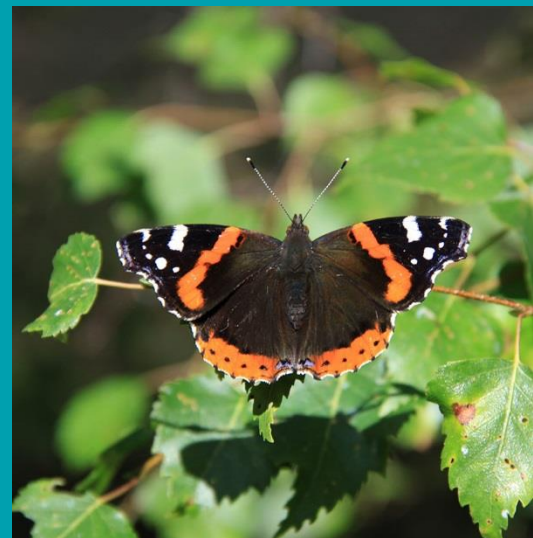


Dŵr Cymru Welsh Water

Habitats Regulations Assessment of the Water Resource Management Plan 2024

Information to support an assessment under Regulation 63 of
the *Conservation of Habitats and Species Regulations 2017*



This report was prepared by WSP Environment & Infrastructure Solutions UK Limited (formerly known as Wood Environment & Infrastructure Solutions UK Limited), company registration number 02190074, which is carrying out these services as a subcontractor and/or agent to Wood Group UK Limited – November 2022

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1. Introduction

Water Resource Management Plans set out how water supply-demand balances and water supply security will be maintained over the next 25 years and beyond. These plans are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017* (as amended).

1.1 Dŵr Cymru Welsh Water's Water Resources Management Plan 2024

- 1.1.1 The Water Act 2003 requires that all water companies in England and Wales prepare and maintain Water Resources Management Plans (WRMPs). These plans set out how public water supply (PWS) will be maintained over a minimum of 25 years in a way that is economically, socially and environmentally sustainable. The WRMPs must be revised every five years.
- 1.1.2 Dŵr Cymru Welsh Water (DCWW) is preparing its WRMP (WRMP24) for the period 2025 – 2050 and has published a draft ('the draft WRMP') for consultation. The draft WRMP sets out DCWW's preferred resource and demand management options ('the preferred options') for meeting predicted deficits in the water available for PWS, and for ensuring security of supply.
- 1.1.3 DCWW's WRMP24 is being developed within a regional water resources planning framework covering all or part of the operational areas of Dŵr Cymru Welsh Water (DCWW), Severn Trent Water (STW), South Staffordshire Water (SSW) and United Utilities Water (UU)¹ that is managed by Water Resources West (WRW). WRW is currently preparing a Regional Plan² for the period 2025 to 2085 that will address long-term regional and inter-regional, multi-sectoral water resources management pressures and will draw on water resource options from the member water companies' WRMP24s, as well as the Strategic Resource Options (SROs) being taken forward by the companies.

1.2 Habitats Regulations Assessment

- 1.2.1 Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017* (as amended) (the 'Habitats Regulations')³.

¹ Hafren Dyfrdwy operates in mid-Wales and borders the WRW Regional Plan area; no Hafren Dyfrdwy water resources zones are included in the regional plan and so Hafren Dyfrdwy is an associate rather than core member of WRW.

² EA (2020) *Water Resources National Framework: Appendix 2: Regional planning*.

³ The 2017 Regulations have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 to reflect the UK's exit from the EU, although these largely carried forward the provisions and terminology of the 2017 Regulations and do not fundamentally alter their interpretation. This report therefore primarily refers to the 2017 Regulations and (where appropriate for clarity) the relevant provisions of the Habitats Directive.

- 1.2.2 Regulations 63 and 64 transposed the provisions of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') as they related to plans or projects in England Wales.
- 1.2.3 Regulation 63 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 giving consent or authorisation. The plan or project can only be given effect if it can be concluded (following an 'appropriate assessment') that it "*...will not adversely affect the integrity*" of a site unless the provisions of Regulation 64 are met.
- 1.2.4 This assessment process 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)⁷ and, if so, whether there will be any 'adverse effects on site integrity'⁸.

1.3 This Report

- 1.3.1 DCWW has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. DCWW has appointed Wood Group UK Limited (Wood) and Ricardo Energy and Environment (Ricardo) to assist with its assessment of WRMP24 against Regulations 63 and (if required) 64.
- 1.3.2 This report accompanies the draft WRMP24 that has been published for consultation and summarises the current assessment of DCWW's preferred options against the

⁴ As noted, the 2019 amendment to the Habitats Regulations largely carried forward the provisions and terminology of the 2017 Regulations, and so the term 'European site' is currently retained and for all practical purposes the definition is essentially unchanged. European sites are therefore: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agreed the site as a 'Site of Community Importance' (SCI) (if this was before 31 Jan 2020); any classified Special Protection Area (SPA); and any candidate SAC (cSAC). 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') are applied; 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. 181; TAN5 para. 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this document in its broadest sense, as an umbrella term for all of the above designated sites. Note, it is likely that this term will be supplanted at some point in the future although an appropriate UK-wide alternative has not yet been agreed (e.g. the NPPF in England has adopted the term 'Habitats sites' to refer collectively to those sites defined by Regulation 8; the *Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019* does not offer a direct alternative to "European site" but uses the term 'National Site Network' in place of 'Natura 2000').

⁵ 'European offshore marine sites' are defined by Regulation 18 of The Conservation of Offshore Marine Habitats and Species Regulations 2017; 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 more typically referred to as 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to a specific stage within the process.

⁷ Also referred to as the 'test of significance'.

⁸ Also referred to as the 'integrity test'.

requirements of the Habitats Regulations. It also documents the iterative HRA process that has been applied through the development of the draft WRMP24. The report is structured as follows:

- **Section 2** provides a brief summary of the draft WRMP and the preferred options;
- **Section 3** sets out the approach to HRA of WRMP24, including the key issues for these strategic plans (**Section 3**);
- **Section 4** documents the 'screening' of the preferred options;
- **Sections 5 – 9** provide 'appropriate assessments' for those European sites where significant effects could not be excluded, including option-specific 'in combination' assessments;
- **Section 10** summarises the plan-level 'in combination' assessment; and
- **Section 11** sets out the proposed conclusion of the HRA of DCWW's WRMP24 (assuming that final WRMP reflects the draft WRMP, and subject to any additional data gathering that may be required to resolve residual uncertainties).

- 1.3.3 The report necessarily focuses on the assessment of the preferred options; the iterative HRA-related processes used to inform the development of the plan (including the feasible options assessments) are therefore documented separately for clarity. In addition, the assessment is of the draft WRMP only and not the WRW Regional Plan (although it will contribute to the HRA of the Regional Plan).
- 1.3.4 Note that the HRA draws on the environmental data and assessments undertaken within other assessments, particularly in relation to operational effects and the hydrological zone of influence. These include the Water Framework Directive (WFD) assessment; this HRA report should therefore be read in conjunction with these reports.
- 1.3.5 In addition, it should be noted that any conclusions are necessarily preliminary (since the HRA is only finalised based on the plan intended for adoption), based on the available data and information on the options; where there are uncertainties, either in option operation or in the likely response of European sites and features, these are identified and approaches for resolution identified. Additional assessments and amendment may therefore be required if there are changes between the draft and final WRMP.

2. DCWW's WRMP24

The WRMP process identifies potential deficits between the water available for supply and the projected demand. DCWW has identified five supply-side options and two 'demand-side' options to resolve predicted deficits in its supply area, and to release water for transfer to other water companies.

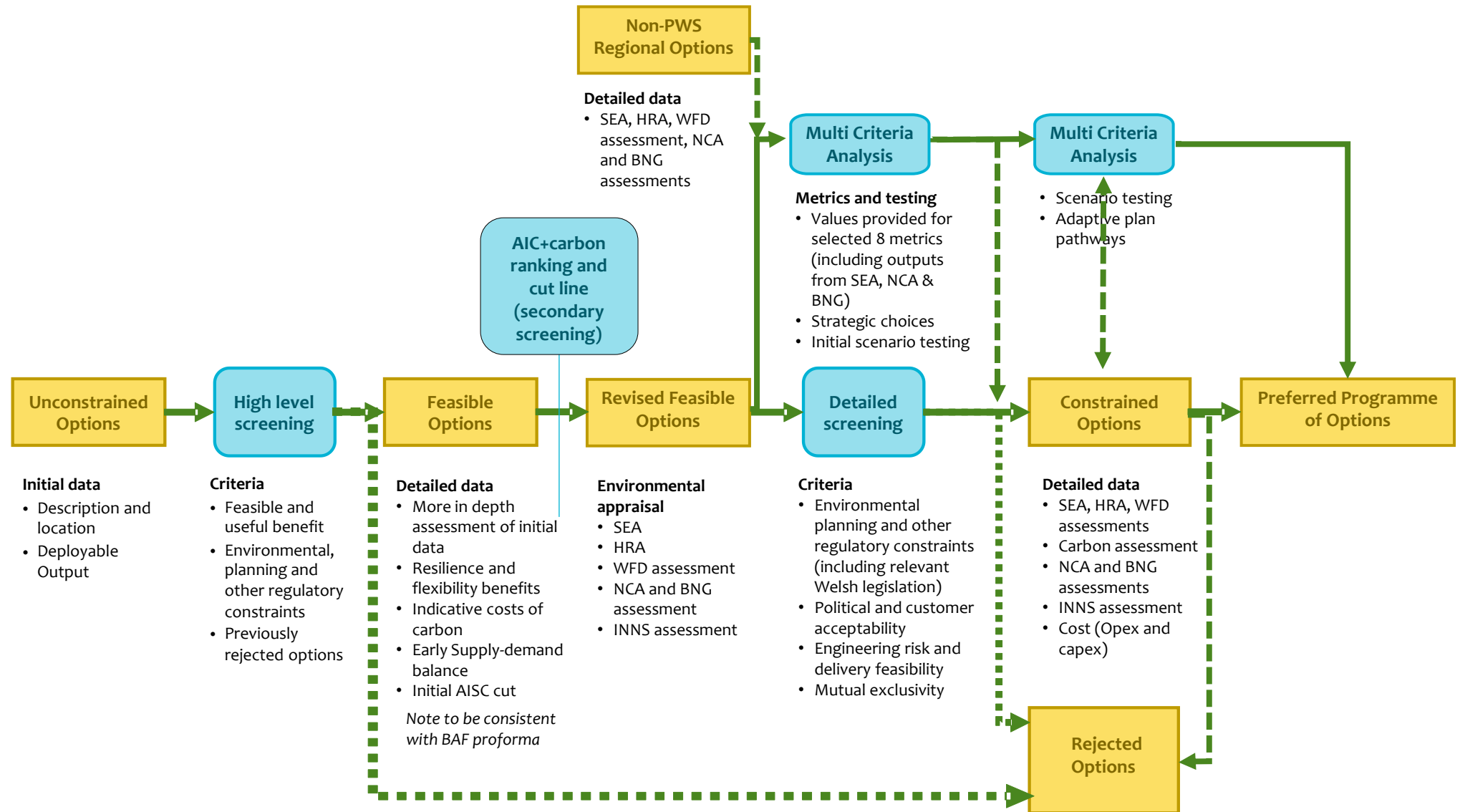
2.1 Water Resources Planning

- 2.1.1 The WRMP process establishes supply and demand balances for each Water Resource Zone⁹ (WRZ) operated by the water company, identifying potential deficits between the water available for supply and the projected demand. Each supply-demand balance calculation is structured around a consistent central set of planning assumptions and is used to identify WRZs in deficit over the plan period. Options are then proposed to resolve these deficits.
- 2.1.2 The supply-demand balance calculations are based on the comparison of much supply capability we have (Water Available For Use (WAFU)) which is then compared against the forecast demand for water plus an allowance for planning uncertainty known as Headroom.
- 2.1.3 Supply and Demand forecasts are completed in accordance with the *Water Resources Planning Guideline*¹⁰
- 2.1.4 The WRMP process initially identifies as many potential deficit solutions as possible (the 'unconstrained list' of options) irrespective of cost or technical merit. These are then refined to identify '**feasible options**' and subsequently the '**preferred options**' for meeting any supply-demand deficits. All zones with deficits are subject to a decision-making process using a Multi-Criteria Analysis (MCA), and other methods where appropriate, to identify a preferred plan (comprising 'preferred options') to address the supply demand deficit. The decision-making method factors in multiple costs and benefits and considers the interaction between zones to establish a best value plan for the region (and individual company). This staged filtering process allows various assessments, including HRA, to inform the plan development (see **Figure 2.1**).

⁹ Section 4.4. of the draft WRPg defines a water resource zone as "an area within which the abstraction and distribution of water to meet demand is largely self-contained (with the exception of agreed bulk transfers)".

¹⁰ UK Government (2022). Water resources planning guideline [online.]. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>. [Accessed April 2022].

Figure 2.1 Environmental assessments into Option and plan development



2.1.5 WRMP options are typically characterised as **supply-side** (measures that increase available supply, such as new sources of water) or **demand-side** (measures which reduce the amount of water required such as leakage detection and reduction). HRAs generally focus on supply-side options¹¹ and their potential effects; these options would typically involve 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 regimes (e.g. additional abstraction; changes in timing of abstractions; etc);
- 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 (e.g. to improve resilience);
- transferring water from adjacent water companies or third-parties with a supply / demand surplus; or
- Strategic Resource Options¹² involving multiple companies and sources.

2.2 DCWW's WRMP24

2.2.1 Welsh Water manages its water supplies and demands across 23 water resource zones (WRZs). Welsh Water provides water and sewerage services to some 3 million customers in much of Wales and small parts of Cheshire and Herefordshire in England. It also has over 100,000 business customers, and in total delivers more than 850 million litres of drinking water every day. This can increase by up to 20 per cent during a hot summer. Most of the water Welsh Water abstracts is supplied from impounding reservoirs although significant volumes are abstracted from lowland river sources such as those on the Rivers Wye and Usk in South East Wales, the River Towy in South West Wales and the River Dee in North Wales. Groundwater accounts for less than 5 per cent of water supplies by Welsh Water but at a local level, may be the whole supply¹³.

2.2.2 In previous WRMPs, Welsh Water identified and implemented significant asset investment to manage the implementation of the Water Framework Directive and Habitats Directives

¹¹ 'Demand management' options (i.e. options designed to reduce treated water use such as metering or provision of water butts) are generally considered unlikely to have any significant or adverse effects on any European sites (see Section 3.2).

¹² There are six Strategic Resource Options (SROs) being taken forward by the companies (the Severn Thames transfer, Grand Union Canal transfer, Minworth Effluent Reuse, Severn Trent Sources, Vyrnwy Reservoir Source, United Utilities Sources).

¹³ Welsh Water (2019) *Final Water Resources Management Plan 2019. Technical Report. March 2019*. Available online: <https://www.dwrcymru.com/en/our-services/water/water-resources/final-water-resources-management-plan-2019> [Accessed March 2021].

through abstraction licence changes. Demand management and leakage reduction by at least 15% during AMP7 was also mandated by regulatory expectation.

- 2.2.3 Although the environment remains a key aspect of the draft WRMP24, no confirmed abstraction licence changes have been agreed through the National Environment Programmes that would reduce Welsh Water's current supply capability.
- 2.2.4 Welsh Water's supply demand balances (SDB) have been generated for each of the 23 water resource zones. This identified that three zones would not be resilient under the preferred planning scenario (1 in 200 year level of drought resilience for emergency measures, tested against a medium emission climate change scenario) within the 25-year period to 2050. The zones with an identified shortfall are SEWCUS, the Tywi Gower, Mid-South Ceredigion (which has a forecast deficit under more extreme scenarios), and Clwyd Coastal. To resolve these issues, Welsh Water's draft WRMP24 proposes:
- A leakage programme to maintain leakage performance over the AMP8 period. The plan presents a challenging target of reducing leakage by a further 10% during AMP8 as part of Welsh Water's longer term target to achieve 50% reduction of 2017/18 leakage levels by 2050, thus reducing abstraction from the environment.
 - A metering programme that will support both the achievement of Welsh Water's leakage strategy and the long term reduction in average domestic per capita consumption to 110 l/p/d by 2050.
 - Network improvements to increase drought resilience in the SEWCUS and Tywi Gower Zones.
 - WTW enhancement to increase our peak supply capability in the Mid & South Ceredigion zone
- 2.2.5 As part of the WRMP development process, DCWW initially identified feasible supply-side and demand-side options to resolve deficits, improve network resilience and make water available for transfer. These options were subject to a staged filtering process (which included a high-level consideration of the HRA-related risks associated with each option) designed to establish the best-value plan for DCWW taking into account the regional plan requirements.
- 2.2.6 The draft WRMP24 therefore proposes:
- a total of five supply options for three of the WRZs, Tywi Gower, SEWCUS and Mid and South Ceredigion; and
 - four 'demand' management options (one for each of the WRZ's identified).
- 2.2.7 These options are summarised in **Tables 2.1, 2.2, 2.3 and 2.4**. Please note that following completion of the assessment, there has been minor amendments and refinement of the yield values by DCWW.

Table 2.1 Preferred Options for the Tywi Gower WRZ included in the draft WRMP24

Option ID	Option name	Yield (MI/d)	Description
TWG12	Crai Distribution Option - Upsize Christopher Road WPS	1.7	In order to reduce demand on Crai resources, GCG SRv (2.4 MI/d average demand) and Bros SRv(1.7MI/d average demand) will be rezoned to the Felindre WTW by upsizing Christopher Road PS to reverse flows in the 17" main from Crai and putting two booster PS's to pump to GCG SRv and Bros SRv.
TWG14	Ystradfellte - Reverse flow through Tonna control valve	2.5	In order to reduce the stress on the resource from Cefn Drysgoed, flows through the Tonna Flow control valve will be reversed so that 2.5MI/d from the Felindre system can meet some of the demand on the Cefn Drysgoed network. Elements: New Park Field Pumping Station (PS) to pump to the Cefn Drysgoed network (2.5MI/d - from the model).
WEF-MET-8201	WEF-MET-8201	23.75	This option would involve the significant increase in metering of customer properties in the zone, and the fixing of identified leakage as it is detected on customer supply pipes.

