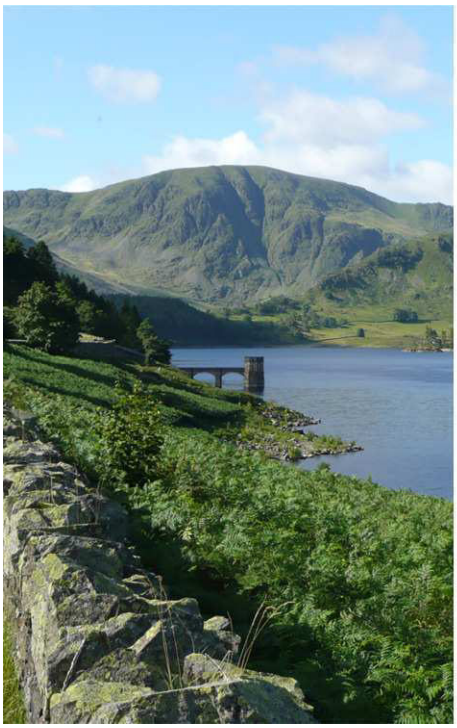
# United Utilities

# Habitats Regulations Assessment of the Water Resources Management Plan

Assessment of Feasible and Preferred Options



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## Assessment of Feasible and Preferred Options

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# Executive Summary

Under the Water Act 2003 all water companies must publish a Water Resources Management Plan (WRMP) that sets out their strategy for managing water resources across their supply area over the next 25 years. The WRMP process requires supply-demand balance calculations for each Water Resource Zone (WRZ) to identify those zones where deficits in supply are forecast; it then requires the identification of suitable options for resolving any deficits based on financial, environmental and social costing.

The *Conservation of Habitats and Species Regulations 2010* (as amended) (the 'Habitats Regulations') require that competent authorities assess the potential impacts of plans and programmes on the Natura 2000 network of European protected sites to determine whether there will be any 'likely significant effects' (LSE) on any European site as a result of the Plan's implementation (either on its own or 'in combination' with other plans or projects); and, if so, whether these effects will result in any adverse effects on the site's integrity. The process by which the impacts of a Plan or Programme are assessed against the conservation objectives of a European site is known as Habitats Regulations Assessment (HRA).

The HRA is essentially a test that the final WRMP must pass. However, as with SEA it is accepted best-practice for HRA of strategic planning documents to be run as an iterative *process* alongside the plan development, with the emerging proposals or options continually assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or adverse effects on any European sites, either alone or 'in combination' with other plans. This is undertaken in consultation with Natural England, the Countryside Council for Wales, and other appropriate consultees. The strategic HRA is therefore as much about guiding the development of the plan as it is about (ultimately) assessing its effects.

This report summarises AMEC's assessment of United Utilities' 'feasible' and 'preferred' options against the conservation objectives of any European sites that may be affected, and summarises the iterative HRA process that has been undertaken to support the development of the WRMP.

United Utilities has determined that only one WRZ, West Cumbria, is predicted to be in deficit within the 25 year planning horizon of the WRMP. Accordingly, only the feasible options for this zone are assessed and reported. UU identified sixteen feasible options for resolving the predicted deficit within this zone, some of which could address the deficit on their own and some of which would have to operate conjunctively. An assessment of these feasible options was undertaken using the principles of HRA, to identify those with a risk of 'significant' or 'adverse' effects on a European site which (critically) are unlikely to be avoidable or mitigatable at either the strategy or scheme-level. This assessment was then used by United Utilities to guide their selection of preferred options.

Three options to help address the deficit in the West Cumbria WRZ (one of which comprises a combination of the feasible options) were taken forward for more detailed consideration as candidate preferred options. These options are:

- WC01: Thirlmere Transfer into West Cumbria;
- WC14d: Kielder Water Transfer to West Cumbria (Cumwhinton Treated);
- 'Lower Cost Option', a combination of the following options:
  - WC04: Wastwater (negotiate part abstraction licence);
  - WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d);
  - WC09: Development of Boreholes in North Cumbria Aquifer; and
  - WC19: Crummock Automated Compensation Control.

Options WC01 and WC14d would be able to meet the predicted deficit on their own, with some additional headroom which may improve the resilience of the water supply network; in contrast, all of the components of the 'Lower Cost Option' would need to be delivered to meet the predicted deficit, and little additional headroom would be provided. Using a standard industry method that includes consideration of technical feasibility, financial costs and benefits, and quantified impacts on the environment and community, together with the emerging findings of the Strategic Environmental Assessment and the HRA, United Utilities identified Option WC01 (Thirlmere Transfer into West Cumbria) as the preferred option for the WRMP.

The preferred WRMP option involves increasing abstraction from Thirlmere reservoir within current licence conditions by enhancing infrastructure capacity. This option is a large scale scheme comprising several infrastructure components including new service reservoirs, a water treatment works, pumping stations and over 100km of new pipeline together with the decommissioning of three existing water treatment works (Ennerdale, Corn How and Quarry Hill).

Construction of the scheme would have a risk of significant effects if not suitably mitigated. Pipeline sections would cross / run adjacent to several European sites (including the River Derwent and Bassenthwaite Lake SAC, Clint's Quarry SAC, the Lake District High Fells SAC, and the River Ehen SAC) and there are risks of significant effects if the scheme is not suitably designed, controlled and mitigated. There are a number of uncertainties surrounding the likely effects of construction which cannot be resolved until detailed design has been completed; however, pipelines will be mostly within existing roads (unless future studies demonstrated that non-road routes can be employed without adverse effects on any European sites), with new WTWs and assets be located on existing United Utilities operational sites where possible, although some greenfield locations may be required. Scheme specific mitigation measures obviously cannot be exhaustively identified at this level, but bespoke mitigation and standard best-practice measures will be implemented (unless scheme specific investigations demonstrate that they are not required) which can be relied on to prevent adverse effects occurring.

With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC. The scheme would operate within the terms of the existing licence, and therefore the current compensation release regime to the River Derwent would be maintained (i.e. there would be no change in low flows in St John's Beck as these are controlled by the compensation release; United Utilities is also required, under the existing legal framework, to provide spate flows of up to 100 Ml/d from Thirlmere on request from the EA to encourage salmon migration as part of the EA RSA programme). The scheme would reduce the size and frequency of the largest flows (the Q5 flows), which will have an effect on the St. John's Beck (and hence the River Derwent and Bassenthwaite Lake SAC); however, assessment has indicated that this will not have an adverse effect on the interest features or the integrity of the River Derwent and Bassenthwaite Lake SAC.

It is considered that the preferred option will not, based on the available data, have significant adverse effects on any European sites. However, as a precautionary approach WC14d: Kielder Water transfer to West Cumbria (Cumwhinton treated) may be a more preferable alternative should future studies or data demonstrate that the Thirlmere option will have unavoidable adverse effects on a European site that cannot be mitigated or compensated.

# Contents

# 1. Introduction

## 1.1 Water Resource Planning

All water companies in England and Wales must set out their plan for managing water resources across their supply area over the next 25 years. This statutory requirement is defined under the Water Act 2003, which also sets out how water companies should publish a Water Resources Management Plan (WRMP) for consultation, setting out how they will balance supply and demand over the 25 year planning period. The WRMP is also linked to other water resource planning and policy documents, including the Drought Plan.

The WRMP process identifies potential shortages in the future availability of water and sets out the possible solutions required to maintain the balance between water available and future demand for water. The process initially reviews as many potential solutions as possible (the 'unconstrained list' of options) to identify 'feasible' options for each Water Resource Zone (WRZ) where deficits are predicted. These 'feasible' options are reviewed according to an industry standard methodology to identify 'preferred options' to resolve any supply deficits in relation to financial, environmental and social costing. This preferred list is based on standard assessment methodologies set out in the WRMP, the Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment. Options to resolve deficits or predicted deficits can be broadly categorised as follows:

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

## 1.2 Habitats Regulations Assessment

Regulation 61 of the *Conservation of Habitats and Species Regulations 2010* (as amended) (the 'Habitats Regulations') requires that competent authorities assess the potential impacts of plans and programmes on the Natura 2000 network of European protected sites[1] to determine whether there will be any 'likely significant effects' (LSE) on any European site as a result of the plan's implementation (either on its own or 'in combination' with other plans or projects); and, if so, whether these effects will result in any adverse effects on the site's integrity. The process by which the impacts of a plan or programme are assessed against the conservation objectives of a

[1] Strictly, a European Site is any classified Special Protection Area (SPA) or any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI). However, the provisions of the Habitats Regulations and Article 4(4) of *Directive 2009/147/EC* (the 'new wild birds directive') are also applied (respectively) to candidate SACs (cSACs) and potential SPAs (pSPAs); and as a matter of Government policy for possible SACs (pSACs) and listed Ramsar Sites for the purpose of considering development proposals affecting them (TAN 5 para. 5.1.3)). As such, pSPAs, pSACs and Ramsar Sites must also be considered by any HRA. Within this report "European site" is used as a generic term for all of the above designated sites. Additional information on European site designations is provided in **Error! Reference source not found.**.

European site is known as Habitats Regulations Assessment (HRA)[2]. WRMPs are not explicitly included within this legislation, although Natural England (NE) and the Countryside Council for Wales (CCW) have previously stated that this requirement should extend to plans such as the WRMP. The Habitats Regulations require every Competent Authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive. Water Companies have a statutory duty to prepare WRMPs and are therefore the Competent Authority for a HRA.

## 1.3 This Report

Regulation 61 essentially provides a test that the final WRMP must pass; there is no requirement for HRA to be undertaken on draft plans or similar developmental stages. However, as with SEA it is accepted best-practice for HRA of strategic planning documents to be run as an iterative *process* alongside the plan development, with the emerging proposals or options continually assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or adverse effects on any European sites, either alone or 'in combination' with other plans. This is undertaken in consultation with NE[3], CCW, and other appropriate consultees. It is therefore important to recognise that the strategic HRA is as much about guiding the development of the plan (and demonstrating that this has been done) as it is about (ultimately) assessing its effects.

AMEC E&I UK Ltd (AMEC) has been commissioned by United Utilities to undertake the data collection and interpretation required to support a HRA of the WRMP, and to determine whether any aspects of the WRMP (alone or 'in combination') could have significant or adverse effects on the integrity of any European sites.

**This report summarises AMEC's assessment of United Utilities' 'feasible' and 'preferred' options against the conservation objectives of any European sites that may be affected, and summarises the iterative HRA process that has been undertaken to support the WRMP and ensure that it meets the requirements of Regulation 61.**

[2] 'Appropriate Assessment' has been historically used as an umbrella term to describe the process of assessment as a whole. The whole process is now more usually termed 'Habitats Regulations Assessment' (HRA), and 'Appropriate Assessment' is used to indicate a specific stage within the HRA.

[3] NE and CCW have been included in consultation meetings at the feasible options and preferred options stages.

# 2. HRA of Water Resources Management Plans

## 2.1 Guidance

WRMPs are not explicitly included within the legislation underpinning HRA, and therefore HRA of strategic documents such as the WRMP (as opposed to land-use plans) is very much an emerging field; indeed, the WRMP has many characteristics that make it less amenable to a standard 'land-use plans' approach. However, the following guidance will be used in the preparation of the assessment:

- UK Water Industry Research Ltd (2012) *Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans*. UKWIR, Queen Anne's Gate, London;
- Tyldesley D, (2010). *Draft Guidance for Plan Making Authorities in Wales: The Appraisal of Plans Under the Habitats Directive*. David Tyldesley and Associates, for the Countryside Council for Wales;
- WAG, (2009). *Technical Advice Note 5 (Annexe VI)*. Welsh Assembly Government, Cardiff;
- DCLG, (2006). *Planning for the Protection of European Sites: Appropriate Assessment. Guidance for Regional Spatial Strategies and Local Development Documents. Department for Communities and Local Government*, HMSO, London;
- English Nature, (1997-2001). *Habitats Regulations Guidance Notes 1-9*, Natural England, Peterborough;
- European Commission, (2002). *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission, Brussels;
- European Commission, (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites. European Commission*, Brussels;
- European Communities, (2007). *Managing Natura 2000 sites: The provisions of Article 6 of the Habitats Directive 92/433/EEC*. European Commission, Brussels.

## 2.2 Overview

An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. The current European Commission guidance[4] suggests a four-stage process for HRA, although not all stages will be necessarily required:

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

**Box 1 Stages of Habitats Regulations Assessment**

**Stage 1 – Screening:**

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

**Stage 2 – Appropriate Assessment:**

Where there are likely significant impacts, this stage considers the impacts of the Plan or project on the integrity of the relevant European Sites, either alone or 'in combination' with other projects or plans, with respect to the sites' structure and function and their conservation objectives. Where there are adverse impacts, it also includes an assessment of the potential mitigation for those impacts.

**Stage 3 – Assessment of Alternative Solutions:**

Where adverse impacts are predicted, this stage examines alternative ways of achieving the objectives of the project or Plan that avoid adverse impacts on the integrity of European Sites.

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

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

HABITATS REGULATIONS ASSESSMENT (HRA)

The standard stepwise approach summarised in **Box 1** works well at the project-level where the scheme design is established and possible effects on European sites can be quantitatively assessed with the benefit of detailed survey data. In contrast, the fundamental nature of the WRMP presents a number of distinct challenges for a 'strategic' HRA and it is therefore important to understand how the WRMP is developed, how it would operate in practice, and hence how it might consequently affect European sites. In particular, there is a potential conflict between the specific nature of the options; the requirement that the options (and hence the plan) have 'no likely significant effects (LSE)' or 'no adverse effects'; the level of certainty that can be established at the strategic level; and the desirability of not excluding every potential solution which cannot be conclusively investigated within the WRMP development timescales.

It should also be recognised that the rigid 'staged' approach to assessment suggested in **Box 1** can be difficult to apply to evolving plans that are being assessed iteratively. The HRA is ultimately a test that the final document must pass, and there is no statutory requirement for the developmental phases of the WRMP (e.g. 'feasible options' or the subsequent 'preferred options') to undergo HRA themselves. Therefore, it is important to recognise that the strategic HRA is as much about guiding the development of the plan (and demonstrating that this has been done) as it is about (ultimately) assessing its effects. It should also be recognised that the HRA 'test' (as opposed to the process) applies to the finished plan and therefore 'screening' or 'appropriate assessment' of the developmental stages (e.g. feasible options) needs to be applied mindfully.

## 2.3 Key Issues for HRA of the WRMP

### 2.3.1 Understanding the Likely Outcomes of the WRMP

The WRMP process establishes supply and demand balances for the United Utilities WRZs, and identifies potential supply deficits between water available and the projected demand for water within each WRZ. Options are then proposed to resolve these deficits. The estimation of future water available is based on:

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

Demand forecasts comply with the *Water Resources Planning Guidelines* (published by the Environment Agency) and take into account economic factors (economic growth, metering, pricing), behavioural factors (patterns of water use), demographic factors (population growth, inward and outward migration, changes in occupancy rate), planning policy (local planning authority land use plans), company policies (e.g. on leakage control and water efficiency measures) and environmental factors, including climate change. The WRMP is based upon an established growth forecast model and informed by historic connections data and population/household projections.

The WRMP process initially sets out an 'unconstrained list' of possible solutions regardless of cost or technical merit. This is then refined to identify 'feasible options' and subsequently the 'preferred options'. This filtering process is based on a range of assessments including SEA and the principles of HRA and produces a short list of feasible options for financial, environmental and social costing. These options are then reviewed and assessed to derive 'preferred options' for the zones that are predicted to be in deficit within the planning horizon (25 years)

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

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

These are also characterised as '**demand-side**' measures (options which reduce consumption post-treatment, such as metering or leakage reduction) or '**supply-side**' measures (options that vary yield). The HRA focuses on the supply-side options[5] and their potential effects. The options will generally require one or more of the following:

[5] 'Demand-side' options (i.e. options designed to reduce water use such as metering or provision of water butts) are considered unlikely to have any significant or adverse effects on any European sites (see Section 4.1).

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

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

- **direct** (for example, construction of a new intake within a SPA reservoir; discharges to a SAC from a desalination plant; new groundwater abstractions causing drawdown in a groundwater dependent terrestrial ecosystems (GWDTE));
- **indirect** (for example, construction affecting a downstream SAC through sediment release, or a new abstraction entraining SAC fish species away from the SAC itself); or
- **consequential** (for example, adjusting or stopping a bulk transfer between water resource zones, or between water companies, may have indirect 'consequential' effects on distant European sites if this results in additional abstraction to make up a shortfall; this is more typically a type of 'in combination' effect).

The iterative stage of the HRA identifies likely outcomes of each option, its 'zone of influence', and the European sites that could potentially be affected. This information is then used to assess, as far as possible, the likely effects of these options, and to identify the most suitable (from an HRA perspective). Any avoidance measures or mitigation are also identified.

The HRA of the WRMP must consider any European sites that could be affected by the implementation of the Plan, whether they are within the geographical boundaries of the United Utilities supply area or not. When determining this it is also necessary to consider potential 'in combination' effects; these are possible cumulative effects on European sites caused by the WRMP, together with the effects of any existing or proposed projects or plans[6]. However, it must be recognised that many of the possible 'in combination' effects (particularly with respect to water resources and land-use plans) are explicitly considered and accounted for as part of the WRMP development process (see **Section 2.3.2**).

### 2.3.2 Sustainability Reductions and the Review of Consents

There are two broad components to the WRMP that require consideration in the HRA:

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

- the specific options that are proposed through the WRMP (either during construction or operation, alone or 'in combination'); and

- the assumptions (in terms of consented abstractions and effects on European sites) underpinning the supply/deficit calculations, i.e. are the currently permitted consents (on which the Plan is based) sustainable?

The second aspect requires precise quantification of the effects of abstraction and other consents (including non-United Utilities consents) on European sites. This is not within the remit of United Utilities (or its WRMP) since it is not the consenting authority. The examination of individual consents is undertaken by the Environment Agency (EA) through its Review of Consents (RoC) process. Where individual consents have been identified as requiring changes, the EA will advise United Utilities and any required changes would be incorporated within the WRMP.

The EA's RoC process is an evidence-led examination of the effects (alone and 'in combination') of all current and proposed abstraction licences and discharge consents that potentially affect European designated sites and features. This is then used as a basis for establishing mitigation to protect these sites from adverse environmental effects. The WRMP takes account of the RoC process so that sustainability reductions can be included within the proposed solutions.

The sustainability reductions required by the RoC are fully accounted for within the modelled scenarios underpinning the WRMP. Where RoC analysis has been carried out on the catchment, the findings are considered to be valid over the planning period. This means that the WRMP should be compliant with any current RoC needs for sustainability reductions to abstractions, and therefore the Plan will only affect European sites through any new resource and production side options it advocates to resolves deficits, and not through the existing permissions regime.

The exception to this (for United Utilities) is the Ennerdale and River Ehen compensation which is currently unresolved and which is subject to additional studies; however, the uncertainty in relation to Ennerdale has been included in the WRMP scenario modelling that underpins the WRMP supply-demand balance.

### 2.3.3 Uncertainty and Determining Significant or Adverse Effects

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

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

- the strategic nature of the WRMP ensures that there are fundamental limitations on the scheme details that are available to the HRA; **but**

- its principal components (the options that are proposed to resolve actual or predicted deficits) are generally specific schemes with a clear spatial component, rather than the broad policies that are characteristic of most strategies.

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

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

- the options have to solve specific deficits but are heavily constrained by existing sources and infrastructure, the availability of new resources, and the patterns of customer demand;

- it is possible that there will be several options where the precise effects are unclear, but which United Utilities or the EA would wish to be able to explore in more detail at a later stage (and therefore would wish to include as preferred options within the WRMP); and

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

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

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

As a result, the HRA must consider and assess the specific options within the WRMP **appropriately**, whilst recognising (and mitigating) the inherent uncertainties within those options (i.e. the absence of detailed scheme design or parameters) and within the plan itself (i.e. so that the WRMP, as a whole, is compliant with the HRA regulations even if some residual uncertainty persists with some options).

### 2.3.4 Mitigating Uncertainty and 'Down the Line' Assessment

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

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

Nevertheless, it is possible that the potential effects (or required mitigation) for some options cannot be clearly determined at the strategic-level. In these instances, current guidance[7] indicates that it may be appropriate and acceptable for assessment to be undertaken 'down-the-line' at a lower tier in the planning hierarchy, if:

- the higher tier plan appraisal cannot reasonably predict the effects on a European site in a meaningful way; whereas;
- the lower tier plan, which will identify more precisely the nature, scale or location of development, and thus its potential effects, retains enough flexibility within the terms of the higher tier plan over the exact location, scale or nature of the proposal to enable an adverse effect on site integrity to be avoided; and
- Habitats Regulations Appraisal of the Plan at the lower tier is required as a matter of law or Government policy.

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

[7] Tyldesley D, (2010). *Draft Guidance for Plan Making Authorities in Wales: The Appraisal of Plans Under the Habitats Directive*. David Tyldesley and Associates, for the Countryside Council for Wales.

necessarily include assessments of their potential to affect European sites during their construction or operation (i.e. HRA is required by law).

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

- will meet the required demand / deficit should the preferred option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
- will not themselves have any significant or adverse effect on any European sites.

It should be noted that this flexibility is desirable in any case, since it is possible that a 'no LSE' option might be subsequently proven to have significant or adverse effects when brought to the design stage.

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

It should be noted that there are some 'known uncertainties' for the United Utilities WRMP including the potential need for additional reductions in association with the River Ehen SAC; the timescale for resolving these issues is not yet certain, although the likely revocation of the licence has been included in the WRMP scenario modelling that underpins the WRMP supply-demand balance.

# 3. Feasible Options Assessment

## 3.1 Overview

As noted, for strategic plans it is accepted that HRA should run as an iterative *process* alongside the plan development. Emerging proposals or options are assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or adverse effects on any European sites. A key part of this is the assessment of the feasible options.

The assessment of the feasible options is primarily intended to guide the selection of options by United Utilities and inform the scope of any further assessments or data collection that may be required if an option is considered as a preferred option. It also provides an opportunity for the statutory consultees to identify any other potential effects that may need investigation if an option is progressed to the preferred option stage.

The assessment of the feasible options is not a formal 'screening' of the WRMP, and this term must be used carefully in the context of the HRA process as a whole. However, the assessment applies the methods and principles of 'screening', and the process will identify options and European sites that can realistically be excluded from further, more detailed assessment at the preferred options stage, where there are self-evidently no significant effects (i.e. they can be 'screened out' based on the available data). For example, a new distribution main sited within an existing road, with no European sites within 15km or downstream, is extremely unlikely to have any significant effects; the feasible options 'screening' can therefore reasonably promote the option for consideration as a preferred option, and conclude that additional assessment or data is unlikely to be required to complete the HRA. Obviously, the screening process is only formally reported following the selection of the preferred options, and the conclusions of the feasible options 'screening' are reviewed at that stage to ensure that they are remain correct.

Nevertheless, the feasible options 'screening' aims to identify the potential for significant effects to occur and therefore makes use of the typical screening terminology (e.g. 'no LSE') to facilitate this, even if it is not reaching a formal conclusion regarding the option. Ultimately, the feasible options assessment is looking to highlight those options which have a risk of 'significant' or 'adverse'[8] effects on a European site which (critically) are unlikely to be avoidable or mitigatable at either the strategy level or scheme level. These options with unavoidable risk of significant or adverse effects can then be discarded and not progressed to the preferred options stage.

[8] Note that it is recognised that a conclusion of 'adverse effects' can only be made following appropriate assessment; however, it is usually evident at the screening stage when adverse effects are likely, and therefore this can reasonably be used to exclude options that are unlikely to be acceptable from an HRA perspective at an early stage in the WRMP development.

## 3.2 Data Collection

### 3.2.1 WRMP Options

Data on the feasible options are provided by United Utilities. These data include descriptions of each option; the likely outcomes (design capacities); the scheme requirements; the type and indicative location of any works; and an outline of how the option would function. Further information on general water resources was obtained from United Utilities (groundwater (GW) and surface water (SW) abstraction locations, source operational parameters, WRZ operation, emergency or drought plan operations) and the EA. It should be noted that United Utilities produce feasible options for all of their WRZs, although some of these zones will not be in deficit. There is no requirement to assess feasible options that won't be employed and therefore the assessment focuses on the deficit zones only.

### 3.2.2 European Sites

Data on site locations; interest features; conservation objectives; and condition assessments were collected from the Joint Nature Conservation Committee (JNCC), Natural England (NE) and Countryside Council for Wales (CCW). These data were used to determine the locations of the sites relative to the options; the condition, vulnerabilities and sensitivities of the sites and their interest features; and the approximate locations of the interest features within each site (if reported). European sites within 20km of the United Utilities supply area and their interest features are listed in **Appendix B**, although it should be noted that sites outside this area were also considered where there was a potential risk of effects as a result of an option. Additional information is summarised in Error! Reference source not found. (**Error! Reference source not found.**) and Error! Reference source not found. (**Error! Reference source not found.**).

### 3.2.3 'In combination' Plans and Projects

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.

As noted, the detailed examination of non-United Utilities abstraction or discharge consents for 'in combination' effects can only be undertaken through any HRA required at the licence application stage. It is therefore important to recognise that whilst European sites are considered individually it is not possible or appropriate for a strategic HRA to quantify the effects of individual abstraction licences or consents (alone or 'in combination') on those sites - the mechanism for this is the RoC process. As stated earlier, the results of the RoC process are taken into account in the WRMP.

With regard to other strategic plans, the list of plans included within the SEA will be used as the basis for the 'in combination' assessment (see Error! Reference source not found.). The SEA is used to provide information on the themes, policies and objectives of the 'in combination' plans. The plans themselves are examined in more detail as

necessary. Plans are obtained from the SEA datasets or internet sources where possible. With regard to projects, the WRMP explicitly accounts for known major projects (e.g. power station decommissioning) during its development, which effectively contributes to the 'in combination' assessment of potential interactions with other projects. However, it is not possible to produce a definitive list of existing or anticipated planning applications within the zone of influence of each proposed option to review possible local 'in combination' effects, and in reality, the nature of the WRMP and the timescales over which it operates ensure that generating a list at this stage would be of very little value.

It should be noted that a detailed 'in combination' assessment is not undertaken at the feasible options stage, in accordance with current guidance, although the potential for options to operate 'in combination' with each other, and with other United Utilities plans (e.g. the Drought Plan) is considered but not explicitly reported; the 'in combination' assessment is completed at the preferred options stage, and alternative options selected if any of the preferred options have a risk of significant 'in combination' effects.

## 3.3 'Screening' of the unconstrained list

The unconstrained list of options was subjected to a very coarse 'screening' to inform the selection of feasible options; this assessment is necessarily high level and primarily identifies those options that will self-evidently be unacceptable from (inter alia) an environmental perspective due to the high likelihood or certainty of adverse effects which cannot be avoided or mitigated. This stage is primarily to guide the plan development and is not formally reported.

## 3.4 'Screening' of feasible options

The feasible options assessment aims to identify those options which have a risk of 'significant' or 'adverse' effects on a European site which (critically) are unlikely to be avoidable or mitigatable at either the strategy or scheme-level. Obviously it is not possible, or appropriate, to exhaustively consider the possible effects of each feasible option on every European site since many sites will not be vulnerable to the effects of an option (or the Final WRMP as a whole) due to their location or the sensitivities of their interest features. Furthermore, some feasible options will self-evidently have substantial negative effects on European sites and so will not be progressed as preferred options, limiting the value of detailed assessment at the feasible options stage. Accordingly, the 'screening' exercise undertaken for the feasible options aims to identify:

- those European sites which are **likely** to be significantly affected by an option (i.e. effects are likely and not negligible);
- those European sites where effects are **uncertain** as the result of an option;
- those European sites which are **unlikely** to be significantly affected by an option; and
- those **options** that are unlikely to affect any European site due to their nature or location.

The location and functional description of each option is used to determine its outcomes and likely effects, based on:

- the anticipated operation of each option and predicted zone of hydrological influence[9];
- any predicted construction works required for each option[10];
- European site interest features and their sensitivities;
- the exposure of the site or features to the likely effects of the option (i.e. presence of reasonable impact pathways).

In practice, for the feasible options, all European sites that are within 15km or directly downstream of a supply-side option[11] are included in the 'screening', with sites beyond this considered on an option-by-option basis depending on the site interest features and how the option would function. This is considered to be a suitably precautionary approach that has important advantages due to the number of options and hence the benefits of a consistent approach across all options[12].

The feasible options 'screening' makes use of the typical screening terminology (e.g. 'no LSE') to facilitate the assessment, although it does not reach a formal conclusion regarding the option. Accordingly, the feasible options screening exercise will indicate whether 'significant effects' are likely, uncertain, or unlikely as a result of the implementation of a feasible option for each site and interest feature, as follows:

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

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

[11] i.e. any abstraction, new infrastructure, changed discharge etc. associated with an option.

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

**Table 3.1 Summary of significance assessment criteria**

| LSE?* | Summary |
|---|---|
| No (N) | The option will not, as far as can be reasonably determined, have any significant effects on the European site due to either:<br>• the site or interest features not being **sensitive** to the likely outcomes of the WRMP (e.g. sites without water resource dependent[13] interest features or mobile species); and/or<br>• the site or interest features not being **exposed** to the likely outcomes of the WRMP due to the absence of impact pathways.<br>This will include options where there is no reason to assume that works could not be accommodated without significant effects assuming that standard construction best-practice or mitigation that is common, established and known to be successful in similar situations, is applied.<br>Feasible options in this category are recommended for consideration as preferred options, subject to future review as part of the iterative HRA process. |
| Uncertain (U) | Options where a potential effect is conceivable and cannot be discounted, and the likely effects are therefore uncertain (at the feasible options stage). This is typically due to limitations on the information available, either in terms of the operation of the scheme, or the data available on the interest features of the sites. These options, if pursued as preferred options, may require some additional investigation to determine the likelihood of significant effects, and it is possible that the risk of effects cannot be quantified sufficiently at the strategic level to show no LSE (for example, substantial additional modelling or site-specific investigation may be required). Adverse effects are not necessarily likely (should appropriate assessment be undertaken) but generic mitigation measures may not be sufficient to ensure no LSE.<br>Feasible options in this category may be recommended for consideration as preferred options, subject to future review as part of the iterative HRA process, but may require some additional information to support their inclusion in the WRMP potentially including a more formal 'appropriate assessment' stage if effects cannot be clearly demonstrated to be negligible with additional information. |
| Yes (Y) | Significant effects (i.e. not negligible or inconsequential) on a European site are very likely or certain due to the scale/ nature/location of the Option proposals, or the sensitivity and distribution of the interest features within /near the European site. Although a full appropriate assessment is not undertaken at this stage, adverse effects may be more likely (or even certain) if the scheme is taken forward as a preferred option and it is likely that extensive and uncertain mitigation will be required following scheme-level investigations.<br>Feasible options in this category are **not** recommended for consideration as preferred options (although additional information may allow a re-assessment) as there appears, at the strategic level, to be a substantial risk of significant and potentially adverse effects, and the option would probably have to rely substantially on detailed 'down-the-line' assessment, which is unlikely to be appropriate for inclusion in the WRMP. |

*LSE – Likely Significant Effects

Although the feasible options 'screening' does not make a formal judgment on significance of any effects, some options will be 'screened out' of further assessment, on the basis that they cannot negatively affect any European sites. This is likely to include all 'customer-side' options (i.e. options designed to reduce water use such as metering or provision of water butts) and leakage reduction options[14] (although this will obviously be reviewed to ensure that the conclusions are robust). Similarly, some European sites and interest features will self-evidently be unaffected by the delivery of the WRMP, due to either the site or interest features not being **sensitive** to the likely

[13] Based on data within the National EA guidance *Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff.*

[14] The only realistic mechanism for a negative effect would be through direct encroachment at the local-level (for example a leaking pipe might be located in or near an SAC), but this cannot be meaningfully assessed at the strategic level since location-specific information is not available without specific investigations, which would form part of the package (i.e. the precise location and severity of most leakages is not known ahead of detection).

outcomes of the WRMP (e.g. sites without water-resource dependent[15] interest features or mobile species); and / or the site or interest features not being **exposed** to the likely outcomes of the WRMP due to the absence of impact pathways.

### 3.4.1 Key assumptions

Due to the strategic nature of the WRMP, and its position in the water resources planning cycle, there are often data gaps and uncertainties surrounding the options that cannot necessarily be fully resolved without substantial additional investigation, including field investigation. These studies would inevitably be required ahead of any Environmental Impact Assessment (EIA), planning application or licence application and so there is an inherent post-WRMP safeguard that can be relied on to ensure that adverse effects are avoided or mitigated. As a result it is necessary to make some broad assumptions when assessing the options that reflect the best available data. These include the following:

- Construction:
  - most if not all pipelines will be located within existing roads and watercourse crossings will make use of existing bridges and river crossing points;
  - if river crossing points are unavailable construction will be by a non-invasive techniques (e.g. directional drilling) which avoid direct effects on the watercourse;
  - unless explicitly noted, construction works will be located outside all European sites (i.e. no direct encroachment);
  - normal best-practice, including the measures outlined in Error! Reference source not found., will be applied to all schemes as a minimum and will be successful in avoiding 'accidental' and 'predictable' impacts (pollution incidents; disturbance of SPA birds due to inappropriate timing of works etc.);
  - standard mitigation and avoidance measures for specific features will be applied at the scheme-level and will be successful (e.g. avoiding construction near an estuarine SPA during winter).
- Operation:
  - options that involve the use of 'spare water' within existing licensed volumes and operating parameters / conditions are generally likely to be acceptable, subject to a thorough understanding of the effects relative to the status quo;
  - the availability of water from existing sources (e.g. through licence variations) is based on United Utilities data, discussions with the EA and other available data including the Catchment Abstraction Management Strategy (CAMS) documents;
  - the availability of 'new water' (e.g. development of new boreholes; new river abstractions) is based on United Utilities' discussions with the EA and the best-available data including the CAMS

[15] Based on data within the National EA guidance *Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff*

documents, and which are assumed to be correct subject to further investigation at the scheme level[16];

- all new licence applications and amendments will be subject to scheme-level HRA before the licence can be amended, which provides a reliable guarantee that adverse effects will not occur as a result of the scheme.

### 3.4.2 Avoidance measures and incorporated mitigation

In accordance with best-practice, the 'screening' takes account of 'designed in' mitigation; appropriate mitigation and avoidance measures for construction effects are therefore identified in Error! Reference source not found. to this report and it is considered (based on professional experience) that the majority of potential construction effects can almost certainly be avoided or mitigated at the project-level using these measures or similar. In these instances an assessment of 'no likely significant effects' is reached on the assumption that the measures proposed within Error! Reference source not found. will be incorporated into the WRMP, and implemented at the project stage (the normal consenting mechanisms will obviously ensure that these are delivered).

Options where scheme-specific mitigation is likely to be required (in addition to the generic measures identified in Error! Reference source not found.) are not necessarily excluded from consideration as preferred options; in these instances appropriate measures are be identified at the preferred options stage[17]. For the operational aspects of supply-side options, potential avoidance measures are considered where these have been determined through discussion between the Environment Agency and United Utilities, although in most instances specific operational mitigation that may be appropriate (e.g. 'hands-off' flows, etc.) for an option cannot necessarily be determined at this stage.

[16] This is particularly relevant for unexploited aquifers that have not been characterised by groundwater models (which would be required prior to any licence application).

[17] For example, a pipeline crossing an SAC river may require specific measures (such as timing of works to avoid key migration periods), which can be reasonably identified and included if the option is selected as a preferred option. As noted, the feasible options 'screening' is aiming to identify those options that almost certainly cannot be accommodated without significant effects, or mitigated.

# 4. Summary of Feasible Options Assessment

## 4.1 Deficit zones

United Utilities has determined that only one WRZ, West Cumbria, is predicted to be in deficit within the 25 year planning horizon of the WRMP. Accordingly, only the feasible options for this zone are assessed and reported.

## 4.2 Feasible demand-side and leakage reduction options

'Demand side measures' which are designed to reduce water demand, such as provision of water butts or metering are included within the feasible options list. If implemented, the 'demand side measures' will collectively have a positive effect on European sites by reducing water demand. Some 'supply-side' options will also effectively reduce 'demand', most notably leakage reduction. With these types of option the only realistic mechanism for a negative effect would be through direct encroachment at the local-level (for example a leaking pipe might be located in or near a SAC), but the likelihood of this cannot be identified or meaningfully assessed at the strategic level since location-specific information on the measures is not available without specific investigations, which would form part of the package (for example, the precise location and severity of most leakages is not known ahead of detection, and a 'leakage option' will simply comprise measures to improve leakage detection rather than commitments to repair specific leaks). In these instances, normal best-practice and project-level environmental controls (including those outlined in Error! Reference source not found.) will ensure that any potential effects are appropriately addressed at the scheme level. **As a result, the demand-side and leakage options are 'screened-out' and not considered further within the HRA**.

## 4.3 Feasible supply-side options

The HRA focuses on the supply-side options and their potential effects (i.e. a standard source-pathway-receptor approach to assessment). The options will generally require one or more of the following:

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

The assessment considers both the implementation (construction, if required) and operational effects of the options. In general, options that are within currently licensed volumes (either making use of spare capacity within existing licences, or re-instating mothballed sources where the licence has been retained) are unlikely to have operational effects, although there will be some exceptions (for example, some raw water transfers between catchments). Options that do not require construction will not have construction effects.

The deficit zones and hence feasible options are determined by United Utilities, and reviewed as the WRMP progresses. As noted, only one WRZ is predicted to be in deficit (West Cumbria); the feasible options for this zone are listed in **Table 4.1**.

