



Habitats Regulation Assessment Screening Report

Yorkshire Water's Drought Plan 2022

Public

Customer:

Yorkshire Water

Customer reference:

Drought Plan 2022 Habitats Regulation
Assessment Screening Report

Contact:

Anne Fairhead
Ricardo Energy & Environment
Bright Building, First Floor
Manchester Science Park
Manchester, M15 6GZ
United Kingdom

T: +44 (0) 1235 753 488

E: Anne.Fairhead@ricardo.com

Confidentiality, copyright and reproduction:

This report is the Copyright of Yorkshire Water and has been prepared by Ricardo Energy & Environment, a trading name of Ricardo-AEA Ltd under contract dated 15/04/2020. The contents of this report may not be reproduced, in whole or in part, nor passed to any organisation or person without the specific prior written permission of Yorkshire Water. Ricardo Energy & Environment accepts no liability whatsoever to any third party for any loss or damage arising from any interpretation or use of the information contained in this report, or reliance on any views expressed therein, other than the liability that is agreed in the said contract.

Author:

Martin Ferreira, Paul Cronje, Flora Whyte

Approved by:

Anne Fairhead

Date:

20 April 2022

Ref: ED13609

Ricardo is certified to ISO9001, ISO14001, ISO27001 and ISO45001

Table of Contents

1	Introduction.....	1
1.1	Background	1
1.2	Requirement.....	1
1.3	Context	2
2	Approach.....	3
2.1	Overview of HRA stages	3
2.2	Potential Impacts.....	4
3	Environmental Assessment of the Drought Plan 2022.....	11
3.1	Consideration of In-Combination Effects	12
3.2	Review of Consents	12
3.3	HRA Screening Results	13
3.3.1	Potential Effects of Drought Options	13
3.4	Information to Inform the Appropriate Assessment.....	79
3.5	Potential In-Combination Effects of Drought Options	79
4	Conclusions	83
4.1	HRA Screening and Requirement for Appropriate Assessment	83
4.2	In-combination Impacts	83
4.2.1	Between Yorkshire Water Drought Options	83
4.2.2	With neighbouring water companies	84
	Appendix A: Information to Inform the Appropriate Assessment	85

1 Introduction

1.1 Background

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

A water company must ensure its Drought Plan meets the requirements of the Habitats Regulations before implementation. The requirement for a HRA is established through the Conservation of Habitats and Species Regulations 2017 as amended. Under Regulations 63 and 105, any plan or project which is likely to have a significant effect on a European site (either alone or in-combination with other plans or projects) and is not directly connected with, or necessary for the management of the site, must be subject to a HRA to determine the implications for the site in view of its conservation objectives.

Water companies in England are required to produce a Drought Plan every five years and submit a draft plan to the Secretary State in line with the timescales set out in the Drought Plan (England) Direction 2020. The Environment Agency’s Drought Plan Guidance¹ also specifies that a water company must ensure that its drought plan meets the requirements of the Habitats Regulations. The Environment Agency’s 2020 Drought Plan Guidance advises companies to consult the UK Water Industry Research (UKWIR) report ‘Strategic Environmental Assessment and Habitat Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans’² in preparing its HRA. The UKWIR report recommends that all Drought Plans should be subject to the first stage of HRA, i.e., screening for Likely Significant Effects (LSE).

1.2 Requirement

The responsibility for undertaking the Habitats Regulations Assessment lies with Yorkshire Water as the Plan making authority.

HRA Guidance for the appraisal of Plans³, summarises the Habitats Regulations. Regulation 63 states that the Plan making authority (in this case Yorkshire Water) shall adopt, or otherwise give effect to, the Plan only after having ascertained that it will not adversely affect the integrity of a European site, subject to Regulation 64 or 105 of the Habitats Regulations.

Regulation 64 of the Habitats Regulations states:

- (1) If the competent authority is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), it may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be).*
- (2) Where the site concerned hosts a priority natural habitat type or a priority*

¹ Environment Agency (2020) Water Company Drought Plan Guideline, December 2020 (Version 1.1)

² UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (WR/02/S). Prepared by Ricardo Energy & Environment.

³ Tyldesley, D. & Chapman, C. (2013) The Habitats Regulations Assessment Handbook, November 2020 edition UK: DTA Publications Limited.

species, the reasons referred to in paragraph (1) must be either—
(a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment; or
(b) any other reasons which the competent authority, having due regard to the opinion of the European Commission, considers to be imperative reasons of overriding public interest.

Regulation 105 of the Habitats Regulations states:

- (1) Where a land use plan—*
(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and
(b) is not directly connected with or necessary to the management of the site, the plan-making authority for that plan must, before the plan is given effect, make an appropriate assessment of the implications for the site in view of that site's conservation objectives.
(2) The plan-making authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specifies.
(3) The plan-making authority must also, if it considers it appropriate, take the opinion of the general public, and if it does so, it must take such steps for that purpose as it considers appropriate.
(4) In the light of the conclusions of the assessment, and subject to regulation 107, the plan-making authority must give effect to the land use plan only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).
(5) A plan-making authority must provide such information as the appropriate authority may reasonably require for the purposes of the discharge by the appropriate authority of its obligations under this Chapter.
(6) This regulation does not apply in relation to a site which is—
(a) a European site by reason of regulation 8(1)(c), or
(b) a European offshore marine site by reason of regulation 18(c) of the Offshore Marine Conservation Regulations (site protected in accordance with Article 5(4) of the Habitats Directive).

Best practice guidance⁴ recommends that if there are no alternative solutions and if, in exceptional circumstances, it is proposed that a Plan be adopted despite the fact that it may adversely affect the integrity of a European site, the HRA will need to address and explain the Imperative Reasons of Overriding Public Interest (IROPI) which the Plan making authority considers to be sufficient to outweigh the potentially adverse effects on the European site(s). It must also agree and secure a package of compensation measures for the features of the site that may be adversely affected by implementation of the Plan.

1.3 Context

The amended 2017 Habitats Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes:

- existing Special Areas of Conservation SACs and Special Protected Areas (SPAs)
- new SACs and SPAs designated under these Regulations
- SPAs are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC; 'Birds Directive') for the protection of **wild birds and their**

⁴ Tyldesley, D. & Chapman, C. (2013) The Habitats Regulations Assessment Handbook, November 2020 edition UK: DTA Publications Limited.

habitats (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).

- SACs are designated under the Habitats Directive (92/43/EEC) and target particular **habitats** (Annex 1) **and/or species** (Annex II) identified as being of European importance.
- Designated Wetlands of International Importance (known as Ramsar sites) do not form part of the national site network. Many Ramsar sites overlap with SACs and SPAs, and may be designated for the same or different species and habitats. All Ramsar sites are protected in the same way as SACs and SPAs.

For ease of reference through this HRA report, these designations are collectively referred to as “European sites”. As per Natural England (NE) guidance⁵, any HRA should also consider any European Marine Protected Areas (MPAs) within England’s inshore waters (out to 12 nautical miles) to support sites in achieving conservation objectives and to guide effective management. No MPAs of European importance or Marine Conservation Zones (MCZs) are associated with the study area.

2 Approach

2.1 Overview of HRA stages

There are four stages of the HRA process:

1. Firstly, a screening process was undertaken to identify whether each drought management measure in Yorkshire Water’s Drought Plan 2022 (either alone or in combination with other plans or projects) is likely to have any significant effects on European sites (reported in this HRA Report). There was an important judgment in the Court of Justice of the European Union (CJEU) in April 2018⁶ which ruled that Article 6(3) of the Habitats Directive must be interpreted as meaning that mitigation measures should be assessed within the framework of an Appropriate Assessment and that it is not permissible to take account of mitigation measures at the screening stage.
2. Where a likely significant effect cannot be ruled out (noting the precautionary principle and the requirement to exclude consideration of mitigation measures), an Appropriate Assessment should be undertaken of the drought management measure to determine whether this would adversely affect the integrity of the European site(s), either alone or in combination with other Drought Plan 2022 options or other plans and projects, taking into account available specific mitigation measures.
3. Where adverse effects cannot be ruled out at the Appropriate Assessment stage, alternative, reasonably feasible options should be examined to determine whether it is possible to avoid adverse effects on the integrity of the European site as Stage 3 of the HRA.
4. Stage 4 comprises an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest, and consideration of compensation measures it has been concluded that the Secretary of State should be asked to determine that the Plan should proceed (this is decision of the Secretary of State, not Yorkshire Water).

This document reports the HRA screening (i.e. Stage 1 as identified above) carried out for Yorkshire Water’s Drought Plan 2022. The HRA screening reaches conclusions as to whether

⁵ Help Note: Tips and advice on how to assess potential impacts of water company statutory plans on the marine environment¹ – Focussing on Marine Conservation Zones (MCZ)

⁶ Court of Justice of the European Union Case C-323/17: People over Wind & Sweetman v Coillte Teoranta

LSE on European sites of the drought options contained within Yorkshire Water's Drought Plan 2022 can be ruled out, and, as such, determines the requirement for Appropriate Assessment. HRA is based on a rigorous application of the precautionary principle. Where uncertainty or doubt remains, an impact should be assumed, triggering the requirement for Appropriate Assessment of that option. This document also reports the Appropriate Assessment where that is relevant.

2.2 Potential Impacts

To provide an indication of those measures more likely to have a significant effect on a European site(s), those drought management measures that are within 10km of a European site were identified initially. Consideration has also been given to the relative spatial locations of the drought management measures and designated sites within the same surface water and groundwater catchments and/or estuarine system to ensure that any hydrological connectivity over a longer distance that might affect water-dependent sites, qualifying features and designated mobile species has been taken into account. GIS data were used to map the locations and boundaries of European sites within or adjacent to the Yorkshire Water Resource Zones (WRZs) using publicly available data from Natural England.

The attributes of the European sites, which contribute to and define their integrity, have been considered with reference to Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites. An analysis of these information sources has enabled the identification of the site's qualifying features. This information, as well as Article 12 and 17 reporting, site conservation objectives, supplementary guidance, Site Improvement Plans, and the supporting Site of Special Scientific Interest's favourable condition tables, has been used to identify those features of each site which determine current conservation status, site integrity and the specific sensitivities of the site. Analysis of how potential impacts of the drought management measures may affect a European site has been undertaken using this information. The locations of the supply side and drought permit/order options were also mapped in order to establish their geographic proximity to the European sites.

The Drought Plan 2022 proposes a number of options which would make more water available for supply than is available under normal licensed conditions. Drought options include demand side options (e.g. water use restrictions), continued utilisation of existing licensed water sources within Yorkshire Water's resource base (referred to as supply side options) and drought permits/orders.

Demand side options are designed to reduce the demand for water and the options available to Yorkshire Water are consistent across all resource zones (see **Table 2.1**).

Supply side measures are measures available to Yorkshire Water to introduce during the course of a drought to increase the amount of water available for supply. Supply side drought options that require drought permits/orders are listed in **Table 2.2**.

Table 2.1: Demand-side Drought Management Options (All Water Resource Zones)

Demand-side options	Comments
Drought publicity campaigns	Increased water efficiency messages via increased customer communications.
Increased leakage detection and repair activity	Ensure that all maintenance programmes are up-to-date and undertake additional leakage control, leading to demonstrable water savings.
Introduction of temporary use ban	Restrictions on the use of hosepipes for a range of uses, including the washing of vehicles and boats, watering gardens and sports grounds and filling of paddling pools.
Introduction of a drought order to ban non-essential water uses (defined in the Drought Direction 2011)	Drought order to restrict non-essential water uses to be applied for when reservoir stocks fall below the Drought Control Line
Emergency drought order to temporarily supply water by means of rota cuts or standpipes	An Emergency Drought order may be applied for in the event of an exceptional drought, in consultation and liaison with the Environment Agency, local authorities and the Consumer Council for Water. This situation would be extremely unlikely to occur and would not arise under a repeat of the worst recorded drought events in Yorkshire.

Table 2.2: Supply Side Options

Water Source		Type of Drought Management Option
Grid Surface Water Resource Zone		
North Area	<u>Standard Option Reservoirs [5]⁷:</u> North Area Reservoir 1, North Area Reservoir 2, North Area Reservoir 3, North Area Reservoir 4, North Area Reservoir 5	Compensation flow release reductions
	<u>Long Term Option (LTO) [1]:</u> North Yorkshire Groundwater increased abstraction ⁸	Increase in abstraction.
North West Area	<u>Standard Option Reservoirs [12]:</u> North West Area Reservoir 1, North West Area Reservoir 2, North West Area Reservoir 3, North West Area Reservoir 4, North West Area Reservoir 5, North West Area Reservoir 6, North West Area Reservoir 7, North West Area Reservoir 8, North West Area Reservoir 9, North West Area Reservoir 10, North West Area Reservoir 11, North West Area Reservoir 12	Compensation flow release reductions
	<u>LTO [1]:</u> North West Reservoir Abstraction	Increase in abstraction from Reservoir. Water abstracted from the reservoir would be transferred via a temporary pipeline to the aqueduct for subsequent treatment at e.g. Bradford WTW 1.
South Area	<u>Standard Option Reservoirs [6]:</u> South Area Reservoir 1, South Area Reservoir 2, South Area Reservoir 3, South Area	Compensation flow or maintained flow release reductions

⁷ The number in square bracket refers to the number of drought options within each area.

⁸ This option was included in WRMP19 preferred solution and is scheduled to be brought into supply in 2022/23, however is included as a long term option in the drought plan until that time.

Water Source		Type of Drought Management Option
	Reservoir 4, South Area Reservoir 5, South Area Reservoir 6	
South West Area	<u>Standard Option Reservoirs [20]:</u> South West Area Reservoir 1, South West Area Reservoir 2, South West Area Reservoir 3, South West Area Reservoir 4, South West Area Reservoir 6, South West Area Reservoir 7, South West Area Reservoir 8, South West Area Reservoir 10, South West Area Reservoir 11, South West Area Reservoir 12, South West Area Reservoir 13, South West Area Reservoir 14, South West Area Reservoir 15, South West Area Reservoir 16, South West Area Reservoir 17, South West Area Reservoir 18, South West Area Reservoir 19, South West Area Reservoir 20, South West Area Reservoir 21, South West Area Reservoir 22	Compensation flow release reductions
South West (EA)	<u>Environment Agency Drought Order options [2]:</u> South West Area Reservoir 5, South West Area Reservoir 9	Compensation flow release reductions
Stand Alone	<u>Standard option [6]:</u> Ouse increased abstraction	Increase river abstraction rates at lower river flows
	Ure increased abstraction	Permit river abstraction at low flows
	Wharfe reduced regulated flow	Reduce river regulation requirements.
	Wharfe increased annual abstraction	Increase annual abstraction limit
	Hull increased abstraction	Reduce hands-off river flow to enable increased abstraction.
	Derwent annual abstraction increase	Increase annual abstraction limit
	<u>LTO: [7]</u> East Yorkshire Groundwater Option 2	Utilisation of existing abstraction which will require relocation of borehole.
	Tees – Swale transfer	Permit abstraction of up to 40 MI/d from the River Tees for transfer by pipeline to the River Swale, with subsequent re-abstraction of the discharged water further downstream from the Ouse increased abstraction.
	Tees - Derwent Pipeline <i>This option would not be additional to the River Tees to River Swale Transfer option. Only one of these two options would be implemented.</i>	Abstraction of up to 40 MI/d from the River Tees with construction of new pipelines to transfer the raw water to River Derwent Water Treatment Works.
	Aire abstraction	New river abstraction of up to 50 MI/d
	Ouse increased abstraction	Increase the abstraction capacity of the Ouse pumping station by 10 MI/d. This would enable the full daily abstraction licence volume to be abstracted from the Ouse increased abstraction when river flows exceed the prescribed flow set in the abstraction licence (or in a drought permit if granted).