Table 2.2 Preferred Options for the SEWCUS WRZ included in the draft WRMP24

Option ID	Option name	Yield (MI/d)	Description
SEW166	Memorial and Cefn Mably upgrade	47	This option would involve providing 47 MI/d peak flows to the Pontsticill Low Level network in order to release the flows from the Pontsticill WTW to enable other WRMP options and the trading option. In order to be able to supply the combined 47 MI/d, Cilfynydd WPS (21MI/d) will be reinstated to support the Memorial WPS (26 MI/d). The Pumps at Memorial WPS will be replaced with Low suction, high lift pumps to be able to pump to Ty Gwyn SRv. Cefn Mably WPS will be reinstated to provide additional pressure to the supply side of Memorial WPS and Tongwynlais SRv. Installation of a pressure and flow control valve arrangement at the inlet to Tongwynlais SRv to ensure that the service reservoir does not overtop.
SEW168	Removal of Llwynon Min flow	<9	Scheme to enable DCWW to stop supplying c9 MI/d minimum sweetening flow year round into the Llwynon gravity main in order to avoid WQ issues. The scheme comprises installation of new pressure reducing valves (PRVs), meters, burst protection valves and flow control valves.
WEF-MET-8121	WEF-MET-8121	43.31	This option would involve the significant increase in metering of customer properties in the zone, and the fixing of identified leakage as it is detected on customer supply pipes.

Table 2.3 Preferred Options for the Clwyd Coastal WRZ included in the draft WRMP24

Option ID	Option name	Yield (MI/d)	Description
WEF-MET-8012	WEF-MET-8012	2.03	This option would involve the significant increase in metering of customer properties in the zone, and the fixing of identified leakage as it is detected on customer supply pipes.

Table 2.4 Preferred Options for the Mid-South Ceredigion WRZ included in the draft WRMP24

Option ID	Option name	Yield (Ml/d)	Description
MSC08	Upsize Llechryd WTW	2	Llechryd WTW currently has a maximum capacity of 19 Ml/d. The maximum abstraction rate is 800 m ³ /h. It is expected that the abstraction licence could be increased to 880 m ³ /h freeing up an extra 2 Ml/d.
WEF-MET-8202	WEF-MET-8202	1.79	This option would involve the significant increase in metering of customer properties in the zone, and the fixing of identified leakage as it is detected on customer supply pipes.

- 2.2.8 Further work is being completed by Welsh Water on its leakage options, which will be reflected in any update to this HRA.

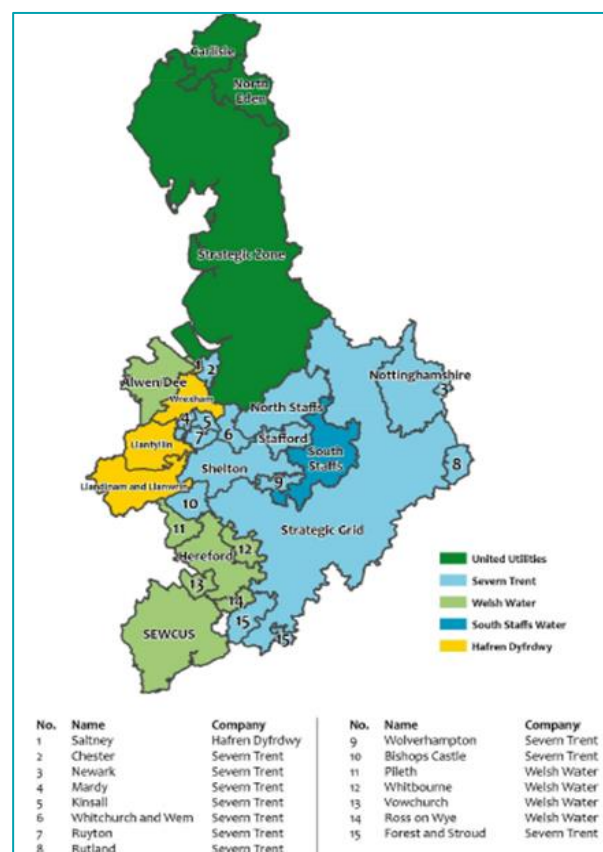
2.3 Relationship with the WRW Regional Plan and SROs

Regional Plan

- 2.3.1 The Water Resources West (WRW) Regional Plan covers the management of water resources in the North West of England, the West Midlands and the cross-border catchments with Wales. It includes all or part of the operational areas of Dŵr Cymru Welsh Water (DCWW), Hafren Dyfrdwy¹⁴, Severn Trent Water (STW), United Utilities (UU) and South Staffordshire Water (SSW) (see figure to right).

- 2.3.2 These five companies, like all water companies in England and Wales, are required¹⁵ to prepare, maintain and publish a WRMP.

- 2.3.3 WRW is taking an integrated approach to preparing the Regional Plan and the WRMPs and aims to provide a Regional Plan that is multi-sector and takes account of the water supply needs of non-public water supply (non-PWS) abstractors as well as public water supplies. WRW member water companies have used a regionally consistent set of methodologies to reflect local, regional and national needs into the development of the plans.



¹⁴ AT 1st July 2018, Hafren Dyfrdwy combined the water service area of Dee Valley Water and Severn Trent lying in Wales.

¹⁵ Section 37 and 37A of Water Industry Act 1991, as amended by the Water Act 2003 and the Water Act 2014.

- 2.3.4 Each water company is leading the development of their individual WRMP and relevant aspects of the regional plan in the parts of their area included with WRW as a single piece of work. This has necessitated a high degree of integration and fostered greater collaboration between companies and stakeholders.
- 2.3.5 The WRW Regional Plan covers the period 2025 to 2085 and addresses long-term regional and inter-regional, multi-sectoral water resources management pressures and draws on water resource options from the member water companies' WRMP24s, as well as the Strategic Resource Options¹⁶ (SROs) being taken forward by the companies.
- 2.3.6 In March 2020, WRW published its Initial Resource Position¹⁷. This identified that by 2050, an estimated 166 million litres per day of additional water would be needed for public water supplies, and in the region of an additional 41 million litres per day needed for other abstractors. In an update¹⁸ (published in February 2021) to its resource position, WRW noted that the need maybe greater than previously estimated. WRW published its Emerging Regional Plan¹⁹ in January 2022. This updated the forecast, taking into account a commitment to achieve a 50% reduction in leakage from the public water supply network by 2050 and a per capita consumption reduction to 110 litres/person/day. The updated WRW forecast identified that 215ML/d of new water would be needed to meet public supply demand by 2031 and that an additional 63ML/d would be needed by 2050, for non-public water supply sectors.

Strategic Resource Options

- 2.3.7 Two SROs are within Wales but do not interact with the DCWW supply area, namely the North-West Transfer SRO and the Severn-Thames Transfer SRO.
- 2.3.8 The NWT SRO solution promotes cost efficient source options selected to facilitate transfer volumes by the release of raw water directly from Lake Vyrnwy into River Vyrnwy or transferred through a new River Vyrnwy bypass pipeline into the River Severn as part of the Severn Thames Transfer (STT) SRO. The NWT SRO provides new sources to be brought online if water were to be transferred out of region, maintaining resilience for customers in the North West. The NWT SRO comprises two principal components:
- new sources to offset water transferred out of region from Lake Vyrnwy as part of the STT SRO; and

¹⁶ The Strategic Water Resource Options (SROs) programme has been initiated by Ofwat to provide at least 1500ML/d of water to areas of England facing a water deficit. The SRO Programme includes 17 schemes which will be funded and assessed during AMP7 to determine the right portfolio of projects to be selected by Regional Plans ready for implementation in AMP8. Schemes are evaluated at a series of decision points (Gates).

¹⁷ WRW (2020) *Initial Resource Position, March 2020*. Available from <https://waterresourceswest.co.uk/s/WRW-Initial-Resource-Position.pdf> [Accessed August 2022].

¹⁸ WRW (2021) *Update on our Resource Position, February 2021*. Available from <https://waterresourceswest.co.uk/s/WRW-Update-on-Resource-Position-February-2021-web.pdf> [Accessed March 2022].

¹⁹ WRW (2022) *Emerging Regional Plan, January 2022*. Available from: <https://static1.squarespace.com/static/5e67889204d86850e1fdcece/t/61e5a4e237970d62de92fa10/1642439906757/WRW+Emerging+Regional+Plan+Executive+Summary.pdf>

- enabling works on the Vyrnwy Aqueduct to allow treated water from regional UU sources to be transferred by pumping into the Vyrnwy Aqueduct to maintain customer supplies (for transfer volumes greater than 50MI/d).

2.3.9 The potential for these SROs to interact with the DCWW options is considered as part of the 'in combination' assessment.

3. Approach to HRA

The nature of the WRMP (a long-term strategic plan with specific projects) presents challenges for a 'strategic' or plan-level HRA and it is therefore important to understand how the WRMP is developed and hence how it might consequently affect European sites.

3.1 Key Guidance

- 3.1.1 The key guidance document for HRA of WRMPs is **UKWIR (2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans*. UK Water Industry Research Limited, London.**
- 3.1.2 Other relevant guidance and case-practice includes:
- Regulators' Alliance for Progressing Infrastructure Development (2022). Strategic regional water resource solutions guidance for Gate 2.
 - Defra (2021). *Policy paper: Changes to the Habitats Regulations 2017* [online]. Available at: <https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017> [Accessed March 2021].
 - UK Government (2019). *Appropriate assessment: Guidance on the use of Habitats Regulations Assessment* [online]. Available at: <https://www.gov.uk/guidance/appropriate-assessment> [Accessed March 2021].
 - Tyldesley, D. & Chapman, C. (2021). *The Habitats Regulations Assessment Handbook* [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>. [Accessed March 2021].
 - UK Government (2021). Water resources planning guideline [online]. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline> [Accessed March 2021].
 - Natural England (2020). *Guidance on how to use Natural England's Conservation Advice Packages in Environmental Assessments*. Natural England, Peterborough.
 - European Commission (2018). *Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Union, 1-86.
 - Defra (2012). *The Habitats and Wild Birds Directives in England its seas: Core guidance for developers, regulators & land/marine managers* [online]. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82706/habitats-simplify-guide-draft-20121211.pdf. [Accessed March 2021].
 - PINS Note 05/2018: *Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind*, Peter Sweetman v Coillte Teoranta. [withdrawn].

- SNH (2019). SNH Guidance Note: *The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement* [online]. Scottish Natural Heritage. Available at: <https://www.nature.scot/sites/default/files/2019-08/Guidance%20Note%20-%20The%20handling%20of%20mitigation%20in%20Habitats%20Regulations%20Appraisal%20-%20the%20People%20Over%20Wind%20CJEU%20judgement.pdf>. [Accessed March 2021].

3.2 Application of HRA of WRMPs

Process Overview

- 3.2.1 European Commission guidance²⁰ and established case-practice suggests a four-stage process for addressing Articles 6(3) and 6(4), and hence Regulations 63 and 64 (see **Box 1**), although not all stages will necessarily be required:

²⁰ *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC 2002).

Box 1 – Stages of HRA

Stage 1 – Screening or ‘Test of significance’

This stage identifies the likely effects of a project or plan on a European site, either alone or ‘in combination’ with other projects or plans and considers whether these effects are likely to be significant. The ‘screening’ test or ‘test of significance’ is a low bar, intended as a trigger rather than a threshold test: a plan should be considered ‘likely’ to have an effect if the competent authority is unable (on the basis of objective information) to exclude the possibility that the plan or project could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be ‘significant’ simply if it could undermine the site’s conservation objectives. Note that mitigation measures should not be considered at the ‘screening’ stage, in accordance with the **People over Wind** (Court of Justice of the European Union (ECJ) Case C-323/17); this reinforces the idea of screening as a ‘low bar’ and makes ‘appropriate assessments’ more common.

Stage 2 – Appropriate Assessment (including the ‘Integrity test’)

An ‘appropriate assessment’ (if required) involves a closer examination of the plan or project where the effects on relevant European sites are significant or uncertain, to determine whether any sites will be subject to ‘adverse effects on integrity’ if the plan or project is given effect, taking into account the sites’ conservation objectives and conservation status. Site integrity (in HRA terms) is *“the coherent sum of the site’s ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated”* (EC Guidance ‘Managing Natura 2000’ (2018)). The scope of any ‘appropriate assessment’ stage is not set, and the assessments will not be extremely detailed in every case (particularly if mitigation is clearly available, achievable, and likely to be effective). The assessments must be ‘appropriate’ to the effects and proposal being considered, and sufficient to ensure that there is no reasonable doubt that adverse effects on site integrity will not occur (or sufficient for those effects to be appropriately quantified should Stages 3 and 4 be required).

Stage 3 – Assessment of Alternative Solutions

Where adverse effects remain after the inclusion of mitigation, Stage 3 examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of European sites. A plan or project that has adverse effects on the integrity of a European site cannot be permitted if alternative solutions are available, except for imperative reasons of overriding public interest (IROPI; see Stage 4).

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

This stage assesses compensatory measures where it is deemed that there are no alternatives that have no or lesser adverse effects on European sites, and 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, although the IROPI need to be sufficient to override the adverse effects on European site integrity, taking into account the compensatory measures that can be secured (which must ensure the overall coherence of the ‘national site network’).

- 3.2.2 The stages in Box 1 (if required) are used to ensure compliance with the Habitats Regulations and so principally reflect the stepwise legislative tests applied to the final, submitted project or plan; **there is no statutory requirement for HRA (or its specific stages) to be completed for draft plans or similar developmental stages.**
- 3.2.3 Consequently there is flexibility for the HRA process to be run in a manner that provides maximum benefit for plan-development and sound decision-making, whilst still ultimately meeting the legislative tests.
- 3.2.4 In practice, HRAs of WRMPs usually have two functional components: they informally guide each water company as it considers which water resource options will be included in the published plan; and subsequently provide a formal assessment of the published WRMP against Regulation 63. A degree of separation between these functions is therefore sometimes necessary, and the rigid application of the stages in Box 1 to the

emerging or interim stages of strategic plans²¹ is not always appropriate, reducing the clarity and usefulness of the HRA as a plan-shaping process for both plan-makers and consultees. For WRMPs this is especially true for the assessment of the emerging feasible options and the application of the 'People over Wind' (PoW)²² case.

3.2.5 Therefore, whilst the principles of HRA have been applied to the emerging WRMP and the feasible options **the specific tests associated with Regulation 63 are applied to the preferred programme of options only**. The overarching HRA *process* for the WRMP has therefore included the following key steps:

- An initial **'risk review' of the supply-side²³ feasible options**, to assist DCWW's selection of constrained options (i.e. 'HRA as a process'). The review of the feasible options applied the normal principles and practices associated with 'HRA screening' but also took account of the deliverability of the options including potential mitigation opportunities²⁴ (for clarity, this review process is not documented in this report since the scope of some options has changed in response to the review).
- The **assessment of the preferred programme of options** against the provisions of Regulation 63, comprising formal 'screening' and an 'appropriate assessment' designed to meet the legislative tests (this report).

Key Challenges and Assumptions

3.2.6 The fundamental nature of the WRMP (a long-term strategic plan with specific projects) presents a number of distinct challenges for a 'strategic' or plan-level HRA and it is therefore important to understand how the WRMP is developed, its objectives, and hence how it might consequently affect European sites.

²¹ Particularly those (such as WRMPs) where the guideline HRA stages do not map easily on to the agreed or statutory stages in the plan development process.

²² *People Over Wind and Sweetman v Coillte Teoranta* (C-323/17)

²³ Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or 'down-the-line' deferral, depending on the nature of the option.

²⁴ Applying a PoW-compliant 'screening' assessment to the feasible options would have little value for plan-development since mitigation opportunities, including effective and well-established measures for marginal effects, would be ignored. All options with 'likely significant effects' would therefore be treated equally, with no distinction between options that would (from an HRA perspective) be easily achievable in practice and those that would be extremely challenging or impossible. The review of the feasible options is not therefore intended to be, or replicate, a formal and fully compliant 'HRA screening' or be a 'draft HRA' or similar. It takes a broad view of the 'HRA-related risk' associated with an option that captures both the risk to DCWW and the delivery of the WRMP within the statutory timescales (for example, the data collection required to definitively demonstrate that an option is acceptable might not be achievable in the time available for delivery of the WRMP) and the risks of the option to European site integrity (i.e. where adverse effects would appear to be an unavoidable outcome of the option as presented). The terminology intentionally reflects a typical RAG risk assessment to provide clarity for DCWW and to avoid the perception of premature assessment conclusions.