**Table 4.2 Summary of feasible options assessment (see Error! Reference source not found. for scheme descriptions; note Pref. Opt. is 'preferred option'**

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC01 | Thirlmere Transfer into West Cumbria | This scheme would require substantial lengths of new pipeline and several other new assets. As proposed, the pipelines would be mostly within existing roads, other than some short linking sections and it would generally be expected that effects could be avoided with normal best practice and some scheme-specific mitigation (although suitable measures would be defined through project-level HRA). However, pipeline sections would cross / run adjacent to the River Ehen SAC and a new abstraction would be required near the River Derwent and Bassenthwaite Lake SAC (but from the reservoir itself). Other pipeline sections would be in close proximity to other SACs (for example: Lake District High Fells SAC, Clint's Quarry SAC, North Pennine Dales Meadows SAC). Significant construction effects on the River Derwent and Bassenthwaite Lake SAC are possible due to the proximity of the works although it is likely that these can be managed / avoided with standard mitigation measures. For other sites it is likely that significant adverse construction impacts could be avoided, although specific measures (e.g. timing of the works to avoid migration periods) will be required.<br><br>With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC and therefore adverse effects on this site would not be expected. It is assumed that the current abstraction levels and compensation releases to the River Derwent would be maintained (i.e. there would be no change in flows in the upper Derwent). It is noted that the EA wish to reduce the licence to 231 Ml/d, but this is understood to be a 'technical' rationalisation of several licences rather than something that will impact deployable output. There may be some positive benefits for the lower reaches of the Derwent as the scheme would allow the closure of WTWs downstream. The scheme is unlikely to have operational impacts on any other sites.<br><br>Overall, the scheme may have significant effects as a result of construction, but it should be possible to avoid these, or prevent adverse effects with scheme specific mitigation. | Yes - although some option-specific mitigation may need to be identified (e.g. seasonal working) |
| WC02 | River Derwent Abstraction | Construction works will be required adjacent to the River Derwent and Bassenthwaite Lake SAC, and the pipeline will have to cross this watercourse. It is likely that these works can be suitably managed to avoid significant or adverse effects (e.g. timing of works to avoid migration periods; routing pipeline to make use of existing road crossings) but a risk of effects would remain.<br><br>Operationally, this option is likely to significantly affect the River Derwent and Bassenthwaite Lake SAC (although the increase in abstraction is relatively modest). The current Q75 and Q98 flows of the River Derwent at the gauging station at Camerton (around 2 km upstream of the abstraction point at Barepot) are approximately 8 and 3 m3s-1( ). This equates to flows of around 691 Ml/d and 259 Ml/d respectively. An increase in abstraction of 3 Ml/d would represent around 1.2% of Q98 flows and 0.4% of Q75 flows. This would be considered a significant effect and it is certain that scheme level appropriate assessment would be required should the option be bought forward. Given the modest size of the increase adverse effects may not be inevitable but this option should ideally be avoided. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC04 | Wastwater (negotiate part abstraction licence) | Additional abstraction from Wastwater would be within existing licences but it would be higher than recent actual so Wastwater actual levels would tend to be lower on average than they have been previously. This would affect the River Ehen SAC, although it is uncertain whether these changes would have significant effects.<br>The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC05 | Development of New boreholes in West Cumbria Aquifer | The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse.<br>Operation of the scheme is more difficult to characterise; the new boreholes are outside the surface water catchment of the Ehen and therefore any localised drawdown would not affect tributaries of the river. It is possible that the new boreholes may affect groundwater supplies to the Ehen, although it is not clear what contribution to flow these are likely to make; in fact, any effects are likely to be felt outside of the SAC, but may affect mobile species (Atlantic salmon) migrating through the lower reaches. It may be necessary to characterise this to support the option. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC05a | Development of New boreholes in West Cumbria Aquifer (10 Ml/d) | This option would be the same as WC05, except with a 10Ml/d capacity rather than 5Ml/d. The effects are the same, although operational effects may be more likely. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC06a | Roughton Gill Mine Adit (Option 1) | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (i.e. through the SAC) will be slip-lined, which will minimise potential effects on the SAC, but some excavation is still possible. Overall, the scheme is likely to have significant effects but the scale of these can only be assessed accurately at the delivery stage; however, it should be assumed that excavation within the SAC will not be permitted.<br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the Review of Consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC06b | Roughton Gill Mine Adit (Option 2) | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (within the SAC) would be replaced, which would require excavation of the SAC. The scheme is will to have significant effects that will be difficult to avoid or mitigate.<br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the review of consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |
| WC07 | Kirklinton Borehole Development | The construction of this scheme is unlikely to affect any sites except the River Eden SAC (which the pipeline must cross, presumably by an existing crossing) and the North Pennine Moors SAC / SPA (where construction will be required within 500m at Waygill Hill SR). Construction effects on both of these sites are likely to be avoidable with best-practice and scheme specific mitigation (e.g. avoiding migration periods) although any pipeline excavation outside existing roads may need careful consideration if near the River Eden.<br>Operational impacts are more uncertain. A new abstraction licence will be required and abstraction from this aquifer could affect the River Eden SAC directly (the Scaleby boreholes are only 4km from the Eden at its closest point, near Low Crosby) or (more likely) indirectly by affecting flows within tributaries of this watercourse (e.g. the Brunstoke Beck). Similarly, abstraction from the Longtown boreholes could affect the Esk and hence the interest features of the Solway Firth suite of estuarine sites. This would require some additional modelling to quantify, although the CAMS indicates that there is water available for use in the Lower Eden catchment, and the EA has indicated that the under-utilised Curlington aquifer has substantial water available for use. On this basis it is clear that some additional information would be required to support the scheme, although it is recognised that a new licence will not be granted if future investigations demonstrate that the scheme will have an adverse effect on any site. | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC09 | Development of Boreholes in North Cumbria Aquifer | The construction of the scheme would have no effects assuming normal best-practice.<br>New borehole abstractions at Waverly and Thursby have the potential to impact on the nearby River Waverly and River Wampool, which discharges into the Solway Firth. The Waverton site is located approximately 12km upstream of Solway Firth, whilst Thursby is around 17 km upstream of the same site (SAC, SPA and Ramsar Site). It has been assumed a 1.5km reach downstream of the abstraction could be impacted, however, and therefore significant effects on this site would not be expected; the EA have indicated that some water is available for use from the North Cumbria aquifer (up to approx. 4.5 Ml/d). All other sites are almost certainly too distant for the abstraction to have a significant direct effect, including the River Eden SAC and the South Solway Mosses SAC which are both over 5km from the nearest borehole. | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC10 | Desalination, Workington | The scheme would involve pipelines across the River Derwent although the route is currently road-based and so effects could probably be managed with normal best-practice and some scheme-specific measures. Construction would also be required at Workington, and although the scale of this is uncertain it is likely to affect the Derwent estuary and therefore has a high risk of significant effects on the mobile interest features of the site. This impact could be reduced or avoided through appropriate timing of the construction, although in reality this would be difficult and so significant effects would be anticipated.<br>Similarly, the mobile species of the River Derwent would be vulnerable to the operation of the scheme; it is not clear where the intake or outfall would be, but it is likely that salinity etc will be locally affected near the estuary with possibly significant effects on the interest features. No other sites are likely to be affected through operation. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |
| WC14d | Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | There are a number of major uncertainties around the scheme which will determine the likelihood of significant effects - not least the uncertainty regarding pipeline routes from Kielder to the United Utilities network.<br>For Option WC14 d the main impacts are likely to be associated with construction, but will depend heavily on the pipeline routes. At the moment, the primary pipeline from Kielder to United Utilities is assumed to be a straight line across Kielder Forest (and hence across the Border Mires, Kielder – Butterburn SAC) although clearly this will be unacceptable. It should be possible to identify a cross-country route that will not affect any European sites directly, although the mire sites will have hydrological linkages extending a considerable distance from the site boundaries and it may be necessary to consider a significant diversion. At the moment, it is likely that the scheme will have significant construction effects on the Border Mires, Kielder – Butterburn SAC and (probably) the River Eden SAC (since several tributaries are crossed, not at existing crossing points). However, careful routing and scheme-specific mitigation could avoid or minimise these impacts.<br>Operational effects will be limited and not significant; the use of water from Kielder will not affect any WRD interest features at sites within its catchment and the only real mechanism for impacts would be indirect, through increases in discharges in the United Utilities WRZs after usage (in theory, 80Ml/d could be entering the West Cumbria WRZ). In reality, however, it is assumed that the transfer will be tailored to the deficit (there is no point in transferring 80Ml/d if it is not all required) and any increase in (for example) river flows will be well within natural variation. Although an interbasin transfer of raw water, it will be treated immediately on arrival and risks associated with this (e.g. invasive species transfer, significant variations in water chemistry) would not be expected.<br>On this basis, assuming that a suitable pipeline route can be established that avoids direct effects on any SAC, the scheme would not have any significant and unavoidable effects. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC19 | Crummock Automated Compensation Control | The River Derwent and Bassenthwaite Lake SAC will be affected by the option but the construction works required to deliver this option would be relatively minor and can be controlled / managed with normal best practice and scheme-specific measures (e.g. avoiding key migration periods, etc), and no adverse effects would be anticipated although project-level appropriate assessment would be required.<br>Operation of the scheme would be within the terms of the existing licence, and would allow releases to be more responsive to the needs of the river; however, although additional abstraction would be within existing licences but it would be higher than recent actual so River Cocker actual flows would tend to be lower on average than they have been recently. It is therefore possible that the River Derwent and Bassenthwaite Lake SAC could be affected by the scheme as compensation flows into the River Cocker would be reduced relative to the current volumes as the releases currently 'over-compensate' for the inaccuracies in gauging. It is therefore possible that there may be effects on the interest features, although the changes would be within the existing licensed volumes. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC23a | Supply of Final Effluent to Non-household Customers | It is not possible to undertake an assessment on this option as the effects will depend entirely on the location of the customer and hence the supplying WTW. The use of final effluent could be beneficial or deleterious, depending on the location of the WTW and which European sites could be affected (particularly as a proportion of the effluent use would probably be consumptive). However, effluent re-use would generally be expected to have beneficial consequences for the environment and therefore would be worth including as a preferred option despite the uncertainty, since this can only be resolved at the scheme level and effects are more likely to be beneficial than negative. If used as a preferred option it will be necessary to identify possible recipients and WTWs | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC23b | Supply of Final Effluent to Non-household Customers | As for WC23a | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC23c | Supply of Final Effluent to Non-household Customers | As for WC23a | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC72 | Raw Water Reduction of Losses (leak detection) | This cannot be assessed at this level since the location of leaks is not known. However, it would be unlikely to result in significant effects unless the repairs were located in / close to a European site, in which case scheme-specific measures would be required. | Yes - although some option-specific mitigation may need to be identified (e.g. seasonal working) |

## 4.4 Summary

The majority of the schemes in the West Cumbria WRZ require substantial network improvements to allow the available water to be delivered to the population centres. Such improvements are desirable in any case, to increase the resilience of the system, particularly under drought conditions. As a result, the majority of schemes require construction in close proximity to SACs (particularly riverine SACs, which must often be crossed) even if no additional abstraction is required. Clearly there is a risk that construction could significantly affect some of these sites, either accidentally (e.g. pollution events) or predictably (e.g. if poor planning means construction takes place at an inappropriate time of year). No detailed designs or construction plans can be produced at the WRMP stage, but the WRMP (and hence its assessments) assumes that all pipeline construction can be located within existing roads, and make use of existing river crossings, and that any other construction (e.g. new WTWs) will be discrete and located to avoid direct encroachment on any European sites (this would be a significant and probably adverse effect that would be difficult to mitigate). It is therefore considered (based on experience) that normal best-practice and some bespoke scheme-level mitigation (some of which can be identified at the strategy level) will be sufficient to ensure that construction works can be accommodated without significant or adverse effects on any European site (assuming that there is no direct encroachment). Therefore, although most of the options are 'maybes', it is likely that appropriate measures can be implemented to avoid or mitigate potential effects with a high degree of confidence of success.

With regard to the operation of the options, those that are operating within the terms of the existing licences are generally considered unlikely to have any significant or adverse effects (assuming that alterations are not required under RoC), although some options may need some additional exploration to determine the likely effects. For options requiring 'new water', these are usually treated cautiously and recommended for avoidance. It is often not certain what the exact effects will be since some of the modelling required to precisely determine yield and operating parameters cannot be completed without field data; this is particularly true of some of the new borehole options. In these instances, the information available from the EA and the CAMS documents on the water available is used as a basis for the assessment. For example, the EA considers that further water maybe available from the West Cumbria aquifer (see Option WC05) but this cannot be established accurately without more detailed groundwater modelling; therefore option WC05 and WC05a (5 Ml/d and 10Ml/d respectively) are considered potentially acceptable, whereas abstraction beyond this would have a high risk of significant effects, such that it should not be relied on to meet the deficit without the identification of suitable alternatives. Use of these options would therefore have a residual uncertainty that would be difficult to resolve at the strategic level.

The feasible options assessment was used by United Utilities to guide their selection of preferred options.

# 5. Preferred Options Assessment

## 5.1 Approach

Following from the preliminary screening of feasible options, the preferred options were re-screened and assessed for their likely impacts on European sites. For each option, the European sites that may be affected are identified (based on the criteria used for the feasible options), and a determination of LSE made on a site-by-site basis (with the outcomes recorded using the criteria summarised in **Table 3.3**). As before, 'no LSE' is not concluded for an option unless there are no clear or reasonable impact pathways, or where effects are likely to be negligible or inconsequential and it is reasonable to assume that standard and established measures (e.g. best-practice construction) will be sufficient to ensure that significant effects are avoided. Subsequently, an assessment of whether the option is likely to adversely affect the integrity of the European sites is made. The evidence underpinning the screening and assessment is summarised in the tables below. The assessment tables also identify measures that should be included within the WRMP to help avoid significant or adverse effects.

To allow the WRMP to pass the HRA test, any options with potential adverse effects have had a 'preferred alternative' identified from the feasible options list, which has also been assessed (alone and 'in combination'). A conclusion of 'no adverse effects' is made where there is sufficient confidence that significant or adverse effects can be avoided using either specific measures such as timetabling construction (to be included within the WRMP), or can clearly be avoided at the project level using established measures.

### 5.1.1 'In combination' Effects

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

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

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

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

- the Review of Consents (RoC) process has completed an 'in combination' assessment for all currently licensed abstractions (and many unlicensed abstractions);
- the RoC underpins (and drives) the WRMP, which also explicitly accounts for land-use plans and growth forecasts when calculating future water demand (and hence areas with potential deficits);
- land-use plans and population projections are accounted for in the demand forecasts that underpin the WRMP;
- known major projects that are likely to increase demand are also taken into account during the development of the WRMP.

This means that 'in combination' water-resource effects with other known plans or projects are explicitly considered and accounted for during the WRMP development process. It is therefore considered that (for the HRA) potential 'in combination' effects in respect of water-resource demands associated with other plans or projects are generally unlikely since these demands are considered when developing the WRMP and its associated plans.

The main exception to this is other water company WRMPs, which are currently in development and consequently cannot be reliably assessed at this stage. It should also be noted that the detailed examination of non-United Utilities abstraction or discharge consents for 'in combination' effects can only be undertaken by the EA through their permitting procedures.

### 5.1.2 Key assumptions, avoidance measures and incorporated mitigation

The same key assumptions, avoidance measures and incorporated mitigation outlined for the feasible options assessment (see Sections 3.3.3 and 3.3.4) apply to the preferred options assessment also. Any additional mitigation requirements are identified in the assessments and Appendix G.

## 5.2 Preferred option

Three options to help address the deficit in the West Cumbria WRZ (one of which comprises a combination of the feasible options) were taken forward for more detailed consideration as candidate preferred options. These options were:

- WC01: Thirlmere Transfer into West Cumbria;
- WC14d: Kielder Water Transfer to West Cumbria (Cumwhinton Treated);
- 'Lower Cost Option', a combination of the following options:
  - WC04: Wastwater (negotiate part abstraction licence);
  - WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d);
  - WC09: Development of Boreholes in North Cumbria Aquifer; and

- WC19: Crummock Automated Compensation Control.

It should be noted that all of the components of the 'Lower Cost Option' would need to be delivered to meet the predicted deficit.

Using a standard industry method that includes consideration of technical feasibility, financial costs and benefits, and quantified impacts on the environment and community, together with the emerging findings of the SEA and HRA, United Utilities identified Option WC01: Thirlmere Transfer into West Cumbria as the preferred option for the WRMP.

The preferred WRMP option involves increasing abstraction from Thirlmere reservoir within current licence conditions by enhancing infrastructure capacity. This option represents a large scale scheme comprising several infrastructure components including new service reservoirs, a water treatment works, pumping stations and over 100km of new pipeline together with the decommissioning of three existing water treatment works (Ennerdale, Corn How and Quarry Hill). The likely effects of this option on European sites are identified and assessed in the following sections.

## 5.3 Assessment: WC01 – Thirlmere Transfer into West Cumbria

### 5.3.1 Summary of scheme and assumptions

United Utilities currently hold a combined abstraction licence on the Thirlmere reservoir which meets both local and more regional needs. However, United Utilities currently do not have the capacity to abstract the entirety of the licensed water through the existing abstraction points. United Utilities' preferred option would be to increase the current abstraction from the reservoir by adding a new abstraction point in the reservoir and providing a new treatment works near Bridge End.

In order to distribute the additional water within West Cumbria, a number of infrastructure new builds and upgrades would be required. A new treatment works near Bridge End at the outlet of Thirlmere reservoir will be constructed; the precise location of this is not known but it is assumed (for assessment purposes) that it will be located within 200m of the St. John's Beck near Bridge End. Treated water from this new WTW will be pumped to a new service reservoir near Castle Rigg (adjacent to the A591), from which the water will flow by gravity down a large diameter trunk main (LDTM) terminating at Stainburn Service Reservoir (SR). It is currently proposed that this gravity main will run along the A591 and A66. For security of supply this LDTM will be twin pipelines, each capable of 50% of the maximum flow. Regular cross-connection valving will allow sections to be isolated in the event of a burst, whilst maintaining supplies. There will be three main take-offs from this LDTM to supply the Corn How, Ennerdale and Quarry Hill areas. The Ennerdale and Corn How connections will not require any additional pumping to deliver treated water to the existing Corn How SR and the proposed Ennerdale SR. However, additional pumping is required to transfer flows from Corn How to Buttermere SR. Water delivered from both Ennerdale and Corn How SRs to existing zones will be fluoride dosed. The Quarry Hill take-off will require booster pumping to deliver water to Bothel Moor SR. This option would also involve the abandonment of three existing WTWs in West Cumbria, Quarry Hill, Ennerdale, and Corn How. It should be noted that the option

would involve the decommissioning of the sources from permanent operational use, although United Utilities may seek to retain some locations as contingency sources.

### 5.3.2 Summary of likely impact pathways

#### Construction

This scheme would require substantial lengths of new pipeline, several new assets and the closure / mothballing of three existing WTWs. As proposed, the pipelines would be mostly within existing roads, other than some short linking sections to some of the new assets (which themselves may be in previously undeveloped areas, although this cannot be determined at this stage). However, pipeline sections would cross / run adjacent to several European sites (including Clint's Quarry SAC, the Lake District High Fells SAC, and the River Ehen SAC) and a new WTW would be required near the River Derwent and Bassenthwaite Lake SAC (near St. John's Beck, downstream of Thirlmere). This construction project has an obvious risk of significant effects if not suitably mitigated.

#### Operation

With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC. The scheme would operate within the terms of the existing licence (notwithstanding any licence consolidation that may take place), and therefore the current compensation release regime to the River Derwent would be maintained (i.e. there would be no change in low flows in the St John's Beck as these are controlled by the compensation release). In addition, United Utilities (on request from the EA) provide spate flows of up to 100 Ml/d from Thirlmere to encourage salmon migration as part of the EA RSA programme. The EA have previously indicated that, under RoC, they plan to alter UU's Thirlmere abstraction licence to include a waterbank of 972.78Ml/yr for release to the downstream river, with maximum rates of 100Ml/d and 50Ml/d set for these releases from Thirlmere dam and the Mill Gill/Helvellyn Gill intake respectively (releases will only occur between the 1 October and 31 December each year and will be on request from the EA; this waterbank has been factored in to the modelling for the option.

The existing legal framework (Section 37 of the Manchester Corporation Act 1924) also provides for additional flow releases to the downstream river over and above the normal compensation flow of 13.64Ml/d. These requirements have been taken into account in the WRMP development process and option design.

United Utilities has undertaken water resources modelling of the impact of this option on abstraction rates, storage levels within Thirlmere and on flows in the St John's Beck downstream of the reservoir. The modelling has been undertaken using hydrological conditions from 1927 – 2010 and during dry periods (e.g. from January 1995 to December 1996) and can be considered as representative of the likely impacts on storage and downstream flows that the implementation of this option would have. This is summarised in **Table 5.1**, although interpretation of the simulated maximum, minimum and mean figures should be made carefully since they provide a coarse summary of the hydrological functioning of the scheme only.

**Table 5.1 Effect of implementation of this option on simulated storage levels in Thirlmere and on simulated outflow to St John's Beck during dry conditions**

| | Simulated Minimum | | | Simulated Mean | | | Simulated Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| | Current | Revised | Diff. | Current | Revised | Diff. | Current | Revised | Diff. |
| Abstraction (Ml/d) | 3.9 | 59.5 | 55.6 | 173.5 | 187.7 | 14.2 | 224.3 | 280.0 | 55.7 |
| Reservoir Storage (Ml) | 11388 | 6735 | -4653 | 33390 | 31917 | -1473 | 40714 | 40714 | 0 |
| Outflow to St John's Beck (Ml/d) | 13.6 | 13.6 | 0 | 76.2 | 62.1 | -14.1 | 9404.2 | 9374.8 | -29.4 |

As would be expected, the model results show that mean, minimum and maximum simulated abstraction rates from the reservoir would increase compared to current operation, with mean abstraction increasing by approximately 14 Ml/d, whilst the maximum abstraction would increase by 55.7 Ml/d. Storage in Thirlmere reservoir would therefore be lower than under current operational practice (as represented by the water resources model) and so spill frequency would be less. Further analysis of the flow duration curve for St John's Beck under the same modelling conditions shows that low flows in the beck would be unaffected as the compensation discharge of 13.6 Ml/d would be unchanged. Under the simulation of current operation, the compensation flow is exceeded approximately 38% of the time. Under this option, the simulated compensation flow would be exceeded around 33% of the time. These modelling conditions show that the option would impact on higher flows in the St John's Beck, a result of the reservoir being drawn down more and not spilling as frequently. The Q5 flow (the very high flows exceeded 5% of the time) would decrease from 168.5 Ml/d to 124.2 Ml/d.

Overall, therefore, the scheme will have no effect on minimum low flows in St. John's Beck (although they would occur slightly more frequently based on current simulations), but would reduce the frequency and average size of the largest flows. In theory this might reduce the frequency of high 'flushing' flows, which remove silts from gravels used for spawning, although it is important to note that the very highest flows (i.e. Q5) are arguably less important for their 'flushing' effect as they can wash gravels away as well as silts. Furthermore, the size of the largest flows would probably remain unchanged (i.e. when the reservoir is full and spilling), although they would be less frequent (hence reduction in average size). Spate flows to encourage salmon migration in autumn will not be affected as these are implemented and managed (as necessary) under the existing regime, which will be maintained.

St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the absence of significant gravel input is (again, thought to be due to the reservoir).

The reservoir and downstream river sections are located in the Upper Derwent Water Resources Management Unit (WRMU), which has a water resource availability status of 'water available' for abstraction up to target status in 2019. There may be some positive benefits for the lower reaches of the Derwent as the scheme would allow the closure of WTWs downstream and on the River Cocker.

### 5.3.3 Initial screening of European sites

The initial assessment at the feasible options stage identified fourteen European sites within 15km of the infrastructure likely to be required to deliver this option. These are as follows.

- Borrowdale Woodland Complex SAC
- Clints Quarry SAC
- Lake District High Fells SAC
- North Pennine Dales Meadows SAC
- River Derwent and Bassenthwaite Lake SAC
- River Eden SAC
- River Ehen SAC
- Solway Firth SAC
- South Solway Mosses SAC
- Tarn Moss SAC
- Ullswater Oakwoods SAC
- Wast Water SAC
- Upper Solway Flats and Marshes SPA
- Upper Solway Flats and Marshes Ramsar

There are no additional sites that could potentially be affected by the scheme (e.g. other downstream sites, or sites potentially affected by consequent effects).

The initial assessment has demonstrated that several of these sites will not be affected by the scheme, primarily due to the absence of impact pathways; these sites are set out below, and are not considered further within the assessment of this option.

**Table 5.2 European sites screened out of further assessment (no likely significant effects expected)**

| Site | Rationale |
|---|---|
| Borrowdale Woodland Complex SAC | Great Wood SSSI and Scales Wood SSSI are within approximately 1.5km of the proposed pipleine routes but will not be directly or indirectly affected by construction based on their location and interest features. |
| North Pennines Dales Meadows SAC | One unit of this site (Sandybeck Meadow SSSI) is located approximately 800m from a pipline route, although it is on the far side of the River Cocker and the pipeline will be located within the road or nearby. The site will not be directly or indirectly affected by construction based on its location and interest features. |
| River Eden SAC | Site is over 11km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Solway Firth SAC | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| South Solway Mosses SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Tarn Moss SAC | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Ullswater Oakwoods SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Wast Water SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Upper Solway Flats and Marshes SPA | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Upper Solway Flats and Marshes Ramsar | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |

The potential effects of the scheme on the remaining sites (Clint's Quarry SAC; Lake District High Fells SAC; River Derwent and Bassenthwaite Lake SAC; and River Ehen SAC) are considered in more detail within the following sections.

### 5.3.4 Assessment of effects on European sites

| **Clints Quarry SAC** |
|---|
| **Interest Features** |
| Great crested newt |
| **Assessment of possible effects - Implementation** |
| The quarry supports great crested newts within a number of pools, with the closest unit of this SAC is approximately 160m from a pipeline route (assuming this is within the A595). Works entirely within the road would not affect any suitable habitat for this species, although it is possible that mitigation (exclusion fencing) may be required if the pipe trench is open during the key migration periods, to prevent GCN being accidentally killed or injured. Works outside the carriageway may affect habitats that are suitable for this species but are not anticipated at this stage. However, the risk of effects can be easily managed with established mitigation and no significant effects would be anticipated. |
| **Recommended Avoidance / Mitigation:**<br>Mitigation requirements for GCN will need to be identified at the scheme level but there is nothing to suggest that standard mitigation approaches (fencing; timing of works) will not be entirely effective. |
| **Conclusion:**<br>No likely significant effects |
| **Assessment of possible effects - Operation** |
| The interest features are not exposed to the likely operational effects of the scheme. |
| **Recommended Avoidance / Mitigation:**<br>None. |
| **Conclusion:**<br>No likely significant effects. |

| Lake District High Fells SAC | |
|---|---|
| **Interest Features** | |
| Slender green feather-moss | Alpine and Boreal heaths |
| Calcareous rocky slopes | Juniper on heaths and calcareous grasslands |
| Oligotrophic to mesotrophic standing waters | Siliceous alpine and boreal grasslands |
| Alkaline fens | Blanket bog* |
| Siliceous scree | Species-rich Nardus grassland* |
| Wet heaths | Western acidic oak woodland |
| Siliceous rocky slopes | Hydrophilous tall herb communities |
| Dry heaths | |
| **Assessment of possible effects - Implementation** | |
| The proposed pipeline to Buttermere SR will run immediately adjacent to the Buttermere Fells SSSI unit of this site, where the pipe runs up the Buttermere valley along the B5289. It is not possible to determine exactly which interest features are present adjacent to the road in this sector of the SAC based on the available data, although the road here is cut into the adjacent Skiddaw Slates and so is bordered on one side by rock outcrops with gorse, and by Crummock Water on the other. The features closest to the road are therefore likely to be **Siliceous scree, Siliceous rocky slopes** and **Siliceous alpine and boreal grasslands**, with possible areas of **dry heath**. The remaining features of the site are not thought to be present to any significant extent in vicinity of the road.<br>The rocky features adjacent to the road will obviously be sensitive to direct encroachment, but are unlikely to be especially sensitive to indirect effects (e.g. dust deposition etc.). Assuming all the works are retained within the existing carriageway then the scheme would not be expected to have any effects on the SAC. | |
| **Recommended Avoidance / Mitigation:**<br>A scheme specific mitigation plan will be required but a commitment to remain within the road at this location will ensure that significant effects do not occur. | |
| **Conclusion:**<br>No likely significant effects. | |
| **Assessment of possible effects - Operation** | |
| The interest features are not exposed to the likely operational effects of the scheme. | |
| **Recommended Avoidance / Mitigation:**<br>None. | |
| **Conclusion:**<br>No likely significant effects. | |

*Priority features

| River Ehen SAC | |
|---|---|
| **Interest Features** | |
| Freshwater pearl mussel | Atlantic salmon |
| **Assessment of possible effects - Implementation** | |
| The proposed pipeline to a new service reservoir at Ennerdale (location to be confirmed). Will cross the River Ehen at least once and possibly (depending on the route) up to three times. It is likely that these crossings will be by existing road bridges but it is possible that a new sub-surface lay may be required (it has been assumed that this will be by directional drilling, if required). Atlantic salmon and Freshwater pearl mussel are present throughout the SAC and works anywhere near the river could potentially affect these species directly or indirectly. The most likely impacts would be through siltation or other incidental pollution; noise and vibration disturbance; and bankside vegetation clearance. It is conceivable that a directional drill may locally affect groundwater that contributes to river flow but any such effects cannot be assessed at this level and are likely to be local and not significant. Ennerdale WTW will be closed as part of the scheme<br><br>**Freshwater pearl mussel**<br><br>This species would be vulnerable to water quality impacts, particularly acute **sediment inputs** / **siltation** events that may be associated with construction. The general target for the river is $10mgl^{-1}$, which is a more precautionary figure than the standard normally associated with rivers ($25mgl^{-1}$ as laid down in the EC Freshwater Fish Directive). It is not possible at the strategic assessment level to determine whether this figure is likely to be exceeded (since this will depend on a range of variable s that cannot yet be determined, such as route, construction techniques, time of year, background levels at construction start etc.) but it will be possible to design a specific sediment control regime, supported by monitoring, which will ensure that significant increased in suspended sediment do not occur as a result of any construction works. Other potential acute pollution / water quality issues will be managed with the same processes.<br><br>The pearl mussel is also dependent on **overhanging bankside vegetation**, which helps suppress filamentous algae. The route is currently located mainly within roads although it is possible that some pipeline sections may be located outside carriageways, and so could impact riparian trees. The extent of this cannot be determined at this level without detailed routing studies, but the potential effects can be avoided through a commitment to not remove any bankside trees to facilitate installation of the pipe.<br><br>The pearl mussel is also dependent on Atlantic salmon for part of its lifecycle and so any effects on this species would negatively affect pearl mussel also.<br><br>**Atlantic salmon**<br><br>Atlantic salmon will be vulnerable to the same potential effects as freshwater pearl mussel, particularly with regard to sedimentation, and the same monitoring / mitigation targets would apply. As with pearl mussel, it will be possible to design a specific sediment control regime, supported by monitoring, which will ensure that significant sediment discharges (or other water quality impacts) do not occur.<br><br>Additionally, salmon will be sensitive to noise and vibration disturbance, particularly during the key migration periods and so construction works must be timed to avoid possible effects on migrating salmon (construction within 200m of the river should be completed before late summer, prior to the autumn migration period). This should be included or referenced within the WRMP to ensure that it is taken into account during the project planning stages. | |
| **Recommended Avoidance / Mitigation:**<br><br>A scheme specific mitigation plan (with detailed sediment control measures) will be required at the scheme level but a commitment to remain within the road will ensure that adverse effects do not occur. The scheme should be designed to ensure that no bankside trees are removed. Construction within 200m of the river should be completed before late summer, prior to the autumn migration period. | |
| **Conclusion:**<br><br>No significant adverse effects, assuming route remains within roads and mitigation measures are employed. Routing outside the existing carriageway may increase the risk of significant effects (particularly near the river) but there is a high degree of certainty that these effects can be avoided or mitigated. | |
| **Assessment of possible effects - Operation** | |
| The interest features are not directly exposed to the likely operational effects of the scheme, although the scheme is designed to allow for flows within the Ehen to be increased, which will benefit the interest features. Operation of the scheme is therefore likely to have a significant positive effect on the SAC. | |
| **Recommended Avoidance / Mitigation:**<br><br>None. | |
| **Conclusion:**<br><br>No significant adverse effects. | |

## River Derwent and Bassenthwaite Lake SAC

**Interest Features**

| | |
|---|---|
| River Lamprey | Marsh fritillary butterfly |
| Brook lamprey | Floating water-plantain |
| Sea lamprey | Otter |
| Oligotrophic to mesotrophic standing waters | Water courses with Ranunculus-type vegetation |
| Atlantic salmon | |

**Assessment of possible effects - Implementation**

The scheme will require construction of a new WTW near Bridge End, which may be in the vicinity of the St. John's Beck unit of the SAC. Transfer pipelines from this WTW will then run along the A591 and A66, in close proximity to the river, with some additional crossing points lower downstream. At this stage the pipeline has been routed along existing roads and it has been assumed that this will be achievable; however, it is possible that some sections may need to run adjacent to the road or along separate (cross country) routes, depending on several factors that cannot be determined at this stage – for example, the location of other services within the road. However, it is clear that the main twin pipes from Thirlmere will be large (750mm) requiring a substantial amount of road-space to accommodate them, and therefore it is possible that some construction outside the main carriageway may be required in this area at least; this has been factored in to the assessment. The other mains required (to link to the decommissioned WTWs and hence to distribution) will be single mains, typically between 200 – 750mm, and it is more certain that these can be accommodated entirely within existing roads or along existing pipe routes. It has also been assumed that all river crossings will be by existing road or pipe-bridges, or through directional drilling (or similar), and that no invasive excavations etc. will be required in or adjacent to the rivers (e.g. cut and fill across the watercourses).

**River lamprey / Brook lamprey / Sea lamprey**

This SAC has features that provide the necessary conditions for both spawning and nursery areas, including extensive gravel shoals, good water quality and areas of marginal silt. River lamprey and brook lamprey are thought likely to spawn in the St. John's Beck (NE, pers. comm.) and there are extensive river lamprey nursery grounds below Bassenthwaite Lake on the River Derwent. Sea lamprey do not generally migrate as far upstream as river or brook lamprey, and it is thought that they are largely confined to the middle and lower reaches of the Derwent, below Bassenthwaite Lake. Juvenile brook lamprey are also found on the lower river although their distribution is more localised. Nursery grounds of river and brook lampreys also occur between Derwentwater and Bassenthwaite and on the River Cocker below Buttermere.

The lamprey species will be primarily vulnerable to deterioration in water quality associated with construction (particularly sedimentation of spawning gravels) and (to a lesser extent) noise / vibration disturbance. Effects could theoretically occur anywhere along the pipeline route as a result of construction run-off, but St. John's Beck is likely to be particularly vulnerable due to the proximity of the new WTW required near here and the sensitivity of the beck due to the spawning areas. Some of the distribution mains will have to cross the SAC and construction will be in close proximity to the SAC at other points (although it is currently proposed that the works will be sited within existing roads).

It is expected that normal construction best-practice could be relied on to minimise any effects and ensure that they are not likely to significantly affect this interest feature. However, it may be necessary to schedule works that are near the river (within, for example, 200m) outside the main migration (spring, autumn) and spawning periods (April – May for brook and river lamprey; May – July for sea lamprey). It should be noted that any effects will be short-term only, associated with the construction period, and any acute pollution event is likely to be quickly attenuated.

**Atlantic salmon**

Important salmon spawning areas are found below Bassenthwaite Lake on the Derwent and below Buttermere on the Cocker. The principal tributaries for salmon spawning and nursery grounds are the Rivers Greta, Glenderamackin and Marron as well as St John's, Naddle, Whit and Sandy Becks. The Greta-Glenderamackin, with its tributaries St John's and Naddle Backs, act as the prime salmon fry and parr production area in the Upper Derwent catchment.

As with the lamprey species, salmon will be primarily vulnerable to deterioration in water quality associated with construction (particularly sedimentation of spawning gravels) and noise / vibration disturbance. The avoidance and mitigation measures that are appropriate for the lamprey species will also be effective for salmon, although construction works must be timed to avoid possible effects on migrating salmon (construction within 200m of the river should be completed before late summer, prior to the autumn migration period). This should be included or referenced within the WRMP to ensure that it is taken into account during the project planning stages.

| River Derwent and Bassenthwaite Lake SAC |
|---|
| **Assessment of possible effects (cont'd.) - Implementation** |
| **Oligotrophic to mesotrophic standing waters** |
| The four main lakes in the SAC (Bassenthwaite, Crummock, Buttermere and Derwentwater) all contribute to this feature. Bassenthwaite, Derwentwater are mesotrophic, with Buttermere and Crummock Water tending to be more oligotrophic. Derwentwater and Buttermere are unlikely to be particularly vulnerable to the implementation of the scheme due to their position in the catchment relative to the likely construction areas (they are effectively upstream). However, construction is likely to be required within the roads adjacent to Bassenthwaite and Crummock Water, which may affect this interest feature if not appropriately managed. The conservation value of the lakes is largely determined by **structural diversity** and **water quality** (particularly nutrient status). The scheme is unlikely to affect the structural diversity within the lake, unless acute sediment inputs are catastrophic. However, construction run-off could affect water quality through sediment input and consequent input of nutrients, depending on the location of the works and the type of sediment released (for example, sediment associated with run-off from improved grassland is likely to be more nutrient-rich than sediment from sub-road excavations). The proximity of the works in the roads alongside these lakes means that some construction run-off is likely depending on the arrangement of road drainage in these areas. However, it is expected that normal construction best-practice could be relied on to minimise any effects and ensure that they are not likely to significantly affect this interest feature. It should also be noted that any effects will be short-term only, associated with the construction period, and the hydrological functioning of the lakes is likely to ensure that any acute pollution event is quickly attenuated. |
| **Marsh fritillary butterfly** |
| This interest feature is located at Braithwaite Moss SSSI, at the southern end of Bassenthwaite Lake. The closest unit of this SSSI is approximately 50m from the main road and therefore it will be important that construction in this area is restricted to the road although the habitats of this species are unlikely to be directly affected by the works. The species is relatively sedentary and is largely dependent on the presence of its food-plant, Devil's bit scabious, and so any indirect effects can largely be avoided by ensuring that works do not encroach on habitats supporting the food-plant within approximately 500m of the Braithwaite Moss SSSI unit of the SAC. This will require scheme specific survey and mitigation, but any effects on this interest feature can clearly be avoided or (at worst) mitigated at the scheme level with appropriate replanting. No significant effects would be expected. |
| **Floating water-plantain** |
| Floating water plantain is restricted to Derwent Water and Bassenthwaite Lake. The location of Derwent Water relative to the proposed pipelines makes it unlikely that this population will be negatively affected by the scheme. The species requires moderately nutrient-rich water but is sensitive to **eutrophication** (which will be primarily associated with diffuse pollution from surrounding agricultural land at this site). Construction effects, notably **sediment** release, could affect this species particularly where the pipeline skirts Bassenthwaite Lake although in general the lake will provide some buffering of any effects unless (e.g.) sediment inputs are substantial and directly affect stands of this species. Appropriate construction measures can be relied on to prevent any catastrophic acute pollution / sedimentation event although these will need to be specified in a dedicated construction management plan. No significant effects would be expected. |
| **Otter** |
| Otters use all parts of the Derwent catchment and so there are likely to be numerous opportunities for them to be exposed to the implementation effects of the scheme. They are most likely to be affected directly through **disturbance** (e.g. individuals disturbed or displaced by construction; impacts on holts; risk of death due to construction activities and traffic) but could also be affected indirectly through **impacts on their fish prey**.<br>The risk of construction effects on otters can only be accurately quantified following field surveys at the project level, although it is reasonable to assume that standard mitigation measures (e.g. ensuring trenches have a means of escape; using pipe-end caps) would be effective at minimising the risk of impacts on individual otters away from the river. Construction near the river could disturb otters in holts, although this can be avoided with best-practice or mitigated through construction of replacement holts, although construction within roads is likely to be the least disturbing approach for this species. It is therefore possible that individual otters may be temporarily affected by construction (although this will require appropriate survey) but these effects can be reliably avoided or mitigated using established measures and the scheme is therefore unlikely to have any significant direct effects on the interest feature as a whole.<br>It is possible that indirect effects may occur through impacts on their fish prey, although the avoidance and mitigation measures set out for fish will be sufficient to ensure that this does not occur. Any construction effects are will also be temporary only. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd.) - Implementation** |
| **Water courses with Ranunculus-type vegetation** |
| The Derwent and Cocker support this feature in their middle and lower reaches. The SSSI citation notes that "*higher plant species become an important component of the aquatic flora* [between Derwentwater and Bassenthwaite]", and that stable flows in the Buttermere Dubs (between Buttermere and Crummock Water) also result in a rich flora including elements of this feature. The feature is then present throughout the river downstream of the Derwent / Cocker confluence. This feature will be most vulnerable to **sedimentation** and **changes in nutrient status**; it is assumed that the risks associated with these aspects can be managed or avoided with an appropriate mitigation plan / site environmental management plan, developed at the scheme level, and significant effects would not be anticipated as a result of construction. |
| **Recommended Avoidance / Mitigation:**<br>A scheme specific mitigation plan will be required but a commitment to remain within the road will ensure that significant effects do not occur. The mitigation plan will include location specific sediment control measures designed to prevent any acute pollution or sedimentation events as a result of construction run-off, and must be agreed with NE.<br>At the scheme level ensure that any areas likely to be affected by the scheme which are within 500m of Braithwaite Moss and which may support the food-plant of the Marsh Fritillary butterfly are clearly mapped; these areas will need to be avoided or an appropriate mitigation scheme (re-seeding with appropriate seed mix) identified.<br>Works within approximately 200m of the river should be scheduled outside the main autumn migration period for salmon to avoid noise and vibration disturbance; works within 200m (particularly around the new WTW near Bridge End) should be scheduled to avoid the key spawning periods. |
| **Conclusion:**<br>No significant effects, assuming route remains within roads and mitigation measures are employed. Routing outside the existing carriageway may increase the risk of significant effects (particularly near the river) but there is a high degree of certainty that these effects can be avoided or mitigated using normal measures approaches. |

| River Derwent and Bassenthwaite Lake SAC |
|---|
| **Assessment of possible effects - Operation** |
| The scheme will involve the use of spare licensed capacity within Thirlmere to supply West Cumbria. The abstraction would be from the reservoir itself, so St John's Beck would not form part of the abstraction system (i.e. water would not be used on a 'put and take' basis). The scheme would operate within the terms of the existing licence (subject to consolidation) so there would be no effects on the low flows (since the compensation release regime would be maintained). However, the use of 'spare' water within the reservoir would reduce the size of the Q5 flows (i.e. the flow volume that is exceeded 5% of the time); this could in theory reduce their 'flushing' effect, which removes silts from gravels used for spawning, although this is unlikely to be significant as (a) flushing flows for a watercourse of this size are more critical in the mid- flow ranges (~Q30), since larger flows may remove gravels as well as silts; (b) the current spill frequency in the key months for flushing flows (early autumn spates) is low and will remain low (since the reservoir is naturally at its lowest at this point); and (c) the size of the very largest flows would probably remain unchanged (i.e. when the reservoir is full and spilling), although they would be less frequent. The Q5 reduction could also reduce the frequency of 'spate' flows which are thought to stimulate salmon migration in the autumn, although there is currently provision for UU to undertake spate releases of up to 100Ml/d for this reason (in association with the RSA programme) which will be maintained.<br><br>The targets for the SAC indicate that abstraction levels should be managed to protect the characteristic flow regime, including seasonal base flows and flushing flows; it is considered that the scheme will not significantly affect these due to the compensation flow provisions that will be maintained, and the ecological effect of the Q5 reduction will be minimal and not adverse; furthermore, it is likely that any effects identified with monitoring can be avoided or mitigated by additional compensation releases e.g. to provide for periodic set-volume flushing flows. The alteration to high flows will not have a significant effect on the SAC downstream of the confluence with the Greta or Bassenthwaite Lake. |
| **Atlantic salmon** |
| Important salmon spawning areas are found below Bassenthwaite Lake on the Derwent and below Buttermere on the Cocker. The principal tributaries for salmon spawning and nursery grounds are the Rivers Greta, Glenderamackin and Marron as well as St John's, Naddle, Whit and Sandy Becks. The Greta-Glenderamackin, with its tributaries St John's and Naddle Becks, act as the prime salmon fry and parr production area in the Upper Derwent catchment.<br><br>The operation of the scheme would not affect low flows due to the maintenance of the current compensation release, but may affect the frequency of the very highest flows (i.e. when reservoir is full and spilling) and the size of the Q5 flows (likely to be reduced from approximately 168 to 124 Ml/d). Higher flows in watercourses can be important for flushing some sediments from spawning gravels, although very high flows (such as the Q5 flows on this watercourse) are more likely to result in gravels also being removed and therefore a reduction in the volumes of these is unlikely to significantly reduce spawning success. The timing of the flows is also important, and higher flows associated with early autumn spates are more important than very high winter flows in this respect (as the latter can wash redds away). Furthermore, higher spate flows or freshets can be important for stimulating salmon migration and therefore arrangements are currently in place for the periodic release of up to 100Ml/d from Thirlmere to encourage this under the EA RSA programme; this has been factored into the calculations for the option. Investigations of the effectiveness of this are ongoing under the EA RSA programme.<br><br>St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the reservoir is having a negative effect on the supply of gravel to the beck. This option will not alter this one way or the other, although lower Q5 flows may reduce the entrainment of gravels in the beck.<br><br>Overall, the proposed changes to the abstraction regime are unlikely to significantly reduce the value of St John's Beck to salmon, or affect the favourable conservation status of this feature. Furthermore, any flow requirements identified by ongoing studies can almost certainly be achieved through appropriate regulation releases, which UU would be obliged to implement under the 1924 Act. No measurable effects would be anticipated downstream of Bassenthwaite, although the lower reaches of the Derwent may benefit from reduced abstraction on the Cocker. On this basis, the option would not be expected to have significant adverse effects on this feature as a result of its operation. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd)- Operation** |
| **River lamprey / Brook lamprey / Sea lamprey** |
| River lamprey and brook lamprey are thought likely to spawn in the St. John's Beck (NE, pers. comm.) and there are extensive river lamprey nursery grounds below Bassenthwaite Lake on the River Derwent. Nursery grounds of river and brook lampreys also occur between Derwentwater and Bassenthwaite and on the River Cocker below Buttermere. Sea lamprey do not generally migrate as far upstream as river or brook lamprey, and it is thought that they are largely confined to the middle and lower reaches of the Derwent, below Bassenthwaite Lake, and therefore significant adverse on this species are very unlikely.<br><br>With regard to operation of the scheme, river and brook lamprey species will be primarily vulnerable to consequent effects associated with potential reductions in higher flows within the St John's Beck. These could result in the reduction of some flushing flows although, as with salmon very high flows during spates can be detrimental to populations of these species, by making it difficult for them to access spawning grounds and by lowering recruitment after spawning (Maitland 2003). The operation of the scheme would not affect low flows due to the maintenance of the current compensation release, but may affect the frequency of the very highest flows (i.e. when reservoir is full and spilling) and the size of the Q5 flows (likely to be reduced from approximately 168 to 124 Ml/d). Higher flows in watercourses can be important for flushing some sediments from spawning gravels, although very high flows (such as the Q5 flows on this watercourse) are more likely to result in gravels being removed also and therefore a reduction in the volumes of these is unlikely to significantly reduce spawning success. Higher spate flows or freshets are thought to be less important for stimulating lamprey migration than they are for salmon.<br><br>St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the reservoir is having a negative effect due to the reduction in supply of gravel to the beck. This option will not alter this one way or the other, although lower Q5 flows may reduce the entrainment of gravels in the beck.<br><br>Overall, the proposed changes to the abstraction regime are unlikely to significantly reduce the value of St John's Beck to the lamprey species, or affect the favourable conservation status of these features, and no significant adverse effect would be anticipated. |
| **Oligotrophic to mesotrophic standing waters** |
| The four main lakes in the SAC (Bassenthwaite, Crummock, Buttermere and Derwentwater) all contribute to this feature. Bassenthwaite, Derwentwater are mesotrophic, with Buttermere and Crummock Water tending to be more oligotrophic. The only lake likely to be directly affected by the operation of the scheme is Bassenthwaite, although this feature is not particularly dependent on high flows or flushing events and in reality buffers the lower Derwent against these. The conservation value of the lakes is largely determined by **structural diversity** and **water quality** (particularly nutrient status). The scheme is unlikely to significantly affect either of these aspects. |
| **Marsh fritillary butterfly** |
| This interest feature will not be affected by the operation of the scheme. |
| **Floating water-plantain** |
| Floating water plantain is restricted to Derwent Water and Bassenthwaite Lake. The location of Derwent Water makes it very unlikely that this population will be negatively affected by the operation of the scheme. The species requires moderately nutrient-rich water but is sensitive to eutrophication (which will be primarily associated with diffuse pollution from surrounding agricultural land at this site). However, it is considered that the lakes and the flows within the Greta will buffer any operational effects (which would be at high flows only) and so no significant effects would be expected. |
| **Otter** |
| The operation of the scheme is unlikely to affect otters directly, although they could be affected indirectly through **impacts on their fish prey**; however, it is considered that the operation of the scheme will not adversely affect the fish interest features or other fish species that make up the diet of otters, and so significant effects on otters would not be expected. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd)- Operation** |
| **Water courses with Ranunculus-type vegetation** |
| The Derwent and Cocker support this feature in their middle and lower reaches. The SSSI citation notes that "*higher plant species become an important component of the aquatic flora* [between Derwentwater and Bassenthwaite]", and that stable flows in the Buttermere Dubs (between Buttermere and Crummock Water) also result in a rich flora including elements of this feature. The feature is then present throughout the river downstream of the Derwent / Cocker confluence. This feature will be most vulnerable to **sedimentation** and **changes in nutrient status**. In theory, the reduction in the frequency of the highest flows from Thirlmere could affect this feature upstream of Bassenthwaite lake by reducing the flushing effect. However, this is unlikely to be significant based on the contribution of the St John's Beck to these flows in the main river, and it is unlikely that the reduction in frequency will substantially reduce the flushing that occurs. |
| **Recommended Avoidance / Mitigation:**<br>Continued monitoring of the condition of St John's Beck will allow for regulation releases to be implemented. |
| **Conclusion:**<br>The scheme may have 'significant' (i.e. not negligible) effects on higher flows within the beck although these would still be within the parameters of the existing licence. However, adverse effects would not occur on the basis that the scheme will not affect low flows and arrangements for periodic 'spate' releases will be maintained unless monitoring demonstrates that these are having negative effects. |

## 5.4 'In combination' effects

### 5.4.1 'In combination' effects between preferred options

Since there is only one preferred option there cannot be any 'in combination' effects arising from within the plan itself.