Water Source		Type of Drought Management Option
	Ouse water treatment works extension	Additional river abstraction and water treatment capacity (additional 25 MI/d average abstraction) at Ouse abstraction, within existing abstraction licence conditions.
	Ouse Raw Water Transfer ⁹	Additional river abstraction capacity of 60 MI/d to enable the full average abstraction licence quantity of 96 MI/d average to be abstracted (130MI/d peak). New raw water pipeline to link to existing raw water pipeline Ouse pumping station to River Derwent Water Treatment Works 1.
East Surface Water Resource Zone		
None	n/a	n/a
East Groundwater Resource Zone		
None	n/a	n/a

In determining the likelihood of significant effects on European sites from any drought management measure, particular consideration has been given to the possible source-receptor pathways through which effects may be transmitted from activities associated with the measures to features contributing to the integrity of the European sites (e.g. groundwater or surface water catchments, air, etc.). **Table 2.3** provides examples of the types of impacts the measures might have on European site qualifying features. Screening for LSEs has been determined on a proximity basis for many of the types of impacts, based on the proximity of the potential location of each measure to each European site. However, there are many uncertainties associated with using set distances as there are very few standards available as a guide to how far impacts will extend. Different types of impacts can occur over different distances, and the assumptions and distances used in the HRA and justification for them are shown in **Table 2.3**.

Yorkshire Water's Drought Plan 2022 includes alternative long term options available to the company in the event of a third consecutive year of drought which would, if deployed, involve some construction activity (e.g. intakes, pumping stations, recommissioning of STW and pipelines). For all of the remaining options, there is no construction phase associated with the option and it is only operational impacts that will need to be considered.

Table 2.3: Potential Impacts of Drought Options¹⁰

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
Physical loss: <ul style="list-style-type: none"> Removal (including offsite effects, e.g. foraging habitat, and removal of supporting habitat within boundary of a SPA) Smothering 	Development of infrastructure associated with scheme, e.g. new or temporary pipelines, transport infrastructure, temporary weirs. Indirect effects from a reduction in flows e.g. drying out marginal habitat. Physical loss is most likely to be significant where the boundary of the scheme extends within the boundary of the European site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).

⁹ It is most likely Yorkshire Water would only require one of the River Ouse options 1 and 2 but it is possible that they could also be developed as a combined scheme, but with the aggregate additional abstraction capacity limited to 60 MI/d to keep within the 96 MI/d average abstraction licence limit. This would give maximum treatment and water distribution flexibility.

¹⁰ Note that the distances given in Table 2.3 are illustrative only and should be defined for each DP on a case by case basis.

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
Physical damage: <ul style="list-style-type: none"> • Sedimentation / silting • Prevention of natural processes including coastal and fluvial bank stabilisation, prevention of long-shore drift etc. • Habitat degradation • Erosion • Fragmentation • Severance/barrier effect • Edge effects 	<p>Reduction in river flow leading to permanent and/or temporary loss of available habitat, sedimentation/siltation, fragmentation, etc.</p> <p>Physical damage is likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of a scheme, long shore drift along the coast, or the scheme impacts the linking habitat).</p>
Non-physical disturbance: <ul style="list-style-type: none"> • Noise (incl. underwater) • Visual presence • Human presence • Light pollution • Vibration (incl. underwater). 	<p>Noise from temporary construction or temporary pumping activities.</p> <p>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European site¹¹.</p> <p>Noise from vehicular traffic during operation of a scheme.</p> <p>Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the European site.</p> <p>Plant and personnel involved in in operation of the scheme.</p> <p>These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p> <p>Schemes which might include artificial lighting, e.g. for security around a temporary pumping station.</p> <p>Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site.</p> <p>Vibration from temporary construction</p> <p>From a review of Environment Agency internal guidance on HRA and various websites/sources^{12,13,14} it is considered that effects of vibration are more likely to be significant if development is within 500m of a European site.</p>
Water table/availability: <ul style="list-style-type: none"> • Drying • Flooding / stormwater • Changes to surface water levels and flows including both increases and reductions. 	<p>Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and</p>

¹¹ British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.

¹² Institute of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011

¹³ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

¹⁴ Cutts N, Hemingway K and Spencer J (2013) The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
<ul style="list-style-type: none"> • Changes in groundwater levels and flows • Changes to coastal water movement <p>Toxic contamination:</p> <ul style="list-style-type: none"> • Water pollution • Soil contamination • Air Pollution 	<p>the European site, and sometimes, whether the scheme is up or down stream from the European site.</p> <p>Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p> <p>Air emissions associated with plant and vehicular traffic during construction and operation of schemes.</p> <p>The effect of dust is only likely to be significant where site is within or in proximity to the boundary of the European site^{15,16}. Without mitigation, dust and dirt from the construction site may be transported onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit.</p> <p>Effects of road traffic emissions from the transport route to be taken by the project traffic are only likely to be significant where the protected site falls within 200 metres of the edge of a road affected¹⁷.</p>
<p>Non-toxic contamination:</p> <ul style="list-style-type: none"> • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • Changes in water chemistry (e.g. pH, calcium balance etc) • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting 	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, storage, or reduced compensation flow releases to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p>
<p>Biological disturbance:</p> <ul style="list-style-type: none"> • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession 	<p>Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds due to changes in abstraction or reduced compensation flow releases to river systems. In addition, via removal of vegetation (including hedgerows and trees) used by based as foraging, roosting and hibernation sites and birds as roosting and nesting sites.</p> <p>Creation of new pathway of non-native invasive species.</p> <p>This effect is only likely to be significant where the scheme is situated within the European site or an upstream tributary of the European site (or affects groundwater levels supporting these sites or tributaries)</p>

¹⁵ Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.

¹⁶ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.

¹⁷ NE Internal Guidance – Approach to Advising Competent Authorities on Road Traffic Emissions and HRAs V1.4 Final - June 2018

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
	<p>Entrapment during in-river or terrestrial construction works causing injury and/or mortality of mobile species</p> <p>Likely to be a risk of entrapment, injury and/or mortality where the boundary of the option extends within or is directly adjacent to the boundary of a European site or within/adjacent to offsite functionally linked habitat. Mobile species could include fish, bats and European otters for example.</p> <p>Potential for changes to habitat availability via removal of vegetation (including hedgerows and trees) to facilitate construction activities and potential entrapment, injury and/or mortality of breeding birds and roosting/hibernating bats.</p> <p>This effect is dependent on the requirement to remove vegetation (if it cannot be avoided), ecological surveys to determine species presence and timing of removal based on species specific ecological considerations.</p>

3 Environmental Assessment of the Drought Plan 2022

For the Drought Plan 2022, environmental assessments of each drought option have been undertaken, culminating in the production of Environmental Assessment Reports (EARs) as described below. The outcomes of this assessment have informed this HRA.

According to the DPG, Drought Plan reporting requirements include undertaking significant environmental assessment which can be aligned to fulfil wider reporting requirements, such as those for HRA (and SEA if applicable). This approach ensures duplication of work between HRA, SEA and the Drought Plan itself can be minimised.

Yorkshire Water has undertaken environmental assessment of the Drought Plan 2022 supply options according to guidance in the 2020 Drought Plan Guidelines¹⁸ DPG and the July 2020 'Environmental Assessment for Water Company Drought Plans - supplementary guidance'. This is reported in the EARs. For each drought option, the assessment included the following stages:

1. an assessment of the likely changes in flow/level regime due to implementing the drought permit ;
2. identification of the environmental features that are sensitive to these changes and an assessment of the likely impacts on these features;
3. identification of mitigation that may be required to prevent or reduce impacts on sensitive features; and
4. recommendations for baseline, in-drought and post-drought permit monitoring requirements.

The initial stage determined the zone and extent of hydrological influence of each drought option both on an individual basis, and taking into account cumulative effects of simultaneous option deployment where options were located within the same catchment, and across catchments. The assessment also considered cumulative effects of other discharges and abstractions using abstraction licence and discharge consent information supplied by the Environment Agency.

The sensitivity assessment used these outputs and using GIS identified sites and features which could be impacted by drought option implementation. These included European sites (SAC, SPA and RAMSAR). The assessment considered the susceptibility of each site/feature to hydrological impacts (flow/level changes) in order to conclude the sensitivity of each site/feature, and whether it should be taken forward for further consideration in the environmental assessment. Consideration of susceptibility in the case of SACs and SPAs took account of qualifying interests and whether, or to what extent, they were water dependent, and likely to be impacted by a drought option's implementation, taking into account the appropriate baseline conditions against which an impact would be likely to arise (often severe drought conditions).

Drought options within the Drought Plan 2022 comprise reservoir compensation release reductions, river abstraction licence changes, new river abstractions, inter-basin transfer, groundwater abstractions, and recommissioning of unused or under-utilised licensed water sources.

¹⁸ Environment Agency (2020) Water Company Drought Plan Guideline, December 2020 (Version 1.1)

3.1 Consideration of In-Combination Effects

The hydrological impact assessment described above and documented in the EARs considered cumulative hydrological impacts of simultaneous deployment of options within the same catchments, and across different catchments. Cumulative impacts that could arise with other non-public water supply abstractions are also considered, as are indirect impacts on water quality as a result of reduced dilution.

In accordance with the Habitats Regulations the review has therefore considered the in-combination effects of the drought options in the Yorkshire Water Drought Plan 2022, and the in-combination effects of the Drought Plan 2022 and a number of plans and projects, that could have an impact on the European sites identified within this HRA of the Drought Plan 2022. The following plans and projects have been considered in the cumulative effects assessment:

- Inter-option effects within the Yorkshire Water Drought Plan 2022
- Other water company Water Resource Management Plans (WRMPs) and Drought Plans:
 - Severn Trent
 - United Utilities
 - Northumbrian Water
 - Anglian Water Services Limited
- Water Resource Management Plan for Yorkshire Water (2019)¹⁹
- Environment Agency National Drought Action Plan
- Canal and Rivers Trust Putting Water into Waterways Water Resources Strategy 2015-2020.

The assessment has used all publicly available information. It should also be noted that the water companies are at different stages of updating their WRMPs and Drought Plans and therefore further updates may be required to the HRA cumulative assessment as these become available between the draft and final submissions.

The findings of the in-combination impact assessments between each drought option and the schemes above can be found in **Table 3.2**, column 6: 'Effect in combination with other options, plans and projects'.

3.2 Review of Consents

The Environment Agency's Review of Consents process considered all existing abstraction licences to determine whether any could have the potential to affect the hydrogeological or hydrological regime of European sites. Investigations of relevance to Yorkshire Water's Drought Plan 2022 include those which reviewed licences in relation to impacts on the Humber Estuary SAC/SPA/Ramsar (collectively referred to as the Humber Estuary European Marine Site (or EMS)), and the North Pennine Moors SAC/Moorhouse and Upper Teesdale SPA. The Humber Estuary investigation resulted in the modification of two abstraction licences for the river intakes at two WTWs, to include the requirement for installing fish protection measures, to reduce the potential for lamprey entrainment.

¹⁹ Yorkshire Water Services Limited 2018. Revised Draft Water Resources Management Plan 2019. September 2018.

3.3 HRA Screening Results

3.3.1 Potential Effects of Drought Options

The HRA of the Drought Plans screened all of the drought options in each of Yorkshire Water WRZs. A total of 65 options (demand side, supply side and supply side drought permit/order options) were screened. This provided an indication of the schemes that may be likely to have a significant effect on a European site(s). The HRA screening matrix for this assessment is presented in **Tables 3.1 - 3.3**.

Effects in combination with other drought options within Yorkshire Water Drought Plan 2022 were assessed and are documented in the matrix.

The tables show that, apart from the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction drought option, all of the other options within Yorkshire Water Drought Plan 2022 are not considered to have likely significant effects on the qualifying features of European sites.

Table 3.1: Screening of Demand Side Drought Options for Impacts on European Sites

Option	Likely Significant Effect and Potential for Alteration of Measure to Avoid Effects?	Further HRA Assessment Required?
Drought publicity campaigns	None – media/water efficiency campaign includes increased water efficiency messages via increased customer communications. No impacts on designated sites are anticipated, other than to acknowledge that decreased consumer demand will have a net positive effect in combination with existing abstraction and/or drought option sites that have the potential to impact European sites due to reduced pressure on water resources and reduced abstraction at source.	No
Increased leakage detection and repair activity	None - it is envisaged that leakage detection and repair schemes will largely be undertaken primarily in urban areas. No impacts on designated sites are anticipated, other than to acknowledge that decreased consumer demand will have a net positive effect in combination with existing abstraction and/or drought option sites that have the potential to impact European sites due to reduced pressure on water resources and reduced abstraction at source.	No
Introduction of temporary use ban	None – a hose pipe ban, or any restrictions on consumer water use are demand management measures and as such, are not anticipated to have impacts on European sites. It is acknowledged that decreased consumer demand will have a net positive effect in combination with existing abstraction and/or drought option sites that have the potential to impact European sites, due to reduced pressure on water resources and reduced abstraction at source.	No
Introduction of a drought order to ban non-essential water uses (defined in the Drought Direction 2011)	None – a non-essential use ban and its components are demand management measures and as such are not anticipated to have impacts on European sites. It is acknowledged that decreased consumer demand will have a net positive effect in combination with existing abstraction and/or drought option sites that have the potential to impact European sites due to reduced pressure on water resources and reduced abstraction at source.	No
Emergency drought order to temporarily supply water by means of rota cuts or standpipes	None – an emergency drought order includes extreme demand management measures and as such are not anticipated to have impacts on European sites. It is acknowledged that decreased consumer demand will have a net positive effect in combination with existing abstraction and/or drought option sites that have the potential to impact European sites due to reduced pressure on water resources and reduced abstraction at source.	No

Table 3.2: HRA Screening of Supply Side Drought Options

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
North Area Reservoirs						
North Area Reservoir 1	North Pennine Moors SAC (0.60km)	<p>Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>European dry heaths</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands</p> <p><i>Calaminarian</i> grasslands of the <i>Violetalia calaminariae</i></p> <p>Siliceous alpine and boreal grasslands</p> <p>Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>)</p> <p>Blanket bogs</p> <p>Petrifying springs with tufa formation (<i>Cratoneurion</i>)</p> <p>Alkaline fens</p> <p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>)</p> <p>Calcareous rocky slopes with chasmo phytic vegetation</p> <p>Siliceous rocky slopes with chasmophytic vegetation</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</p> <p><i>Saxifraga hirculus</i></p>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

²⁰ The distance given is to the nearest element of the drought option (e.g., impacted reaches or constructional element) and the designated site.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (0.60km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	Humber Estuary SAC (>10km ²¹)	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines <i>Salicornia</i> and other annuals colonising mud and sand Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) Embryonic shifting dunes	No construction related to this option has been identified. Any reduction in freshwater flows could potentially affect qualifying interests for which the Humber Estuary is designated, specifically river and sea lamprey (recruitment and reproductive capability and spatial distribution of the species). The drought permit being assessed involves a reduction in the compensation flow release from North Area Reservoir 1 to the River Ure. The operation of the option has the potential to impact on the flow/level regime downstream of the North Area Reservoir 1 within Pott Beck, River Burn and River Ure.	Yes (Lamprey Species only)	No	Yes (Lamprey Species only)