Uncertainty and plan-level mitigation

- 3.2.7 HRAs of plans and strategies typically have to deal with a degree of uncertainty; very often, it is not possible to provide a detailed assessment of the effects of a proposal as many aspects simply cannot be fully defined at the strategy-level in the planning hierarchy. This is particularly true for options that will only be required over longer-term planning horizons, which are inevitably less defined than options that are required in the near term.
- 3.2.8 Where the available information is fundamentally insufficient to complete a meaningful appropriate assessment, then case-practice (both for WRMPs and strategic plans in general) suggests some assessment may be deferred 'down the line' to a lower planning tier provided that certain criteria are met.
- 3.2.9 This is usually only appropriate where there is sufficient certainty that the proposal can (with the implementation of established scheme-level measures that are known to be effective) avoid adverse effects on the integrity of European sites; and/or if appropriate investigation schemes are identified to resolve the uncertainty and commitments are made within the plan to not pursue an option if adverse effects are identified through these investigations.
- 3.2.10 Case-practice in WRMP HRAs²⁵ suggests it may be acceptable to include Preferred Programme options with residual uncertainties provided that:
- there is sufficient flexibility within the terms of the WRMP to ensure adverse effects can be avoided at the project level (e.g. the plan does not dictate specific pipeline routes or yields that cannot be deviated from); and/or
 - the option is not required within the first five years of the plan period, so allowing time for additional investigations to be completed; and
 - the uncertainty that this creates is mitigated at the plan-level by the inclusion of alternative options which:
 - ▶ will meet the required demand / deficit should the Preferred Programme option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
 - ▶ will not themselves have any adverse effect on any European sites.
- 3.2.11 Note, this is not intended to provide a mechanism for the inclusion of options where there appears to be no reasonable way of avoiding adverse effects. It should be noted that this flexibility is perhaps desirable in any case, since it is possible that a 'no adverse effect' option might be subsequently proven to have adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations, since certainty over outcomes for the plan as a whole is provided.
- 3.2.12 However, it is important to note that some uncertainties will remain (particularly with regard to 'in combination' effects) and for some options it will only be possible to fully assess any potential effects at the pre-project planning stage, when certain specific details

²⁵ For example, in relation to DCWW's WRMP14.

are known; for example: construction techniques; site specific survey information; the precise timing of implementation; or the status of other projects that may operate 'in combination'. In addition, it may be several years before an option is employed, during which time other factors may alter the baseline or the likely effects of the option.

WRMP development parameters and relevance to HRA

3.2.13 The modelling underpinning the WRMP development and option selection process incorporates several assumptions that influence the scope of the HRA:

- The WRMP development process takes account of the existing consents regime, and any known (or reasonably anticipated) amendments that are likely to be required (e.g. following WINEP (Water Industry National Environment Programme) investigations or similar) since there has to be a starting point / basis for the assessment (i.e. the modelling / optioneering process cannot start with the assumption that no current consents are reliable). Any required licence amendments are factored into the supply-deficit calculations, and the EA will have confirmed that these are valid for the planning period when the WRMP modelling is undertaken. The existing consents regime (taking into account any required sustainability reductions) is therefore 'the baseline'²⁶ and, by extension the HRA of the WRMP necessarily focuses on the additional effects introduced by the WRMP options and does not (and cannot) reassess or reconfirm the existing consents regime.
- In some instances, when considering water that may be available from existing sources, consultees have indicated that consideration of 'recent actual' abstraction is more appropriate than the currently licenced maximum, particularly for waterbodies that are considered 'over-licensed'; it is understood that these licences have been identified to DCWW during the plan-development process and factored into the supply-demand balance calculations.
- The modelling takes account of predicted local and regional growth when identifying risk areas and potential solutions, based (*inter alia*) on Local Plans and population growth models. 'In combination' effects with respect to land-use plans and specific options are therefore inherently considered and accounted for as part of the WRMP option development process (i.e. an option that does not account for local growth is not a solution) and this can be relied on by the HRA. Likewise, the modelling accounts for climate change.
- Unless otherwise stated by the EA / NRW during the options development process, it is assumed that the relevant Catchment Abstraction Management Strategy (CAMS) documents are correct and reliable, and that there is 'water available' where this is confirmed by the CAMS.

²⁶ 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); it is assumed that these will be identified to the water companies as part of the WRMP development process.

In combination effects with SROs

- 3.2.14 With regard to schemes involving multiple water companies (particularly some SROs) the assessment will necessarily focus on those European sites directly exposed to the activities proposed and managed by DCWW, rather than sites that will only be affected by those scheme elements proposed and managed by other water companies; i.e. when undertaking the 'in combination' assessment of a scheme that appears in multiple plans the effects from source/donor will be considered distinct from supply/beneficiary.
- 3.2.15 For example, the source/donor plan will only consider the implications of the abstraction, etc on relevant European sites and water bodies within its catchment (and downstream catchments where relevant), and the supply/beneficiary plan would consider any implications on European sites / water bodies from the application of the supplied water within its catchment/s²⁷. This approach is intended to ensure unnecessary duplication is avoided, and pragmatism will be applied to address indirect, downstream effects and effects on functional habitat.

3.3 HRA of the Preferred Options

Geographical Scope

- 3.3.1 'Arbitrary' buffers are not generally appropriate for HRA. However, as distance is a strong determinant of the scale and likelihood of effects, the application of a suitably precautionary study area (based on a thorough understanding of both the options and European site interest features) has some important advantages due to the number of options and the benefits of a consistent approach:
- using buffers allows the systematic identification of European sites using GIS, so minimising the risk of sites or features being overlooked;
 - it ensures that sites for which there are no reasonable impact pathways can be quickly and transparently excluded from any further screening or assessment; and
 - when assessing multiple options it provides 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.
- 3.3.2 Professional experience and case-practice relating to typical water industry schemes demonstrates that environmental changes associated with construction in terrestrial environments are rarely notable more than 2 km from a source, and the UKWIR (2021) guidance includes accepted 'zones of influence' for certain aspects (for example, noise impacts would almost never be significant over 1km from the source). Operational effects can extend further, depending on the scale and nature of the option, and so an

²⁷ Note: for the Severn Thames transfer we would expect the in-combination assessment of impacts on the Severn to feature in both WRW and WRSEs plans. This is due to the complex interaction of releases and abstractions particular to this scheme.

intentionally precautionary overarching assessment scope has been used as a starting point for the assessment; this includes:

- All European sites that are within 20km of any operational facilities or new infrastructure required to deliver each option (including temporary infrastructure). This is an intentionally large buffer that can also reliably capture the vast majority of possible interactions with 'mobile species' in terrestrial environments.
- All European sites that are downstream of any operational facilities or new infrastructure required to deliver each option (including temporary infrastructure), or upstream sites that support migratory fish (no distance thresholds). This reflects the potential for hydrological impacts to operate over greater distances, and to address the potential for catchment-scale in combination effects from operation.

- 3.3.3 These parameters are used as a starting point for identifying potentially exposed sites. It is not a 'hard buffer' and in some instances it may be appropriate to consider more distant sites²⁸; however, unless otherwise noted, sites over 20km from the options that are not hydrologically linked and which do not support wide-ranging mobile species are typically considered sufficiently remote such that any environmental changes will be effectively nil, and so there will be 'no effects' on sites beyond this distance (and so no possibility of 'in combination' effects).
- 3.3.4 The European sites and interest features considered potentially exposed to the outcomes of the WRMP are listed in **Appendix A**.

Data Collection

European site data collection and conservation objectives

- 3.3.5 The screening and appropriate assessment stages take account of the baseline condition of the European sites and their interest features²⁹, including (where reported) data on
- the site boundaries and the boundaries of the component SSSIs;
 - the conservation objectives;
 - information on the attributes of the European sites that contribute to and define their integrity;

²⁸ For example, where an option is likely to directly affect the marine environment (e.g. through desalination schemes) and so potentially result in environmental changes that could coincide with areas used by wide-ranging marine species; however, wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options.

²⁹ The interest features are taken to be the qualifying features; and other within-site features that may be relevant to site integrity, particularly 'typical species' (for SACs) and within-site supporting habitats for SPAs. 'Functional land' would not usually be considered an interest feature of the site (although it may be important to the integrity of some interest features).

- the condition, vulnerabilities and sensitivities of the sites and their interest features, including known pressures and threats;
- the approximate locations of the interest features within each site (if reported); and
- designated or non-designated 'functional habitats' (if identified).

3.3.6 These data were derived from:

- the most recent JNCC-hosted GIS datasets;
- the Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites;
- Article 12 and 17 reporting;
- the published site Conservation Objectives;
- Supplementary Advice to the conservation objectives (SACO) where available³⁰;
- Site Improvement Plans (SIPs);
- Core Management Plans (Wales); and
- the supporting Site of Special Scientific Interest's favourable condition tables where relevant and where no SACOs applicable to the features are available.

3.3.7 Note:

- For SPAs, the qualifying features are taken as those identified on the most recent JNCC datasets and citations where these post-date the 2nd SPA Review (i.e. it will be assumed that any amendments suggested by the SPA review have been made) unless otherwise identified to us by NE or NRW; any site-specific issues relating to the SPA Review can be addressed in the screening and appropriate assessment of the preferred options (see below).
- The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); SSSI Definition of Favourable Condition Tables (FCTs) will be used for those features not covered by SAC/SPA designations.

3.3.8 Where possible the site data is used to identify other features that may be relevant to site integrity, particularly '**typical species**' (for SACs), within-site **supporting habitats**, and designated or non-designated '**functional habitats**'.

3.3.9 A '**typical species**' is broadly described by EC guidance as being any species (or community of species) which is particularly characteristic of, confined to, and/or dependent upon the qualifying Annex I habitat feature at a particular site. This may include those species which:

³⁰ NE has published '*Supplementary advice on conserving and restoring site features*' for most European sites in England which describe in more detail the range of ecological attributes which are most likely to contribute to a site's overall integrity, and the targets each qualifying feature needs to achieve in order for the site's conservation objectives to be met.

- are critical to the composition or structure of an Annex I habitat (e.g. constant species identified by the National Vegetation Classification (NVC) community classification);
- exert a critical positive influence on the Annex I habitat's structure or function (e.g. a bioturbator (mixer of soil/sediment), grazer, surface borer or predator);
- are consistently associated with, and dependent upon, the Annex I habitat feature for specific ecological needs (e.g. feeding, sheltering), completion of life-cycle stages (e.g. egg-laying) and/or during certain seasons/times; or
- are particularly distinctive or representative of the Annex I habitat feature at a particular site.

3.3.10 Within-site **supporting habitats** are those which support the population(s) of the qualifying species and which are therefore critical to the integrity of the feature.

3.3.11 '**Functional habitats**' are generally taken to be habitats or features outside a European site boundary that are important or critical to the functional integrity of the site habitats and / or its interest features. These might include, for example:

- 'buffer' areas around a site (e.g. dense scrub areas preventing public access; areas of land that reduce the effects of agricultural run-off; etc.);
- specific features or habitats relied on by mobile species during their lifecycle (e.g. high-tide roosts for waders; significant maternity colonies for bats known to hibernate within an SAC; areas that are critical for foraging or migration; etc).

3.3.12 **Conservation Objectives** benchmark Favourable Conservation Status (FCS) for each feature. Guidance³¹ from the UK Statutory Nature Conservation Bodies (SNCBs) provides a broad characterisation of FCS, stating that it "*relates to the long-term distribution and abundance of the populations of species in their natural range, and for habitats to the long-term natural distribution, structure and functions as well as the long-term survival of its typical species in their natural range. It describes a situation in which individual habitats and species are maintaining themselves at all relevant geographical scales and with good prospects to continue to do so in the future*".

3.3.13 The conservation objectives for European sites in England have been revised by Natural England in recent years to improve the consistency of assessment and reporting. As a result, the high-level conservation objectives for all sites are effectively the same:

3.3.14 For SACs:

- *With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features'...), and subject to natural change; ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring [as applicable to each site];*

³¹ JNCC (2018). *Favourable Conservation Status: UK Statutory Nature Conservation Bodies Common Statement* [online]. Available at: <https://data.jncc.gov.uk/data/b9c7f55f-ed9d-4d3c-b484-c21758cec4fe/FCS18-InterAgency-Statement.pdf>. [Accessed March 2022].

- ▶ *The extent and distribution of the qualifying natural habitats;*
- ▶ *The extent and distribution of the habitats of qualifying species;*
- ▶ *The structure and function (including typical species) of the qualifying natural habitats;*
- ▶ *The structure and function of the habitats of qualifying species;*
- ▶ *The supporting processes on which the qualifying natural habitats rely;*
- ▶ *The supporting processes on which the habitats of qualifying species rely;*
- ▶ *The populations of qualifying species; and,*
- ▶ *The distribution of qualifying species within the site.*

3.3.15 For SPAs:

- *With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features'...), and subject to natural change; ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:*
 - ▶ *The extent and distribution of the habitats of the qualifying features;*
 - ▶ *The structure and function of the habitats of the qualifying features;*
 - ▶ *The supporting processes on which the habitats of the qualifying features rely;*
 - ▶ *The population of each of the qualifying features; and*
 - ▶ *The distribution of the qualifying features within the site.*

3.3.16 The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); where Ramsar sites do not coincide with an SAC or SPA, or where the Ramsar features are not ecologically coincident with SAC or SPA features, the conservation objectives and definitions of favourable condition for the underlying SSSIs are used.

3.3.17 The conservation objectives are considered when assessing the potential effects of plans and policies on the sites; information on the sensitivities of the interest features also informs the assessment.

3.3.18 NE has published '*Supplementary advice on conserving and restoring site features*' for most sites, which describe in more detail the range of ecological attributes which are most likely to contribute to a site's overall integrity, and the minimum targets each qualifying feature needs to achieve in order to meet the site's conservation objectives. These are considered at the screening and appropriate assessment stages, as necessary.

3.3.19 In Wales, the Regulation 37 advice and Core Management Plans for the SACs and SPAs set out conservation objectives that benchmark Favourable Conservation Status (FCS) for each feature. For the Welsh European sites the conservation objectives comprise a 'vision' for the feature (the key component of the objective) and (where relevant) performance

indicators by which the objectives may be measured. These are used and referred to as necessary within the assessment but are not generally reproduced in this report.

Water resources baseline data

- 3.3.20 Information on the water resources baseline in the region is drawn from other assessment reports (e.g. the WFD), DCWW (e.g. groundwater (GW) and surface water (SW) abstraction locations, source operational parameters, WRZ operation, emergency or drought plan operations) and the EA (Public Water Supply (PWS) and other GW/ SW abstractions, CAMS documentation).
- 3.3.21 Note, unless otherwise stated by the EA / NRW during the options development process, it is assumed that the relevant Catchment Abstraction Management Strategy (CAMS) documents are correct and reliable, and that there is 'water available' where this is confirmed by the CAMS.

Option data

- 3.3.22 Information on the preferred options is provided by DCWW. This includes an outline of how the option will function, including the intended outcomes (design yields/capacities); and the scheme delivery requirements, including the type and indicative location of any permanent or temporary infrastructure.
- 3.3.23 It should be noted that the location of some scheme aspects cannot always be established at the WRMP level: whilst some elements may be clear (for example, new plant will often be located within or close to existing water company assets) the exact routes of pipelines (etc.) cannot be finalised at this stage. In most instances an indicative design route is provided for option costing purposes, which has been informed by the feasible options review process at the stage (i.e. in most cases direct impacts on designated sites would be avoided if possible). However, it should be recognised that the options are not fixed proposals for delivery that cannot be deviated from, and there will be many aspects (particularly relating to construction) that cannot be defined at the strategy level ahead of scheme-specific investigations (e.g. the location of any temporary enabling works; precise locations for additional materials storage; etc.)).

Preferred Options Assessment

Overview

- 3.3.24 For each option (or group of options, as appropriate), the assessment comprises:
- a 'screening' to identify those options that cannot have significant effects due to the fundamental nature of the option (this might include, for example, options that are designed to reduce demand but which do not involve any direct physical changes, such as education programmes to reduce water use);
 - a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive

effects due to the option³², and those where significant effects are likely or uncertain; and

- an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).

3.3.25 The conservation objectives are taken into account at the screening and appropriate assessment stages as necessary.

General Assumptions

3.3.26 Most environmental changes associated with construction and operation will have an inherent range over which they naturally attenuate³³, and many interest features will have little or no sensitivity to the likely magnitude of the environmental changes expected as the result of an option. Broad or universal assumptions that can be robustly applied to the assessments of the individual options or interest features are set out in **Appendix B**.

3.3.27 In addition:

- It is assumed that all normal licensing, consenting and management procedures will be employed at option delivery and throughout operation, and that established best-practice avoidance and mitigation measures will be employed throughout scheme design and construction to safeguard environmental receptors, including European site interest features. The HRA will not therefore assess speculative or hypothetical effects based on assumptions of non-compliance (e.g. accidental spillages of treatment chemicals from a new WTW).
- Guidance from the EA suggests that significant direct effects on groundwater dependent terrestrial ecosystems (GWDTEs) from drawdown associated with abstraction are unlikely for 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*).

Screening

3.3.28 The screening identifies possible effects on European sites based on:

- the anticipated operation of each Option and predicted hydrological zone of influence;
- the anticipated scope of any construction or enabling works required for each option;
- the European site interest features and their sensitivities; and

³² Note, for options with 'no effects' or positive effects there is no possibility of 'in combination' effects.

³³ For example, construction noise will almost invariably be indistinguishable from background levels over 600m from the source due to natural attenuation alone; several studies have demonstrated that visual disturbance of wading birds by construction plant or personnel is inconsequential over ~500m.

- the exposure of the site or features to the likely effects of the option (i.e. presence of reasonable impact pathways, taking into account species mobility and the likelihood of functional habitats being affected³⁴).

3.3.29 The screening therefore identifies:

- those European sites where significant effects are considered likely as the result of an option;
- those European sites where significant effects are considered uncertain as the result of an option;
- those European sites where significant effects were considered unlikely (alone) as the result of an option (but where in combination effects might still be possible); and
- those options that will have no effects on any European sites due to their nature or location (and hence no possibility of 'in combination' effects).