### 5.4.2 'In combination' effects - other plans

#### Local / regional planning documents and population growth

The WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). These forecasts are based upon population and property forecasts published by the Office of National Statistics (ONS) as well as historical reporting data and property changes on the billing system. Housing growth figures in local plans are reviewed for consistency, although the ONS data are known to provide a more reliable indicator of future demand.

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. Arguably, therefore, potential 'in combination' effects in respect of water-resource demands due to other plans or projects are unlikely since these demands are explicitly modelled when determining deficit zones and hence developing feasible options. As a result (in respect of water resources) the WRMP is not likely to make non-significant effects in other plans

significant (indeed, other plans are arguably the 'source' of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).

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

- The plan safeguards against uncertainty in option yield and timing through 'Target Headroom'; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand side measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would 'suddenly' result in a deficit that might affect a European site; and (in any case);

- The WRMP is prepared 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.

## United Utilities' Draft Statutory Drought Plan 2012

Public consultation on United Utilities' Draft Statutory Drought Plan 2012 closed in January 2013. It provides a comprehensive statement of the actions that may be implemented during drought conditions to safeguard essential water supplies to customers and minimise environmental impact.

The Draft Statutory Drought Plan 2012 identifies that the West Cumbria WRZ is the most sensitive to drought due to its short (75 days) critical period. Drought triggers have been produced for water resources in the West Cumbria WRZ: Ennerdale and Crummock Water. Drought triggers have also been developed for the Scales boreholes based on actual abstraction compared to the annual licence limit.

**Table** 5.3 summarises the drought permit/order sites that have been identified in the draft Plan for the West Cumbria WRZ together with details of the change that would be sought in a drought event and any protected sites in the vicinity of the source.

**Table 5.3 Potential Drought Permit/Order Sites (West Cumbria WRZ)**

| Source | Change Sought | Designated Sites in Vicinity |
|---|---|---|
| Crummock Water | Allow pumping of abstraction and compensation flows at lake levels below 1.1m below weir crest level to 1.5m below weir crest level | River Derwent and Bassenthwaite Lake SAC |
| Ennerdale Water | Allow drawdown of the lake to 1.7m below weir crest with mitigated compensation flow regime<br>Note: The Ennerdale Operating Agreement states that abstraction is only possible down to 1.35 m below weir crest and to abstract below this would require a drought permit/order | River Ehen SAC, Ennerdale Lake SSSI |
| Scales boreholes | Increase the annual licence limit from 365 Ml to between 438 and 621 Ml to enable the continuation of a higher daily abstraction rate (up to the licence limit of 6 Ml/d) | No protected sites |

**Source: United Utilities**

The likely effects of these options were considered within an SEA and HRA prepared in support of the Draft Statutory Drought Plan 2012. The HRA highlights the potential for 'in combination' effects with the existing abstraction licence at Ennerdale, noting that the Environment Agency RoC concluded that the normal compensation flow in the River Ehen could not be demonstrated not to impact the freshwater pearl mussel population, although a mitigated flow regime has been discussed with the Environment Agency and Natural England. With the mitigated flow regime in place, the Drought Plan HRA concluded no adverse effects of the drought option's implementation on the River Ehen SAC. The HRA identified potential adverse impacts on the River Derwent & Bassenthwaite Lakes SAC although the Appropriate Assessment for this drought option concluded that no adverse effects are anticipated. In respect of the Scales borehole drought option, there are no likely effects on any European site.

Obviously, the WRMP preferred option is designed to relieve pressure on the River Ehen SAC and so no adverse effects on this site would be expected 'in combination' with the Drought Plan as it currently stands; likewise, the decommissioning of Corn How water treatment works under the WRMP preferred option and cessation of abstraction from Crummock Water will decrease the risk of 'in combination' effects on the River Derwent and Bassenthwaite Lake SAC.

However, it is critical to note that the implementation of the WRMP preferred option would substantially change water resource management in the West Cumbria zone, such that the existing elements of the Drought Plan would immediately become irrelevant once the option was brought on-line. This would require a new drought plan be developed. Logically, therefore, the current Drought Plan cannot have 'in combination' effects with the WRMP as the options and scenarios promoted in the two plans cannot operate together. It should be noted that the new scheme should increase the resilience of the West Cumbria WRZ to drought conditions.

## Other Water Company WRMPs

There is potential for United Utilities' WRMP to have 'in combination' effects with the WRMPs of adjacent water companies. However, these WRMPs are currently being reviewed and updated on the same statutory timescale as

the United Utilities WRMP and therefore 'in combination' effects with the new WRMPs cannot be assessed until after the plans are published for consultation.

### Other strategic plans

Other strategic plans have been reviewed for potential 'in combination' effects as a result of specific works or development that they may advocate, or with their objectives (see Error! Reference source not found.). In summary, some of the plans have objectives that could conflict with the WRMP when implemented, although such conflict will be not significant as the plans have been fully considered during the WRMP development.

It is important to note that the WRMP is prepared on a five-yearly cycle and reviewed annually. This means that any changes in demand forecasts (e.g. as new plans come forward) will be included in review process and suitable intervention options proposed accordingly. This process ensures that the WRMP effectively monitors the ongoing water demands and the effectiveness of the plan in both meeting and predicting these, and allows for timely intervention should a measure not be performing as expected.

## 5.4.3 'In combination' effects – major projects

The key project in West Cumbria is the potential **new nuclear build at Sellafield** (NuGen's Moorside Project). Proposals are currently at the pre-application stage, with an application for the scheme due to be submitted to the Planning Inspectorate in 2014. In addition to the Moorside project, **National Grid's North West Coast Connections Project** (a 400kV electricity transmission connection from Moorside to the existing transmission system in Cumbria/Lancashire) is due to be submitted to the Planning Inspectorate in summer 2015. The likely construction requirements of these schemes are not known, although National Grid have previously published routing options for the 400kV line.

A number of further Nationally Significant Infrastructure Projects (NPISs) that are not detailed in the National Policy Statements (NPSs) are set out on the Planning Inspectorate website. This lists eight additional projects in the North West at the pre-application stage (three wind farms, one grid connection project, one road enhancement project, one new hazardous waste management facility, one biomass project and one railway scheme), although only one of these (the **Walney Extension Offshore Wind Farm**, located off the Isle of Walney Coast) is near the West Cumbria WRZ.

### Effects on water resources

The WRMP accounts for known major projects likely to have significant water resource demands when determining future deficits; this is in addition to the growth scenarios that are used to determine the effects of local plans/housing growth and population growth, and ensures that anticipated demand increases can be accounted for in the forecasts.

The key project in West Cumbria from a water resource perspective is the potential new nuclear build at Sellafield (NuGen's Moorside Project). Proposals are currently at the pre-application stage, with an application for the scheme due to be submitted to the Planning Inspectorate in 2014. It is understood that the operational demands will

be met from the development's own licensed sources and not via United Utilities abstractions (although United Utilities may supply potable water); the potential operational demands cannot therefore be accounted for by the WRMP. However, the Nuclear NPS and its accompanying HRA highlight the potential for impacts associated with the operation of Sellafield on the River Ehen SSSI/SAC via effects on migratory fish due to obstruction and on pearl mussels as a result of the abstraction of cooling water. It is understood that environmental baseline studies are underway and therefore robust conclusions on the potential scale and extent of any 'in combination' abstraction effects cannot be made. However, United Utilities' preferred option (WC01) has been developed in response to sustainability reductions driven by the Review of Consents, which accounted for the existing water demands of Sellafield when considering sustainability reductions. The WRMP preferred option will relieve pressure on the River Ehen SAC in accordance with the RoC requirements and so any future 'in combination' effects with Moorside can only be addressed by the EA once a licence application for this scheme is made.

### Construction effects

In addition to the Moorside project, National Grid's North West Coast Connections Project is due to be submitted to the Planning Inspectorate in summer 2015. Given the timescales associated with the planning process and construction of these major schemes it is possible that the construction periods for these projects and the Thirlmere option will coincide at some point. It is unlikely that the schemes will simultaneously impact the same locations (based on available information on transmission line routes and Moorside) although there is clearly a substantial risk of 'in combination' construction impacts on the riverine SACs if these developments are not suitably managed and mitigated. The United Utilities scheme will obviously employ the measures outlined in Error! Reference source not found. as a minimum, in addition to any other specific mitigation required to avoid impacts on European sites, and it is assumed that the other projects will apply similar measures (in which case adverse effects would not be expected). However, this can only be tested and the risk of 'in combination' effects meaningfully determined once more information is available on the other schemes and the construction timescales. No significant 'in combination' effects would be expected with the Walney Extension Offshore Wind Farm.

United Utilities will consider the potential implications of water demands associated with the construction and operation of these schemes as part of monitoring and through the five year review of the WRMP when more details of the schemes should be available.

## 5.4.4 'In combination' effects – minor projects

It has not been possible to produce a definitive list of existing (minor) planning applications within the West Cumbria WRZ to review possible local 'in combination' effects. In reality, the timescales for construction of the preferred option are such that generating a list at this stage would be of little value. Since the WRMP has been based on the most recent ONS growth projections and developed with reference to local plans, the combined effect of any minor developments on water demand has been accounted for within the WRMP projections. As a result, it is considered that there will be no impacts in terms of water resource availability (i.e. it is unlikely that a substantial water-using development or industry would come online that had not been considered by the WRMP).

It is possible that there will be 'in combination' scheme-specific construction effects associated with future planning applications, although this can only be reasonably assessed nearer the time of construction.

### 5.4.5 'In combination' – summary

Based on the available data, the preferred option is unlikely to have any significant or adverse effects 'in combination' with other plans or projects through its operation; indeed, by reducing pressure on the River Ehen SAC the likelihood of adverse 'in combination' effects with future plant at Sellafield is greatly reduced. It is possible that 'in combination' effects with other large-scale construction schemes could occur if the construction programmes or locations coincide, but this cannot be meaningfully assessed at this stage due to the absence of information on the schemes, including likely construction timescales. Measures that will prevent significant effects occurring are set out in Error! Reference source not found., and it is assumed that the other schemes will employ these as a minimum; on this basis, no significant effects would be expected although clearly this will require continual review as the plan is implemented.

## 5.5 Alternative options

As noted, UU identified three candidate preferred options. The other options considered were:

- WC14d: Kielder Water Transfer to West Cumbria (Cumwhinton Treated); and
- the 'Lower Cost Option', a combination of the following options:
  - WC04: Wastwater (negotiate part abstraction licence);
  - WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d);
  - WC09: Development of Boreholes in North Cumbria Aquifer; and
  - WC19: Crummock Automated Compensation Control.

Strictly, the HRA does not focus on the assessment of alternatives unless unavoidable adverse effects are identified, and it does not look to balance the relative merits of options, since options are either acceptable (no significant adverse effects) or unacceptable. However, the HRA does contribute to the selection of the preferred option and this requires that the impacts of the other candidate options are fully understood. Furthermore, it is appropriate for the WRMP to consider alternative or secondary options which could be relied on to meet the deficit should the preferred option not be deliverable for any reason (whether or not this relates to European sites). In reality, a future change to the preferred option (should Thirlmere not be deliverable) would require an update to the WRMP, and hence the HRA; however, it is worth noting the merits of these schemes to demonstrate that alternatives are available to meet the deficit.

## WC14d: Kielder Water transfer to West Cumbria (Cumwhinton treated)

The assessment work undertaken on the Kielder option (see Table 4.2 for a summary) has demonstrated that although potential pathways for significant or adverse effects would exist (the pipeline would almost certainly have to cross the River Derwent and Bassenthwaite Lake SAC and the River Eden SAC at some point) all of these risks could clearly be avoided or mitigated using established measures and appropriate routing design. Conceptually, the primary pipeline has been located directly between Kielder and Carlisle, but it is clear that this pipeline could be routed via existing roads and tracks to minimise the risk of impacts, with existing river crossing points used as necessary. **UU have therefore indicated that the pipeline route would be sited within existing roads to minimise its environmental impact, unless scheme-specific routing studies demonstrated that alternative (non-road) routes would have no adverse effects on any European site**. Scheme specific mitigation measures obviously cannot be identified at this level, but the measures outlined in Error! Reference source not found. would be implemented (unless scheme specific investigations demonstrate that they are not required) and can be relied on to prevent adverse effects occurring.

With regard to operation, the scheme would use 'spare' water available from Kielder within the terms of the existing licence, and therefore no sites within the Kielder catchment would be affected (all compensation releases etc. will be maintained). The scheme is likely to marginally increase flows within water courses in the West Cumbria WRZ as water is used and passed through WWTWs, although this will only be a proportion of the daily transfer (some will be consumptive, much will be discharged to sea) and any changes will be negligible and within natural variations (assuming that the additional water is distributed and consumed in proportion to the current usage). The scheme will not, therefore, have any significant effects on any European sites as a result of its operation.

Fundamentally, although the pipeline is a large scheme the effects will be temporary and there is nothing to suggest that the option is of a scale or type that could not be accommodated without significant effects. On this basis, and given the 'spare' capacity that it would introduce into West Cumbria (and potentially other WRZs in the future) this option would be a suitable alternative to the Thirlmere option with respect to its effects on European sites.

## Lower Cost Option

All of the options that comprise the 'Lower Cost Option' would need to be delivered to meet the predicted deficit. This means that its acceptability is determined by its most damaging or risky component(s). The assessment of the component options (see see Table 4.2 for a summary) demonstrated that whilst significant adverse effects as a result of these options were probably unlikely, some of the options had a few uncertainties (particularly with regard to their operation) that it could be difficult to resolve at the strategy level without scheme-specific studies. For example:

- WC04: Wastwater (negotiate part abstraction licence): although additional abstraction from Wastwater would be within existing licences it would be higher than recent actual so Wastwater levels would be lower on average; this would effect the River Ehen SAC, and although it is uncertain whether these changes would have significant effects (and additional modelling or studies may demonstrate 'no LSE') it is clear that this is a potentially significant risk given the effect that abstraction is currently having on the Ehen.

- WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d): the new boreholes are outside the surface water catchment of the Ehen but the West Cumbria aquifer has not been modelled in detail and it is possible that additional abstraction could affect groundwater supplies to the Ehen. The EA have stated that 10M/d are likely to be available, and this is likely to be a conservative position, but this also presents an uncertainty that would be difficult to resolve at the strategy level.

- WC09: Development of Boreholes in North Cumbria Aquifer: the new boreholes are over 5km from any groundwater dependent terrestrial ecosystems, but may potentially affect surface waters feeding the Solway Firth. The EA have stated that 4.5M/d are likely to be available, and this is very unlikely to affect any water-resource dependent European sites or features, but additional modelling may be required to establish this with some certainty.

- WC19: Crummock Automated Compensation Control: operation of the scheme would be within the terms of the existing licence but abstraction would be higher than recent actual so River Cocker actual flows would tend to be lower on average than they have been recently (although this would still be acceptable in terms of the RoC for the planning period).

It should also be noted that the 'Lower Cost Option' set would cover the predicted deficit and little more, so would not provide the potential additional headroom that may be available from the other options. This would not in itself result in significant effects but would not improve the resilience of the system or reduce the risk of in combination effects with, for example, the drought plan. The option does not have any clear or inevitable significant effects, and therefore could be explored as a preferred option, but it is evidently a more marginal option than Kielder and so would be less suitable as an alternative to the Thirlmere option based on the data currently available.

# 6. Conclusions

## 6.1 'Strategic Water Availability' - the WRMP and the Review of Consents

United Utilities uses calculations of Deployable Output (DO) when developing the WRMP to establish supply/demand balances for all the WRZs and identify those zones with potential supply deficits. DO is based on (*inter alia*) the water available from existing permitted abstraction consents; the Sustainability Reductions required due to the RoC and other processes; and the predicted future demand (derived from demand forecasting in accordance with the EA's *Water Resources Planning Guidelines and the impact of climate change*). Options are then proposed for each WRZ to resolve identified deficits. Under the RoC and WRMP processes the RoC changes (and non-changes) to licences are valid over the planning period for the WRMP.

By incorporating the results of the RoC process, the WRMP is explicitly accounting for (and so mitigating, as far as United Utilities can) effects on European sites that are occurring (or predicted to occur) as a result of existing public water supply (PWS) water-resource permissions. Together, the RoC and WRMP processes also ensure (as far as is achievable) that future changes in demand will not affect any European sites. The HRA of the WRMP cannot (and should not) attempt to determine general 'water availability' within WRZs (and the potential for effects on European sites due to the currently consented abstraction regime) since this would only be replicating the strategic water availability assessments that are intrinsic to the RoC and the WRMP processes. The HRA therefore focuses on the likely outcomes of the WRMP - the likely effects of the specific schemes that it advocates to resolve deficits - and relies on the conclusions of the RoC being robust (i.e. that the abstraction regime proposed under RoC, and incorporated into the WRMP, will not have any adverse effects on any European sites).

## 6.2 Assessment of the Preferred Option

### 6.2.1 Overview

One preferred option has been identified by United Utilities: Option WC01: Thirlmere Transfer into West Cumbria. This scheme involves increasing abstraction from Thirlmere reservoir within current licence conditions by enhancing infrastructure capacity.

#### Construction

Option WC01 would require over 100km of new pipeline, several new assets including a new WTW near St. John's Beck (part of the River Derwent and Bassenthwaite Lake SAC) and the closure / mothballing of three existing WTWs. Pipeline sections would cross / run adjacent to several European sites (including the River Derwent and Bassenthwaite Lake SAC, Clint's Quarry SAC, the Lake District High Fells SAC, and the River Ehen SAC) and there are risks of significant effects if the scheme is not suitably designed, controlled and mitigated.

There are a number of uncertainties surrounding the likely effects of construction which cannot be resolved until detailed design has been completed; however, it is intended that the pipelines would be mostly within existing roads, with new WTWs and assets be located on existing United Utilities operational sites where possible, although some greenfield locations may be required. Scheme specific mitigation measures obviously cannot be identified at this level, but the measures outlined in Error! Reference source not found. will be implemented (unless scheme specific investigations demonstrate that they are not required) which can be relied on to prevent adverse effects occurring.

### Operation

With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC. The scheme would operate within the terms of the existing licence (notwithstanding any licence consolidation that may take place), and therefore the current compensation release regime to the River Derwent would be maintained (i.e. there would be no change in low flows in St John's Beck as these are controlled by the compensation release).

The scheme would reduce the size and frequency of the largest flows (the Q5 flows) from approximately 168.5 Ml/d to124.2 Ml/d, which will obviously have an effect on the St. John's Beck (and hence the River Derwent and Bassenthwaite Lake SAC). United Utilities has undertaken water resources modelling of the impact of this option on abstraction rates, storage levels within Thirlmere and on flows in the St John's Beck downstream of the reservoir. The modelling has been undertaken using hydrological conditions from 1927 – 2010 and during dry periods (e.g. from January 1995 to December 1996), and can be considered as representative of the impacts on storage and downstream flows that the implementation of this option would have. However, **it is considered that the operation of the scheme will not have an adverse effect on the interest features or the integrity of the River Derwent and Bassenthwaite Lake SAC**. This is because the practical effects of the reduction in high flows will be limited (the beck is already heavily regulated by the reservoir), and the existing low- and high-flow compensation regimes will be maintained (United Utilities are required to maintain a low flow compensation release; it also, on request from the EA, provides spate flows of up to 100 Ml/d from Thirlmere to encourage salmon migration as part of the EA RSA programme; the existing legal framework (Section 37 of the Manchester Corporation Act 1924) requires that these be provided).

## 6.2.2 Potential alternatives

It is considered that the preferred option will not, based on the available data, have any significant adverse effects on any European sites and therefore the identification of specific alternatives is not essential to mitigate any residual uncertainty within the plan. However, as a precautionary approach **WC14d: Kielder Water transfer to West Cumbria (Cumwhinton treated)** may be a more preferable alternative should future studies or data demonstrate that the Thirlmere option will have unavoidable adverse effects on a European site that cannot be mitigated or compensated. There is a high-degree of confidence that the WC14d scheme could be delivered and operated with no significant adverse effects on any European sites, subject to appropriate routing studies and normal construction best-practice.

## 6.3 Summary

The WRMP accounts for the Sustainability Reductions required by the RoC, and so explicitly accounts for effects on European sites that are occurring (or predicted to occur) as a result of existing water-resource permissions. Together, the RoC and WRMP processes also ensure (as far as is achievable) that future changes in demand will not affect any European sites (this is aided by the WRMP's five-year review cycle, which monitors the performance of the WRMP and allows for adjusted demand forecasts).

The preferred option to resolve the identified deficit in the West Cumbria WRZ is the transfer of spare water from Thirlmere. Assessment of this scheme has demonstrated that it will have no adverse effects on any European sites as a result of either its operation (since it will operate within licence and the key compensation releases will be maintained) or construction (since identified mitigation measures and best-practice can be relied on, even though the scheme is a substantial undertaking), either alone or 'in combination' with other plans and projects.

This conclusion is based on the available data on the scheme and European sites, and it is possible that future investigations or studies may require that this conclusion be reviewed. However, it must be recognised that the WRMP is inherently flexible due to the formal five-yearly review process, which provides a clear mechanism for monitoring performance and an opportunity to adjust the proposals to reflect any changing circumstances. Finally, the preferred option will, of course, be subject to project-level environmental assessment as part of the normal EIA, planning and/or EA consenting processes, which will necessarily include assessments of their potential to affect European sites during their construction or operation. These measures can therefore be further relied on to ensure that adverse effects do not occur as a result of the implementation of the WRMP. In addition, UU have an alternative option that can be relied on to meet the deficit.

In summary, therefore, it is considered that the WRMP will have no adverse effects on any European sites as a result of its implementation, either alone or 'in combination' with other plans or projects.

The results of the screening assessments are summarised in **Table 4.2** with the site-specific details of the assessment are provided in Error! Reference source not found.. The likelihood of significant effects is categorised for each European site and each option as per **Table 3.1** (**Section 3.4**). The abbreviations used in screening feasible option screening tables are summarised in Error! Reference source not found..

**Table 4.1 Feasible options in the West Cumbria WRZ**

| Option No. | Name |
|---|---|
| WC01 | Thirlmere Transfer into West Cumbria |
| WC02 | River Derwent Abstraction |
| WC04 | Wastwater (negotiate part abstraction licence) |
| WC05 | Development of New Boreholes in West Cumbria Aquifer |

| Option No. | Name |
|---|---|
| WC05a | Development of New Boreholes in West Cumbria Aquifer (10 Ml/d) |
| WC06a | Roughton Gill Mine Adit (Option 1) |
| WC06b | Roughton Gill Mine Adit (Option 2) |
| WC07 | Kirklinton Borehole Development |
| WC09 | Development of Boreholes in North Cumbria Aquifer |
| WC10 | Desalination, Workington |
| WC14d | Kielder Water Transfer to West Cumbria (Cumwhinton Treated) |
| WC19 | Crummock Automated Compensation Control |
| WC23a | Supply of Final Effluent to Non-household Customers |
| WC23b | Supply of Final Effluent to Non-household Customers |
| WC23c | Supply of Final Effluent to Non-household Customers |
| WC72 | Raw Water Losses |

**Table 4.2 Summary of feasible options assessment (see Error! Reference source not found. for scheme descriptions; note Pref. Opt. is 'preferred option'**

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC01 | Thirlmere Transfer into West Cumbria | This scheme would require substantial lengths of new pipeline and several other new assets. As proposed, the pipelines would be mostly within existing roads, other than some short linking sections and it would generally be expected that effects could be avoided with normal best practice and some scheme-specific mitigation (although suitable measures would be defined through project-level HRA). However, pipeline sections would cross / run adjacent to the River Ehen SAC and a new abstraction would be required near the River Derwent and Bassenthwaite Lake SAC (but from the reservoir itself). Other pipeline sections would be in close proximity to other SACs (for example: Lake District High Fells SAC, Clint's Quarry SAC, North Pennine Dales Meadows SAC). Significant construction effects on the River Derwent and Bassenthwaite Lake SAC are possible due to the proximity of the works although it is likely that these can be managed / avoided with standard mitigation measures. For other sites it is likely that significant adverse construction impacts could be avoided, although specific measures (e.g. timing of the works to avoid migration periods) will be required.<br><br>With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC and therefore adverse effects on this site would not be expected. It is assumed that the current abstraction levels and compensation releases to the River Derwent would be maintained (i.e. there would be no change in flows in the upper Derwent). It is noted that the EA wish to reduce the licence to 231 Ml/d, but this is understood to be a 'technical' rationalisation of several licences rather than something that will impact deployable output. There may be some positive benefits for the lower reaches of the Derwent as the scheme would allow the closure of WTWs downstream. The scheme is unlikely to have operational impacts on any other sites.<br><br>Overall, the scheme may have significant effects as a result of construction, but it should be possible to avoid these, or prevent adverse effects with scheme specific mitigation. | Yes - although some option-specific mitigation may need to be identified (e.g. seasonal working) |
| WC02 | River Derwent Abstraction | Construction works will be required adjacent to the River Derwent and Bassenthwaite Lake SAC, and the pipeline will have to cross this watercourse. It is likely that these works can be suitably managed to avoid significant or adverse effects (e.g. timing of works to avoid migration periods; routing pipeline to make use of existing road crossings) but a risk of effects would remain.<br><br>Operationally, this option is likely to significantly affect the River Derwent and Bassenthwaite Lake SAC (although the increase in abstraction is relatively modest). The current Q75 and Q98 flows of the River Derwent at the gauging station at Camerton (around 2 km upstream of the abstraction point at Barepot) are approximately 8 and 3 m3s-1( ). This equates to flows of around 691 Ml/d and 259 Ml/d respectively. An increase in abstraction of 3 Ml/d would represent around 1.2% of Q98 flows and 0.4% of Q75 flows. This would be considered a significant effect and it is certain that scheme level appropriate assessment would be required should the option be bought forward. Given the modest size of the increase adverse effects may not be inevitable but this option should ideally be avoided. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC04 | Wastwater (negotiate part abstraction licence) | Additional abstraction from Wastwater would be within existing licences but it would be higher than recent actual so Wastwater actual levels would tend to be lower on average than they have been previously. This would affect the River Ehen SAC, although it is uncertain whether these changes would have significant effects.<br>The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC05 | Development of New boreholes in West Cumbria Aquifer | The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse.<br>Operation of the scheme is more difficult to characterise; the new boreholes are outside the surface water catchment of the Ehen and therefore any localised drawdown would not affect tributaries of the river. It is possible that the new boreholes may affect groundwater supplies to the Ehen, although it is not clear what contribution to flow these are likely to make; in fact, any effects are likely to be felt outside of the SAC, but may affect mobile species (Atlantic salmon) migrating through the lower reaches. It may be necessary to characterise this to support the option. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC05a | Development of New boreholes in West Cumbria Aquifer (10 Ml/d) | This option would be the same as WC05, except with a 10Ml/d capacity rather than 5Ml/d. The effects are the same, although operational effects may be more likely. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC06a | Roughton Gill Mine Adit (Option 1) | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (i.e. through the SAC) will be slip-lined, which will minimise potential effects on the SAC, but some excavation is still possible. Overall, the scheme is likely to have significant effects but the scale of these can only be assessed accurately at the delivery stage; however, it should be assumed that excavation within the SAC will not be permitted.<br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the Review of Consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC06b | Roughton Gill Mine Adit (Option 2) | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (within the SAC) would be replaced, which would require excavation of the SAC. The scheme is will to have significant effects that will be difficult to avoid or mitigate.<br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the review of consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |
| WC07 | Kirklinton Borehole Development | The construction of this scheme is unlikely to affect any sites except the River Eden SAC (which the pipeline must cross, presumably by an existing crossing) and the North Pennine Moors SAC / SPA (where construction will be required within 500m at Waygill Hill SR). Construction effects on both of these sites are likely to be avoidable with best-practice and scheme specific mitigation (e.g. avoiding migration periods) although any pipeline excavation outside existing roads may need careful consideration if near the River Eden.<br>Operational impacts are more uncertain. A new abstraction licence will be required and abstraction from this aquifer could affect the River Eden SAC directly (the Scaleby boreholes are only 4km from the Eden at its closest point, near Low Crosby) or (more likely) indirectly by affecting flows within tributaries of this watercourse (e.g. the Brunstoke Beck). Similarly, abstraction from the Longtown boreholes could affect the Esk and hence the interest features of the Solway Firth suite of estuarine sites. This would require some additional modelling to quantify, although the CAMS indicates that there is water available for use in the Lower Eden catchment, and the EA has indicated that the under-utilised Curlington aquifer has substantial water available for use. On this basis it is clear that some additional information would be required to support the scheme, although it is recognised that a new licence will not be granted if future investigations demonstrate that the scheme will have an adverse effect on any site. | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC09 | Development of Boreholes in North Cumbria Aquifer | The construction of the scheme would have no effects assuming normal best-practice.<br>New borehole abstractions at Waverly and Thursby have the potential to impact on the nearby River Waverly and River Wampool, which discharges into the Solway Firth. The Waverton site is located approximately 12km upstream of Solway Firth, whilst Thursby is around 17 km upstream of the same site (SAC, SPA and Ramsar Site). It has been assumed a 1.5km reach downstream of the abstraction could be impacted, however, and therefore significant effects on this site would not be expected; the EA have indicated that some water is available for use from the North Cumbria aquifer (up to approx. 4.5 Ml/d). All other sites are almost certainly too distant for the abstraction to have a significant direct effect, including the River Eden SAC and the South Solway Mosses SAC which are both over 5km from the nearest borehole. | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC10 | Desalination, Workington | The scheme would involve pipelines across the River Derwent although the route is currently road-based and so effects could probably be managed with normal best-practice and some scheme-specific measures. Construction would also be required at Workington, and although the scale of this is uncertain it is likely to affect the Derwent estuary and therefore has a high risk of significant effects on the mobile interest features of the site. This impact could be reduced or avoided through appropriate timing of the construction, although in reality this would be difficult and so significant effects would be anticipated.<br>Similarly, the mobile species of the River Derwent would be vulnerable to the operation of the scheme; it is not clear where the intake or outfall would be, but it is likely that salinity etc will be locally affected near the estuary with possibly significant effects on the interest features. No other sites are likely to be affected through operation. | Avoid if possible - significant and probably adverse effects identifiable which will be difficult to avoid / mitigate at the strategy level |
| WC14d | Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | There are a number of major uncertainties around the scheme which will determine the likelihood of significant effects - not least the uncertainty regarding pipeline routes from Kielder to the United Utilities network.<br>For Option WC14 d the main impacts are likely to be associated with construction, but will depend heavily on the pipeline routes. At the moment, the primary pipeline from Kielder to United Utilities is assumed to be a straight line across Kielder Forest (and hence across the Border Mires, Kielder – Butterburn SAC) although clearly this will be unacceptable. It should be possible to identify a cross-country route that will not affect any European sites directly, although the mire sites will have hydrological linkages extending a considerable distance from the site boundaries and it may be necessary to consider a significant diversion. At the moment, it is likely that the scheme will have significant construction effects on the Border Mires, Kielder – Butterburn SAC and (probably) the River Eden SAC (since several tributaries are crossed, not at existing crossing points). However, careful routing and scheme-specific mitigation could avoid or minimise these impacts.<br>Operational effects will be limited and not significant; the use of water from Kielder will not affect any WRD interest features at sites within its catchment and the only real mechanism for impacts would be indirect, through increases in discharges in the United Utilities WRZs after usage (in theory, 80Ml/d could be entering the West Cumbria WRZ). In reality, however, it is assumed that the transfer will be tailored to the deficit (there is no point in transferring 80Ml/d if it is not all required) and any increase in (for example) river flows will be well within natural variation. Although an interbasin transfer of raw water, it will be treated immediately on arrival and risks associated with this (e.g. invasive species transfer, significant variations in water chemistry) would not be expected.<br>On this basis, assuming that a suitable pipeline route can be established that avoids direct effects on any SAC, the scheme would not have any significant and unavoidable effects. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |
| WC19 | Crummock Automated Compensation Control | The River Derwent and Bassenthwaite Lake SAC will be affected by the option but the construction works required to deliver this option would be relatively minor and can be controlled / managed with normal best practice and scheme-specific measures (e.g. avoiding key migration periods, etc), and no adverse effects would be anticipated although project-level appropriate assessment would be required.<br>Operation of the scheme would be within the terms of the existing licence, and would allow releases to be more responsive to the needs of the river; however, although additional abstraction would be within existing licences but it would be higher than recent actual so River Cocker actual flows would tend to be lower on average than they have been recently. It is therefore possible that the River Derwent and Bassenthwaite Lake SAC could be affected by the scheme as compensation flows into the River Cocker would be reduced relative to the current volumes as the releases currently 'over-compensate' for the inaccuracies in gauging. It is therefore possible that there may be effects on the interest features, although the changes would be within the existing licensed volumes. | Maybe - significant effects possible / likely but these will not inevitably be adverse and will probably be mitigatable at the strategy / scheme level |

| Feasible Option | | Summary assessment | Consider as Pref. Opt? |
|---|---|---|---|
| WC23a | Supply of Final Effluent to Non-household Customers | It is not possible to undertake an assessment on this option as the effects will depend entirely on the location of the customer and hence the supplying WTW. The use of final effluent could be beneficial or deleterious, depending on the location of the WTW and which European sites could be affected (particularly as a proportion of the effluent use would probably be consumptive). However, effluent re-use would generally be expected to have beneficial consequences for the environment and therefore would be worth including as a preferred option despite the uncertainty, since this can only be resolved at the scheme level and effects are more likely to be beneficial than negative. If used as a preferred option it will be necessary to identify possible recipients and WTWs | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC23b | Supply of Final Effluent to Non-household Customers | As for WC23a | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC23c | Supply of Final Effluent to Non-household Customers | As for WC23a | Maybe - significant effects unlikely but additional information on option required to confirm acceptability |
| WC72 | Raw Water Reduction of Losses (leak detection) | This cannot be assessed at this level since the location of leaks is not known. However, it would be unlikely to result in significant effects unless the repairs were located in / close to a European site, in which case scheme-specific measures would be required. | Yes - although some option-specific mitigation may need to be identified (e.g. seasonal working) |

## 6.4 Summary

The majority of the schemes in the West Cumbria WRZ require substantial network improvements to allow the available water to be delivered to the population centres. Such improvements are desirable in any case, to increase the resilience of the system, particularly under drought conditions. As a result, the majority of schemes require construction in close proximity to SACs (particularly riverine SACs, which must often be crossed) even if no additional abstraction is required. Clearly there is a risk that construction could significantly affect some of these sites, either accidentally (e.g. pollution events) or predictably (e.g. if poor planning means construction takes place at an inappropriate time of year). No detailed designs or construction plans can be produced at the WRMP stage, but the WRMP (and hence its assessments) assumes that all pipeline construction can be located within existing roads, and make use of existing river crossings, and that any other construction (e.g. new WTWs) will be discrete and located to avoid direct encroachment on any European sites (this would be a significant and probably adverse effect that would be difficult to mitigate). It is therefore considered (based on experience) that normal best-practice and some bespoke scheme-level mitigation (some of which can be identified at the strategy level) will be sufficient to ensure that construction works can be accommodated without significant or adverse effects on any European site (assuming that there is no direct encroachment). Therefore, although most of the options are 'maybes', it is likely that appropriate measures can be implemented to avoid or mitigate potential effects with a high degree of confidence of success.

With regard to the operation of the options, those that are operating within the terms of the existing licences are generally considered unlikely to have any significant or adverse effects (assuming that alterations are not required under RoC), although some options may need some additional exploration to determine the likely effects. For options requiring 'new water', these are usually treated cautiously and recommended for avoidance. It is often not certain what the exact effects will be since some of the modelling required to precisely determine yield and operating parameters cannot be completed without field data; this is particularly true of some of the new borehole options. In these instances, the information available from the EA and the CAMS documents on the water available is used as a basis for the assessment. For example, the EA considers that further water maybe available from the West Cumbria aquifer (see Option WC05) but this cannot be established accurately without more detailed groundwater modelling; therefore option WC05 and WC05a (5 Ml/d and 10Ml/d respectively) are considered potentially acceptable, whereas abstraction beyond this would have a high risk of significant effects, such that it should not be relied on to meet the deficit without the identification of suitable alternatives. Use of these options would therefore have a residual uncertainty that would be difficult to resolve at the strategic level.

The feasible options assessment was used by United Utilities to guide their selection of preferred options.

# 7. Preferred Options Assessment

## 7.1 Approach

Following from the preliminary screening of feasible options, the preferred options were re-screened and assessed for their likely impacts on European sites. For each option, the European sites that may be affected are identified (based on the criteria used for the feasible options), and a determination of LSE made on a site-by-site basis (with the outcomes recorded using the criteria summarised in **Table 3.3**). As before, 'no LSE' is not concluded for an option unless there are no clear or reasonable impact pathways, or where effects are likely to be negligible or inconsequential and it is reasonable to assume that standard and established measures (e.g. best-practice construction) will be sufficient to ensure that significant effects are avoided. Subsequently, an assessment of whether the option is likely to adversely affect the integrity of the European sites is made. The evidence underpinning the screening and assessment is summarised in the tables below. The assessment tables also identify measures that should be included within the WRMP to help avoid significant or adverse effects.

To allow the WRMP to pass the HRA test, any options with potential adverse effects have had a 'preferred alternative' identified from the feasible options list, which has also been assessed (alone and 'in combination'). A conclusion of 'no adverse effects' is made where there is sufficient confidence that significant or adverse effects can be avoided using either specific measures such as timetabling construction (to be included within the WRMP), or can clearly be avoided at the project level using established measures.