²¹ Although outside of the buffer zone (10km radius), this has been included as the River Ouse discharges into the Humber Estuary EMS.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Fixed dunes with herbaceous vegetation ("grey dunes") Dunes with <i>Hippophae rhamnoides</i> Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Grey seal <i>Halichoerus grypus</i>				
North Area Reservoir 2	North Pennine Moors SAC (1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation (<i>Cratoneurion</i>) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) Calcareous rocky slopes with chasmo phytic vegetation	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (1km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
North Area Reservoir 3	North Pennine Moors SAC (6.4km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>(Cratoneurion)</i> Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmo phytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (6.4km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
North Area Reservoir 4	North Pennine Moors SAC (4.10km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation (<i>Cratoneurion</i>) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (4.10km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>				
North Area Reservoir 5	North Pennine Moors SAC (0.6km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands <i>Calaminarian</i> grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation (<i>Cratoneurion</i>) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are designated on higher elevations above the river level. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions	None	No	No
	North Pennine Moors SPA (0.6km)	Assemblages of breeding birds-upland moorland and grassland breeding birds	There is no construction related to this option and no operational impacts have been identified.	None	No	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>	The Moors are designated on higher elevations above the river level. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions			
North West Area Reservoirs						
North West Area Reservoir 1	South Pennine Moors SAC (1.20km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (1.20km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 2	South Pennine Moors SAC (1.0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.			
	Peak District Moors (South Pennine Moors Phase 2) SPA (1.0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 3	South Pennine Moors SAC (<1.0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<1.0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 4	South Pennine Moors SAC (3.0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	Peak District Moors (South Pennine Moors Phase 2) SPA (3.0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
North West Area Reservoir 5	South Pennine Moors SAC (3.60km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (3.60km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 6	South Pennine Moors SAC (1.00km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	Moors Phase 2) SPA (1.00km)	Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
North West Area Reservoir 7	South Pennine Moors SAC (<1.0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<1.0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 8	South Pennine Moors SAC (<0.5km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<0.5km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
North West Area Reservoir 9	South Pennine Moors SAC (2.20km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are designated on higher elevations above the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (2.20km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
North West Area Reservoir 10	North Pennine Moors SAC (0.25km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>(Cratoneurion)</i> Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (0.25km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
North West Area Reservoir 11	North Pennine Moors SPA (0.68km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
North West Area Reservoir 12	South Pennine Moors SAC (0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The drought option will influence low flows in Carr Beck, of which a 150m reach is situated within the site. However the designated features of the site are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South Area Reservoirs						
South Area Reservoir 1	North Pennine Moors SAC (5.50km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths orcalcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>(Cratoneurion)</i> Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	North Pennine Moors SPA (5.50km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i> Curlew <i>Numenius arquata</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South Area Reservoir 2	Peak District Moors (South Pennine Moors Phase 1) SPA (<0.50km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			hydrodynamic connectivity between channel and the moor, particularly during dry conditions.			
	South Pennine Moors SAC (<0.50km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South Area Reservoir 3	Peak District Moors (South Pennine Moors Phase 1) SPA (1.90km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	South Pennine Moors SAC (1.90km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South Area Reservoir 4	Peak District Moors (South Pennine Moors Phase 1) SPA (4.40km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	South Pennine Moors SAC (4.40km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South Area Reservoir 5	Peak District Moors (South Pennine Moors Phase 1) SPA (2.15km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	South Pennine Moors SAC (2.15km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South Area Reservoir 6	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	Peak District Moors (South Pennine Moors Phase 1) SPA (<1km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i>	There is no construction related to this option and no operational impacts have been identified. None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
South West Area Reservoirs						
South West Area Reservoir 1	South Pennine Moors SAC (option is within designated site)	Northern Atlantic wet heaths with <i>Erica tetralix</i>	There is no construction related to these options and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
South West Area Reservoir 2		European dry heaths				
South West Area Reservoir 3		Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles				
South West Area Reservoir 6	Peak District Moors (South Pennine Moors Phase 1) SPA (option is within designated site)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 4	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to these options and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i>				

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	Moors Phase 1) SPA (<1km)	Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
South West Area Reservoir 5 [EA Drought Order]	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are on higher elevations above the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (<1km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 7	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (<1km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
South West Area Reservoir 8	South Pennine Moors SAC (1.70km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (1.70km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 9 [EA Drought Order]	South Pennine Moors SAC (1.35km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (1.35km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
South West Area Reservoir 10	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<1km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 11	South Pennine Moors SAC (<1km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<1km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 12	South Pennine Moors SAC (1.4km)	Northern Atlantic wet heaths with <i>Erica tetralix</i>	There is no construction related to this option and no operational impacts have been identified.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.			
	Peak District Moors (South Pennine Moors Phase 2) SPA (1.4km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 13	South Pennine Moors SAC (<1km or within designation)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs.	None	None	No
South West Area Reservoir 14	Peak District Moors (South Pennine Moors Phase 2) SPA (<1km or within designation)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
South West Area Reservoir 15	South Pennine Moors SAC (2.15km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.			
	Peak District Moors (South Pennine Moors Phase 2) SPA (2.15km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 16	South Pennine Moors SAC (<0.50km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 2) SPA (<0.50km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 17	South Pennine Moors SAC (within designation)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and	None. No hydrological continuity with the canal.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>Blechnum</i> in the British Isles				
	Peak District Moors (South Pennine Moors Phase 2) SPA (within designation)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 18	South Pennine Moors SAC (<0.5km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
South West Area Reservoir 19	Peak District Moors (South Pennine Moors Phase 1&2) SPA (<0.5km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 20	South Pennine Moors SAC (2.6km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to	None	None	No
	Peak District Moors	Short eared owl <i>Asio flammeus</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	(South Pennine Moors Phase 1) SPA (2.6km)	Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	maintain rate of drawdown within the bounds of normal operations.			
South West Area Reservoir 21	South Pennine Moors SAC (3.10km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (3.10km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
South West Area Reservoir 22	South Pennine Moors SAC (<1.0km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought options will only affect flows downstream of reservoirs. Drought options will help to maintain rate of drawdown within the bounds of normal operations.	None	None	No
	Peak District Moors (South Pennine Moors Phase 1) SPA (<1.0km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
River Abstractions						
Ouse increased abstraction	Strensall Common SAC (7.1km)	North Atlantic wet heaths with <i>Erica tetralix</i> European dry heath	There is no construction related to this option and no operational impacts have been identified. The SAC is a sufficient distance from the impacted reach that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	Humber Estuary SAC (>10km ²²)	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines <i>Salicornia</i> and other annuals colonising mud and sand Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) Embryonic shifting dunes Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")	Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc). The potential impact associated with entrainment has been addressed by the installation of permanent fish screens and this will negate any likely significant effect on designated species. Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid	None	None	No

²² Although outside of the buffer zone (10km radius), this has been included as the River Ouse discharges into the Humber Estuary EMS.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Fixed dunes with herbaceous vegetation ("grey dunes") Dunes with <i>Hippophae rhamnoides</i> Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Grey seal <i>Halichoerus grypus</i>	<p>for the current suite of options included in the Drought Plan 2022. The Derwent catchment was previous discounted from the assessment as no options were present in the catchment. The current plan does include an option in the Derwent catchment however the hydrological impacts of the option are restricted to a transfer of abstraction limits between two existing abstraction points and impacts are assessed as negligible.</p> <p>Since the assessment in 2011 Naburn Weir has been modified and fish bypass was installed. An eel/lamprey bypass channel (lamprey bypass) was formalized next to the salmon ladder on the river bank-side in 2014 to aid the upstream migration of European eel juveniles (elvers) and river lamprey. The bypass largely followed the route of a complex channel, littered with rocks, concrete debris and tree roots, partly water-fed by an erosion generated hole in the retaining wall adjoining the salmon ladder. A detailed study by Durham University looked at the behaviour of fishes (including lamprey) at Naburn Weir²³. The study noted that under normal flows Naburn weir impacts on the upstream migration of river lamprey, delaying the movement of river lamprey through the reach. The lamprey moved quickly (less than two days) through the unobstructed tidal reach of the Yorkshire Ouse. However, river lamprey once entering the area immediately</p>			

²³ Lothian, Angus, John (2021) Behaviour of fishes around engineered structures and in modified rivers, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/13872/>

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			<p>downstream of the weir took 32.6 days on average before either moving in an upstream direction passing the weir or a downstream one. This delay at Naburn weir under normal flow conditions will likely lead to an increase in predation pressure through the aggregation of river lamprey in a relatively small area.</p> <p>The assessment in 2011 remains valid as reduced flow levels triggered by the application of drought permits would not significantly alter the amount of time that Naburn Weir would be passable to sea and river lamprey, with the additional Lamprey bypass providing additional passability.</p> <p>It therefore follows that this option would individually have no likely significant effect ²¹.</p>			
	Humber Estuary SPA (>10km)	Teal <i>Anas crecca</i> Wigeon <i>Anas penelope</i> Mallard <i>Anas platyrhynchos</i> Ruddy turnstone <i>Arenaria interpres</i> Pochard <i>Aythya ferina</i> Great Bittern <i>Botaurus stellaris</i> Dark bellied brent goose <i>Branta bernicla bernicla</i> A067 Goldeneye <i>Bucephala clangula</i> Sanderling <i>Calidris alba</i> Dunlin <i>Calidris alpina alpina</i> Red Knot <i>Calidris canutus</i> Ringed plover <i>Charadrius hiaticula</i>	<p>Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated.</p> <p>Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022. It therefore follows that this</p>	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Eurasian Marsh harrier <i>Circus aeruginosus</i> Hen harrier <i>Circus cyaneus</i> Oystercatcher <i>Haematopus ostralegus</i> Bar tailed godwit <i>Limosa lapponica</i> Black tailed godwit <i>Limosa limosa islandica</i> Curlew <i>Numenius arquata</i> Whimbrel <i>Numenius phaeopus</i> Ruff <i>Philomachus pugnax</i> European Golden plover <i>Pluvialis apricaria</i> Grey plover <i>Pluvialis squatarola</i> Pied avocet <i>Recurvirostra avosetta</i> Little tern <i>Sterna albifrons</i> Common Shelduck <i>Tadorna tadorna</i> Common greenshank <i>Tringa nebularia</i> Common Redshank <i>Tringa totanus</i> Lapwing <i>Vanellus vanellus</i> scaup <i>Aythya marila</i> golden plover <i>Pluvialis apricaria</i> knot <i>Calidris canutus</i>	option would individually have no likely significant effect ²¹ .			
	Humber Estuary RAMSAR (>10km)	Ramsar Criterion 1 The site is a representative example of a near-natural estuary with the following component habitats; dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats,	There is no construction related to this option and no operational impacts have been identified Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc).	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>saltmarshes, and coastal brackish/saline lagoons.</p> <p>Ramsar Criterion 3 The Humber Estuary Ramsar site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i>.</p> <p>Ramsar Criterion 5 Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)</p> <p>Ramsar Criterion 6 12 Species/populations occurring at levels of international importance.</p> <p>Ramsar Criterion 8 The Humber Estuary acts as an important migration route for both river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i> between coastal waters and their spawning areas.</p>	<p>Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022.</p>			

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
Ure increased abstraction	North Pennine Moors SAC (3.2km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Blanket bogs Petrifying springs with tufa formation (<i>Cratoneurion</i>) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles Marsh saxifrage <i>Saxifraga hirculus</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	Yes	No
	North Pennine Moors SPA (0.25km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover.	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	hydrodynamic connectivity between channel and the moor, particularly during dry conditions.			
	Humber Estuary SAC (>10km ²⁴)	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines <i>Salicornia</i> and other annuals colonising mud and sand Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) Embryonic shifting dunes Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Fixed dunes with herbaceous vegetation ("grey dunes") Dunes with <i>Hippophae rhamnoides</i>	Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc). Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022. The Derwent catchment was previously discounted from the assessment as no options were present in the catchment. The current plan does include an option in the Derwent catchment however the hydrological impacts of the option are restricted to a transfer of abstraction limits between two existing	None	None	No

²⁴ Although outside of the buffer zone (10km radius), this has been included as the River Ure discharges into the Humber Estuary EMS.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Grey seal <i>Halichoerus grypus</i>	<p>abstraction points and impacts are assessed as negligible.</p> <p>Since the assessment in 2011 Naburn Weir has been modified and fish bypass was installed. An eel/lamprey bypass channel (lamprey bypass) was formalized next to the salmon ladder on the river bank-side in 2014 to aid the upstream migration of European eel juveniles (elvers) and river lamprey. The bypass largely followed the route of a complex channel, littered with rocks, concrete debris and tree roots, partly water-fed by an erosion generated hole in the retaining wall adjoining the salmon ladder. A detailed study by Durham University looked the behaviour of fishes (including lamprey) at Naburn Weir²⁵. The study noted that under normal flows Naburn weir impacts on the upstream migration of river lamprey quite dramatically, delaying the movement of river lamprey through the reach. The lamprey moved quickly (less than two days) through the unobstructed tidal reach of the Yorkshire Ouse. However, river lamprey once entering the area immediately downstream of the weir took 32.6 days on average before either moving in an upstream direction passing the weir or a downstream one. This delay at Naburn weir under normal flow conditions will likely lead to an increase in predation pressure through the aggregation of river lamprey in a relatively small area.</p>			

²⁵ Lothian, Angus, John (2021) Behaviour of fishes around engineered structures and in modified rivers, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/13872/>

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			<p>The assessment in 2011 remains valid as reduced flow levels triggered by the application of drought permits would not significantly alter the amount of time that Naburn Weir would be passable to sea and river lamprey, with the additional Lamprey bypass providing additional passability.</p> <p>It therefore follows that this option would individually have no likely significant effect²¹.</p>			
	Humber Estuary SPA (>10km)	<p>Teal <i>Anas crecca</i> Wigeon <i>Anas penelope</i> Mallard <i>Anas platyrhynchos</i> Ruddy turnstone <i>Arenaria interpres</i> Pochard <i>Aythya ferina</i> Great Bittern <i>Botaurus stellaris</i> Dark bellied brent goose <i>Branta bernicla bernicla</i> Goldeneye <i>Bucephala clangula</i> Sanderling <i>Calidris alba</i> Dunlin <i>Calidris alpina alpina</i> Red Knot <i>Calidris canutus</i> Ringed plover <i>Charadrius hiaticula</i> Eurasian Marsh harrier <i>Circus aeruginosus</i> Hen harrier <i>Circus cyaneus</i> Oystercatcher <i>Haematopus ostralegus</i> Bar tailed godwit <i>Limosa lapponica</i></p>	<p>Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated.</p> <p>Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022.</p>	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Black tailed godwit <i>Limosa limosa islandica</i> Curlew <i>Numenius arquata</i> Whimbrel <i>Numenius phaeopus</i> Ruff <i>Philomachus pugnax</i> European Golden plover <i>Pluvialis apricaria</i> Grey plover <i>Pluvialis squatarola</i> Pied avocet <i>Recurvirostra avosetta</i> Little tern <i>Sterna albifrons</i> Common Shelduck <i>Tadorna tadorna</i> Common greenshank <i>Tringa nebularia</i> Common Redshank <i>Tringa totanus</i> Lapwing <i>Vanellus</i> scaup <i>Aythya marila</i> golden plover <i>Pluvialis apricaria</i> knot <i>Calidris canutus</i>				
	Humber Estuary RAMSAR (>10km)	Ramsar Criterion 1 The site is a representative example of a near-natural estuary with the following component habitats; dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Ramsar Criterion 3 The Humber Estuary Ramsar site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna	There is no construction related to this option and no operational impacts have been identified Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc). Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i>.</p> <p>Ramsar Criterion 5 Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)</p> <p>Ramsar Criterion 6 12 Species/populations occurring at levels of international importance.</p> <p>Ramsar Criterion 8 The Humber Estuary acts as an important migration route for both river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i> between coastal waters and their spawning areas.</p>	any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022.			
Wharfe reduced regulated flow	North Pennine Moors SPA (1.40km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover.	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	hydrodynamic connectivity between channel and the moor, particularly during dry conditions.			
	North Pennine Moors SAC (1.40km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (Festuco-Brometalia) Blanket bogs Petrifying springs with tufa formation (Cratoneurion) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	Peak District Moors (South Pennine Moors Phase 2) SPA (1.20km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	South Pennine Moors SAC (1.20km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles		None	None	No
	Humber Estuary SAC (>10km ²⁶)	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines <i>Salicornia</i> and other annuals colonising mud and sand Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>)	Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc). Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an	None	None	No