3.3.30 The 'low-bar' principle is used for the screening of the preferred options³⁵; in general, unless the possibility of significant effects can be simply and self-evidently excluded then an 'appropriate assessment' is completed (rather than a more detailed 'secondary screening' or similar). This applies to the options alone and in combination (i.e. unless it is evident that there will be 'no effects' from any options the possibility of 'in combination' effects is not excluded and these are taken forward to 'appropriate assessment'). This approach simplifies the overall assessment and ensures procedural clarity.

3.3.31 The 'low bar' approach is consistent with the 'People Over Wind'³⁶ case law, which requires that mitigation not be considered at screening. Historically, HRAs of plans typically assumed that established best-practice avoidance and mitigation measures (see **Appendix C**) would be employed at the project level 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 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.

3.3.32 In this instance, therefore, mitigation measures (including the established best-practice avoidance and mitigation measures noted in **Appendix C**) are not taken into account at screening, but are instead introduced at the 'appropriate assessment' stage (if required).

³⁴ With regard to functional habitat, it should be noted that field investigations would not be undertaken for a plan-level assessment except in very exceptional circumstances, and so specific areas of 'functional habitat' may not be identifiable for assessment at the plan level unless explicitly noted in the site documentation.

³⁵ The low-bar nature of the screening test is characterised in case-law (*C-258/11 - Sweetman and Others*) as 'should we bother to check?' – i.e. is a closer examination of possible effects required (i.e. appropriate assessment) or can effects self-evidently be excluded as nil or entirely nugatory?

³⁶ Case C 323/17 Court of Justice of the European Union: *People Over Wind*

Appropriate Assessments

- 3.3.33 The 'appropriate assessments' are an extension of the assessment processes undertaken at the screening stage, with significant effects (or areas of uncertainty) examined to determine whether there will be any adverse effects on the integrity of any European sites taking into account the conservation objectives.
- 3.3.34 The presentation of the assessments depends on the nature of the options and European sites that might be exposed to effects. In this case the assessments are 'European site led' (i.e. each assessment section relates to a specific European site), rather than being 'option by option'; this tends to simplify the 'in combination' assessment and minimises repetition of information relating to the interest features / sensitivities (etc.) of the sites.
- 3.3.35 Shared evidence applicable to multiple sites or features (for example, in relation to birds and construction noise) are provided in appendices to reduce repetition.
- 3.3.36 The appropriate assessments are 'appropriate' to the nature of the WRMP as a strategic plan, the option under consideration, and the scale and likelihood of any effects; for example, exhaustive examination of feature sensitivities and possible effect pathways is not undertaken for options that would have previously been 'screened out with mitigation' if there is a high degree of confidence in the mitigation measures. The assessments include inter-option 'in combination' assessments.

3.4 Plan-Level In Combination Assessments

- 3.4.1 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, although guidance is provided by the ACWG.
- 3.4.2 Broadly, it is considered that the DCWW WRMP could have the following in combination effects:
- Within-plan effects, i.e. separate options within the WRMP affecting the same European site(s); these are addressed as part of the option assessment process outlined above.
 - 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.
- 3.4.3 In undertaking the 'in combination' assessment it is important to note the following:
- The WRMP development process explicitly accounts for land-use plans, growth forecasts and population projections when determining future treatment and water management requirements.

- The detailed examination of non-water company consents for 'in combination' effects can only be undertaken by the EA or NRW through their permitting procedures.
- Likely water resource demands of known major projects are also taken into account during the development of the WRMPs, unless otherwise noted.

3.4.4 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 and related plans (including the SROs). The main exception to this is other water company WRMPs, which are developed concurrently.
- With regard to other strategic plans, the list of plans included within the SEA of the emerging DCWW WRMP is used as the basis for a high-level 'in combination' assessment. The SEA is used to provide information on themes, policies and objectives of the 'in combination' plans, with the plans themselves examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- With regard to projects:
 - ▶ The WRMP development process 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.

4. Preferred Options Screening

The 'screening' adopts a low-bar approach; in general, unless the possibility of significant effects can be simply and self-evidently excluded then an 'appropriate assessment' is completed (rather than a more detailed 'secondary screening' or similar). This applies to the options alone and in combination.

4.1 Demand-side options

- 4.1.1 The demand side options are summarised in **Tables 2.1 and 2.2**, Section 2, and essentially comprise household metering roll-outs.
- 4.1.2 These are likely to require some form of physical intervention or amendment to the network. The works required to install meters are very minor with no risk of significant effects on European sites; **these options are therefore 'screened out' and not considered further.**

4.2 Supply-side options

- 4.2.1 The initial 'alone' screening assessments for each preferred portfolio option are set out in **Tables 4.2 – 4.5** below. In summary, the assessment aims to identify those European site features that are potentially vulnerable to a particular option – i.e. which have features that are both exposed and sensitive to the likely outcomes (see **Table 4.1**), taking into account the baseline for the site including the conservation objectives. Features that are both exposed and sensitive to an environmental change are assumed to be subject to 'likely significant effects' unless there is a clear over-riding reason why significant effects cannot occur.

Table 4.1 Summary of screening criteria

LSE?	Notes
0	Sites or features that are not exposed to the effects of an option via any reasonable impact pathways and so there will be 'no effect' (hence no risk of 'in combination' effects)
No (N)	Sites or features that are potentially exposed and sensitive to the predicted environmental changes, but where effects are not considered significant (alone) due to their scale, nature etc. based on the information within the EARs and other contextual assessment information.
Uncertain (U)	Sites or features where a potential effect is clear and identifiable, which cannot be self-evidently excluded and which require additional consideration through 'appropriate assessment' (including options relying on mitigation to ensure significant effects do not occur).
Uncertain* (U*)	Sites where a potential effect pathway is evident, but where this is typically minor / precautionary and can be clearly avoided or mitigated at the project-level with the application of established best-practice measures; these sites are taken through AA to avoid potential conflict with PoW.

LSE?	Notes
Yes (Y)	Sites or features where significant effects are very likely or certain due to the scale/nature of the option proposals, or the vulnerability and distribution of the interest features on the European site. Adverse effects may be more likely and there is more certainty that (at scheme level) the option would have to rely on specific mitigation or compensation rather than general / simple environmental avoidance measures.

Table 4.2 Option screening summary – TWG12 Crai Distribution Option

TWG12			
Crai Distribution Option - Upsize Christopher Road WPS			
Option Summary			
In order to reduce demand on Crai resources, GCG SRv (2.4 Ml/d average demand) and Bros SRv (1.7Ml/d average demand) will be rezoned to the Felindre WTW by upsizing Christopher Road PS to reverse flows in the 17" main from Crai and putting two booster PS's to pump to GCG SRv and Bros SRv.			
General Notes			
There are 13 European sites within 20km of the proposed pumping station (Christopher Road) and two booster pumping stations (Brynawel and Rhos). The closest sites are Crymlyn Bog / Cors Crymlyn SAC and Crymlyn Bog Ramsar located 4.2km from the closest element of the proposed works (Christopher Road PS). The construction works are required in the catchment of the Afon Tawe and so there are no down- or upstream European sites. Due to the small scale of the proposed works, located within urban areas, and absence of potential impacts pathways (no hydrological connectivity, disturbance and air quality impacts highly unlikely given standard threshold distances; no risk of effects on 'functional habitats' for any interest features) it is considered that there will be 'no effects' (and hence no possibility of 'in combination' effects) on any European sites during the construction phase.			
The operational changes are limited to a change in distribution within the existing network. Therefore with no additional abstractions or discharges, there are no operational effects.			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Crymlyn Bog / Cors Crymlyn SAC	4.2	0	Located 4.2km from the proposed new pumping station at Christopher Road. No likely significant effects during construction from direct habitat loss, habitat degradation, or disruption of supporting processes due to small scale of works and distance to the site. No potential impact pathways identified during operation.
Crymlyn Bog Ramsar	4.2	0	Located 4.2km from the proposed new pumping station. No likely significant effects during construction from direct habitat loss, habitat degradation, or disruption of supporting processes due to small scale of works and distance to the site. No potential impact pathways identified during operation
Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC	9.7	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works. The proposed works are in the River Tawe catchment with no direct hydrological connectivity to the Carmarthen Bay and Estuaries site.
European sites in scope	Dist (km)*	LSE (alone?)	Notes

Burry Inlet Ramsar	10.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works. The proposed works are in the River Tawe catchment with no direct hydrological connectivity to the Burry Inlet.
Burry Inlet SPA	10.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works. The proposed works are in the River Tawe catchment with no direct hydrological connectivity to the Burry Inlet.
Gower Commons / Tiroedd Comin Gwyr SAC	11.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Gower Ash Woods / Coedydd Ynn Gwyr SAC	15.4	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Caeau Mynydd Mawr SAC	15.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Coedydd Nedd a Mellte SAC	16.2	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Cernydd Carmel SAC	16.6	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru SAC	16.6	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Kenfig / Cynffig SAC	19	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works.
Afon Tywi / River Tywi SAC	19.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works. The proposed works are in the River Tawe catchment with no hydrological connectivity to the River Tywi.

*DS = Downstream site

Table 4.3 Option screening summary – TWG14 Ystradfellte - Reverse flow through Tonna control valve

TWG14			
Ystradfellte - Reverse flow through Tonna control valve			
Option Summary			
In order to reduce the stress on the resource from Cefn Drysgoed, flows through the Tonna Flow control valve will be reversed so that 2.5Ml/d from the Felindre system can meet some of the demand on the Cefn Drysgoed network. Elements: New Park Field Pumping Station (PS) to pump to the Cefn Drysgoed network (2.5Ml/d - from the model).			
General Assessment Notes			
<p>There are 10 European sites within 20km of the option components. The proposed PS is to be set within an urban area, with potential loss of some woodland habitat, but separated from local watercourses by built up residential areas, road networks and an industrial estate. The PS would be located in the Afon Nedd catchment, and so there are no down- or upstream European sites and so no direct hydrological connectivity for pollution or sedimentation issues. Similarly, all the European sites are at sufficient distances such that they will not be impacted by direct habitat loss, or air quality, noise, visual impacts etc. The habitats affected by the option will not be important to the functional integrity of any sites or the populations of mobile species. Therefore, with no potential impact pathways, it is considered that there will be 'no effects' (and hence no possibility of 'in combination' effects) on any European sites during the construction phase.</p> <p>The operational changes are limited to a change in distribution within the existing network. Therefore with no additional abstractions or discharges, there are no operational effects.</p>			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Crymlyn Bog / Cors Crymlyn SAC	7.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological pathways, and scale of the proposed works. There are no mobile qualifying features and no hydrological connectivity between the proposed new PS and site.
Crymlyn Bog Ramsar	7.5	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological pathways, and scale of the proposed works. There are no mobile qualifying features and no hydrological connectivity between the proposed new PS and site.
Coedydd Nedd a Mellte SAC	15.1	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological pathways, and scale of the proposed works. There are no mobile qualifying features and no hydrological connectivity between the proposed new PS and site.
Kenfig SAC	15.7	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological pathways, and scale of the proposed works. There are no mobile qualifying features and no hydrological connectivity between the proposed new PS and site.

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Cefn Cribur Grasslands SAC	17.7	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological impact, and scale of the proposed works. The proposed PS location is not within suitable habitat for marsh fritillary butterfly, and is at sufficient distance, such that no Likely Significant Effects have been identified.
Blaen Cynon SAC	18.1	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological impact, and scale of the proposed works. The proposed PS location is not within suitable habitat for marsh fritillary butterfly, and is at sufficient distance, such that no Likely Significant Effects have been identified.
Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC	19.3	0	No potential impact pathways identified for operation due to distance, type, absence of hydrological connectivity, and scale of the proposed works. The proposed new PS is located within a predominantly urban area and separated by buildings and road networks from the nearby to River Neath (200m west) and Neath canal (60m west). As such, there is no direct pathway for pollution and sedimentation issues to enter the watercourse and affect downstream receptors.
Blackmill Woodlands SAC	19.7	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological impact, and scale of the proposed works. There are no mobile qualifying features and no hydrological connectivity between the proposed new PS and site.
Burry Inlet SPA	19.9	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological impact, and scale of the proposed works. There is no suitable off-site supporting habitat within the footprint of the proposed new PS. Therefore no Likely Significant Effects have been identified.
Burry Inlet Ramsar	19.9	0	No potential impact pathways identified for construction or operation due to distance, type, absence of hydrological impact, and scale of the proposed works. There is no suitable off-site supporting habitat within the footprint of the proposed new PS. Therefore no Likely Significant Effects have been identified.

*DS = Downstream site

Table 4.4 Option screening summary – SEW166 Memorial and Cefn Mably upgrade

SEW166			
Memorial and Cefn Mably upgrade			
Option Summary			
<p>Providing 47 Ml/d peak flows to the Pontsticill Low Level network in order to release the flows from the Pontsticill WTW to enable other WRMP options.</p> <p>In order to be able to supply the combined 47 Ml/d, Cilfynydd WPS (21Ml/d) will be reinstated to support the Memorial WPS (26 Ml/d). The Pumps at Memorial WPS will be replaced with Low suction, high lift pumps to be able to pump to Ty Gwyn SRv. Cefn Mably WPS will be reinstated to provide additional pressure to the supply side of Memorial WPS and Tongwynlais SRv. Installation of a pressure and flow control valve arrangement at the inlet to Tongwynlais SRv to ensure that the service reservoir does not overtop.</p>			
General Assessment Notes			
<p>This option requires minor works at existing operational sites in the south Wales valleys. Cilfynydd WPS and Memorial WPS are located near Pontypridd (River Taff catchment); Tongwynlais SRv is located on the outskirts of Cardiff near the M4; Cefn Mably is located east of Cardiff near the Afon Rhymni. The option is a network resilience solution that will not require 'new water' and so will not have any operational effects. The only sites potentially exposed to effects from construction are the Severn estuary sites (downstream sites, may be exposed to site-derived pollutants) and the Cardiff Beech Woods SAC (within approximately 500m of Tongwynlais SRv). Effects on the Severn estuary sites will be avoidable with established measures, although these are necessarily considered through AA; with regard to Tongwynlais SRv and the Cardiff Beech Woods SAC, this site will not be exposed to any effects as a result of the option due to (a) the very small scale of the works at Tongwynlais (modifications to valves); (b) the location of the SAC (up catchment from the SRv location); and (c) the distance to the SAC (~500m, ensuring no risk of air quality changes etc.). The option will have 'no effect' on this SAC hence no risk of 'in combination' effects.</p>			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Cardiff Beech Woods SAC	0.5	0	Site relatively close to Tongwynlais SRv (~500m); however, this site will not be exposed to any effects as a result of the option due to (a) the very small scale of the works at Tongwynlais (modifications to valves); (b) the location of the SAC (up catchment from the SRv location); and (c) the distance to the SAC (~500m, ensuring no risk of air quality changes etc.). The option will have 'no effect' on this SAC hence no risk of 'in combination' effects.
Severn Estuary Ramsar	5.8/DS	U*	Downstream site, potentially exposed to site-derived pollutants (principally for works at Cefn Mably due to proximity; effects clearly avoidable with established measures although these are necessarily considered through AA for consistency with PoW.
Severn Estuary SPA	5.8/DS	U*	Downstream site, potentially exposed to site-derived pollutants (principally for works at Cefn Mably due to proximity; effects clearly avoidable with established measures although these are necessarily considered through AA for consistency with PoW.

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Severn Estuary/ Môr Hafren SAC	5.8/DS	U*	Downstream site, potentially exposed to site-derived pollutants (principally for works at Cefn Mably due to proximity; effects clearly avoidable with established measures although these are necessarily considered through AA for consistency with PoW.
Aberbargoed Grasslands SAC	9.3	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works at existing sites).
River Usk/ Afon Wysg SAC	9.5	0	No operation- or construction-related effects (distance, separate catchment, minor nature of construction works at existing sites). Otters associated with the site may periodically use habitats close to the construction areas but these will not be functionally critical to the integrity of the otter population and will not be affected due to the small-scale of the works.
Blackmill Woodlands SAC	16.5	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works at existing sites).
Blaen Cynon SAC	17.9	0	No pathways for operation- or construction-related effects (distance, up-catchment, minor nature of construction works at existing sites).
Cwm Cadlan SAC	19.9	0	No pathways for operation- or construction-related effects (distance, up-catchment, minor nature of construction works at existing sites).

Table 4.5 Option screening summary – SEW168 Removal of Llwynon Min flow

SEW168			
Removal of Llwynon Min flow			
Option Summary			
Scheme to enable DCWW to stop supplying ~7 MI/d minimum sweetening flow year round into the Llwynon gravity main in order to avoid WQ issues. The scheme comprises installation of new pressure reducing valves (PRVs), meters, burst protection valves and flow control valves.			
General Assessment Notes			
This option requires minor works on or alongside an existing main below Llwynon reservoir (north of Merthyr Tydfil) that runs close to the A470. The option does not require 'new water' and so will not have any operational effects. No sites are considered to be exposed to the environmental changes associated with the option due to the small-scale of the required works, the distance to the European sites and the characteristics of the interest features; the option will have 'no effect' on any European sites and hence no risk of 'in combination' effects.			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Cwm Cadlan SAC	3.7	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Blaen Cynon SAC	6.8	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Brecon Beacons/ Bannau Brycheiniog SAC	7.2	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Coedydd Nedd a Mellte SAC	7.8	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
River Usk/ Afon Wysg SAC	12.5	0	No operation- or construction-related effects (distance, separate catchment, minor nature of construction works at existing sites). Otters associated with the site may periodically use habitats close to the construction areas but these will not be functionally critical to the integrity of the otter population and will not be affected due to the small-scale of the works.
Usk Bat Sites / Safleodd Ystlumod Wysg SAC	15.7	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works; extremely unlikely to affect 'functional habitat' for bat species).