### 7.1.1 'In combination' Effects

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

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

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

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

- the Review of Consents (RoC) process has completed an 'in combination' assessment for all currently licensed abstractions (and many unlicensed abstractions);
- the RoC underpins (and drives) the WRMP, which also explicitly accounts for land-use plans and growth forecasts when calculating future water demand (and hence areas with potential deficits);
- land-use plans and population projections are accounted for in the demand forecasts that underpin the WRMP;
- known major projects that are likely to increase demand are also taken into account during the development of the WRMP.

This means that 'in combination' water-resource effects with other known plans or projects are explicitly considered and accounted for during the WRMP development process. It is therefore considered that (for the HRA) potential 'in combination' effects in respect of water-resource demands associated with other plans or projects are generally unlikely since these demands are considered when developing the WRMP and its associated plans.

The main exception to this is other water company WRMPs, which are currently in development and consequently cannot be reliably assessed at this stage. It should also be noted that the detailed examination of non-United Utilities abstraction or discharge consents for 'in combination' effects can only be undertaken by the EA through their permitting procedures.

### 7.1.2 Key assumptions, avoidance measures and incorporated mitigation

The same key assumptions, avoidance measures and incorporated mitigation outlined for the feasible options assessment (see Sections 3.3.3 and 3.3.4) apply to the preferred options assessment also. Any additional mitigation requirements are identified in the assessments and Appendix G.

## 7.2 Preferred option

Three options to help address the deficit in the West Cumbria WRZ (one of which comprises a combination of the feasible options) were taken forward for more detailed consideration as candidate preferred options. These options were:

- WC01: Thirlmere Transfer into West Cumbria;
- WC14d: Kielder Water Transfer to West Cumbria (Cumwhinton Treated);
- 'Lower Cost Option', a combination of the following options:
  - WC04: Wastwater (negotiate part abstraction licence);
  - WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d);
  - WC09: Development of Boreholes in North Cumbria Aquifer; and

- WC19: Crummock Automated Compensation Control.

It should be noted that all of the components of the 'Lower Cost Option' would need to be delivered to meet the predicted deficit.

Using a standard industry method that includes consideration of technical feasibility, financial costs and benefits, and quantified impacts on the environment and community, together with the emerging findings of the SEA and HRA, United Utilities identified Option WC01: Thirlmere Transfer into West Cumbria as the preferred option for the WRMP.

The preferred WRMP option involves increasing abstraction from Thirlmere reservoir within current licence conditions by enhancing infrastructure capacity. This option represents a large scale scheme comprising several infrastructure components including new service reservoirs, a water treatment works, pumping stations and over 100km of new pipeline together with the decommissioning of three existing water treatment works (Ennerdale, Corn How and Quarry Hill). The likely effects of this option on European sites are identified and assessed in the following sections.

## 7.3 Assessment: WC01 – Thirlmere Transfer into West Cumbria

### 7.3.1 Summary of scheme and assumptions

United Utilities currently hold a combined abstraction licence on the Thirlmere reservoir which meets both local and more regional needs. However, United Utilities currently do not have the capacity to abstract the entirety of the licensed water through the existing abstraction points. United Utilities' preferred option would be to increase the current abstraction from the reservoir by adding a new abstraction point in the reservoir and providing a new treatment works near Bridge End.

In order to distribute the additional water within West Cumbria, a number of infrastructure new builds and upgrades would be required. A new treatment works near Bridge End at the outlet of Thirlmere reservoir will be constructed; the precise location of this is not known but it is assumed (for assessment purposes) that it will be located within 200m of the St. John's Beck near Bridge End. Treated water from this new WTW will be pumped to a new service reservoir near Castle Rigg (adjacent to the A591), from which the water will flow by gravity down a large diameter trunk main (LDTM) terminating at Stainburn Service Reservoir (SR). It is currently proposed that this gravity main will run along the A591 and A66. For security of supply this LDTM will be twin pipelines, each capable of 50% of the maximum flow. Regular cross-connection valving will allow sections to be isolated in the event of a burst, whilst maintaining supplies. There will be three main take-offs from this LDTM to supply the Corn How, Ennerdale and Quarry Hill areas. The Ennerdale and Corn How connections will not require any additional pumping to deliver treated water to the existing Corn How SR and the proposed Ennerdale SR. However, additional pumping is required to transfer flows from Corn How to Buttermere SR. Water delivered from both Ennerdale and Corn How SRs to existing zones will be fluoride dosed. The Quarry Hill take-off will require booster pumping to deliver water to Bothel Moor SR. This option would also involve the abandonment of three existing WTWs in West Cumbria, Quarry Hill, Ennerdale, and Corn How. It should be noted that the option

would involve the decommissioning of the sources from permanent operational use, although United Utilities may seek to retain some locations as contingency sources.

### 7.3.2 Summary of likely impact pathways

#### Construction

This scheme would require substantial lengths of new pipeline, several new assets and the closure / mothballing of three existing WTWs. As proposed, the pipelines would be mostly within existing roads, other than some short linking sections to some of the new assets (which themselves may be in previously undeveloped areas, although this cannot be determined at this stage). However, pipeline sections would cross / run adjacent to several European sites (including Clint's Quarry SAC, the Lake District High Fells SAC, and the River Ehen SAC) and a new WTW would be required near the River Derwent and Bassenthwaite Lake SAC (near St. John's Beck, downstream of Thirlmere). This construction project has an obvious risk of significant effects if not suitably mitigated.

#### Operation

With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC. The scheme would operate within the terms of the existing licence (notwithstanding any licence consolidation that may take place), and therefore the current compensation release regime to the River Derwent would be maintained (i.e. there would be no change in low flows in the St John's Beck as these are controlled by the compensation release). In addition, United Utilities (on request from the EA) provide spate flows of up to 100 Ml/d from Thirlmere to encourage salmon migration as part of the EA RSA programme. The EA have previously indicated that, under RoC, they plan to alter UU's Thirlmere abstraction licence to include a waterbank of 972.78Ml/yr for release to the downstream river, with maximum rates of 100Ml/d and 50Ml/d set for these releases from Thirlmere dam and the Mill Gill/Helvellyn Gill intake respectively (releases will only occur between the 1 October and 31 December each year and will be on request from the EA; this waterbank has been factored in to the modelling for the option.

The existing legal framework (Section 37 of the Manchester Corporation Act 1924) also provides for additional flow releases to the downstream river over and above the normal compensation flow of 13.64Ml/d. These requirements have been taken into account in the WRMP development process and option design.

United Utilities has undertaken water resources modelling of the impact of this option on abstraction rates, storage levels within Thirlmere and on flows in the St John's Beck downstream of the reservoir. The modelling has been undertaken using hydrological conditions from 1927 – 2010 and during dry periods (e.g. from January 1995 to December 1996) and can be considered as representative of the likely impacts on storage and downstream flows that the implementation of this option would have. This is summarised in **Table 5.1**, although interpretation of the simulated maximum, minimum and mean figures should be made carefully since they provide a coarse summary of the hydrological functioning of the scheme only.

**Table 5.1 Effect of implementation of this option on simulated storage levels in Thirlmere and on simulated outflow to St John's Beck during dry conditions**

| | Simulated Minimum | | | Simulated Mean | | | Simulated Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| | Current | Revised | Diff. | Current | Revised | Diff. | Current | Revised | Diff. |
| Abstraction (Ml/d) | 3.9 | 59.5 | 55.6 | 173.5 | 187.7 | 14.2 | 224.3 | 280.0 | 55.7 |
| Reservoir Storage (Ml) | 11388 | 6735 | -4653 | 33390 | 31917 | -1473 | 40714 | 40714 | 0 |
| Outflow to St John's Beck (Ml/d) | 13.6 | 13.6 | 0 | 76.2 | 62.1 | -14.1 | 9404.2 | 9374.8 | -29.4 |

As would be expected, the model results show that mean, minimum and maximum simulated abstraction rates from the reservoir would increase compared to current operation, with mean abstraction increasing by approximately 14 Ml/d, whilst the maximum abstraction would increase by 55.7 Ml/d. Storage in Thirlmere reservoir would therefore be lower than under current operational practice (as represented by the water resources model) and so spill frequency would be less. Further analysis of the flow duration curve for St John's Beck under the same modelling conditions shows that low flows in the beck would be unaffected as the compensation discharge of 13.6 Ml/d would be unchanged. Under the simulation of current operation, the compensation flow is exceeded approximately 38% of the time. Under this option, the simulated compensation flow would be exceeded around 33% of the time. These modelling conditions show that the option would impact on higher flows in the St John's Beck, a result of the reservoir being drawn down more and not spilling as frequently. The Q5 flow (the very high flows exceeded 5% of the time) would decrease from 168.5 Ml/d to 124.2 Ml/d.

Overall, therefore, the scheme will have no effect on minimum low flows in St. John's Beck (although they would occur slightly more frequently based on current simulations), but would reduce the frequency and average size of the largest flows. In theory this might reduce the frequency of high 'flushing' flows, which remove silts from gravels used for spawning, although it is important to note that the very highest flows (i.e. Q5) are arguably less important for their 'flushing' effect as they can wash gravels away as well as silts. Furthermore, the size of the largest flows would probably remain unchanged (i.e. when the reservoir is full and spilling), although they would be less frequent (hence reduction in average size). Spate flows to encourage salmon migration in autumn will not be affected as these are implemented and managed (as necessary) under the existing regime, which will be maintained.

St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the absence of significant gravel input is (again, thought to be due to the reservoir).

The reservoir and downstream river sections are located in the Upper Derwent Water Resources Management Unit (WRMU), which has a water resource availability status[18] of 'water available' for abstraction up to target status in

[18] Environment Agency: The Derwent, West Cumbria and Duddon Catchment Abstraction Management Strategy

2019. There may be some positive benefits for the lower reaches of the Derwent as the scheme would allow the closure of WTWs downstream and on the River Cocker.

### 7.3.3 Initial screening of European sites

The initial assessment at the feasible options stage identified fourteen European sites within 15km of the infrastructure likely to be required to deliver this option. These are as follows.

- Borrowdale Woodland Complex SAC
- Clints Quarry SAC
- Lake District High Fells SAC
- North Pennine Dales Meadows SAC
- River Derwent and Bassenthwaite Lake SAC
- River Eden SAC
- River Ehen SAC
- Solway Firth SAC
- South Solway Mosses SAC
- Tarn Moss SAC
- Ullswater Oakwoods SAC
- Wast Water SAC
- Upper Solway Flats and Marshes SPA
- Upper Solway Flats and Marshes Ramsar

There are no additional sites that could potentially be affected by the scheme (e.g. other downstream sites, or sites potentially affected by consequent effects).

The initial assessment has demonstrated that several of these sites will not be affected by the scheme, primarily due to the absence of impact pathways; these sites are set out below, and are not considered further within the assessment of this option.

**Table 5.2 European sites screened out of further assessment (no likely significant effects expected)**

| Site | Rationale |
|---|---|
| Borrowdale Woodland Complex SAC | Great Wood SSSI and Scales Wood SSSI are within approximately 1.5km of the proposed pipleine routes but will not be directly or indirectly affected by construction based on their location and interest features. |
| North Pennines Dales Meadows SAC | One unit of this site (Sandybeck Meadow SSSI) is located approximately 800m from a pipline route, although it is on the far side of the River Cocker and the pipeline will be located within the road or nearby. The site will not be directly or indirectly affected by construction based on its location and interest features. |
| River Eden SAC | Site is over 11km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Solway Firth SAC | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| South Solway Mosses SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Tarn Moss SAC | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Ullswater Oakwoods SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Wast Water SAC | Site is ~10km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Upper Solway Flats and Marshes SPA | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |
| Upper Solway Flats and Marshes Ramsar | Site is ~12km away from nearest infrastructure in a separate catchment; site / interest features are therefore not exposed to likely effects of scheme |

The potential effects of the scheme on the remaining sites (Clint's Quarry SAC; Lake District High Fells SAC; River Derwent and Bassenthwaite Lake SAC; and River Ehen SAC) are considered in more detail within the following sections.

## 7.3.4 Assessment of effects on European sites

| **Clints Quarry SAC** |
|---|
| **Interest Features** |
| Great crested newt |
| **Assessment of possible effects - Implementation** |
| The quarry supports great crested newts within a number of pools, with the closest unit of this SAC is approximately 160m from a pipeline route (assuming this is within the A595). Works entirely within the road would not affect any suitable habitat for this species, although it is possible that mitigation (exclusion fencing) may be required if the pipe trench is open during the key migration periods, to prevent GCN being accidentally killed or injured. Works outside the carriageway may affect habitats that are suitable for this species but are not anticipated at this stage. However, the risk of effects can be easily managed with established mitigation and no significant effects would be anticipated. |
| **Recommended Avoidance / Mitigation:**<br>Mitigation requirements for GCN will need to be identified at the scheme level but there is nothing to suggest that standard mitigation approaches (fencing; timing of works) will not be entirely effective. |
| **Conclusion:**<br>No likely significant effects |
| **Assessment of possible effects - Operation** |
| The interest features are not exposed to the likely operational effects of the scheme. |
| **Recommended Avoidance / Mitigation:**<br>None. |
| **Conclusion:**<br>No likely significant effects. |

| Lake District High Fells SAC | |
|---|---|
| **Interest Features** | |
| Slender green feather-moss | Alpine and Boreal heaths |
| Calcareous rocky slopes | Juniper on heaths and calcareous grasslands |
| Oligotrophic to mesotrophic standing waters | Siliceous alpine and boreal grasslands |
| Alkaline fens | Blanket bog* |
| Siliceous scree | Species-rich Nardus grassland* |
| Wet heaths | Western acidic oak woodland |
| Siliceous rocky slopes | Hydrophilous tall herb communities |
| Dry heaths | |
| **Assessment of possible effects - Implementation** | |
| The proposed pipeline to Buttermere SR will run immediately adjacent to the Buttermere Fells SSSI unit of this site, where the pipe runs up the Buttermere valley along the B5289. It is not possible to determine exactly which interest features are present adjacent to the road in this sector of the SAC based on the available data, although the road here is cut into the adjacent Skiddaw Slates and so is bordered on one side by rock outcrops with gorse, and by Crummock Water on the other. The features closest to the road are therefore likely to be **Siliceous scree, Siliceous rocky slopes** and **Siliceous alpine and boreal grasslands**, with possible areas of **dry heath**. The remaining features of the site are not thought to be present to any significant extent in vicinity of the road.<br>The rocky features adjacent to the road will obviously be sensitive to direct encroachment, but are unlikely to be especially sensitive to indirect effects (e.g. dust deposition etc.). Assuming all the works are retained within the existing carriageway then the scheme would not be expected to have any effects on the SAC. | |
| **Recommended Avoidance / Mitigation:**<br>A scheme specific mitigation plan will be required but a commitment to remain within the road at this location will ensure that significant effects do not occur. | |
| **Conclusion:**<br>No likely significant effects. | |
| **Assessment of possible effects - Operation** | |
| The interest features are not exposed to the likely operational effects of the scheme. | |
| **Recommended Avoidance / Mitigation:**<br>None. | |
| **Conclusion:**<br>No likely significant effects. | |

*Priority features

| River Ehen SAC | |
|---|---|
| **Interest Features** | |
| Freshwater pearl mussel | Atlantic salmon |
| **Assessment of possible effects - Implementation** | |
| The proposed pipeline to a new service reservoir at Ennerdale (location to be confirmed). Will cross the River Ehen at least once and possibly (depending on the route) up to three times. It is likely that these crossings will be by existing road bridges but it is possible that a new sub-surface lay may be required (it has been assumed that this will be by directional drilling, if required). Atlantic salmon and Freshwater pearl mussel are present throughout the SAC and works anywhere near the river could potentially affect these species directly or indirectly. The most likely impacts would be through siltation or other incidental pollution; noise and vibration disturbance; and bankside vegetation clearance. It is conceivable that a directional drill may locally affect groundwater that contributes to river flow but any such effects cannot be assessed at this level and are likely to be local and not significant. Ennerdale WTW will be closed as part of the scheme<br><br>**Freshwater pearl mussel**<br><br>This species would be vulnerable to water quality impacts, particularly acute **sediment inputs** / **siltation** events that may be associated with construction. The general target for the river is $10mgl^{-1}$, which is a more precautionary figure than the standard normally associated with rivers ($25mgl^{-1}$ as laid down in the EC Freshwater Fish Directive). It is not possible at the strategic assessment level to determine whether this figure is likely to be exceeded (since this will depend on a range of variable s that cannot yet be determined, such as route, construction techniques, time of year, background levels at construction start etc.) but it will be possible to design a specific sediment control regime, supported by monitoring, which will ensure that significant increased in suspended sediment do not occur as a result of any construction works. Other potential acute pollution / water quality issues will be managed with the same processes.<br><br>The pearl mussel is also dependent on **overhanging bankside vegetation**, which helps suppress filamentous algae. The route is currently located mainly within roads although it is possible that some pipeline sections may be located outside carriageways, and so could impact riparian trees. The extent of this cannot be determined at this level without detailed routing studies, but the potential effects can be avoided through a commitment to not remove any bankside trees to facilitate installation of the pipe.<br><br>The pearl mussel is also dependent on Atlantic salmon for part of its lifecycle and so any effects on this species would negatively affect pearl mussel also.<br><br>**Atlantic salmon**<br><br>Atlantic salmon will be vulnerable to the same potential effects as freshwater pearl mussel, particularly with regard to sedimentation, and the same monitoring / mitigation targets would apply. As with pearl mussel, it will be possible to design a specific sediment control regime, supported by monitoring, which will ensure that significant sediment discharges (or other water quality impacts) do not occur.<br><br>Additionally, salmon will be sensitive to noise and vibration disturbance, particularly during the key migration periods and so construction works must be timed to avoid possible effects on migrating salmon (construction within 200m of the river should be completed before late summer, prior to the autumn migration period). This should be included or referenced within the WRMP to ensure that it is taken into account during the project planning stages. | |
| **Recommended Avoidance / Mitigation:**<br><br>A scheme specific mitigation plan (with detailed sediment control measures) will be required at the scheme level but a commitment to remain within the road will ensure that adverse effects do not occur. The scheme should be designed to ensure that no bankside trees are removed. Construction within 200m of the river should be completed before late summer, prior to the autumn migration period. | |
| **Conclusion:**<br><br>No significant adverse effects, assuming route remains within roads and mitigation measures are employed. Routing outside the existing carriageway may increase the risk of significant effects (particularly near the river) but there is a high degree of certainty that these effects can be avoided or mitigated. | |
| **Assessment of possible effects - Operation** | |
| The interest features are not directly exposed to the likely operational effects of the scheme, although the scheme is designed to allow for flows within the Ehen to be increased, which will benefit the interest features. Operation of the scheme is therefore likely to have a significant positive effect on the SAC. | |
| **Recommended Avoidance / Mitigation:**<br><br>None. | |
| **Conclusion:**<br><br>No significant adverse effects. | |

| River Derwent and Bassenthwaite Lake SAC | |
|---|---|
| **Interest Features** | |
| River Lamprey | Marsh fritillary butterfly |
| Brook lamprey | Floating water-plantain |
| Sea lamprey | Otter |
| Oligotrophic to mesotrophic standing waters | Water courses with Ranunculus-type vegetation |
| Atlantic salmon | |

**Assessment of possible effects - Implementation**

The scheme will require construction of a new WTW near Bridge End, which may be in the vicinity of the St. John's Beck unit of the SAC. Transfer pipelines from this WTW will then run along the A591 and A66, in close proximity to the river, with some additional crossing points lower downstream. At this stage the pipeline has been routed along existing roads and it has been assumed that this will be achievable; however, it is possible that some sections may need to run adjacent to the road or along separate (cross country) routes, depending on several factors that cannot be determined at this stage – for example, the location of other services within the road. However, it is clear that the main twin pipes from Thirlmere will be large (750mm) requiring a substantial amount of road-space to accommodate them, and therefore it is possible that some construction outside the main carriageway may be required in this area at least; this has been factored in to the assessment. The other mains required (to link to the decommissioned WTWs and hence to distribution) will be single mains, typically between 200 – 750mm, and it is more certain that these can be accommodated entirely within existing roads or along existing pipe routes. It has also been assumed that all river crossings will be by existing road or pipe-bridges, or through directional drilling (or similar), and that no invasive excavations etc. will be required in or adjacent to the rivers (e.g. cut and fill across the watercourses).

**River lamprey / Brook lamprey / Sea lamprey**

This SAC has features that provide the necessary conditions for both spawning and nursery areas, including extensive gravel shoals, good water quality and areas of marginal silt. River lamprey and brook lamprey are thought likely to spawn in the St. John's Beck (NE, pers. comm.) and there are extensive river lamprey nursery grounds below Bassenthwaite Lake on the River Derwent. Sea lamprey do not generally migrate as far upstream as river or brook lamprey, and it is thought that they are largely confined to the middle and lower reaches of the Derwent, below Bassenthwaite Lake. Juvenile brook lamprey are also found on the lower river although their distribution is more localised. Nursery grounds of river and brook lampreys also occur between Derwentwater and Bassenthwaite and on the River Cocker below Buttermere.

The lamprey species will be primarily vulnerable to deterioration in water quality associated with construction (particularly sedimentation of spawning gravels) and (to a lesser extent) noise / vibration disturbance. Effects could theoretically occur anywhere along the pipeline route as a result of construction run-off, but St. John's Beck is likely to be particularly vulnerable due to the proximity of the new WTW required near here and the sensitivity of the beck due to the spawning areas. Some of the distribution mains will have to cross the SAC and construction will be in close proximity to the SAC at other points (although it is currently proposed that the works will be sited within existing roads).

It is expected that normal construction best-practice could be relied on to minimise any effects and ensure that they are not likely to significantly affect this interest feature. However, it may be necessary to schedule works that are near the river (within, for example, 200m) outside the main migration (spring, autumn) and spawning periods (April – May for brook and river lamprey; May – July for sea lamprey). It should be noted that any effects will be short-term only, associated with the construction period, and any acute pollution event is likely to be quickly attenuated.

**Atlantic salmon**

Important salmon spawning areas are found below Bassenthwaite Lake on the Derwent and below Buttermere on the Cocker. The principal tributaries for salmon spawning and nursery grounds are the Rivers Greta, Glenderamackin and Marron as well as St John's, Naddle, Whit and Sandy Becks. The Greta-Glenderamackin, with its tributaries St John's and Naddle Backs, act as the prime salmon fry and parr production area in the Upper Derwent catchment.

As with the lamprey species, salmon will be primarily vulnerable to deterioration in water quality associated with construction (particularly sedimentation of spawning gravels) and noise / vibration disturbance. The avoidance and mitigation measures that are appropriate for the lamprey species will also be effective for salmon, although construction works must be timed to avoid possible effects on migrating salmon (construction within 200m of the river should be completed before late summer, prior to the autumn migration period). This should be included or referenced within the WRMP to ensure that it is taken into account during the project planning stages.

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd.) - Implementation** |
| **Oligotrophic to mesotrophic standing waters** |
| The four main lakes in the SAC (Bassenthwaite, Crummock, Buttermere and Derwentwater) all contribute to this feature. Bassenthwaite, Derwentwater are mesotrophic, with Buttermere and Crummock Water tending to be more oligotrophic. Derwentwater and Buttermere are unlikely to be particularly vulnerable to the implementation of the scheme due to their position in the catchment relative to the likely construction areas (they are effectively upstream). However, construction is likely to be required within the roads adjacent to Bassenthwaite and Crummock Water, which may affect this interest feature if not appropriately managed. The conservation value of the lakes is largely determined by **structural diversity** and **water quality** (particularly nutrient status). The scheme is unlikely to affect the structural diversity within the lake, unless acute sediment inputs are catastrophic. However, construction run-off could affect water quality through sediment input and consequent input of nutrients, depending on the location of the works and the type of sediment released (for example, sediment associated with run-off from improved grassland is likely to be more nutrient-rich than sediment from sub-road excavations). The proximity of the works in the roads alongside these lakes means that some construction run-off is likely depending on the arrangement of road drainage in these areas. However, it is expected that normal construction best-practice could be relied on to minimise any effects and ensure that they are not likely to significantly affect this interest feature. It should also be noted that any effects will be short-term only, associated with the construction period, and the hydrological functioning of the lakes is likely to ensure that any acute pollution event is quickly attenuated. |
| **Marsh fritillary butterfly** |
| This interest feature is located at Braithwaite Moss SSSI, at the southern end of Bassenthwaite Lake. The closest unit of this SSSI is approximately 50m from the main road and therefore it will be important that construction in this area is restricted to the road although the habitats of this species are unlikely to be directly affected by the works. The species is relatively sedentary and is largely dependent on the presence of its food-plant, Devil's bit scabious, and so any indirect effects can largely be avoided by ensuring that works do not encroach on habitats supporting the food-plant within approximately 500m of the Braithwaite Moss SSSI unit of the SAC. This will require scheme specific survey and mitigation, but any effects on this interest feature can clearly be avoided or (at worst) mitigated at the scheme level with appropriate replanting. No significant effects would be expected. |
| **Floating water-plantain** |
| Floating water plantain is restricted to Derwent Water and Bassenthwaite Lake. The location of Derwent Water relative to the proposed pipelines makes it unlikely that this population will be negatively affected by the scheme. The species requires moderately nutrient-rich water but is sensitive to **eutrophication** (which will be primarily associated with diffuse pollution from surrounding agricultural land at this site). Construction effects, notably **sediment** release, could affect this species particularly where the pipeline skirts Bassenthwaite Lake although in general the lake will provide some buffering of any effects unless (e.g.) sediment inputs are substantial and directly affect stands of this species. Appropriate construction measures can be relied on to prevent any catastrophic acute pollution / sedimentation event although these will need to be specified in a dedicated construction management plan. No significant effects would be expected. |
| **Otter** |
| Otters use all parts of the Derwent catchment and so there are likely to be numerous opportunities for them to be exposed to the implementation effects of the scheme. They are most likely to be affected directly through **disturbance** (e.g. individuals disturbed or displaced by construction; impacts on holts; risk of death due to construction activities and traffic) but could also be affected indirectly through **impacts on their fish prey**.<br>The risk of construction effects on otters can only be accurately quantified following field surveys at the project level, although it is reasonable to assume that standard mitigation measures (e.g. ensuring trenches have a means of escape; using pipe-end caps) would be effective at minimising the risk of impacts on individual otters away from the river. Construction near the river could disturb otters in holts, although this can be avoided with best-practice or mitigated through construction of replacement holts, although construction within roads is likely to be the least disturbing approach for this species. It is therefore possible that individual otters may be temporarily affected by construction (although this will require appropriate survey) but these effects can be reliably avoided or mitigated using established measures and the scheme is therefore unlikely to have any significant direct effects on the interest feature as a whole.<br>It is possible that indirect effects may occur through impacts on their fish prey, although the avoidance and mitigation measures set out for fish will be sufficient to ensure that this does not occur. Any construction effects are will also be temporary only. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd.) - Implementation** |
| **Water courses with Ranunculus-type vegetation** |
| The Derwent and Cocker support this feature in their middle and lower reaches. The SSSI citation notes that "*higher plant species become an important component of the aquatic flora* [between Derwentwater and Bassenthwaite]", and that stable flows in the Buttermere Dubs (between Buttermere and Crummock Water) also result in a rich flora including elements of this feature. The feature is then present throughout the river downstream of the Derwent / Cocker confluence. This feature will be most vulnerable to **sedimentation** and **changes in nutrient status**; it is assumed that the risks associated with these aspects can be managed or avoided with an appropriate mitigation plan / site environmental management plan, developed at the scheme level, and significant effects would not be anticipated as a result of construction. |
| **Recommended Avoidance / Mitigation:**<br>A scheme specific mitigation plan will be required but a commitment to remain within the road will ensure that significant effects do not occur. The mitigation plan will include location specific sediment control measures designed to prevent any acute pollution or sedimentation events as a result of construction run-off, and must be agreed with NE.<br>At the scheme level ensure that any areas likely to be affected by the scheme which are within 500m of Braithwaite Moss and which may support the food-plant of the Marsh Fritillary butterfly are clearly mapped; these areas will need to be avoided or an appropriate mitigation scheme (re-seeding with appropriate seed mix) identified.<br>Works within approximately 200m of the river should be scheduled outside the main autumn migration period for salmon to avoid noise and vibration disturbance; works within 200m (particularly around the new WTW near Bridge End) should be scheduled to avoid the key spawning periods. |
| **Conclusion:**<br>No significant effects, assuming route remains within roads and mitigation measures are employed. Routing outside the existing carriageway may increase the risk of significant effects (particularly near the river) but there is a high degree of certainty that these effects can be avoided or mitigated using normal measures approaches. |

| River Derwent and Bassenthwaite Lake SAC |
|---|
| **Assessment of possible effects - Operation** |
| The scheme will involve the use of spare licensed capacity within Thirlmere to supply West Cumbria. The abstraction would be from the reservoir itself, so St John's Beck would not form part of the abstraction system (i.e. water would not be used on a 'put and take' basis). The scheme would operate within the terms of the existing licence (subject to consolidation) so there would be no effects on the low flows (since the compensation release regime would be maintained). However, the use of 'spare' water within the reservoir would reduce the size of the Q5 flows (i.e. the flow volume that is exceeded 5% of the time); this could in theory reduce their 'flushing' effect, which removes silts from gravels used for spawning, although this is unlikely to be significant as (a) flushing flows for a watercourse of this size are more critical in the mid- flow ranges (~Q30), since larger flows may remove gravels as well as silts; (b) the current spill frequency in the key months for flushing flows (early autumn spates) is low and will remain low (since the reservoir is naturally at its lowest at this point); and (c) the size of the very largest flows would probably remain unchanged (i.e. when the reservoir is full and spilling), although they would be less frequent. The Q5 reduction could also reduce the frequency of 'spate' flows which are thought to stimulate salmon migration in the autumn, although there is currently provision for UU to undertake spate releases of up to 100Ml/d for this reason (in association with the RSA programme) which will be maintained.<br><br>The targets for the SAC indicate that abstraction levels should be managed to protect the characteristic flow regime, including seasonal base flows and flushing flows; it is considered that the scheme will not significantly affect these due to the compensation flow provisions that will be maintained, and the ecological effect of the Q5 reduction will be minimal and not adverse; furthermore, it is likely that any effects identified with monitoring can be avoided or mitigated by additional compensation releases e.g. to provide for periodic set-volume flushing flows. The alteration to high flows will not have a significant effect on the SAC downstream of the confluence with the Greta or Bassenthwaite Lake. |
| **Atlantic salmon** |
| Important salmon spawning areas are found below Bassenthwaite Lake on the Derwent and below Buttermere on the Cocker. The principal tributaries for salmon spawning and nursery grounds are the Rivers Greta, Glenderamackin and Marron as well as St John's, Naddle, Whit and Sandy Becks. The Greta-Glenderamackin, with its tributaries St John's and Naddle Becks, act as the prime salmon fry and parr production area in the Upper Derwent catchment.<br><br>The operation of the scheme would not affect low flows due to the maintenance of the current compensation release, but may affect the frequency of the very highest flows (i.e. when reservoir is full and spilling) and the size of the Q5 flows (likely to be reduced from approximately 168 to 124 Ml/d). Higher flows in watercourses can be important for flushing some sediments from spawning gravels, although very high flows (such as the Q5 flows on this watercourse) are more likely to result in gravels also being removed and therefore a reduction in the volumes of these is unlikely to significantly reduce spawning success. The timing of the flows is also important, and higher flows associated with early autumn spates are more important than very high winter flows in this respect (as the latter can wash redds away). Furthermore, higher spate flows or freshets can be important for stimulating salmon migration and therefore arrangements are currently in place for the periodic release of up to 100Ml/d from Thirlmere to encourage this under the EA RSA programme; this has been factored into the calculations for the option. Investigations of the effectiveness of this are ongoing under the EA RSA programme.<br><br>St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the reservoir is having a negative effect on the supply of gravel to the beck. This option will not alter this one way or the other, although lower Q5 flows may reduce the entrainment of gravels in the beck.<br><br>Overall, the proposed changes to the abstraction regime are unlikely to significantly reduce the value of St John's Beck to salmon, or affect the favourable conservation status of this feature. Furthermore, any flow requirements identified by ongoing studies can almost certainly be achieved through appropriate regulation releases, which UU would be obliged to implement under the 1924 Act. No measurable effects would be anticipated downstream of Bassenthwaite, although the lower reaches of the Derwent may benefit from reduced abstraction on the Cocker. On this basis, the option would not be expected to have significant adverse effects on this feature as a result of its operation. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd)- Operation** |
| **River lamprey / Brook lamprey / Sea lamprey** |
| River lamprey and brook lamprey are thought likely to spawn in the St. John's Beck (NE, pers. comm.) and there are extensive river lamprey nursery grounds below Bassenthwaite Lake on the River Derwent. Nursery grounds of river and brook lampreys also occur between Derwentwater and Bassenthwaite and on the River Cocker below Buttermere. Sea lamprey do not generally migrate as far upstream as river or brook lamprey, and it is thought that they are largely confined to the middle and lower reaches of the Derwent, below Bassenthwaite Lake, and therefore significant adverse on this species are very unlikely.<br><br>With regard to operation of the scheme, river and brook lamprey species will be primarily vulnerable to consequent effects associated with potential reductions in higher flows within the St John's Beck. These could result in the reduction of some flushing flows although, as with salmon very high flows during spates can be detrimental to populations of these species, by making it difficult for them to access spawning grounds and by lowering recruitment after spawning (Maitland 2003). The operation of the scheme would not affect low flows due to the maintenance of the current compensation release, but may affect the frequency of the very highest flows (i.e. when reservoir is full and spilling) and the size of the Q5 flows (likely to be reduced from approximately 168 to 124 Ml/d). Higher flows in watercourses can be important for flushing some sediments from spawning gravels, although very high flows (such as the Q5 flows on this watercourse) are more likely to result in gravels being removed also and therefore a reduction in the volumes of these is unlikely to significantly reduce spawning success. Higher spate flows or freshets are thought to be less important for stimulating lamprey migration than they are for salmon.<br><br>St John's Beck is currently considered to be in 'unfavourable no change' condition, due to the presence of signal crayfish and wider catchment issues associated with diffuse water pollution from agriculture (DWPA). Sedimentation is not thought to be a significant issue in the beck, partly due to the presence of the reservoir, although the reservoir is having a negative effect due to the reduction in supply of gravel to the beck. This option will not alter this one way or the other, although lower Q5 flows may reduce the entrainment of gravels in the beck.<br><br>Overall, the proposed changes to the abstraction regime are unlikely to significantly reduce the value of St John's Beck to the lamprey species, or affect the favourable conservation status of these features, and no significant adverse effect would be anticipated. |
| **Oligotrophic to mesotrophic standing waters** |
| The four main lakes in the SAC (Bassenthwaite, Crummock, Buttermere and Derwentwater) all contribute to this feature. Bassenthwaite, Derwentwater are mesotrophic, with Buttermere and Crummock Water tending to be more oligotrophic. The only lake likely to be directly affected by the operation of the scheme is Bassenthwaite, although this feature is not particularly dependent on high flows or flushing events and in reality buffers the lower Derwent against these. The conservation value of the lakes is largely determined by **structural diversity** and **water quality** (particularly nutrient status). The scheme is unlikely to significantly affect either of these aspects. |
| **Marsh fritillary butterfly** |
| This interest feature will not be affected by the operation of the scheme. |
| **Floating water-plantain** |
| Floating water plantain is restricted to Derwent Water and Bassenthwaite Lake. The location of Derwent Water makes it very unlikely that this population will be negatively affected by the operation of the scheme. The species requires moderately nutrient-rich water but is sensitive to eutrophication (which will be primarily associated with diffuse pollution from surrounding agricultural land at this site). However, it is considered that the lakes and the flows within the Greta will buffer any operational effects (which would be at high flows only) and so no significant effects would be expected. |
| **Otter** |
| The operation of the scheme is unlikely to affect otters directly, although they could be affected indirectly through **impacts on their fish prey**; however, it is considered that the operation of the scheme will not adversely affect the fish interest features or other fish species that make up the diet of otters, and so significant effects on otters would not be expected. |

| River Derwent and Bassenthwaite Lake SAC |
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| **Assessment of possible effects (cont'd)- Operation** |
| **Water courses with Ranunculus-type vegetation** |
| The Derwent and Cocker support this feature in their middle and lower reaches. The SSSI citation notes that "*higher plant species become an important component of the aquatic flora* [between Derwentwater and Bassenthwaite]", and that stable flows in the Buttermere Dubs (between Buttermere and Crummock Water) also result in a rich flora including elements of this feature. The feature is then present throughout the river downstream of the Derwent / Cocker confluence. This feature will be most vulnerable to **sedimentation** and **changes in nutrient status**. In theory, the reduction in the frequency of the highest flows from Thirlmere could affect this feature upstream of Bassenthwaite lake by reducing the flushing effect. However, this is unlikely to be significant based on the contribution of the St John's Beck to these flows in the main river, and it is unlikely that the reduction in frequency will substantially reduce the flushing that occurs. |
| **Recommended Avoidance / Mitigation:**<br>Continued monitoring of the condition of St John's Beck will allow for regulation releases to be implemented. |
| **Conclusion:**<br>The scheme may have 'significant' (i.e. not negligible) effects on higher flows within the beck although these would still be within the parameters of the existing licence. However, adverse effects would not occur on the basis that the scheme will not affect low flows and arrangements for periodic 'spate' releases will be maintained unless monitoring demonstrates that these are having negative effects. |

## 7.4 'In combination' effects

### 7.4.1 'In combination' effects between preferred options

Since there is only one preferred option there cannot be any 'in combination' effects arising from within the plan itself.

### 7.4.2 'In combination' effects - other plans

#### Local / regional planning documents and population growth

The WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). These forecasts are based upon population and property forecasts published by the Office of National Statistics (ONS) as well as historical reporting data and property changes on the billing system. Housing growth figures in local plans are reviewed for consistency, although the ONS data are known to provide a more reliable indicator of future demand.

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. Arguably, therefore, potential 'in combination' effects in respect of water-resource demands due to other plans or projects are unlikely since these demands are explicitly modelled when determining deficit zones and hence developing feasible options. As a result (in respect of water resources) the WRMP is not likely to make non-significant effects in other plans

significant (indeed, other plans are arguably the 'source' of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).

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

- The plan safeguards against uncertainty in option yield and timing through 'Target Headroom'; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand side measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would 'suddenly' result in a deficit that might affect a European site; and (in any case);

- The WRMP is prepared 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.

## United Utilities' Draft Statutory Drought Plan 2012

Public consultation on United Utilities' Draft Statutory Drought Plan 2012[19] closed in January 2013. It provides a comprehensive statement of the actions that may be implemented during drought conditions to safeguard essential water supplies to customers and minimise environmental impact.

The Draft Statutory Drought Plan 2012 identifies that the West Cumbria WRZ is the most sensitive to drought due to its short (75 days) critical period. Drought triggers have been produced for water resources in the West Cumbria WRZ: Ennerdale and Crummock Water. Drought triggers have also been developed for the Scales boreholes based on actual abstraction compared to the annual licence limit.

[19] Available from http://corporate.unitedutilities.com/documents/Draft_Drought_Plan.pdf [Accessed January 2013].

**Table** 5.3 summarises the drought permit/order sites that have been identified in the draft Plan for the West Cumbria WRZ together with details of the change that would be sought in a drought event and any protected sites in the vicinity of the source.

**Table 5.3 Potential Drought Permit/Order Sites (West Cumbria WRZ)**

| Source | Change Sought | Designated Sites in Vicinity |
|---|---|---|
| Crummock Water | Allow pumping of abstraction and compensation flows at lake levels below 1.1m below weir crest level to 1.5m below weir crest level | River Derwent and Bassenthwaite Lake SAC |
| Ennerdale Water | Allow drawdown of the lake to 1.7m below weir crest with mitigated compensation flow regime<br>Note: The Ennerdale Operating Agreement states that abstraction is only possible down to 1.35 m below weir crest and to abstract below this would require a drought permit/order | River Ehen SAC, Ennerdale Lake SSSI |
| Scales boreholes | Increase the annual licence limit from 365 Ml to between 438 and 621 Ml to enable the continuation of a higher daily abstraction rate (up to the licence limit of 6 Ml/d) | No protected sites |

**Source: United Utilities**

The likely effects of these options were considered within an SEA and HRA prepared in support of the Draft Statutory Drought Plan 2012[20]. The HRA highlights the potential for 'in combination' effects with the existing abstraction licence at Ennerdale, noting that the Environment Agency RoC concluded that the normal compensation flow in the River Ehen could not be demonstrated not to impact the freshwater pearl mussel population, although a mitigated flow regime has been discussed with the Environment Agency and Natural England. With the mitigated flow regime in place, the Drought Plan HRA concluded no adverse effects of the drought option's implementation on the River Ehen SAC. The HRA identified potential adverse impacts on the River Derwent & Bassenthwaite Lakes SAC although the Appropriate Assessment for this drought option concluded that no adverse effects are anticipated. In respect of the Scales borehole drought option, there are no likely effects on any European site.

Obviously, the WRMP preferred option is designed to relieve pressure on the River Ehen SAC and so no adverse effects on this site would be expected 'in combination' with the Drought Plan as it currently stands; likewise, the decommissioning of Corn How water treatment works under the WRMP preferred option and cessation of abstraction from Crummock Water will decrease the risk of 'in combination' effects on the River Derwent and Bassenthwaite Lake SAC.

However, it is critical to note that the implementation of the WRMP preferred option would substantially change water resource management in the West Cumbria zone, such that the existing elements of the Drought Plan would immediately become irrelevant once the option was brought on-line. This would require a new drought plan be developed. Logically, therefore, the current Drought Plan cannot have 'in combination' effects with the WRMP as the options and scenarios promoted in the two plans cannot operate together. It should be noted that the new scheme should increase the resilience of the West Cumbria WRZ to drought conditions.

[20] Casacde (2012) *Strategic Environmental Assessment of United Utilities' Draft Statutory Drought Plan: Environmental Report.* Available from http://corporate.unitedutilities.com/documents/Strategic_Environmental_Assessment_SEA_Environmental_Report.pdf [Accessed January 2013]

### Other Water Company WRMPs

There is potential for United Utilities' WRMP to have 'in combination' effects with the WRMPs of adjacent water companies. However, these WRMPs are currently being reviewed and updated on the same statutory timescale as the United Utilities WRMP and therefore 'in combination' effects with the new WRMPs cannot be assessed until after the plans are published for consultation.