²⁶ Although outside of the buffer zone (10km radius), this has been included as the River Wharfe discharges into the Humber Estuary EMS.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Embryonic shifting dunes Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Fixed dunes with herbaceous vegetation ("grey dunes") Dunes with <i>Hippophae rhamnoides</i> Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Grey seal <i>Halichoerus grypus</i>	assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022. The Derwent catchment was previously discounted from the assessment as no options were present in the catchment. The current plan does include an option in the Derwent catchment however the hydrological impacts of the option are restricted to a transfer of abstraction limits between two existing abstraction points and impacts are assessed as negligible. It therefore follows that this option would individually have no likely significant effect ²¹ .			
	Humber Estuary SPA (>10km)	Teal <i>Anas crecca</i> Wigeon <i>Anas penelope</i> Mallard <i>Anas platyrhynchos</i> Ruddy turnstone <i>Arenaria interpres</i> Pochard <i>Aythya ferina</i> Great Bittern <i>Botaurus stellaris</i> Dark bellied brent goose <i>Branta bernicla bernicla</i> Goldeneye <i>Bucephala clangula</i> Sanderling <i>Calidris alba</i> Dunlin <i>Calidris alpina alpina</i> Red Knot <i>Calidris canutus</i> Ringed plover <i>Charadrius hiaticula</i>	Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated. Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Eurasian Marsh harrier <i>Circus aeruginosus</i> Hen harrier <i>Circus cyaneus</i> Oystercatcher <i>Haematopus ostralegus</i> Bar tailed godwit <i>Limosa lapponica</i> Black tailed godwit <i>Limosa limosa islandica</i> Curlew <i>Numenius arquata</i> Whimbrel <i>Numenius phaeopus</i> Ruff <i>Philomachus pugnax</i> European Golden plover <i>Pluvialis apricaria</i> Grey plover <i>Pluvialis squatarola</i> Pied avocet <i>Recurvirostra avosetta</i> Little tern <i>Sterna albifrons</i> Common Shelduck <i>Tadorna tadorna</i> Common greenshank <i>Tringa nebularia</i> Common Redshank <i>Tringa totanus</i> Lapwing <i>Vanellus vanellus</i> scaup <i>Aythya marila</i> golden plover <i>Pluvialis apricaria</i> knot <i>Calidris canutus</i>				
	Humber Estuary RAMSAR (>10km)	Ramsar Criterion 1 The site is a representative example of a near-natural estuary with the following component habitats; dune systems and humid dune slacks, estuarine waters,	There is no construction related to this option and no operational impacts have been identified Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.</p> <p>Ramsar Criterion 3 The Humber Estuary Ramsar site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i>.</p> <p>Ramsar Criterion 5 Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)</p> <p>Ramsar Criterion 6 12 Species/populations occurring at levels of international importance.</p> <p>Ramsar Criterion 8 The Humber Estuary acts as an important migration route for both river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i> between</p>	<p>and sea lamprey (entrainment, attractant flows, dissolved oxygen etc).</p> <p>Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022. The Derwent catchment was previous discounted from the assessment as no options were present in the catchment. The current plan does include an option in the Derwent catchment however the hydrological impacts of the option are restricted to a transfer of abstraction limits between two existing abstraction points and impacts are assessed as negligible.</p> <p>Since the assessment in 2011 Naburn Weir has been modified and fish bypass was installed. An eel/lamprey bypass channel (lamprey bypass) was formalized next to the salmon ladder on the river bank-side in 2014 to aid the upstream migration of European eel juveniles (elvers) and river lamprey. The bypass largely followed the route of a complex channel, littered with rocks, concrete debris and tree roots, partly water-fed by an erosion generated hole in the retaining wall adjoining the salmon ladder. A detailed study by</p>			

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		coastal waters and their spawning areas.	<p>Durham University looked the behaviour of fishes (including lamprey) at Naburn Weir²⁷. The study noted that under normal flows Naburn weir impacts on the upstream migration of river lamprey quite dramatically, delaying the movement of river lamprey through the reach. The lamprey moved quickly (less than two days) through the unobstructed tidal reach of the Yorkshire Ouse was relatively fast, however, river lamprey once entering the area immediately downstream of the weir took 32.6 days on average before either moving in an upstream direction passing the weir or a downstream one. This delay at Naburn weir under normal flow conditions will likely lead to an increase in predation pressure through the aggregation of river lamprey in a relatively small area.</p> <p>The assessment in 2011 remains valid as reduced flow levels triggered by the application of drought permits would not significantly alter the amount of time that Naburn Weir would be passable to sea and river lamprey, with the additional Lamprey bypass providing additional passability.</p> <p>It therefore follows that this option would individually have no likely significant effect²¹.</p>			
Hull increased abstraction	Humber Estuary SAC/SPA/ RAMSAR (<1km)	As above	There is no construction related to this option and no operational impacts have been identified. Reductions in freshwater flows to the Humber Estuary from the River Hull would not affect any	None	Yes	No

²⁷ Lothian, Angus, John (2021) Behaviour of fishes around engineered structures and in modified rivers, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/13872/>

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			<p>qualifying interests for which the Estuary is designated a SAC/SPA/Ramsar.</p> <p>The lamprey population within the River Hull is unlikely to be impacted directly by flow changes associated with this option, however the water quality implications of reduced flow on estuarine flushing (of one STW effluent plume) may become apparent and impact lamprey migration. At times of poor flushing a plume of diluted effluent is understood to persist within the tidal reach, with local water quality implications. Flushing of the tidal reach is dependent on the tidal cycle as well as the freshwater contribution from the River Hull. The potential for a dissolved oxygen (DO) sag as a result of one STW may potential to result in a small-scale, localised and temporary barrier to lamprey migration. The timing of a potential temporary localised DO sag is most likely to occur in summer/autumn which does not coincide with lamprey migration to spawning grounds which occur between November and March²⁸. Any temporary and localised DO sag is not expected to prevent the downstream movement of any post metamorphic individuals either. It therefore follows that this option would have no likely significant effect²¹.</p> <p>Additionally, a review of the lamprey population in the Humber basin made no reference to the River Hull as an important river for lamprey populations; unlike the Ouse, Derwent and Trent</p>			

²⁸ Hopkins, D. 2008. River lamprey. Brief summary of Humber basin information: The Bellflask Ecological Survey Team.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			<p>catchments²⁹. However, lamprey are not SAC Monitored Features and are not allocated to unit(s) for conditions assessments. In all, the Humber basin provides an excellent habitat for river lamprey feeding, shelter, reproduction and migration across all life stages, and is considered the most important river lamprey habitat potentially supporting the largest population in the UK³⁰.</p> <p>The River Hull discharges to the estuary through natural gravity flow (there is normally no barrier unless the tidal gate is lowered), at a location where impacts on designated habitats would not occur, through the docks of Kingston upon Hull.</p> <p>Any potential barriers to migration are not anticipated to result in significant impacts on the lamprey's migration route and will likely remain free of obstacles – physical or pollution in order to reach their spawning grounds with minimal delay.</p>			
Wharfe increased annual abstraction	North Pennine Moors SPA (1.40km)	<p>Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover.</p> <p>Golden Plover <i>Pluvialis apricaria</i></p>	<p>There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.</p>	None	None	No

²⁹ APEM (2007). Review of information on lamprey populations in the Humber Basin.

³⁰ Jang, M.-H. and Lucas, M. C. 2005. Reproductive ecology of the river lamprey. Journal of Fish Biology 499-512.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>				
	North Pennine Moors SAC (1.40km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (Festuco-Brometalia) Blanket bogs Petrifying springs with tufa formation (Cratoneurion) Alkaline fens Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Marsh saxifrage <i>Saxifraga hirculus</i>				
	Peak District Moors (South Pennine Moors Phase 2) SPA (1.20km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	There is no construction related to this option and no operational impacts have been identified. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	None	None	No
	South Pennine Moors SAC (1.20km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles		None	None	No
	Humber Estuary SAC (>10km ³¹)	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Coastal lagoons Annual vegetation of drift lines <i>Salicornia</i> and other annuals colonising mud and sand	There is no construction related to this option and no operational impacts have been identified. The drought permit would increase the daily average abstraction by ~23.7Ml/d (an indicative value that would be confirmed at time of application) which would otherwise be constrained by the annual licence total. This would affect river flows at moderate and higher flows. At most this would be up to a 5% reduction in flow at moderate flows (flows greater than 571.4Ml/d at Addingham gauge), proportionally less at higher flows and no change	None	None	No

³¹ Although outside of the buffer zone (10km radius), this has been included as the River Wharfe discharges into the Humber Estuary EMS.

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) Embryonic shifting dunes Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Fixed dunes with herbaceous vegetation ("grey dunes") Dunes with <i>Hippophae rhamnoides</i> Sea lamprey <i>Petromyzon marinus</i> River lamprey <i>Lampetra fluviatilis</i> Grey seal <i>Halichoerus grypus</i>	at low flows where these are supported by regulation releases. The extent considered is from the intake to the tidal limit of the river at Ulleskelf, North Yorkshire, 72km of the River Wharf. The magnitude of effect is considered indiscernible (i.e. negligible), when compared with the range of winter flows in the river, and freshwater flows into the estuary will not be affected.			
	Humber Estuary SPA (>10km)	Teal <i>Anas crecca</i> Wigeon <i>Anas penelope</i> Mallard <i>Anas platyrhynchos</i> Ruddy turnstone <i>Arenaria interpres</i> Pochard <i>Aythya ferina</i> Great Bittern <i>Botaurus stellaris</i> Dark bellied brent goose <i>Branta bernicla bernicla</i> Goldeneye <i>Bucephala clangula</i> Sanderling <i>Calidris alba</i> Dunlin <i>Calidris alpina alpina</i> Red Knot <i>Calidris canutus</i> Ringed plover <i>Charadrius hiaticula</i>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Eurasian Marsh harrier <i>Circus aeruginosus</i> Hen harrier <i>Circus cyaneus</i> Oystercatcher <i>Haematopus ostralegus</i> Bar tailed godwit <i>Limosa lapponica</i> Black tailed godwit <i>Limosa limosa islandica</i> Curlew <i>Numenius arquata</i> Whimbrel <i>Numenius phaeopus</i> Ruff <i>Philomachus pugnax</i> European Golden plover <i>Pluvialis apricaria</i> Grey plover <i>Pluvialis squatarola</i> Pied avocet <i>Recurvirostra avosetta</i> Little tern <i>Sterna albifrons</i> Common Shelduck <i>Tadorna tadorna</i> Common greenshank <i>Tringa nebularia</i> Common Redshank <i>Tringa totanus</i> Lapwing <i>Vanellus vanellus</i> scaup <i>Aythya marila</i> golden plover <i>Pluvialis apricaria</i> knot <i>Calidris canutus</i>				
	Humber Estuary RAMSAR (>10km)	Ramsar Criterion 1 The site is a representative example of a near-natural estuary with the following component habitats; dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats,		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>saltmarshes, and coastal brackish/saline lagoons.</p> <p>Ramsar Criterion 3 The Humber Estuary Ramsar site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad <i>Bufo calamita</i>.</p> <p>Ramsar Criterion 5 Assemblages of international importance: 153,934 waterfowl, non-breeding season (5 year peak mean 1996/97-2000/2001)</p> <p>Ramsar Criterion 6 12 Species/populations occurring at levels of international importance.</p> <p>Ramsar Criterion 8 The Humber Estuary acts as an important migration route for both river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i> between coastal waters and their spawning areas.</p>				

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
Derwent annual abstraction increase	River Derwent SAC (<1km)	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation River lamprey <i>Lampetra fluviatilis</i> Sea lamprey <i>Petromyzon marinus</i> Bullhead <i>Cottus gobio</i> Otter <i>Lutra lutra</i>	In hydrological terms a 20Ml/d increase in daily average flows (to be confirmed at time of application) is a potentially positive impact (7.6-9.9% increase in low flows) as it changes flow in the direction of a more natural flow regime for the lower River Derwent (when compared with Buttercrambe flow gauge). The extent considered is for 24km of the River Derwent.	None	None	No
	Lower Derwent Valley SAC (<1km)	Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) Otter <i>Lutra lutra</i>	The hydrological effect is considered indiscernible (i.e. negligible), when compared with the range of winter flows in the river, and in the context of daily variability. Furthermore, where there is significant sub-daily differences in flow, as caused by the Barmby Barrage (at least from Bubwith Bridge) that pattern is the dominant feature on river hydrology.	None	None	No
	Lower Derwent Valley SPA (<1km)	Corncrake <i>Crex crex</i> , Ruff <i>Philomachus pugnax</i> Spotted Crake <i>Porzana porzana</i> Bewick's Swan <i>Cygnus columbianus bewickii</i> Bittern <i>Botaurus stellaris</i> Golden Plover <i>Pluvialis apricaria</i> Teal <i>Anas crecca</i> Over winter, the area regularly supports 39,936 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Lapwing <i>Vanellus vanellus</i> , Pochard <i>Aythya ferina</i> , Shoveler <i>Anas clypeata</i> , Mallard <i>Anas platyrhynchos</i> , Wigeon <i>Anas penelope</i> , Teal <i>Anas crecca</i> , Ruff <i>Philomachus pugnax</i> , Golden Plover <i>Pluvialis apricaria</i> , Bewick's Swan <i>Cygnus columbianus bewickii</i> , Bittern		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>Botaurus stellaris</i> .				
	Lower Derwent Valley Ramsar (<1km)	<p>Ramsar Criterion 1</p> <p>The site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK and they play a substantial role in the hydrological and ecological functioning of the Humber basin.</p> <p>Ramsar Criterion 2</p> <p>The site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates and is the only known site in GB for the leafhopper <i>Cicadula ornata</i>.</p> <p>Ramsar Criterion 4</p> <p>The site qualifies as a staging post for passage birds in spring, with nationally important numbers of ruff <i>Philomachus pugnax</i> and whimbrel <i>Numenius phaeopus</i>.</p> <p>Ramsar Criterion 5</p> <p>The site supports an internationally important assemblage of waterfowl in the winter with 31,942 waterfowl.</p> <p>Ramsar Criterion 6</p> <p>The site supports Eurasian wigeon <i>Anas penelope</i> and Eurasian teal <i>Anas</i></p>		None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>crecca</i> at levels of international importance during the winter.				
Long-term options						
East Yorkshire Groundwater Option 2	Skipwith Common SAC (8.7km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths	Hydrological impacts of the option are unlikely to influence the designated site. Impacts resulting from this are unlikely to lead to significant effects on qualifying features as the abstraction would not be associated with the aquifer underlying the SACs, SPA or Ramsar site. Abstraction would also be within the limits of the existing licence. The site is sufficiently distanced for proposed infrastructure for direct and in-direct impacts to be unlikely and is not located within the IRZ of any European Sites.	None	No	No
	River Derwent SAC (9.5km)	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation River lamprey <i>Lampetra fluviatilis</i> Sea lamprey <i>Petromyzon marinus</i> Bullhead <i>Cottus gobio</i> Otter <i>Lutra lutra</i>				
	Lower Derwent Valley SAC (>10km)	Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) Otter <i>Lutra lutra</i>				
	Lower Derwent Valley SPA (>10km)	Corncrake <i>Crex crex</i> , Ruff <i>Philomachus pugnax</i> Spotted Crake <i>Porzana porzana</i> Bewick's Swan <i>Cygnus columbianus bewickii</i> Bittern <i>Botaurus stellaris</i> Golden Plover <i>Pluvialis apricaria</i> Teal <i>Anas crecca</i> Over winter, the area regularly supports 39,936 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including:				