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Llangorse Lake/ Llyn Syfaddan SAC	18.7	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Aberbargoed Grasslands SAC	18.9	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	19.4	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Severn Estuary SPA	DS	0	Downstream site, but is at least 45km down-catchment via the Afon Taff; this option will have 'no effects' on this site (hence no possibility of 'in combination' effects) irrespective of any scheme level mitigation due to the distance downstream and the very minor nature of the works (hence no possibility of pollution etc. events of sufficient magnitude to be measurable at the estuary).
Severn Estuary Ramsar	DS	0	Downstream site, but is at least 45km down-catchment via the Afon Taff; this option will have 'no effects' on this site (hence no possibility of 'in combination' effects) irrespective of any scheme level mitigation due to the distance downstream and the very minor nature of the works (hence no possibility of pollution etc. events of sufficient magnitude to be measurable at the estuary).
Severn Estuary/ Môr Hafren SAC	DS	0	Downstream site, but is at least 45km down-catchment via the Afon Taff; this option will have 'no effects' on this site (hence no possibility of 'in combination' effects) irrespective of any scheme level mitigation due to the distance downstream and the very minor nature of the works (hence no possibility of pollution etc. events of sufficient magnitude to be measurable at the estuary).

DS = downstream sites

Table 4.6 Option screening summary – MSC08 Upsize Llechryd WTW

SEW168			
Upsize Llechryd WTW			
Option Summary			
Llechryd WTW currently has a maximum capacity of 19 MI/d. The maximum abstraction rate is 800 m3/h. It is expected that the abstraction licence could be increased to 880 m3/h freeing up an extra 2 MI/d.			
General Assessment Notes			
This option would require additional abstraction from the Afon Teifi/ River Teifi SAC; the option would require minor construction works at the WTW to bring the additional abstraction to supply (new pipework, new filters, dosing plant, new pumps). The additional abstraction has the potential to significantly affect the Afon Teifi/ River Teifi SAC, and West Wales Marine / Gorllewin Cymru Forol SAC and Cardigan Bay / Bae Ceredigion SAC are downstream receptors; no other sites are likely to be exposed to the operation or construction of the option (hence 'no effects' and no risk of 'in combination' effects on any other sites). Note that the additional abstraction would have a very small effect on flows in the Afon Teifi (<1% at current Q95 flows, and substantially less for all flows greater than this) and so the effect of this on the marine habitats of the West Wales Marine / Gorllewin Cymru Forol SAC and Cardigan Bay / Bae Ceredigion SAC is considered inconsequential in relation to the dominant marine influences.			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Afon Teifi/ River Teifi SAC	0/DS	Y	Downstream site
Cardigan Bay/ Bae Ceredigion SAC	8.6/DS	Y	Downstream site; several of the site features (notably Sandbanks which are slightly covered by sea water all the time; Reefs; Submerged or partially submerged sea caves; Bottlenose dolphin <i>Tursiops truncatus</i> ; and Grey seal <i>Halichoerus grypus</i> are essentially marine features that are not (based on EA/NRW review of consents guidance) considered to be 'water resource sensitive'. These features will not be exposed to the effects of the option due to their location within the SAC (offshore, outside the Teifi estuary) and the small magnitude of change in flows from the Teifi (<1% vs. current flows) that will be inconsequential in relation to the marine influence on these features. These features are screened out. The remaining features (Sea lamprey <i>Petromyzon marinus</i> and River lamprey <i>Lampetra fluviatilis</i>) may be exposed when utilising the Teifi.
West Wales Marine / Gorllewin Cymru Forol SAC	9.1/DS	0	Downstream site; the feature of this site (Harbour porpoise) is not considered directly or indirectly water resource sensitive and so will not be affected by the option.
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	10.4	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works; extremely unlikely to affect 'functional habitat' for bat species).

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Preseli SAC	12.2	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Gweunydd Blaencleddau SAC	12.5	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Afonydd Cleddau / Cleddau Rivers SAC	13.4	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).
Pembrokeshire Bat Sites and Bosherton Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton SAC	16.5	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works; extremely unlikely to affect 'functional habitat' for bat species).
Rhos Llawr-cwrt SAC	18.8	0	No pathways for operation- or construction-related effects (distance, separate catchment, minor nature of construction works).

DS = downstream site

- 4.2.2 In summary, only two options (SEW166 Memorial and Cefn Mably upgrade; and MSC08 Upsize Llechryd WTW) have the potential to affect any European sites; these options are taken to appropriate assessment.
- 4.2.3 There are no pathways for 'in combination' effects between the preferred options. Furthermore, as the options will (with the exception of those European sites taken to appropriate assessment) have 'no effect' on any European sites (i.e. there are no reasonable pathways for effects), there will not be 'in combination' LSE between the WRMP options and other plans or projects except potentially for those European sites taken to AA.

5. Appropriate Assessment – SEW166

5.1 Screening Summary

- 5.1.1 This option requires minor works at existing operational sites in the south Wales valleys:
- Cilfynydd WPS and Memorial WPS are located near Pontypridd (River Taff catchment);
 - Tongwynlais SRv is located on the outskirts of Cardiff near the M4 (River Taff catchment);
 - Cefn Mably is located east of Cardiff near the Afon Rhymni.
- 5.1.2 The option is a network resilience solution that will not require 'new water' and so will not have any operational effects. The only sites potentially exposed to effects from construction are the Severn estuary sites (**Severn Estuary Ramsar, Severn Estuary SPA, Severn Estuary/ Môr Hafren SAC**) which may be exposed to site-derived pollutants (principally from works at Cefn Mably, which is approximately 9km upstream (~5.8km direct) of the Severn estuary via the Afon Rhymni) in the absence of mitigation.
- 5.1.3 Due to the limited scope of the effects the assessment structure is simplified to ensure it is appropriate to the scale and complexity of the potential effects.

5.2 Assessment of Effects – Severn Estuary Ramsar, Severn Estuary SPA, Severn Estuary/ Môr Hafren SAC

Site Features

- 5.2.1 The Severn Estuary is the largest example of a coastal plain estuary in the United Kingdom, comprising an interdependent mosaic of subtidal and intertidal habitats that are closely associated with surrounding terrestrial habitats.
- 5.2.2 The tidal range in the Severn Estuary is the second highest in the world and the scouring of the seabed and strong tidal streams result in natural erosion of the habitats and the presence of high sediment loads. The extreme hydrodynamic and sedimentary conditions essentially determine the type of habitats and species present and result in characteristic animal and plant communities. The predominant unconsolidated sediments are muds and sands which form the basis of the estuarine habitats, which include saltmarshes, intertidal mud and sand flats, subtidal sand banks, mixed mud and sand, rock outcrops, boulder and shingle shores as well as biogenic (worm built) reefs. There are also sandy beaches on the southern shores in the outer part of the estuary, backed by sand dunes.
- 5.2.3 The estuary is vulnerable to large-scale interference, mainly as a result of human actions. These include land-claim, aggregate extraction, physical developments such as barrage construction and other commercial construction activities, flood defences, industrial pollution, oil spillage and tourism-based activities and disturbance.
- 5.2.4 The **Severn Estuary/ Môr Hafren SAC** has the following qualifying features:

- Sandbanks which are slightly covered by sea water all the time
- Estuaries
- Mudflats and sandflats not covered by seawater at low tide
- Reefs
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- Sea lamprey *Petromyzon marinus*
- River lamprey *Lampetra fluviatilis*
- Twaite shad *Alosa fallax*

5.2.5 The Regulation 33 advice for the site³⁷ identifies '**typical species**' associated with the qualifying habitats; these are not reproduced here but largely comprise the invertebrate fauna characteristic of the marine habitats; and the plant species that relate to the four principal saltmarsh communities (pioneer, transitional, low to mid-marsh, and mid- to upper-marsh).

5.2.6 With regard to '**functional habitat**', the Regulation 33 advice does not identify specific habitats or areas that are considered important to the integrity of the qualifying features, although generally these are taken to include:

- for the anadromous fish species, the natal rivers supporting the populations associated with the Severn estuary;
- for the habitats, the wider environment of the estuary and Bristol Channel which is important for maintaining hydrodynamic and sediment transport processes, sediment supply and coastal morphology.

5.2.7 The **Severn Estuary SPA** supports the following qualifying features (all non-breeding):

- Tundra swan *Cygnus columbianus bewickii*
- Common shelduck *Tadorna tadorna*
- Gadwall *Anas strepera*
- Common redshank *Tringa totanus*
- Greater white-fronted goose *Anser albifrons albifrons*
- Dunlin *Calidris alpina alpina*
- Waterbird assemblage

5.2.8 The '**supporting habitats**' for the SPA features are principally the intertidal mud- and sand-flats and saltmarshes, along with terrestrial areas of freshwater coastal grazing marsh, improved grassland and open standing waters, and that are used for foraging,

³⁷ Available at: <http://publications.naturalengland.org.uk/file/3977366>

roosting and shelter. The Regulation 33 advice notes that concentrations of shelduck, dunlin and redshank are often found around the mouth of the Afon Rhymni.

5.2.9 With regard to non-designated '**functional habitat**' for the SPA features, these will predominantly be grazing marshes and similar habitats close to the estuary that provide roosting and foraging habitat (e.g. areas of Wentlooge Levels on the Welsh side), although use of these areas can be variable depending on food availability and the state of the tide.

5.2.10 The site meets the following **Ramsar** criteria:

- Crit. 1 (sites containing representative, rare or unique wetland types): the Annex I habitats characteristic of the high tidal range);
- Crit. 3 (supports populations of plant/animal species important for maintaining regional biodiversity): low diversity / high productivity estuarine communities;
- Crit. 4 (supports plant/animal species at a critical stage in their life cycles, or provides refuge): anadromous fish including the Annex II features plus sea trout *Salmo trutta* and eel *Anguilla Anguilla*, and migratory birds.
- Crit. 5 (regularly supports 20,000 or more waterbirds): assemblage of wintering birds;
- Crit. 6 (regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds):
 - ▶ Tundra swan *Cygnus columbianus bewickii*
 - ▶ Common shelduck *Tadorna tadorna*
 - ▶ Gadwall *Anas strepera*
 - ▶ Common redshank *Tringa totanus*
 - ▶ Greater white-fronted goose *Anser albifrons albifrons*
 - ▶ Dunlin *Calidris alpina alpina*
- Crit. 8 (important source of food for fishes, spawning ground, nursery and/or migration path).

Effect Pathways and Feature Exposure

5.2.11 The works required for the option will be relatively minor, at existing operational sites located in urban and urban-fringe habitats several kilometres from the estuary. There will be no significant permanent land-take. The only mechanisms for effects on the qualifying features of the sites are therefore as follows:

- short-term effects on the habitats of the designated sites (hence the qualifying species) from construction site-derived pollutants);
- short-term effects on non-designated 'functional habitat' for wintering birds or anadromous fish close to the construction areas from:
 - ▶ noise / vibration or visual disturbance;

- ▶ site-derived pollutants.

Assessment

- 5.2.12 With regard to effects from site-derived pollutants, these are likely to be negligible at most locations due to the scale of the works; however, potential effects can be clearly reduced to 'nil' with the application of normal best-practice construction measures (see Appendix C) to prevent run-off entering local watercourses. Consequently, there will be no effects on either the habitats of the European sites, or functional habitats associated with the mobile species, through this mechanism.
- 5.2.13 With regard to noise / vibration / visual disturbance:
- The construction areas are all over 150m from the nearest watercourses (Afon Taff and Afon Rhymni) and so fish species associated with the SAC/Ramsar will not be exposed to noise / vibration effects.
 - The construction areas are not located near habitats or land that is likely to be functionally important to wintering birds associated with the SPA/Ramsar, based on topographic mapping and aerial photography (predominantly urban / urban fringe habitats where sight-lines are constrained by buildings and vegetation).
- 5.2.14 In addition, potential effects through these pathways can be easily avoided at the project level using established avoidance and mitigation approaches, if required. As a result, there will be no effects on the mobile species associated with the Severn estuary sites these pathways.

In combination effects

Options in other DCWW plans

- 5.2.15 With regard to other DCWW plans:
- The drought options identified in DCWW's revised draft **Drought Plan 2020**³⁸ do not affect these European sites.
 - The interaction of the WRMP options with specific schemes derived from the emerging **Drainage and Wastewater Management Plan** (DWMP) can only be assessed at the project level due to the generic nature of the DWMP options.

Severn to Thames Transfer

- 5.2.16 The Severn to Thames Transfer (STT) SRO will affect the Severn estuary sites, although information available from the draft Gate 2 submission suggests that these effects will not be adverse; however, the effects of the STT will predominately be felt (if at all) in the upper estuary and there is no prospect of this scheme operating 'in combination' with option

³⁸ <https://www.dwrcymru.com/en/our-services/water/water-resources/final-drought-plan-2020>

SEW166 to adversely affect the Severn estuary sites (particularly when mitigation is considered).

Minor projects

- 5.2.17 It has not been possible to produce a definitive list of existing (minor) planning applications near the option's zone of influence, and generating a list at this stage would be of little value. It is possible that there will be 'in combination' project-specific construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

Major Projects:

- 5.2.18 Reference has been made to the Planning Inspectorate's National Infrastructure Projects database³⁹; major projects in close proximity to the Severn estuary sites include:
- various tidal lagoons (Cardiff, Newport, West Somerset) that do not currently have applications submitted;
 - Seabank 3 combined cycle gas turbines (CCGT) at Avonmouth (no application yet submitted).
- 5.2.19 Potential 'in combination' effects cannot be assessed in the absence of detail on these schemes; however, it is unlikely that construction associated with the SEW166 option will coincide with these schemes. In practice, WRMP option SEW166 will have 'no effects' on the interest features of the Severn estuary designated sites or functionally-associated habitats with the application of established avoidance and best-practice measures; as a result, no 'in combination' effects with other plans or projects would be expected.

Uncertainties and Conclusion

- 5.2.20 There are no notable uncertainties over either the option or likely exposure / response of site interest features to the likely outcomes of the scheme.
- 5.2.21 In summary:
- there will be no operational effects;
 - potential construction effects will be very minor due to the scale of the works and can be avoided / prevented entirely using established best-practice measures.
- 5.2.22 As a result there will be no **adverse effects, alone or in combination, on the integrity of the Severn Estuary Ramsar, Severn Estuary SPA or Severn Estuary/ Môr Hafren SAC.**

³⁹ <https://infrastructure.planninginspectorate.gov.uk/projects/>

6. Appropriate Assessment – MSC08

6.1 Screening Summary

- 6.1.1 Llechryd WTW currently abstracts from the Afon Teifi. It has a maximum capacity of 19 MI/d, with a maximum abstraction rate is currently 800 m³/h. This option would increase the abstraction to 880 m³/h freeing up an extra 2 MI/d. The option would require minor construction works at the WTW to bring the additional abstraction to supply (new pipework, new filters, dosing plant, new pumps).
- 6.1.2 The additional abstraction has the potential to significantly affect the interest features of the **Afon Teifi/ River Teifi SAC**. The **West Wales Marine / Gorllewin Cymru Forol SAC** and **Cardigan Bay / Bae Ceredigion SAC** are downstream receptors although the interest features of these marine SACs will have a very low sensitivity and exposure to the effects of the option, and so these sites are screened out, with the exception of the fish interest qualifying features of **Cardigan Bay / Bae Ceredigion SAC** which may use the Afon Teifi. No other sites are likely to be exposed to the operation or construction of the option (hence 'no effects' on these sites (see **Table 4.6, Section 4**) and no risk of 'in combination' effects on any other sites).

6.2 Assessment of Effects – Afon Teifi/ River Teifi SAC

Site Features

- 6.2.1 The Teifi in west Wales is a large river flowing over hard rock. It is mainly mesotrophic but also has oligotrophic sections in the upper reaches, and represents an outstanding example of a sub-type 3 river with water-crowfoot *Ranunculus* vegetation in western Britain. Rocky, tree-lined gorges are a feature of the lower part of the river particularly at Alltycafán, Henllan and Cilgerran. Below Cilgerran gorge the estuary begins before flowing out into Cardigan Bay. The whole of the river from source to sea is included in the SAC, as are ten tributaries: the Groes, Brefi, Dulas, Grannell, Clettwr, Cerdin, Tyweli, Ceri, Cych and Piliaw.
- 6.2.2 The **SAC** has the following qualifying features:
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
 - Water courses of plain to montane levels with the *Ranunculum fluitantis* and *Callitriche-Batrachion* vegetation
 - Sea lamprey *Petromyzon marinus*
 - Brook lamprey *Lampetra planeri*
 - River lamprey *Lampetra fluviatilis*
 - Atlantic salmon *Salmo salar*

- Bullhead *Cottus gobio*
- Otter *Lutra lutra*
- Floating water-plantain *Luronium natans*

- 6.2.3 The Core Management Plan for the site⁴⁰ identifies the '**typical species**' associated with the qualifying habitats as being defined by the relevant JNCC vegetation type, unless differing from this type due to natural variability when other typical species may be defined as appropriate.
- 6.2.4 With regard to '**functional habitat**', the Core Management Plan does not identify specific non-designated habitats or areas that are considered important to the integrity of the qualifying features, although generally these are taken to include (for the anadromous fish species), the natal rivers supporting the populations associated with the SAC and the estuarine areas used during their migration.
- 6.2.5 The Core Management Plan indicates that the fish interest features are likely to be in unfavourable condition; the assessments are relatively old although fisheries data (notably for salmon) does not suggest that there has been an improvement in populations since these assessment points.