### Other strategic plans

Other strategic plans have been reviewed for potential 'in combination' effects as a result of specific works or development that they may advocate, or with their objectives (see Error! Reference source not found.). In summary, some of the plans have objectives that could conflict with the WRMP when implemented, although such conflict will be not significant as the plans have been fully considered during the WRMP development.

It is important to note that the WRMP is prepared on a five-yearly cycle and reviewed annually. This means that any changes in demand forecasts (e.g. as new plans come forward) will be included in review process and suitable intervention options proposed accordingly. This process ensures that the WRMP effectively monitors the ongoing water demands and the effectiveness of the plan in both meeting and predicting these, and allows for timely intervention should a measure not be performing as expected.

## 7.4.3 'In combination' effects – major projects

The key project in West Cumbria is the potential **new nuclear build at Sellafield** (NuGen's Moorside Project). Proposals are currently at the pre-application stage, with an application for the scheme due to be submitted to the Planning Inspectorate in 2014. In addition to the Moorside project, **National Grid's North West Coast Connections Project** (a 400kV electricity transmission connection from Moorside to the existing transmission system in Cumbria/Lancashire) is due to be submitted to the Planning Inspectorate in summer 2015. The likely construction requirements of these schemes are not known, although National Grid have previously published routing options for the 400kV line.

A number of further Nationally Significant Infrastructure Projects (NPISs) that are not detailed in the National Policy Statements (NPSs) are set out on the Planning Inspectorate website[21]. This lists eight additional projects in the North West at the pre-application stage (three wind farms, one grid connection project, one road enhancement project, one new hazardous waste management facility, one biomass project and one railway scheme), although only one of these (the **Walney Extension Offshore Wind Farm**, located off the Isle of Walney Coast) is near the West Cumbria WRZ.

### Effects on water resources

The WRMP accounts for known major projects likely to have significant water resource demands when determining future deficits; this is in addition to the growth scenarios that are used to determine the effects of local

[21] See http://infrastructure.planningportal.gov.uk// [Accessed 21.02.2013]

plans/housing growth and population growth, and ensures that anticipated demand increases can be accounted for in the forecasts.

The key project in West Cumbria from a water resource perspective is the potential new nuclear build at Sellafield (NuGen's Moorside Project). Proposals are currently at the pre-application stage, with an application for the scheme due to be submitted to the Planning Inspectorate in 2014. It is understood that the operational demands will be met from the development's own licensed sources and not via United Utilities abstractions (although United Utilities may supply potable water); the potential operational demands cannot therefore be accounted for by the WRMP. However, the Nuclear NPS and its accompanying HRA highlight the potential for impacts associated with the operation of Sellafield on the River Ehen SSSI/SAC via effects on migratory fish due to obstruction and on pearl mussels as a result of the abstraction of cooling water. It is understood that environmental baseline studies are underway and therefore robust conclusions on the potential scale and extent of any 'in combination' abstraction effects cannot be made. However, United Utilities' preferred option (WC01) has been developed in response to sustainability reductions driven by the Review of Consents, which accounted for the existing water demands of Sellafield when considering sustainability reductions. The WRMP preferred option will relieve pressure on the River Ehen SAC in accordance with the RoC requirements and so any future 'in combination' effects with Moorside can only be addressed by the EA once a licence application for this scheme is made.

### Construction effects

In addition to the Moorside project, National Grid's North West Coast Connections Project is due to be submitted to the Planning Inspectorate in summer 2015. Given the timescales associated with the planning process and construction of these major schemes it is possible that the construction periods for these projects and the Thirlmere option will coincide at some point. It is unlikely that the schemes will simultaneously impact the same locations (based on available information on transmission line routes and Moorside) although there is clearly a substantial risk of 'in combination' construction impacts on the riverine SACs if these developments are not suitably managed and mitigated. The United Utilities scheme will obviously employ the measures outlined in Error! Reference source not found. as a minimum, in addition to any other specific mitigation required to avoid impacts on European sites, and it is assumed that the other projects will apply similar measures (in which case adverse effects would not be expected). However, this can only be tested and the risk of 'in combination' effects meaningfully determined once more information is available on the other schemes and the construction timescales. No significant 'in combination' effects would be expected with the Walney Extension Offshore Wind Farm.

United Utilities will consider the potential implications of water demands associated with the construction and operation of these schemes as part of monitoring and through the five year review of the WRMP when more details of the schemes should be available.

## 7.4.4 'In combination' effects – minor projects

It has not been possible to produce a definitive list of existing (minor) planning applications within the West Cumbria WRZ to review possible local 'in combination' effects. In reality, the timescales for construction of the preferred option are such that generating a list at this stage would be of little value. Since the WRMP has been

based on the most recent ONS growth projections and developed with reference to local plans, the combined effect of any minor developments on water demand has been accounted for within the WRMP projections. As a result, it is considered that there will be no impacts in terms of water resource availability (i.e. it is unlikely that a substantial water-using development or industry would come online that had not been considered by the WRMP).

It is possible that there will be 'in combination' scheme-specific construction effects associated with future planning applications, although this can only be reasonably assessed nearer the time of construction.

### 7.4.5 'In combination' – summary

Based on the available data, the preferred option is unlikely to have any significant or adverse effects 'in combination' with other plans or projects through its operation; indeed, by reducing pressure on the River Ehen SAC the likelihood of adverse 'in combination' effects with future plant at Sellafield is greatly reduced. It is possible that 'in combination' effects with other large-scale construction schemes could occur if the construction programmes or locations coincide, but this cannot be meaningfully assessed at this stage due to the absence of information on the schemes, including likely construction timescales. Measures that will prevent significant effects occurring are set out in Error! Reference source not found., and it is assumed that the other schemes will employ these as a minimum; on this basis, no significant effects would be expected although clearly this will require continual review as the plan is implemented.

## 7.5 Alternative options

As noted, UU identified three candidate preferred options. The other options considered were:

- WC14d: Kielder Water Transfer to West Cumbria (Cumwhinton Treated); and
- the 'Lower Cost Option', a combination of the following options:
  - WC04: Wastwater (negotiate part abstraction licence);
  - WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d);
  - WC09: Development of Boreholes in North Cumbria Aquifer; and
  - WC19: Crummock Automated Compensation Control.

Strictly, the HRA does not focus on the assessment of alternatives unless unavoidable adverse effects are identified, and it does not look to balance the relative merits of options, since options are either acceptable (no significant adverse effects) or unacceptable[22]. However, the HRA does contribute to the selection of the preferred option and this requires that the impacts of the other candidate options are fully understood. Furthermore, it is appropriate for the WRMP to consider alternative or secondary options which could be relied on to meet the deficit should the preferred option not be deliverable for any reason (whether or not this relates to European sites). In reality, a future

[22] Indeed, the focus of the HRA (solely on European sites) is too narrow to allow for any such balancing.

change to the preferred option (should Thirlmere not be deliverable) would require an update to the WRMP, and hence the HRA; however, it is worth noting the merits of these schemes to demonstrate that alternatives are available to meet the deficit.

## WC14d: Kielder Water transfer to West Cumbria (Cumwhinton treated)

The assessment work undertaken on the Kielder option (see Table 4.2 for a summary) has demonstrated that although potential pathways for significant or adverse effects would exist (the pipeline would almost certainly have to cross the River Derwent and Bassenthwaite Lake SAC and the River Eden SAC at some point) all of these risks could clearly be avoided or mitigated using established measures and appropriate routing design. Conceptually, the primary pipeline has been located directly between Kielder and Carlisle, but it is clear that this pipeline could be routed via existing roads and tracks to minimise the risk of impacts, with existing river crossing points used as necessary. **UU have therefore indicated that the pipeline route would be sited within existing roads to minimise its environmental impact, unless scheme-specific routing studies demonstrated that alternative (non-road) routes would have no adverse effects on any European site**. Scheme specific mitigation measures obviously cannot be identified at this level, but the measures outlined in Error! Reference source not found. would be implemented (unless scheme specific investigations demonstrate that they are not required) and can be relied on to prevent adverse effects occurring.

With regard to operation, the scheme would use 'spare' water available from Kielder within the terms of the existing licence, and therefore no sites within the Kielder catchment would be affected (all compensation releases etc. will be maintained). The scheme is likely to marginally increase flows within water courses in the West Cumbria WRZ as water is used and passed through WWTWs, although this will only be a proportion of the daily transfer (some will be consumptive, much will be discharged to sea) and any changes will be negligible and within natural variations (assuming that the additional water is distributed and consumed in proportion to the current usage). The scheme will not, therefore, have any significant effects on any European sites as a result of its operation.

Fundamentally, although the pipeline is a large scheme the effects will be temporary and there is nothing to suggest that the option is of a scale or type that could not be accommodated without significant effects. On this basis, and given the 'spare' capacity that it would introduce into West Cumbria (and potentially other WRZs in the future) this option would be a suitable alternative to the Thirlmere option with respect to its effects on European sites.

## Lower Cost Option

All of the options that comprise the 'Lower Cost Option' would need to be delivered to meet the predicted deficit. This means that its acceptability is determined by its most damaging or risky component(s). The assessment of the component options (see see Table 4.2 for a summary) demonstrated that whilst significant adverse effects as a result of these options were probably unlikely, some of the options had a few uncertainties (particularly with regard to their operation) that it could be difficult to resolve at the strategy level without scheme-specific studies. For example:

- WC04: Wastwater (negotiate part abstraction licence): although additional abstraction from Wastwater would be within existing licences it would be higher than recent actual so Wastwater levels would be lower on average; this would effect the River Ehen SAC, and although it is uncertain whether these changes would have significant effects (and additional modelling or studies may demonstrate 'no LSE') it is clear that this is a potentially significant risk given the effect that abstraction is currently having on the Ehen.

- WC05a: Development of New Boreholes in West Cumbria Aquifer (10 Ml/d): the new boreholes are outside the surface water catchment of the Ehen but the West Cumbria aquifer has not been modelled in detail and it is possible that additional abstraction could affect groundwater supplies to the Ehen. The EA have stated that 10M/d are likely to be available, and this is likely to be a conservative position, but this also presents an uncertainty that would be difficult to resolve at the strategy level.

- WC09: Development of Boreholes in North Cumbria Aquifer: the new boreholes are over 5km from any groundwater dependent terrestrial ecosystems, but may potentially affect surface waters feeding the Solway Firth. The EA have stated that 4.5M/d are likely to be available, and this is very unlikely to affect any water-resource dependent European sites or features, but additional modelling may be required to establish this with some certainty.

- WC19: Crummock Automated Compensation Control: operation of the scheme would be within the terms of the existing licence but abstraction would be higher than recent actual so River Cocker actual flows would tend to be lower on average than they have been recently (although this would still be acceptable in terms of the RoC for the planning period).

It should also be noted that the 'Lower Cost Option' set would cover the predicted deficit and little more, so would not provide the potential additional headroom that may be available from the other options. This would not in itself result in significant effects but would not improve the resilience of the system or reduce the risk of in combination effects with, for example, the drought plan. The option does not have any clear or inevitable significant effects, and therefore could be explored as a preferred option, but it is evidently a more marginal option than Kielder and so would be less suitable as an alternative to the Thirlmere option based on the data currently available.

# 8. Conclusions

## 8.1 'Strategic Water Availability' - the WRMP and the Review of Consents

United Utilities uses calculations of Deployable Output (DO) when developing the WRMP to establish supply/demand balances for all the WRZs and identify those zones with potential supply deficits. DO is based on (*inter alia*) the water available from existing permitted abstraction consents; the Sustainability Reductions required due to the RoC and other processes; and the predicted future demand (derived from demand forecasting in accordance with the EA's *Water Resources Planning Guidelines and the impact of climate change*). Options are then proposed for each WRZ to resolve identified deficits. Under the RoC and WRMP processes the RoC changes (and non-changes) to licences are valid over the planning period for the WRMP.

By incorporating the results of the RoC process, the WRMP is explicitly accounting for (and so mitigating, as far as United Utilities can) effects on European sites that are occurring (or predicted to occur) as a result of existing public water supply (PWS) water-resource permissions[23]. Together, the RoC and WRMP processes also ensure (as far as is achievable) that future changes in demand will not affect any European sites[24]. The HRA of the WRMP cannot (and should not[25]) attempt to determine general 'water availability' within WRZs (and the potential for effects on European sites due to the currently consented abstraction regime) since this would only be replicating the strategic water availability assessments that are intrinsic to the RoC and the WRMP processes[26]. The HRA therefore focuses on the likely outcomes of the WRMP - the likely effects of the specific schemes that it advocates to resolve deficits - and relies on the conclusions of the RoC being robust (i.e. that the abstraction regime proposed under RoC, and incorporated into the WRMP, will not have any adverse effects on any European sites).

[23] Future water resource permissions will obviously be subject to their own licensing and consenting processes, and should not be issued if they are likely to adversely affect a European site alone or in combination with other permissions (including UU PWS permissions).

[24] Calculations of DO include for Target Headroom (precautionary 'over-capacity' in available water) to buffer any unforeseen variation in predicted future demand; the WRMP is also reviewed on a five-yearly cycle to ensure it is performing as expected and to account for any variations between predicted and actual demand.

[25] Quantification of the effects of abstraction and other consents (including non-UU consents) on European sites is not within the remit of UU (or its WRMP) since it is not the consenting authority.

[26] Indeed, the approach required for any such assessment would probably be practically indistinguishable from the water availability assessments undertaken as part of the RoC and WRMP processes.

## 8.2 Assessment of the Preferred Option

### 8.2.1 Overview

One preferred option has been identified by United Utilities: Option WC01: Thirlmere Transfer into West Cumbria. This scheme involves increasing abstraction from Thirlmere reservoir within current licence conditions by enhancing infrastructure capacity.

#### Construction

Option WC01 would require over 100km of new pipeline, several new assets including a new WTW near St. John's Beck (part of the River Derwent and Bassenthwaite Lake SAC) and the closure / mothballing of three existing WTWs. Pipeline sections would cross / run adjacent to several European sites (including the River Derwent and Bassenthwaite Lake SAC, Clint's Quarry SAC, the Lake District High Fells SAC, and the River Ehen SAC) and there are risks of significant effects if the scheme is not suitably designed, controlled and mitigated.

There are a number of uncertainties surrounding the likely effects of construction which cannot be resolved until detailed design has been completed; however, it is intended that the pipelines would be mostly within existing roads, with new WTWs and assets be located on existing United Utilities operational sites where possible, although some greenfield locations may be required. Scheme specific mitigation measures obviously cannot be identified at this level, but the measures outlined in Error! Reference source not found. will be implemented (unless scheme specific investigations demonstrate that they are not required) which can be relied on to prevent adverse effects occurring.

#### Operation

With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC. The scheme would operate within the terms of the existing licence (notwithstanding any licence consolidation that may take place), and therefore the current compensation release regime to the River Derwent would be maintained (i.e. there would be no change in low flows in St John's Beck as these are controlled by the compensation release).

The scheme would reduce the size and frequency of the largest flows (the Q5 flows) from approximately 168.5 Ml/d to124.2 Ml/d, which will obviously have an effect on the St. John's Beck (and hence the River Derwent and Bassenthwaite Lake SAC). United Utilities has undertaken water resources modelling of the impact of this option on abstraction rates, storage levels within Thirlmere and on flows in the St John's Beck downstream of the reservoir. The modelling has been undertaken using hydrological conditions from 1927 – 2010 and during dry periods (e.g. from January 1995 to December 1996), and can be considered as representative of the impacts on storage and downstream flows that the implementation of this option would have. However, **it is considered that the operation of the scheme will not have an adverse effect on the interest features or the integrity of the River Derwent and Bassenthwaite Lake SAC**. This is because the practical effects of the reduction in high flows will be limited (the beck is already heavily regulated by the reservoir), and the existing low- and high-flow compensation regimes will be maintained (United Utilities are required to maintain a low flow compensation

release; it also, on request from the EA, provides spate flows of up to 100 Ml/d from Thirlmere to encourage salmon migration as part of the EA RSA programme; the existing legal framework (Section 37 of the Manchester Corporation Act 1924) requires that these be provided).

### 8.2.2 Potential alternatives

It is considered that the preferred option will not, based on the available data, have any significant adverse effects on any European sites and therefore the identification of specific alternatives is not essential to mitigate any residual uncertainty within the plan. However, as a precautionary approach **WC14d: Kielder Water transfer to West Cumbria (Cumwhinton treated)** may be a more preferable alternative should future studies or data demonstrate that the Thirlmere option will have unavoidable adverse effects on a European site that cannot be mitigated or compensated. There is a high-degree of confidence that the WC14d scheme could be delivered and operated with no significant adverse effects on any European sites, subject to appropriate routing studies and normal construction best-practice.

## 8.3 Summary

The WRMP accounts for the Sustainability Reductions required by the RoC, and so explicitly accounts for effects on European sites that are occurring (or predicted to occur) as a result of existing water-resource permissions. Together, the RoC and WRMP processes also ensure (as far as is achievable) that future changes in demand will not affect any European sites (this is aided by the WRMP's five-year review cycle, which monitors the performance of the WRMP and allows for adjusted demand forecasts).

The preferred option to resolve the identified deficit in the West Cumbria WRZ is the transfer of spare water from Thirlmere. Assessment of this scheme has demonstrated that it will have no adverse effects on any European sites as a result of either its operation (since it will operate within licence and the key compensation releases will be maintained) or construction (since identified mitigation measures and best-practice can be relied on, even though the scheme is a substantial undertaking), either alone or 'in combination' with other plans and projects.

This conclusion is based on the available data on the scheme and European sites, and it is possible that future investigations or studies may require that this conclusion be reviewed. However, it must be recognised that the WRMP is inherently flexible due to the formal five-yearly review process, which provides a clear mechanism for monitoring performance and an opportunity to adjust the proposals to reflect any changing circumstances. Finally, the preferred option will, of course, be subject to project-level environmental assessment as part of the normal EIA, planning and/or EA consenting processes, which will necessarily include assessments of their potential to affect European sites during their construction or operation. These measures can therefore be further relied on to ensure that adverse effects do not occur as a result of the implementation of the WRMP. In addition, UU have an alternative option that can be relied on to meet the deficit.

In summary, therefore, it is considered that the WRMP will have no adverse effects on any European sites as a result of its implementation, either alone or 'in combination' with other plans or projects.

# 9. References

Maitland PS (2003). *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Hendry K & Cragg-Hine D (2003). *Ecology of the Atlantic Salmon*. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

# Appendix A
# European sites and associated protected areas

| Box A1 | European sites and associated protected areas | |
|---|---|---|
| Special Area of Conservation | SAC | Designated under the EU *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, and implemented in the UK through the *Conservation of Habitats and Species Regulations 2010* (as amended), and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended). |
| Sites of Community Importance | SCI | Sites of Community Importance (SCIs) are sites that have been adopted by the European Commission but not yet formally designated by the government of each country. Although not formally designated they are nevertheless fully protected by *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, the *Conservation of Habitats and Species Regulations 2010* (as amended), and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended). |
| Candidate SAC | cSAC | Candidate SACs (cSACs) are sites that have been submitted to the European Commission, but not yet formally adopted. Although these sites are still undergoing designation and adoption they are still fully protected by *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, the *Conservation of Habitats and Species Regulations 2010* (as amended) and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended). |
| Possible SACs | pSAC | Sites that have been formally advised to UK Government, but not yet submitted to the European Commission. As a matter of policy the Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SACs. |
| Draft SACs | dSAC | Areas that have been formally advised to UK government as suitable for selection as SACs, but have not been formally approved by government as sites for public consultation. These are not protected (unless covered by some other designation) and it is likely that their existence will not be established through desk study except through direct contact with the relevant statutory authority; however, the statutory authority is likely to take into account the proposed reasons for designation when considering potential impacts on them. |
| Special Protection Area | SPA | Designated under *EU Council Directive 79/409/EEC on the Conservation of Wild Birds* (the 'old Wild Birds Directive') and *Directive 2009/147/EC on the Conservation of Wild Birds* (the 'new Wild Birds Directive, which repeals the 'old Wild Birds Directive'), and protected by Article 6 of *Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora.* These directives are implemented in the UK through the *Wildlife & Countryside Act 1981* (as amended), the *Conservation of Habitats and Species Regulations 2010* (as amended), the *Wildlife (Northern Ireland) Order 1985*, the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985* and *The Conservation (Natural Habitats, &C.) (Northern Ireland) Regulations 1995* (as amended) and the *Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007*. |
| Potential SPA | pSPA | These are sites that are still undergoing designation and have not been designated by the Secretary of State; however, ECJ case law indicates that these sites are protected under Article 4(4) of *Directive 2009/147/EC* (which in theory provides a higher level of protection than the Habitats Directive, which does not apply until the sites are designated as SPAs), and as a matter of policy the Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SPAs, and they may be protected by some other designation (e.g. SSSI). |
| Ramsar | | The *Convention on Wetlands of International Importance especially as Waterfowl Habitat* (Ramsar Convention or Wetlands Convention) was adopted in Ramsar, Iran in February 1971. The UK ratified the Convention in 1976. In the UK Ramsar sites are generally underpinned by notification of these areas as Sites of Special Scientific Interest (SSSIs) (or Areas of Special Scientific Interest (ASSIs) in Northern Ireland). Ramsar sites therefore receive statutory protection under the *Wildlife & Countryside Act 1981* (as amended), and the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985*. However, as a matter of policy the Governments in England, Scotland and Wales extend the same protection to listed Ramsar sites in respect of new development as that afforded to SPAs and SACs. |

# Appendix B
# European sites and interest features

**Table B1** **SACs and Interest Features within 20km *(based on www.jncc.gov.uk)*** *(Note: I = Annex I Habitat; II = Annexe II Species; * = Feature that is Primary Reason for site selection; all other features are Qualifying Features)*

| SAC | Interest Features | |
|---|---|---|
| Alyn Valley Woods/ Coedwigoedd Dyffryn Alun | Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) | I* |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| Asby Complex | *Vertigo geyeri* | II |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| | Limestone pavements | I* |
| | Alkaline fens | I |
| | Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* | I* |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | *Drepanocladus* (*Hamatocaulis*) *vernicosus* | II |
| | Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. | I |
| | European dry heaths | I |
| Berwyn a Mynyddoedd de Clwyd/ Berwyn and South Clwyd Mountains | Blanket bogs | I* |
| | European dry heaths | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | Transition mires and quaking bogs | I |
| | Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) | I |
| | Calcareous rocky slopes with chasmophytic vegetation | I |
| Bolton Fell Moss | Degraded raised bogs still capable of natural regeneration | I |
| Border Mires, Kielder – Butterburn | European dry heaths | I |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| | Transition mires and quaking bogs | I |
| | Northern Atlantic wet heaths with *Erica tetralix* | I |
| | Blanket bogs | I* |
| Borrowdale Woodland Complex | Siliceous rocky slopes with chasmophytic vegetation | I |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | Bog woodland | I* |

| SAC | Interest Features | |
|---|---|---|
| Brown Moss | *Luronium natans* | II |
| Calf Hill and Cragg Woods | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) | I* |
| Clints Quarry | *Triturus cristatus* | II |
| Craven Limestone Complex | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Alkaline fens | I |
| | *Cottus gobio* | II |
| | Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. | I |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| | Active raised bogs | I* |
| | Limestone pavements | I* |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| | *Austropotamobius pallipes* | II |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | Cypripedium calceolus | II |
| Cumbrian Marsh Fritillary Site | *Euphydryas (Eurodryas, Hypodryas) aurinia* | II |
| Dee Estuary/ Aber Dyfrdwy | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | I |
| | *Petalophyllum ralfsii* | II |
| | Humid dune slacks | I |
| | Fixed dunes with herbaceous vegetation ("grey dunes") | I* |
| | *Lampetra fluviatilis* | II |
| | *Petromyzon marinus* | II |
| | Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | I |
| | Embryonic shifting dunes | I |
| | Vegetated sea cliffs of the Atlantic and Baltic coasts | I |
| | Salicornia and other annuals colonising mud and sand | I |
| | Annual vegetation of drift lines | I |
| | Mudflats and sandflats not covered by seawater at low tide | I |
| | Estuaries | I |
| Deeside and Buckley Newt Sites | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | *Triturus cristatus* | II |
| Denby Grange Colliery Ponds | *Triturus cristatus* | II |

| SAC | Interest Features | |
|---|---|---|
| Drigg Coast | Estuaries | I |
| | Fixed dunes with herbaceous vegetation ("grey dunes") | I* |
| | Mudflats and sandflats not covered by seawater at low tide | I |
| | Salicornia and other annuals colonising mud and sand | I |
| | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | I |
| | Embryonic shifting dunes | I |
| | Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | I |
| | Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) | I* |
| | Humid dune slacks | I |
| | Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) | I |
| Duddon Mosses | Active raised bogs | I* |
| | Degraded raised bogs still capable of natural regeneration | I |
| Fenn`s, Whixall, Bettisfield, Wem and Cadney Mosses | Degraded raised bogs still capable of natural regeneration | I |
| | Active raised bogs | I* |
| Halkyn Mountain/ Mynydd Helygain | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | *Triturus cristatus* | II |
| | European dry heaths | I |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| Helbeck and Swindale Woods | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| Ingleborough Complex | Calcareous rocky slopes with chasmophytic vegetation | I |
| | Limestone pavements | I* |
| | Juniperus communis formations on heaths or calcareous grasslands | I |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Alkaline fens | I |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| | Blanket bogs | I* |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| Johnstown Newt Sites | *Triturus cristatus* | II |
| Lake District High Fells | *Drepanocladus (Hamatocaulis) vernicosus* | II |
| | Calcareous rocky slopes with chasmophytic vegetation | I |
| | Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* | I |

| SAC | Interest Features | |
|---|---|---|
| | Alkaline fens | I |
| | Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) | I |
| | Northern Atlantic wet heaths with *Erica tetralix* | I |
| | Siliceous rocky slopes with chasmophytic vegetation | I |
| | European dry heaths | I |
| | Alpine and Boreal heaths | I |
| | Juniperus communis formations on heaths or calcareous grasslands | I |
| | Siliceous alpine and boreal grasslands | I |
| | Blanket bogs | I* |
| | Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe) | I* |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | I |
| Manchester Mosses | Degraded raised bogs still capable of natural regeneration | I |
| Moor House – Upper Teesdale | *Juniperus communis* formations on heaths or calcareous grasslands | I |
| | Siliceous rocky slopes with chasmophytic vegetation | I |
| | Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | Blanket bogs | I* |
| | Limestone pavements | I* |
| | Alpine and Boreal heaths | I |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | I |
| | European dry heaths | I |
| | Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* | I* |
| | *Vertigo genesii* | II |
| | Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. | I |
| | Siliceous alpine and boreal grasslands | I |
| | Mountain hay meadows | I |
| | Calcareous rocky slopes with chasmophytic vegetation | I |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| | Alkaline fens | I |
| | *Saxifraga hirculus* | II |
| | Calcareous and calcshist screes of the montane to alpine levels *(Thlaspietea rotundifolii*) | I |

| SAC | Interest Features | |
|---|---|---|
| Morecambe Bay | *Triturus cristatus* | II |
| | Humid dune slacks | I |
| | Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) | I |
| | Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) | I* |
| | Fixed dunes with herbaceous vegetation ("grey dunes") | I* |
| | Embryonic shifting dunes | I |
| | Reefs | I |
| | Coastal lagoons | I* |
| | Sandbanks which are slightly covered by sea water all the time | I |
| | Mudflats and sandflats not covered by seawater at low tide | I |
| | Large shallow inlets and bays | I |
| | Shifting dunes along the shoreline with Ammophila arenaria ("white dunes") | I |
| | Estuaries | I |
| | Salicornia and other annuals colonising mud and sand | I |
| | Perennial vegetation of stony banks | I |
| | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | I |
| Morecambe Bay Pavements | Limestone pavements | I* |
| | Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. | I |
| | Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* | I* |
| | *Taxus baccata* woods of the British Isles | I* |
| | *Juniperus communis* formations on heaths or calcareous grasslands | I |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | European dry heaths | I |
| | *Vertigo angustior* | II |
| Naddle Forest | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | European dry heaths | I |
| | Northern Atlantic wet heaths with *Erica tetralix* | I |
| North Pennine Dales Meadows | Mountain hay meadows | I |
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | I |
| North Pennine Moors | European dry heaths | I |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | Siliceous scree of the montane to snow levels (*Androsacetalia alpinae and Galeopsietalia ladani*) | I |
| | Siliceous rocky slopes with chasmophytic vegetation | I |

| SAC | Interest Features | |
|---|---|---|
| | Alkaline fens | I |
| | Calcareous rocky slopes with chasmophytic vegetation | I |
| | Northern Atlantic wet heaths with *Erica tetralix* | I |
| | *Saxifraga hirculus* | II |
| | Blanket bogs | I* |
| | *Juniperus communis* formations on heaths or calcareous grasslands | I |
| | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | Siliceous alpine and boreal grasslands | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | Petrifying springs with tufa formation (*Cratoneurion*) | I* |
| Oak Mere | Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) | I |
| | Transition mires and quaking bogs | I |
| Ox Close | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| Peak District Dales | Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | I |
| | *Austropotamobius pallipes* | II |
| | Alkaline fens | I |
| | European dry heaths | I |
| | *Cottus gobio* | II |
| | *Lampetra planeri* | II |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| | Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) | I |
| | Calcareous rocky slopes with chasmophytic vegetation | I |
| River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | I |
| | *Luronium natans* | II |
| | *Salmo salar* | II |
| | *Cottus gobio* | II |
| | *Lutra lutra* | II |
| | *Lampetra planeri* | II |
| | *Petromyzon marinus* | II |
| | *Lampetra fluviatilis* | II |
| River Derwent and | *Lampetra fluviatilis* | II |

| SAC | Interest Features | |
|---|---|---|
| Bassenthwaite Lake | *Lampetra planeri* | II |
| | *Petromyzon marinus* | II |
| | Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* | I |
| | *Salmo salar* | II |
| | *Euphydryas (Eurodryas, Hypodryas) aurinia* | II |
| | *Luronium natans* | II |
| | *Lutra lutra* | II |
| | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | I |
| River Eden | *Salmo salar* | II |
| | *Austropotamobius pallipes* | II |
| | *Petromyzon marinus* | II |
| | *Cottus gobio* | II |
| | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | I |
| | *Lampetra fluviatilis* | II |
| | *Lampetra planeri* | II |
| | Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) | I* |
| | *Lutra lutra* | II |
| | Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* | I |
| River Ehen | *Margaritifera margaritifera* | II |
| | *Salmo salar* | II |
| River Kent | *Margaritifera margaritifera* | II |
| | *Cottus gobio* | II |
| | *Austropotamobius pallipes* | II |
| | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | I |
| Rixton Clay Pits | *Triturus cristatus* | II |
| Rochdale Canal | *Luronium natans* | II |
| Roman Wall Loughs | Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation | I |
| Roudsea Wood and Mosses | *Taxus baccata* woods of the British Isles | I* |
| | *Tilio-Acerion* forests of slopes, screes and ravines | I* |
| | Active raised bogs | I* |
| | Degraded raised bogs still capable of natural regeneration | I |
| Sefton Coast | Fixed dunes with herbaceous vegetation ("grey dunes") | I* |

| SAC | Interest Features | |
|---|---|---|
| | Humid dune slacks | I |
| | Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) | I |
| | Embryonic shifting dunes | I |
| | Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) | I* |
| | *Petalophyllum ralfsii* | II |
| | *Triturus cristatus* | II |
| | Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | I |
| Solway Firth | Salicornia and other annuals colonising mud and sand | I |
| | Estuaries | I |
| | Sandbanks which are slightly covered by sea water all the time | I |
| | Mudflats and sandflats not covered by seawater at low tide | I |
| | Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | I |
| | *Petromyzon marinus* | II |
| | Reefs | I |
| | Fixed dunes with herbaceous vegetation ("grey dunes") | I* |
| | Perennial vegetation of stony banks | I |
| | *Lampetra fluviatilis* | II |
| South Pennine Moors | Northern Atlantic wet heaths with *Erica tetralix* | I |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | Transition mires and quaking bogs | I |
| | Blanket bogs | I* |
| | European dry heaths | I |
| | Active raised bogs | I* |
| | Degraded raised bogs still capable of natural regeneration | I |
| Subberthwaite, Blawith and Torver Low Commons | Depressions on peat substrates of the *Rhynchosporion* | I |
| | Transition mires and quaking bogs | I |
| Tarn Moss | Transition mires and quaking bogs | I |
| Tyne and Allen River Gravels | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| Tyne and Nent | Calaminarian grasslands of the *Violetalia calaminariae* | I |
| Ullswater Oakwoods | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| Walton Moss | Active raised bogs | I* |
| | Degraded raised bogs still capable of natural regeneration | I |
| Wast Water | Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* | I |

| SAC | Interest Features | |
|---|---|---|
| West Midlands Mosses | Transition mires and quaking bogs | I |
| | Natural dystrophic lakes and ponds | I |
| Witherslack Mosses | Active raised bogs | I* |
| | Degraded raised bogs still capable of natural regeneration | I |
| Yewbarrow Woods | *Juniperus communis* formations on heaths or calcareous grasslands | I |
| | Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | I |
| | *Taxus baccata* woods of the British Isles | I* |

**Table B2 SPAs and Interest Features *(based on www.jncc.gov.uk)*** *(Note: Art = Article 4.1 or 4.2 of the Birds Directive; B = Breeding; P = Passage; R = Resident; W = Wintering; ( ) = Proposed for removal in SPA review; + = Added in SPA review*

| SPA | Interest Features | Art. | B | P | R | W |
|---|---|---|---|---|---|---|
| Bowland Fells | Hen harrier *Circus cyaneus* | | B | | | |
| | Lesser black-backed gull *Larus fuscus* | | B | | | |
| | Merlin *Falco columbarius* | | B | | | |
| Duddon Estuary | Knot *Calidris canutus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | | | W |
| | Ringed plover *Charadrius hiaticula* | | | P+ | | |
| | Sanderling *Calidris alba* | | | P+ | | |
| | Sandwich tern *Sterna sandvicensis* | | B | | | |
| | Waterfowl assemblage | | | | | W |
| Leighton Moss | Bittern *Botaurus stellaris* | | B | | | W+ |
| | Marsh harrier *Circus aeruginosus* | | B | | | |
| Liverpool Bay / Bae Lerpwl | Common scoter *Melanitta nigra* | | | | | W |
| | Red-throated diver *Gavia stellata* | | | | | W |
| | Waterfowl assemblage | | | | | W |
| Martin Mere | Bewick's swan Cygnus *columbianus bewickii* | | | | | W |
| | Pink-footed goose *Anser brachyrhynchus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Waterfowl assemblage | | | | | W |
| | Whooper swan *Cygnus cygnus* | | | | | W |
| | Wigeon *Anas penelope* | | | | | (W) |
| Mersey Estuary | Black-tailed godwit *Limosa limosa islandica* | | | | | (W) |
| | Curlew *Numenius arquata* | | | | | (W) |
| | Dunlin (ssp. alpina) *Calidris alpina alpina* | | | | | W |
| | Golden plover *Pluvialis apricaria* | | | | | W |
| | Great crested grebe *Podiceps cristatus* | | | | | (W) |
| | Grey plover *Pluvialis squatarola* | | | | | (W) |
| | Lapwing *Vanellus vanellus* | | | | | (W) |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | P | | W |
| | Ringed plover *Charadrius hiaticula* | | | P | | |
| | Shelduck *Tadorna tadorna* | | | | | W |
| | Teal *Anas crecca* | | | | | W |
| | Waterfowl assemblage | | | | | W+ |
| | Wigeon *Anas penelope* | | | | | (W) |

| SPA | Interest Features | Art. | B | P | R | W |
|---|---|---|---|---|---|---|
| Morecambe Bay | Bar-tailed godwit *Limosa lapponica* | | | | | W |
| | Curlew *Numenius arquata* | | | | | W |
| | Dunlin (ssp. alpina) *Calidris alpina alpina* | | | | | W |
| | Golden plover *Pluvialis apricaria* | | | | | W+ |
| | Grey plover *Pluvialis squatarola* | | | | | W |
| | Herring gull *Larus argentatus* | | B+ | | | |
| | Knot *Calidris canutus* | | | | | W |
| | Lesser black-backed gull *Larus fuscus* | | B+ | | | |
| | Little tern *Sterna albifrons* | | B+ | | | |
| | Oystercatcher *Haematopus ostralegus* | | | | | (W) |
| | Pink-footed goose *Anser brachyrhynchus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | | | W |
| | Ringed plover *Charadrius hiaticula* | | | P | | |
| | Sanderling *Calidris alba* | | | P+ | | |
| | Sandwich tern *Sterna sandvicensis* | | B | | | |
| | Seabird assemblage | | B | | | |
| | Shelduck *Tadorna tadorna* | | | | | W |
| | Turnstone *Arenaria interpres* | | | | | W |
| | Waterfowl assemblage | | | | | W |
| North Pennine Moors | Curlew *Numenius arquata* | | B+ | | | |
| | Dunlin (ssp. *schinzii*) *Calidris alpina schinzii* | | B+ | | | |
| | Golden plover *Pluvialis apricaria* | | B | | | |
| | Hen harrier *Circus cyaneus* | | B | | | |
| | Merlin *Falco columbarius* | | B | | | |
| | Peregrine falcon *Falco peregrinus* | | (B) | | | |
| Peak District Moors (South Pennine Moors Phase 1) | Dunlin (ssp. *schinzii*) *Calidris alpina schinzii* | | B+ | | | |
| | Golden plover *Pluvialis apricaria* | | B | | | |
| | Merlin *Falco columbarius* | | B | | | |
| | Short-eared owl *Asio flammeus* | | (B) | | | |
| Ribble and Alt Estuaries | Bar-tailed godwit *Limosa lapponica* | | | | | W |
| | Bewick's swan *Cygnus columbianus bewickii* | | | | | W |
| | Black-headed gull *Larus ridibundus* | | (B) | | | |
| | Black-tailed godwit *Limosa limosa islandica* | | | | | W |
| | Common scoter *Melanitta nigra* | | | | | (W) |
| | Common tern *Sterna hirundo* | | B | | | |
| | Cormorant *Phalacrocorax carbo* | | | | | (W) |

| SPA | Interest Features | Art. | B | P | R | W |
|---|---|---|---|---|---|---|
| | Curlew *Numenius arquata* | | | | | (W) |
| | Dunlin (ssp. *alpina*) *Calidris alpina alpina* | | | | | W |
| | Golden plover *Pluvialis apricaria* | | | | | W |
| | Grey plover *Pluvialis squatarola* | | | | | W |
| | Knot *Calidris canutus* | | | | | W |
| | Lapwing *Vanellus vanellus* | | | | | (W) |
| | Lesser black-backed gull *Larus fuscus* | | B | | | |
| | Oystercatcher *Haematopus ostralegus* | | | | | W |
| | Pink-footed goose *Anser brachyrhynchus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | (P) | | W |
| | Ringed plover *Charadrius hiaticula* | | | P | | |
| | Ruff *Philomachus pugnax* | | B | | | |
| | Sanderling *Calidris alba* | | | P | | W |
| | Scaup *Aythya marila* | | | | | (W) |
| | Seabird assemblage | | B | | | |
| | Shelduck *Tadorna tadorna* | | | | | W |
| | Teal *Anas crecca* | | | | | W |
| | Waterfowl assemblage | | | | | W |
| | Whimbrel *Numenius phaeopus* | | | (P) | | |
| | Whooper swan *Cygnus cygnus* | | | | | W |
| | Wigeon *Anas penelope* | | | | | W |
| South Pennine Moors Phase 2 | Breeding bird assemblage | | B | | | |
| | Common sandpiper *Actitis hypoleucos* | | B | | | |
| | Curlew *Numenius arquata* | | B | | | |
| | Dunlin (ssp. *schinzii*) *Calidris alpina schinzii* | | B | | | |
| | Golden plover *Pluvialis apricaria* | | B | | | |
| | Lapwing *Vanellus vanellus* | | B | | | |
| | Merlin *Falco columbarius* | | B | | | |
| | Redshank *Tringa totanus* | | B | | | |
| | Ring ouzel *Turdus torquatus* | | B | | | |
| | Short-eared owl *Asio flammeus* | | B | | | |
| | Snipe *Gallinago gallinago* | | B | | | |
| | Twite *Carduelis flavirostris* | | B | | | |
| | Wheatear *Oenanthe oenanthe* | | B | | | |
| | Whinchat *Saxicola rubetra* | | B | | | |
| The Dee Estuary | Bar-tailed godwit *Limosa lapponica* | | | | | W |

| SPA | Interest Features | Art. | B | P | R | W |
|---|---|---|---|---|---|---|
| | Black-tailed godwit *Limosa limosa islandica* | | | | | W |
| | Common tern *Sterna hirundo* | | B | | | |
| | Curlew *Numenius arquata* | | | | | W |
| | Dunlin (ssp. *alpina*) *Calidris alpina alpina* | | | | | W |
| | Grey plover *Pluvialis squatarola* | | | | | W |
| | Knot *Calidris canutus* | | | | | W |
| | Little tern *Sterna albifrons* | | B | | | |
| | Oystercatcher *Haematopus ostralegus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | P | | W |
| | Sandwich tern *Sterna sandvicensis* | | | P | | |
| | Shelduck *Tadorna tadorna* | | | | | W |
| | Teal *Anas crecca* | | | | | W |
| | Waterfowl assemblage | | | | | W |
| Upper Solway Flats and Marshes | Barnacle goose *Branta leucopsis* | | | | | W+ |
| | Bar-tailed godwit *Limosa lapponica* | | | | | W |
| | Curlew *Numenius arquata* | | | | | W |
| | Dunlin (ssp. *alpina*) *Calidris alpina alpina* | | | | | W |
| | Golden plover *Pluvialis apricaria* | | | | | W |
| | Goldeneye *Bucephala clangula* | | | | | (W) |
| | Grey plover *Pluvialis squatarola* | | | | | (W) |
| | Knot *Calidris canutus* | | | | | W |
| | Oystercatcher *Haematopus ostralegus* | | | | | W |
| | Pink-footed goose *Anser brachyrhynchus* | | | | | W |
| | Pintail *Anas acuta* | | | | | W |
| | Redshank *Tringa totanus* | | | | | W |
| | Ringed plover *Charadrius hiaticula* | | | P+ | | |
| | Sanderling *Calidris alba* | | | | | (W) |
| | Scaup *Aythya marila* | | | | | (W) |
| | Shelduck *Tadorna tadorna* | | | | | (W) |
| | Shoveler *Anas clypeata* | | | | | (W) |
| | Teal *Anas crecca* | | | | | (W) |
| | Turnstone *Arenaria interpres* | | | | | (W) |
| | Waterfowl assemblage | | | | | W |
| | Whooper swan *Cygnus cygnus* | | | | | W |