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Lapwing <i>Vanellus vanellus</i> , Pochard <i>Aythya ferina</i> , Shoveler <i>Anas clypeata</i> , Mallard <i>Anas platyrhynchos</i> , Wigeon <i>Anas penelope</i> , Teal <i>Anas crecca</i> , Ruff <i>Philomachus pugnax</i> , Golden Plover <i>Pluvialis apricaria</i> , Bewick's Swan <i>Cygnus columbianus bewickii</i> , Bittern <i>Botaurus stellaris</i> .				
	Lower Derwent Valley Ramsar (>10km)	<p>Ramsar Criterion 1</p> <p>The site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK. The river and flood meadows play a substantial role in the hydrological and ecological functioning of the Humber Basin</p> <p>Ramsar Criterion 2</p> <p>The site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates as well as a leafhopper, <i>Cicadula ornata</i> for which Lower Derwent Valley is the only known site in Great Britain.</p> <p>Ramsar Criterion 4</p> <p>The site qualifies as a staging post for passage birds in spring. Of particular</p>				

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>note are the nationally important numbers of Ruff, <i>Philomachus pugnax</i> and Whimbrel, <i>Numenius phaeopus</i>.</p> <p>Ramsar Criterion 5</p> <p>Assemblages of international importance: Species with peak counts in winter: 31942 waterfowl (5 year peak mean 1998/99-2002/2003)</p> <p>Ramsar Criterion 6</p> <p>Two species/populations occurring at levels of international importance</p>				
North Yorkshire Groundwater increased abstraction	North Pennine Dales Meadows SAC (4.8 km)	<p>Mountain hay meadows</p> <p><i>Molinia</i> meadows on calcareous, peaty of clayey-silt-laden soils (<i>Molinia caeruleae</i>)</p>	The SAC is located between 4 and 6km from the borehole location. Despite being some distance from the abstraction point, there is uncertainty with regards to the extent to which additional drawdown may impact on the designated habitats. As such, there is uncertainty with regards to the potential impacts on the designated features and whether these impacts are likely to be significant.	Yes	No	Yes
Tees – Swale transfer	Moorhouse-Upper Teesdale SAC (~6.70km)	<p>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp.</i></p> <p>European dry heaths</p> <p>Alpine and Boreal heaths</p> <p>Juniperus communis formations on heaths or calcareous grasslands</p> <p>Calaminarian grasslands of the Violetalia</p> <p>Siliceous alpine and boreal grasslands</p>	<p>These designated sites incorporate Cow Green Reservoir and the Upper Tees.</p> <p>These sites are designated for moorland and upland habitats which would not be impacted by water level changes in the River Tees as a result of the transfer. At Cow Green Reservoir, all releases and associated water level drawdown would be within the bounds of the operating agreement. The licensed abstractions and associated reservoir releases and changes in</p>	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Molinia meadows on calcareous, peaty or clayey-siltladen soils (<i>Molinion caeruleae</i>) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels Mountain hay meadows Blanket bogs Petrifying springs with tufa formation (Cratoneurion) Alkaline fens Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i> Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietea rotundifolii</i>) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Limestone pavements Round mouthed whorl snail <i>Vertigo genesii</i> Marsh saxifrage <i>Saxifraga hirculus</i>	water levels have been considered by the Habitats Directive Review of Consents process, which concluded there would be no likely significant effect on the integrity of these European sites.			

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
	North Pennine Moors SPA (<1km)	Assemblages of breeding birds-upland moorland and grassland breeding birds with waterbodies. Species include common sandpiper, curlew and ringed plover. Golden Plover <i>Pluvialis apricaria</i> Hen harrier <i>Circus cyaneus</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>		None	None	No
	Humber estuary SAC/SPA/Ramsar (<1km)	As listed above	Transfer of water of potentially varying quality between catchments – Swale discharges to the Humber estuary via the Ouse. Water quality impacts on the Swale were deemed likely to be insignificant by the 2000 study. It follows that impacts of a much reduced transfer on the Humber Estuary would be negligible. At low flows (Q95), 42ML/d transferred from the Tees/Tyne would make up 0.3% of the flow discharging to the Humber Estuary.	None	None	No
	Teesmouth and Cleavland Coast SPA/Ramsar	Avocet (<i>Recurvirostra avosetta</i>) Common tern (<i>Sterna hirundo</i>) Knot (<i>Calidris canutus</i>) Little tern (<i>Sternula albifrons</i>) Redshank (<i>Tringa totanus</i>) Ruff (<i>Calidris pugnax</i>) Sandwich tern (<i>Thalasseus sandvicensis</i>) Waterbird assemblage	The transfer is likely to result in a negligible change in flows within the River Tees downstream of the Blackwell intake. As the river flow may be held at minimum maintained flow for longer under the Tees transfer options, on a precautionary basis the hydrological impacts are assessed in the 2021 Long Term Options EAR as minor to the tidal limit at Stockton, upstream of the Teesmouth and Cleavland Coast SPA/Ramsar/SSSI. The option would only be implemented in an extreme drought situation in the third year of a drought and	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			significant impacts as a result of drought option implementation on sediment supply over and above the natural drought are not anticipated under these conditions.			
Aire abstraction	South Pennine Moors SAC (>4km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	The option requires the construction of a new river intake, a new pumping station, a break pressure tank, and a pipeline. The nearest designated site is >4km away from the proposed pipeline, the associated construction and the impacted reach. The site is sufficiently distanced for proposed infrastructure for direct and in-direct impacts to be unlikely and is not located within the IRZ of any European Sites The operation of the proposed option is unlikely to impact upon the site hydrologically, with the site located upstream in the catchment compared to the abstraction	None	None	No
	South Pennine Moors SPA (>41km)	Short eared owl <i>Asio flammeus</i> Merlin <i>Falco columbarius</i> Golden plover <i>Pluvialis apricaria</i> Merlin <i>Falco columbarius</i> Peregrine <i>Falco peregrinus</i> Dunlin <i>Calidris alpina schinzii</i>	The option requires the construction of a new river intake, a new pumping station, a break pressure tank, and a pipeline. The nearest designated site is >4km away from the proposed pipeline, the associated construction and the impacted reach. The site is sufficiently distanced for proposed infrastructure for direct and in-direct impacts to be unlikely and is not located within the IRZ of any European Sites	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			The operation of the proposed scheme is unlikely to impact upon the site hydrologically, with the site located upstream in the catchment compared to the abstraction.			
Ouse water treatment works extension	Strensall Common SAC (7.25km)	North Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths	<p>The option requires the construction of a new river intake and a new connection to the existing raw water main. The nearest designated site is 7.25km away and as it is sufficiently distanced, there should be no likely significant effect on noise or visual amenity. The construction will require minimal numbers of HGV lorries to transport the material. Transport will utilise the existing road network, however, the increase in vehicle numbers required for the construction of the scheme is considered to be negligible, and will be for a temporary period.</p> <p>No operational impacts have been identified. The SAC is a sufficient distance from the impacted reach that there would be no hydrodynamic connectivity between channel and the common, particularly during dry conditions.</p>	None	None	No
Ouse Raw Water Transfer	Strensall Common SAC (7.25km)	North Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths	The option requires the construction of a new river intake. The nearest designated site is 7.25km away as it is sufficiently distanced, there should be no likely significant effects on noise or visual amenity. The construction will require minimal numbers of HGV lorries to transport the material. Transport will utilise the existing road network, however, the increase in vehicle numbers required for the construction of the scheme is considered to be negligible, and will be for a temporary period.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			No operational impacts have been identified. The SAC is a sufficient distance from the impacted reach that there would be no hydrodynamic connectivity between channel and the common, particularly during dry conditions.			
Ouse increased abstraction	Strensall Common SAC (7.1km)	North Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths	<p>The option requires the construction of a new pipeline and pumps. The nearest designated site is 7.1km away and as it is sufficiently distanced, there should be no likely significant effects on noise or visual amenity. The construction will require minimal numbers of HGV lorries to transport the material. Transport will utilise the existing road network, however, the increase in vehicle numbers required for the construction of the scheme is considered to be negligible, and will be for a temporary period.</p> <p>The SAC is a sufficient distance from the impacted reach that there would be no hydrodynamic connectivity between channel and the common, particularly during dry conditions and the operation.</p>	None	None	No
Tees - Derwent Pipeline	North Pennine Dales Meadows SAC (>7km)	Mountain hay meadows <i>Molinia</i> meadows on calcareous, peaty of clayey-silt-laden soils (<i>Molinion caeruleae</i>)	Construction associated with this option includes a new pipeline and inline pumping station which will connect the existing Blackwell to Birkby pipeline to a high point and a new break pressure tank at the Yorkshire Water site. The construction will require number of HGV lorries to transport the material. Transport will utilise the existing road network, however, the increase in vehicle numbers required for the construction of the scheme is considered to be negligible, and will be for a temporary period. Noise and dust is likely to be minimal as the site is sufficiently distanced.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			<p>Further, the proposed pipeline and infrastructure required for the scheme are sufficiently distanced from this European site for direct and in-direct impacts to be unlikely to affect qualifying features during construction and operation.</p> <p>A single component of the European site, Thorneyburn Meadow, an alluvial floodplain, is located adjacent to the River Tyne approximately 7km downstream of Kielder Water. Although the impacts of additional releases from Kielder Reservoir during dry weather flows have the potential to alter water levels in the Tyne, it is unlikely that they will be of significant magnitude to have a significant effect on the qualifying features.</p> <p>Elsewhere, operation of the proposed scheme will not affect this European site as the hydrological connectivity falls outside of the area of influence of the scheme.</p>			
	Border Mires, Kielder-Butterburn SAC (3.2km)	Blanket bogs Transition mires and quaking bogs Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Petrifying springs with tufa formation (<i>Cratoneurion</i>)	<p>The construction associated with this option is not nearby to the designated site, therefore no construction impacts are anticipated.</p> <p>The operational impact of additional drawdown of the reservoir to support the scheme and higher releases in dry weather is unlikely to impact on the bogs and mire habitat as the reservoir and flow releases do not contribute to the hydrological balance of these habitats.</p>	None	None	No
	Teesmouth and Cleavland Coast SPA/Ramsar	Avocet (<i>Recurvirostra avosetta</i>) Common tern (<i>Sterna hirundo</i>) Knot (<i>Calidris canutus</i>)	The construction associated with this option is not nearby to the designated site, therefore no construction impacts are anticipated.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>Little tern (<i>Sternula albifrons</i>)</p> <p>Redshank (<i>Tringa totanus</i>)</p> <p>Ruff (<i>Calidris pugnax</i>)</p> <p>Sandwich tern (<i>Thalasseus sandvicensis</i>)</p> <p>Waterbird assemblage</p>	<p>The transfer is likely to result in a negligible change in flows within the River Tees downstream of the Blackwell intake. As the river flow may be held at minimum maintained flow for longer under the Tees transfer options, on a precautionary basis the hydrological impacts are assessed in the 2021 Long Term Options EAR as minor to the tidal limit at Stockton, upstream of the Teesmouth and Cleavland Coast SPA/Ramsar/SSSI. The option would only be implemented in an extreme drought situation in the third year of a drought and significant impacts as a result of drought option implementation on sediment supply over and above the natural drought are not anticipated under these conditions.</p>			
	North Pennine Moors SAC (10km)	<p>Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>European dry heaths</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i></p> <p>Siliceous alpine and boreal grasslands</p> <p>Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>)</p> <p>Blanket bogs</p> <p>Petrifying springs with tufa formation (<i>Cratoneurion</i>)</p> <p>Alkaline fens</p> <p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and</p>	<p>Construction associated with this option is not near this designated site.</p> <p>These designated sites incorporate Cow Green Reservoir and the Upper Tees. These sites are designated for moorland and upland habitats which would not be impacted by water level changes in the River Tees as a result of the transfer and operational use. At Cow Green Reservoir, all releases and associated water level drawdown would be within the bounds of the operating agreement. The licensed abstractions and associated reservoir releases and changes in water levels have been considered by the Habitats Directive Review of Consents process, which concluded there would be no likely significant effect on the integrity of these European sites.</p>	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<i>Galeopsietalia ladanii</i> Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <i>Saxifraga hirculus</i> Marsh saxifrage <i>Saxifraga hirculus</i>				
	Moor House - Upper Teesdale SAC (<1km)	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. Alpine and Boreal heaths <i>Juniperus communis</i> formations on heaths or calcareous grassland Calaminarian grasslands of the <i>Violetalia calaminariae</i> Siliceous alpine and boreal grasslands Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels Mountain hay meadows Blanket bogs Petrifying springs with tufa formation (<i>Cratoneurion</i>) Alkaline fens Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i>	Construction associated with this option is not near this designated site. These designated sites incorporate Cow Green Reservoir and the Upper Tees. These sites are designated for moorland and upland habitats which would not be impacted by water level changes in the River Tees as a result of the transfer and operational use. At Cow Green Reservoir, all releases and associated water level drawdown would be within the bounds of the operating agreement. The licensed abstractions and associated reservoir releases and changes in water levels have been considered by the Habitats Directive Review of Consents process, which concluded there would be no likely significant effect on the integrity of these European sites.	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
		<p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>)</p> <p>Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietea rotundifolii</i>)</p> <p>Calcareous rocky slopes with chasmophytic vegetation</p> <p>Siliceous rocky slopes with chasmophytic vegetation</p> <p>Round-mouthed whorl snail <i>Vertigo genesii</i></p> <p>Marsh saxifrage <i>Saxifraga hirculus</i></p> <p>European dry heaths</p> <p>Limestone pavements</p>				
	North York Moors SPA & SAC (13km)	<p>Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>European dry heaths</p> <p>Blanket bogs</p> <p>Falcon <i>Falco columbarius</i></p> <p>golden plover <i>Pluvialis apricaria</i></p>	<p>Construction associated with this option is not near this designated site.</p> <p>Operation of the proposed scheme will not affect the European site as the hydrological connectivity falls outside of the area of influence of the scheme. In addition, the proposed pipeline and infrastructure required for the scheme are sufficiently distanced from the European site for direct and in-direct impacts to be unlikely to affect qualifying features.</p>	None	None	No
	Irthinghead Mires Ramsar (7.48km)	<p>The site supports an outstanding example of undamaged blanket bog characteristic of the vegetation of upland north-western Britain. The site also supports a notable variety of <i>Sphagnum</i> moss, several rare plants and the rare spider <i>Eboria caliginosa</i>.</p>	<p>No construction associated with this option is near the designated site.</p> <p>The operation of option and the compensation release in dry weather conditions from Kielder Water is unlikely to influence the hydrology of this European site. In addition, the proposed infrastructure required for this scheme is sufficiently distanced (>10km) from this European</p>	None	None	No

Option(s)	European Site within zone of minor, moderate or major hydrological impact ²⁰	Qualifying features (European sites)	Potential for effects on qualifying features/main habitats?	Potential likely significant effect of scheme on European site(s) alone?	Effect in combination with other options, plans and projects?	Is scheme likely to have a significant effect on European site(s)?
			site for direct and in-direct impacts to be negligible.			
North West Reservoir Abstraction	South Pennine Moors SAC (2.20km)	Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Blanket bogs Transition mires and quaking bogs Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	A temporary pump would be needed to transfer the water from North West Reservoir to Bradford WTW 1. The construction will require a number of HGV lorries to transport the material. Transport will utilise the existing road network, however, the increase in vehicle numbers required for the construction of the scheme is considered to be negligible, and will be for a temporary period. Noise and dust is likely to be minimal as it is sufficiently distanced. As the pipe is temporary there will be no long-lasting impacts on the designation. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions. The drought option allows the continued release of compensational flows and operational impacts are considered negligible.	None	None	No

3.4 Information to Inform the Appropriate Assessment

HRA Guidance indicates that the Plan making authority (in this case Yorkshire Water) shall adopt, or otherwise give effect to the Plan, only after having ascertained that it will not cause a likely significant effect on the integrity of a European site. Stage 1 HRA screening of the Drought Plan 2022 has indicated that likely significant effects on the North Pennine Dales Meadows SAC and the Humber Estuary SAC could not be ruled out. Impacts on the North Pennine Dales Meadows SAC are a result of the implementation of the North Yorkshire Groundwater increased abstraction drought option. Impacts on the Humber Estuary SAC are a result of the implementation of the North Area Reservoir 1. As such, a Stage 2 HRA was required to determine whether the implementation of the drought options could impact on the conservation objectives and subsequently site integrity of these European sites.