Table 6.1 Feature condition

Feature	Condition and Assessment Date	Key Issues affecting FCS
Oligotrophic to mesotrophic standing waters	Favourable (2007)	-
Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> vegetation	Favourable (2006)	-
Sea lamprey <i>Petromyzon marinus</i>	Unfavourable (2005)	Unfavourable condition thought to be principally related to diffuse pollution and siltation rather than abstraction directly.
Brook lamprey <i>Lampetra planeri</i>	Unfavourable (2005)	Unfavourable condition thought to be principally related to diffuse pollution and siltation rather than abstraction directly.
River lamprey <i>Lampetra fluviatilis</i>	Unfavourable (2005)	Unfavourable condition thought to be principally related to diffuse pollution and siltation rather than abstraction directly.
Atlantic salmon <i>Salmo salar</i>	Unfavourable (2007)	Unfavourable condition thought to be principally related to diffuse pollution and siltation rather than abstraction directly.

⁴⁰ Available at: <https://naturalresources.wales/media/682845/afon-teifi-river-teifi-management-plan.pdf>

Feature	Condition and Assessment Date	Key Issues affecting FCS
Bullhead <i>Cottus gobio</i>	Unfavourable (2006)	Unfavourable condition thought to be principally related to diffuse pollution and siltation rather than abstraction directly.
Otter <i>Lutra lutra</i>	Favourable (2004)	-
Floating water-plantain <i>Luronium natans</i>	Favourable (2004)	-

Effect Pathways and Feature Exposure

6.2.6 Llechryd WTW is located adjacent to the lower reaches of the river and so most of the river will be unaffected by the construction or operation of the scheme. In particular, the only NRW-defined SAC site unit exposed to the environmental changes associated with the option will be Unit 1 (essentially the lowest reaches of the river from Llechryd to the inner estuary downstream of St. Dogmaels), much of which is tidal (the tidal limit is ~4.5km downstream of Llechryd near Cilgerran). The Core Management Plan indicates that the following features are absent from this unit:

- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (only associated with Teifi Pools in the upper reaches of the site);
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation (found in Units 2 – 6, i.e. upstream of Llechryd);
- Floating water-plantain *Luronium natans* (found in Units 4 and 5 (near Cors Caron) and Unit 7, i.e. upstream of Llechryd).

6.2.7 **These features will not be exposed to the effects of the option, alone or in combination, and are not considered further.**

6.2.8 The remaining features will be exposed to environmental changes occurring in Unit 1 as a result of the option. The construction works required for the option will be relatively minor, at an existing operational site; there will be no significant permanent land-take outside the site boundary. The only mechanisms for effects on the interest features of the sites are therefore as follows:

- short-term effects on the mobile features of the site or their supporting habitats from construction activities, including site-derived pollutants and disturbance or displacement from noise/vibration/visual changes;
- long-term changes to site habitats associated with reduced flows within Unit 1 of the SAC, hence effects on the mobile species when using these reaches;
- possible increased entrainment risk depending on the precise operational changes required for the existing intake.

Assessment – Construction

- 6.2.9 With regard to effects from site-derived pollutants, these are likely to be negligible at most locations due to the scale of the works; however, potential effects can be clearly reduced to 'nil' with the application of normal best-practice construction measures (see Appendix C) to prevent run-off entering local watercourses. Consequently, there will be no effects on either the habitats of the European sites, or functional habitats associated with the mobile species, through this mechanism.
- 6.2.10 Similarly, with regard to noise / vibration / visual disturbance or displacement, potential effects through these pathways can be easily avoided at the project level using established avoidance and mitigation approaches, if required, including timing works to avoid key migration periods. As a result, there will be no adverse effects on the mobile species associated with the SAC through these mechanisms.

Assessment – Operation

- 6.2.11 The lowest National River Flow Archive (NRFA) monitoring station on the Teifi is located at Glanteifi, immediately downstream of the confluence of the Afon Cych with the Teifi and approximately 2.75km upstream of the abstraction at Llechryd. This provides a reasonable proxy for flows in the Teifi below Llechryd (i.e. within SAC Unit 1)⁴¹
- 6.2.12 The approximate effect of the option on flows in the Teifi are summarised in **Table 6.2**, based on the maximum 2MI/d increase in abstraction relative to the current licence.

Table 6.2 Effect of additional 2M/d abstraction at key flow thresholds

Flow Percentile	Current Gauged Flow (MI/d) at Glanteifi	Relative flow reduction from option
Q95	278.0	0.72%
Q70	853.5	0.23%
Q50	1586.3	0.13%
Q10	5797.4	0.03%
Q5	7753.5	0.03%

- 6.2.13 The current abstraction regime on the Teifi is not adversely affecting the integrity of the SAC, based on the Review of Consents and the absence of any sustainability reductions or abstraction-related WINEP investigation schemes on the river. Furthermore, the Abstraction Licensing Strategy (ALS)⁴² for the Teifi at the tidal limit indicates that up to

⁴¹ Note that there are several additional inputs to SAC Unit 1 of the Teifi downstream of Llechryd, including the Afon Morgenuau and Afon Plysgog which are both upstream of the tidal limit at Cilgerran.

⁴² Available at: https://naturalresources.wales/media/681623/teifi-north-ceredigion_strategy_english.pdf

13.5MI/d is available for abstraction, with a Q85 (491.2MI/d) hands-off flow condition (the hands-off flow is specifically identified in order to safeguard the SAC).

- 6.2.14 The Core Management Plan for the SAC includes flow targets; in summary, these utilise the Habitats Directive Ecological River Flow (HDERF) objective and require that the maximum permissible percentage reduction from naturalised flow levels is as per **Table 6.3**:

Table 6.3 Afon Teifi / River Teifi SAC Core Management Plan river flow thresholds

Sensitivity to abstraction	Max. % reduction from daily naturalised flow at flow thresholds		
	>Q50	Q50 – Q95	<Q95
High	10	10	1 – 5
Very high	15	10	5 – 10

- 6.2.15 The flows provided in **Table 6.2** are gauged rather than naturalised (naturalised flows will usually be higher as abstractions from a catchment are not typically balanced by discharges). However, in this instance the gauged flows at Glanteifi are considered to provide a good proxy for naturalised flows as (a) the Teifi as a whole is considered fairly naturalised and (b) the Llechryd abstraction is the only major abstraction on the river, is downstream of the Glanteifi monitoring location, and there are no substantial discharges (e.g. WWTWs) upstream of this location.
- 6.2.16 Taking the total proposed abstraction (i.e. 21 MI/d), the effect on flows will be as follows:

Table 6.4 Effect of 21M/d abstraction at key flow thresholds

Flow Percentile	Current Gauged Flow (MI/d) at Glanteifi	Impact on flows
Q95	278.0	7.55%
Q70	853.5	2.46%
Q50	1586.3	1.32%
Q10	5797.4	0.36%
Q5	7753.5	0.27%

- 6.2.17 The proposed abstraction licence (i.e. for 21MI/d will therefore be below the flow thresholds set by NRW in the Core Management Plan (the thresholds for flows lower than Q95 are not relevant in this instance as the ALS indicates that any licence will be subject to HOF conditions at Q85, and the operation of the licence assumes this to be the case).
- 6.2.18 On this basis, therefore, adverse effects on the fish interest features due to flow reductions per se below Llechryd would not be expected. Furthermore, the impact relative to the current 'no adverse effects' abstraction regime would be very small (<1% at all flows

above Q95) and so ancillary effects (e.g. through effects on sediment deposition, wetted perimeter, etc.) would not be expected (particularly given the morphology of the river between the abstraction and the tidal limit, i.e. largely constrained through a gorge).

- 6.2.19 With regard to increased entrainment, this would not be expected given the small increase in abstraction and hence pumping requirements, and can in any case be mitigated at the scheme level using established measures for preventing or reducing entrainment.
- 6.2.20 Whilst it will be necessary to complete an HRA for the licence application (which will necessarily consider effects with the benefit of additional hydrological modelling) there is nothing to suggest that the option will have adverse effects on the Afon Teifi/ River Teifi SAC as a result of its operation.

In combination effects

Options in other DCWW plans

- 6.2.21 With regard to other DCWW plans:
- DCWW's revised draft **Drought Plan 2020**⁴³ includes one option that affects the Afon Teifi/ River Teifi SAC. This Drought Option is essentially the same as WRMP Option MSC08 (i.e. increase abstraction by 2MI/d) except it would only operate during the summer months. The HRA of the Drought Plan⁴⁴ concluded that this drought option would have negligible (not significant, in HRA terms) effects on the SAC. Adopting option MSC08 would require that the Drought Option for the Teifi be revised; however, if it were to remain the same (i.e. additional 2MI/d against a future baseline of 21MI/d abstraction rather than the current 19MI/d baseline) then the additional effect on Q95 flows would be ~1%, and the overall impact of a 23MI/d abstraction (i.e. 21MI/d plus 2MI/d) would remain below the Q95 10% threshold identified by NRW in the Core Management Plan. The overall impact may result in exceedances of the thresholds for the very lowest (Q99) flows, although these will obviously be short-term only. Adverse in combination effects would not be expected, although it will be necessary to review this through amendment of the Drought Plan.
 - The interaction of the WRMP options with specific schemes derived from the emerging **Drainage and Wastewater Management Plan** (DWMP) can only be assessed at the project level due to the generic nature of the DWMP options.

Minor projects

- 6.2.22 It has not been possible to produce a definitive list of existing (minor) planning applications near the option's zone of influence, and generating a list at this stage would be of little value. It is possible that there will be 'in combination' project-specific

⁴³ <https://www.dwrcymru.com/en/our-services/water/water-resources/final-drought-plan-2020>

⁴⁴ Available at: <https://www.dwrcymru.com/my/my-water/water-resources/-/media/a62e6a8212e4458bab99429866fea4c4.ashx>

construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

Major Projects:

- 6.2.23 Reference has been made to the Planning Inspectorate's National Infrastructure Projects database⁴⁵; no major projects in close proximity to the Afon Teifi have been identified.

Uncertainties and Conclusion

- 6.2.24 There are no notable uncertainties over either the option or likely exposure / response of site interest features to the likely outcomes of the scheme.
- 6.2.25 In summary:
- Potential construction effects will be very minor due to the scale of the works and can be avoided / prevented entirely using established best-practice measures.
 - Potential operational effects will be negligible and within the flow thresholds identified in the Core Management Plan; the ALS indicates that water is available for abstraction at all flows.
- 6.2.26 As a result there will be no **adverse effects, alone or in combination, on the integrity of the Afon Teifi/ River Teifi SAC as a result of this option.**

6.3 Assessment of Effects – Cardigan Bay/ Bae Ceredigion SAC

Site Features

- 6.3.1 Cardigan Bay SAC is sited off the south Ceredigion and north Pembrokeshire coast, in the southern part of Cardigan Bay. The landward boundary runs along the coast from Aberarth to Ceibwr just south of the Teifi Estuary. The SAC encompasses areas of sea and coast that support a wide range of different marine habitats and wildlife.
- 6.3.2 The SAC has the following qualifying features:
- Sandbanks which are slightly covered by sea water all the time
 - Reefs
 - Submerged or partially submerged sea caves
 - Bottlenose dolphin *Tursiops truncatus*
 - Sea lamprey *Petromyzon marinus*
 - River lamprey *Lampetra fluviatilis*

⁴⁵ <https://infrastructure.planninginspectorate.gov.uk/projects/>

- Grey seal *Halichoerus grypus*

6.3.3 All of these features, with the exception of Sea lamprey and River lamprey, are essentially marine features that are not (based on EA/NRW review of consents guidance) considered to be 'water resource sensitive'. These features will not be exposed to the effects of the option due to their location within the SAC (offshore, outside the Teifi estuary) and the small magnitude of change in flows from the Teifi (<1% vs. current flows, see Section 6.2 above) that will be inconsequential in relation to the marine influence on these features. These features are screened out. The remaining features (Sea lamprey *Petromyzon marinus* and River lamprey *Lampetra fluviatilis*) may be exposed when utilising the Teifi.

Effect Pathways and Feature Exposure

- 6.3.4 The pathways for effects on the fish species of the SAC are essentially as for the Afon Teifi/River Teifi SAC (Section 6.2 above); in summary the only mechanisms for effects on the interest features of the sites are therefore as follows:
- short-term effects on the mobile features of the site or their supporting habitats from construction activities, including site-derived pollutants and disturbance or displacement from noise/vibration/visual changes;
 - long-term changes to site habitats associated with reduced flows within Unit 1 of the SAC, hence effects on the mobile species when using these reaches;
 - possible increased entrainment risk depending on the precise operational changes required for the existing intake.

Assessment – Construction

- 6.3.5 With regard to effects from site-derived pollutants, these are likely to be negligible at most locations due to the scale of the works; however, potential effects can be clearly reduced to 'nil' with the application of normal best-practice construction measures (see Appendix C) to prevent run-off entering local watercourses. Consequently, there will be no effects on either the habitats of the European sites, or functional habitats associated with the mobile species, through this mechanism.
- 6.3.6 Similarly, with regard to noise / vibration / visual disturbance or displacement, potential effects through these pathways can be easily avoided at the project level using established avoidance and mitigation approaches, if required, including timing works to avoid key migration periods. As a result, there will be no adverse effects on the mobile species associated with the SAC through these mechanisms.

Assessment – Operation

- 6.3.7 The assessment of operational effects on Sea lamprey and River Lamprey is as per that for these features in the Afon Teifi/ River Teifi SAC; in summary, the effect of the option on flows in the Teifi will be negligible and within the thresholds identified by NRW, and so whilst it will be necessary to complete an HRA for the licence application (which will necessarily consider effects with the benefit of additional hydrological modelling) there is

nothing to suggest that the option will have adverse effects on the fish qualifying features of Afon Teifi/ River Teifi SAC as a result of its operation, and hence on the integrity of the populations of these species that are associated with the Cardigan Bay/ Bae Ceredigion SAC.

In combination effects

Options in other DCWW plans

6.3.8 With regard to other DCWW plans:

- DCWW's revised draft **Drought Plan 2020**⁴⁶ includes one option that affects the Afon Teifi/ River Teifi SAC. This Drought Option is essentially the same as WRMP Option MSC08 (i.e. increase abstraction by 2MI/d) except it would only operate during the summer months. The HRA of the Drought Plan⁴⁷ concluded that this drought option would have negligible (not significant, in HRA terms) effects on the SAC. Adopting option MSC08 would require that the Drought Option for the Teifi be revised; however, if it were to remain the same (i.e. additional 2MI/d against a future baseline of 21MI/d abstraction rather than the current 19MI/d baseline) then the additional effect on Q95 flows would be ~1%, and the overall impact of a 23MI/d abstraction (i.e. 21MI/d plus 2MI/d) would remain below the Q95 10% threshold identified by NRW in the Core Management Plan. The overall impact may result in exceedances of the thresholds for the very lowest (Q99) flows, although these will obviously be short-term only. Adverse in combination effects would not be expected, although it will be necessary to review this through amendment of the Drought Plan. It should be noted that the Drought Plan HRA concluded that there would be no significant effects on the Cardigan Bay/ Bae Ceredigion SAC.
- The interaction of the WRMP options with specific schemes derived from the emerging **Drainage and Wastewater Management Plan** (DWMP) can only be assessed at the project level due to the generic nature of the DWMP options.

Minor projects

6.3.9 It has not been possible to produce a definitive list of existing (minor) planning applications near the option's zone of influence, and generating a list at this stage would be of little value. It is possible that there will be 'in combination' project-specific construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

⁴⁶ <https://www.dwrcymru.com/en/our-services/water/water-resources/final-drought-plan-2020>

⁴⁷ Available at: <https://www.dwrcymru.com/my/my-water/water-resources/-/media/a62e6a8212e4458bab99429866fea4c4.ashx>

Major Projects:

- 6.3.10 Reference has been made to the Planning Inspectorate's National Infrastructure Projects database⁴⁸; no major projects in close proximity to the Afon Teifi (including in the estuarine areas of around the mouth of the the Cardigan Bay/ Bae Ceredigion SAC) have been identified.

Uncertainties and Conclusion

- 6.3.11 There are no notable uncertainties over either the option or likely exposure / response of site interest features to the likely outcomes of the scheme.
- 6.3.12 In summary:
- Potential construction effects will be very minor due to the scale of the works and can be avoided / prevented entirely using established best-practice measures.
 - Potential operational effects will be negligible and within the flow thresholds identified in the Core Management Plan; the ALS indicates that water is available for abstraction at all flows.
- 6.3.13 As a result there will be no **adverse effects, alone or in combination, on the integrity of the Cardigan Bay/ Bae Ceredigion SAC as a result of this option.**

⁴⁸ <https://infrastructure.planninginspectorate.gov.uk/projects/>

7. Strategic In Combination Assessment

7.1 Between-option 'in combination' effects

- 7.1.1 The effects of the WRMP options operating 'in combination' have been explored through the screening and appropriate assessment phases (see **Sections 4 – 5**). These assessments indicate that adverse 'in combination' effects are not likely to occur for any European sites or features.

7.2 'In combination' effects with other DCWW Plans

Drought Plan

- 7.2.1 DCWW's revised draft Drought Plan 2020 includes one option that affects the Afon Teifi/ River Teifi SAC. This Drought Option is essentially the same as WRMP Option MSC08 (i.e. increase abstraction by 2MI/d) except it would only operate during the summer months. The HRA of the Drought Plan concluded that this drought option would have negligible (not significant, in HRA terms) effects on the SAC. Adopting option MSC08 would require that the Drought Option for the Teifi be revised; however, if it were to remain the same (i.e. additional 2MI/d against a future baseline of 21MI/d abstraction rather than the current 19MI/d baseline) then the additional effect on Q95 flows would be ~1%, and the overall impact of a 23MI/d abstraction (i.e. 21MI/d plus 2MI/d) would remain below the Q95 10% threshold identified by NRW in the Core Management Plan. The overall impact may result in exceedances of the thresholds for the very lowest (Q99) flows, although these will obviously be short-term only. Adverse in combination effects would not be expected, although it will be necessary to review this through amendment of the Drought Plan. It should be noted that the Drought Plan HRA concluded that there would be no significant effects on the Cardigan Bay/ Bae Ceredigion SAC.
- 7.2.2 No other sites are affected by options in the Drought Plan and the draft WRMP.