**Table B3 Ramsar Sites Considered During HRA**

| Ramsar Site | Cri. | Features |
|---|---|---|
| Duddon Estuary | 2 | Supports nationally important numbers of the rare natterjack toad *Bufo calamita*, near the northwestern edge of its range (an estimated 18-24% of the British population). Supports a rich assemblage of wetland plants and invertebrates - at least one nationally scarce plant and at least two British Red Data Book invertebrates. |
| | 4 | The site supports nationally important numbers of waterfowl during spring and autumn passage. |
| | 5 | 26326 waterfowl (5 year peak mean 1998/99-2002/2003) |
| | 6 | Pintail *Anas acuta,* Redshank *Tringa tetanus,* Knot *Calidris canutus* |
| Esthwaite Water | 1 | Esthwaite Water is a particularly good example of a mesotrophic lake, with a well developed hydrosere at the northern end. |
| | 2 | The lake supports a rich assemblage of pondweed species and is the only known locality in England and Wales for slender naiad *Najas flexilis*. The diverse aquatic invertebrate fauna includes a number of species with restricted distributions in Britain. |
| Irthinghead Mires | 1 | Supports an outstanding example of undamaged blanket bogs which are characteristic of the vegetation of upland north-western Britain. Most English (and many Scottish) blanket bogs have been extensively degraded by afforestation, burning, agricultural drainage and overgrazing. The Irthinghead Mires are one of few examples of this vegetation type in a near-natural state. There is also good representation of different topographic mire type and surface patterning. |
| | 2 | A notable variety of Sphagnum mosses. |
| | 3 | Butterburn Flow several rare plants, whilst a rare spider, *Eboria caliginosa*, has been recorded at Coom Rogg Moss. |
| Leighton Moss | 1 | An example of large reedbed habitat characteristic of the biogeogaphical region. The reedbeds are of particular importance as a northern outpost for breeding populations of great bittern *Botaurus stellaris*, Eurasian marsh harrier *Circus aeruginosus* and bearded tit *Panurus biarmicus*. |
| | 3 | The site supports a range of breeding birds including great bittern *Botaurus stellaris*, Eurasian marsh harrier *Circus aeruginosus* and bearded tit *Panurus biarmicus*. Species occurring in nationally important numbers outside the breeding season include northern shoveler *Anas clypeata* and water rail *Rallus aquaticus* |
| Malham Tarn | 1 | Contains the highest marl lake in Britain, along with acidophilous bog, calcareous fen and soligenous mire. |
| | 2 | Supports the nationally rare alpine bartisia *Bartsia alpina* and narrow small reed *Calamagrostis stricta* and seven nationally scarce species. Supports five listed British Red Data Book invertebrates including the caddis fly *Agrypnia crassicornis*. |
| Martin Mere | 5 | 25306 waterfowl (5 year peak mean 1998/99-2002/2003) |
| | 6 | Pink-footed goose *Anser brachyrhynchus,* Bewick's swan Cygnus *columbianus bewickii,* Whooper swan *Cygnus cygnus,* Wigeon *Anas Penelope,* Pintail *Anas acuta* |
| Mersey Estuary | 5 | 89576 waterfowl (5 year peak mean 1998/99-2002/2003) |
| | 6 | Shelduck *Tadorna tadorna,* Black-tailed godwit *Limosa limosa islandica,* Redshank *Tringa tetanus,* Teal *Anas cracca,* Pintail *Anas acuta,* Dunlin (ssp. alpina) *Calidris alpina alpina* |
| Midland Meres and Mosses Phase 1 | 1 | Diverse range of habitats from open water to raised bog. |
| | 2 | Supports a number of rare species of plants associated with wetlands including five nationally scarce species together with an assemblage of rare wetland invertebrates (three endangered insects and five other British Red Data Book species of invertebrates) |
| Morecambe Bay | 4 | The site is a staging area for migratory waterfowl including internationally important numbers of passage ringed plover *Charadrius hiaticula*. |
| | 5 | 223709 waterfowl (5 year peak mean 1998/99-2002/2003) |

| Ramsar Site | Cri. | Features |
|---|---|---|
| | 6 | Lesser black-backed gull *Larus fuscus,* Herring gull *Larus argentatus,* Sandwich tern *Sterna sandvicensis,* Cormorant Phalacrocorax carbo, Shelduck *Tadorna tadorna,* Common eider *Somateria mollissima*, Oystercatcher *Haematopus ostralegus,* Ringed plover *Charadrius hiaticula,* Sanderling *Calidris alba,* Golden plover *Pluvialis apricari*, Curlew *Numenius arquata*, Redshank *Tringa tetanus*, Turnstone *Arenaria interpres*, Great crested grebe *Podiceps cristatus cristatus*, Pink-footed goose *Anser brachyrhynchus*, Wigeon *Anas penelope*, Common goldeneye *Bucephala clangula clangula*, Red-breasted merganser *Mergus serrator*, Golden plover *Pluvialis apricaria apricaria*, Northern lapwing *Vanellus vanellus*, Knot *Calidris canutus*, Dunlin (ssp. alpina) *Calidris alpina alpina*, Bar-tailed godwit *Limosa lapponica* |
| Ribble and Alt Estuaries | 2 | This site supports up to 40% of the Great Britain population of natterjack toads Bufo calamita. |
| | 5 | 222038 waterfowl (5 year peak mean 1998/99-2002/2003) |
| | 6 | Lesser black-backed gull *Larus fuscus*, Bar-tailed godwit *Limosa lapponica*, Bewick's swan *Cygnus columbianus bewickii*, Black-tailed godwit *Limosa limosa islandica*, Dunlin (ssp. alpina) *Calidris alpina alpina*, Golden plover *Pluvialis apricaria*, Grey plover *Pluvialis squatarola*, Knot *Calidris canutus*, Oystercatcher *Haematopus ostralegus*, Pink-footed goose Anser brachyrhynchus, Pintail *Anas acuta*, Redshank *Tringa totanus*, Sanderling *Calidris alba*, Shelduck *Tadorna tadorna*, Teal *Anas crecca*, Whooper swan *Cygnus cygnus*, Wigeon *Anas penelope* |
| Rostherne Mere | 1 | Rostherne Mere is one of the deepest and largest of the meres of the Shropshire-Cheshire Plain. Its shoreline is fringed with common reed Phragmites australis. |
| Upper Solway Flats and Marshes | 2 | Supports over 10% of the British population of natterjack toad Bufo calamita (Habitats Directive Annex IV species (S1202)) |
| | 5 | 135720 waterfowl (5 year peak mean 1998/99-2002/2003) |
| | 6 | Lesser black-backed gull *Larus fuscus,* Herring gull *Larus argentatus,* Barnacle goose *Branta leucopsis*, Bar-tailed godwit *Limosa lapponica*, Curlew *Numenius arquata*, Dunlin (ssp. *alpina*) *Calidris alpina alpina*, Knot *Calidris canutus*, Oystercatcher *Haematopus ostralegus*, Pink-footed goose *Anser brachyrhynchus*, Pintail *Anas acuta*, Redshank *Tringa tetanus*, Ringed plover *Charadrius hiaticula*, Scaup *Aythya marila*, Whooper swan *Cygnus cygnus* |
| Midland Meres and Mosses Phase 2 | 1 | Diverse range of habitats from open water to raised bog. |
| | 2 | Supports a number of rare species of plants associated with wetlands, including the nationally scarce cowbane *Cicuta virosa* and, elongated sedge *Carex elongata*. Also present are the nationally scarce bryophytes *Dicranum* affine and *Sphagnum pulchrum*. Also supports an assemblage of invertebrates including several rare species. There are 16 species of British Red Data Book insect listed for this site including the following endangered species: the moth *Glyphipteryx lathamella*, the caddisfly *Hagenella clathrata* and the sawfly *Trichiosoma vitellinae*. |
| The Dee Estuary | 1 | Extensive intertidal mud and sand flats (20 km by 9 km) with large expanses of saltmarsh towards the head of the estuary. |
| | 2 | Supports breeding colonies of the vulnerable Natterjack Toad *Epidalea calamita* |
| | 5 | Non-breeding season regularly supports 120,726 individual waterbirds (5 year peak mean 1994/5 – 1998/9). |
| | 6 | Bar-tailed godwit *Limosa lapponica*, Black-tailed godwit *Limosa limosa islandica*, Curlew *Numenius arquata*, Dunlin (ssp. *alpina*) *Calidris alpina alpina*, Grey plover *Pluvialis squatarola*, Knot *Calidris canutus*, Oystercatcher *Haematopus ostralegus*, Pintail *Anas acuta*, Redshank *Tringa tetanus*, Shelduck *Tadorna tadorna*, Teal *Anas crecca* |

NOTES ON CRITERIA

1 Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the biogeographic region.

2 Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

3 Supports populations of plant and/or animal species important for maintaining the biodiversity of a particular biogeographic region.

4 Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

5 Regularly supports 20,000 or more waterbirds.

| Ramsar Site | Cri. | Features |
|---|---|---|
| 6 | | Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird. |
| 7 | | Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity. |
| 8 | | An important source of food for fish, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. |
| 9 | | Regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species. |

# Appendix C
# Interest feature abbreviations

**Table C1 SAC features and abbreviations**

| Feature name | Abbreviation |
|---|---|
| Active raised bogs | Active raised bogs |
| Alkaline fens | Alkaline fens |
| Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) | Alluvial forests |
| *Alosa alosa* | Allis shad |
| *Alosa fallax* | Twaite shad |
| Alpine and Boreal heaths | Alpine and Boreal heaths |
| Alpine and subalpine calcareous grasslands | Alpine and subalpine calcareous grasslands |
| Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* | Alpine pioneer formations |
| *Anisus vorticulus* | Ramshorn snail |
| Annual vegetation of drift lines | Annual vegetation of drift lines |
| *Apium repens* | Creeping marshwort |
| *Asperulo-Fagetum* beech forests | Beech forests on neutral to rich soils |
| Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) | Beech forests on acid soils |
| Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) | Coastal dune heathland |
| Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) | Atlantic Salt Meadows |
| *Austropotamobius pallipes* | White-clawed crayfish |
| *Barbastella barbastellus* | Barbastelle bat |
| Blanket bogs | Blanket bog |
| Bog woodland | Bog woodland |
| *Buxbaumia viridis* | Green shield-moss |
| Calaminarian grasslands of the *Violetalia calaminariae* | Grassland on heavy metal-rich soils |
| Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) | Calcareous scree |
| Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* | Calcareous fens |
| Calcareous rocky slopes with chasmophytic vegetation | Calcareous rocky slopes |
| Caledonian forest | Caledonian forest |
| Caves not open to the public | Caves not open to the public |
| Coastal dunes with *Juniperus* spp. | Dunes with juniper thickets |
| Coastal lagoons | Coastal lagoons |

| Feature name | Abbreviation |
|---|---|
| *Cobitis taenia* | Spined loach |
| *Coenagrion mercuriale* | Southern Damselfly |
| *Cottus gobio* | Bullhead |
| *Cypripedium calceolus* | Lady`s-slipper orchid |
| Decalcified fixed dunes with *Empetrum nigrum* | Decalcified fixed dunes with crowberry |
| Degraded raised bogs still capable of natural regeneration | Degraded raised bog |
| Depressions on peat substrates of the *Rhynchosporion* | Depressions on peat substrates |
| *Drepanocladus (Hamatocaulis) vernicosus* | Slender green feather-moss |
| Dry Atlantic coastal heaths with Erica vagans | Dry coastal heaths |
| Dunes with *Hippophae rhamnoides* | Dunes with sea-buckthorn |
| Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*) | Dunes with creeping willow |
| Embryonic shifting dunes | Embryonic shifting dunes |
| Estuaries | Estuaries |
| *Euphydryas (Eurodryas, Hypodryas) aurinia* | Marsh fritillary butterfly |
| European dry heaths | Dry heaths |
| Fixed dunes with herbaceous vegetation ("grey dunes") | Grey dunes |
| *Gentianella anglica* | Early gentian |
| *Halichoerus grypus* | Grey seal |
| Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. | Hard oligo-mesotrophic waters |
| Humid dune slacks | Humid dune slacks |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | Hydrophilous tall herb communities |
| Inland dunes with open *Corynephorus* and *Agrostis* grasslands | Inland dunes |
| Inland salt meadows | Inland saltmarshes |
| *Juniperus communis* formations on heaths or calcareous grasslands | Juniper on heaths and calcareous grasslands |
| *Lampetra fluviatilis* | River Lamprey |
| *Lampetra planeri* | Brook lamprey |
| Large shallow inlets and bays | Large shallow inlets and bays |
| Limestone pavements | Limestone pavements |
| *Limoniscus violaceus* | Violet click beetle |
| *Liparis loeselii* | Fen orchid |
| Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) | Lowland hay meadows |
| *Lucanus cervus* | Stag beetle |
| *Luronium natans* | Floating water-plantain |
| *Lutra lutra* | Otter |
| Machairs | Machair |

| Feature name | Abbreviation |
|---|---|
| *Margaritifera margaritifera* | Freshwater pearl mussel |
| *Marsupella profunda* | Western rustwort |
| Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) | Mediterranean saltmarsh scrub |
| Mediterranean temporary ponds | Mediterranean temporary ponds |
| Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) | Purple moor-grass meadows |
| Mountain hay meadows | Mountain hay meadows |
| Mudflats and sandflats not covered by seawater at low tide | Mudflats and sandflats |
| *Myotis bechsteini* | Bechstein`s bat |
| *Najas flexilis* | Slender naiad |
| Natural dystrophic lakes and ponds | Natural dystrophic lakes |
| Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation | Natural eutrophic lakes |
| Northern Atlantic wet heaths with *Erica tetralix* | Wet heaths |
| Old acidophilous oak woods with *Quercus robur* on sandy plains | Dry oak-dominated woodland |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles | Western acidic oak woodland |
| Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* | Oligotrophic to mesotrophic standing waters |
| Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) | Nutrient-poor shallow waters |
| Perennial vegetation of stony banks | Perennial vegetation of stony banks |
| *Petalophyllum ralfsii* | Petalwort |
| Petrifying springs with tufa formation (*Cratoneurion*) | Petrifying springs with tufa |
| *Petromyzon marinus* | Sea lamprey |
| *Phoca vitulina* | Common seal |
| *Phocoena phocoena* | Harbour porpoise |
| Reefs | Reefs |
| *Rhinolophus ferrumequinum* | Greater horseshoe bat |
| *Rhinolophus hipposideros* | Lesser Horseshoe Bat |
| *Rumex rupestris* | Shore dock |
| *Salicornia* and other annuals colonising mud and sand | Salicornia and other annuals |
| *Salmo salar* | Atlantic salmon |
| Sandbanks which are slightly covered by sea water all the time | Sandbanks |
| *Saxifraga hirculus* | Marsh saxifrage |
| Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) | Calcareous dry grassland and scrub |
| Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") | White dunes |
| Siliceous alpine and boreal grasslands | Siliceous alpine and boreal grasslands |
| Siliceous rocky slopes with chasmophytic vegetation | Siliceous rocky slopes |

| Feature name | Abbreviation |
|---|---|
| Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) | Siliceous scree |
| Spartina swards (*Spartinion maritimae*) | Spartina swards |
| Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe) | Species-rich Nardus grassland |
| Stable *xerothermophilous* formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.) | Natural box scrub |
| Sub-Arctic *Salix* spp. scrub | Mountain willow scrub |
| Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* | Oak-hornbeam forests |
| Submarine structures made by leaking gases | Submarine structures made by leaking gases |
| Submerged or partially submerged sea caves | Sea caves |
| *Taxus baccata* woods of the British Isles | Taxus baccata woods |
| Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* | Atlantic wet heath |
| *Tilio-Acerion* forests of slopes, screes and ravines | Tilio-Acerion forests |
| Transition mires and quaking bogs | Transition mires and quaking bogs |
| *Trichomanes speciosum* | Killarney fern |
| *Triturus cristatus* | Great crested newt |
| Turloughs | Turloughs |
| *Tursiops truncatus* | Bottlenose dolphin |
| Vegetated sea cliffs of the Atlantic and Baltic coasts | Vegetated sea cliffs |
| *Vertigo angustior* | Narrow-mouthed whorl snail |
| *Vertigo genesii* | Round-mouthed whorl snail |
| *Vertigo geyeri* | Geyer`s whorl snail |
| *Vertigo moulinsiana* | Desmoulin`s whorl snail |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | Water courses with Ranunculus-type vegetation |

**Table C2 SPA features and abbreviations**

| Feature name | Abbreviation |
|---|---|
| *Acrocephalus paludicola* | Aquatic warbler |
| *Acrocephalus schoenobaenus* | Sedge warbler |
| *Acrocephalus scirpaceus* | Reed warbler |
| *Actitis hypoleucos* | Common sandpiper |
| *Alca torda* | Razorbill |
| *Alcedo atthis* | Kingfisher |
| *Anas acuta* | Pintail |
| *Anas clypeata* | Shoveler |
| *Anas crecca* | Teal |
| *Anas penelope* | Wigeon |
| *Anas platyrhynchos* | Mallard |
| *Anas querquedula* | Garganey |
| *Anas strepera* | Gadwall |
| *Anser albifrons albifrons* | White-fronted goose |
| *Anser albifrons flavirostris* | Greenland white-fronted goose |
| *Anser anser* | Greylag goose |
| *Anser brachyrhynchus* | Pink-footed goose |
| *Anser fabalis fabalis* | Taiga bean goose |
| *Aquila chrysaetos* | Golden eagle |
| *Arenaria interpres* | Turnstone |
| *Asio flammeus* | Short-eared owl |
| *Aythya ferina* | Pochard |
| *Aythya fuligula* | Tufted duck |
| *Aythya marila* | Scaup |
| *Botaurus stellaris* | Bittern |
| *Branta bernicla bernicla* | Dark-bellied brent goose |
| *Branta bernicla hrota* | Light-bellied brent goose |
| *Branta leucopsis* | Barnacle goose |
| *Breeding bird assemblage* | Breeding bird assemblage |
| *Bucephala clangula* | Goldeneye |
| *Burhinus oedicnemus* | Stone-curlew |
| *Calidris alba* | Sanderling |
| *Calidris alpina alpina* | Dunlin (ssp. alpina) |

| Feature name | Abbreviation |
|---|---|
| *Calidris alpina schinzii* | Dunlin (ssp. schinzii) |
| *Calidris canutus* | Knot |
| *Calidris maritima* | Purple sandpiper |
| *Caprimulgus europaeus* | Nightjar |
| *Carduelis flavirostris* | Twite |
| *Catharacta skua* | Great skua |
| *Cepphus grylle* | Black guillemot |
| *Charadrius hiaticula* | Ringed plover |
| *Charadrius morinellus* | Dotterel |
| *Circus aeruginosus* | Marsh harrier |
| *Circus cyaneus* | Hen harrier |
| *Clangula hyemalis* | Long-tailed duck |
| *Coturnix coturnix* | Common quail |
| *Crex crex* | Corn crake |
| *Cygnus columbianus bewickii* | Bewick's swan |
| *Cygnus cygnus* | Whooper swan |
| *Cygnus olor* | Mute swan |
| *Egretta garzetta* | Little egret |
| *Emberiza schoeniclus* | Reed bunting |
| *Falco columbarius* | Merlin |
| *Falco peregrinus* | Peregrine falcon |
| *Falco subbuteo* | Hobby |
| *Fratercula arctica* | Puffin |
| *Fulica atra* | Common coot |
| *Fulmarus glacialis* | Fulmar |
| *Gallinago gallinago* | Snipe |
| *Gallinula chloropus* | Moorhen |
| *Gavia arctica* | Black-throated diver |
| *Gavia stellata* | Red-throated diver |
| *Haematopus ostralegus* | Oystercatcher |
| *Hydrobates pelagicus* | Storm-petrel |
| *Larus argentatus* | Herring gull |
| *Larus canus* | Common gull |
| *Larus fuscus* | Lesser black-backed gull |
| *Larus marinus* | Great black-backed gull |

| Feature name | Abbreviation |
|---|---|
| *Larus melanocephalus* | Mediterranean gull |
| *Larus ridibundus* | Black-headed gull |
| *Limosa lapponica* | Bar-tailed godwit |
| *Limosa limosa islandica* | Black-tailed godwit |
| *Locustella luscinioides* | Savi's warbler |
| *Locustella naevia* | Grasshopper warbler |
| *Loxia scotica* | Scottish crossbill |
| *Lullula arborea* | Wood lark |
| *Melanitta fusca* | Velvet scoter |
| *Melanitta nigra* | Common scoter |
| *Mergus merganser* | Goosander |
| *Mergus serrator* | Red-breasted merganser |
| *Milvus milvus* | Red kite |
| *Morus bassanus* | Gannet |
| *Numenius arquata* | Curlew |
| *Numenius phaeopus* | Whimbrel |
| *Oceanodroma leucorhoa* | Leach’s storm-petrel |
| *Oenanthe oenanthe* | Wheatear |
| *Pandion haliaetus* | Osprey |
| *Pernis apivorus* | Honey buzzard |
| *Phalacrocorax aristotelis* | Shag |
| *Phalacrocorax carbo* | Cormorant |
| *Phalaropus lobatus* | Red-necked phalarope |
| *Philomachus pugnax* | Ruff |
| *Phylloscopus sibilatrix* | Wood warbler |
| *Pluvialis apricaria* | Golden plover |
| *Pluvialis squatarola* | Grey plover |
| *Podiceps auritus* | Slavonian grebe |
| *Podiceps cristatus* | Great crested grebe |
| *Porzana porzana* | Spotted crake |
| *Puffinus puffinus* | Manx shearwater |
| *Pyrrhocorax pyrrhocorax* | Chough |
| *Rallus aquaticus* | Water rail |
| *Recurvirostra avosetta* | Avocet |
| *Rissa tridactyla* | Kittiwake |

| Feature name | Abbreviation |
|---|---|
| *Saxicola rubetra* | Whinchat |
| *Seabird assemblage* | Seabird assemblage |
| *Somateria mollissima* | Common eider |
| *Stercorarius parasiticus* | Arctic skua |
| *Sterna albifrons* | Little tern |
| *Sterna dougallii* | Roseate tern |
| *Sterna hirundo* | Common tern |
| *Sterna paradisaea* | Arctic tern |
| *Sterna sandvicensis* | Sandwich tern |
| *Sylvia undata* | Dartford warbler |
| *Tadorna tadorna* | Shelduck |
| *Tetrao urogallus* | Capercaillie |
| *Tringa glareola* | Wood sandpiper |
| *Tringa nebularia* | Greenshank |
| *Tringa totanus* | Redshank |
| *Troglodytes troglodytes fridariensis* | Fair Isle wren |
| *Turdus torquatus* | Ring ouzel |
| *Uria aalge* | Guillemot |
| *Vanellus vanellus* | Lapwing |
| *Waterfowl assemblage* | Waterfowl assemblage |

# Appendix D
# Water resource dependent interest features


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| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fens and wet habitats | Alkaline fens | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Inland saltmarshes | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lowland hay meadows | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Purple moor-grass meadows | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Wet heaths | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Alluvial forests | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Atlantic wet heath | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Coastal Habitats | Annual vegetation of drift lines | **N** | | | | | | | | | |
| | Embryonic shifting dunes | **N** | | | | | | | | | |
| | Decalcified fixed dunes with crowberry | **N** | | | | | | | | | |
| | Grey dunes | **N** | | | | | | | | | |
| | Mediterranean saltmarsh scrub | **N** | | | | | | | | | |
| | Inland dunes | **N** | | | | | | | | | |
| | Perennial vegetation of stony banks | **N** | | | | | | | | | |
| | White dunes | **N** | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coastal habitats (sensitive to abstraction) | Dunes with creeping willow | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Humid dune slacks | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Coastal lagoons | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mediterranean saltmarsh scrub | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Vegetated sea cliffs | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Estuarine & intertidal habitats | Atlantic Salt Meadows | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Estuaries | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Large shallow inlets and bays | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mudflats and sandflats | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Reefs | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Salicornia and other annuals | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Spartina swards | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Submerged marine habitats | Reefs | **N** | | | | | | | | | |
| | Sandbanks | **N** | | | | | | | | | |
| | Sea caves | **N** | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bogs and wet habitats | Active raised bogs | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Blanket bog | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bog woodland | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Calcareous fens | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Degraded raised bog | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Depressions on peat substrates | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Transition mires and quaking bogs | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Riverine habitats & running waters | Water courses with Ranunculus-type vegetation | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Petrifying springs with tufa | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Standing Waters (sensitive to acidification) | Natural dystrophic lakes | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mediterranean temporary ponds | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Nutrient-poor shallow waters | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hard oligo-mesotrophic waters | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Natural eutrophic lakes | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Turloughs | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dry Woodlands & scrub | Beech forests on neutral to rich soils | N | | | | | | | | | |
| | Beech forests on acid soils | N | | | | | | | | | |
| | Dry oak-dominated woodland | N | | | | | | | | | |
| | Western acidic oak woodland | N | | | | | | | | | |
| | Natural box scrub | N | | | | | | | | | |
| | Oak-hornbeam forests | N | | | | | | | | | |
| | Taxus baccata woods | N | | | | | | | | | |
| | Tilio-Acerion forests | N | | | | | | | | | |
| Dry grassland | Grassland on heavy metal-rich soils | N | | | | | | | | | |
| | Calcareous dry grassland and scrub | N | | | | | | | | | |
| | Calcareous dry grassland and scrub | N | | | | | | | | | |
| Dry heathland habitats | Dry coastal heaths | N | | | | | | | | | |
| | Dry heaths | N | | | | | | | | | |
| | Juniper on heaths and calcareous grasslands | N | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Upland | Alpine and Boreal heaths | **N** | | | | | | | | | |
| | Alpine pioneer formations | **N** | | | | | | | | | |
| | Calcareous rocky slopes | **N** | | | | | | | | | |
| | Siliceous rocky slopes | **N** | | | | | | | | | |
| | Calcareous scree | **N** | | | | | | | | | |
| | Hydrophilous tall herb communities | **N** | | | | | | | | | |
| | Limestone pavements | **N** | | | | | | | | | |
| | Mountain hay meadows | **N** | | | | | | | | | |
| | Siliceous alpine and boreal grasslands | **N** | | | | | | | | | |
| | Siliceous scree | **N** | | | | | | | | | |
| Vascular plants of aquatic habitats | Floating water-plantain | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Amphibia | Great crested newt | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Coastal plants | Shore dock | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Marine mammals | Bottlenose dolphin | **N** | | | | | | | | | |
| | Common seal | **N** | | | | | | | | | |
| | Grey seal | **N** | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vascular plants lower plants and invertebrates of wet habitats | Creeping marshwort | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Depressions on peat substrates | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Fen orchid | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Freshwater pearl mussel | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Marsh fritillary butterfly | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Narrow-mouthed whorl snail | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Round-mouthed whorl snail | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Southern Damselfly | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Marsh saxifrage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Vascular plants of grassland | Early gentian | **N** | | | | | | | | | |
| | Killarney fern | **N** | | | | | | | | | |
| Mosses and Liverworts | Petalwort | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Slender green feather-moss | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Western rustwort | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anadromous fish | Allis shad | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Atlantic salmon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | River Lamprey | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Sea lamprey | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Twaite shad | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Non-migratory fish & invertebrates of rivers | White-clawed crayfish | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Brook lamprey | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bullhead | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Freshwater pearl mussel | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Spined loach | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Invertebrates of wooded habitats | Stag beetle | **N** | | | | | | | | | |
| | Violet click beetle | **N** | | | | | | | | | |
| Mammals of wooded habitats | Barbastelle bat | **N** | | | | | | | | | |
| | Calcareous scree | **N** | | | | | | | | | |
| | Greater horseshoe bat | **N** | | | | | | | | | |
| | Lesser Horseshoe Bat | **N** | | | | | | | | | |
| Mammals of riverine habitats | Otter | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of uplands | Curlew | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Golden plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hen harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Kittiwake | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lapwing | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lesser black-backed gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Manx shearwater | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Merlin | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Peregrine falcon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Razorbill | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Red kite | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Short-eared owl | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Snipe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Storm-petrel | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of open sea and offshore rocks | Arctic tern | N | | | | | | | | | |
| | Common scoter | N | | | | | | | | | |
| | Common tern | N | | | | | | | | | |
| | Cormorant | N | | | | | | | | | |
| | Gannet | N | | | | | | | | | |
| | Guillemot | N | | | | | | | | | |
| | Herring gull | N | | | | | | | | | |
| | Lesser black-backed gull | N | | | | | | | | | |
| | Little tern | N | | | | | | | | | |
| | Puffin | N | | | | | | | | | |
| | Red-throated diver | N | | | | | | | | | |
| | Roseate tern | N | | | | | | | | | |
| | Sandwich tern | N | | | | | | | | | |
| | Scaup | N | | | | | | | | | |
| | Seabird assemblage | N | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of woodland & scrub | Honey buzzard | **N** | | | | | | | | | |
| | Nightjar | **N** | | | | | | | | | |
| | Red kite | **N** | | | | | | | | | |
| | Wood lark | **N** | | | | | | | | | |
| Birds of lowland heaths & brecks | Dartford warbler | **N** | | | | | | | | | |
| | Hen harrier | **N** | | | | | | | | | |
| | Honey buzzard | **N** | | | | | | | | | |
| | Nightjar | **N** | | | | | | | | | |
| | Stone-curlew | **N** | | | | | | | | | |
| | Wood lark | **N** | | | | | | | | | |
| Birds of lowland wet grassland | Barnacle goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bar-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bewick's swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Black-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dark-bellied brent goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Light-bellied brent goose | **N** | | | | | | | | | |
| | Curlew | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dunlin (ssp. alpina) | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dunlin (ssp. schinzii) | **N** | | | | | | | | | |
| | Golden plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Greylag goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Grey plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hen harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Knot | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lapwing | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Oystercatcher | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pink-footed goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Redshank | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Ruff | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Snipe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Teal | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Whooper swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of lowland dry grassland | Stone-curlew | **N** | | | | | | | | | |
| Birds of lowland freshwaters & their margins | Avocet | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bewick's swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bittern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Common tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Cormorant | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Gadwall | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Great crested grebe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Greylag goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hen harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lesser black-backed gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Little egret | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Marsh harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mediterranean gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pink-footed goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pintail | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Red-throated diver | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Ringed plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ruff | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Shelduck | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Shoveler | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Snipe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Teal | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Tufted duck | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | White-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Greenland white-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Whooper swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Wigeon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Waterfowl assemblage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Farmland Birds | Barnacle goose | **N** | | | | | | | | | |
| | Bar-tailed godwit | **N** | | | | | | | | | |
| | Bewick's swan | **N** | | | | | | | | | |
| | Dark-bellied brent goose | **N** | | | | | | | | | |
| | Light-bellied brent goose | **N** | | | | | | | | | |
| | Curlew | **N** | | | | | | | | | |
| | Dunlin (ssp. alpina) | **N** | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dunlin (ssp. schinzii) | N | | | | | | | | | |
| | Golden plover | N | | | | | | | | | |
| | Greylag goose | N | | | | | | | | | |
| | Grey plover | N | | | | | | | | | |
| | Hen harrier | N | | | | | | | | | |
| | Knot | N | | | | | | | | | |
| | Lapwing | N | | | | | | | | | |
| | Marsh harrier | N | | | | | | | | | |
| | Oystercatcher | N | | | | | | | | | |
| | Pink-footed goose | N | | | | | | | | | |
| | Red kite | N | | | | | | | | | |
| | Redshank | N | | | | | | | | | |
| | Stone-curlew | N | | | | | | | | | |
| | White-fronted goose | N | | | | | | | | | |
| | Greenland white-fronted goose | N | | | | | | | | | |
| | Whooper swan | N | | | | | | | | | |
| | Wigeon | N | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of coastal habitats | Arctic tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Avocet | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Barnacle goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bar-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bewick's swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Black-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dark-bellied brent goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Light-bellied brent goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Chough | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Common scoter | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Common tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Cormorant | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Curlew | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dunlin (ssp. alpina) | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dunlin (ssp. schinzii) | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Gannet | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Golden plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Great crested grebe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grey plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Guillemot | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hen harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Herring gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Knot | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lesser black-backed gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Little egret | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Little tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Marsh harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mediterranean gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Merlin | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Oystercatcher | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Peregrine falcon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pink-footed goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pintail | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Puffin | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Purple sandpiper | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Redshank | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ringed plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Roseate tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Ruff | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Sanderling | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Sandwich tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Scaup | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Shelduck | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Short-eared owl | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Slavonian grebe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Teal | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Turnstone | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | White-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Greenland white-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Whooper swan | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Wigeon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Waterfowl assemblage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Seabird assemblage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds of estuarine habitats | Arctic tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Avocet | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Barnacle goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Bar-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Black-tailed godwit | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dark-bellied brent goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Light-bellied brent goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Common scoter | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Common tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Cormorant | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Curlew | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dunlin (ssp. alpina) | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Dunlin (ssp. schinzii) | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Golden plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Great crested grebe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Grey plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Hen harrier | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Herring gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knot | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lapwing | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Lesser black-backed gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Little egret | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Little tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Mediterranean gull | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Merlin | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Oystercatcher | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Peregrine falcon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pink-footed goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Pintail | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Purple sandpiper | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Redshank | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Ringed plover | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Ruff | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Sanderling | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Sandwich tern | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Scaup | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shelduck | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Shoveler | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Slavonian grebe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Snipe | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Teal | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Turnstone | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | White-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Greenland white-fronted goose | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Wigeon | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Waterfowl assemblage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | Seabird assemblage | **Y** | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Not classified by EA | Submarine structures made by leaking gases | **N** | | | | | | | | | |
| | Coastal dune heathland | **N** | | | | | | | | | |
| | Dunes with sea-buckthorn | **N** | | | | | | | | | |
| | Machair | **Y** | | | | | | | | | |
| | Dunes with juniper thickets | **N** | | | | | | | | | |
| | Oligotrophic to mesotrophic standing waters | **Y** | | | | | | | | | |
| | Mountain willow scrub | **N** | | | | | | | | | |

| EA Class Name | Abbreviation | WR Sensitive? | Change in water levels or table | Change in flow or velocity regime | Change in surface flooding | Changed water chemistry | Change in FW flow to estuary | Change in salinity regime | Reduced dilution capacity | Habitat loss | Entrapment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alpine and subalpine calcareous grasslands | N | | | | | | | | | |
| | Species-rich Nardus grassland | N | | | | | | | | | |
| | Caves not open to the public | N | | | | | | | | | |
| | Caledonian forest | N | | | | | | | | | |
| | Harbour porpoise | N | | | | | | | | | |
| | Green shield-moss | Y | | | | | | | | | |
| | Killarney fern | Y | | | | | | | | | |
| | Slender naiad | Y | | | | | | | | | |
| | Ramshorn snail | Y | | | | | | | | | |

# Appendix E
# Feasible options assessment summary

**Table E.1 Abbreviations Used in Feasible Option Screening Tables**

| Abbreviation | Definition |
|---|---|
| SAC | Special Area of Conservation (see also Section 1.2 and Appendix F) |
| SPA | Special Protection Area (see also Section 1.2 and Appendix F) |
| Ramsar | Not an abbreviation; a 'wetland of international importance' (see also Section 1.2 and Appendix F) |
| Dist. | Approximate distance to nearest point of the European site (note this is not necessarily the distance to the features) |
| LSE | 'Likely significant effects' (see also Section 3.3.2 and Table 3.1) |
| Cons. | Construction; assessment of likely effects as a result of construction activities (see also Section 3.3.2) |
| Oper. | Operation; assessment of likely effects as a result of operation activities (see also Section 3.3.2) |
| N | No (i.e. no 'likely significant effects'; see Table 3.1) |
| U | Uncertain (i.e. effects uncertain; see Table 3.1) |
| Y | Yes (i.e. significant effects likely; see Table 3.1) |

| Option<br>WC01 | Option Name<br>Thirlmere Transfer into West Cumbria |
|---|---|
| **Summary description of scheme** | **General assessment** |
| This option would involve increasing current abstraction from Thirlmere reservoir by enhancing infrastructure capacity. The option would require a new treatment works and pumping station in the vicinity of Bridge End at the outlet of Thirlmere reservoir. Treated water would be pumped to a new service reservoir (SR) at Castle Rigg, from which the water would flow by gravity down a large diameter trunk main (LDTM) terminating at Stainburn SR. There would be three main take-offs from this LDTM to supply the Corn How, Ennerdale and Quarry Hill areas. The Ennerdale and Corn How connections would not require any additional pumping to deliver treated water to the existing Cornhow SR (which would be upgraded) and a proposed new replacement SR at Ennerdale. However, additional pumping would be required to transfer flows from Corn How to Buttermere SR. The Quarry Hill take-off would require booster pumping to deliver water to Bothel Moor SR. The total length of additional new pipeline required under this option would be approximately 100km. This option would also involve the abandonment of three existing water treatment works (WTWs) in West Cumbria namely, Quarry Hill, Ennerdale, and Corn How. | This scheme would require substantial lengths of new pipeline and several other new assets. As proposed, the pipelines would be mostly within existing roads, other than some short linking sections and it would generally be expected that effects could be avoided with normal best practice and some scheme-specific mitigation (although suitable measures would be defined through project-level HRA). However, pipeline sections would cross / run adjacent to the River Eden SAC and a new abstraction would be required near the River Derwent and Bassenthwaite Lake SAC (near St. John's Beck, downstream of Thirlmere). Other pipeline sections would be in close proximity to other SACs (for example: Lake District High Fells SAC, Clints Quarry SAC, North Pennine Dales Meadows SAC). Significant construction effects on the River Derwent and Bassenthwaite Lake SAC are possible due to the proximity of the works although it is likely that these can be managed / avoided with standard mitigation measures. For other sites it is likely that significant adverse construction impacts could be avoided, although specific measures (e.g. timing of the works to avoid migration periods) will be required.<br><br>With regard to operation, the scheme is designed to relieve pressure on the River Ehen SAC and therefore adverse effects on this site would not be expected. It is assumed that the current abstraction levels and compensation releases to the River Derwent would be maintained (i.e. there would be no change in flows in the upper Derwent. It is noted that the EA wish to reduce the licence to 231 Ml/d, but this is understood to be a 'technical' rationalisation of several licences rather than something that will impact deployable output. There may be some positive benefits for the lower reaches of the Derwent as the scheme would allow the closure of WTWs downstream. The scheme is unlikely to have operational impacts on any other sites.<br><br>Overall, the scheme is may have significant effects as a result of construction, but it should be possible to avoid these, or prevent adverse effects with scheme specific mitigation. |

| Site and interest features | Dist. | LSE? Cons. | LSE? Oper. | Summary |
|---|---|---|---|---|
| **Borrowdale Woodland Complex SAC** | **2** | | | |
| Siliceous rocky slopes | | N | N | Interest feature not exposed / vulnerable to likely effects |
| Western acidic oak woodland | | N | N | Interest feature not exposed / vulnerable to likely effects |
| Bog woodland* | | N | N | Interest feature not exposed / vulnerable to likely effects |
| **Clints Quarry SAC** | **<1** | | | |
| Great crested newt | | N | N | Construction effects avoidable with established measures |
| **Lake District High Fells SAC** | **<1** | | | |
| Slender green feather-moss | | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Calcareous rocky slopes | | N | N | Construction in roads near site; effects avoidable with established measures / best practice |

| Option<br>WC01 | Option Name<br>Thirlmere Transfer into West Cumbria | | |
|---|---|---|---|
| Oligotrophic to mesotrophic standing waters | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Alkaline fens | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Siliceous scree | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Wet heaths | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Siliceous rocky slopes | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Dry heaths | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Alpine and Boreal heaths | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Juniper on heaths and calcareous grasslands | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Siliceous alpine and boreal grasslands | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Blanket bog* | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Species-rich Nardus grassland* | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Western acidic oak woodland | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| Hydrophilous tall herb communities | N | N | Construction in roads near site; effects avoidable with established measures / best practice |
| **North Pennine Dales Meadows SAC** | **<1** | | |
| Mountain hay meadows | N | N | One unit of this is within approximately 800m of a proposed pipeline, but effects avoidable |
| Purple moor-grass meadows | N | N | One unit of this is within approximately 800m of a proposed pipeline, but effects avoidable |
| **River Derwent and Bassenthwaite Lake SAC** | **<1** | | |
| River Lamprey | Y | Y | Feature at risk from construction and operation |
| Brook lamprey | Y | Y | Feature at risk from construction and operation |
| Sea lamprey | N | N | Interest feature not exposed to likely effects |
| Oligotrophic to mesotrophic standing waters | U | U | Effects uncertain but unlikely based on distribution in SAC |
| Atlantic salmon | U | U | Feature at risk from construction and operation |
| Marsh fritillary butterfly | N | N | Interest feature not exposed to likely effects |
| Floating water-plantain | U | U | Effects uncertain but unlikely based on distribution in SAC |
| Otter | N | U | Construction effects avoidable with established measures; operational effects uncertain but unlikely to be significant |
| Water courses with Ranunculus-type vegetation | U | U | Effects uncertain but unlikely based on distribution in SAC |