The Information to Inform the Appropriate Assessment is provided in full as **Appendix A**.

North Pennine Dales Meadows SAC

In summary, the units of the North Pennine Dales Meadows SAC most likely to be affected by the scheme are located between 4.9km and 6.7km from the North Yorkshire Groundwater increased abstraction location. Analysis of geological and borehole data indicate that the SACs are above the groundwater water table level and that the SACs are designated for non-water dependant features. As such, it is concluded that abstraction from the proposed North Yorkshire Groundwater increased abstraction scheme will not have a likely significant effect on the qualifying features of the North Pennine Dales Meadows SAC.

Humber Estuary SAC

In summary, both qualifying lamprey species are unlikely to be impacted by the implementation of the proposed North Area Reservoir 1 option within the Ouse catchment (River Ure). Based on detailed habitat mapping and barrier assessments of the impacted reaches it has been determined that the impacted reaches do not serve of functionally linked habitat for qualifying lamprey species. As such, it is concluded that the proposed North Area Reservoir 1 option will not have a likely significant effect on the qualifying features of the Humber Estuary SAC.

3.5 Potential In-Combination Effects of Drought Options

Individually, apart from the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction drought options, all of the other options within Yorkshire Water Drought Plan 2022 are not considered likely to have likely significant effects on the qualifying features of European sites. (see **Table 3.2**). However, a number of drought options could be used at a similar time, should they be required, and therefore an assessment has been completed to determine the potential for LSEs, as detailed in **Table 3.2**, column 6. In addition, **Table 3.3** shows the cumulative effects assessment for the Humber Estuary EMS.

In summary, no cumulative or in-combination impacts of operating the drought options at the same time, or with other relevant plans and projects, on European Sites have been identified.

Table 3.3: Cumulative Effects Assessment on the Humber Estuary

Option	European Site or SSSI within zone of minor, moderate or major hydrological impact	Qualifying features (European sites) and main habitats (SSSI)	Potential for cumulative effects on qualifying features/main habitats?	Potential cumulative effect?	Are the cumulative effects of schemes likely to have a significant effect on European sites?
All Options	Humber Estuary SAC/SPA/ RAMSAR	As above	<p>Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (recruitment and reproductive capability and Presence and spatial distribution of the species).</p> <p>Previously in 2011, extensive work undertaken by Yorkshire Water and signed off by Natural England and the Environment Agency for those options to be implemented in the first two years of a drought has shown that cumulative impacts of all drought options would be unlikely to have any likely significant effect on the integrity of the European site. Though the report includes an assessment of a previous Drought Plan period, review of the reports finding show they are valid for the current suite of options included in the Drought Plan 2022. The Derwent catchment was previously discounted from the assessment as no options were present in the catchment. The current plan does include an option in the Derwent catchment however the hydrological impacts of the option are restricted to a transfer of abstraction limits between two existing abstraction points and impacts are assessed as negligible.</p> <p>Since the assessment in 2011 Naburn Weir has been modified and fish bypass was installed. An eel/lamprey bypass channel (lamprey byass) was formalized next to the salmon ladder on the river bank-side in 2014 to aid the upstream migration of European eel juveniles (elvers) and river lamprey. The bypass largely followed the route of a complex channel, littered with rocks, concrete debris and tree roots, partly water-fed by an erosion generated hole in the retaining wall adjoining the salmon ladder. A detailed study by Durham University looked the behaviour of fishes (including lamprey) at Naburn Weir³². The study noted that under normal flows Naburn weir impacts on the upstream migration of river lamprey quite dramatically, delaying the movement of river lamprey through the reach. The lamprey moved</p>	Yes	No

³² Lothian, Angus, John (2021) Behaviour of fishes around engineered structures and in modified rivers, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/13872/>

Option	European Site or SSSI within zone of minor, moderate or major hydrological impact	Qualifying features (European sites) and main habitats (SSSI)	Potential for cumulative effects on qualifying features/main habitats?	Potential cumulative effect?	Are the cumulative effects of schemes likely to have a significant effect on European sites?
			<p>quickly (less than two days) through the unobstructed tidal reach of the Yorkshire Ouse. However, river lamprey once entering the area immediately downstream of the weir took 32.6 days on average before either moving in an upstream direction passing the weir or a downstream one. This delay at Naburn weir under normal flow conditions will likely lead to an increase in predation pressure through the aggregation of river lamprey in a relatively small area.</p> <p>The assessment in 2011 remains valid as reduced flow levels triggered by the application of drought permits would not significantly alter the amount of time that Naburn Weir would be passable to sea and river lamprey, with the additional Lamprey bypass providing additional passability.</p> <p>The in-combination impacts from the implementation of the Hull increased abstraction and one STW is unlikely to impact the lamprey population within the River Hull. The water quality implications of reduced flow on estuarine flushing (of one STW effluent plume) do not coincide with lamprey migration to spawning grounds which occur between November and March³³. Any temporary and localised DO sag is not expected to prevent the downstream movement of any post metamorphic individuals either.</p> <p>Assessment of the cumulative impact of options in a third year of drought has been carried out. Not all of the options for a third year of drought would be implemented - at most, only 2 options are likely to be implemented. The two options involving abstraction from the River Tees would have no cumulative effect on flows to the Humber Estuary EMS. Assessment indicates that the additional abstraction from any combination of the remaining long-term drought options is unlikely to lead to any significant effect on the Humber Estuary EMS.</p>		

³³ Hopkins, D. 2008. River lamprey. Brief summary of Humber basin information: The Bellflask Ecological Survey Team.

Option	European Site or SSSI within zone of minor, moderate or major hydrological impact	Qualifying features (European sites) and main habitats (SSSI)	Potential for cumulative effects on qualifying features/main habitats?	Potential cumulative effect?	Are the cumulative effects of schemes likely to have a significant effect on European sites?
			If all of the River Ouse options were to be implemented (and assuming the Ouse increased abstraction drought permit is already in place), cumulative impacts downstream of a sewage treatment works to the tidal limit at Q99 and Q95 flows would be moderate and minor adverse respectively. Mass balance water quality calculations suggest that this would not result in significant effects on water quality in the Humber Estuary, but this should be reviewed in more detail in the event that a decision was made to implement all of the River Ouse options in a 3rd consecutive year of drought. This would need to take into account the prevailing water quality conditions during that specific drought event which will vary according to time of year temperature and underlying water quality conditions in the lower Ouse and Humber Estuary.		
Ure increased abstraction and North Area Reservoir 1	Humber Estuary SAC/SPA/ RAMSAR	As above	<p>Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (recruitment and reproductive capability and Presence and spatial distribution of the species).</p> <p>The detailed assessment is discussed above, noting that passability and connectivity to the Ouse catchment and therefore the River Ure is limited due to the presence of significant barriers for lamprey. The conclusion for in-combination effects remains no likely significant effect, as weirs are impassable in drought for sea lamprey (when they make spawning runs in summer). Spawning habitat for both lamprey species is limited in the reaches and the impacts on lamprey ammocoete habitat in the in-combination reach is considered minor at most in the context of drought and the lowland nature of the river at this point.</p>	Yes	No

4 Conclusions

4.1 HRA Screening and Requirement for Appropriate Assessment

Stage 1 HRA screening of the Drought Plan 2022 has indicated that likely significant effects on the North Pennine Dales Meadows SAC and the Humber Estuary SAC could not be ruled out. Impacts on the North Pennine Dales Meadows SAC are a result of the implementation of the North Yorkshire Groundwater increased abstraction drought option. Impacts on the Humber Estuary SAC are a result of the implementation of the North Area Reservoir 1. An Appropriate Assessment for each option has been undertaken and are provided as **Appendix A**. The Appropriate Assessment for North Pennine Dales Meadows SAC concludes that abstraction from the proposed North Yorkshire Groundwater increased abstraction drought option will not have a likely significant effect on the qualifying features of the North Pennine Dales Meadows SAC. The Appropriate Assessment for Humber Estuary SAC concludes that the proposed North Area Reservoir 1 option will not have a likely significant effect on the qualifying features of the Humber Estuary SAC. The HRA screening concludes there are no likely significant effects on the Humber Estuary European Marine site (EMS) or other European Designated Sites within the drought option areas. **Table 3.2** shows the assessment for each drought option and **Table 3.3** shows the cumulative effects assessment for the Humber Estuary EMS. Accordingly, it is concluded that there are no other requirements for Appropriate Assessment.

The HRA has included Long Term Options (LTO) in the event of a third year of a drought, although the specific timing of the LTO is unknown. None of these options would lead to likely significant effects on a European site.

Should all of the River Ouse options be implemented in a third year of drought, the cumulative impact would be a moderate impact on river flows in the reach between two STW discharges and a minor impact on river flows downstream due to the flow contribution from the STWs. The cumulative impact on water quality downstream of a STW to the tidal limit due to reduced dilution is a minor change (7%) in ammonia concentrations and BOD at Q95 flows. The impacts of these changes in water quality are not considered to have a likely significant effect on water quality in the Humber Estuary EMS. It is important to distinguish between the impact of drought on the Humber Estuary and the additional impact due to implementation of the drought management options. The reduction in river flow due to the drought management options is ameliorated by the dry weather flow from a sewage works discharge, such that the reduction in the River Ouse discharge to the Humber Estuary is not considered to have a likely significant effect on water quality in the Humber Estuary.

4.2 In-combination Impacts

4.2.1 Between Yorkshire Water Drought Options

As identified above, cumulative impacts have been assessed between drought options and the conclusion reached that likely significant effects on the Humber Estuary SAC as a result of the combined implementation of the Ure increased abstraction and North Area Reservoir 1 options and could not be ruled out. As such, a Stage 2 HRA was required to determine whether the combined implementations of the drought options could cumulatively impact on the conservation objectives and subsequently site integrity of the European site.

The Information to inform the Appropriate Assessment is provided in full as **Appendix A**.

Additionally, it would be important to review the potential for cumulative effects on the Humber Estuary EMS as a drought develops, taking into consideration the prevailing water quality conditions, time of year, water temperatures and the prevailing quality of the key effluent

discharges to the river systems draining to the Humber. This information would be available from the in-drought baseline monitoring set out in the Environmental Monitoring Plan.

4.2.2 With neighbouring water companies

Assessment of cumulative impacts on the Humber Estuary EMS arising from drought plan options of neighbouring water companies that may affect river catchments draining to the Humber Estuary has also been carried out. There are no drought plan options in the Anglian Water Drought Plan 2019 that impact on the Humber Estuary. There are a small number of options in the River Trent basin in the Severn Trent Water Drought Plan 2019, but these are located a considerable distance upstream in the Derbyshire Derwent catchment and are assessed as having only a negligible impact on flows to the Humber Estuary.

Consequently, the cumulative impact of other water company drought plan options acting in combination with the Yorkshire Water Drought Plan is assessed as not having likely significant effects on the Humber Estuary EMS.

Appendix A: Information to Inform the Appropriate Assessment

Introduction

Requirement for Habitats Regulations Assessment

This Appendix presents the information required to inform the Appropriate Assessment of the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction options which must be undertaken by the competent authorities, in this case Yorkshire Water. This Appendix represents Stage 2 of the Habitats Regulations Assessment (HRA) process.

The Stage 2 assessment is required as screening has indicated that likely significant effects on the Humber Estuary Special Area of Conservation (SAC) could not be ruled out as a result of the implementation of the North Area Reservoir 1. In addition likely significant effects on the North Pennine Dales Meadows Special Area of Conservation (SAC) could not be ruled out as a result of the implementation of the North Yorkshire Groundwater increased abstraction drought option.

It should be noted that screening identified that the implementation of North Area Reservoir 1 and Ure increased abstraction may result in effects when considered in-combination. These potential effects are discussed below.

HRA Guidance for the appraisal of Plans³⁴, summarises the Habitats Regulations. Regulation 63(5) states that the Plan making authority (in this case Yorkshire Water) shall adopt, or otherwise give effect to the Plan, only after having ascertained that it will not cause a likely significant effect on the integrity of a European site, subject to Regulation 64 or 105 of the Habitats Regulations.

Regulation 64 of the Habitats Regulations states:

- If the competent authority is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), it may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be).
- (2) Where the site concerned hosts a priority natural habitat type or a priority species, the reasons referred to in paragraph (1) must be either—
 - (a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment; or
 - (b) any other reasons which the competent authority, having due regard to the opinion of the European Commission, considers to be imperative reasons of overriding public interest.

Regulation 105 of the Habitats Regulations states:

- Where a land use plan –
 - (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and
 - (b) is not directly connected with or necessary to the management of the site, the plan-making authority for that plan must, before the plan is given effect, make an appropriate assessment of the implications for the site in view of that site's conservation objectives.

³⁴ Tyldesley, D. & Chapman, C. (2015) The Habitats Regulations Assessment Handbook. DTA Publications. Version 4.

- (2) The plan-making authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specifies.
- (3) The plan-making authority must also, if it considers it appropriate, take the opinion of the general public, and if it does so, it must take such steps for that purpose as it considers appropriate.
- (4) In the light of the conclusions of the assessment, and subject to regulation 107, the plan-making authority must give effect to the land use plan only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).
- (5) A plan-making authority must provide such information as the appropriate authority may reasonably require for the purposes of the discharge by the appropriate authority of its obligations under this Chapter.
- (6) This regulation does not apply in relation to a site which is –
 - (a) a European site by reason of regulation 8(1)(c), or
 - (b) a European offshore marine site by reason of regulation 18(c) of the Offshore Marine Conservation Regulations (site protected in accordance with Article 5(4) of the Habitats Directive).

Article 6 of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna) states:

- 6(3). Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.
- 6(4). If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

The Integrity test

The integrity test is the conclusion of the Stage 2 HRA (Appropriate Assessment) and requires the competent authority to ascertain whether the Plan (either alone or in-combination with other plans or projects), will not have an adverse effect on site integrity. The following definition of site integrity is provided by Defra; the integrity of the site is:

“the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the level of populations of the species for which it was classified”³⁵.

From the evidence and assessments undertaken, a statement has been made as to whether it can be ascertained that the North Yorkshire Groundwater increased abstraction drought option alone, or in-combination with other plans or projects, will not cause a likely significant effect on the integrity of a European site.

³⁵ Defra Circular 01/2005.

Aims and content of this Appendix

This assessment considers the potentially damaging aspects of the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction drought options and the potential effects on the European sites' qualifying features and achievement of the conservation objectives.

The potential for adverse effect on the integrity of the site depends on the scale and magnitude of the proposed activity and its predicted impacts, taking into account the distribution of the designated features across the site in relation to the predicted impact and the location, timing and duration of the proposed activity and the level of understanding of the effect, such as whether it has been recorded before and, based on current ecological knowledge, whether it can be expected to operate at the site in question. Where qualitative and/or quantitative information is available, this has been used to inform the assessment. Where this information is not available, professional judgement has been used.

This report aims to set out, in sufficient detail for it to be transparent and understandable, what the effects of the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction drought options are likely to be on the internationally-designated site's qualifying feature, referring to relevant background documents and other information on which these judgements, which are essentially ecological judgements, rely. Guidance states that the size or complexity of the HRA Stage 2 report to inform the Appropriate Assessment will not necessarily reflect the scale of the project or plan, but rather the complexity of potential effects. The length of the report may not reflect the complexity of ecological judgements made to arrive at the necessary conclusions. Very complex ecological analysis and judgements may be expressed succinctly, with detailed supporting analyses contained in appendices or clearly referenced separate documents.