Drainage and Wastewater Management Plan (DWMP)

- 7.2.3 For this iteration of the DWMP Welsh Water has prioritised solutions for 19 'Level 4' (L4) drainage areas where there are multiple incidents of internal property flooding or significant spills to European sites. Within each L4 catchment the DWMP process identifies specific locations where internal property flooding or spills to European sites have triggered the development of an option to resolve this; these are the 'Level 7' (L7) risk areas.
- 7.2.4 In most instances the environmental changes associated with the options will almost certainly be manageable or avoidable at the scheme level, although this relies on mitigation assumptions and so some options and L4 areas have been 'screened in' for appropriate assessment (to avoid potential conflict with 'People over Wind'). 'Appropriate

assessments' of the options in these L4 areas were undertaken based on the information available at the plan-level. In summary:

- Whilst options are identified, the proposals are not intended to be definitive plans for schemes that cannot be deviated from; in practice, none of the options are of a scale or type where adverse effects (through construction or operation) are likely to be an unavoidable consequence of their delivery.
- For all options the environmental changes associated with construction will be manageable or avoidable at the scheme level using standard project-level avoidance and mitigation measures that known to be available, achievable and effective.
- With regard to operation, the options within the current iteration of the DWMP are fundamentally addressing relatively small-scale local flow-management issues to reduce spills or flooding at a particular location and ensure that these volumes can be passed to the relevant WwTW for treatment in accordance with the WwTW's permits. Their operational effect on receiving waters is therefore likely to be positive (or at least neutral) compared to the status quo.

7.2.5 Consequently, the interaction of the WRMP options with specific schemes derived from the DWMP can only be assessed at the project level (although there is nothing to suggest that adverse effects will be unavoidable); and overall water quality within the receiving waterbodies (including European sites potentially affected by the WRMP) will be positive as a result of the DWMP (so adverse in combination effects would not occur).

7.3 Between-company 'in combination' effects

WRMPs

7.3.1 Other water company plans are currently in preparation, and so an 'in combination' assessment cannot be completed at this stage; however, only the sites associated with the Severn estuary have the potential to be exposed to effects associated with more than one plan, and the DCWW WRMP options will have very marginal or no effects on these sites; consequently in combination effects with other WRMPs would not be expected.

Drought Plans

7.3.2 As with the WRMPs, only the sites associated with the Severn estuary have the potential to be exposed to effects associated with more than one plan, and the DCWW WRMP options will have very marginal or no effects on these sites; consequently in combination effects with other water company Drought Plans would not be expected.

7.4 In combination effects with other plans and programmes

Effects with other strategic plans and water resource demand

7.4.1 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.

7.4.2 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).

7.4.3 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 management 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. Delivery is also formally reviewed on an annual basis.

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

Effects with major projects

7.4.5 Known major projects that are likely to increase demand have been taken into account during the development of DCWW's WRMP and determination of future deficits.

7.4.6 With regard to individual projects interacting with specific options to affect particular sites, this is addressed in **Sections 4 – 5**.

7.4.7 In summary, reference has been made to the Planning Inspectorates National Infrastructure Projects database⁴⁹ which includes major projects, subject to the requirements of the Planning Act 2008. It includes projects:

- where the developer has advised the Planning Inspectorate in writing that they intend to submit an application in the future;

⁴⁹ <https://infrastructure.planninginspectorate.gov.uk/projects/>

- where an application has already been made to the Planning Inspectorate and is undergoing the development consent process;
- where a Development Consent Order (DCO) application has been determined.

7.4.8 This exercise did not identify any major projects likely to adversely affect the integrity of any sites in combination with the WRMP.

Minor projects

7.4.9 It has not been possible to produce a definitive list of existing (minor) planning applications near each option's zone of influence and, generating a list at this stage would be of little value. It is possible that there will be 'in combination' project-specific construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

Effects with strategic development pressure

7.4.10 Regional and local plans have been reviewed at a high level to determine whether there are any likely significant 'in combination' effects, 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 implementation of the options and the absence of detail on allocation proposals makes any 'in combination' assessment difficult and potentially meaningless. However, the construction works required for the WRMP options are temporary and not of a scale or type that would make 'in combination' effects likely.

8. Draft HRA Conclusions

8.1 Overview

- 8.1.1 DCWW has identified five supply-side and four 'demand-side' options to maintain supplies to customers in Wales.
- 8.1.2 Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017* (as amended). DCWW has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. This draft HRA report accompanies the draft WRMP24 that has been published for consultation, and summarises the current assessment of DCWW's preferred portfolio of options against the requirements of the Habitats Regulations. It also documents the iterative HRA process that has been applied through the development of the draft WRMP24.
- 8.1.3 For each option (or group of options, as appropriate), the assessment comprises:
- a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option⁵⁰, and those where significant effects are likely or uncertain; and
 - an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).
- 8.1.4 The conservation objectives are taken into account at the screening and appropriate assessment stages as necessary.

8.2 Screening

- 8.2.1 The screening has concluded that two options (**SEW166 Memorial and Cefn Mably upgrade**; and **MSC08 Upsize Llechryd WTW**) have the potential to affect any European sites, specifically:
- SEW166 Memorial and Cefn Mably upgrade:
 - ▶ Severn Estuary Ramsar;
 - ▶ Severn Estuary SPA;
 - ▶ Severn Estuary/ Môr Hafren SAC.
 - MSC08 Upsize Llechryd WTW:
 - ▶ Afon Teifi/ River Teifi SAC;

⁵⁰ Note, for options with 'no effects' or positive effects there is no possibility of 'in combination' effects.

- ▶ Cardigan Bay/ Bae Ceredigion SAC.

8.2.2 These options and sites have therefore been considered through appropriate assessment.

8.2.3 For the remaining options:

- The demand side options (both water-meter roll-out programmes) will have 'no effects' on any European sites or features due to the extremely small scale of the works required to install meters, and the location of these (invariably in developed areas).
- The other supply-side options will have 'no effect' on any European sites or features due to the absence of pathways for effects.

8.2.4 As the options will (with the exception of those sites noted above) have 'no effect' on any European sites (i.e. there are no reasonable pathways for effects), there will not be 'in combination' effects between the WRMP options and other plans or projects that require screening. In combination effects are only therefore possible for the European sites taken forward to appropriate assessment.

8.3 Appropriate Assessment

8.3.1 Appropriate assessments were undertaken for those European sites that may be significantly affected by WRMP options (or where there was uncertainty at the screening stage), alone or in combination.

8.3.2 In summary:

- For Option SEW166 and the Severn Estuary Ramsar, Severn Estuary SPA or Severn Estuary/ Môr Hafren SAC:
 - ▶ There will be no operational effects.
 - ▶ Potential construction effects will be very minor due to the scale of the works and can be avoided / prevented entirely using established best-practice measures.

8.3.3 For Option MSC08 and the Afon Teifi/ River Teifi SAC and the Cardigan Bay/ Bae Ceredigion SAC:

- ▶ Potential operational effects on flows (and hence ancillary aspects such as sedimentation or geomorphology) will be negligible and within the favourable conservation status flow thresholds identified in the Core Management Plan; the ALS indicates that water is available for abstraction at all flows.
- ▶ Potential construction effects will be very minor due to the scale of the works and can be avoided / prevented entirely using established best-practice measures.

8.3.4 The potential for the WRMP (as a strategic plan) to operate with other strategic plans to have 'in combination' effects on European sites was also considered; no 'in combination' effects were identified.

8.3.5 **Therefore it can be concluded that the WRMP (if adopted as drafted) will have no adverse effects, alone or in combination, on the integrity of any European sites.**

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Appendix A

European sites considered by the HRA process

The table below lists the European sites and their features considered for the assessment of the supply-side options (i.e. sites within 20km of an option, or downstream, or upstream sites supporting fish that may use affected reaches of rivers). Note, all European sites within or close to the DCWW supply area might theoretically be exposed to effects of some demand-side options, but these sites are not listed here for clarity.

<u>Aberbargoed Grasslands SAC</u>
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>)
Marsh fritillary butterfly <i>Euphydryas</i> (<i>Eurodryas</i> , <i>Hypodryas</i>) <i>aurinia</i>
<u>Afon Tywi/ River Tywi SAC</u>
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>
Bullhead <i>Cottus gobio</i>
Otter <i>Lutra lutra</i>
<u>Blackmill Woodlands SAC</u>
Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles
<u>Blaen Cynon SAC</u>
Marsh fritillary butterfly <i>Euphydryas</i> (<i>Eurodryas</i> , <i>Hypodryas</i>) <i>aurinia</i>
<u>Brecon Beacons/ Bannau Brycheiniog SAC</u>
European dry heaths
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
Calcareous rocky slopes with chasmophytic vegetation
Siliceous rocky slopes with chasmophytic vegetation
<u>Burry Inlet Ramsar</u>
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

Burry Inlet SPA

Common shelduck *Tadorna tadorna*
 Eurasian wigeon *Anas penelope*
 Eurasian teal *Anas crecca*
 Northern pintail *Anas acuta*
 Northern shoveler *Anas clypeata*
 Eurasian oystercatcher *Haematopus ostralegus*
 Grey plover *Pluvialis squatarola*
 Red knot *Calidris canutus*
 Eurasian curlew *Numenius arquata*
 Common redshank *Tringa totanus*
 Ruddy turnstone *Arenaria interpres*
 Dunlin *Calidris alpina alpina*
 Waterbird assemblage

Caeau Mynydd Mawr SAC

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
 Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*

Cardiff Beech Woods SAC

Asperulo-Fagetum beech forests
 Tilio-Acerion forests of slopes, screes and ravines

Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC

Sandbanks which are slightly covered by sea water all the time
 Estuaries
 Mudflats and sandflats not covered by seawater at low tide
 Large shallow inlets and bays
 Salicornia and other annuals colonizing mud and sand
 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
 Sea lamprey *Petromyzon marinus*
 River lamprey *Lampetra fluviatilis*
 Allis shad *Alosa alosa*
 Twaite shad *Alosa fallax*
 Otter *Lutra lutra*

Cernydd Carmel SAC

Turloughs

Northern Atlantic wet heaths with *Erica tetralix*

European dry heaths

Active raised bogs

Tilio-Acerion forests of slopes, screes and ravines

Coedydd Nedd a Mellt SAC

Tilio-Acerion forests of slopes, screes and ravines

Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Crymlyn Bog Ramsar

Crit. 1 - sites containing representative, rare or unique wetland types

Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities

Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity

Crymlyn Bog/ Cors Crymlyn SAC

Transition mires and quaking bogs

Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Cwm Cadlan SAC

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

Alkaline fens

Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC

Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion roboret-petraeae* or *Ilici-Fagenion*)

Asperulo-Fagetum beech forests

Glaswelltiroedd Cefn Cribwr/ Cefn Cribwr Grasslands SAC

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

Marsh fritillary butterfly *Euphydryas* (*Eurodryas*, *Hypodryas*) *aurinia*

Gower Ash Woods/ Coedydd Ynn Gwyr SAC

Tilio-Acerion forests of slopes, screes and ravines

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Gower Commons/ Tiroedd Comin Gwyr SAC

Northern Atlantic wet heaths with *Erica tetralix*

European dry heaths

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

Southern damselfly *Coenagrion mercuriale*

Marsh fritillary butterfly *Euphydryas* (*Eurodryas*, *Hypodryas*) *aurinia*

Kenfig/ Cynffig SAC

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Fixed coastal dunes with herbaceous vegetation ("grey dunes")

Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)

Humid dune slacks

Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Petalwort *Petalophyllum ralfsii*

Fen orchid *Liparis loeselii*

Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC

Vegetated sea cliffs of the Atlantic and Baltic Coasts

Fixed coastal dunes with herbaceous vegetation ("grey dunes")

European dry heaths

Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)

Caves not open to the public

Submerged or partially submerged sea caves

Greater horseshoe bat *Rhinolophus ferrumequinum*

Petalwort *Petalophyllum ralfsii*

Early gentian *Gentianella anglica*

Llangorse Lake/ Llyn Syfaddan SAC

Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation

River Usk/ Afon Wysg SAC

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation

Sea lamprey *Petromyzon marinus*

Brook lamprey *Lampetra planeri*

River lamprey *Lampetra fluviatilis*

Allis shad *Alosa alosa*

Twaite shad *Alosa fallax*

Atlantic salmon *Salmo salar*

Bullhead *Cottus gobio*

Otter *Lutra lutra*

Severn Estuary Ramsar

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

Tundra swan *Cygnus columbianus bewickii*

Common shelduck *Tadorna tadorna*

Gadwall *Anas strepera*

Common redshank *Tringa totanus*

Greater white-fronted goose *Anser albifrons albifrons*

Dunlin *Calidris alpina alpina*

Waterbird assemblage

Severn Estuary/ Môr Hafren SAC

Sandbanks which are slightly covered by sea water all the time

Estuaries

Mudflats and sandflats not covered by seawater at low tide

Reefs

Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)

Sea lamprey *Petromyzon marinus*

River lamprey *Lampetra fluviatilis*

Twaite shad *Alosa fallax*

Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC

European dry heaths

Degraded raised bogs still capable of natural regeneration

Blanket bogs (* if active bog)

Calcareous rocky slopes with chasmophytic vegetation

Caves not open to the public

Tilio-Acerion forests of slopes, screes and ravines

Lesser horseshoe bat *Rhinolophus hipposideros*



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Appendix B

Notes on Effect Pathways

Table B1 (from UKWIR 2021) and the following paragraphs outline some of the general assumptions that are typically (and reliably) applied to plan-level assessments where effect pathways are imaginable but not quantifiable at the plan level. These are applied cautiously, recognising that there is always a risk of atypical scenarios, but have been proved to be generally robust across a wide range of scenarios.

Table B1 Potential Impacts of Plan Options (from UKWIR 2021)

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
Physical loss: <ul style="list-style-type: none"> Removal (including offsite effects, e.g. foraging habitat, and removal of supporting habitat within boundary of a SPA) Smothering 	Development of infrastructure associated with scheme, e.g. new or temporary pipelines, transport infrastructure, temporary weirs. Indirect effects from a reduction in flows e.g. drying out marginal habitat. Physical loss is most likely to be significant where the boundary of the scheme extends within the boundary of the European site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).
Physical damage: <ul style="list-style-type: none"> Sedimentation / silting Prevention of natural processes including coastal and fluvial bank stabilisation, prevention of long-shore drift etc. Habitat degradation Erosion Fragmentation Severance/barrier effect Edge effects 	Reduction in river flow leading to permanent and/or temporary loss of available habitat, sedimentation/siltation, fragmentation, etc. Physical damage is likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of a scheme, long shore drift along the coast, or the scheme impacts the linking habitat).

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Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
<p>Non-physical disturbance:</p> <ul style="list-style-type: none"> • Noise (incl. underwater) • Visual presence • Human presence • Light pollution • Vibration (incl. underwater). 	<p>Noise from temporary construction or temporary pumping activities.</p> <p>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European site⁵¹.</p> <p>Noise from vehicular traffic during operation of a scheme.</p> <p>Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the European site.</p> <p>Plant and personnel involved in in operation of the scheme.</p> <p>These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p> <p>Schemes which might include artificial lighting, e.g. for security around a temporary pumping station.</p> <p>Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site.</p> <p>Vibration from temporary construction</p> <p>From a review of Environment Agency internal guidance on HRA and various websites/sources^{52,53,54} it is considered that effects of vibration are more likely to be significant if development is within 500m of a European site.</p>

⁵¹ British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.

⁵² Institute of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011

⁵³ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

⁵⁴ Cutts N, Hemingway K and Spencer J (2013) The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.

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Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
<p>Water table/availability:</p> <ul style="list-style-type: none"> • Drying • Flooding / stormwater • Changes to surface water levels and flows including both increases and reductions. • Changes in groundwater levels and flows • Changes to coastal water movement 	<p>Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p>
<p>Toxic contamination:</p> <ul style="list-style-type: none"> • Water pollution • Soil contamination • Air Pollution 	<p>Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p> <p>Air emissions associated with plant and vehicular traffic during construction and operation of schemes.</p> <p>The effect of dust is only likely to be significant where site is within or in proximity to the boundary of the European site^{55,56}. Without mitigation, dust and dirt from the construction site may be transported onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit.</p> <p>Effects of road traffic emissions from the transport route to be taken by the project traffic are only likely to be significant where the protected site falls within 200 metres of the edge of a road affected⁵⁷.</p>

⁵⁵ Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.

⁵⁶ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.