| Option<br>WC01 | Option Name<br>Thirlmere Transfer into West Cumbria | | |
|---|---|---|---|
| **River Eden SAC** | **11** | | |
| Atlantic salmon | N | N | No impact pathways to site (all works in separate catchments) |
| White-clawed crayfish | N | N | No impact pathways to site (all works in separate catchments) |
| Sea lamprey | N | N | No impact pathways to site (all works in separate catchments) |
| Bullhead | N | N | No impact pathways to site (all works in separate catchments) |
| Water courses with Ranunculus-type vegetation | N | N | No impact pathways to site (all works in separate catchments) |
| River Lamprey | N | N | No impact pathways to site (all works in separate catchments) |
| Brook lamprey | N | N | No impact pathways to site (all works in separate catchments) |
| Alluvial forests* | N | N | No impact pathways to site (all works in separate catchments) |
| Otter | N | N | No impact pathways to site (all works in separate catchments) |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways to site (all works in separate catchments) |
| **River Ehen SAC** | **<1** | | |
| Freshwater pearl mussel | U | N | Construction required over / adjacent to SAC; may require special measures |
| Atlantic salmon | U | N | Construction required over / adjacent to SAC; may require special measures |
| **Solway Firth SAC** | **12** | | |
| Salicornia and other annuals | N | N | No impact pathways to site (all works in separate catchments) |
| Estuaries | N | N | No impact pathways to site (all works in separate catchments) |
| Sandbanks | N | N | No impact pathways to site (all works in separate catchments) |
| Mudflats and sandflats | N | N | No impact pathways to site (all works in separate catchments) |
| Atlantic Salt Meadows | N | N | No impact pathways to site (all works in separate catchments) |
| Sea lamprey | N | N | No impact pathways to site (all works in separate catchments) |
| Reefs | N | N | No impact pathways to site (all works in separate catchments) |
| Grey dunes* | N | N | No impact pathways to site (all works in separate catchments) |
| Perennial vegetation of stony banks | N | N | No impact pathways to site (all works in separate catchments) |
| River Lamprey | N | N | No impact pathways to site (all works in separate catchments) |
| **South Solway Mosses SAC** | **10** | | |

| Option<br>WC01 | Option Name<br>Thirlmere Transfer into West Cumbria | | |
|---|---|---|---|
| Active raised bogs* | N | N | No impact pathways to site (all works in separate catchments) |
| Degraded raised bog | N | N | No impact pathways to site (all works in separate catchments) |
| **Tarn Moss SAC** | **12** | | |
| Transition mires and quaking bogs | N | N | No impact pathways to site (all works in separate catchments) |
| **Ullswater Oakwoods SAC** | **10** | | |
| Western acidic oak woodland | N | N | No impact pathways to site (all works in separate catchments) |
| **Wast Water SAC** | **10** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways to site (all works in separate catchments) |
| **Upper Solway Flats and Marshes SPA** | **12** | | |
| Barnacle goose | N | N | No impact pathways to site (all works in separate catchments) |
| Bar-tailed godwit | N | N | No impact pathways to site (all works in separate catchments) |
| Curlew | N | N | No impact pathways to site (all works in separate catchments) |
| Dunlin (ssp. alpina) | N | N | No impact pathways to site (all works in separate catchments) |
| Golden plover | N | N | No impact pathways to site (all works in separate catchments) |
| Goldeneye | N | N | No impact pathways to site (all works in separate catchments) |
| Grey plover | N | N | No impact pathways to site (all works in separate catchments) |
| Knot | N | N | No impact pathways to site (all works in separate catchments) |
| Oystercatcher | N | N | No impact pathways to site (all works in separate catchments) |
| Pink-footed goose | N | N | No impact pathways to site (all works in separate catchments) |
| Pintail | N | N | No impact pathways to site (all works in separate catchments) |
| Redshank | N | N | No impact pathways to site (all works in separate catchments) |
| Ringed plover | N | N | No impact pathways to site (all works in separate catchments) |
| Sanderling | N | N | No impact pathways to site (all works in separate catchments) |
| Scaup | N | N | No impact pathways to site (all works in separate catchments) |
| Shelduck | N | N | No impact pathways to site (all works in separate catchments) |
| Shoveler | N | N | No impact pathways to site (all works in separate catchments) |

| Option<br>WC01 | Option Name<br>Thirlmere Transfer into West Cumbria | | |
|---|---|---|---|
| Teal | N | N | No impact pathways to site (all works in separate catchments) |
| Turnstone | N | N | No impact pathways to site (all works in separate catchments) |
| Waterfowl assemblage | N | N | No impact pathways to site (all works in separate catchments) |
| Whooper swan | N | N | No impact pathways to site (all works in separate catchments) |
| **Upper Solway Flats and Marshes Ramsar** | **12** | | |
| | N | N | No impact pathways to site (all works in separate catchments) |

| Option<br>WC02 | Option Name<br>River Derwent Abstraction | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option would involve the construction of a new three stage water treatment works on the existing Barepot site and a 4 Ml/d capacity pumping station. A new treated water pumping main (1.5 km in length) would also be required in addition to a further16km of new pipeline from Stainburn to Summergrove service reservoirs transferring at 3Ml/d. | Construction works will be required adjacent to the River Derwent and Bassenthwaite Lake SAC, and the pipeline will have to cross this watercourse. It is likely that these works can be suitably managed to avoid significant or adverse effects (e.g. timing of works to avoid migration periods; routing pipeline to make use of existing road crossings) but a risk of effects would remain.<br><br>Operationally, this option is likely to significantly affect River Derwent and Bassenthwaite Lake SAC (although the increase in abstraction is relatively modest). The current Q75 and Q98 flows of the River Derwent at the gauging station at Camerton (around 2 km upstream of the abstraction point at Barepot) are approximately 8 and 3 m3s-1( ). This equates to flows of around 691 Ml/d and 259 Ml/d respectively. An increase in abstraction of 3 Ml/d would represent around 1.2% of Q98 flows and 0.4% of Q75 flows. This would be considered a significant effect and it is certain that scheme level appropriate assessment would be required should the option be bought forward. Given the modest size of the increase adverse effects may not be inevitable but this option should ideally be avoided. | | | |
| **Site and interest features** | | **LSE?** | | **Summary** |
| | **Dist.** | **Cons.** | **Oper.** | |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | | |
| River Lamprey | | U | Y | Interest feature exposed and sensitive to construction and operation effects |
| Brook lamprey | | U | Y | Interest feature exposed and sensitive to construction and operation effects |
| Sea lamprey | | U | Y | Interest feature exposed and sensitive to construction and operation effects |
| Oligotrophic to mesotrophic standing waters | | N | N | Interest feature not exposed to likely effects |
| Atlantic salmon | | U | Y | Interest feature exposed and sensitive to construction and operation effects |
| Marsh fritillary butterfly | | N | N | Interest feature not exposed to likely effects |
| Floating water-plantain | | N | N | Interest feature not exposed to likely effects |
| Otter | | U | U | Interest feature exposed and sensitive to construction and operation effects |
| Water courses with Ranunculus-type vegetation | | N | U | Interest feature exposed and sensitive to construction and operation effects |
| **Lake District High Fells SAC** | **7** | | | |
| Slender green feather-moss | | N | N | No impact pathways |
| Calcareous rocky slopes | | N | N | No impact pathways |
| Oligotrophic to mesotrophic standing waters | | N | N | No impact pathways |
| Alkaline fens | | N | N | No impact pathways |

| Option<br>WC02 | Option Name<br>River Derwent Abstraction | | |
|---|---|---|---|
| Siliceous scree | N | N | No impact pathways |
| Wet heaths | N | N | No impact pathways |
| Siliceous rocky slopes | N | N | No impact pathways |
| Dry heaths | N | N | No impact pathways |
| Alpine and Boreal heaths | N | N | No impact pathways |
| Juniper on heaths and calcareous grasslands | N | N | No impact pathways |
| Siliceous alpine and boreal grasslands | N | N | No impact pathways |
| Blanket bog* | N | N | No impact pathways |
| Species-rich Nardus grassland* | N | N | No impact pathways |
| Western acidic oak woodland | N | N | No impact pathways |
| Hydrophilous tall herb communities | N | N | No impact pathways |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |
| Atlantic salmon | N | N | No effects, assuming normal best-practice |

| Option<br>WC04 | Option Name<br>Wastwater (negotiate part abstraction licence) | | |
|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | |
| This option involves an agreement with third party licence holders for water transfer from Brow Top Service Reservoir to Ennerdale WTW. It would require the construction of a new 10Ml/d pumping station at Brow Top, 13.5km pipeline and a new mixing tank at Ennerdale. | Additional abstraction from Wastwater would be within existing licences but it would be higher than recent actual so Wastwater actual levels would tend to be lower on average than they have been previously. This would affect the River Ehen SAC, although it is uncertain whether these changes would have significant effects.<br>The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse. | | |
| **Site and interest features** | | **LSE?** | **Summary** |
| | **Dist.** | **Cons.** **Oper.** | |
| **Borrowdale Woodland Complex SAC** | **7** | | |
| Siliceous rocky slopes | | N N | No impact pathways |
| Western acidic oak woodland | | N N | No impact pathways |
| Bog woodland* | | N N | No impact pathways |
| **Drigg Coast SAC** | **6** | | |
| Estuaries | | N N | No impact pathways |
| Grey dunes* | | N N | No impact pathways |
| Mudflats and sandflats | | N N | No impact pathways |
| Salicornia and other annuals | | N N | No impact pathways |
| Atlantic Salt Meadows | | N N | No impact pathways |
| Embryonic shifting dunes | | N N | No impact pathways |
| White dunes | | N N | No impact pathways |
| Coastal dune heathland* | | N N | No impact pathways |
| Humid dune slacks | | N N | No impact pathways |
| Dunes with creeping willow | | N N | No impact pathways |
| **Lake District High Fells SAC** | **<1** | | |
| Slender green feather-moss | | N N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Calcareous rocky slopes | | N N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Oligotrophic to mesotrophic standing waters | | N N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |

| Option<br>WC04 | Option Name<br>Wastwater (negotiate part abstraction licence) | | |
|---|---|---|---|
| Alkaline fens | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous scree | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Wet heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous rocky slopes | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Dry heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Alpine and Boreal heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Juniper on heaths and calcareous grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous alpine and boreal grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Blanket bog* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Species-rich Nardus grassland* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Western acidic oak woodland | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Hydrophilous tall herb communities | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| **North Pennine Dales Meadows SAC** | **12** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **5** | | |
| River Lamprey | N | Y | No impact pathways for construction; consequent operational effects likely due to changes in abstractions although within licence |
| Brook lamprey | N | Y | |
| Sea lamprey | N | Y | |
| Oligotrophic to mesotrophic standing waters | N | Y | |
| Atlantic salmon | N | Y | |
| Marsh fritillary butterfly | N | Y | |
| Floating water-plantain | N | Y | |
| Otter | N | Y | |
| Water courses with Ranunculus-type vegetation | N | Y | |
| **River Ehen SAC** | **0** | | |
| Freshwater pearl mussel | U | Y | Pipeline will need to cross river twice but likely to be via existing road crossings. Operation within existing licence but will change flows. |
| Atlantic salmon | U | Y | |
| **Wast Water SAC** | **10** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |

| Option<br>WC05 | Option Name<br>Development of New boreholes in West Cumbria Aquifer | | |
|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | |
| This option would involve the construction of three new boreholes at Sandwith, Rottington and Moor Platts in addition to utilising an existing borehole at Catgill. The option would require drilling of a borehole at each site, a new fixed speed borehole pump and a new headworks GRP kiosk. The Catgill site would also require a new break tank, aeration tower and RWPS. A total of 1.5km of pipeline would be required from Sandwith to Rottington, 4km from Rottington to Moor Platts and 2.5km from Moor Platts to Catgill. Finally, a 13km pipeline would transfer all raw water to Ennerdale WTW. A new 1km washout main would also be needed at Catgill to the nearest Egremont sewer. | The construction of the scheme could potentially affect the River Ehen SAC as it is likely that this will be crossed by the transfer pipeline, but potential effects of this could be avoided / mitigated by using existing road crossings and by (for example) appropriate timing of works / mitigation. Appropriate assessment will be required at the scheme level but the effects are not clearly unavoidable or adverse.<br><br>Operation of the scheme is more difficult to characterise; the new boreholes are outside the surface water catchment of the Ehen and therefore any localised drawdown would not affect tributaries of the river. It is possible that the new boreholes may affect groundwater supplies to the Ehen, although it is not clear what contribution to flow these are likely to make; in fact, any effects are likely to be felt outside of the SAC, but may affect mobile species (Atlantic salmon) migrating through the lower reaches. It may be necessary to characterise this to support the option. | | |

| Site and interest features | Dist. | LSE? Cons. | LSE? Oper. | Summary |
|---|---|---|---|---|
| **Borrowdale Woodland Complex SAC** | **7** | | | |
| Siliceous rocky slopes | | N | N | No impact pathways |
| Western acidic oak woodland | | N | N | No impact pathways |
| Bog woodland* | | N | N | No impact pathways |
| **Drigg Coast SAC** | **10** | | | |
| Estuaries | | N | N | No impact pathways |
| Grey dunes* | | N | N | No impact pathways |
| Mudflats and sandflats | | N | N | No impact pathways |
| Salicornia and other annuals | | N | N | No impact pathways |
| Atlantic Salt Meadows | | N | N | No impact pathways |
| Embryonic shifting dunes | | N | N | No impact pathways |
| White dunes | | N | N | No impact pathways |
| Coastal dune heathland* | | N | N | No impact pathways |
| Humid dune slacks | | N | N | No impact pathways |
| Dunes with creeping willow | | N | N | No impact pathways |

| Option<br>WC05 | Option Name<br>Development of New boreholes in West Cumbria Aquifer | | |
|---|---|---|---|
| **Lake District High Fells SAC** | **<1** | | |
| Slender green feather-moss | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Calcareous rocky slopes | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Alkaline fens | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous scree | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Wet heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous rocky slopes | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Dry heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Alpine and Boreal heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Juniper on heaths and calcareous grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous alpine and boreal grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Blanket bog* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Species-rich Nardus grassland* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Western acidic oak woodland | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Hydrophilous tall herb communities | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| **North Pennine Dales Meadows SAC** | **11** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **5** | | |
| River Lamprey | N | N | No impact pathways |
| Brook lamprey | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |
| Atlantic salmon | N | N | No impact pathways |
| Marsh fritillary butterfly | N | N | No impact pathways |
| Floating water-plantain | N | N | No impact pathways |
| Otter | N | N | No impact pathways |
| Water courses with Ranunculus-type vegetation | N | N | No impact pathways |
| **River Ehen SAC** | **0** | | |

| Option<br>WC05 | Option Name<br>Development of New boreholes in West Cumbria Aquifer | | | |
|---|---|---|---|---|
| Freshwater pearl mussel | | U | U | Pipeline will need to cross river twice but likely to be via existing road crossings. New boreholes mostly outside Eden SW catchment but drawdown effects possible in lower reaches which could affect mobile species. |
| Atlantic salmon | | U | U | Pipeline will need to cross river twice but likely to be via existing road crossings. No operational effects |
| **Wast Water SAC** | **12** | | | |
| Oligotrophic to mesotrophic standing waters | | N | N | No impact pathways |

| Option<br>WC05A | Option Name<br>Development of New boreholes in West Cumbria Aquifer (10 Ml/d) | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option would involve the construction of seven new boreholes at Sandwith, Rottington and Moor Platts in addition to utilising an existing borehole at Catgill (eight boreholes in total). The remainder of this scheme would be as Option WC05. | This option would be the same as WC05, except with a 10Ml/d DO rather than 5Ml/d. The effects are the same, although operational effects may be more likely. | | | |
| **Site and interest features** | **Dist.** | **LSE? Cons.** | **LSE? Oper.** | **Summary** |
| **Borrowdale Woodland Complex SAC** | **7** | | | |
| Siliceous rocky slopes | | N | N | No impact pathways |
| Western acidic oak woodland | | N | N | No impact pathways |
| Bog woodland* | | N | N | No impact pathways |
| **Drigg Coast SAC** | **10** | | | |
| Estuaries | | N | N | No impact pathways |
| Grey dunes* | | N | N | No impact pathways |
| Mudflats and sandflats | | N | N | No impact pathways |
| Salicornia and other annuals | | N | N | No impact pathways |
| Atlantic Salt Meadows | | N | N | No impact pathways |
| Embryonic shifting dunes | | N | N | No impact pathways |
| White dunes | | N | N | No impact pathways |
| Coastal dune heathland* | | N | N | No impact pathways |
| Humid dune slacks | | N | N | No impact pathways |
| Dunes with creeping willow | | N | N | No impact pathways |
| **Lake District High Fells SAC** | **<1** | | | |
| Slender green feather-moss | | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Calcareous rocky slopes | | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Oligotrophic to mesotrophic standing waters | | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Alkaline fens | | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous scree | | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |

| Option<br>WC05A | Option Name<br>Development of New boreholes in West Cumbria Aquifer (10 Ml/d) | | |
|---|---|---|---|
| Wet heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous rocky slopes | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Dry heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Alpine and Boreal heaths | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Juniper on heaths and calcareous grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Siliceous alpine and boreal grasslands | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Blanket bog* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Species-rich Nardus grassland* | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Western acidic oak woodland | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| Hydrophilous tall herb communities | N | N | Construction within approx 1km but down slope and effects avoidable with best-practice; no operational effects |
| **North Pennine Dales Meadows SAC** | **11** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **5** | | |
| River Lamprey | N | N | No impact pathways |
| Brook lamprey | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |
| Atlantic salmon | N | N | No impact pathways |
| Marsh fritillary butterfly | N | N | No impact pathways |
| Floating water-plantain | N | N | No impact pathways |
| Otter | N | N | No impact pathways |
| Water courses with Ranunculus-type vegetation | N | N | No impact pathways |
| **River Ehen SAC** | **0** | | |
| Freshwater pearl mussel | U | U | Pipeline will need to cross river twice but likely to be via existing road crossings. New boreholes mostly outside Eden SW catchment but drawdown effects possible in lower reaches which could affect mobile species. |
| Atlantic salmon | U | U | Pipeline will need to cross river twice but likely to be via existing road crossings. No operational effects |
| **Wast Water SAC** | **12** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |

| Option<br>WC06A | Option Name<br>Roughton Gill Mine Adit (Option 1) | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option involves refurbishment of the existing Roughton Gill mine adit abstraction main. A new collection tank and raw water pumping station would also be required at Fellside together with 5km of associated pipework to transfer water between Fellside and Chapel House reservoir and 40km of pipeline from Quarry Hill WTW to Summergrove reservoir via Stainburn. | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (i.e. through the SAC) will be slip-lined, which will minimise potential effects on the SAC, but some excavation is still possible. Overall, the scheme is likely to have significant effects but the scale of these can only be assessed accurately at the delivery stage; however, it should be assumed that excavation within the SAC will not be permitted.<br><br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the review of consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | | | |
| **Site and interest features** | | **LSE?** | | **Summary** |
| | **Dist.** | **Cons.** | **Oper.** | |
| **Borrowdale Woodland Complex SAC** | **15** | | | |
| Siliceous rocky slopes | | N | N | No impact pathways |
| Western acidic oak woodland | | N | N | No impact pathways |
| Bog woodland* | | N | N | No impact pathways |
| **Cumbrian Marsh Fritillary Site SAC** | **11** | | | |
| Marsh fritillary butterfly | | N | N | No impact pathways |
| **Lake District High Fells SAC** | **0** | | | |
| Slender green feather-moss | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Calcareous rocky slopes | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Oligotrophic to mesotrophic standing waters | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Alkaline fens | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Siliceous scree | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Wet heaths | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Siliceous rocky slopes | | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |

| Option<br>WC06A | Option Name<br>Roughton Gill Mine Adit (Option 1) | | |
|---|---|---|---|
| Dry heaths | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Alpine and Boreal heaths | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Juniper on heaths and calcareous grasslands | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Siliceous alpine and boreal grasslands | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Blanket bog* | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Species-rich Nardus grassland* | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Western acidic oak woodland | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Hydrophilous tall herb communities | U | N | Pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| **River Eden SAC** | **3** | | |
| Atlantic salmon | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| White-clawed crayfish | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Sea lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Bullhead | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Water courses with Ranunculus-type vegetation | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| River Lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Brook lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Alluvial forests* | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Otter | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Oligotrophic to mesotrophic standing waters | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| **Tarn Moss SAC** | **14** | | |
| Transition mires and quaking bogs | N | N | No impact pathways |
| **Clints Quarry SAC** | **<1** | | |
| Great crested newt | N | N | In close proximity but effects mitigatable at the scheme level |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Brook lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Sea lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |

| Option<br>WC06A | Option Name<br>Roughton Gill Mine Adit (Option 1) | | |
|---|---|---|---|
| Atlantic salmon | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Marsh fritillary butterfly | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Floating water-plantain | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Otter | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Water courses with Ranunculus-type vegetation | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |
| Atlantic salmon | N | N | No effects, assuming normal best-practice |
| **Solway Firth SAC** | **14** | | |
| Salicornia and other annuals | N | N | No impact pathways |
| Estuaries | N | N | No impact pathways |
| Sandbanks | N | N | No impact pathways |
| Mudflats and sandflats | N | N | No impact pathways |
| Atlantic Salt Meadows | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Reefs | N | N | No impact pathways |
| Grey dunes* | N | N | No impact pathways |
| Perennial vegetation of stony banks | N | N | No impact pathways |
| River Lamprey | N | N | No impact pathways |
| **South Solway Mosses SAC** | **9** | | |
| Active raised bogs* | N | N | No impact pathways |
| Degraded raised bog | N | N | No impact pathways |
| **Upper Solway Flats and Marshes SPA** | **14** | | |
| Barnacle goose | N | N | No impact pathways |
| Bar-tailed godwit | N | N | No impact pathways |
| Curlew | N | N | No impact pathways |
| Dunlin (ssp. alpina) | N | N | No impact pathways |
| Golden plover | N | N | No impact pathways |
| Goldeneye | N | N | No impact pathways |
| Grey plover | N | N | No impact pathways |
| Knot | N | N | No impact pathways |

| Option<br>WC06A | Option Name<br>Roughton Gill Mine Adit (Option 1) | | |
|---|---|---|---|
| Oystercatcher | N | N | No impact pathways |
| Pink-footed goose | N | N | No impact pathways |
| Pintail | N | N | No impact pathways |
| Redshank | N | N | No impact pathways |
| Ringed plover | N | N | No impact pathways |
| Sanderling | N | N | No impact pathways |
| Scaup | N | N | No impact pathways |
| Shelduck | N | N | No impact pathways |
| Shoveler | N | N | No impact pathways |
| Teal | N | N | No impact pathways |
| Turnstone | N | N | No impact pathways |
| Waterfowl assemblage | N | N | No impact pathways |
| Whooper swan | N | N | No impact pathways |
| **Upper Solway Flats and Marshes** | **14** | | |
| 0 | N | N | No impact pathways |

| Option<br>WC06B | Option Name<br>Roughton Gill Mine Adit (Option 2) | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option involves refurbishment of the existing Roughton Gill mine adit abstraction main. It would require the replacement of the existing main between Roughton Gill and Fellside together with a new 8.7km pipeline to Chapel House reservoir and 40km of pipeline from Quarry Hill WTW to Summergrove reservoir via Stainburn. | The Roughton Gill mine adit is located within the Lake District High Fells SAC although the collection point is located outside at Fell Side. However, construction of a new collection tank and PS at this location would risk impinging on the SAC, and it is also in the headwaters of the River Eden SAC (risks of construction run-off etc). It addition, the proposed new pipeline route currently follows a road and then a miner's track which is partly within the SAC. Keeping to the track is likely to minimise effects but there is still a likelihood of significant effects if this route is used. It may be possible to alter the route slightly although this may affect the PS sizing. The pipes from the mine to Fell Side (within the SAC) would be replaced, which would require excavation of the SAC. The scheme is will to have significant effects that will be difficult to avoid or mitigate.<br><br>Operation of the scheme would be within the terms of the existing licence, which was reviewed under the review of consents with respect to flows to the River Eden, with the scheme simply improving the collection from the adit. Since it is effectively a 'passive' collection there is little risk of increased drawdown in the Lake District High Fells SAC that would affect any features and no significant operational effects would be expected. | | | |
| **Site and interest features** | **Dist.** | **LSE? Cons.** | **LSE? Oper.** | **Summary** |
| **Borrowdale Woodland Complex SAC** | **15** | | | |
| Siliceous rocky slopes | | N | N | No impact pathways |
| Western acidic oak woodland | | N | N | No impact pathways |
| Bog woodland* | | N | N | No impact pathways |
| **Cumbrian Marsh Fritillary Site SAC** | **11** | | | |
| Marsh fritillary butterfly | | N | N | No impact pathways |
| **Lake District High Fells SAC** | **0** | | | |
| Slender green feather-moss | | Y | N | Replacement pipeline in SAC; new pipeline will skirt edge of SAC and may enter it if following existing track; significant effects possible. No operational effects |
| Calcareous rocky slopes | | Y | N | |
| Oligotrophic to mesotrophic standing waters | | Y | N | |
| Alkaline fens | | Y | N | |
| Siliceous scree | | Y | N | |
| Wet heaths | | Y | N | |
| Siliceous rocky slopes | | Y | N | |
| Dry heaths | | Y | N | |
| Alpine and Boreal heaths | | Y | N | |

| Option<br>WC06B | Option Name<br>Roughton Gill Mine Adit (Option 2) | | |
|---|---|---|---|
| Juniper on heaths and calcareous grasslands | Y | N | |
| Siliceous alpine and boreal grasslands | Y | N | |
| Blanket bog* | Y | N | |
| Species-rich Nardus grassland* | Y | N | |
| Western acidic oak woodland | Y | N | |
| Hydrophilous tall herb communities | Y | N | |
| **River Eden SAC** | **3** | | |
| Atlantic salmon | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| White-clawed crayfish | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Sea lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Bullhead | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Water courses with Ranunculus-type vegetation | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| River Lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Brook lamprey | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Alluvial forests* | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Otter | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| Oligotrophic to mesotrophic standing waters | U | N | Construction required across tributary of SAC; specific mitigation likely to be required. No operational effects |
| **Tarn Moss SAC** | **14** | | |
| Transition mires and quaking bogs | N | N | No impact pathways |
| **Clints Quarry SAC** | **<1** | | |
| Great crested newt | N | N | In close proximity but effects mitigatable at the scheme level |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Brook lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Sea lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Atlantic salmon | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Marsh fritillary butterfly | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |

| Option<br>WC06B | Option Name<br>Roughton Gill Mine Adit (Option 2) | | |
|---|---|---|---|
| Floating water-plantain | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Otter | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Water courses with Ranunculus-type vegetation | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |
| Atlantic salmon | N | N | No effects, assuming normal best-practice |
| **Solway Firth SAC** | **14** | | |
| Salicornia and other annuals | N | N | No impact pathways |
| Estuaries | N | N | No impact pathways |
| Sandbanks | N | N | No impact pathways |
| Mudflats and sandflats | N | N | No impact pathways |
| Atlantic Salt Meadows | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Reefs | N | N | No impact pathways |
| Grey dunes* | N | N | No impact pathways |
| Perennial vegetation of stony banks | N | N | No impact pathways |
| River Lamprey | N | N | No impact pathways |
| **South Solway Mosses SAC** | **9** | | |
| Active raised bogs* | N | N | No impact pathways |
| Degraded raised bog | N | N | No impact pathways |
| **Upper Solway Flats and Marshes SPA** | **14** | | |
| Barnacle goose | N | N | No impact pathways |
| Bar-tailed godwit | N | N | No impact pathways |
| Curlew | N | N | No impact pathways |
| Dunlin (ssp. alpina) | N | N | No impact pathways |
| Golden plover | N | N | No impact pathways |
| Goldeneye | N | N | No impact pathways |
| Grey plover | N | N | No impact pathways |
| Knot | N | N | No impact pathways |
| Oystercatcher | N | N | No impact pathways |
| Pink-footed goose | N | N | No impact pathways |

| Option<br>WC06B | Option Name<br>Roughton Gill Mine Adit (Option 2) | | |
|---|---|---|---|
| Pintail | N | N | No impact pathways |
| Redshank | N | N | No impact pathways |
| Ringed plover | N | N | No impact pathways |
| Sanderling | N | N | No impact pathways |
| Scaup | N | N | No impact pathways |
| Shelduck | N | N | No impact pathways |
| Shoveler | N | N | No impact pathways |
| Teal | N | N | No impact pathways |
| Turnstone | N | N | No impact pathways |
| Waterfowl assemblage | N | N | No impact pathways |
| Whooper swan | N | N | No impact pathways |
| **Upper Solway Flats and Marshes** | **14** | | |
| 0 | N | N | No impact pathways |

| Option<br>WC07 | Option Name<br>Kirklinton Borehole Development | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option comprises the development of 3 new boreholes at Scaleby and 2 new boreholes at Longtown supplying 5Ml/d of water to a new treatment works located at Skitby. This treated water would be delivered to Waygill Hill service reservoir (SR), to feed the Carlisle WRZ. The option would also require a new booster pumping station (PS), located at the High Brow Nelson SR site, pumping 5Ml/d of water to Quarry Hill WTW SR to feed the West Cumbria WRZ. A further 40km of pipeline from Quarry Hill WTW to Summergrove reservoir via Stainburn would also be required. | The construction of this scheme is unlikely to affect any sites except the River Eden SAC (which the pipeline must cross, presumably by an existing crossing) and the North Pennine Moors SAC / SPA (where construction will be required within 500m at Waygill Hill SR). Construction effects on both of these sites are likely to be avoidable with best-practice and scheme specific mitigation (e.g. avoiding migration periods) although any pipeline excavation outside existing roads may need careful consideration if near the R. Eden.<br><br>Operational impacts are more uncertain. A new abstraction licence will be required and abstraction from this aquifer could affect the River Eden SAC directly (the Scalby boreholes are only 4km from the Eden at its closest point, near Low Crosby) or (more likely) indirectly by affecting flows within tributaries of this watercourse (e.g. the Brunstoke Beck). Similarly, abstraction from the Longtown boreholes could affect the Esk and hence the interest features of the Solway Firth suite of estuarine sites. This would require some additional modelling to quantify, although the CAMS indicates that there is water available for use in the Lower Eden catchment, and the EA has indicated that the under-utilised Curlington aquifer has substantial water available for use. On this basis it is clear that some additional information would be required to support the scheme, although it is recognised that a new licence will not be granted if future investigations demonstrate that the scheme will have an adverse effect on any site. | | | |
| **Site and interest features** | **Dist.** | **LSE? Cons.** | **Oper.** | **Summary** |
| **Bolton Fell Moss SCI** | **1** | | | |
| Degraded raised bog | | N | U | Construction effects avoidable with best-practice; operational effects unlikely as nearest borehole over 5km away |
| **Border Mires, Kielder – Butterburn SAC** | **10** | | | |
| Dry heaths | | N | N | No impact pathway (separate catchment) |
| Petrifying springs with tufa* | | N | N | No impact pathway (separate catchment) |
| Transition mires and quaking bogs | | N | N | No impact pathway (separate catchment) |
| Wet heaths | | N | N | No impact pathway (separate catchment) |
| Blanket bog* | | N | N | No impact pathway (separate catchment) |
| **Clints Quarry SAC** | **<1** | | | |
| Great crested newt | | N | N | In close proximity but effects mitigatable at the scheme level |
| **Cumbrian Marsh Fritillary Site SAC** | **12** | | | |
| Marsh fritillary butterfly | | N | N | No impact pathway |
| **Lake District High Fells SAC** | **6** | | | |
| Slender green feather-moss | | N | N | No impact pathway |

| Option<br>WC07 | Option Name<br>Kirklinton Borehole Development | | |
|---|---|---|---|
| Calcareous rocky slopes | N | N | No impact pathway |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathway |
| Alkaline fens | N | N | No impact pathway |
| Siliceous scree | N | N | No impact pathway |
| Wet heaths | N | N | No impact pathway |
| Siliceous rocky slopes | N | N | No impact pathway |
| Dry heaths | N | N | No impact pathway |
| Alpine and Boreal heaths | N | N | No impact pathway |
| Juniper on heaths and calcareous grasslands | N | N | No impact pathway |
| Siliceous alpine and boreal grasslands | N | N | No impact pathway |
| Blanket bog* | N | N | No impact pathway |
| Species-rich Nardus grassland* | N | N | No impact pathway |
| Western acidic oak woodland | N | N | No impact pathway |
| Hydrophilous tall herb communities | N | N | No impact pathway |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **North Pennine Moors SAC** | **<1** | | |
| Dry heaths | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Western acidic oak woodland | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Siliceous scree | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Siliceous rocky slopes | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Alkaline fens | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Calcareous rocky slopes | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Wet heaths | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Marsh saxifrage | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Blanket bog* | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Juniper on heaths and calcareous grasslands | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Grassland on heavy metal-rich soils | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Siliceous alpine and boreal grasslands | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Calcareous dry grassland and scrub | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |

| Option<br>WC07 | Option Name<br>Kirklinton Borehole Development | | |
|---|---|---|---|
| Petrifying springs with tufa* | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| **North Pennine Moors SPA** | **<1** | | |
| Curlew | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Dunlin (ssp. schinzii) | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Golden plover | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Hen harrier | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Merlin | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| Peregrine falcon | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Brook lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Sea lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Atlantic salmon | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Marsh fritillary butterfly | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Floating water-plantain | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Otter | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Water courses with Ranunculus-type vegetation | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| **River Eden SAC** | **0** | | |
| Atlantic salmon | U | U | Pipeline route crosses river; effects probably mitigatable / avoidable. Operational effects uncertain, likely to lead to local drawdown which may affect the river directly, or through its tributaries |
| White-clawed crayfish | U | U | |
| Sea lamprey | U | U | |
| Bullhead | U | U | |
| Water courses with Ranunculus-type vegetation | U | U | |
| River Lamprey | U | U | |
| Brook lamprey | U | U | |
| Alluvial forests* | U | U | |
| Otter | U | U | |
| Oligotrophic to mesotrophic standing waters | U | U | |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |

| Option<br>WC07 | Option Name<br>Kirklinton Borehole Development | | |
|---|---|---|---|
| Atlantic salmon | N | N | No effects, assuming normal best-practice |
| **Solway Firth SAC** | **5** | | |
| Salicornia and other annuals | N | U | Construction effects avoidable with best-practice; operational effects unlikely to be direct but could impact on surface flows into estuary |
| Estuaries | N | U | |
| Sandbanks | N | U | |
| Mudflats and sandflats | N | U | |
| Atlantic Salt Meadows | N | U | |
| Sea lamprey | N | U | |
| Reefs | N | U | |
| Grey dunes* | N | U | |
| Perennial vegetation of stony banks | N | U | |
| River Lamprey | N | U | |
| **South Solway Mosses SAC** | **6** | | |
| Active raised bogs* | N | N | No impact pathways (construction only within 6km) |
| Degraded raised bog | N | N | No impact pathways (construction only within 6km) |
| **Tyne and Allen River Gravels SAC** | **14** | | |
| Grassland on heavy metal-rich soils | N | N | No impact pathway (separate catchment) |
| **Upper Solway Flats and Marshes** | **5** | | |
| 0 | N | N | Construction within 500m of woodlands near River Gelt, but effects avoidable with best practice. Operational effects unlikely |
| **Upper Solway Flats and Marshes SPA** | **5** | | |
| Barnacle goose | N | U | Construction effects avoidable with best-practice; operational effects unlikely to be direct but could impact on surface flows into estuary |
| Bar-tailed godwit | N | U | |
| Curlew | N | U | |
| Dunlin (ssp. alpina) | N | U | |
| Golden plover | N | U | |
| Goldeneye | N | U | |
| Grey plover | N | U | |
| Knot | N | U | |
| Oystercatcher | N | U | |
| Pink-footed goose | N | U | |
| Pintail | N | U | |

| Option<br>WC07 | Option Name<br>Kirklinton Borehole Development | | |
|---|---|---|---|
| Redshank | N | U | |
| Ringed plover | N | U | |
| Sanderling | N | U | |
| Scaup | N | U | |
| Shelduck | N | U | |
| Shoveler | N | U | |
| Teal | N | U | |
| Turnstone | N | U | |
| Waterfowl assemblage | N | U | |
| Whooper swan | N | U | |
| **Walton Moss SAC** | **3** | | |
| Active raised bogs* | N | U | Construction effects avoidable with best-practice; operational effects unlikely as nearest borehole over 5km away |
| Degraded raised bog | N | U | Construction effects avoidable with best-practice; operational effects unlikely as nearest borehole over 5km away |

| Option<br>WC09 | Option Name<br>Development of Boreholes in North Cumbria Aquifer | | |
|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | |
| This option comprises the construction of two new boreholes at Waverton and Thursby for abstraction and transfer to Quarry Hill WTW. The option would also require a new 8km raw water transfer pipe from Waverton to the WTW and a15km transfer pipe from Thursby to the WTW. A further 25km of pipeline from Quarry Hill WTW to Summergrove reservoir via Stainburn would also be required. The WTW is assumed to be able to accommodate this extra capacity at this stage. | The construction of the scheme would have no effects assuming normal best-practice.<br><br>New borehole abstractions at Waverly and Thursby have the potential to impact on the nearby River Waverly and River Wampool, which discharges into the Solway Firth. The Waverton site is located approximately 12km upstream of Solway Firth, whilst Thursby is around 17 km upstream of the same site (SAC, SPA and Ramsar Site). It has been assumed a 1.5km reach downstream of the abstraction could be impacted, however, and therefore significant effects on this site would not be expected; the EA have indicated that some water is available for use from the North Cumbria aquifer (up to approx. 4.5 Ml/d). All other sites are almost certainly too distant for the abstraction to have a significant direct effect, including the River Eden SAC and the South Solway Mosses SAC which are both over 5km from the nearest borehole. | | |
| **Site and interest features** | **Dist.** | **LSE? Cons.** | **LSE? Oper.** | **Summary** |
| **Clints Quarry SAC** | **<1** | | | |
| Great crested newt | | N | N | In close proximity but effects mitigatable at the scheme level |
| **Cumbrian Marsh Fritillary Site SAC** | **13** | | | |
| Marsh fritillary butterfly | | N | N | No impact pathways |
| **Lake District High Fells SAC** | **7** | | | |
| Slender green feather-moss | | N | N | No impact pathways |
| Calcareous rocky slopes | | N | N | No impact pathways |
| Oligotrophic to mesotrophic standing waters | | N | N | No impact pathways |
| Alkaline fens | | N | N | No impact pathways |
| Siliceous scree | | N | N | No impact pathways |
| Wet heaths | | N | N | No impact pathways |
| Siliceous rocky slopes | | N | N | No impact pathways |
| Dry heaths | | N | N | No impact pathways |
| Alpine and Boreal heaths | | N | N | No impact pathways |
| Juniper on heaths and calcareous grasslands | | N | N | No impact pathways |
| Siliceous alpine and boreal grasslands | | N | N | No impact pathways |
| Blanket bog* | | N | N | No impact pathways |

| Option<br>WC09 | Option Name<br>Development of Boreholes in North Cumbria Aquifer | | |
|---|---|---|---|
| Species-rich Nardus grassland* | N | N | No impact pathways |
| Western acidic oak woodland | N | N | No impact pathways |
| Hydrophilous tall herb communities | N | N | No impact pathways |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Brook lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Sea lamprey | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Atlantic salmon | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Marsh fritillary butterfly | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Floating water-plantain | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Otter | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| Water courses with Ranunculus-type vegetation | N | N | Pipelines will cross Derwent; construction effects should be avoidable; no operational effects |
| **River Eden SAC** | **5** | | |
| Atlantic salmon | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| White-clawed crayfish | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Sea lamprey | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Bullhead | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Water courses with Ranunculus-type vegetation | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| River Lamprey | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Brook lamprey | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Alluvial forests* | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Otter | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| Oligotrophic to mesotrophic standing waters | N | N | No a downstream receptor; abstraction effects possible if significant drawdown but unlikely to be significant |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |
| Atlantic salmon | N | N | No effects, assuming normal best-practice |
| **Solway Firth SAC** | **8/DS** | | |
| Salicornia and other annuals | N | U | No construction effects assuming best-practice; abstraction may affect flows in tributaries but unlikely to be significant at the |
| Estuaries | N | U | estuary |
| Sandbanks | N | U | |

| Option<br>WC09 | Option Name<br>Development of Boreholes in North Cumbria Aquifer | | |
|---|---|---|---|
| Mudflats and sandflats | N | U | |
| Atlantic Salt Meadows | N | U | |
| Sea lamprey | N | U | |
| Reefs | N | U | |
| Grey dunes* | N | U | |
| Perennial vegetation of stony banks | N | U | |
| River Lamprey | N | U | |
| **South Solway Mosses SAC** | **5** | | |
| Active raised bogs* | N | U | No construction effects assuming best-practice; abstraction effects possible if significant drawdown but unlikely to be significant |
| Degraded raised bog | N | U | No construction effects assuming best-practice; abstraction effects possible if significant drawdown but unlikely to be significant |
| **Upper Solway Flats and Marshes** | **8/DS** | | |
| 0 | N | U | No construction effects assuming best-practice; abstraction may affect flows in tributaries but unlikely to be significant at the estuary |
| **Upper Solway Flats and Marshes SPA** | **8/DS** | | |
| Barnacle goose | N | U | No construction effects assuming best-practice; abstraction may affect flows in tributaries but unlikely to be significant at the estuary |
| Bar-tailed godwit | N | U | |
| Curlew | N | U | |
| Dunlin (ssp. alpina) | N | U | |
| Golden plover | N | U | |
| Goldeneye | N | U | |
| Grey plover | N | U | |
| Knot | N | U | |
| Oystercatcher | N | U | |
| Pink-footed goose | N | U | |
| Pintail | N | U | |
| Redshank | N | U | |
| Ringed plover | N | U | |
| Sanderling | N | U | |
| Scaup | N | U | |
| Shelduck | N | U | |
| Shoveler | N | U | |

| Option<br>WC09 | Option Name<br>Development of Boreholes in North Cumbria Aquifer | |
|---|---|---|
| Teal | N | U |
| Turnstone | N | U |
| Waterfowl assemblage | N | U |
| Whooper swan | N | U |