The main concern regarding the North Area Reservoir 1 drought option relates to the reduced flows and the potential changes in wetted width which could impact on the decrease in available marginal habitats utilised by qualifying lamprey species ammocetes (river and sea lamprey), i.e the qualifying features of the Humber Estuary SAC.

The main concern regarding the North Yorkshire Groundwater increased abstraction drought option relates to the increased abstraction and the potential increase in groundwater drawdown which could impact on the structure and function of water dependant habitat such as *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (purple moor-grass meadows), a qualifying feature of the North Pennine Dales Meadows SAC.

The following sections describe the European sites and their associated conservation objectives, the location of the SAC and the SPA in relation to the North Area Reservoir 1 and the North Yorkshire Groundwater increased abstraction options, the potential impacts on the European sites and the findings of the integrity test.

Potential impacts of the North Area Reservoir 1 Drought Option

Humber Estuary Special Area of Conservation (SAC)

The potential minor threat to the Humber Estuary Special Area of Conservation (SAC) is from the change in hydrology due to the drought option and the potential impacts on designated features resulting from this.

The site hosts both river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*). Sea and river lamprey are designated as part of the Humber Estuary SAC. Sea and river lamprey are Annex I (Habitats Directive) features and are classed as two separate features in the citation.

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following Species listed in Annex II:

- 1095 Sea lamprey *Petromyzon marinus*
- 1099 River lamprey *Lampetra fluviatilis*

Of particular concern with regards to the proposed scheme is the potential hydrological impact of the scheme on the habitat availability and connectivity for lamprey species. The River Ure and Burn, as part of the Humber Estuary catchment, may provide suitable habitat (ammocoete habitat) for river lamprey.

Both species can be present in parts of the Ouse catchment, though records of lamprey ammocoetes were not recorded to species level during historical surveys due to the difficulty in identification during the larval life-stage of lamprey. Lamprey ammocoetes are likely to be brook lamprey (which don't migrate from sea) in upper reaches given the significant barriers that are present in the catchment.

The North Area Reservoir 1 drought option aims to reduce the compensation release by 50% to 6.83MI/d from the date the permit is granted and to reduce further to 4.51MI/d if North Area Reservoir 1 stocks are below the regional Drought Control Line for more than four consecutive weeks. Although the minor threats to the SAC are related to hydrological changes (water velocity, wetted depth, wetted width) the drought permit implementation period is outside the spawning periods of the designated river lamprey – March to April, but could coincide with spawning period for sea lamprey. In addition, it is noted that the option may impact on the downstream migration for post-metamorphic transformers of both lamprey species.

Conservation Objectives

The Humber Estuary SAC Supplementary Advice on Conservation Objectives (SACOs) presents attributes for river lamprey, which may be impacted by drought permit implementation:

- Maintain the unrestricted usage of the estuary by adult and juvenile river lamprey including for migratory passage and juvenile development.
- Maintain the reproductive and recruitment capability of the species.
- Maintain the presence and spatial distribution of the species and their ability to undertake key life cycle stages and behaviours.
- Restore connectivity of estuarine features to surrounding rivers, freshwater, marine and coastal habitats, to ensure larval dispersal and recruitment, maintain nursery grounds for mobile species, and to allow movement of migratory

- Maintain the extent and spatial distribution of the following supporting habitats: water column.
- Maintain the abundance of preferred food items required by the species.
- Maintain the natural physico-chemical properties of the water.
- Maintain all hydrodynamic and physical conditions such that natural water flow is not significantly altered or constrained.

Location of SAC in relation to the North Area Reservoir 1

The most upstream point of the SAC most likely to be affected by the scheme are located approximately 95km from the most downstream end of the North Area Reservoir 1 impacted reaches.

The drought permit being assessed involves a reduction in the compensation flow release from North Area Reservoir 1 to the River Ure.

The operation of the option has the potential to impact on the flow/level regime downstream of the North Area Reservoir 1 within Pott Beck, River Burn and River Ure.

Three hydrological reaches have been identified:

- Reach 1: Pott beck from North Area Reservoir 1 to River Burn.
- Reach 2: River Burn from Pott Beck confluence to River Ure.
- Reach 3: River Ure from the River Burn confluence to the River Skell confluence.

Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey by impacting on recruitment and reproductive capability as well as the presence and spatial distribution of the species. Such impacts will become apparent where there is any habitat degradation and/or loss in connectivity between habitats and watercourses as a result of implementation of the drought permit.

Habitat / Connectivity degradation

The River Ure and Burn, as part of the Humber Estuary catchment, may provide suitable habitat (ammocete habitat) for both lamprey species.

Hydrological changes (water velocity, wetted depth, wetted width and natural flood regime) due to drought plan could result in lower flow leading to loss of important marginal habitats, water quality degradation (changes to physiochemical elements such as pH, temperature, ammonia and phosphate levels) and/or fragmentation of habitats and increased significance of obstacles/barriers.

Significant barriers have been identified within the reaches which significantly limits the upstream movement of poor swimming species such as lamprey during low flow and natural drought conditions. These barriers are considered non-passable even before the implementation of the drought permit (see sections below). Details regarding the geographical location and passability of the barriers within the impacted reaches of the North Area Reservoir 1 drought option is presented in **Table A2**.

A barrier assessment was completed within the zone of hydrological influence, including all three impacted reaches below above. The assessment included a desktop review, and satellite imagery of all available barrier datasets for known obstruction in order to identify the likely passability under low flow conditions

Pott Beck:

The presence of a significant barrier has been identified within the downstream reach which significantly limits the upstream movement of poor swimming species such as river and sea lamprey under majority flow conditions. The barrier is considered non-passable even before the implementation of the drought permit.

In summary, the evidence provided below shows that the North Area Reservoir 1 Drought Option would have no adverse impact on the integrity of the European site.

River Burn:

Isolated, small areas of optimal and suboptimal habitats are limited within the impacted reach. The reach characterised by extensive areas of large boulder and fast sections of run/riffle habitat. Habitat connectivity was poor with marginal soft sediment dispersed over the reach. Possible spawning habitat was noted in the lower section of the reach however this was not optimal. Therefore, any potential ammocoete habitat noted above the possible spawning habitat will not provide ammocoete habitat as lamprey larvae drift downstream from spawning habitat before settling in suitable soft sediment. The drought permit implementation period is outside the spawning periods of the designated river lamprey – March to April, and it is therefore considered to pose no risk on this stage of the life cycle.

The drought permit will not be implemented within the upstream migration period of river lamprey associated with the Humber Estuary and the reach can be classified as not providing functionally linked offsite habitat. The implementation of the option may coincide with spawning period for sea lamprey, however due to the presence of significant impassable barriers within the impacted reaches and downstream in the catchment the implementation of the drought permit will not have an adverse effect on migration.

River Ure:

The River Ure as part of the Humber Estuary catchment may provide suitable habitat (ammocoete habitat) for river lamprey.

Significant barriers have been identified within the reach which may significantly limit the upstream movement of poor swimming species such as lamprey during low flow and natural drought conditions. Some of these barriers are considered non-passable even before the implementation of the drought permit (see sections above).

Baseline data within the River Ure show no records of river lamprey within the impacted reach of the River Ure, with limited records in the River Ure catchment downstream of the impacted reaches.

Due to the presence of significant barriers, it is assumed that the associated river reaches provide limited functionally linked habitat to support the population abundances of the migratory species associated with the Humber Estuary.

In addition, should any ammocoete be present, no adverse effects are unlikely as the impacts on wetted margins are considered minor at most due to the lowland nature of the Ure. The impacted reach is moderately sinuous lowland river surrounded by extensive floodplains with a varied Channel width between 27-47m, although the channel is generally around 30-36m wide. Minor changes in wetted width are unlikely to impact the available habitat within the reach.

Summary of impacts

In summary, the evidence provided above shows that the North Area Reservoir 1 drought option would have no adverse impact on the integrity of the European site.

Integrity Test

In conclusion, the North Area Reservoir 1 drought option will not have an impact on the conservation objectives or the qualifying features of the Humber estuary SAC. As such, the North Area Reservoir 1 drought option will not have a likely significant effect on the integrity of the European site.

Table A1: Details of the barriers within the impacted reaches of North Area Reservoir 1

Site Name	NGR	Catchment	Barrier	Slope (m)	Slope Length (m)	Number of Steps	Velocity over Slope	Passable for Lamprey	Notes
72594	[Grid References Redacted]	Ure	Wier	Variable (Stepped)		4	Medium	Unlikely	Pool ramp fish pass on LHB 6 pods approx. 3m wide - non rounded edges - turbid flow and deep pools means lamprey unlikely to pass
64181		Ure	Wier	Variable (1 in 4 and 1 in 1 lower)	10		High	Yes (right bank)	Fish pass on RHB has a Denil design making it passable for lamprey
0		Ure	Wier	>1 in 1	>6 to 9		Medium	Yes	Single step (20cm to 40cm) - concrete apron downstream of bridge unlikely to be a barrier under high flows. RHB and LHB passable
71124		Ure	Wier	Variable (Step at toe)	>2-6			Yes under high flows on RHB	RHB - Increased slope lower velocity more likely to passable LHB - Steep 0.5m drop - turbulent
55011		Ure	Wier	1 in 4 - 1 in 1			Medium	Yes	Passability is fine - 1 step bed level change - not a barrier to migration
N/A		Ure	Wier	Variable (Stepped)		4 (30cm each)	Medium	RHB Possible	Stepped weir - not passable. RHB - possible passage through culvert unclear due to vegetation
N/A		Ure	Sluice	>1 in 1					Sluice gate potential barrier - lamprey habitat downstream
59611		Ure	Wier	1 in 4 - 1 in 1	>2-6		Medium	Unlikely	Fish pass on LHB, type unclear - High velocity potentially high turbidity - not passable at weir
75842		Burn	Wier	1 in 4 - 1 in 1	>2-6		Low	Yes (Under high flows)	No lamprey habitat u/s or d/s of structure - lamprey may pass under high flows
62738		North Area Reservoir 1 (Potbeck)	Dam	<1 in 4	>10		Low	No	Spill way to North Area reservoir 1 - no migration upstream - no loss of sites functional habitat

Figure A1: Location barriers within the impacted reaches of North Area Reservoir 1

Figure redacted for security purposes

Potential impacts of the North Yorkshire Groundwater increased abstraction Drought Option

North Pennine Dales Meadows SAC

The potential major threat to the North Pennine Dales Meadows SAC is from the change in hydrology due to the drought option and the potential impacts on designated features resulting from this. The site contains a series of isolated fields within several north Pennine and Cumbrian valleys and encompasses the range of variation exhibited by mountain hay meadows in the UK. The grasslands included within the site exhibit very limited effects of agricultural improvement and show good conservation of structure and function. A wide range of rare and local meadow species are contained within the meadows, including globeflower *Trollius europaeus*, the lady's-mantles *Alchemilla acutiloba*, *A. monticola* and *A. subcrenata*, and spignel *Meum athamanticum*.

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caerulea*) (purple moor-grass meadows).
- Mountain hay meadows.

Of particular concern with regards to the proposed scheme is the potential hydrological impact of the scheme on the *Molinia* meadows. These meadows are found mainly on moist, moderately base-rich, peats and peaty gley soils, often with fluctuating water tables. This habitat type includes the most species-rich *Molinia* grasslands in the UK, in which purple moor-grass *Molinia caerulea* is accompanied by a wide range of associated species, including rushes, sedges and tall-growing herbs.

The North Yorkshire Groundwater increased abstraction drought option aims to increase average abstraction by 2MI/d (from 8MI/d to 10MI/d) and peak abstraction from 12.5 to 14.5MI/d. Although the major threats to the SAC are related to soil compaction and land use management, there remains uncertainty with regards to the extent of drawdown associated with the increased abstraction and the subsequent impact on groundwater.

Conservation Objectives

The conservation objectives for North Pennine Dales Meadows SAC aims to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

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

Location of SAC in relation to the North Yorkshire boreholes

Details regarding the geographical location of the SAC in relation to the North Yorkshire Groundwater increased abstraction drought option is presented in **Table A22**. The units of the SAC most likely to be affected by the scheme are located between 4.9km and 6.7km from the North Yorkshire boreholes. North Pennines Dales Meadows Unit 1 is associated with the Richmond Meadows Site of Special Scientific Interest (SSSI), while Unit 2 and Unit 3 are associated with the Gingerfields SSSI.

Table A2: SAC geographical details

SAC name and NGR	Associated SSSI	Distance from borehole to closest point on boundary (km)	Surface elevation (lowest point) (mAOD)	Difference in surface elevation between SAC and borehole (68.4mAOD) (mAOD)
North Pennines Dales Meadows (Unit 1) (NZ1757900764)	Richmond Meadows	4.911	100.6	32.2
North Pennines Dales Meadows (Unit 2) (NZ1671102229)	Gingerfields	5.966	214	145.6
North Pennines Dales Meadows (Unit 3) (NZ1608402419)	Gingerfields	6.692	240	171.6

Richmond Meadows

Richmond Meadows are of special interest for their areas of unimproved neutral grassland of a type that is rare and threatened at the local and national levels. The nature conservation is maintained through hay meadow management without agricultural intensification. The site comprises two fields (SSSI units) which lie at altitudes of approximately 100m (eastern field) and 150m (western field) above sea level. Both lie on moderately sloping ground, the former on a north-facing slope, the latter south-facing. The grassland communities present are typical of traditionally managed hay meadows of the Northern English Uplands.

Despite the differences in altitude and aspect, the two units are very similar in character and retain a rich flora throughout with a diverse range of hay meadow species. Wood crane's bill, ribwort plantain (*Plantago lanceolata*), common sorrel (*Rumex acetosa*), sweet vernal-grass and red fescue (*Festuca rubra*) are common components of both swards. Also occurring in both fields are meadow crane's bill (*Geranium pratense*), pignut (*Conopodium majus*), meadow vetchling (*Lathyrus pratensis*), crested dog's tail (*Cynosurus cristatus*), common mouse-ear (*Cerastium fontanum*), and lady's-mantle (*Alchemilla glabra*).

Localised variations in soil moisture contribute to variety in the sward's species composition, with great burnet (*Sanguisorba officinalis*) and meadowsweet (*Filipendula ulmaria*) being locally frequent on the damper areas. A marked ditch runs across the eastern field and this supports a range of moisture-loving species absent from the western half of the site, including, marsh-marigold (*Caltha palustris*), yellow iris (*Iris pseudacorus*), reed canarygrass (*Phalaris arundinacea*) and floating sweet-grass (*Glyceria fluitans*).

A condition assessment of the SSSI habitat units indicated that the habitats were in an Unfavourable (recovering) and favourable condition respectively. Considering the grassland species associated with the Richmond Meadows SSSI, the meadows are most likely representative of the Annex 1 habitat - Mountain hay meadows. This habitat type is not considered to be a water dependant habitat³⁶.

Gingerfields

Gingerfields comprises two meadows in close proximity which are botanically rich and depend on the continuation of traditional grazing and mowing management for the survival of their flora.

The eastern field (SSSI unit 1) is bounded by trees and shrubs including ash *Fraxinus excelsior*, hazel *Corylus avellana*, blackthorn *Prunus spinosa* and dog-rose *Rosa canina*. The

³⁶ UK Technical Advisory Group on the Water Framework Directive (2003). Guidance on the Identification of Natura Protected Areas [Final].

sward is characterised by sweet vernal-grass *Anthoxanthum odoratum*, crested dog's-tail *Cynosurus cristatus*, yellow oat-grass *Trisetum flavescens*, quaking-grass *Briza media* and false oat-grass *Arrhenatherum elatius*. Herbs are abundant and include wood crane's-bill *Geranium sylvaticum*, meadow crane's-bill *G. pratense*, oxeye daisy *Leucanthemum vulgare*, red clover *Trifolium pratense*, cowslip *Primula veris*, meadow vetchling *Lathyrus pratensis*, lady's-mantle *Alchemilla* agg., betony *Stachys officinalis* and goat's-beard *Tragopogon pratensis*.