⁵⁷ NE Internal Guidance – Approach to Advising Competent Authorities on Road Traffic Emissions and HRAs V1.4 Final - June 2018

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Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
<p>Non-toxic contamination:</p> <ul style="list-style-type: none"> • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • Changes in water chemistry (e.g. pH, calcium balance etc) • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting 	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, storage, or reduced compensation flow releases to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p>
<p>Biological disturbance:</p> <ul style="list-style-type: none"> • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession 	<p>Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds due to changes in abstraction or reduced compensation flow releases to river systems. In addition, via removal of vegetation (including hedgerows and trees) used by based as foraging, roosting and hibernation sites and birds as roosting and nesting sites.</p> <p>Creation of new pathway of non-native invasive species.</p> <p>This effect is only likely to be significant where the scheme is situated within the European site or an upstream tributary of the European site (or affects groundwater levels supporting these sites or tributaries)</p> <p>Entrapment during in-river or terrestrial construction works causing injury and/or mortality of mobile species</p> <p>Likely to be a risk of entrapment, injury and/or mortality where the boundary of the option extends within or is directly adjacent to the boundary of a European site or within/adjacent to offsite functionally linked habitat. Mobile species could include fish, bats and European otters for example.</p> <p>Potential for changes to habitat availability via removal of vegetation (including hedgerows and trees) to facilitate construction activities and potential entrapment, injury and/or mortality of breeding birds and roosting/hibernating bats.</p> <p>This effect is dependent on the requirement to remove vegetation (if it cannot be avoided), ecological surveys to determine species presence and timing of removal based on species specific ecological considerations.</p>

In addition:

Water resource sensitive features

The EA has previously published advice on qualifying species and habitats that it considers to be water-resource dependent (*National EA guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff*). This is not reproduced here, but as a general rule most species are not considered water resource dependent

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with the exception of aquatic features (fish, otter) and wildfowl and waders associated with estuarine and wetland sites. Wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

Estuarine birds and freshwater flows

Several studies have suggested that the number and densities of wintering waterbirds around estuarine freshwater channels are consistently greater than across associated mudflats, and that several bird species show significant preferences for freshwater flow areas over mudflats (e.g. Ravenscroft et al. (1997), Ravenscroft (1998, 1999), Ravenscroft & Beardall (2002) & Ravenscroft & Emes (2004)), although other studies have indicated that deeply incised channels associated with large volume inflows are less attractive to birds (Ravenscroft & Beardall, 2002).

There are a number of possible mechanisms for this. Correlations between freshwater flow and particle size (e.g. Ravenscroft & Emes (2004)), and substrate particle size distribution and invertebrate distribution have been recognised (e.g. Goss-Custard et al. (1991), Colwell and Landrum (1993), Yates et al. (1993)). Freshwater flow, salinity and invertebrate distribution have also been correlated (Kelly (2001)).

These physical relationships between invertebrate distributions and freshwater flows are important since there are numerous studies detailing relationships between overwintering waterbirds and the densities or distributions of their invertebrate prey (e.g. Goss-Custard et al. (1991), Colwell (1993), Colwell and Landrum (1993), Yates et al. (1993), Dierschke et al. (1999), Ravenscroft et al. (2002, 2004). Associations between bird densities and particle size (Granadeiro et al. 2004) have also been recognised.

Possible relationships between birds and freshwater flows were investigated in detail through a series of studies in The Swale SPA/Ramsar and the Medway Estuary and Marshes SPA/Ramsar (RPS 2004a, 2004b, 2004c, 2005a; Humpheryes & Kellett 2003). These studies found few consistent patterns, however; for example:

- Whilst the general relationship of birds and creek corridors (rather than channels) was usually replicated between watercourses and embayments, the species assemblage was variable between creeks and years, suggesting that creek-specific variables may be less important for determining the community composition than environmental or community processes operating in the wider estuary or beyond. Most species (67%) displayed no, or a negative, association with creeks (70% when feeding behaviour only was considered).

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- Latitudinal relationships between creeks and invertebrates were inconsistent, with only a slight tendency for invertebrate biomass to be higher within the creek corridor than the channel or surrounding mudflats.
- Significant decreases in invertebrate abundance and biomass down longitudinal gradients (potentially related to greater exposure to tidal processes) were recorded, although bird numbers showed the opposite (i.e. greater numbers towards the sea), perhaps reflecting greater foraging accessibility due to interstitial water, or less disturbance.

Furthermore, no significant differences in the usage of creeks by birds were recorded between freshwater creeks and those that were predominantly saline.

A broad consensus position appears to be that it is not freshwater flow volumes *per se* that are critical to the bird / intertidal channel relationship, rather the presence of some flows within channels to maintain morphology, and that bird distributions are often influenced instead by estuary-wide factors (e.g. changes in disturbance levels, reductions in bird populations altering estuary usage, proximity of roost sites), local factors (e.g. the role of creek morphology or substrate penetrability) and small-scale interactions (e.g. inter and intra-specific bird relationships, or prey availability associated with behavioural or physiological responses to intertidal exposure).

Bat species and functional land

Bat species associated with UK SACs are not considered 'water resource sensitive' and so (in the absence of substantial habitat changes caused by operational aspects (e.g. draining of a wetland or replacement of extensive foraging habitat with a reservoir; or introduction of light etc. sources that may disrupt commuting or seasonal movements), their exposure to the outcomes of the WRMP will be limited to incidental effects from construction. In most instances potential effects will not be specifically identifiable or quantifiable (as the locations of works are not necessarily defined, and field surveys would not typically be undertaken at plan level).

UK bat species do not typically travel substantial distances (i.e. tens of kilometres) when foraging and the Bat Conservation Trust has therefore identified Core Sustenance Zones (CSZs) – defined as *"the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the roost"* – for UK bat species; the CSZs for all UK species have a radius of 4km or less, with the exception of the CSZ for barbastelle (6km). This can be cautiously applied to bat SACs, although it is recognised that many roosts used by SAC bat populations will not be within the boundaries of the SAC. In general, therefore, unavoidable adverse effects would not be expected unless significant permanent land-take within those zones is likely; virtually all other potential effects are avoidable with normal good practice in planning and design, and with established mitigation measures that are known to be effective – although these inevitably cannot be defined above the project level.

Birds and construction noise / visual disturbance

The **exposure** of any birds using the reservoir to **noise** and **visual disturbance** associated with the development will depend on several factors, including:

- the sound power level of the machinery;

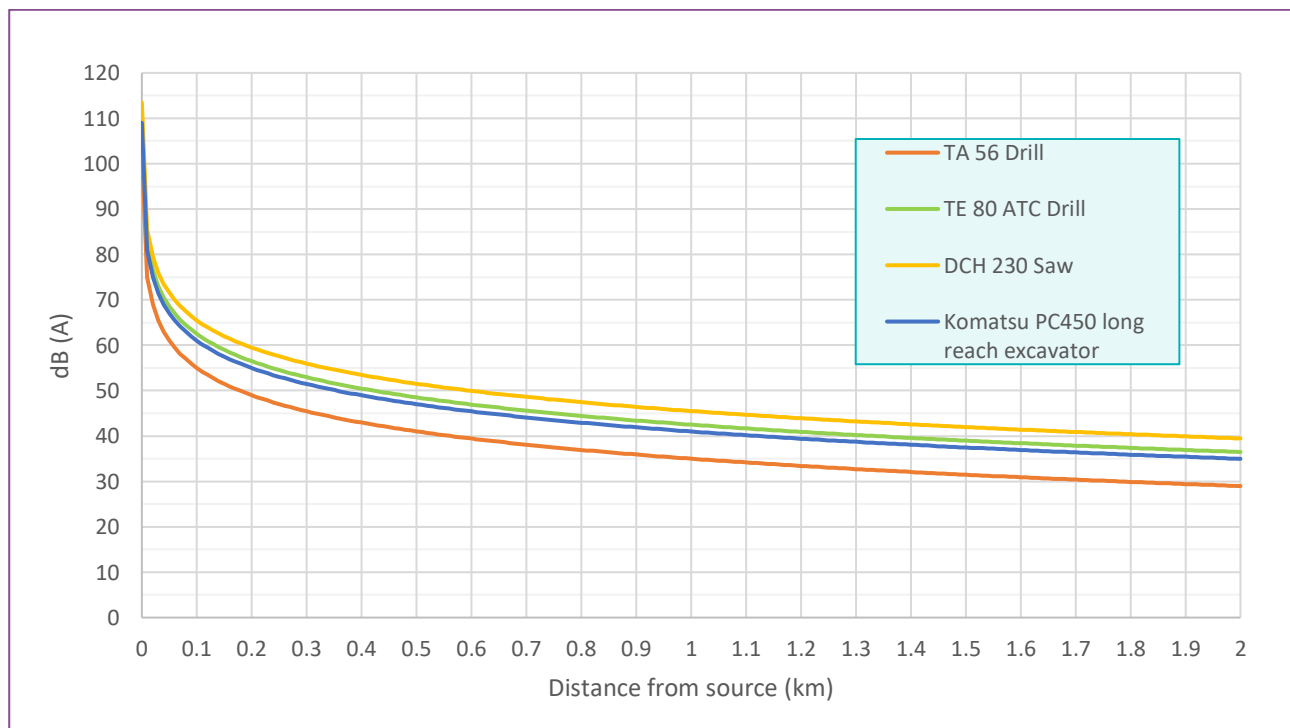
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- the principal habitats and locations used by the birds species (and hence the distance from the source of any disturbance);
- attenuating factors (such as screening by topography, buildings or vegetation);
- the seasonal timing of the works;
- background noise levels in this area⁵⁸.

The sensitivity of the interest features will depend on their behavioural characteristics, their general tolerance / habituation to existing or new activities at a site, and the extent to which avoidance behaviours are achievable. This may also vary during the year (for example, most bird species will be more sensitive when nesting as avoidance behaviours are more constrained).

With regard to noise, a typical long-reach excavator has sound power level of ~109 dB(A); drills and saws have sound power level between 103 dB(A) and 114 dB(A). Without any barriers, the noise level of the loudest equipment used would attenuate to around 55dB(A) within 300m, and to 50 dB(A)⁵⁹ within 600m due to distance alone (see Figure B1).

Figure B1 Approximate attenuation of equipment noise with no barriers



With regard to visual disturbance, sensitivity may be broadly correlated with size, with larger species typically having greater 'flush distances' (the distances at which birds typically move when

⁵⁸ Noise levels do not operate additively, so the dB levels in an area are not the sum of the component sources.

⁵⁹ As a guide, 60dB(A) is approximately equivalent to a conversation; 50dB(A) is approximately equivalent to the level associated with a quiet suburb or light traffic (which is unlikely to be reached except at night in this area).

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approached by people). Laursen *et al.* (2005) determined that the mean flush distance for shelduck was 225 m; 319 m for brent geese; but only 70 m for dunlin (a much smaller species).

Cutts *et al.* (2009)⁶⁰ provide a useful review of available data on bird disturbance. It makes particular reference to noise and disturbance investigations studies undertaken during sea defence works, which included piling works. These studies identified disturbance levels for various activities associated with construction, based on observations of bird responses, which are summarised in **Table B2** below.

Table B2 Observed disturbance associated with sea wall construction activities (after Cutts *et al.* 2009) and the need for similar activities at site

Activity	Observed Disturbance Level	Equivalent activity required for substation works
Personnel and plant on mudflat	High	No
Personnel and plant on seaward toe and face	High to Moderate	No
Intermittent plant and personnel on crest	High to Moderate	No
Irregular piling noise (above 70 dB)	High to Moderate	No
Long term plant and personnel on crest	Moderate	No
Regular piling noise (below 70dB)	Moderate	No
Irregular noise (50-70 dB)	Moderate	Yes
Regular noise (50-70dB)	Moderate to low	Yes
Occasional movement of the crane jib and load above sight-line	Moderate to low	No
Noise below 50 dB	Low	Yes
Long-term plant only on crest	Low	No
Activity behind flood bank (inland)	Low	Yes

Key:

High	Maximum response; preparing to fly away and flying away, may leave area altogether
Moderate-high	Head turning, scanning behaviour, reduced feeding, movement to other areas close by (decreasing response)
Moderate	
Moderate-low	
Low	No effect

⁶⁰ Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull

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The study also records the following observations from other construction schemes on the Humber:

- Piling activity on the landward side of the sea wall at Pyewipe (southern shore), associated with construction of a pumping station, had no disturbance effect on birds in January, February and March; the numbers and distributions of birds were similar during periods with and without piling. Disturbance only occurred when construction was moved to the seaward-side of the sea wall in April.
- Six years of bird monitoring associated with the construction of the Humber International Terminal (HIT) concluded that most disturbance only caused birds to move over a small area, and that the HIT development did not have a significant effect on usage of the area by birds.

In general, therefore, effects from noise and visual disturbance during construction typically have a limited range and duration, are reversible, and do not result in long-term adjustments in bird behaviours (such that they might constitute an adverse effect).

Air Quality Effects from Construction Schemes

A number of pollutants have a negative effect on air quality; however, the most significant and relevant to habitats and species (particularly plant species) are the primary pollutants sulphur dioxide (SO₂, typically from combustion of coal and heavy fuel oils although this has declined substantially), nitrogen oxides (NO_x, mainly from vehicles) and ammonia (NH₃, principally from agriculture), which (together with secondary aerosol pollutants⁶¹) are deposited as wet or dry deposits. These pollutants affect habitats and species mainly through acidification and eutrophication.

Acidification increases the acidity of soils, which can directly affect some organisms and which also promotes leaching of some important base chemicals (e.g. calcium), and mobilisation and uptake by plants of toxins (especially metals such as aluminium).

Air pollution contributes to eutrophication within ecosystems by increasing the amounts of available nitrogen (N)⁶². This is a particular problem in low-nutrient habitats, where available nitrogen is frequently the limiting factor on plant growth, and results in slow-growing low-nutrient species being out-competed by faster growing species that can take advantage of the increased amounts of available N.

Overall in the UK, there has been a significant decline in SO_x and NO_x emissions in recent years and a consequential decrease in acid deposition. In England, SO_x and NO_x have declined by 97% and 72% respectively since 1970 (Defra, 2018) which is the result of a switch from coal to gas, nuclear and renewables for energy generation, and increased efficiency and emissions standards for cars. These emissions are expected to decline further in future years with the transition to electric vehicles. In contrast, emissions of ammonia have remained largely unchanged; they have

⁶¹ Secondary pollutants are not emitted, but are formed following further reactions in the atmosphere; for example, SO₂ and NO_x are oxidised to form SO₄²⁻ and NO₂⁻ compounds; ozone is formed by the reaction of other pollutants (e.g. NO_x or volatile organic compounds) with UV light; ammonia reacts with SO₄²⁻ and NO₂⁻ to form ammonium (NH₄⁺).

⁶² Nitrogen that is in a form that can be absorbed and used by plants.

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declined by 10% in England since 1980 (Defra, 2018), but since 2008 have started to increase slightly.

The effect of SO_x and NO_x decreases on ecosystems has been marked, particularly in respect of acidification; the key contributor to acidification is now thought to be deposited nitrogen, for which the major source (ammonia emissions) has not decreased significantly. Indeed, eutrophication from N-deposition (again, primarily from ammonia) is now considered the most significant air quality issue for many habitats.

In terms of the exposure of designated sites to air quality changes associated with construction, this tends to be considered on a case-by-case basis. However, the Department of Transport's *Transport Analysis Guidance*⁶³ states that "**beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant**" and this distance is typically applied to construction schemes also when considering the potential for European sites to be exposed to any local effects associated with emissions to air. However, it should be noted that concentrations and deposition of traffic-generated pollutants do not decline linearly with distance from the road; typically, air pollution levels fall sharply within the first 20 – 30m before declining more slowly with increased distance⁶⁴. Concentrations and deposition will also be affected by physical parameters, such as local topography or vegetation structure.

Highways England's *Design Manual for Roads and Bridges* (DMRB) sets out an approach for assessing the effect of emissions from specific road schemes on designated sites; this suggests that a quantitative air quality assessment may be required if a European site is within 200m of an affected road and the predicted change in annual average daily traffic (AADT) is over 1000. It should be noted that this is 'in combination' with other projects (etc.), but this is a relatively large increase which

- would not be met by the vast majority of construction schemes when considering either vehicle access to the site / deliveries, or the equivalent movement / use of construction plant); and
- is assumed to be permanent (which is not the case for most construction).

Although it is not simple to apply 'rule of thumb' estimates to relationships between traffic volumes and N-deposition (as this is influenced by a number of factors), it is worth noting that the DMRB guidance regarding air quality thresholds is based on the assumption that 1,000 extra vehicles is equivalent to ~0.01 kg N/ha/yr (this is obviously a coarse figure and there are other factors that come into play such as the emissions factors used for opening year/ wind direction / number of HGVs / speed etc.). The EA-accepted threshold for 'significant effects' on habitats to be possible is an increase of > 1% of the minimum critical load⁶⁵.

⁶³ See <http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013>; accessed 15/06/14.

⁶⁴ For example, recent air quality modelling by Wood of a new link road at an MoD establishment in the UK found that an Average Annual Daily Traffic (AADT) increase of ~7,000 increased nitrogen deposition by 0.21 kg N/ha/yr at the worst receptor point (at the immediate kerbside), and that by 25m from the road the increase in N-deposition was zero.

⁶⁵ The 1% threshold is used as it is accepted that levels below this are difficult to measure and not typically distinguishable from background fluctuations. An exceedance of 1% of the critical load should be seen as a 'starting

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Air quality modelling and assessment is unlikely to be achievable at the WRMP level due to the absence of information on scheme design and construction approaches; and arguably not proportionate. However, it is clear that in the vast majority of cases emissions associated with construction schemes are of a magnitude that (a) will not exceed the thresholds for significant or significant adverse effects (even if relatively close to a site), and which (b) can be reliably managed or avoided using standard and unexceptional avoidance and mitigation measures, if required.

point' for assessing the significance of any effects; the Institute of Air Quality Management (IAQM) position statement on air quality effects notes that *"it is the position of the IAQM that the use of a criterion of 1% of an assessment level in the context of habitats should be used only to screen out impacts that will have an insignificant effect. It should not be used as a threshold above which damage is implied and is therefore used to conclude that a significant effect is likely."*

Appendix C

Standard Mitigation and Avoidance Measures

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 project-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 designs required to ensure no adverse effects occur (e.g. screening, additional treatment, etc.) – although note that these measures can only be identified through detailed investigation schemes and agreed through the project-level HRA process.

REVISED**Pollution Prevention**

The habitats of European sites are most likely to be affected indirectly, through 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 industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes⁶⁶, including:
 - ▶ PPG1: General guide to the prevention of pollution (May 2001);
 - ▶ 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 DWMP 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 (DP) 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

⁶⁶ 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.

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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 NRW/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.

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