| Option<br>WC10 | Option Name<br>Desalination, Workington | | |
|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | |
| This option comprises a new 20 Ml/d desalination plant located in Workington and would require 63km of associated pipelines, new pumping station and service reservoir at Brigham as well as a new pumping station at Corn How. | The pipelines would cross the River Derwent although the route is currently road-based and so effects could probably be managed with normal best-practice and some scheme-specific measures. Construction would also be required at Workington, and although the scale of this is uncertain it is likely to affect the Derwent estuary and therefore has a high risk of significant effects on the mobile interest features of the site. This impact could be reduced or avoided through appropriate timing of the construction, although in reality this would be difficult and so significant effects would be anticipated.<br><br>Similarly, the mobile species of the River Derwent would be vulnerable to the operation of the scheme; it is not clear where the intake or outfall would be, but it is likely that salinity etc will be locally affected near the estuary with possibly significant effects on the interest features. No other sites are likely to be affected through operation. | | |
| **Site and interest features** | | **LSE?** | **Summary** |
| | **Dist.** | **Cons.** **Oper.** | |
| **Borrowdale Woodland Complex SAC** | **5** | | |
| Siliceous rocky slopes | | N N | No impact pathways |
| Western acidic oak woodland | | N N | No impact pathways |
| Bog woodland* | | N N | No impact pathways |
| **Clints Quarry SAC** | **<1** | | |
| Great crested newt | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| **Lake District High Fells SAC** | **<1** | | |
| Slender green feather-moss | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Calcareous rocky slopes | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Oligotrophic to mesotrophic standing waters | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Alkaline fens | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Siliceous scree | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Wet heaths | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Siliceous rocky slopes | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Dry heaths | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Alpine and Boreal heaths | | N N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |

| Option<br>WC10 | Option Name<br>Desalination, Workington | | |
|---|---|---|---|
| Juniper on heaths and calcareous grasslands | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Siliceous alpine and boreal grasslands | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Blanket bog* | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Species-rich Nardus grassland* | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Western acidic oak woodland | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| Hydrophilous tall herb communities | N | N | Construction required within approx. 1km within roads and significant effects can be avoided with best practice |
| **North Pennine Dales Meadows SAC** | **1** | | |
| Mountain hay meadows | N | N | Construction required within approx. 1km but significant effects can be avoided with best practice |
| Purple moor-grass meadows | N | N | Construction required within approx. 1km but significant effects can be avoided with best practice |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | U | Y | Construction effects possible but can be managed; risk of significant operational effects |
| Brook lamprey | N | N | Feature unlikely to be exposed to effects of scheme; construction effects avoidable |
| Sea lamprey | U | Y | Construction effects possible but can be managed; risk of significant operational effects |
| Oligotrophic to mesotrophic standing waters | N | N | Feature unlikely to be exposed to effects of scheme; construction effects avoidable |
| Atlantic salmon | U | Y | Construction effects possible but can be managed; risk of significant operational effects |
| Marsh fritillary butterfly | N | N | Feature unlikely to be exposed to effects of scheme; construction effects avoidable |
| Floating water-plantain | N | N | Feature unlikely to be exposed to effects of scheme; construction effects avoidable |
| Otter | U | U | Construction effects possible but can be managed; risk of significant operational effects |
| Water courses with Ranunculus-type vegetation | N | N | Feature unlikely to be exposed to effects of scheme; construction effects avoidable |
| **River Eden SAC** | **12** | | |
| Atlantic salmon | N | N | No impact pathways |
| White-clawed crayfish | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Bullhead | N | N | No impact pathways |
| Water courses with Ranunculus-type vegetation | N | N | No impact pathways |
| River Lamprey | N | N | No impact pathways |
| Brook lamprey | N | N | No impact pathways |
| Alluvial forests* | N | N | No impact pathways |
| Otter | N | N | No impact pathways |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |
| **River Ehen SAC** | **2** | | |

| Option<br>WC10 | Option Name<br>Desalination, Workington | | |
|---|---|---|---|
| Freshwater pearl mussel | N | N | Construction required within approx. 2km but significant effects can be avoided with best practice |
| Atlantic salmon | N | N | Construction required within approx. 2km but significant effects can be avoided with best practice |
| **Solway Firth SAC** | **12** | | |
| Salicornia and other annuals | N | N | No impact pathways |
| Estuaries | N | N | No impact pathways |
| Sandbanks | N | N | No impact pathways |
| Mudflats and sandflats | N | N | No impact pathways |
| Atlantic Salt Meadows | N | N | No impact pathways |
| Sea lamprey | N | N | No impact pathways |
| Reefs | N | N | No impact pathways |
| Grey dunes* | N | N | No impact pathways |
| Perennial vegetation of stony banks | N | N | No impact pathways |
| River Lamprey | N | N | No impact pathways |
| **South Solway Mosses SAC** | **7** | | |
| Active raised bogs* | N | N | No impact pathways |
| Degraded raised bog | N | N | No impact pathways |
| **Wast Water SAC** | **15** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |
| **Upper Solway Flats and Marshes SPA** | **12** | | |
| Barnacle goose | N | N | No impact pathways |
| Bar-tailed godwit | N | N | No impact pathways |
| Curlew | N | N | No impact pathways |
| Dunlin (ssp. alpina) | N | N | No impact pathways |
| Golden plover | N | N | No impact pathways |
| Goldeneye | N | N | No impact pathways |
| Grey plover | N | N | No impact pathways |
| Knot | N | N | No impact pathways |
| Oystercatcher | N | N | No impact pathways |
| Pink-footed goose | N | N | No impact pathways |
| Pintail | N | N | No impact pathways |
| Redshank | N | N | No impact pathways |

| Option<br>WC10 | Option Name<br>Desalination, Workington | | |
|---|---|---|---|
| Ringed plover | N | N | No impact pathways |
| Sanderling | N | N | No impact pathways |
| Scaup | N | N | No impact pathways |
| Shelduck | N | N | No impact pathways |
| Shoveler | N | N | No impact pathways |
| Teal | N | N | No impact pathways |
| Turnstone | N | N | No impact pathways |
| Waterfowl assemblage | N | N | No impact pathways |
| Whooper swan | N | N | No impact pathways |
| **Upper Solway Flats and Marshes** | **12** | | |
| 0 | N | N | No impact pathways |

| Option<br>WC14D | Option Name<br>Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | | | |
|---|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | | |
| This option comprises the transfer of water from Kielder Water in the Northumbrian Water supply region to the West Cumbria WRZ. The option would require: a new intake structure, pumping station and screening equipment at Kielder Water with a 80Ml/d capacity; new 40km raw water transfer main from Kielder to Carlisle; new booster pumping station located at Catgallow service reservoir; new WTW facility adjacent to Cumwhinton WTW; 23km raw water transfer main to Quarry Hill WTW; new bulk supply point (BSP) located close to Quarry Hill WTW; new branch main feed into Quarry Hill service reservoir; new continuation of previous LDTM between the new Quarry Hill BSP and a further BSP located close to Corn How service reservoir; new main between Corn How BSP and Corn How service reservoir and fluoridation at the reservoir; and new continuation of previous LDTM between Corn How pumping station and Summergrove service reservoir (with fluoridation at the reservoir). The option would also involve the abandonment of three existing WTWs in West Cumbria namely, Quarry Hill, Ennerdale, and Corn How. | There are a number of major uncertainties around the scheme which will determine the likelihood of significant effects - not least the uncertainty regarding pipeline routes from Kielder to the United Utilities network.<br>For Option WC14 d the main impacts are likely to be associated with construction, but will depend heavily on the pipeline routes. At the moment, the primary pipeline from Kielder to United Utilities is assumed to be a straight line across Kielder Forest (and hence across the Border Mires, Kielder – Butterburn SAC) although clearly this will be unacceptable. It should be possible to identify a cross-country route that will not affect any European sites directly, although the mire sites will have hydrological linkages extending a considerable distance from the site boundaries and it may be necessary to consider a significant diversion. At the moment, it is likely that the scheme will have significant construction effects on the Border Mires, Kielder – Butterburn SAC and (probably) the River Eden SAC (since several tributaries are crossed, not at existing crossing points). However, careful routing and scheme-specific mitigation could avoid or minimise these impacts.<br>Operational effects will be limited and not significant; the use of water from Kielder will not affect any WRD interest features at sites within its catchment and the only real mechanism for impacts would be indirect, through increases in discharges in the United Utilities WRZs after usage (in theory, 80Ml/d could be entering the West Cumbria WRZ). In reality, however, it is assumed that the transfer will be tailored to the deficit (there is no point in transferring 80Ml/d if it is not all required) and any increase in (for example) river flows will be well within natural variation. Although an interbasin transfer of raw water, it will be treated immediately on arrival and risks associated with this (e.g. invasive species transfer, significant variations in water chemistry) would not be expected.<br>On this basis, assuming that a suitable pipeline route can be established that avoids direct effects on any SAC, the scheme would not have any significant and unavoidable effects. | | | |
| **Site and interest features** | **Dist.** | **LSE? Cons.** | **LSE? Oper.** | **Summary** |
| **Bolton Fell Moss SCI** | **6** | | | |
| Degraded raised bog | | N | N | No impact pathways |
| **Border Mires, Kielder – Butterburn SAC** | **0** | | | |
| Dry heaths | | Y | Y | Current route crosses SAC; significant adverse effects likely unless alternative route chosen; route would also have operational effects associated with pipe maintenance |
| Petrifying springs with tufa* | | Y | Y | Current route crosses SAC; significant adverse effects likely unless alternative route chosen; route would also have operational effects associated with pipe maintenance |
| Transition mires and quaking bogs | | Y | Y | Current route crosses SAC; significant adverse effects likely unless alternative route chosen; route would also have operational effects associated with pipe maintenance |
| Wet heaths | | Y | Y | Current route crosses SAC; significant adverse effects likely unless alternative route chosen; route would also have operational |

| Option<br>WC14D | Option Name<br>Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | | |
|---|---|---|---|
| | | | effects associated with pipe maintenance |
| Blanket bog* | Y | Y | Current route crosses SAC; significant adverse effects likely unless alternative route chosen; route would also have operational effects associated with pipe maintenance |
| **Borrowdale Woodland Complex SAC** | **5** | | |
| Siliceous rocky slopes | N | N | No impact pathways |
| Western acidic oak woodland | N | N | No impact pathways |
| Bog woodland* | N | N | No impact pathways |
| **Clints Quarry SAC** | **<1** | | |
| Great crested newt | U | N | Scheme specific mitigation required; high likelihood of success; no effects if in road |
| **Cumbrian Marsh Fritillary Site SAC** | **5** | | |
| Marsh fritillary butterfly | N | N | No impact pathways |
| **Lake District High Fells SAC** | **<1** | | |
| Slender green feather-moss | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Calcareous rocky slopes | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Oligotrophic to mesotrophic standing waters | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Alkaline fens | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Siliceous scree | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Wet heaths | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Siliceous rocky slopes | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Dry heaths | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Alpine and Boreal heaths | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Juniper on heaths and calcareous grasslands | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Siliceous alpine and boreal grasslands | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Blanket bog* | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Species-rich Nardus grassland* | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Western acidic oak woodland | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| Hydrophilous tall herb communities | N | N | Site within 1km but will not be directly affected and features unlikely to be impacted by development |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impacts assuming normal best-practice |
| Purple moor-grass meadows | N | N | No impacts assuming normal best-practice |
| **North Pennine Moors SAC** | **3** | | |

| Option<br>WC14D | Option Name<br>Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | | |
|---|---|---|---|
| Dry heaths | N | N | No impacts assuming normal best-practice |
| Western acidic oak woodland | N | N | No impacts assuming normal best-practice |
| Siliceous scree | N | N | No impacts assuming normal best-practice |
| Siliceous rocky slopes | N | N | No impacts assuming normal best-practice |
| Alkaline fens | N | N | No impacts assuming normal best-practice |
| Calcareous rocky slopes | N | N | No impacts assuming normal best-practice |
| Wet heaths | N | N | No impacts assuming normal best-practice |
| Marsh saxifrage | N | N | No impacts assuming normal best-practice |
| Blanket bog* | N | N | No impacts assuming normal best-practice |
| Juniper on heaths and calcareous grasslands | N | N | No impacts assuming normal best-practice |
| Grassland on heavy metal-rich soils | N | N | No impacts assuming normal best-practice |
| Siliceous alpine and boreal grasslands | N | N | No impact pathways |
| Calcareous dry grassland and scrub | N | N | No impact pathways |
| Petrifying springs with tufa* | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Brook lamprey | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Sea lamprey | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Oligotrophic to mesotrophic standing waters | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Atlantic salmon | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Marsh fritillary butterfly | U | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Floating water-plantain | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Otter | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Water courses with Ranunculus-type vegetation | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| **River Eden SAC** | **0** | | |
| Atlantic salmon | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| White-clawed crayfish | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Sea lamprey | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Bullhead | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Water courses with Ranunculus-type vegetation | N | U | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| River Lamprey | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |

| Option<br>WC14D | Option Name<br>Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | | |
|---|---|---|---|
| Brook lamprey | U | Y | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Alluvial forests* | N | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Otter | N | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| Oligotrophic to mesotrophic standing waters | N | N | Construction of pipeline likely to cross SAC; bespoke mitigation required |
| **River Ehen SAC** | **2/DS** | | |
| Freshwater pearl mussel | N | N | Construction of pipeline likely to cross tributaries of SAC; bespoke mitigation required |
| Atlantic salmon | N | N | Construction of pipeline likely to cross tributaries of SAC; bespoke mitigation required |
| **Solway Firth SAC** | **11/DS** | | |
| Salicornia and other annuals | N | N | No impacts assuming normal best-practice |
| Estuaries | N | N | No impacts assuming normal best-practice |
| Sandbanks | N | N | No impacts assuming normal best-practice |
| Mudflats and sandflats | N | N | No impacts assuming normal best-practice |
| Atlantic Salt Meadows | N | N | No impacts assuming normal best-practice |
| Sea lamprey | U | N | No impacts assuming effects on Eden are avoided |
| Reefs | N | N | No impacts assuming normal best-practice |
| Grey dunes* | N | N | No impact pathways |
| Perennial vegetation of stony banks | N | N | No impact pathways |
| River Lamprey | U | N | No impacts assuming effects on Eden are avoided |
| **South Solway Mosses SAC** | **9** | | |
| Active raised bogs* | N | N | No impact pathways |
| Degraded raised bog | N | N | No impact pathways |
| **Tyne and Allen River Gravels SAC** | **13** | | |
| Grassland on heavy metal-rich soils | N | N | No impact pathways (separate catchment) |
| **Walton Moss SAC** | **4** | | |
| Active raised bogs* | N | N | No impact pathways |
| Degraded raised bog | N | N | No impact pathways |
| **Wast Water SAC** | **14** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways (separate catchment) |
| **North Pennine Moors SPA** | **3** | | |
| Curlew | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |
| Dunlin (ssp. schinzii) | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |

| Option<br>WC14D | Option Name<br>Kielder Water Transfer to West Cumbria (Cumwhinton Treated) | | |
|---|---|---|---|
| Golden plover | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |
| Hen harrier | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |
| Merlin | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |
| Peregrine falcon | N | N | Risk of construction disturbance, may need bespoke mitigation; operational effects unlikely |
| **Upper Solway Flats and Marshes SPA** | **11/DS** | | |
| Barnacle goose | N | N | No impacts assuming normal best-practice |
| Bar-tailed godwit | N | N | No impacts assuming normal best-practice |
| Curlew | N | N | No impacts assuming normal best-practice |
| Dunlin (ssp. alpina) | N | N | No impacts assuming normal best-practice |
| Golden plover | N | N | No impacts assuming normal best-practice |
| Goldeneye | N | N | No impacts assuming normal best-practice |
| Grey plover | N | N | No impacts assuming normal best-practice |
| Knot | N | N | No impacts assuming normal best-practice |
| Oystercatcher | N | N | No impacts assuming normal best-practice |
| Pink-footed goose | N | N | No impacts assuming normal best-practice |
| Pintail | N | N | No impacts assuming normal best-practice |
| Redshank | N | N | No impacts assuming normal best-practice |
| Ringed plover | N | N | No impacts assuming normal best-practice |
| Sanderling | N | N | No impacts assuming normal best-practice |
| Scaup | N | N | No impacts assuming normal best-practice |
| Shelduck | N | N | No impacts assuming normal best-practice |
| Shoveler | N | N | No impacts assuming normal best-practice |
| Teal | N | N | No impacts assuming normal best-practice |
| Turnstone | N | N | No impacts assuming normal best-practice |
| Waterfowl assemblage | N | N | No impacts assuming normal best-practice |
| Whooper swan | N | N | No impacts assuming normal best-practice |
| **Irthinghead Mires** | **4** | | |
| 0 | N | N | No impact pathways |
| **Upper Solway Flats and Marshes** | **11/DS** | | |
| 0 | U | N | Current route runs within 4km, site vulnerable to hydrological impacts; likely to be functionally linked. Significant effects possible |

| Option<br>WC19 | Option Name<br>Crummock Automated Compensation Control | | |
|---|---|---|---|
| **Summary description of scheme** | **General assessment** | | |
| This option would involve the replacement of Crummock weir's penstock with automated compensation control. This would allow for an automated control of the compensation flow to the River Derwent. The option would also require 16km of new pipeline from Stainburn to Summergrove service reservoirs. The engineering scope states this will benefit deployable output by 2.7 Ml/d by allowing the compensation release to be controlled more accurately and responsively to changes in flows. All abstraction and compensation release will still occur within the boundaries of the existing licence agreement. | The River Derwent and Bassenthwaite Lake SAC will be affected by the option but the construction works required to deliver this option would be relatively minor and can be controlled / managed with normal best practice and scheme-specific measures (e.g. avoiding key migration periods, etc), and no adverse effects would be anticipated although project-level appropriate assessment would be required.<br>Operation of the scheme would be within the terms of the existing licence, and would allow releases to be more responsive to the needs of the river; however, although additional abstraction would be within existing licences but it would be higher than recent actual so River Cocker actual flows would tend to be lower on average than they have been recently. It is therefore possible that the River Derwent and Bassenthwaite Lake SAC could be affected by the scheme as compensation flows into the River Cocker would be reduced relative to the current volumes as the releases currently 'over-compensate' for the inaccuracies in gauging. It is therefore possible that there may be effects on the interest features, although the changes would be within the existing licensed volumes. | | |
| **Site and interest features** | | **LSE?** | **Summary** |
| | **Dist.** | **Cons.** **Oper.** | |
| **Borrowdale Woodland Complex SAC** | **4** | | |
| Siliceous rocky slopes | | N N | No impact pathways |
| Western acidic oak woodland | | N N | No impact pathways |
| Bog woodland* | | N N | No impact pathways |
| **Clints Quarry SAC** | **15** | | |
| Great crested newt | | N N | No impact pathways |
| **Lake District High Fells SAC** | **<1** | | |
| Slender green feather-moss | | N N | No effects assuming normal construction best-practice |
| Calcareous rocky slopes | | N N | No effects assuming normal construction best-practice |
| Oligotrophic to mesotrophic standing waters | | N N | No effects assuming normal construction best-practice |
| Alkaline fens | | N N | No effects assuming normal construction best-practice |
| Siliceous scree | | N N | No effects assuming normal construction best-practice |
| Wet heaths | | N N | No effects assuming normal construction best-practice |
| Siliceous rocky slopes | | N N | No effects assuming normal construction best-practice |
| Dry heaths | | N N | No effects assuming normal construction best-practice |
| Alpine and Boreal heaths | | N N | No effects assuming normal construction best-practice |

| Option<br>WC19 | Option Name<br>Crummock Automated Compensation Control | | |
|---|---|---|---|
| Juniper on heaths and calcareous grasslands | N | N | No effects assuming normal construction best-practice |
| Siliceous alpine and boreal grasslands | N | N | No effects assuming normal construction best-practice |
| Blanket bog* | N | N | No effects assuming normal construction best-practice |
| Species-rich Nardus grassland* | N | N | No effects assuming normal construction best-practice |
| Western acidic oak woodland | N | N | No effects assuming normal construction best-practice |
| Hydrophilous tall herb communities | N | N | No effects assuming normal construction best-practice |
| **North Pennine Dales Meadows SAC** | **5** | | |
| Mountain hay meadows | N | N | No impact pathways |
| Purple moor-grass meadows | N | N | No impact pathways |
| **River Derwent and Bassenthwaite Lake SAC** | **0** | | |
| River Lamprey | Y | U | Construction will impact the SAC although this will be significant (i.e. not negligible) it will probably not be adverse. Operational effects will be within the terms of the existing licence but flows will be reduced relative to the status quo which is likely to affect the SAC |
| Brook lamprey | Y | U | |
| Sea lamprey | Y | U | |
| Oligotrophic to mesotrophic standing waters | Y | U | |
| Atlantic salmon | Y | U | |
| Marsh fritillary butterfly | Y | U | |
| Floating water-plantain | Y | U | |
| Otter | Y | U | |
| Water courses with Ranunculus-type vegetation | Y | U | |
| **River Ehen SAC** | **3** | | |
| Freshwater pearl mussel | N | N | No effects, assuming normal best-practice |
| Atlantic salmon | N | N | No effects, assuming normal best-practice |
| **Wast Water SAC** | **13** | | |
| Oligotrophic to mesotrophic standing waters | N | N | No impact pathways |

| Option<br>WC23A | Option Name<br>Supply of Final Effluent to Non-household Customers |
|---|---|
| **Summary description of scheme** | **General assessment** |
| This option would involve the supply of final effluent to non-household customers as non-potable supply. There are a number of possible customers that could accept final effluent from various facilities in the West Cumbria WRZ and no specific wastewater treatment works have been identified for the implementation of this option (as implementation would be dependent on the location of customers that can accept final effluent as a non-potable supply). | It is not possible to undertake an assessment on this option as the effects will depend entirely on the location of the customer and hence the supplying WTW. The use of final effluent could be beneficial or deleterious, depending on the location of the WTW and which European sites could be affected (particularly as a proportion of the effluent use would probably be consumptive). However, effluent re-use would generally be expected to have beneficial consequences for the environment and therefore would be worth including as a preferred option despite the uncertainty, since this can only be resolved at the scheme level and effects are more likely to be beneficial than negative. |

| Option<br>WC23B | Option Name<br>Supply of Final Effluent to Non-household Customers |
|---|---|
| **Summary description of scheme** | **General assessment** |
| As per Option WC23a but capacity increased to 1Ml/d. | As per option WC23A |

| Option<br>WC23C | Option Name<br>Supply of Final Effluent to Non-household Customers |
|---|---|
| **Summary description of scheme** | **General assessment** |
| As per Option WC23a but capacity increased to 2Ml/d. | As per option WC23A |

| Option<br>WC72 | Option Name<br>Raw Water Reduction of Losses (leak detection) |
|---|---|
| **Summary description of scheme** | **General assessment** |
| This option would involve reducing raw water losses from the system. This would include identification of leaks on raw water transfers and repairing pipes to reduce leakage. | This cannot be assessed at this level since the location of leaks is not known. However, it would be unlikely to result in significant effects unless the repairs were located in / close to a European site, in which case scheme-specific measures would be required. |

# Appendix F
# Summary of ‘in combination’ assessment with other strategic plans


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**Table I1 Assessment of possible in combination effects with other strategic plans**

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| DECC (2011) National Policy Statements for Energy Infrastructure | The energy National Policy Statements (NPSs) set out national policy against which proposals for major energy projects will be assessed and decided on by the Infrastructure Planning Commission. The following six NPSs have been designated:<br>- Overarching NPS for Energy (EN1);<br>- Fossil Fuel Electricity Generating Infrastructure NPS (EN2);<br>- Renewable Energy Infrastructure NPS (EN3) ;<br>- Gas Supply Infrastructure & Gas and Oil Pipelines NPS (EN4);<br>- Electricity Networks Infrastructure NPS (EN5);<br>- Nuclear Power Generation NPS (EN6).<br>The Overarching NPS for Energy sets out that the purpose of the NPSs is to develop a clear, long-term policy framework which facilitates investment in the necessary new infrastructure (by the private sector) and in energy efficiency. The NPS highlights that the construction, operation and decommissioning of this infrastructure can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment. The NPSs expect applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment.<br>Two sites are identified in the United Utilities area (Heysam and Sellafield) as being potentially suitable for the deployment of a new nuclear power station. .<br>The NPSs reiterate and are underpinned by the target to cut greenhouse gas emissions by at least 80 per cent by 2050, compared to 1990 levels. | Neutral | Yes | The WRMP may need to consider the potential impact of major energy proposals on water resources in the United Utilities area. This may include the potential development of nuclear power stations at Heysham and Sellafield.<br>The HRA has considered these proposals, and no adverse effects are likely based on the available data. |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Defra (2000) Waterways for Tomorrow | The key objective of this document is the promotion of waterways, encouraging their use and development whilst maximising the opportunities the waterways offer for leisure and recreation as a catalyst for urban and rural regeneration and for freight transport. The strategy also encourages the innovative use of waterways such as water transfer and telecommunication. | Positive | No | The WRMP should contribute towards meeting the objective of the strategy.<br>No in combination effects |
| Defra (2005) Making Space for Water: Taking forward a new Government strategy for flood and coastal erosion risk management in England (first Government response to 2004 consultation) | The programme seeks to embed flood and coastal erosion risk management across a range of Government policies, including planning, urban and rural development, agriculture, transport, nature conservation and conservation of the historic environment.<br>Objectives:<br>- To reduce the threat of flooding to people and their property; and<br>- To deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles.<br>Targets:<br>No formal targets or indicators. | Positive | No | The WRMP may have some linkages with this strategy but in combination effects are unlikely. |
| Defra (2006) Shoreline Management Plan Guidance | A shoreline management plan (SMP) is a coastal defence management tool. It is a large-scale assessment of the risks associated with coastal processes and helps to reduce these risks to people and the developed, historic and natural environment. This guidance document sets out Defra's and the Welsh Government's strategy for managing flooding and coastal erosion. | Positive | No | In combination effects unlikely with preferred option; will not affect shorelines |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Defra (2012) National Policy Statement for Waste Water | This National Policy Statement (NPS) sets out Government policy for the provision of major waste water infrastructure. It will be used by the Infrastructure Planning Commission (IPC) to guide its decision making on development consent applications for waste water developments that fall within the definition of Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act 2008. As well as considering the general need for new waste water infrastructure, this NPS covers two NSIPs which have been assessed as required to meet this need although these do not fall within the United Utilities or neighbouring areas and are therefore unlikely to influence, or be influenced by, the WRMP. | Positive | Yes | No major waste water infrastructure is planned and in combination effects not likely |
| Environment Agency (2005) Cleaner Coasts, Healthier Seas: EA Marine Strategy | This is EA's Marine Strategy which aims to create cleaner coasts and healthier seas by:<br>- Promoting sustainable development;<br>- Integrating management between land and sea;<br>- Providing efficient regulation of our coasts and coastal waters;<br>Ensuring that we all value our coastal and marine environment. | Positive | No | |
| Environment Agency (2008) Better Sea Trout and Salmon Fisheries: Our Strategy for 2008-2021 | The strategy has the goal of more sea trout and more salmon in more rivers bringing more benefit. This goal is to be brought about through achieving three broad targets:<br>1 Self-sustaining sea trout and salmon in abundance in more rivers<br>2 Economic and social benefits optimised for sea trout and salmon fisheries<br>3 Widespread and positive partnerships, producing benefits<br>There are twelve more detailed targets lying below these broad goals which relate to salmon and fisheries. These could be relevant to monitoring the effects of the WRMP, e.g. a target of 70 per cent of rivers outside the 'at risk' (i.e. better than) the 'at risk' category in 2011 and 2021 to demonstrate rivers meeting their potential for salmon | Positive | No | Objectives for fisheries management will generally benefit some SACs. Potential to conflict with WRMP, but in combination effects unlikely. |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Environment Agency (2009) Water for People and the Environment: Water Resource Strategy for England and Wales | EA's water resources strategy sets out how EA believe water resources should be managed England and Wales to 2050 and beyond to ensure that there will be enough water for people and the environment. It sets out how water resources should be managed within Defra frameworks in its water strategy for England 'Future Water', and in Wales, the Welsh Government's 'Environment Strategy for Wales'.<br>Objectives in the strategy are set out under four broad themes: adapting to and mitigating climate change; a better water environment; sustainable planning and management of water resources; and, water and the water environment are valued. | Positive | No | Potential to conflict with WRMP, although is taken into account in the plan development. In combination effects unlikely. |
| Environment Agency (2009) Water for People and the Environment: Water Resource Strategy for Wales | This strategy sets out how the EA will exercise its statutory duty to secure the proper use of water resources in Wales for the next 25 years. It considers both the environment and societies need for water and looks at the uncertainties about future water demand and availability. | Positive | No | Potential to conflict with WRMP, although is taken into account in the plan development. In combination effects unlikely. |
| Environment Agency (2012) Water Resources Planning Guidelines | The water resources planning guideline provides a framework for water companies to follow in developing and presenting their water resources plans. It sets out good practice behind the composition of a plan, the approaches to developing a plan and the information that a plan should contain. Companies should follow this guideline to ensure that their plans cover the requirements specified by the Water Industry Act 1991.<br>Consultation has recently been undertaken on revised guidelines published in March 2012, with final guidelines published in June 2012. | - | No | WRMP uses these guidelines during production, no pathway for in combination effects |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Environment Agency (various) Drought Plans | Drought Plans prepared by the EA:<br>- outline how the EA will manage water resources during a drought and defines their role and responsibilities;<br>- aim to reconcile the competing interests of the environment, the need for public water supply and other abstractions;<br>- show what additional environmental monitoring the EA will carry out;<br>- provide a framework for liaison with water companies, awareness campaigns and determination of drought permits;<br>- range from high-level activities where they co-ordinate drought management over England and Wales to a local level where they outline specific operational activities.<br>Those plans particularly relevant to the United Utilities area include the Head Office Drought Plan (covering England and Wales), Drought Plans for the North West as well as area plans for Yorkshire and the North East, Midlands and Anglian regions and the Environment Agency Wales Drought plan. | Neutral | Yes | Drought plans are taken into account in the preparation of the WRMP and the UU Drought Plan and therefore significant adverse effects are unlikely. |
| Welsh Government (2008) People, Places, Futures: The Wales Spatial Plan 2008 Update | The Wales Spatial Plan provides the context and direction of travel for local development plans and the work of local service boards. The 2008 update brings the Wales Spatial Plan into line with One Wales, and gives status to the area work which has developed since 2006. | Neutral | No | This plan is taken into account in the preparation of the WRMP and therefore significant adverse effects are unlikely. |
| Welsh Government (2011) Strategic Policy Position Statement on Water | The Welsh Government published its first Strategic Policy Position Statement on Water in 2009 with the purpose of providing Ofwat, the water companies, regulators and other interested parties a clear steer on the Welsh Government's priorities for water in the context of the water price review. This revised Statement updates the position reflecting key developments over the last two years and highlights areas that will be a priority in the future | Neutral | No | This plan is taken into account in the preparation of the WRMP and therefore significant adverse effects are unlikely. |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Other Water Company Drought Plans | Drought Plans set out the steps that each water company will take through the stages of developing drought, drought, severe drought and recovery from drought to ensure their supply of water resources. Drought Plans must be produced by all water companies to fulfil their requirements under the Water Act 2003. Those Drought Plans relevant to the WRMP are:<br>- United Utilities Draft Drought Plan;<br>- Dee Valley Water Draft Drought Plan;<br>- Welsh Water Drought Plan<br>- Severn Trent Water Drought Plan;<br>- Yorkshire Water Drought Plan.<br>- Northumbrian Water Drought Plan | Neutral | Yes | The drought plans aim to plan appropriately for droughts and avoid adverse effects on European sites. However, the drought plan proposals need to be reviewed after the WRMPs are produced and therefore the assessment cannot be made at this stage; however, the WRMP as proposed will not have in combination effects with the proposals contained with the existing drought plans. |
| Other Water Company WRMPs | These are in preparation and cannot be assessed | - | - | - |
| Environment Agency (2012) Managing Drought in the North West | The Environment Agency's drought plan for the north west sets out the indicators the EA currently use to classify the different stages of drought. This plan sets out:<br>which organisations are involved in managing drought and what their responsibilities are<br>the impacts of drought on businesses and communities<br>the Environment Agency's commitments<br>how to find out further information and how we can work together.<br>The Environment Agency's regional drought plans are voluntary and are not required under statutory legislation, nor under regulatory or administrative provision. | | | Drought plans are taken into account in the preparation of the WRMP and the UU Drought Plan and therefore significant adverse effects are unlikely. |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Drought Contingency Plans – Environment Agency | The EA produce drought plans for each EA region to set out how to plan for and manage drought. | - | Yes | The drought plans aim to plan appropriately for droughts and avoid adverse effects on European sites. However, some drought plan proposals need additional investigations to ensure that significant or adverse effects do not occur. |
| Catchment Abstraction Management Strategies (CAMS) | Catchment Abstraction Management Strategies are six year plans detailing how the Environment Agency are going to manage the water resources/water abstraction of different river catchments. | Positive | No | The CAMS are designed to avoid or prevent significant effects on European sites and are a component of the RoC process. |
| Environment Agency – Catchment Flood Management Plans | Not yet published for catchments in Wales. They are being developed with the main aims of:<br>• Understanding the factors that contribute to the flood risk within the catchment, such as land use;<br>• Recommending the best ways to manage the flood risk within the catchment over the next 50 – 100 years. | Neutral | No | In combination effects unlikely as the CFMPs are subject to HRA. |
| Environment Agency – River Basin Management Plans | Not yet completed. | Positive | No | In combination effects unlikely as the RBMPs are subject to HRA. |
| Environment Agency Water Resources for the Future –Strategy for Wales (2001) | This strategy sets out how the EA will exercise its statutory duty to secure the proper use of water resources in Wales for the next 25 years. It considers both the environment and societies need for water and looks at the uncertainties about future water demand and availability. | Positive | No | Potential to conflict with WRMP, although is taken into account in the plan development. In combination effects unlikely. |
| Environment Strategy for Wales (2006) | The Environment Strategy for Wales was produced in 2006. Its purpose is to provide a framework within which to achieve an environment which is clean, healthy, biologically diverse and valued by the people of Wales. | Positive | No | |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Local Authority Unitary Development Plans | Plans that provide policies governing or directing development (among other things) within each county. | Neutral | Yes | The plans predate the requirement for HRA and therefore may have in combination effects with the WRMP, although this is most likely in respect of non-water resource / growth issues as this aspect has been considered within the WRMP. |
| Local Biodiversity Action Plans (LBAPs) | Local BAPs will have targets for some European species (e.g. otter) and are likely to have a beneficial effect on European sites. | Positive | No | Potential to conflict with WRMP, but in combination effects unlikely. |
| Maintaining Water Supply – Environment Agency (2004) | The Environment Agencies advice to Ministers on the final water resource management plans submitted by water companies as part of the 2004 periodic review. | Positive | No | This advice will be superseded by the new Revised WRMP. |
| National Park Management Plans | Under development (Pembrokeshire completed). | Positive | No | Potential to conflict with WRMP (e.g. with regard to policies on construction within national parks), but in combination effects unlikely. |
| National Salmon Strategy (1996) | Sets out the four objectives for the management of salmon fisheries in England and Wales 1) Optimise the number of salmon returning to home water fisheries 2) Maintain and improve fitness and diversity of salmon stocks 3) Optimise the total economic value of surplus stock 4) Ensure beneficiaries meet necessary costs. | Neutral | No | Objectives for fisheries management will generally benefit some SACs. Potential to conflict with WRMP, but in combination effects unlikely. |
| National Trout and Grayling Fisheries Strategy – Environment Agency | The strategy aims to conserve and improve wild stocks of trout, sea trout, char and grayling while enhancing the environment for all types of fisheries for these species in England and Wales. It also aims to enhance the social and economic benefits derived from these fisheries. | Positive | | Potential to conflict with WRMP, but in combination effects unlikely. |
| Salmon Action Plans – Environment Agency | Salmon action plans have been produced for the following river catchments in Wales: Cleddau; Clwyd; Conwy; Dee; Dwyfor; River Dyfi; Dysynni; Glaslyn and Dwyryd; Mawddach; Nevern; Ogmore; Ogwen; Rheidol; Taf; Taff and Ely; Tawe; Teifi; River Usk; River Wye. The aim is to ensure that national salmon targets are met. | Positive | No | Potential to conflict with WRMP, but in combination effects unlikely. |

| Plan | Summary (from SEA) | Likely Net Effect of Plan on European Sites | Potential for LSE i/c With WRMP | Notes |
|---|---|---|---|---|
| Sustainable Fisheries Programme – Environment Agency Wales | The Sustainable Fisheries Programme aims to ensure that the fisheries of Wales are healthy, productive and biologically diverse and that they provide a valuable and sustainable natural resource for local Welsh communities and visitors to Wales. | Positive | No | Potential to conflict with WRMP, but in combination effects unlikely. |
| Waterways for Wales – Consultation Draft 2003 | Sets out a strategic approach to the revitalisation of the waterways of Wales in terms of; economic regeneration, rural recovery, sustainable living, vitality of Welsh cultural heritage and Wales in the wider world. | - | Yes | Abstraction to supply some waterways is a significant potential in combination effect, although this can only be assessed through the RoC. |
| A Strategy for the Recreation Fisheries of Wales (November 2003) | This strategy sets out a framework for optimising the value to Wales of its coastal and inland recreational fisheries through working in partnership. | Positive | No | |
| Environment Agency – Catchment Flood Management Plans | Not yet published for catchments in Wales. They are being developed with the main aims of:<br>• Understanding the factors that contribute to the flood risk within the catchment, such as land use;<br>• Recommending the best ways to manage the flood risk within the catchment over the next 50 – 100 years. | Neutral | No | In combination effects unlikely as the CFMPs are subject to HRA. |

**F11**

# Appendix G
# Mitigation, avoidance measures and best-practice

## Overview

The HRA has established that some of the feasible options have the potential for effects on at least one European site, primarily through potential construction-related effects. However, for most of the options it is clear that the potential effects are of a scale and type that could certainly be avoided at the scheme-level with standard and accepted measures, such as construction best-practice, or with obvious and reliable scheme-specific measures.

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

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

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

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

### General Measures and Principles

#### *Scheme Design and Planning*

All options (both Preferred and Feasible options) will be subject to project-level environmental assessment[27] as they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (*inter alia*):

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

[27] These will be undertaken as part of the detailed 'investigation schemes' which are funded through inclusion in the WRMP.

### *Pollution Prevention*

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

- Environment Agency Pollution Prevention Guidance Notes [online]. Available at http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx:
  - PPG1: General guide to the prevention of pollution (May 2001; currently under review);
  - 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; currently under review);
- Environment Agency (2001) *Preventing pollution from major pipelines* [online]. Available at www.environment-agency.gov.uk/static/documents/Business/pipes.pdf. [Accessed 1 March 2011];
- Venables R. *et al*. (2000) *Environmental Handbook for Building and Civil Engineering Projects*. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

**The best-practice procedures and measures detailed in these documents will be followed for all construction works derived from the WRMP[28] 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 this level. In addition, some general 'best-practice' measures may not be relevant or appropriate to the interest features of the European sites concerned (for example, clearing vegetation over winter is usually advocated to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the winter removal of vegetation might actually have a negative effect on these species through disturbance). However, **the following general measures will be followed to minimise the potential for impacts on species that are European site interest features unless project-level environmental studies or HRA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary**:

[28] Both Preferred and Feasible options, if these are used.

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

## Option-Specific Measures

The following sections summarise the Option-specific measures that will be employed (in addition to the general measures outlined above) to avoid specific potential effects on European sites that have been identified during the assessment process. Note that these measures cover both construction and, for some sites, potential operational measures.

The interest features and measures will be taken into account during the design-phase for the schemes, and it may be possible to design the scheme such that these measures are not required; otherwise, **these measures will be refined during the scheme design and employed during construction/operation unless project-level HRAs or scheme-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are more appropriate/required.** Agreement on appropriate measures will be made with NE where potential significant effects are identified at the project-level.

Note that only those European sites and features for which specific additional measures have been identified are noted in the following sections; all other sites and features potentially affected by each Option will be protected by use of the general measures outlined above.

## *Option WC01 – Thirlmere Transfer to West Cumbria*

| Site | Feature | Avoidance Measures (in addition to general measures) |
|---|---|---|
| River Derwent and Bassenthwaite Lake SAC | Atlantic salmon | • Works must be timed to avoid possible effects on migrating fish species – construction within 200 m of the river should be completed outside of the key salmon migration period (late summer)<br>• Works within 200m (particularly around the new WTW near Bridge End) should be scheduled to avoid the key spawning periods.<br>• Maintain existing compensation flow regime (low flows and spate flows) to avoid operational effects |
| | Otter | • Construction should be avoided around dusk and dawn;<br>• All compounds/pipe stores etc. should be fenced to prevent otters accessing them;<br>• All excavations should have ramps or battered ends to allow otters to escape;<br>• Pipe-caps must be installed overnight to prevent otters entering any laid pipe-work. |
| | River Lamprey<br>Brook lamprey<br>Sea lamprey | • Schedule works that are near the river (within 200m) outside the main migration (spring, autumn) and spawning periods (April – May for brook and river lamprey; May – July for sea lamprey).<br>• Maintain existing compensation flow regime (low flows and spate flows) to avoid operational effects |
| | Marsh fritillary butterfly | • Any areas likely to be affected by the scheme which are within 500m of Braithwaite Moss SSSI and which may support the food-plant of the Marsh Fritillary butterfly will be clearly mapped; these areas will be avoided or an appropriate mitigation scheme (re-seeding with appropriate seed mix) identified. |
| River Ehen SAC | Freshwater pearl mussel | • Keep works within existing roads adjacent to / near the SAC or its tributaries<br>• Avoid removing bankside trees |
| | Atlantic salmon | • Keep works within existing roads adjacent to / near the SAC or its tributaries<br>• Works must be timed to avoid possible effects on migrating fish species – construction within 200 m of the river should be completed outside of the key salmon migration period (late summer) |
| Lake District High Fells | (All features) | • Keep works within existing roads adjacent to site |
| Clint's Quarry SAC | Great crested newt | • Works within the road should ideally be undertaken during winter to avoid the risk of affecting migrating newts<br>• If works are required in the spring or summer, trenches within 250m of the SAC will be covered overnight, or suitable exclusion fencing installed with appropriate checks to ensure that migrating newts are not affected by the works. |