mendip Limestone Grasslands SAC.</p>	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)



Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
R24	Bring R24R source back into supply	R24R Well is currently out of service due to high turbidity and associated risk of cryptosporidium. To bring this well back into service it is proposed to pump water from R24R to P10R Water Treatment Works. This option would involve the construction of a new pumping station at the R24R site and the construction of a new 4.2km 300mm diameter pipeline. The option would have a yield of 2.4 Ml/d.	This scheme would involve the reinstatement of an existing licensed source near Draycot and the upgrade of the associated works, and construction of a new main to transfer water from the source to P10R Reservoir. The abstraction would be within the terms of an existing licence. The scheme would be a relatively small pipeline construction scheme, and direct construction effects on nearby sites will not occur. Construction may affect tree and hedgelines, which could interrupt commuting routes for bat species from the nearby North Somerset & Mendip Bats SAC and potentially the Mendip Limestone Grasslands SAC. The scheme would be within the terms of the existing licence although the EA has indicated that the source is down for investigation in the Water Industry National Environment Programme (WINP2), and so the operational effects are considered 'uncertain' at this stage.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
R32	Reduction of bulk transfer agreement with Wessex Water	This option would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 Ml/d to restore Bristol Water's supply demand balance. The water would be made available from the P15R source. The option does not require any new infrastructure.	The potential effects of this option would be associated with the Wessex Water WRMP, depending on how the bulk supply is replaced (i.e. 'new water' may be required). Assessment of this option would sit with Wessex Water.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures





Appendix F

Summary of 'in combination' assessment with other strategic plans

Appendix G

Standard avoidance measures and best-practice

Overview

The 'avoidance measures' that may be applied to the options are detailed below, and are grouped as follows:

- ▶ General Measures (established construction best-practice, etc.) which will be applied to all options;
- ▶ Option-specific Measures (established and reliable measures identified to avoid specific potential effects on European sites, such as in relation to mobile species from the sites).

These measures will be applied unless project-level HRAs or scheme-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate.

Note that these measures are not exhaustive or exclusive and must be reviewed at the project stage, taking into account any changes in best-practice as well as scheme-specific survey information or studies.

General Measures and Principles

Scheme Design and Planning

All options will be subject to project-level environmental assessment as they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (inter alia):

- ▶ opportunities for avoiding potential effects on European sites through design (e.g. alternative pipeline routes; micro siting; etc);
- ▶ construction measures that need to be incorporated into scheme design and/or planning to avoid or mitigate potential effects - for example, ensuring that sufficient working area is available for pollution prevention measures to be installed, such as sediment traps;
- ▶ operational regimes required to ensure no adverse effects occur (e.g. compensation releases - although note that these measures can only be identified through detailed investigation schemes and agreed through the abstraction licensing process).

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through construction-site derived pollutants, rather than through direct encroachment. There is a substantial body of general construction good-practice which is likely to be applicable to all of the proposed options and can be relied on (at this level) to prevent significant or adverse effects on a European site occurring as a result of construction site-derived pollutants. The following guidance documents detail the current industry best-practices in construction that are likely to be relevant to the proposed schemes:

- ▶ Environment Agency Pollution Prevention Guidance Notes²⁸, including:
 - ▶ PPG1: General guide to the prevention of pollution (May 2001);

²⁸ Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are sound and form a reasonable basis for pollution prevention measures.

- ▶ PPG5: Works and maintenance in or near water (October 2007);
- ▶ PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010);
- ▶ PPG21: Pollution incident response planning (March 2009);
- ▶ PPG22: Dealing with spillages on highways (June 2002);
- ▶ Environment Agency (2001) Preventing pollution from major pipelines [online]. Available at www.environment-agency.gov.uk/static/documents/Business/pipes.pdf. [Accessed 1 March 2011];
- ▶ Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The best-practice procedures and measures detailed in these documents will be followed for all construction works derived from the WRMP as a minimum standard, unless scheme-specific investigations identify additional measures and/or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

General measures for species

Most species-specific avoidance or mitigation measures can only be determined at the scheme level, following scheme-specific surveys, and 'best-practice' mitigation for a species will vary according to a range of factors that cannot be determined at the strategic (WRMP) level. In addition, some general 'best-practice' measures may not be relevant or appropriate to the interest features of the European sites concerned (for example, clearing vegetation over winter is usually advocated to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the winter removal of vegetation might actually have a negative effect on these species through disturbance). However, the following general measures will be followed to minimise the potential for impacts on species that are European site interest features unless project level environmental studies or HRA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary:

- ▶ Scheme design will aim to minimise the environmental effects by 'designing to avoid' potential habitat features that may be used by species that are European site interest features when outside the site boundary (e.g. linear features such as hedges or stream corridors; large areas of scrub or woodland; mature trees; etc.) through scheme-specific routing studies.
- ▶ The works programme and requirements for each option will be determined at the earliest opportunity to allow investigation schemes, surveys and mitigation to be appropriately scheduled and to provide sufficient time for consultations with NE.
- ▶ Night-time working, or working around dusk/dawn, should be avoided to reduce the likelihood of negative effects on nocturnal species.
- ▶ Any lighting required (either temporary or permanent) will be designed with an ecologist to ensure that potential 'displacement' effects on nocturnal animals, particularly SAC bat species, are avoided.
- ▶ All compounds/pipe stores etc. will be sited, fenced or otherwise arranged to prevent vulnerable SAC species (notably otters) from accessing them.
- ▶ All materials will be stored away from commuting routes/foraging areas that may be used by species that are European site interest features.
- ▶ All excavations will have ramps or battered ends to prevent species becoming trapped.
- ▶ Pipe-caps must be installed overnight to prevent species entering and becoming trapped in any laid pipe-work.



Option-Specific Measures

No option-specific measures are considered necessary in addition to the general measures outlined above to avoid specific potential effects on European sites that have been identified during the assessment process.