The western field (SSSI unit 2) supports two distinct grassland types. Areas of thin soils have a calcicolous (lime-loving) sward typified by sheep's-fescue *Festuca ovina*, salad burnet *Sanguisorba minor*, common rock-rose *Helianthemum nummularium*, lady's bedstraw *Galium verum* and mouse-eared hawkweed *Hieracium pilosella*. The majority of the field supports a more neutral sward of crested dog's-tail, sweet vernal-grass, common bent *Agrostis capillaris* and perennial ryegrass *Lolium perenne*. Herbs include ribwort plantain *Plantago lanceolata*, cat's-ear *Hypochoeris radicata* and great burnet *Sanguisorba officinalis*. Most notably, the field supports a large population of the regionally rare species, meadow saffron *Colchicum autumnale*.

A condition assessment of the SSSI habitat units indicated that the habitats were in an unfavourable (recovering) and favourable condition respectively. Considering the grassland species associated with the Gingerfields SSSI, the meadows are most likely representative of the Annex 1 habitat - Mountain hay meadows. This habitat type is not considered to be a water depended habitat³⁷.

Potential Impact on SAC designated features

Geology

A review of the geology associated with the study area has been undertaken. The North Yorkshire borehole lies on a fault between Millstone Grit Group mudstones (to the south, Namurian stage: 326-315Ma (millions of years) and Richmond Chert (to the north, Pendelian stage: ~326Ma).

The geology of the North Pennine Dales Meadows SAC is described as follows:

- Unit 1: lies mostly on Richmond Chert. A small section of the SAC lies on Great Limestone Member (Pendelian, ~326Ma). (The Great Limestone Member is also known as the Main Limestone on British Geological Survey (BGS) 50k geological maps).
- Unit 2: Lies nearly wholly upon the Great Limestone Member. A small section of the site margin lies on Richmond Chert.
- Unit 3: Lies mostly upon the Alston Formation (sandstone) (Asbian stage to Pendelian stage, ~337.5-326Ma). Southern and western margins lie on the Great Limestone Member.

Faulting can commonly control groundwater movement. The borehole lies on an SW-NE trending fault, with no faults linking with SACs. Unit 3 lies on a fault but is not connected to others in the area (according to BGS mapping). It is therefore highly likely that there is no fault connectivity between the three sites and the borehole and it is assumed that there is no connectivity in groundwater between the sites and the borehole.

³⁷ UK Technical Advisory Group on the Water Framework Directive (2003). Guidance on the Identification of Natura Protected Areas [Final].

Hydrogeology

A review of *Magic.gov.uk* shows no presence of springs at any of the three sites on its 1:10000 OS mapping layer.

BGS hydrogeology classification data (625k scale) indicates that the lithologies forming the rockhead around the borehole and outwards to the north and west (encompassing the three SAC sites) are the Yordale Group aquifers which are classed as multi-layered, moderately productive aquifers where flow is virtually all through fractures and discontinuities. The BGS data indicates that in these rocks, yields of less than 5l/s are common with most water being derived from limestones and sandstones. On the south side of the fault, where the borehole is situated, the BGS data indicates the rocks are of the Millstone Grit Group aquifer, also a regionally significant, multi-layered, moderately productive aquifer where virtually all flow is through fractures and other discontinuities.

At the North Yorkshire boreholes, BGS aquifer properties data state that the borehole abstracts from the Stainmore Formation, which suggests that the source aquifer is likely the Great Limestone Member.

Consideration of Environment Agency Source Protection Zones shows that there is a Zone 1 plotted around the North Yorkshire boreholes. This is funnel shaped with the wide end of the funnel pointing due west. The largest distance between the boundary of Zone 1 and the borehole itself is not more than 890m. At its nearest, the River Swale is located approximately 64m south of the North Yorkshire boreholes, outside of the Source Protection Zone.

There are two BGS boreholes drilled by George Stow for Yorkshire Water around the abstraction site:

- SE29NW91 (93.5m depth):
http://scans.bgs.ac.uk/sobi_scans/boreholes/83334/images/14440971.html
- SE29NW121 (93.8m depth):
http://scans.bgs.ac.uk/sobi_scans/boreholes/83304/images/10097947.html

Both boreholes were drilled between 2 September 1996 to 13 November 1996 and it appears that both of the aforementioned borehole logs are the same. Data indicates that the boreholes are lined to 46mbgl. It is assumed that these are directly related to the North Yorkshire boreholes. In the logs, the borehole is stated to be artesian and is lined to maintain this. The pumping rate was recorded as 144.7l/s with a pumped water level of 11.99mbgl. The log notes *“Two sets of casings were grouted in to ensure the artesian pressure could be contained at which ever depth it was encountered. Having hit a fissure at 81m the hole made water during drilling.”* The lithology at 81mbgl is noted as *“Hard yellow/grey limestone”* of 6.5m in thickness.

The A8802 Resource Study report³⁸ indicates that the principal source rock for the borehole is the Great Limestone Member (which underlies the Richmond Chert). In addition to this, the report also indicates that water is supplied to the borehole from the underlying Yordale Cycle rocks of the Wensleydale Group. The aquifers are complex multi-layered aquifers comprising sequences of limestone, mudstone and sandstones. Correlation of the aforementioned borehole logs and BGS cross-section and stratigraphic log on BGS 1:50000 map sheet 41 indicates that the Four Fathom Limestone is located around 81mbgl and this is likely to be the other key groundwater source rock supplying the North Yorkshire boreholes. The presence of artesian conditions indicates a confined aquifer, and data indicates artesian flow from a head of up to 6m above ground level³⁹.

³⁸ Arup (2006). A8802 Resource Study. Factual Report. September 2006. 123pp.

³⁹ Ibid.

The combination of geological data and the study report therefore indicate that the Great Limestone Member and Four Fathom Limestone are the main sources of water to the borehole, with the former lithology being the principal source.

The Great Limestone Member outcrops around 3km north west of the site and it is possible that this is in hydraulic continuity with the Richmond Chert and the rocks of the underlying Wensleydale Group. Several potential areas of recharge of the aquifer have been identified, specifically from rainfall falling on the Great Limestone Member where it outcrops to the north and north west or Richmond, indirect recharge through superficial deposits and upward leakage from the underlying Carboniferous limestones particularly along faults and fractures⁴⁰. Analysis of structural geology of the area indicates that these rocks lie on the southern limb of an anticlinal axis, the Middleton Tyas Anticline. As strata dip gently (~6-9°) in a southeasterly direction, groundwater flows are highly likely to follow the stratal dip. Therefore, the recharge areas are likely to lie to the north and northwest of Richmond.

Since all three units of the SAC lie to some degree on the Great Limestone Member or on a lithology likely to be in hydrological connectivity to it, and hence lie within recharge areas for the borehole, there are questions regarding the potential for impacts on groundwater at these sites.

However, the pressure head in the borehole leads to a piezometric surface for the confined water table to be around 6m above the ground level at the borehole (artesian) when the borehole is not being pumped⁴¹. The surface elevation at the borehole is around 68mAOD which places the confined water level at around an elevation of 75mAOD. Any drawdown during pumping will lower this piezometric surface. Even though the three SAC units lie on the primary source lithology for the water in the borehole, they all lie at elevations significantly higher than 75mAOD (Table A2) (the lowest being Unit 1 which is ~35m higher than this level). This indicates that although they lie in the recharge zone, they are all well above the confined groundwater water table even when the borehole is not being pumped.

Summary of impacts

The Resource Study report and analysis of borehole log for the borehole indicate that the Great Limestone Member is the principal aquifer at the borehole, with another source contributing, likely the Four Fathom Limestone. The aquifer itself is confined. These aquifers are multi-layered consisting of limestone beds with interbedded mudstones, siltstones and sandstones. BGS data indicates that the aquifer is likely to be moderately productive aquifer with flow being virtually all through fractures and discontinuities.

Analysis of BGS geological data, particularly faults, indicates that the boreholes lie on a fault. Importantly this fault system does not appear to be connected, or pass close to, any of the three SAC Units. Unit 1, lies on Richmond Chert, Unit 2 lies mostly on the Great Limestone member while Unit 3 lies mostly on the Alston Formation. There are no springs identified on high resolution OS mapping at any of these sites. The lithologies on which these SACs are found are either the principal source for the borehole or likely hydrologically connected to it (Great Limestone Member) and as such the SACs lie within the rainwater recharge area of the borehole.

Although the Four Fathom Limestone has been identified as another source, the SACs lie on rocks which are geologically younger and lie stratigraphically below the Four Fathom Limestone. This, and the presence of less permeable lithologies stacked vertically, indicates there is likely to be no impact on draw down in the Four Fathom Limestone.

⁴⁰ Ibid.

⁴¹ Arup (2006). A8802 Resource Study. Factual Report. September 2006. 123pp.

The borehole is artesian, with a piezometric surface which is ~6mAOD above the ground level at the borehole. This means that the rest water level in the confined aquifer from which water is abstracted is no more than 75mAOD elevation. Compared with all three SAC sites, this is significantly lower than the elevation of these sites. Therefore, all three sites already lie above the groundwater water table and cannot be affected by drawdown.

It is also noted that the three SAC units are associated with the Richmond Meadows SSSI and Gingerfields SSSI respectively. Priority habitat data indicates that the habitats associated with these SSSIs are mountain hay meadows and this habitat is not considered to be a water dependant habitat.

Therefore, given the evidence presented above, namely faults, the absence of springs, stratigraphic relationships, dependency of vegetation habitats on water and relationships between groundwater level and SAC site elevation, it is concluded that even though the SACs lie within the recharge area, the sites cannot be impacted by abstraction from the borehole.

Integrity Test

In conclusion, the North Yorkshire Groundwater increased abstraction drought option will not, alone or in-combination with other plans or projects, have an impact on the conservation objectives or the qualifying features of the North Pennine Dales Meadows SAC. As such, the North Yorkshire boreholes drought option will not have a significant adverse effect on the integrity of the European Site.

Potential In-combination impacts of the North Area Reservoir 1 and Ure increased abstraction Drought Options

Humber Estuary Special Area of Conservation (SAC)

The potential minor impact on the Humber Estuary Special Area of Conservation (SAC) is from the change in hydrology due to the combined implementation of the drought options and the potential cumulative impacts on designated features resulting from these.

The site hosts both river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*). Sea and river lamprey are designated as part of the Humber Estuary SAC. Sea and river lamprey are Annex I (Habitats Directive) features and are classed as two separate features in the citation.

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following Species listed in Annex II:

- 1095 Sea lamprey *Petromyzon marinus*
- 1099 River lamprey *Lampetra fluviatilis*

Of particular concern with regards to the proposed scheme is the potential hydrological impact of the scheme on the habitat availability and connectivity for lamprey species. The River Ure, downstream of the River Burn confluence to the confluence with the River Skell, and may provide suitable habitat (ammocoete habitat) for lamprey.

Both species can be present in parts of the Ouse catchment, though records of lamprey ammocoetes were not recorded to species level during historical surveys due to the difficulty in identification during the larval life-stage of lamprey. Lamprey ammocoetes are likely to be brook lamprey (which don't migrate from sea) in upper reaches given the significant barriers that are present the catchment.

The North Area Reservoir 1 drought option aims to reduce the compensation release by 50% to 6.83MI/d from the date the permit is granted and to reduce further to 4.51MI/d if North Area Reservoir 1 stocks are below the regional Drought Control Line for more than four consecutive weeks. Although the minor threats to the SAC are related to hydrological changes (water velocity, wetted depth, wetted width) the drought permit implementation period is outside the spawning periods of the designated river lamprey – March to April, but could coincide with spawning period for sea lamprey. In addition, it is noted that the option may impact on the downstream migration for post-metamorphic transformers of both lamprey species.

Location of SAC in relation to the cumulative impact reach of North Area Reservoir 1 and Ure increased abstraction

The most upstream point of the SAC most likely to be affected by the scheme are located approximately 95km from the most downstream end of the North Area Reservoir 1 and Ure increased abstraction impacted reach at the confluence with the river Skell.

The drought permits being assessed involves a reduction in the compensation flow release from North Area Reservoir 1 to the River Ure and the increased abstraction from the River Ure.

The operation of the options has the potential to impact on the flow/level regime downstream of the confluence of the River Burn to the confluence of the River Skell.

Any reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey by impacting on recruitment and reproductive capability as well as the presence and spatial distribution of the species. Such impacts will become apparent where there is any habitat degradation and/or loss in connectivity between habitats and watercourses as a result as a result of implementation of the drought permit.

As summarised in the North Area Reservoir 1 assessment above, impacts on passability isn't expected due to the presence of significant impassable barriers under both drought and normal conditions.

Due to the presence of these barriers, any functional habitat will be limited and impacts on this habitat is expected to be minor at most because of the lowland nature of the system with minor impacts on marginal habitats and there will still be significant areas of habitat available.

Summary of impacts

In summary, the evidence provided above shows that the North Area Reservoir 1 and Ure increased abstraction drought options would have no adverse impact on the integrity of the European site.

Integrity Test

In conclusion, the North Area Reservoir 1 and Ure increased abstraction drought options will not, alone or in-combination, have an impact on the conservation objectives or the qualifying features of the Humber estuary SAC. As such, the North Area Reservoir 1 drought option will not have a significant adverse effect on the integrity of the European Site.

Conclusion

Stage 1 HRA screening has indicated that likely significant effects on the Humber Estuary SAC could not be ruled out as a result of the implementation of the North Area Reservoir 1 drought option, alone or in-combination with Ure increased abstraction. Additionally, Stage 1 HRA screening has indicated that likely significant effects on the North Pennine Dales Meadows SAC could not be ruled out as a result of the implementation of the North Yorkshire

Groundwater increased abstraction drought option. Similarly, the Stage 1 HRA screening also concluded that likely significant effects on the South Pennine Moors (Phase 2) SPA could not be ruled out as a result of the construction activities associated with the new pipeline for the North Yorkshire Groundwater increased abstraction drought option.

HRA Guidance indicates that the Plan making authority (in this case Yorkshire Water) shall adopt, or otherwise give effect to the Plan, only after having ascertained that it will not adversely affect the integrity of a European site. As such, a Stage 2 HRA was required to determine whether the implementations of the North Yorkshire Groundwater increased abstraction and North Area Reservoir 1 drought options could impact on the conservation objectives or the qualifying features of the North Pennine Dales Meadows SAC/the South Pennine Moors (Phase 2) SPA and Humber Estuary SAC respectively.

The units of the SAC most likely to be affected by the North Yorkshire Groundwater increased abstraction drought option are located between 4.9km and 6.7km from the North Yorkshire boreholes location. Analysis of geological and borehole data⁴² indicate that the SACs are above the groundwater water table level and that the SACs are designated for non-water dependant features. As such, it is concluded that abstraction from the proposed North Yorkshire Groundwater increased abstraction drought option will not have a significant adverse effect on the qualifying features of the North Pennine Dales Meadows SAC.

The qualify features, river and sea lamprey may be impacted by the implementation of the option within the Ouse catchment (River Ure). Based on detailed habitat mapping and barrier assessments of the impacted reaches it has been determined that the impacted reaches do not serve of functionally linked habitat for qualifying lamprey species. As such, it is concluded that the proposed North Area Reservoir 1 and Ure increased abstraction options will not have a significant adverse effect on the qualifying features of the Humber Estuary SAC.

⁴² Arup (2006). A8802 North Yorkshire Groundwater Borehole Resource Study. Factual Report. September 2006. 123pp.



T: +44 (0) 1235 753000

E: enquiry@ricardo.com

W: ee.ricardo.com